Our Region's Trusted Water Leader
San Diego County Water Authority

December 3, 2021

Areeba Syed
Metropolitan Water District of Southern California
Post Office Box 54153
Los Angeles, CA 90054-0153

RE: Multi-Jurisdictional Optimization of Surface and Groundwater Supplies in the San Dieguito River Watershed Project – Final Report (FSA Agreement 190387)

Dear Ms. Syed:

San Diego County Water Authority submits the Final Report for the Multi-Jurisdictional Optimization of Surface and Groundwater Supplies in the San Dieguito River Watershed Project as documented in FSA Agreement 190387.

The attached Final Report submittal includes the discussion items required per the agreement along with the technical report provided by Olivenhain Municipal Water District's consultant Geoscience Support Services, Inc., as supporting documentation.

The total budget for the study was $1,207,694 with a not to exceed $175,000 funding match from MWD. The study was revised to these amounts through the First Amendment executed on September 22, 2020. Total amount of funds submitted to date for the study is $131,250 with $43,750 remaining as retention.

I am informed and believe that the information contained in this report is true and that the supporting date is accurate and complete. Should you have any questions, please contact me at jcrutchfield@sdcwa.org or (858) 522-6834.

Sincerely,

Jeremy Crutchfield
Water Resources Manager

Enclosure(s):

Multi-Jurisdictional Optimization of Surface and Groundwater Supplies in the San Dieguito River Watershed Project – FINAL REPORT

Future Supply Actions Funding Program

Final Report

Project Title:	Multi-Jurisdictional Optimization of Surface and Groundwater Supplies in the San Dieguito River Watershed Project
Grant:	Metropolitan Water District of Southern California's (Metropolitan) Future Supply Actions Funding Program
Recipient:	San Diego County Water Authority (SDCWA) 4677 Overland Ave., San Diego, CA 92123
Sub-Agency:	Olivenhain Municipal Water District (OMWD) 1966 Olivenhain Road Encinitas, CA 92024
Contact:	Jeremy Crutchfield, Water Resources Manager jcrutchfield@sdcwa.org 858-344-3878
Sub-Agency Contact(s):	John Carnegie, Customer Services Manager jcarnegie@olivenhain.com 760-753-6466 Teresa Chase, Administrative Analyst tchase@olivenhain.com 760-415-3458
Date Submitted:	December 3, 2021

Section 1: Executive Summary

In 2020, OMWD provided 17,100 acre-feet (AF) of potable water to its customers. 100 percent of this water was imported water supplied by SDCWA. A new groundwater supply could potentially be drought-resilient, reliable, cost competitive, and locally controlled. A 2017 study concluded that the San Dieguito Valley groundwater basin within OMWD was a feasible supply for a desalination treatment plant producing at least 1 million gallons a day (MGD) (1,120 AFY) of potable water. However, the reliability of the supply required further confirmation. This FSA report summarizes the project report entitled Report of Design Pilot Testing for the San Dieguito Valley Brackish Groundwater Desalination Project dated August 2021, Attachment A.

The basin consists of a shallow and deep aquifer, separated by an aquitard. There are existing wells in both aquifers. The Design Pilot 12-month pump test provided pumping rate and groundwater level data that was used to re-calibrate the 2017 groundwater model. Modeling of the proposed project to supply a 1 MGD production showed that the decrease in basin storage was less than one percent of basin capacity, a minor impact. Depending on where project wells are located, there could be some localized drawdown in existing wells in the vicinity, that may need to be mitigated. The results of the 2017 study were confirmed, and OMWD will be continuing its investigation into the San Dieguito Groundwater Basin as a source for municipal water supply. The information in the project report will be useful for agencies considering development of a coastal brackish groundwater basin. Specifically, the information on test wells, pump testing, groundwater modeling, and iron and manganese removal will be beneficial.

Section 2: Introduction

FSA Report Organization

The Design Pilot testing is described is greater detail in the following sections of this report, which is organized consistently with Metropolitan's Final Report Format:

- **Section 2: Introduction** – Overview of tasks and accomplishments, summary of findings, and role/involvement of partnering/supporting agencies.
- **Section 3: Cost Summary** – Planned and actual budgets, differences, and problems encountered and addressed.
- **Section 4: Schedule Summary** – Planned and actual schedules, problems encountered and addressed.
- **Section 5: Study Results and Analysis** – The study results and findings, achievement of goals and objectives, problems encountered and resolved, and how the findings can be applied to other areas in the region.
- **Section 6: Conclusions** – Lessons learned and next steps.

Study Overview

The study was comprised of six specific tasks: Pilot Hole and Test Well Construction; Long Term Pump Testing; Recalibration of Groundwater Model;

Hydrogeologic Investigation Report; Field Testing Manganese Pre-Treatment; and Refinement of Treatment Design Criteria. An overview of how the work was performed, along with accomplishments, is provided below. A location map, Figure 1 from Attachment A, is included at the end of this report.

- **Pilot Hole and Test Well Construction** – OMWD partnered with Surf Cup Sports to site the test well near the San Dieguito River and soccer fields. The SCS facility is leased from the City of San Diego, who provided an easement for the well. A consultant was retained to select a well location and design the well and pump. A pilot hole was drilled to verify that the geology was suitable. A contractor was retained to drill the pilot hole, and then drill and construct the test well. The test well was successfully completed and utilized for the long-term pump test.
- **Long-Term Pump Testing** – OMWD and its consultants started the pump test in December 2019 and ran the pump nearly continuously for 12 months. Consultants collected pumping rates, groundwater level, and groundwater quality data from a network of wells in the Valley. The pump test was successfully completed and the data compiled.
- **Recalibration of Groundwater Model** – OMWD's consultant successfully re-calibrated the groundwater model developed in 2017 with three additional years of data, including data from the 12-month pump test.
- **Hydrogeologic Investigation Report** – The hydrogeologic report, Attachment A, combines all the data and data analysis that was collected and prepared from the drilling, construction, development, and testing procedures, along with the long-term test monitoring, and the groundwater model update.
- **Field Testing Manganese Pre-Treatment** – A vendor was hired to test two technologies, Greensand Plus and Mang–Ox, with water from the well, over 10 to 12 hours per day, for two days. The target removal for iron and manganese levels were achieved by each technology. The testing was successfully completed and documented in a report entitled "San Dieguito Valley Brackish Groundwater Desalination Design Pilot – Refine Manganese Treatment Design Criteria Report," August 26, 2020, by Woodard & Curran, Attachment A, Appendix M.
- **Refinement of Treatment Design Criteria** – The design feed water quality has been updated based on sampling and analysis completed during the Design Pilot Project pump test. The pretreatment process field testing confirmed the design criteria from the 2017 report. The refinement is described further in Section 5 and it is documented in the report cited above.

Brief Description of Study Findings

The additional key findings from the design pilot included:

- The impacts to the deep aquifer were local to the test well. Water levels showed the most decline during the dry period of 2020. Once the long-term pumping test was completed, water levels showed complete recovery, suggesting that inflows to the basin can support current groundwater uses. Figure 12 from Attachment A presents the ground water levels in the test well during the pump test. Figure 29 from Attachment A, included at the end of this report, presents the groundwater levels for the impacted wells.

- The groundwater model was recalibrated for 20 years of data from 41 target wells and over 2,400 data points. The relative error was 6.8 percent where 10 percent or less is considered a "good fit."
- With the recalibrated groundwater model, a project simulation of an extraction of 1,600 acre-feet per year (AFY), to support a potable water production of 1,120 AFY or 1 MGD, indicated a reduction in basin capacity of 150 AF. This was during the predominately dry hydrologic period used by the model. Historical data shows that the basin recovers during wet periods.

Role/Involvement of Each Partnering/Supporting Entity

- **Olivenhain Municipal Water District** – Proponent of the San Dieguito Valley Brackish Groundwater Desalination Project, Design Pilot Phase. Project manager and principal funding agency.
- **California Department of Water Resources** – Funding partner through the Water Desalination Grant Program.
- **Metropolitan Water District of Southern California & San Diego County Water Authority** – Funding partners through the Future Supply Actions funding program.
- **City of San Diego** – Provided an easement for the construction of the test well.
- **State Water Resources Control Board** – Provided a permit for the test well discharge.
- **Geoscience Support Services, Inc.** – Consultant to Olivenhain MWD for Tasks 1 through 6. Woodard & Curran, subconsultant to Geoscience.
- **Surf Cup Sports** – Site for test well. Beneficial use of a portion of the pump test discharge.
- Various private well owners agreed to monitoring of production and water levels.

Section 3: Cost Summary

The initial budget and MWD funding match for the project was $1,347,694 and $245,000, respectively, and included four tasks led by the City of San Diego. Due to COVID-19, the City of San Diego was unable to facilitate these tasks. As a result, the tasks were formally removed and the total budget for the study was revised to $1,207,694 with $175,000 funding match from MWD following execution of the First Amendment on September 22, 2020. The study was completed with no significant revisions or impacts to the total study cost and MWD funding match. However, an adjustment was issued to revise the cost per task level slightly due to changes in the effort needed to complete each task during the actual implementation of the study. Below is a summary of the adjustment made to the task level budgets.

Adjustment No. 1

- Requested as a result of additional Reimbursable Costs remaining in Task 5 – Field Test Manganese Pre-Treatment (-$3,740) and Task 6 – Refinement of Treatment Design Criteria (-$1,052). Excess Reimbursable Costs in those tasks were reallocated to Task 3 – Recalibration of Groundwater Model (+1,067) and Task 4 – Hydrogeologic Investigation Report (+$3,725).

Approved budget and actual costs for each task are shown in Table 1 below.

Table 1. Design Pilot Testing Study Budget

No	Task	Planned Budget	Actual Costs	Difference	Problems encountered and addressed	FSA Funding Match
1	Pilot Hole and Test Well Construction	$756,381	$ 659,104	($97,277)	N/A	$121,908
2	Long-Term Pump Test	$142,781	$ 330,317	$187,536	Start of the pump test was delayed while OMWD secured an easement and established the monitoring network.	$21,744
3	Recalibration of Groundwater Model	$56,154	$ 80,867	$24,713	Began later than anticipated due to pump test delay.	$7,306
4	Hydrogeologic Investigation Report	$58,898	$37,504	($21,394)	Began later than anticipated due to pump test delay.	$13,218
5	Field Testing Manganese Pre-Treatment	$21,182	$61,040	$39,858	Began later than anticipated due to pump test delay.	$10,591
6	Refinement of Treatment Design Criteria	$467	$5,220	$4,753	Began later than anticipated due to pump test delay.	$233
	Total	$1,035,863	$1,174,052	($138,189)		$175,000
	Contingency*	$121,896				

**OMWD's planned budget included a contingency for additional expenditures of $121,896. The planned budget total was $1,157,759, including this contingency. The total actual costs incurred by OMWD amounted to $1,174,052, slightly above the budgeted amount by $16,293.*

Table 2 identifies the cost incurred and funds disbursed throughout the duration of the Study between the three invoices processed. The only remaining item is payment of the retention cost of $43,750.

Table 2. Funds Disbursed throughout the Duration of the Study

Task No.	Task Description	Invoice #1		Invoice #2		Invoice #3	
		Cost Incurred	**Funds Dispersed**	**Cost Incurred**	**Funds Dispersed**	**Cost Incurred**	**Funds Dispersed**
Task 1	Pilot Hole and Test Well Construction	$656,977	$121,908	$2,128	$0	$0	$0
Task 2	Long-Term Pump Testing	$145,781	$21,744	$0	$0	$184,535	$0
Task 3	Recalibration of Groundwater Model	$11,932	$5,966	$44,222	$1,340	$24,713	$0
Task 4	Hydrogeologic Investigation Report	$0	$0	$0	$0	$37,504	$13,218
Task 5	Field Test Manganese Pre-Treatment	$21,182	$10,591	$0	$0	$39,858	$0
Task 6	Refinement of Treatment Design Criteria	$40,184	$37	$394	$197	$4,754	$0
	Retention		($40,061)		($384)		($3,304)
Totals			**$120,184**		**$1,153**		**$9,913**

Section 4: Schedule Summary

The planned and actual schedules are shown in the schedule table below.

		Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Jan-Jun
		2019				**2020**				**2021**
		Q1	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**H1**
Task	**Task Name**									
1	Pilot Hole and Test Well Construction									
2	Long Term Pump Testing									
3	Recalibration of Groundwater Model									
4	Hydrogeologic Investigation Report									
5	Field Testing Manganese Pre-Treatment									
6	Refinement Of Treatment Design Criteria									

Planned **Actual**

Pilot hole drilling was completed earlier than anticipated, in September 2019, allowing for test well construction to take place earlier than anticipated (Task 1). The start of the long-term pump testing (Task 2) was delayed due to two major factors. One is that an easement for the test well had not been secured prior to the anticipated start date of the pump test; the easement was ultimately acquired but only after a delay. Likewise, a monitoring network of existing wells was not yet in place prior to the anticipated start date of the pump test. Setting up the network required coordination with well owners to obtain permission. Some owners were not local and others required additional time for permission to be granted. After permission was granted, the team had to install the instrumentation, which is some cases required modification of the well head.

The groundwater model recalibration and hydrogeologic investigation report (Tasks 3 and 4) were dependent upon data gathered through the long-term pump test and thus the start dates for these tasks were impacted by the later-than-anticipated start of pump testing. Field testing of manganese pre-treatment and refinement of design criteria (Tasks 5 and 6) were to be conducted after the start of the long-term pump test, such that these tasks were also delayed due to the later-than-anticipated pump test start.

Section 5: Study Results and Analysis

Analysis of Study Results and Findings

The following is a summary of the results, by task. The goals and objectives, and key study results follow in the next section.

- **Task 1 – Pilot Hole and Test Well Construction** – The pilot hole and test well were successfully completed. The test well was constructed with screens to pump from the deep aquifer and has a capacity of 200 gallons per minute(gpm). A photograph of the well drilling rig is shown below.

- **Task 2 – Long-Term Pump Testing** – A 12-month test was successfully completed. 16 existing wells in both the shallow and deep aquifers were monitored during the pump test for water level and water quality. The maximum drawdown in the test well during pumping was approximately 60 feet. The maximum drawdown in deep aquifer wells, in the vicinity of the test well, was approximately 10 feet.
- **Task 3 – Recalibration of the Groundwater Model** – Successfully completed for 20 years of data. The relative error was 6.8 percent where 10 percent is considered a "good fit." Complete model calibration statistics are shown in the table below taken from Attachment A. The groundwater model was recalibrated for 20 years of data from 41 target wells and over 2,400 data points. In 2017, the model was utilized to simulate an extraction of 1,600 acre-feet per year (AFY), to support a potable water production of 1,120 AFY or 1 million gallons per day (MGD). The model indicated a reduction in basin storage of 260 AF, which is less than one percent of the basin storage capacity during the predominately dry hydrologic period use by the model. Historical data shows that the basin recovers during wet periods. With the recalibrated model, a simulation of an extraction of 1,600 AFY indicated a reduction in basin capacity of 150 AF.

Table 8-1. Model Calibration Water Level Statistics (From Attachment A)

Model Calibration Water Level Statistics	
Residual Mean, ft	0.01
Residual Standard Deviation, ft	4.02
Minimum Residual, ft	-34.16
Maximum Residual, ft	22.31
Relative Error, %	6.8

- **Task 4 – Report of Design Pilot Testing** – Successfully completed and provided as Attachment A, Appendix M Appendix M.
- **Task 5 – Field Testing of Manganese Pre-Treatment** – The intent of the pretreatment pilot was to demonstrate the removal capability of the greensand systems, to support the design criteria. Removal of iron and manganese is very important to protect the reverse osmosis membranes and to achieve regulatory requirements. Removal can also be problematic in high total dissolved solids conditions. Two technologies, Greensand Plus and Mang–Ox, were tested with water from the well over 10 to 12 hours per day, for two days. The 10 to 12 hour per day test runs stressed the filter columns while monitoring removal performance and backwash frequency. While not an absolute validation, this is a strong indication of the technology and its long-term performance. Some future adjustments may be needed as the feed water quality may change with time. Two days is the test duration that was budgeted for in the project work plan. The field testing was successfully completed and provided as Attachment

A, Appendix M. While both technologies performed well, the field testing memorandum recommended Mang-Ox. The pilot test equipment and the revised iron and manganese design water quality criteria is shown below.

Table 3: Revised Iron and Manganese Water Quality (From Attachment A, Appendix M)

Parameter	Unit	Source Water Test Well (May 2019)	RO Feed Mang-Ox (June 2020)
Iron	mg/L	0.63	0.135
Manganese	mg/L	1.1	0.016

- **Task 6 Refinement of Treatment Design Criteria** – The basis for the design criteria is the assumed feed water quality. The previous criteria were based on water quality sampling and analysis from 2017. This was updated with samples from 2019 and 2020. The 2017 pretreatment process design criteria were confirmed through the field tasting and therefore did not require refinement. The work was successfully completed and documented in Attachment A, Appendix M.

Achievement of the Study Goals and Objectives as Proposed

The overall goal of this study was to advance the investigation of the San Dieguito Groundwater Basin as a potable water supply and to develop conclusions relative to continuing the investigation. This goal was met, the results of the 2017 Feasibility Study were confirmed, and OMWD will be continuing the investigation, as described in the next steps in Section 6, below.

The objectives of the Multi-Jurisdictional Optimization of Surface and Groundwater Supplies in San Dieguito River Watershed are to (1) Verify test well locations with pilot borings; (2) Verify water balance of the San Dieguito Valley Groundwater Basin test wells; (3) Verify water quality from test wells for required desalination treatment; and (4) Verify manganese treatment by piloting pre-treatment technologies. Each of these objectives was achieved, as explained below.

1. **Verify test well locations with pilot borings** – OMWD's consultant identified several preferred locations for a test well. OMWD does not own land in the San Dieguito Valley but does have several pipeline easements that were reviewed, but were not in the preferred locations. OMWD then reached out to property owners in the Valley to investigate potential partnerships. There were two responses, one of which was not in the preferred locations. The other response, Surf Cup Sports (SCS) was evaluated by the consultant and determined to be suitable. Based on available well logs, and other geologic information, the consultant identified the best location on the SCS site. A pilot boring was completed and logged by a geologist, and it confirmed the boring penetrated the shallow aquifer, aquitard, and deep aquifer and that the desired water-bearing layers were present. The groundwater basin (and model) layers are shown in Figure 48 from Attachment A, and included at the end of this FSA report. Layers 1 and 3 are the shallow and deep aquifers while layers 2, 4, and 5 are aquitards. Through the pilot boring, the site was verified as suitable for a test well. OMWD then acquired an easement for the well from the City of San Diego, the owner of the SCS site.
2. **Verify water balance of the San Dieguito Valley Groundwater Basin test wells** – The water balance in the basin was successfully verified as shown in the table below. From the 2017 Feasibility Study, the conclusion was that the project would decrease basin storage by 260 acre-feet per year. Using the refined aquifer data from the one-year pump test, and extending the model calibration by three years, the change in storage was found to be 150 acre-feet, very close to the previous water balance. The change in storage for the "with project" scenario is less than one percent of the total basin storage. The major inflow and outflow water balance terms are shown in Table 8-2 below, from Attachment A.

Table 3. Water Balance

Basin Modeling	Inflow (AF)	Outflow (AF)	Change In Storage (AF)
2017 Calibration	4,500	4,370	+130
2021 Calibration	4,680	4,570	+110
2017 With Project	4,590	4,850	-260
2021 With Project	4,800	4,950	-150

Table 8-2. Comparison of Water Budget Terms for Sustainable yield Assessment (From Attachment A) (Acre-Feet)

Term	2017 Model Calibration (2001 – 2015)	2021 Model Calibration (2001 – 2020)
Underflow Inflow	30	20
Deep Percolation from Areal Precipitation and Mountain Front Runoff	1,020	1,090
Streambed Percolation	1,790	1,900
Recharge from Spreading	570	570
Return Flow	1,090	1,100
Groundwater Pumping	2,090	1,830
Evapotranspiration	2,180	2,580
Rising Discharge to Streamflow	40	60
Underflow Outflow to the Ocean	60	100
Change in Storage	130	110

3. **Verify water quality from test wells for required desalination treatment** – A summary of the water quality from the test wells is included in Attachment A. Data collected from the most recent quarterly monitoring report is listed in the table below. The TDS data for the wells is relatively constant over time. The groundwater can be desalinated by reverse osmosis membranes. Iron and manganese water quality data is presented in a portion of Table 6-3 from Attachment A.

Location	Date	Total Dissolved Solids (TDS)
Project Test Well	March 18, 2021	4,238
Surf Cup #1 Active	March 21, 2021	4,568
Surf Cup #2	March 18, 2021	3,318
Valley 7	March 18, 2021	3,807
OMWD Morgan Run	March 18, 2021	4,239
Morgan Run Green 3 N	March 19, 2021	3,380
Morgan Run GunR	March 18, 2021	3,566

Table 6-3 Notable Desalter Test Well and Observation Well Laboratory Water Quality During the Long-Term Pumping Test – Minimum, Maximum, and Average Water Quality Results (Portion from Attachment A) (mg/L)

Constituent	Desalter Test Well	Morgan Run P-2	Morgan Run P-11B	Morgan Run P-11D	Morgan Run GunR	Regulatory Standard MCL
Iron, Total	0.70 – 0.88 (0.81)	0.04-0.45 (0.26)	0.31-2.04 (0.95)	0.82-1.15 (1.03)	0.19-0.26 (0.21)	0.3 (1)
Manganese, Total	0.92-1.07 (1.0)	3.03-4.86 (3.75)	0.10-1.91 (0.71)	0.45-0.48 (0.46)	1.81-2.29 (2.03)	0.050 (1) / 0.5 (2)

(1) DDW Secondary MCL
(2) DDW Notification Level for Unregulated Constituents

4. **Verify manganese treatment by piloting pre-treatment technologies** - The treatment vendor's mobile equipment was delivered to the test well site in June 2020. The testing was successful and operational and water quality data was collected for use in Task 6 – Refinement of Treatment Design Criteria. Attachment A, Appendix M updates the design criteria including manganese pretreatment, reverse osmosis, process design, flow diagram, and site requirements. The table below presents the source water quality, the design criteria for the RO feed which indicates the removal by pretreatment, and the MCL.

Table 4. Revised Iron and Manganese Design Water Quality and Maximum Contaminant Levels (mg/L)

Parameter	Source Water Test Well (May 2019)	RO Feed Mang-Ox (June 2020)	MCL
Iron	0.63	0.135	0.3 (1)
Manganese	1.1	0.016	0.05 (1) / 0.5 (2)

(1) DDW Secondary MCL
(2) DDW Notification Level for Unregulated Constituents

Problems that Occurred in Meeting the Study Goals and Objectives

Two problems that caused schedule impacts are described in Section 4, Schedule Summary, above.

How Study Findings can be Applied to Other Areas of the Region

1. Southern California Coastal Basins are typically two aquifer systems and tend to have brackish water from either anthropogenic activities or inland pumping causing seawater intrusion. Agencies willing to invest in treatment of brackish water can add an additional source to their water supply portfolio.

2. The development and calibration of the groundwater model provides an example of how modeling can be utilized to evaluate the impacts of pumping to provide a municipal supply. Agencies considering similar projects would benefit from this experience.

3. The modeling of the planned project, and development of the water balance also provides an example of the components of a detailed water balance and how they were evaluated. Agencies considering similar projects would benefit from this example.

4. Agencies that have iron and manganese in their groundwater, which is common in the region, can benefit from the results of pilot testing the two pre-treatment technologies.

5. OMWD anticipates a number of steps/obstacles before this project can be implemented including those listed in Section 6, below.

Section 6: Conclusion

Lessons Learned

1. During project planning and scheduling, anticipate and provide adequate time to acquire property or easements, and obtain regulatory approvals.

2. During project planning and scheduling, allow adequate time to coordinate with well owners, obtain permission for monitoring, and to install equipment.

3. The effects of elevated iron and manganese concentrations were noticeable in the pump intake and discharge piping. Iron and manganese consuming bacteria caused fouling and performance issues with the well discharge flow meter. Bacterial treatment at the wellhead will likely be necessary and will need to be incorporated into future facility design plans. During the long-term pump test, pumping water levels reached as low as 20 feet below the elevation of the desalter test well top of screen causing a cascading water effect. This

oxygenation of the less aerobic well water and upper screen section likely increased iron and manganese oxidizing bacteria population growth rates. It is recommended that future system pumping operations always maintain pumping water levels above the top of the well screen. Details and photographs can be found in Section 9 of Attachment A.

Next Steps of the Study

The design pilot phase of the project further confirmed the 2017 study results that the minimum water supply is available and the project is technically feasible. Fiscal years 2021-22 and 2022-23 will be spent on a number of studies intended to inform the decision to move forward with the project preliminary design and environmental impact report/ impact statement. The possible studies and their objectives are listed below:

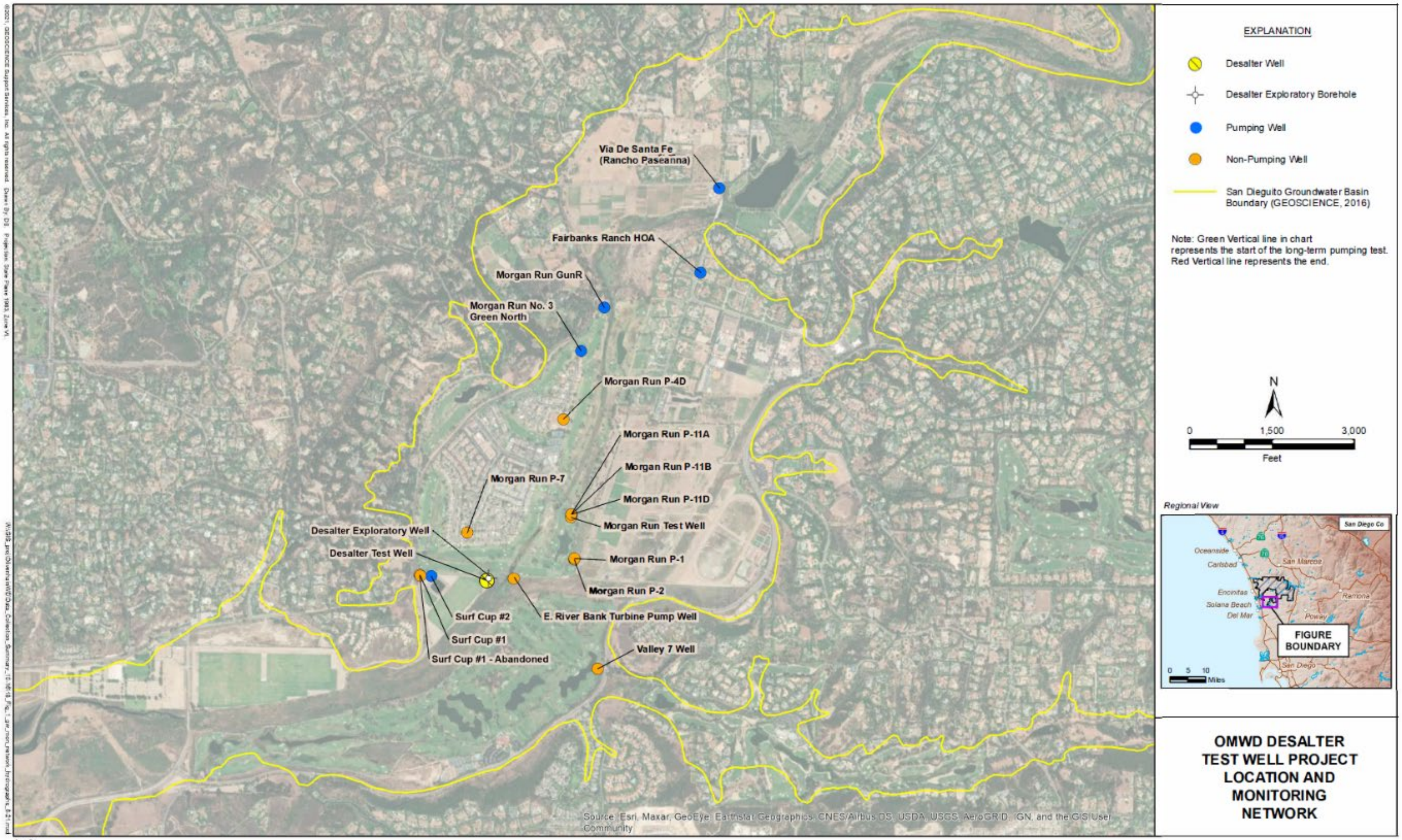
- <u>Water Rights/ Supply Sustainability/ Groundwater Sustainability Plan Scoping</u> – Investigate the best approach to providing OMWD with certainty of the long-term supply, which would justify the project investment.
- <u>Hydrogeologic Peer Review</u> – Provide an independent review of the hydrogeologic report to identify possible additional studies or investigations.
- <u>Facility Siting Analysis</u> – Plan and layout well, pipeline, and treatment plant facilities. Provide regulatory analysis of the facility plans for permitting feasibility. Consider supplemental recharge and indirect potable reuse concepts.
- <u>Independent Construction Cost Estimate</u> – Provide an independent review of the construction cost estimate and identify low and high ranges of costs.
- <u>Outreach</u> – Continue to provide regular updates to the community.
- <u>Economic Analysis</u> – Identify the key economic variables and pessimistic and optimistic ranges. Conduct economic analysis over a 30- or 40-year period. Determine if the project is cost-effective, or what conditions would make it cost-effective.
- <u>Long-Term Hydrologic Analysis</u> – Add another 35 years of hydrologic data to the model and investigate the project under the wet and dry periods. Consider potential effects of climate change.
- <u>Environmental Scoping</u> – Based on the environmental work completed to date, and with limited additional investigations, identify the key issues to be addressed in a project EIR.

- Board of Directors Briefings or Workshops – Provide the results of the studies to OMWD's Board of Directors and collect its input and comments. Provide a forum to discuss proceeding with the project.

Attachments

Attachment A – Report of Design Pilot Testing for the San Dieguito Valley Brackish Groundwater Desalination Project, Geoscience Support Services, Inc. August 2021.

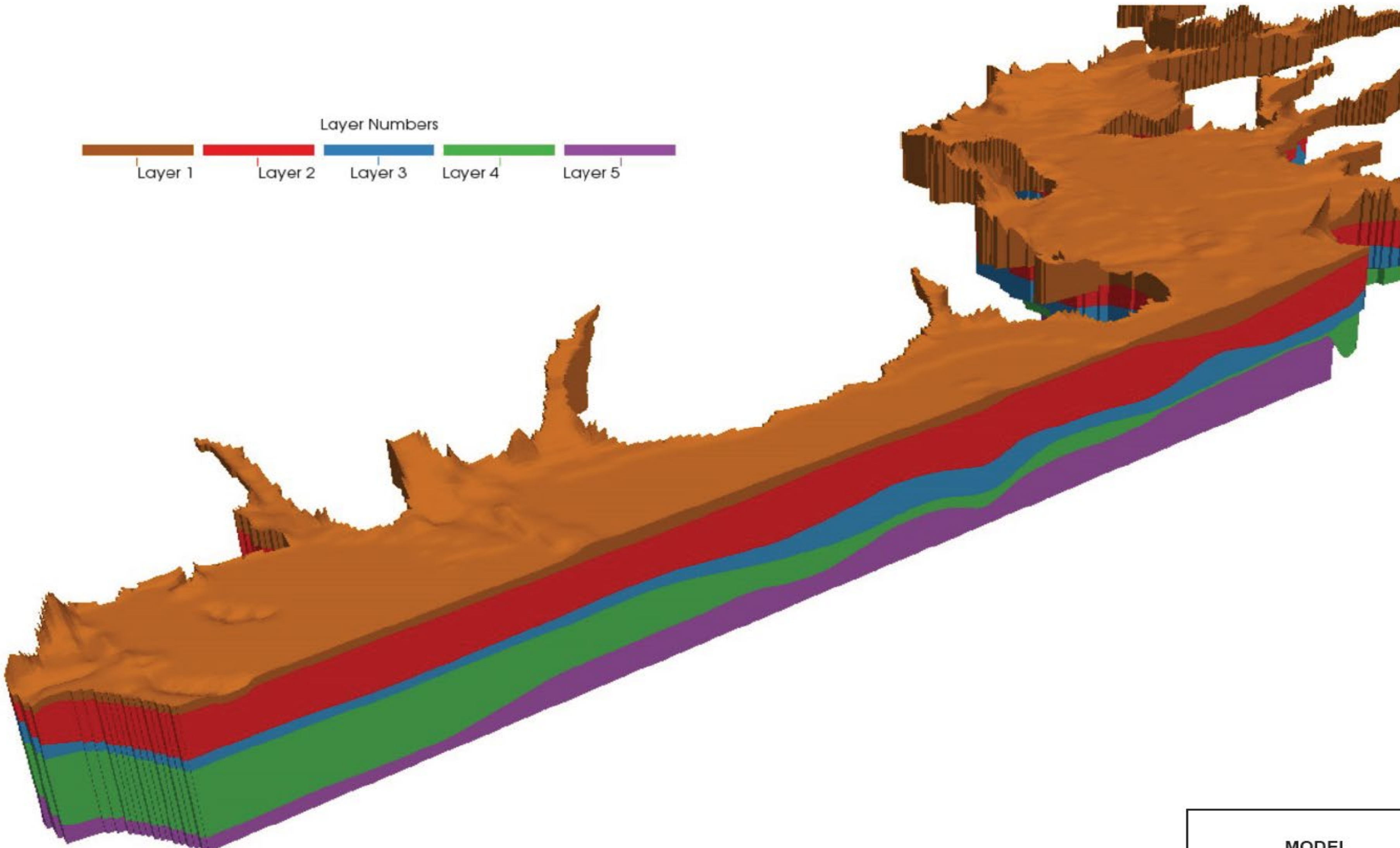
Figures 1, 29, and 48 from Attachment A



OLIVENHAIN MUNICIPAL WATER DISTRICT

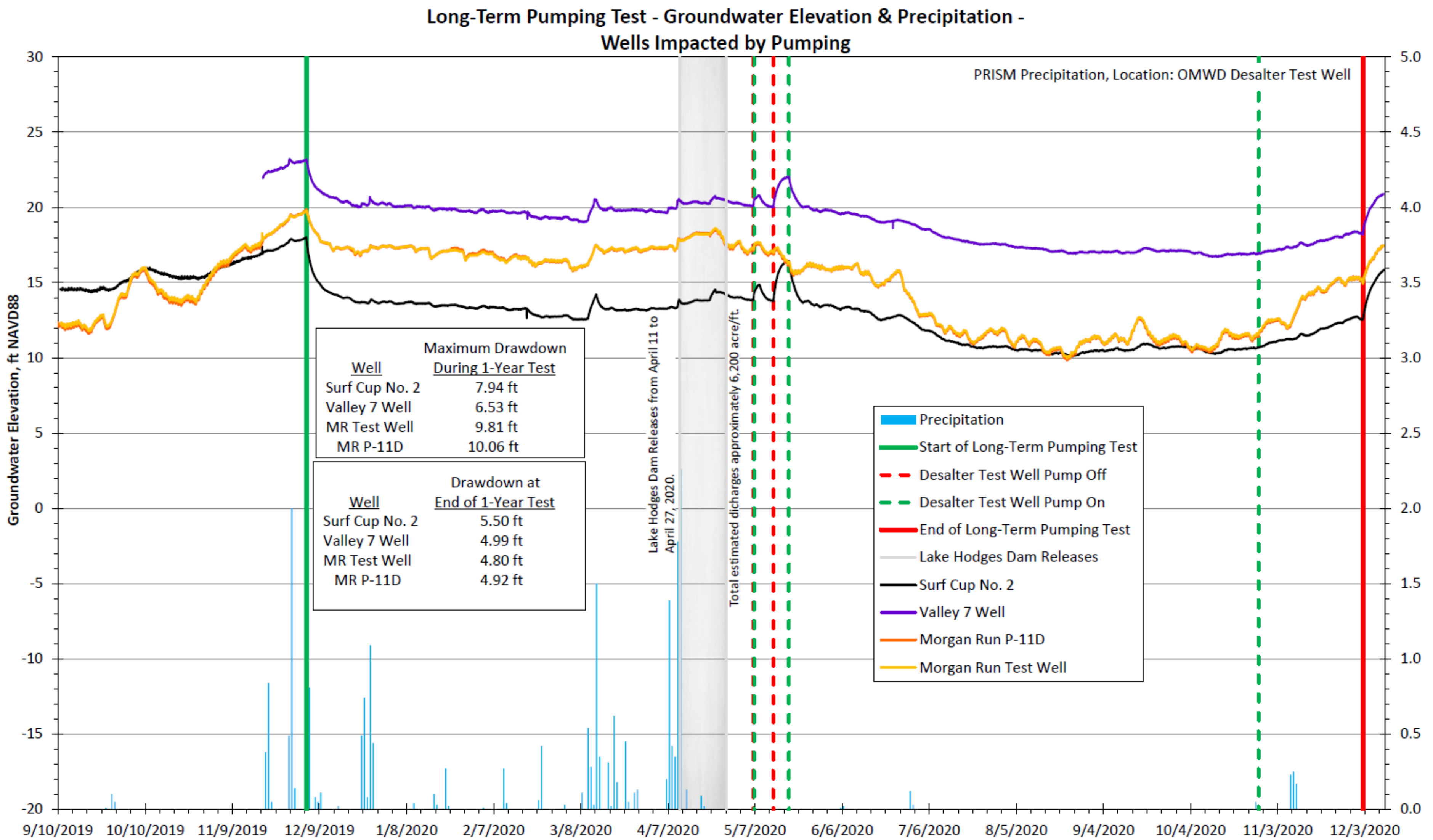
FIGURE 1

W:\GIS_proj\OlivenhainMWD\Data_Collection_Summary_10-16\18_Fig_48_Model_Layers_8x11_8-21.ai



MODEL
LAYERS

Aug-21



Long-Term Pumping Test - Groundwater Elevation & Precipitation -
Wells Impacted by Pumping
PRISM Precipitation, Location: OMWD Desalter Test Well
Groundwater Elevation, ft NAVD88
Precipitation, in
Well
Maximum Drawdown During 1-Year Test
Surf Cup No. 2 7.94 ft
Valley 7 Well 6.53 ft
MR Test Well 9.81 ft
MR P-11D 10.06 ft
Well
Drawdown at End of 1-Year Test
Surf Cup No. 2 5.50 ft
Valley 7 Well 4.99 ft
MR Test Well 4.80 ft
MR P-11D 4.92 ft
Lake Hodges Dam Releases from April 11 to April 27, 2020.
Total estimated discharges approximately 6,200 acre/ft.
Precipitation
Start of Long-Term Pumping Test
Desalter Test Well Pump Off
Desalter Test Well Pump On
End of Long-Term Pumping Test
Lake Hodges Dam Releases
Surf Cup No. 2
Valley 7 Well
Morgan Run P-11D
Morgan Run Test Well
30
25
20
15
10
5
0
-5
-10
-15
-20
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9/10/2019
10/10/2019
11/9/2019
12/9/2019
1/8/2020
2/7/2020
3/8/2020
4/7/2020
5/7/2020
6/6/2020
7/6/2020
8/5/2020
9/4/2020
10/4/2020
11/3/2020
12/3/2020

Figure 29

ATTACHMENT A

Report of Design Pilot Testing for the San Dieguito Valley Brackish Groundwater Desalination Project

Prepared for:

Olivenhain Municipal Water District

August 2021

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THIS REPORT IS RENDERED TO OLIVENHAIN MUNICIPAL WATER DISTRICT AS OF THE DATE HEREOF, SOLELY FOR THEIR BENEFIT IN CONNECTION WITH ITS STATED PURPOSE AND MAY NOT BE RELIED ON BY ANY OTHER PERSON OR ENTITY OR BY THEM IN ANY OTHER CONTEXT. ALL CALCULATIONS WERE PERFORMED USING ACCEPTED PROFESSIONAL STANDARDS.

AS DATA IS UPDATED FROM TIME TO TIME, ANY RELIANCE ON THIS REPORT AT A FUTURE DATE SHOULD TAKE INTO ACCOUNT UPDATED DATA.

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REPORT OF DESIGN PILOT TESTING FOR THE SAN DIEGUITO VALLEY BRACKISH GROUNDWATER DESALINATION PROJECT

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Figures

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(Attached)

Figures (continued)

Figures (continued)

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Tables (continued)

Appendices

Acronyms, Abbreviations, and Initialisms

Abbrev.	Description
acre-ft/yr	acre-feet per year
ACU	Apparent Color Unit
amsl	above mean sea level
ft bgs	feet below ground surface
µg/L	micrograms per liter
mg/L	milligrams per liter
meq/L	milliequivalents per liter
pCi/L	picocuries per liter
µmhos/cm	micromhos per centimeter
NTU	Nephelometric Turbidity Units
MGD	million gallons per day
TON	Threshold Odor Number

REPORT OF DESIGN PILOT TESTING FOR THE SAN DIEGUITO VALLEY BRACKISH GROUNDWATER DESALINATION PROJECT

EX 1.0 Executive Summary

Olivenhain Municipal Water District (OMWD) proposed the San Dieguito Valley Groundwater Desalination Design Pilot (Project) to evaluate the feasibility of desalinating brackish water. A test well was installed, and a one-year pump test was conducted to verify the water balance of the San Dieguito Valley Groundwater Basin, verify water quality and potential impacts to wells of current basin users, and verify effective manganese treatment by piloting pre-treatment technologies. This report combines all the data and data analysis that was collected and prepared from the drilling, construction, development, and testing procedures for the OMWD Desalter Test Well; long-term pumping test monitoring; and model update of the San Dieguito Valley Groundwater Basin Model.

Groundwater levels in the shallow aquifer showed no change during the long-term pumping whereas the deep aquifer was only locally affected by the Desalter Test Well. Based on this evidence, pumping in the deep aquifer does not impact groundwater levels in the shallow aquifer and therefore surface water in the San Dieguito River. The potential impact from the full-scale project assessed using the updated groundwater model suggest additional stream percolation and less outflow to the ocean. The details will be discussed below. Additionally, as anticipated, water levels showed the most decline during the dry period of 2020. Once the long-term pumping test was completed, water levels showed complete recovery suggesting that inflows into the basin can support current groundwater uses. Specific conductivity remained constant throughout the long-term pumping test with the exception of the Morgan Run piezometer, P-11B. This piezometer showed an increase in total dissolved solids (TDS) during the second sampling period. As this well screen crosses the aquitard separating the shallow and deep aquifers, it is likely that higher salinity water from the shallow aquifer moved downward into P-11B. It is recommended that this piezometer be considered for destruction to eliminate this pathway during long-term operations.

The San Dieguito Valley Groundwater Model was updated and recalibrated to 2020 using recent data collected from the construction of the Desalter Test Well and long-term pumping test. Of greatest uncertainty was the specific volume of basin pumping since very few wells are equipped with totalizing flow meters and pumping is unreported. The initial assessment of basin pumping was estimated by applying assumed water demands for the various land uses in the basin along with what data was available for actual well production. The estimated basin pumping was 2,100 acre-ft/yr. This estimation of well production was used as an outflow component for the groundwater model. With additional data collected since the Geoscience 2017 San Dieguito Brackish Groundwater Desalination Study, the basin pumping was revised to 1,830 acre-ft/yr. Using the updated groundwater model, the change in storage calculated for the calibration period only decreased by 20 acre-ft/yr (from 130 acre-ft/yr to 110 acre-ft/yr) compared to the 2017 modeling results. The results of the updated scenario run indicate that the proposed extraction of 1,600 acre-ft/yr at the Desalter Test Well, and in the general vicinity of Sites 2 and 2A will create a minor decrease in storage of 150 acre-ft/yr based on the hydrology of the modeling period and current (2020) groundwater in storage, less than 1% of basin storage. During above average rainfall periods, it is likely that groundwater storage will be replenished, as is typical for many shallow basins in Southern California.

The Project operation may decrease the groundwater elevations at nearby Morgan Run pumping well sites, No. 3 Green North and GunR, by approximately 19 feet and 15 feet beyond the baseline pumping water levels. The cumulative drawdown after 20-year Project pumping at a rate of 1,600 acre ft/yr, in GunR and No. 3 Green North wells are predicted to remain approximately 27 feet above the present pump settings. With the current configuration of modeled Project pumping and assumed continuation of existing basin pumping, including Morgan Run pumping volumes, the water level at the No. 3 Green North well has the potential to reach the top of screen. It appears the top of screen in the No. 3 Green North well is about 29 feet shallower than the GunR well. It should be noted that the model simulated a singular well pumping location of 800 gpm. However, distribution of drawdown could be accomplished by multiple wells pumping at lower rates over a wider area. The modeled drawdown indicates that pump lifts may increase in nearby wells, but this drawdown should not affect the overall production of these wells. Depending on the pump installation depths of area wells, there may be a potential need to lower the pump elevations to maintain an adequate water level above the pump intake.

Findings from the long-term pumping test indicated that pumped water from the Desalter Test Well contained concentrations of iron that were nearly three times the Division of Drinking Water (DDW) secondary maximum contaminant level (MCL) and high levels of manganese. These elevated metal concentrations caused fouling and performance issues and required iron and manganese bacterial treatment. When groundwater levels fall below the well screen this allows the groundwater to become oxygenated, which can result in an increased bacterial growth rate. The on-site pretreatment tests were successful at reducing iron and manganese concentrations in the discharged water to acceptable levels. We recommend that this and any other desalter wells are operated to keep pumping water levels above the well screens to help prevent premature fouling.

1.0 Introduction

1.1 Background

Olivenhain Municipal Water District (OMWD) is a public agency in north San Diego County, providing water, wastewater, and recycled water service; hydroelectric power generation; and the operation of Elfin Forest Recreational Reserve. The surface area of OMWD covers 48 square miles and serves an estimated 2020 population of 72,179 (DLM, 2021). To evaluate the feasibility of desalinating the brackish groundwater in the San Dieguito Valley Groundwater Basin, OMWD proposed the San Dieguito Valley Groundwater Desalination Design Pilot (Project). As part of the San Dieguito Brackish Groundwater Desalination Study (2017), Geoscience Support Services, Inc. (Geoscience) prepared two reports: 1) "OMWD San Dieguito Valley Groundwater Desalination Feasibility Sustainable Yield Assessment" (Appendix B of the study), and 2) "Hydrogeologic Investigation for the San Dieguito Valley Brackish Groundwater Desalination Study Technical Memorandum" (Appendix C of the study). The previous studies investigated and reported on the hydrogeologic conditions of the San Dieguito Groundwater Basin and provided a preliminary estimate of the availability of unused increment of groundwater in the basin.

The San Dieguito Groundwater Basin extends from the mouth of the San Dieguito River to the head of Osuna Valley, approximately 6.5 miles upstream (USGS, 1983). The groundwater boundary was modified from the basin boundary re-published by DWR for the SGMA program and drawn based on the assumption that the groundwater basin aquifers are contained in the valley floor Quaternary sediments flanked and underlain by low permeability Tertiary rocks (Geoscience, 2017a). The alluvium typically ranges in thickness from 125 to 180 feet along the axis of the basin with coarse-grained sand and gravel comprising the eastern-most basin alluvium (Hargis, 2004). The western portion of the basin has not been well-characterized. The San Dieguito Groundwater Basin consists of an upper basin forebay area and middle and lower basin areas. Groundwater recharge occurs mainly in the upper basin forebay area primarily from infiltration of surface flow in the San Dieguito River bottom during the wet season (Geoscience, 2017b). River flows are controlled by the dam at Lake Hodges owned and operated by the City of San Diego. The middle and lower basin areas are where a medial clay zone divides groundwater into two aquifers: a shallow upper unconfined aquifer and a deep lower confined aquifer (Geoscience, 2017b).

The preliminary estimate of available unused increment of groundwater was evaluated using two methods. Initially, a water budget was prepared based on estimated values of historical groundwater basin inflow and outflow. Of greatest uncertainty was the specific volume of basin pumping since very few wells are equipped with totalizing flow meters and pumping is unreported. The initial assessment of basin pumping was estimated by applying assumed water demands for the various land uses in the basin along with what data was available for actual well production. The initial assessment of basin pumping was 2,100 acre-ft./yr. The purpose of the long-term test was to further validate the basin pumping by placing a constant additional pumping stress on the basin through both wet and dry seasons. Since the initial assessment of the available increment of groundwater provided in the 2017 feasibility study, new information of basin pumping was obtained. In 2017, a groundwater model was constructed and calibrated using basin groundwater levels for calibration. The analysis conducted in 2017 showed that 1 MGD of groundwater could be developed without impact to the basin users.

The groundwater model developed in 2017 was updated at the end of the long-term pumping test discussed in this report along with a revised estimation of well production based on data collected since the feasibility study. The revised pumping estimate was used as an outflow component for the groundwater model. In 2017, four model scenarios created using four potential well sites in two general areas—and various pumping rates, project scenario pumping rates, and maximum pumping rates—were run and compared (Geoscience, 2017b). Further details on the four modeling scenarios can be found in Section 8.3 Model Scenarios. Utilizing these two methods, both in 2017 and 2020, an estimate of the additional volume of groundwater that could be developed for the project, while accounting for the groundwater pumping by current basin users, was reported in the sustainable yield assessment provided in the 2017 feasibility study with the update presented here. The model scenario with the least impact on the San Dieguito Groundwater Basin proposed the use of the project extraction volume, 1,600 acre-ft/yr, with potential well sites centrally located in the basin (Geoscience, 2017b). The changes in groundwater elevations between the Project Scenario Run and Baseline Run for model Layer 1 (shallow aquifer) and Layer 3 (deep aquifer) are depicted on Figures 56 and 57, respectively. Assuming existing pumping in the Valley continues, the modelling indicates the Project operation with centrally located wells, as simulated, may decrease the groundwater elevations at nearby Morgan Run pumping well sites, Morgan Run No. 3 Green North and Morgan Run GunR, by approximately 19 feet and 15 feet (see Section 8.3 Model Scenarios for more information). An extraction volume of 1,600 acre-ft/yr allows for 1.0 MGD of potable water to be produced from the brackish groundwater after the desalination process, accounting for the loss to brine (OMWD, 2017). The Desalter Test Well site is located within the area suggested by the sustainable yield assessment. The updated model was used to recalculate the available increment. The result is similar and will be discussed below.

The Project plan for the Design Pilot was to install a test well and conduct a one-year pump test to validate the unused portion of groundwater available to support OMWD in pursuing brackish groundwater desalination in the San Dieguito Valley Groundwater Basin. In order to select a well site, OMWD considered areas of current pipeline easements. However, none of the pipeline easements in the Valley were located in the appropriate locations to accommodate a new well site. Subsequently, OMWD sent out a general request for partnerships. Del Mar Country Club and Surf Cup Sports responded. The Del Mar Country Club location was not located in an area hydrogeologically suitable for a new well. The Surf Cup site was deemed the best of the two available sites. The location of the Desalter Test Well was selected based on several factors including hydrogeologic conditions and the reported historic capacity of area wells. Exploratory borings confirmed the geology at the Surf Cup site was generally appropriate for a test well. However, the deciding factor was the availability of a site for well installation. The Project plan included installation and operation of a test well, along with installation and operation of a manganese field test. Therefore, the Project involved four major components: 1) pilot hole drilling and test well construction, 2) long-term pump testing, 3) field testing manganese pre-treatment system, and 4) updating the groundwater model to reassess the basin water balance.

The overall purpose of the Project was to verify the water balance of the San Dieguito Valley Groundwater Basin using data from a long-term pumping test and verify water quality and potential impacts to water levels in wells of current basin users, as well as verify effective manganese treatment by piloting pre-treatment technologies.

1.2 Geophysical Borehole Logs and Pilot Borehole Reaming

Upon completion of the pilot borehole, several geophysical borehole logs were run on the entire depth of the pilot borehole by Pacific Surveys of Claremont, California. The logs were run in the presence of Geoscience personnel on April 18, 2019, and provided to Olivenhain Municipal Water District (OMWD). The geophysical borehole logs can be found in Appendix E and consisted of the following:

(1) 16-inch and 64-inch normal resistivity with point resistance
(2) Spontaneous potential (SP)
(3) Laterolog 3 (focused resistivity – guard)
(4) Gamma ray
(5) Acoustic (sonic) with Variable Density Log (VDL)
(6) Caliper (following borehole enlargement)

The normal resistivity, spontaneous potential, Laterolog 3, gamma ray, and acoustic (sonic) logs are conducted to provide an understanding of the subsurface lithology. The screen interval of a well is determined by reviewing the results of logs run on a borehole for the most porous subsurface lithology, usually with the highest concentration of sand and gravel layers. Spontaneous potential logs distinguish finer-grained material from coarser-grained material. Gamma ray logs help determine locations of clay layers. Resistivity logs record the resistivity of a formation, the reciprocal of which is conductivity, and provide information about the relative porosity of the aquifer layers. A high resistivity signifies greater porosity or freshwater. Laterolog 3 logs also measure resistivity but are especially useful in higher saline environments. Acoustic (sonic) logs help identify changes in lithology by observing changes of acoustic impedance. After the review and comparison of all five logs, the Desalter Test Well screen interval was selected for placement from 60 to 125 ft below ground surface (ft bgs).

The pilot borehole was later reamed to a depth of 160 ft bgs during the period between April 18 to 19, 2019 and a caliper log was performed on the reamed borehole prior to the start of well casing and screen installation. A caliper log measures the diameter of an uncased borehole versus depth to ensure a proper borehole diameter for the installation of casing and screen. The caliper log is provided in Appendix E.

1.3 Purpose and Scope

The purpose of this Design Pilot report is to combine all the data and data analysis collected and prepared from the drilling, construction, development, and testing procedures for the OMWD Desalter Test Well, long-term pumping test monitoring, and model update of the San Dieguito Valley Groundwater Basin Model.

In addition to a detailed summary report from the exploratory borehole (EX-1) and completion of the Desalter Test Well, a detailed analysis of the approximately one-year long-term pumping test is included. The purpose of the long-term pumping test was to verify water quality and potential impacts to water levels in wells of current basin users to include impacts to water levels and water quality in nearby wells, changes in water levels (piezometric levels) in both upper and lower aquifers, and any changes in groundwater storage in the aquifers. The report includes as-built well completion details for the Desalter Test Well as well as additional documentation such as a chronology of Desalter Test Well construction and long-term pumping test (Appendix C), borehole lithologic logs (Appendices A & D), borehole geophysical logs (Appendix E), final video survey (Appendix F), the DWR well completion report (Appendix G), water quality results from the completed Desalter Test Well and quarterly long-term pumping test sampling events (Appendix I), and the Desalter Test Well permanent pump technical specifications (Appendix L). Finally, a description of model refinements made with the collected data and a summary of the updated water balance and available increments of water is provided.

1.4 Hydrogeologic Conditions in the Desalter Test Well Area

The OMWD boundaries overlie several groundwater basins including the San Dieguito Groundwater Basin, which OMWD is not currently pumping. Historical seawater intrusion has degraded the water quality in the basin, where treating groundwater for total dissolved solids is required for a potential new potable supply.

Historically, groundwater recharge to the San Dieguito Groundwater Basin is primarily the result of infiltration of surface flow in the stream bottom during the wet season. Typically, groundwater levels in the shallow narrow groundwater basins in Southern California, respond quickly to rainfall events. However, with the construction of Lake Hodges, less recharge occurs from natural run-off since run-off is captured in Lake Hodges and some recharge to the aquifer system will occur as a result of occasional spills from the Lake Hodges dam.

2.0 Exploratory Borehole (EX-1) Drilling

Prior to drilling of the OMWD Desalter Test Well (Desalter Test Well) an exploratory borehole (EX-1) was drilled to define aquifer and aquitard thickness and location, as well as depth to bedrock. EX-1 was drilled approximately 20 ft east of the proposed Desalter Test Well location (see Figure 1). The EX-1 field investigation was performed between September 9 to 12, 2018 and included borehole drilling, borehole lithology logging, and destruction. Data from this borehole showed that the thickness of the aquitard was thicker than expected and that bedrock was shallower than expected. The findings from EX-1 would be used to design the Desalter Test Well screen intervals prior to drilling. The following sections describe in detail the various stages of the field investigation and their findings.

2.1 Exploratory Borehole Drilling

Jensen Drilling Company (Jensen) of Eugene, Oregon performed the borehole drilling using a sonic drilling method (see inset Figure 2-1) to a total of 147 ft bgs. Below 147 ft bgs, the formation did not allow for additional advancement of the borehole using this drilling method. Sonic drilling produced continuous core samples that were minimally disturbed. The cores from all borings were logged by the field geologist, photographed, and placed in cardboard boxes to be brought to the office of Geoscience. A detailed borehole log is provided in Appendix A.

Figure 2-1. Sonic drill rig.

2.2 Exploratory Borehole Core Sampling

Core sampling was conducted using an 8-inch diameter inner casing. The core barrel was attached to small-diameter drill rods and vibrated ahead of the outer casing to collect undisturbed formation materials as core samples. With each 10-ft advance of the casing, the core barrel was extracted and brought to the surface to retrieve the core. Soil core samples were collected continuously during drilling. Upon collection, all soil cores were placed in 6-millimeter polyethylene plastic sleeves measuring approximately 5 ft in length. Each bag was photographed and properly labeled in the field with the boring number and sample depth interval. The core samples were then split longitudinally in half and visually classified (logged) in the field in accordance with the Unified Soil Classification System (USCS).

2.3 Exploratory Borehole Mechanical Grading Analysis

Mechanical grading analyses (i.e., sieve analyses) were performed on six (6) formation samples taken from EX-1 between 57 and 108 ft bgs (i.e., 57-59, 62-64, 67-69, 78-79, 90-92, and 106-108 ft bgs). The filter pack was designed using Terzaghi criteria. The mean grain-size diameter (i.e., the 50 percent passing size) of the aquifer materials ranged from 0.15 to 0.30 mm Uniformity coefficients of aquifer materials ranged from 2.6 to 3.8. The mechanical grading analytical results for formation samples and filter pack are shown in Figure 2. A Tacna Sand & Gravel (Yuma, Arizona) ¼ in. x 40 custom blend filter pack material was selected for use in the Desalter Test Well. The design for the custom blend filter pack is shown in the Table 3-3 in Section 3.5 - Filter Pack and Annular Seal.

2.4 Exploratory Borehole Destruction

The exploratory borehole, EX-1, was destroyed following completion to total depth and borehole lithology logging. The borehole was filled with bentonite chips and destruction was accomplished in accordance with the San Diego County Environmental Health Department and in accordance with DWR Bulletins 74 – 81 and 74 – 90. A copy of the borehole well permit can be found in Appendix B.

3.0 Construction of the OMWD Desalter Test Well

Prior to drilling of the Desalter Test Well, the exploratory borehole, EX-1, was drilled. Analysis of EX-1 was performed and a well design created for the Desalter Test Well between September 9 to 12, 2018. EX-1 was drilled approximately 20 ft east of the proposed Desalter Test Well location (see Figure 1). The original Desalter Test Well location was adjusted since the well is located within the San Dieguito River 100-year flood plain. The well was finished above the minimum requirement of 24-inches above the 100-year flood plain elevation (see inset Figure 3- 1).

Figure 3-1. Wellhead completed 24-inches above 100-year flood plain.

Drill rig set-up at the proposed Desalter Test Well site was on April 1, 2019. Drilling and construction of Desalter Test Well began on April 9, 2019, with installation of the conductor casing to a total depth of 50 ft bgs by Barney's Hole Digging Service, Inc., (Barney's) of Long Beach, California. Drilling of the pilot borehole began on April 12, 2019, and was completed to a depth of 165 ft bgs on April 17, 2019. Installation of the Desalter Test Well completed on April 19, 2019. All drilling and construction activities were conducted by Jensen. The Desalter Test Well was drilled and constructed using the fluid reverse circulation rotary drilling method. The reverse circulation drill rig set up at the Desalter Test Well is shown in inset Figure 3-2. Desalter Test Well development was completed on May 17, 2019. Initial aquifer testing at the Desalter Test Well was completed on May 22, 2019. The chronology of the Desalter Test Well construction and testing is summarized in Table 3-1 and Appendix C.

Table 3-1. OMWD Desalter Test Well Construction and Testing Chronology

Dates	Desalter Test Well Construction Phase
April 1 to 17, 2019	Set up, Conductor Install & Pilot Borehole Drilling to 165 ft bgs
April 19, 2019	Installation of 18-inch ID Well Screen, Well Casing, and Filter Pack
April 22, 2019	Installation of Sanitary Seal
April 23 to 29, 2019	Swab and Airlift
May 1, 2019	Installation of Test Pump
May 2 to 17, 2019	Well Development
May 20, 2019	Transducer Installation
May 20, 2019	Step-Drawdown Pumping Test
May 21 to 22, 2019	1-Day Constant Rate Pumping Test and 4-Hour Recovery Test
May 22, 2019	Water Quality Sampling
May 23, 2019	Video Survey

3.1 General Desalter Test Well As-Built Construction Details

The Desalter Test Well is located at latitude 32.985331 N, longitude -117.212779 W within the Surf Cup Sports Park at 14989 Via De La Valle, Del Mar, California. The Desalter Test Well as-built construction details and location are shown in Figures 3 and 4 and Appendix D.

3.2 Conductor Casing Installation and Pilot Borehole Drilling

The Desalter Test Well 48-inch diameter conductor borehole was drilled by Barney's to a depth of approximately 50 ft bgs on April 9, 2019, using a rig equipped with a solid stem auger. The 36-inch outside diameter (OD) by 0.375-inch wall mild steel (American Petroleum Institute (API) 5L Grade B mild steel) conductor casing was installed to 50 ft bgs and cemented in place from the bottom of the borehole to the ground surface with 10.3-sack sand-cement slurry. Soundwalls, shown in Figure 3-2, were placed surrounding the drill rig to suppress noise to the appropriate levels during the drilling operation, minimizing noise impacts on the surrounding community.

Figure 3-2. Reverse circulation drill rig set up.

Below the bottom of the conductor casing, the 17 ½-inch pilot borehole was drilled by Jensen using a fluid reverse circulation rotary drilling rig. Drilling of the pilot borehole began on April 12, 2019, and was advanced to a total depth of 165 ft bgs on April 17, 2019 and was witnessed by Geoscience Support Services, Inc. (Geoscience) personnel. At each change of formation and at 10-foot intervals between changes in formation, large representative grab samples of material were collected, labeled, and preserved from the sampling trough to prepare a lithologic log. The materials encountered during pilot borehole drilling from ground surface to approximately 39 ft bgs consisted primarily of interbedded layers of silts and fine- to medium-grained sands. From 39 to 56 ft bgs was an aquitard consisting of clays, silts, and fine-grained sands, and below that to 122 ft bgs was fine- to coarse-grained sand and gravels. From approximately 122 to total borehole depth 165 ft bgs was bedrock with consisted of sandstone and mudstone. The detailed lithologic log for the Desalter Test Well borehole is included in Appendix D.

3.3 Casing and Screen Design

After the Desalter Test Well borehole was completed to a total depth of 160 ft bgs, the recommended casing and screen design was submitted to OMWD for review and approval. The casing and screen installation was completed on April 19, 2019, with the bottom of the well casing placed at 145 ft bgs. 18-inch ID by ¼-inch wall, ASTM A928 Super Duplex 2507 stainless steel blank casing was installed from

2.5 ft above ground surface (ags) to 60 bgs, and 125 to 145 ft bgs and fitted with an end plate of like steel. Well screen consisting of 18-inch ID by ¼-inch wall, ASTM A928 Super Duplex 2507 stainless steel louvered screen with 0.050-inch openings was installed from 60 to 125 ft bgs. Super Duplex 2507 steel was recommended due to the brackish water in the aquifer which can cause pitting in lower grade steels. Pitting and corrosion caused from brackish water on lower grade steel usually reduces the efficiency and operational lifespan of a well. The general construction details are summarized in Table 3-2, Figures 3 and 4, and Appendix D.

Table 3-2. Construction Details OMWD Desalter Test Well

Interval ft bgs	Borehole Diameter in.	Casing Diameter in.	Wall Thickness in.	Screen Slot Size in.	Material Type
+0.5 - 50	48	36 OD	3/8	-	Conductor Casing (API 5L Grade B Mild Steel)
+2 – 40	Annulus	3 in.	Sch. 40	-	Gravel Feed Pipe (316L stainless steel)
+2 - 58	Annulus	2 in.	Sch. 40	-	Sounding Tube (316L stainless steel)
0 - 25	35.25 (Conductor)	-	-	-	Sand-Cement Seal (10.3-Sack Sand-Cement Slurry)
25 - 30	35.25 (Conductor)	-	-	-	Bentonite-Sand Layer
30 - 160	35.25 (30-50) 28 (50-160)	-	-	-	¼-Inch x 40 Custom Blend Gravel Pack Material
+2.5 - 60	35.25 (0-50) 28 (50-160)	18 ½ OD (18 ID)	1/4	-	Blank Casing (ASTM A928 Super Duplex 2507 Stainless Steel)
60 - 125	28	18 ½ OD (18 ID)	1/4	1/20 (0.050)	Ful-Flo Louvered Screen (ASTM A928 Super Duplex 2507 Stainless Steel)
125 - 145	28	18 ½ OD (18 ID)	1/4	-	Blank Casing with End Cap (ASTM A928 Super Duplex 2507 Stainless Steel)
145 - 160	28	-	-	-	Gravel Filled Borehole
160 - 165	17.5	-	-	-	Backfill

3.4 Filter Pack and Annular Seal

Tacna Sand & Gravel (Yuma, Arizona) ¼ in. x 40 custom blend filter pack material was installed via tremie pipe from 30 to 165 ft bgs in the annular space between the 28-inch diameter borehole and the well casing and screen on April 19, 2019 (see Figure 3). This filter pack blend was selected after performing mechanical grading analyses (i.e., sieve analyses) on formation samples taken from EX-1 (see Figure 2 and Section 2.3 - Exploratory Borehole Mechanical Grading Analysis). The design for the custom blend filter pack is shown in the following table.

Table 3-3. Mechanical Grading Analysis Tacna Sand and Gravel 1/4-inch x 40 Custom Blend Gravel Pack Material

U.S. Standard Sieve No.	Sieve Opening in.	Sieve Opening mm	Cumulative Percent Passing %
1/4"	0.250	6.35	100.0
4	0.187	4.75	95.0
6	0.132	3.36	87.0
8	0.094	2.38	70.0
10	0.079	2.00	58.0
14	0.056	1.41	27.0
16	0.047	1.19	18.0
18	0.039	1.00	13.0
20	0.033	0.84	10.0
30	0.023	0.59	6.0
40	0.017	0.42	2.0

Following installation of the filter pack material, a 5-ft layer of bentonite-sand seal (50/50 mixture of granular bentonite and sand) was placed above the filter pack material to protect the underlying gravel pack from the 10.3-sack sand-cement grout. On April 22, 2019, the annular space between the borehole and well casing was filled with a 10.3-sack sand-cement grout from the top of the bentonite layer (at 25 ft bgs) to the ground surface.

One (1) 3-inch diameter Sch. 40 316L stainless steel gravel feed pipe was installed in the annulus from 2 ft ags to 40 ft bgs. The purpose of the gravel feed pipe is to allow for future addition of filter pack material to the annulus. A 2-inch diameter Sch. 40 316L stainless steel sounding tube was also installed in the annulus from 2 ft ags to 58 ft bgs. 316L stainless steel was used for the sounding tube and gravel feed tube instead of Super Duplex 2507 steel due to the brackish water in the aquifer which can cause pitting in lower grade steels. Pitting and corrosion caused from brackish water on lower grade steel usually reduces the efficiency and operational lifespan of a well.

3.5 Well Development

Initial well development was conducted using a combination of airlifting and swabbing to consolidate the filter pack after placement, and to remove colloidal and fine-grained sediments from within the well, filter pack, and near-well zone. The swabbing and airlifting process was repeated, making upward and additional downward passes through the screen sections as necessary, when continued circulation of sand, silt, or mud to the surface from the section of the screen being cleaned was observed. 10-ft intervals were swabbed and airlifted simultaneously until relatively clean water was discharged. The work was conducted from April 23 to 29, 2019 and a total of 40 hours were used to airlift and swab the screened sections of the well.

Final development (i.e., pumping development) was conducted using a vertical turbine test pump from May 2 to 17, 2019. Final development consisted of pumping the well at gradually increasing discharge rates until the sand concentration reached a minimum threshold. The well was then "surged[1]" repeatedly, starting at low rates, increasing to higher and higher rates of discharge as the sand content decreased; then increasing the number of surges.

During final development, the discharge rate was measured using an in-line propeller meter, or totalizer; water level measurements were collected using an electric wireline water level indicator; and sand concentration was measured using a centrifugal Rossum Sand Tester. Well development was considered complete when there was no increase in the specific capacity (discharge rate divided by drawdown) during at least 24 hours of continuous pumping and surging, turbidity remained stable at less than 1 Nephelometric Turbidity Units (NTU), and sand content was negligible.

During final well development pumping, a maximum short-term discharge rate of approximately 338 gallons per minute (gpm) was achieved with approximately 80 ft of drawdown in the well. However, most of the development was conducted at lower discharge rates. A total of approximately 90 hours were used for final development by pumping and surging.

3.6 Initial Desalter Test Well and Aquifer Testing

After final development was completed, a 6-hour step drawdown and a 24-hour constant rate pumping test were conducted. During both tests the pumping water level, discharge rate, and sand content were closely monitored. Aquifer pumping tests were analyzed using the Theis equation and Jacob's Straight-Line Method, Jacob (1950). The aquifer test data collection and analyses are described in Section 4.0 - Initial Pump Test Procedures, Analysis, and Results.

3.7 Alignment Survey

A line from the center of the well casing at ground surface should not deviate from vertical by more than 0.0067 times the smallest inside diameter of that part of the well being tested per foot of depth (ANSI/AWWA A100-15). Pacific Surveys conducted a gyroscopic (drift/alignment) survey on May 23, 2019, to measure the verticality of the well in the downwards direction. The survey shows approximately 0.84 inches (0.07 feet) of deviation at the anticipated pump setting depth of 130 ft bgs. This is within the

1 To surge a well refers to the act of forcing water into and out of a well by pumping and then abruptly stopping pumping at regular intervals.

maximum allowable deviation at this depth (i.e., the maximum allowable deviation at 130 ft bgs is 15.68 inches (1.31 feet)).

The maximum reported deviation within the Desalter Test Well is 1.20 inches (0.10 feet) at 140 ft bgs is well within the allowable deviation of 16.88 inches (1.41 feet) at that depth. Appendix E contains the gyroscopic survey log provided by Pacific Surveys.

3.8 Downhole Video Survey

A video survey of the post-construction condition of the well was performed on May 23, 2019, by Pacific Surveys. The video survey is a permanent record of the Desalter Test Well construction details, and condition of the Desalter Test Well following development and testing. The well casing and screen were shown to be clean and in good condition with no observable structural flaws or defects. The water column visibility was poor throughout the blank section of casing below the static water level but improved roughly 10 ft above the screened portion of the well. The video survey report is included in Appendix F.

3.9 Well Completion Report

A copy of the well completion report was prepared and submitted to the State of California Department of Water Resources (DWR) by Jensen upon the completion of the construction contract. The final DWR well completion report for the Desalter Test Well is included in Appendix G.

4.0 Initial Pump Test Procedures, Analysis, and Results

4.1 Data Collection

After development pumping was completed, two separate pumping tests were conducted at the Desalter Test Well. A step drawdown test was performed to determine specific capacity and well efficiency relationships for the Desalter Test Well. Following the step drawdown test, a constant rate pumping test was conducted to determine aquifer transmissivity and assist in short- and long-term drawdown estimates. Water level recovery measurements were collected for four hours upon completion of the constant rate pumping test.

During both tests the pumping water level, discharge rate, and sand content were closely monitored at the Desalter Test Well. Groundwater levels were measured using a downhole In-Situ Aqua TROLL 200 pressure transducer programmed to collect measurements at one-minute intervals. The field procedure for these tests followed the American Society for Testing and Material (ASTM), standard test method D 4050 (ASTM 1994).

Two (2) wells located within less than a quarter mile of the Desalter Test Well were used as observation wells during all test phases. These wells were selected based on distance and position in relation to the Desalter Test Well. Groundwater levels were measured using downhole In-Situ Level TROLL 400 pressure transducers programmed to collect measurements at five-minute intervals. Information on the observation wells used during testing is summarized in the following Table 4-1:

Table 4-1. Summary of Observation Well Details

Well Name	Well Depth	Screen Interval	Distance from Desalter Test Well
	ft	ft bgs	ft
Surf Cup No. 2	99.6*	50 to 110	1,011
E. Riverbank Turbine Pump Well	65.8*	-	480

* Monitoring well depths shown are measured depths, as ft bgs, evaluated in the field.

4.2 Basic Assumptions Used in Analysis of Pumping Test Data

The purpose of a pumping test is to obtain field data, which when substituted into an equation or set of equations, will yield estimates of well and aquifer properties. As certain assumptions have been used to derive these equations, it is important to observe or control these factors during the test.

These assumptions are:

- The aquifer material is assumed to consist of porous media, with flow velocities being laminar and obeying Darcy's Law.

- The aquifer is considered to be homogeneous, isotropic, of infinite aerial extent, and of constant thickness throughout.
- Water is released from (or added to) internal aquifer storage instantaneously upon change in water level.
- No storage occurs in the semi-confining layers of leaky aquifers.
- The storage in the well is negligible.
- The pumping well penetrates the entire aquifer and receives water from the entire aquifer thickness by horizontal flow.
- The slope of the water table or piezometric surface is assumed to be flat during the test with no natural, or other, recharge occurring.
- The pumping rate is assumed constant during the entire time period of a constant rate test, as well as during the time period of each discharge step in a step drawdown test.

Actual field conditions do not perfectly adhere to these assumptions; however, the equations are appropriate and customized to estimate aquifer parameters.

4.3 Pumping Test Data Analysis Methods

4.3.1 Step Drawdown Test Method

The purpose of the step drawdown test is to determine formation losses, well losses, and well efficiency – all of which are necessary in creating the final pump design. In an actively pumping well, the total drawdown in the well is composed of both laminar and turbulent head loss components. Laminar losses generally occur away from the borehole (where approach velocities are low), while turbulent losses are confined to the area in and around the immediate vicinity of the well screen and within the well borehole. The total drawdown in a pumping well may be expressed as:

$s_w = BQ + CQ^2$ Drawdown in a Pumping Well (1)

where:

s_w = Total drawdown measured in the well [ft]

B = Formation loss coefficient [ft/gpm]

Q = Discharge rate of the well [gpm]

C = Well loss coefficient [ft/gpm^2]

The first and second terms in equation (1) are referred to as formation loss or aquifer loss[2] (BQ) and well loss[3] (CQ^2), respectively. Formation loss and well loss coefficients are determined from the step drawdown test. The test procedure involves pumping the well at multiple (at least three) discharge rates with each "step" being a fraction of the maximum discharge. Analysis of the step drawdown data requires plotting of specific drawdown (s_w/Q) for each step against discharge rate. The formation loss coefficient (B) is the y-intercept of the best-fit straight line through the specific drawdown data points. The slope of the line is equal to the well loss coefficient (C).

Well Efficiency (E) is defined as the ratio of the formation loss component (BQ) to the total drawdown measured in the well (s_w) and is expressed as a percent:

$$E = 100\frac{BQ}{s_w} = \frac{100}{1 + CQ/B} \qquad \text{Well Efficiency} \qquad (2)$$

where:

E = Well Efficiency [percent]

B = Formation loss coefficient [ft/gpm]

Q = Discharge rate of the well [gpm]

s_w = Total drawdown measured in the well [ft]

C = Well loss coefficient [ft/gpm^2]

4.3.2 Constant Rate Test Method

Calculation of aquifer parameters from pumping test data is based on analytical solutions for the basic differential equation of groundwater flow that can be derived from fundamental laws of physics. One of the most widely used solutions of this equation for non-steady radial flow to wells is the Theis Equation:

[2] Aquifer loss is the head loss measured at the interface between the aquifer and the filter pack. The magnitude of the aquifer loss can be found from consideration of radial flow into the well and calculated using, for example, Jacob's Equation.

[3] Well losses are head losses associated with the entrance of water into and through the well screen, in addition to those losses incurred as the flow moves axially towards the pump intake. These turbulent flow losses vary as the square of the velocity.

$$s(r,t) = \frac{114.6Q}{T} W(u) \qquad \text{Theis Equation} \qquad (3)$$

where:

s(r,t) = Drawdown in the vicinity of an artesian well [ft]

r = Distance from pumping well [ft]

Q = Discharge rate of pumping well [gpm]

T = Transmissivity of aquifer [gallon per day per ft (gpd/ft)]

W(u) = Well Function of Theis

u = 1.87 x r^2 x S / (T x t)

where:

S = Storativity [fraction]

t = Time after pumping started [days]

4.3.2.1 Jacob's Straight-Line (Modified Theis Non-Equilibrium) Method

According to Jacob (1950), for small values of u, u < 0.05, the Theis Equation may be approximated by Jacob's Equation:

$$s(r,t) = \frac{264Q}{T} \log\left(\frac{0.3\ Tt}{r^2\ S}\right) \qquad \text{Jacob's Equation} \qquad (4)$$

Jacob's Equation is valid for most hydrogeologic problems of practical interest, is easier to use than the Theis equation, and involves a simple graphical procedure to calculate transmissivity and storativity. This method (D 4105) is summarized by ASTM (1994).

Transmissivity can be calculated as:

$$T = \frac{264Q}{\Delta s} \qquad (5)$$

where:

T = Transmissivity [gpd/ft]

Q = Pumping rate [gpm]

Δs = Change in drawdown over one log cycle of time [ft]

Δs = Change in drawdown over one log cycle of distance [ft]

4.4 Initial Pumping Test Data Analysis and Results

4.4.1 Desalter Test Well Step Drawdown Pumping Test

The step drawdown test was performed on May 20, 2019, at average discharge rates of 163 gpm, 238 gpm, and 283 gpm. The static water level at the beginning of the test was approximately 10.47 ft bgs. Figure 5 and Appendix H show the step drawdown test data and the time-drawdown curve for each step.

4.4.2 Desalter Test Well Constant Rate Pumping Test

A 1-day constant rate pumping test was conducted from May 21 to 22, 2019 following recovery from the step drawdown test. The static water level at the start of the test was 11.02 ft bgs and the average discharge rate was 197 gpm. Water level drawdown in the Desalter Test Well was 4.4 ft per log cycle. Evaluation of test data obtained from the pumping well using Jacob's straight-line interpretation method shows a transmissivity of approximately 11,800 gpd/ft from the designated Lower aquifer (see Figure 6). Transmissivity is the product of the hydraulic conductivity and thickness of the aquifer (T = KB, where T = transmissivity, K = hydraulic conductivity, and B = aquifer thickness).

4.4.2.1 Observation Wells Time-Drawdown Analyses

During the constant rate pumping test measurable drawdown was observed in the two observation wells Surf Cup No. 2 and E. Riverbank Turbine Pump Well. Time-drawdown plots were created (see Figures 7 and 8) and analyses were performed to determine aquifer parameters. Table 4-2 provides a summary of aquifer characteristics calculated from the observation well data obtained during the constant rate pumping test. However, it should be noted that the aquifer parameters determined from the East Riverbank Turbine Pump Well time-drawdown analysis (Figure 8) are likely artificially high due to the wells casing integrity and proximity to the river. Well screen depth for this abandoned agriculture well site is unknown, and the steel casing was likely deteriorated, resulting in pressure influence from both the shallow aquifer and the river.

Table 4-2. Observation Wells Time-Drawdown Results

Well Name	Distance from Desalter Test Well ft	Drawdown[1] ft	Transmissivity gpd/ft	Storativity
Surf Cup No. 2	1,011	1.7	30,500	0.001
E. Riverbank Turbine Pump Well	480	0.4	130,000	0.033

[1] Water level drawdown value is per log cycle.

4.4.3 Specific Capacity and Well Efficiency

The specific drawdown chart (see Figure 9) shows the relationship between specific drawdown (s/Q) and the discharge rate (Q). Analysis of the data resulted in a formation loss coefficient (B) of 0.1350 ft/gpm and a well loss coefficient (C) of 4.441 x 10^{-4} ft/gpm^2. Data used to generate the specific drawdown chart is shown in Table 4-3.

Table 4-3. Desalter Test Well Specific Drawdown

Aquifer Test	Discharge Rate (Q) gpm	Cumulative Drawdown[1] (s) ft	Specific Drawdown (s/Q) ft/gpm
Step 1	163	32.98	0.203
Step 2	238	54.92	0.231
Step 3	283	74.42	0.263
Constant Rate	197	45.81	0.233

[1] Drawdown at 1,440 minutes after the start of each step.

The specific capacity and well efficiency diagram (see Figure 10) shows estimated drawdown (44.8 ft) and well efficiency (60.3%) based on the formation and well loss coefficients. Estimated drawdown and well efficiency may also be calculated for any given pumping rate (Q) using equations (1) and (2) described above in Section 4.3.1 - Step Drawdown Test Method. The specific capacity and estimated well efficiency are low but consistent with the aquifer materials and thickness at the Desalter Test Well site.

4.4.4 Design Discharge Rate, Total Lift, and Pump Setting

Based on the pumping test data, a continuous design discharge rate of 200 gpm was recommended for the Desalter Test Well. At this discharge rate, and assumed water level conditions similar to those during the May 2019 pumping tests, the short-term (i.e., after one day of continuous pumping) drawdown of approximately 44.8 ft was expected with a total lift (to the land surface) of 56.8 ft. Assuming continuous operation of the Desalter Test Well at this design rate, a long-term (i.e., after one year of continuous pumping) drawdown of approximately 56.9 ft was expected with a total lift of 67.9 ft. Under the May 2019 static water level conditions (i.e., 11.02 ft bgs), the specific capacity of the Desalter Test Well was approximately 4.5 gpm/ft at the recommended discharge rate of 200 gpm (see Figure 10).

Table 4-4 summarizes the pumping parameters based on the May 2019 depth to static water level as well as the assumed pump setting of 103 ft bgs.

Table 4-4. Recommended Desalter Test Well Pumping Parameters

Parameters	Short Term (1-Day)	Long Term (1-Year)
Design Pumping Rate	200 gpm	200 gpm
Design Drawdown	44.8 ft	56.9 ft
Pump Intake Setting	103 ft bgs	103 ft bgs
Static Water Level Depth	11 ft bgs	11 ft bgs
Total Lift to Surface (does not include regional decline in static water levels)	55.8	67.9

The above recommendation is based on the May 2019 pumping tests, however following the 1-year long-term pumping test, conducted from December 2019 to December 2020 (see Section 6.0 – Long-Term Desalter Test Well Pumping Test), a continuous (24 hours, 365 days) 200 gpm discharge rate is not sustainable as determined by pumping water levels below the top of the screen (dewatering) causing cascading water. It is recommended that pumping operations maintain the pumping water levels above the top of the well screen (located at 60 ft bgs) as to prevent dewatering and cascading water. Cascading water is known to reduce well efficiency and can contribute to aerobic bacterial growth in the well (see Section 9.1.1 - Desalter Test Well Test Pump Iron & Manganese Fouling & Filtration System Pilot Study for iron and manganese fouling encountered during the long-term pump testing). Cyclic pumping of Desalter Test Well at this rate is highly recommended.[4]

4.5 Desalter Test Well Groundwater Quality

Groundwater samples were collected by Geoscience personnel at the end of the constant rate pumping test on May 22, 2019. The samples were submitted to Eurofins Eaton Analytical LLC (Eurofins) located in Monrovia, California, for analysis of constituents required by the State of California Code of Regulations Title 22 Rule, in addition to other selected constituents. Selected constituents from the completed well water quality results are presented in Table 4-5. For the complete record of laboratory water quality analyses from the completed well see Appendix I.

The total dissolved solids (TDS) concentration for the completed Desalter Test Well was reported at 3,200 milligrams per liter (mg/L), above both the 500 mg/L lower limit of the State Water Resources Control Board Division of Drinking Water (DDW) secondary maximum contaminant level (MCL) and the upper limit of 1,000 mg/L DDW secondary MCL for TDS. Specific conductance (at 25°C) was reported at 5,500 µmho/cm, above both the 900 µmho/cm lower limit of the DDW secondary MCL, and the upper limit of 1,000 µmho/cm DDW secondary MCL. The brackish nature of the groundwater was anticipated having been reported by previous studies in the basin (USGS, 1983) as well as from data collected on local wells and reported in our previous work presented in the feasibility study (OMWD, 2017). The elevated salinity has been attributed to seawater intrusion and to natural groundwater in rocks of marine origin. The chloride concentration was reported above the both the 250 mg/L lower limit and the upper limit of 500 mg/L DDW secondary MCL of chloride at 1,300 mg/L. Iron Total ICAP was reported at a concentration

[4] OMWD will need to monitor the pumping levels in this and any future desalter wells to ensure that water levels are kept above the screen. The period the well can be pumped before water levels reach the top of the screen will be dependent on flow rate and duration, and seasonal local water level conditions. For reference, during the Long Term Test the desalter was pumped for approximately 76 days at an average rate of 193 gpm before the water level reached the top of the screen. Cyclic pumping of the Desalter Test Well is recommended to allow the well to recover. In addition, continuous monitoring using a dedicated pressure transducer with the ability to remotely monitor will provide the advanced notice when water levels are approaching the well screen.

of 0.63 mg/L, above the DDW secondary MCL of 0.3 mg/L. Manganese Total ICAP/MS was detected at a concentration of 1.1 mg/L above the DDW secondary MCL of 0.050 mg/L and the DDW notification level of 0.5 mg/L. Odor at 60C (TON) was reported above the DDW secondary MCL of 3 TON, at 8 TON. Perfluorooctanesulfonic acid (PFOS)[5] had a concentration of 0.01 micrograms per liter (µg/L), above the current DDW notification level of 0.0065 µg/L but below the DDW response level of 0.040 µg/L. The sulfate concentration was reported above both the 250 mg/L lower limit of the DDW secondary MCL, and the upper limit of 500 mg/L DDW secondary MCL at 730 mg/L. Turbidity was reported just above the DDW secondary MCL of 5 NTU at 5.4 NTU. All other constituents were reported to be below their respective MCL's. Due to the water quality, groundwater from most of the San Dieguito groundwater basin south of Calzada del Bosque is unusable as potable water and for some agricultural applications without treatment.

Table 4-5. Summary of Desalter Test Well Completed Well Laboratory Water Quality Results

Constituent	Method	Units	Result	Regulatory Standard
Aggressiveness Index-Calculated	SM 2330	-	14	NA[7]
Alkalinity in CaCO3 units	SM 2320B	mg/L	380	NA[7]
Alpha, Min Detectable Activity	SM 7110C	pCi/L	0.2	NA[7]
Alpha, Two Sigma Error	SM 7110C	pCi/L	0.46	NA[7]
Anion Sum - Calculated	SM 1030E	meq/L	60	NA[7]
Apparent Color	SM 2120B	ACU	10	15[2]
Arsenic Total ICAP/MS	EPA 200.8	µg/L	5.7	10[1]
Barium Total ICAP/MS	EPA 200.8	mg/L	0.13	1.0[1]
Beta, Gross	EPA 900.0	pCi/L	35	50[1]
Beta, Min Detectable Activity	EPA 900.0	pCi/L	8	NA[7]
Beta, Two Sigma Error	EPA 900.0	pCi/L	2.8	NA[7]
Bicarb. Alkalinity as HCO3calc	SM2330B	mg/L	460	NA[7]
Boron Total ICAP	EPA 200.7	mg/L	0.81	1.0[3]
Calcium Total ICAP	EPA 200.7	mg/L	400	NA[7]
Carbon Dioxide, Free(25C)-Calc.	SM4500-CO2-D	mg/L	12	NA[7]
Carbonate as CO3, Calculated	SM 2330B	mg/L	ND	NA[7]
Cation Sum - Calculated	SM 1030E	meq/L	57	NA[7]
Chloride	EPA 300.0	mg/L	1,300	250 - 500[2]
Chromium, Hexavalent	EPA 218.6	µg/L	ND	50[8]
Chromium, Total	EPA 200.8	mg/L	ND	0.050[1]
Copper	EPA 200.8	mg/L	ND	1.0[2]

[5] In August 2019, DDW revised the notification level for PFOS to 0.0065 ug/L. On February 6, 2020, DDW issued an updated drinking water health advisory response level for PFOS to 0.040 ug/L.

Constituent	Method	Units	Result	Regulatory Standard
Fluoride	SM 4500F-C	mg/L	0.27	2[1]
Gross Alpha + adjusted error	SM 7110C	pCi/L	11	15[1]
Gross Alpha by Coprecipitation	SM 7110C	pCi/L	11	15[1]
Iron Total ICAP	EPA 200.7	mg/L	0.63	0.3[2]
Langelier Index - 25 degree	SM 2330B	-	1.6	NA[7]
Langelier Index at 60 degrees C	SM 2330B	-	2	NA[7]
Magnesium Total ICAP	EPA 200.7	mg/L	100	NA[7]
Manganese Total ICAP/MS	EPA 200.8	mg/L	1.1	0.050[2] / 0.5[3]
Nitrate as N	EPA 300.0	mg/L	ND	10[1]
Nitrate as NO3 (calc)	EPA 300.0	mg/L	ND	45[1]
Nitrite as N	EPA 353.2	mg/L	ND	1[1]
Odor at 60 C (TON)	SM 2150B	TON	8	3[2]
Perfluorobutanesulfonic acid (PFBS)	EPA 537 Rev 1.1	µg/L	ND	0.5[3] / 5[4]
Perfluorohexanesulfonic acid (PFHxS)	EPA 537 Rev 1.1	µg/L	0.0062	NA[7]
Perfluorooctanesulfonic acid (PFOS)	EPA 537 Rev 1.1	µg/L	0.01	0.0065[3] / 0.040[4]
Perfluorooctanoic acid (PFOA)	EPA 537 Rev 1.1	µg/L	0.0032	0.0051[3] / 0.010[4]
pH (H3=past HT not compliant)	SM4500-HB	pH Units	7.8	6.5 - 8.5[5]
pH of CaCO3 saturation(25C)	SM 2330B	pH Units	6.2	NA[7]
pH of CaCO3 saturation(60C)	SM 2330B	pH Units	5.7	NA[7]
Potassium Total ICAP	EPA 200.7	mg/L	39	NA[7]
Radon 222	SM 7500RN	pCi/L	240	4,000[6]
Radon 222, Two Sigma Error	SM 7500RN	pCi/L	12	NA[7]
Silica	EPA 200.7	mg/L	31	NA[7]
Sodium Total ICAP	EPA 200.7	mg/L	620	NA[7]
Specific Conductance, 25°C	SM2510B	µmho/cm	5,500	900 – 1,600[2]
Sulfate	EPA 300.0	mg/L	730	250 - 500[2]
Surfactants	SM 5540C/EPA 425.1	mg/L	0.19	0.5[2]
Total Dissolved Solids (TDS)	E160.1/SM2540C	mg/L	3,200	500 – 1,000[2]
Total Hardness as CaCO3 by ICP (calc)	SM 2340B	mg/L	1,400	NA[7]
Turbidity	EPA 180.1	NTU	5.4	5[2]
Uranium by ICPMS as pCi/L	EPA 200.8	pCi/L	14	20[1]
Uranium ICAP/MS	EPA 200.8	µg/L	21	30[1]
Zinc	EPA 200.8	mg/L	ND	5.0[2]

[1] Division of Drinking Water (DDW) primary maximum contaminant level (MCL).
[2] DDW secondary MCL.
[3] DDW notification level for unregulated chemicals.
[4] DDW response level.
[5] United States Environmental Protection Agency (USEPA) secondary standard for pH.

[6] US EPA MCL advisory level.
[7] Not Applicable – no current MCL.
[8] Chromium-6 is currently regulated under the 50-µg/L DDW primary MCL for total chromium.
ND - Not detected above laboratory detection limits.
Underline Equal to or above current DDW MCLs or notification levels.

5.0 Long-Term Monitoring Network

In order to investigate the impacts of long-term pumping of the Desalter Test Well, the groundwater monitoring network was developed to:

- Evaluate potential impacts to water levels in wells of current basin users
- Verify water quality
- Collect data to calibrate groundwater models
- Verify manganese treatment by piloting pre-treatment technologies

Over 480 driller's logs were collected, reviewed, and vetted during a two day well canvas performed by Geoscience personal from November 22 to 23, 2016. The 16 monitoring wells and piezometers selected for the long-term pumping test best fit the criteria of proximity to the Desalter Test Well, spatial positioning relative to the Desalter Test Well, and suitable well construction to ensure screen interval placement targeted both the shallow and deep aquifers present in the basin. A summary of the monitoring well details is provided in Table 5-1. Additional monitoring well information is provided in attached Table 1.

Table 5-1. Monitoring Network Summary

Monitoring Well	Location Relative to Desalter Test Well	Approximate Distance from Desalter Test Well ft	Monitoring Well Depth ft bgs	Screen Interval ft bgs
Morgan Run P-1	East Northeast	1,646	23	8 - 23
Morgan Run P-2	East Northeast	1,641	23	8 - 23
Morgan Run P-4D	North Northeast	3,215	89	74.5 - 89.5
Morgan Run P-7	Northwest	906	36	15 - 35
Morgan Run P-11A	Northeast	1,935	27	17 - 27
Morgan Run P-11B	Northeast	1,935	45	40 - 45
Morgan Run P-11D	Northeast	1,939	99	84 - 99
Morgan Run Test Well	Northeast	1,900	133.5*	87 - 137
Morgan Run GunR	North Northeast	5,367	120.8*	81.3 - 120.8
Morgan Run No. 3 Green North	North Northeast	4,476	80.2*	52 - 92
Valley 7 Well	Southeast	2,598	123.5*	-
Surf Cup No. 1	West	1,207	61.9*	-
Surf Cup No. 1 (Abandoned)	West	1,216	65	-
Surf Cup No. 2	West	1,011	99.6*	50 - 110
Rancho Paseana Well	North Northeast	8,251	101	68 - 98
Fairbanks HOA Well	Northeast	6,765	-	-

* Monitoring well depths shown are measured depths, as ft bgs, evaluated in the field.

5.1 Baseline Monitoring of Water Levels and Water Quality in the Desalter Test Well

Groundwater quality samples were collected from the Desalter Test Well at the end of the constant rate test on May 22, 2019. The water quality data from the long-term pumping test sampling events are summarized in Table 6-3, attached Table 2, and the full laboratory water quality reports can be found in Appendix I.

Data monitoring in the Desalter Test Well started on September 10, 2019, to provide nearly three months of baseline data. Pressure data and specific conductance was continuously recorded at 15-minute intervals using an In-Situ Aqua TROLL 200 data logger installed inside the Desalter Test Well at a depth of approximately 117 ft bgs, above the submersible pump. An In-Situ BaroTroll was installed in Surf Cup No. 1 to normalize for atmospheric barometric variation. A summary of the method used to convert transducer pressure measurements to groundwater elevations can be found in Appendix J. During non-pumping periods the specific conductivity data recorded by this instrument represents a depth specific sample of water column. A summary of the method used to estimate total dissolved solids from electrical conductivity (EC) measurements can be found in Appendix K.

Presented in Figures 11 and 12 are the baseline non-pumping period and long-term test pumping period for groundwater elevation. Figure 13 is the baseline long-term test pumping for specific conductivity. The Desalter Test Well showed an increasing groundwater elevation trend leading up to the start of the long-term pumping test while entering the rainy season. The manual hand water level taken during the installation of the Desalter Test Well transducer measured the depth to water at 13.75 ft bgs while the hand water level taken before the start of the long-term test measured depth to water at 9.56 ft bgs. The increase in groundwater elevation was roughly 4.19 ft over nearly 85 days. Specific conductivity measured in the Desalter Test Well stayed relatively level at roughly 6,000 microsiemens per centimeter (µS/cm) during the baseline period.

5.2 Baseline Monitoring of Water Levels and Water Quality in the Monitoring Network

The designated monitoring network had 14 wells and piezometers equipped with water level transducers that continually logged pressure data in 15-minute intervals. Level transducers installed consisted of Solinst® Levelogger® Model 3001, non-vented In-Situ AquaTroll devices, and TD-Diver® and Mini-Diver® dataloggers. Groundwater elevation was also measured manually during each data logger download. A Baro-Diver® and In-Situ BaroTroll were installed in Surf Cup No. 1 to normalize for atmospheric barometric variation. A summary of the method used to convert transducer pressure measurements to groundwater elevations can be found in Appendix J. Presented in Figures 14 through 24 are the baseline non-pumping period and long-term test pumping period for groundwater elevation in the monitoring network.

Figure 14 shows groundwater elevations and precipitation during the baseline and long-term testing period. Figure 15 shows the locations and plots of the Desalter Test Well, Morgan Run Wells, and monitoring wells. Figures 16 through 24 show plots of groundwater elevations for specific wells and groups of monitoring wells. The locations of these wells are shown in Figure 15 for reference. Table 5-2 provides a summary of the water level trends in the monitoring wells and piezometers. Additional monitoring network and transducer installation information is provided in attached Table 1.

Table 5-2. Monitoring Wells and Piezometers Baseline Groundwater Level Trend Observations

Monitoring Well	Beginning of Record	Figure Numbers	Observation of Groundwater Level Trends
Morgan Run P-1	09/10/2019	14, 15, 30 ,31	Groundwater levels show a slight upward trend and react to precipitation events.
Morgan Run P-2	09/10/2019	14, 15, 30, 31	Groundwater levels show a slight upward trend and react to precipitation events.
Morgan Run P-4D	09/10/2019	14, 15, 30, 32	Groundwater levels show influence from Morgan Run pumping wells[1] and an overall upward trend. Groundwater levels react to precipitation events.
Morgan Run P-7	11/29/2019	14, 15, 30, 31	Groundwater levels show a slight upward trend.
Morgan Run P-11A	09/10/2019	14, 15, 30, 31	Groundwater levels show a slight upward trend and react to precipitation events.
Morgan Run P-11B	09/10/2019	14, 15, 30, 32	Groundwater levels show an upward trend and react to precipitation events.
Morgan Run P-11D	09/10/2019	14, 15, 29, 30, 32	Groundwater levels show muted response from Morgan Run pumping wells[1] and an overall upward trend. Groundwater levels react to precipitation events.
Morgan Run Test Well	09/10/2019	14, 15, 19, 24, 29	Groundwater levels show muted response from Morgan Run pumping wells[1] and an overall upward trend. Groundwater levels react to precipitation events.
Morgan Run GunR	09/10/2019	14, 15, 16, 17	Groundwater levels show a pumping signature from the GunR pump and an overall upward trend.
Morgan Run No. 3 Green North	11/19/2019	14, 15, 16, 18	Groundwater levels show an overall upward trend.
Valley 7 Well	11/19/2019	14, 15, 19, 23, 29	Groundwater levels show an upward trend and react to precipitation events.
Surf Cup No. 1	09/10/2019	14, 15, 19, 20	Groundwater levels show a level trend.
Surf Cup No. 1 (Abandoned)	11/19/2019	14, 15, 19, 22	Groundwater levels show a slight upward trend.
Surf Cup No. 2	09/10/2019	14, 15, 19, 21, 29	Groundwater levels show an overall upward trend and react to precipitation events.

[1] Morgan Run pumping wells refers to Morgan Run GunR and No. 3 Green North.

In summary, the monitoring well network shows an overall upward trend before the start of the Desalter Test Well long-term pumping test caused by the start of the rainy season and precipitation events. A select few Morgan Run piezometers reflect the pumping signature from the Morgan Run pumping wells (Morgan Run GunR and No. 3 Green North).

Select monitoring wells had transducers capable of recording specific conductivity values as well. Specific conductivity data was also continually logged in 15-minute intervals. Presented in Figures 25 through 27 are the baseline non-pumping period and long-term test pumping period for specific conductivity in select wells of the monitoring network. Table 5-3 provides a summary of the specific conductivity trends in the monitoring wells during the baseline period.

Table 5-3. Monitoring Wells Baseline Specific Conductivity Trend Observations

Monitoring Well	Beginning of Record	Figure Number	Observation of Specific Conductivity Trends
Morgan Run Test Well	09/10/2019	27	Specific conductivity shows an overall upward trend.
Morgan Run GunR	09/10/2019	26	Specific conductivity shows a pumping signature from the GunR pump and an overall level trend.
Morgan Run No. 3 Green North	11/19/2019	26	Specific conductivity shows a reaction to precipitation events and an overall downward trend.
Valley 7 Well	11/19/2019	27	Specific conductivity shows a slight downward trend.
Surf Cup No. 1	09/10/2019	27	Specific conductivity shows a level trend.
Surf Cup No. 2	09/10/2019	27	Specific conductivity shows a reaction to precipitation events and a level trend that spikes before the start of the long-term pumping test.

The only significant change observed in specific conductivity before the start of the long-term pumping test was the observed spike in Surf Cup No. 2. Each monitoring well shows a slight variation in specific conductivity trend compared to each other. Nearly all the trends examined show a gradual change from the start of logging to the start of the long-term pumping test.

5.3 Baseline Monitoring of Pumping Demands in the Monitoring Network

The monitoring network included four (4) high-capacity pumping wells. Flowmeters were installed in available wells to record pumping rate and total production volume.

Morgan Run GunR and Morgan Run No. 3 Green North had flowmeters installed and production rate and volumes recorded. Morgan Run GunR was brought back online around the same time the Desalter Test Well began pumping. Approximately 270 acre-ft pumped from Morgan Run GunR during the long-term pumping test, and 244 acre-ft from Morgan Run No. 3 Green North. For daily volumes pumped from Morgan Run GunR and Morgan Run No. 3 Green North between December 1, 2019 through December 9, 2020, see Figure 28.

6.0 Long-Term Desalter Test Well Pumping Test

The Desalter Test Well long-term pump test was implemented as part of the pilot testing during the period of December 4, 2019, to December 2, 2020. There were 358 total days of pumping of the Desalter Test Well at an average discharge rate of approximately 215 gpm with a total discharge volume of approximately 340 acre-ft. The Desalter Test Well was pumped continuously apart from a few shutdowns related to Desalter Test Well maintenance and repair.

Data collection for the long-term pumping test started on December 4, 2019, from the Desalter Test Well and monitoring network. Water level and conductivity data were downloaded monthly. For quality control, groundwater levels were recorded in each well and piezometer using a wire-line sounder at the time of transducer installation and replacement, during water quality sampling, during monthly transducer data downloads, and at any other time the wells and piezometers were accessed. Water quality was also monitored in the Desalter Test Well and select monitoring wells during the long-term aquifer testing.

6.1 Groundwater Levels in Desalter Test Well During Long-Term Pumping Test

During the long-term pumping test groundwater levels were recorded every 15 minutes in the Desalter Test Well using an In-Situ Aqua TROLL 200 pressure transducer. Hand water levels were taken monthly using an electronic water level indicator during the monthly transducer data download. A plot of the groundwater level data collected from the Desalter Test Well is presented in attached Figures 11 and 12. The total drawdown during the long-term pumping test was 57.5 ft. The groundwater level in the Desalter Test Well did not show significant influence from precipitation events or Lake Hodges Dam releases. The change in the Desalter Test Well pumping rate is apparently the only factor causing changes to the groundwater level. For discussion of the long-term pumping test groundwater levels see Section 9.1.3.2 - Desalter Test Well Trends in Groundwater Elevation.

6.1.1 Pumping Interruptions and Rate Adjustments

On several occasions the Desalter Test Well had pumping interruptions, some unexpected and others intentional, to perform installation, repair, and maintenance cleaning during the long-term pumping test. Planned and unplanned rate adjustments were additional occurrences during the long-term aquifer test. Planned rate adjustments were used to regulate flow rate to closely follow the 200 gpm rate selected for the long-term pumping test. Unplanned rate adjustments were observed during continuous monitoring and pumping rates were corrected back to the 200 gpm rate. The details of the pumping interruptions during the long-term pumping test are summarized in Table 6-1.

Table 6-1. Desalter Test Well Long-Term Pumping Test Pumping Interruptions

Pump Off		Pump On		Time Off	Cause
Date	Time	Date	Time	Hours	
05/06/2020	10:04 AM	05/06/2020	3:49 PM	5.75	Installation of secondary 6-inch flowmeter.
05/13/2020	8:04 AM	05/18/2020	4:04 PM	128	Repair leak in discharge pipe.
10/27/2020	10:15 AM	10/27/2020	10:45 AM	0.5	Clean the Iron and Manganese fouling of Flowmeter 2.

6.2 Groundwater Levels in Monitoring Network During Long-Term Pumping Test

Groundwater levels in 14 monitoring wells and piezometers were recorded every 15 minutes using pressure transducers. Hand water levels were collected during the monthly transducer data downloads using an electronic water level indicator. Plots of the groundwater level data collected from the project monitoring wells are presented in attached Figures 14 through 24. Monitoring network details are summarized above in Table 6-1 and with additional transducer installation information in attached Table 1.

Of the 14 monitoring wells and piezometers, **four** (4) (Surf Cup No. 2, Valley 7 Well, Morgan Run P-11D, and Morgan Run Test Well) showed impacts from Desalter Test Well pumping (see Figure 29). The four (4) impacted wells and piezometers are all screened within the deep aquifer. The largest drawdown observed within the area of influence wells and piezometers during the long-term pumping test was 10 ft in Morgan Run P-11D. The drawdown in each of the four (4) impacted wells and piezometers at the end of the long-term pumping test was about five (5) feet. Table 6-2 summarizes the changes on the monitoring network from the Desalter Test Well pumping.

Table 6-2. Summary of Monitoring Network Impacted by Desalter Test Well Pumping

Monitoring Well	Well Depth	Screen Interval	Maximum Drawdown During Long-Term Test	Drawdown at the End of the Long-Term Test
	ft bgs	ft bgs	ft	ft
Surf Cup No. 2	99.6*	50 - 110	7.94	5.5
Valley 7 Well	123.5*	-	6.53	4.99
Morgan Run Test Well	133.5*	87 - 137	9.81	4.8
Morgan Run P-11D	99	84 - 99	10.06	4.92

* Monitoring well depths shown are measured depths, as ft bgs, evaluated in the field.

The ten (10) additional monitoring wells and piezometers did not show any changes from the Desalter Test Well pumping (see Figure 30). Nearly all the shallow piezometers (Morgan Run P-1, P-2, and P-11A) have several upward trends, spikes, observed in the water level record that do not correlate to Desalter Test Well pump off events (see Figure 31). The deep piezometers Morgan Run P-11B and 11D show similar, but muted, upward trends that also do not correlate to Desalter Test Well pump off events. The deep piezometer Morgan Run P-4D displays oscillations from cyclical pumping of the nearby Morgan Run No. 3 Green North well. The deep piezometer water levels are presented in Figure 32. The Morgan Run pumping wells, No. 3 Green North and GunR, show pumping signatures reflecting their own pumping schedule (see Figure 28). Morgan Run P-7, Surf Cup No. 1, and Surf Cup No. 1 (Abandoned) do not show any variation in groundwater trends.

6.2.1 Precipitation and Lake Hodges Dam Release

During the long-term pumping test, the project area experienced rainfall during the months of December, January, February, March, and April 2020. Minor rain events also occurred in June and November 2020. Several large precipitation events in mid-April resulted in the City of San Diego's calibrated release of approximately 6,200 acre-ft of water from Lake Hodges reservoir over 17 days (April 11 to 27, 2020) to maintain a lower lake level as ordered by the State of California. Precipitation records from PRISM (Parameter-elevation Regressions on Independent Slopes Model) are overlaid on all the water level plots. The larger precipitation events that took place between December and mid-April 2020 likely contributed (through precipitation recharge and/or impacts of precipitation events on basin pumping) to the upward trend of groundwater levels in the shallow piezometers, Morgan Run P-1, P-2, and P-11A, and deep piezometers, Morgan Run P-11B and P-11D (see Figures 31 and 32, respectively).

6.3 Water Quality During Long-Term Pumping Test

Groundwater samples were collected quarterly[6] from the Desalter Test Well and monitoring network piezometers and wells by groundwater consultant Ian Goltz (IKG Environmental, Inc.) during the Long-Term Pumping Test on April 21, 2020, September 16, 2020, and December 1, 2020. The samples were submitted to EnviroMatrix Analytical, Inc. (EMA) located in San Diego, California, for General Mineral and General Physical water quality analyses. These constituents from the newly constructed Test Well and observation well water quality reports are presented in Table 6-3 and attached Table 2, along with relevant regulatory standards. The laboratory water quality reports for samples collected from the Test Well and observation wells can be found in Appendix I. The purpose of the sample collection was to evaluate whether water quality changes would result from the long-term pumping. With the exception of water quality in Monitoring Well P-11B, water quality results remained essentially the same in the monitoring wells for the three sampling events, therefore pumping did not result in salinity changes in the lower or upper aquifer. The well screen in P-11B is at an intermediate level. The increase in TDS in P-11B in the last two sampling events may reflect localized mixing of groundwater from the upper aquifer. Future plans should include abandonment of P-11B to eliminate local mixing of shallow and deeper aquifer water for long-term groundwater development.

[6] Due to site access restrictions and laboratory safety protocols during the COVID 19 pandemic only three of the four planned quarterly water quality samples were collected.

Table 6-3. Notable Desalter Test Well and Observation Well Laboratory Water Quality During the Long-Term Pumping Test - Minimum, Maximum, and Average Water Quality Results

Well or Piezometer:		Desalter Test Well	Morgan Run P-2	Morgan Run P-11B	Morgan Run P-11D	Morgan Run GunR	Regulatory Standard(s)
Screen Interval (ft bgs):		60 - 125	8 - 23	40 - 45	84 - 99	81.3 - 120.8	
Constituent	Units			Min - Max (Avg)*			
Boron, Total	mg/L	ND - 0.96 (0.64)	0.46 - 0.76 (0.62)	0.51 - 0.73 (0.59)	ND - 0.53 (0.33)	ND - 0.38 (0.25)	1.0[3]
Calcium, Total	mg/L	452 - 462 (457)	ND - 624 (390)	68 - 468 (214)	142 - 145 (143)	369 - 403 (385)	NA[5]
Chloride	mg/L	**1,290 – 1,340 (1320)**	**2,200 – 2,480 (2,333)**	380 – **1,790 (953)**	**590 - 630 (607)**	**1,110 – 1,270 (1,203)**	250 - 500[2]
Hardness (Dissolved)	mg CaCO3/L	1,570 – 1,750 (1677)	ND – 3,210 (2,013)	406 – 2,750 (1,338)	800 - 860 (835)	1,820 – 1,880 (1,847)	NA[5]
Iron, Total	mg/L	**0.70 - 0.88 (0.81)**	0.04 - **0.45** (0.26)	**0.31 - 2.04 (0.95)**	**0.82 - 1.15 (1.03)**	0.19 - 0.26 (0.21)	0.3[2]
Manganese, Total	mg/L	**0.92 - 1.07 (1.0)**	**3.03 - 4.86 (3.75)**	**0.10 - 1.91 (0.71)**	**0.45 - 0.48 (0.46)**	**1.81 - 2.29 (2.03)**	0.050[2] / 0.5[3]
pH at 25°C	pH Units	6.96 - 7.04 (7.00)	7.03 - 7.08 (7.06)	7.17 - 7.54 (7.40)	7.30 - 7.37 (7.34)	6.77 - 7.19 (6.93)	6.5 - 8.5[4]
Silicon, Total	mg/L	15 - 17 (16)	11 - 20 (17)	16 - 20 (18)	14 - 15 (14)	15 - 16 (15)	NA[5]
Sodium, Total	mg/L	820 – 900 (847)	2.78 – 1,250 (736)	321 – 976 (624)	474 - 514 (497)	652 – 688 (674)	NA[5]
Specific Conductance (EC)	µmhos/cm	**4,930 – 5,440 (5,160)**	**7,800 – 8,330 (8,063)**	**1,950 – 6,030 (3,633)**	**2,810 – 3,150 (2,937)**	**4,150 – 5,190 (4,697)**	900 - 1,600[2]
Sulfate as SO4	mg/L	**746 - 802 (765)**	**1,240 – 1,430 (1,357)**	183 – **1,080 (533)**	**346 - 376 (360)**	**657 – 853 (751)**	250 - 500[2]
Total Dissolved Solids (TDS)	mg/L	**3,500 – 3,590 (3,557)**	**5,460 – 5,990 (5,763)**	**1,080 – 4,690 (2,517)**	**1,850 – 1,890 (1,870)**	**3,210 – 3,330 (3,287)**	500 - 1,000[2]
Turbidity	NTU	**6.4 - 6.9 (6.6)**	1.1 - **50 (18.7)**	1.3 - **18.0 (6.87)**	4.1 - **10.0 (7.5)**	1.2 - 1.6 (1.4)	5[2]

* Water quality samples were collected for laboratory analysis on April 21, 2020, September 16, 2020, and December 1, 2020.
[1] Division of Drinking Water (DDW) primary maximum contaminant level (MCL).
[2] DDW secondary MCL.
[3] DDW notification level for unregulated chemicals.
[4] United States Environmental Protection Agency (USEPA) secondary standard for pH.
[5] Not Applicable – no current MCL.
ND - Not detected above laboratory detection limits.
BOLD Equal to or above current DDW MCLs or notification levels.

6.3.1 Water Quality in Desalter Test Well During Long-Term Pumping Test

Notable well water quality findings during the Long-Term Test are summarized in Table 6-3 above. The total dissolved solids (TDS) concentration for the Desalter Test Well ranged from 3,500 to 3,590 mg/L, above both the 500 mg/L lower limit of the SWRCB DDW secondary maximum contaminant level (MCL) and the upper limit of 1,000 mg/L for TDS. Specific conductance (at 25°C) was reported above both the 900 µmho/cm lower limit of the DDW secondary MCL, and the upper limit of 1,000 µmho/cm DDW secondary MCL at 4,930 to 5,440 µmho/cm. The chloride concentration was reported above both the

250 mg/L lower limit and the upper limit of 500 mg/L DDW secondary MCL of chloride at 1,290 to 1,340 mg/L. Total iron was reported at a concentration of 0.70 to 0.88 mg/L, above the DDW secondary MCL of 0.3 mg/L. Total manganese was detected at concentrations ranging from 0.92 to 1.07 mg/L, above the DDW secondary MCL of 0.050 mg/L and the DDW notification level of 0.5 mg/L. The sulfate concentration was reported above both the 250 mg/L lower limit of the DDW secondary MCL, and the upper limit of 500 mg/L at 746 to 802 mg/L. Turbidity was reported above the DDW secondary MCL of 5 NTU at 6.4 to 6.9 NTU, however these results may be artificially high due to oxidation of iron and/or manganese prior to running the laboratory turbidity analysis. Total boron was reported at elevated levels including two results at 0.95 and 0.96 mg/L, just below the DDW notification level of 1.0 mg/L. Sampled Desalter Test Well water was found to have high total calcium (457 mg/L average) and can be categorized as hard water (1,677 mg CaCO3/L average). As expected for a brackish groundwater environment, total sodium was found to be between 820 and 900 mg/L. See Figure 33 for a Trilinear Diagram (Piper Diagram) containing the completed well and long-term testing water chemistry for the Desalter Test Well. A Trilinear Diagram is a specialized graph used to plot the relative abundance of common ions in multiple water samples, allowing the grouping of water samples based on water chemistry. Cations, ions with a positive charge (magnesium, calcium, and sodium plus potassium), are represented in the lower left ternary diagram while anions, ions with a negative charge (chloride, sulfate, and carbonate plus bicarbonate), are represented in the lower right ternary diagram. The combination diamond plot in the middle is a projection from the other two ternary diagrams and displays the kind of groundwater (e.g., calcium bicarbonate, sodium chloride, etc.) the water samples represent.

6.3.2 Water Quality in Monitoring Network Selected Wells During Long-Term Pumping Test

In addition to the pumping Desalter Test Well, water quality samples were collected quarterly from three piezometers (Morgan Run P-2, P-11B, and P-11D) and one irrigation well (Morgan Run GunR) during the Long-Term Pumping Test as described in Section 6.3 Water Quality During Long-Term Pumping Test. The notable results are summarized in Table 6-3 above, and in complete detail in attached Table 2. The laboratory water quality reports for samples collected from the test well and observation wells can be found in Appendix I.

All monitoring location results exceeded the Total Dissolved Solids and Specific Conductance (at 25°C) DDW secondary MCL upper limits of 1,000 mg/L and 1,600 mg/L respectively, with the highest concentrations found in Morgan Run P-2 (5,990 mg/L TDS and 8,330 mg/L EC). The shallow piezometer laboratory TDS and EC results proved to have the most fluctuation during the long-term test in comparison to the two pumping wells and deep piezometer. Piezometer samples occasionally exceeded the desired turbidity level for metals analyses. The DDW chloride secondary MCL upper limit of 500 mg/L was exceeded in all samples with the exception of one Morgan Run P-11B sample, which only exceeded the 250 mg/L secondary MCL lower limit at 380 mg/L. Total manganese results exceeded the DDW secondary MCL of 0.050 mg/L at all sampling locations, and three of the four locations had at least one result exceed the DDW notification level of 0.5 mg/L. Generally, total iron was found to be high in most samples, over the DDW secondary MCL of 0.3 mg/L, with the exception of Morgan Run GunR and P-2. Sulfate concentrations ranged from elevated (Morgan Run P-11B) to nearly three times the DDW secondary MCL upper limit of 500 mg/L (Morgan Run P-2). Most results were found to be above the DDW sulfate secondary MCL lower limit of 250 mg/L, with seven of the twelve results exceeding the secondary MCL upper limit of 500 mg/L. See Figure 34 for a Trilinear Diagram (Piper Diagram) containing the completed well and long-term testing water chemistry for the selected monitoring wells.

6.3.2.1 Specific Conductance Measurements in Monitoring Network Selected Wells During Long-Term Pumping Test

As mentioned in Section 6.3.2 above, all monitoring location results exceeded the specific conductance (EC) (at 25°C) DDW secondary MCL upper limit of 1,600 mg/L with the highest concentration found in Morgan Run P-2 at 8,330 mg/L EC. The shallow piezometer laboratory EC results had the most fluctuation during the long-term test in comparison to the two pumping wells and deep piezometer. See attached Table 2 and laboratory water quality reports in Appendix I for specific sampling date EC results. Figures 26 and 27 display the continuous EC reading throughout the long-term pumping test at the selected wells.

6.4 Determination of Transmissivity

Multiple constant rate pumping test analyses were performed using data collected from the long-term pumping test to provide a range of aquifer characteristics for the model update. Several time periods of the long-term test were selected to analyze the Desalter Test Well constant rate pumping tests. Average discharge rates were determined for each time period using field recorded totalizer readings.

Three of the impacted monitoring wells, within a half mile of the Desalter Test Well, were used as observation wells in order to conduct additional calculations for aquifer parameters. These wells were selected due to the measurable drawdown observed during the long-term pumping test and the distance and position in relation to the Desalter Test Well. Information on the observation wells used is summarized in the following Table 6-4.

Table 6-4. Summary of Long-Term Test Observation Well Details

Well Name	Well Depth	Screen Interval	Distance from Desalter Test Well	Static Water Level
	ft bgs	ft bgs	ft	ft bgs
Surf Cup No. 2	99.6*	50 - 110	1,011	8.03
Morgan Run Test Well	133.5*	87 - 137	1,900	4.64
Valley 7 Well	123.5*	-	2,598	1.98

* Monitoring well depths shown are measured depths, as ft bgs, evaluated in the field.

6.4.1 Desalter Test Well Long-Term Pumping Test

The static water level at the start of the constant rate pumping test was 9.56 ft bgs. The long-term constant rate pumping test was analyzed at four (4) time periods throughout the test: start of the test (1-day), first 14-days of the test, until mid-way of the test, and for the entire long-term test. Plots showing the evaluation of the long-term test data using Jacob's straight-line interpretation method are presented in Figures 35 through 38. Table 6-5 provides a summary of aquifer characteristics calculated from the four (4) time periods of the Desalter Test Well long-term pumping test.

Table 6-5. Desalter Test Well Long-Term Pumping Test Results

Period of Long-Term Test	Date Range	Number of Days	Average Pumping Rate gpm	Drawdown[1] ft	Transmissivity gpm/ft
Start of Test	12/04/2019 to 12/05/2019	1	185	3.6	13,600
First 14 Days of Test	12/04/2019 to 12/18/2019	14	185	3.5	14,000
Until Mid-Way of Test	12/04/2019 to 06/06/2020	185	194	3.9	13,100
Entire Test	12/04/2019 to 12/02/2020	364	215	10.6	5,400

[1] Water level drawdown value is per log cycle.

The long term (entire test) transmissivity estimation is low due to fluctuations in pumping rates recorded in the last four months of the pumping test. The rate fluctuations are likely due in part to iron and manganese bacterial fouling of the discharge pipe and flow meter, as well as manual adjustments to the Desalter Test Well pumping rate. Earlier Desalter Test Well pumping periods, observation well, and recovery analysis used to estimate transmissivity are likely more reflective of actual aquifer parameters.

6.4.1.1 Observation Wells Long-Term Pumping Test Time-Drawdown Analyses

Time-drawdown plots were created for the three (3) observation wells Surf Cup No. 2, Morgan Run Test Well, and Valley 7 Well for the start of the long-term pumping test 1-day time period (see Figures 39 through 41). Analyses were performed to determine aquifer parameters based on measurable drawdown due to the Desalter Test Well pumping and time. A summary of the aquifer characteristics calculated from the observation well data is provided below in Table 6-6.

Table 6-6. Observation Wells Long-Term Pumping Test Results

Well	Start of Long-Term Test Date Range	Number of Days	Average Pumping Rate gpm	Drawdown[1] ft	Transmissivity gpm/ft	Storativity
Surf Cup No. 2	12/04/2019 to 12/05/2019	1	185	1.5	32,600	0.00122
Morgan Run Test Well	12/04/2019 to 12/05/2019	1	185	0.8	61,100	0.00111
Valley 7 Well	12/04/2019 to 12/05/2019	1	185	1.2	40,700	0.000359

[1] Water level drawdown value is per log cycle.

6.4.2 Long-Term Pumping Test – Recovery Results

On December 2, 2020, at the end of the Desalter Test Well long-term pumping test water levels recovered when the Desalter Test Well pump was turned off at 8:30 am. The recovery period started at 8:30 am on December 2, 2020, and ended at 8:30 am on December 10, 2020. Recovery analysis plots created for the Desalter Test Well and the three (3) observation wells are shown in Figures 42 through 45. Table 6-7 provides a summary of the aquifer characteristics calculated from the recovery analysis plots. The transmissivity is relatively low but consistent with the materials and relatively low thickness of the aquifer at this location. The storativity values are consistent with a confined aquifer (Todd, 1980).

Table 6-7. Recovery Results for End of Long-Term Pumping Test

Well	End of Long-Term Test Date Range	Number of Days	Average Pumping Rate gpm	Drawdown[1] ft	Transmissivity gpm/ft
Desalter Test Well	12/02/2020 to 12/10/2020	8	220	3.0	19,500
Surf Cup No. 2	12/02/2020 to 12/10/2020	8	220	2.4	24,100
Morgan Run Test Well	12/02/2020 to 12/10/2020	8	220	1.8	33,100
Valley 7 Well	12/02/2020 to 12/10/2020	8	220	1.3	43,500

[1] Water level drawdown value is per log cycle.

7.0 Permanent Pump Installation

The permanent pump was installed in the Desalter Test Well on March 9, 2021. The permanent pump installation was witnessed by DLM Engineering, Inc. of San Diego, California, Geoscience, and Jensen personnel. See Table 7-1 below and Appendix L for submersible pump information.

Table 7-1. Desalter Test Well Permanent Pump Information

Submersible Pump Information	
Pump Type	Grundfos SP 230S
Design Operating Point	200 gpm @ 200 ft TDH (Total Dynamic Head)
Pump Intake	103 ft bgs
Motor Volts	460 V
Motor Hertz	60 Hz
Motor Speed	3,500 rpm
Motor Horsepower	20 HP
Pump Diameter	6 IN.
Pump Material	304 Stainless Steel

Figure 7-1. Permanent pump prior to installation.

Figure 7-2. Permanent Pump testing.

Once the permanent pump was installed into the Desalter Test Well to its intake depth of 103 ft bgs the pump power supply line was connected to the on-site Variable Frequency Drive (VFD) panel. Following confirmation that the pump was powered properly attempts to start the pump and conduct a pump test were made.

Jensen made attempts to start pump using the on-site VFD panel. The pump would shut off after approximately 2 minutes of pumping. Multiple attempts to increase the "pump on" time were made by adjusting the hertz and amps to power the pump. A short pump test was performed following success of maintaining pump power duration. Geoscience performed a pump test at approximately 200 gpm for 1-hour with flowmeter readings taken at the intervals listed in Table 7-2. Jensen continued to monitoring pump properties following Geosciences departure from the well site.

Table 7-2. Measurement Intervals During Permanent Pump Installation Pump Test

Total Time Following Pump Start Up minutes	Flowmeter Reading Intervals minutes
0 – 10	2
10 – 30	5
30 – 60	10

8.0 San Dieguito Valley Groundwater Model Summary

In 2017, a feasibility study was performed for the Project where Geoscience developed the San Dieguito Valley Groundwater Basin Model to evaluate the water budget of the groundwater basin and estimate the groundwater production at various proposed extraction well sites. Since new information (e.g., groundwater elevation measurements and aquifer parameters) was obtained after the construction of the Desalter Test Well and Long-Term pump test, the San Dieguito Valley Groundwater Model was updated and recalibrated to December 2020 to incorporate additional data collected during recent field efforts. One updated scenario model run was also performed to evaluate the water balance and extraction capacity using the updated groundwater model. The following sections describe the model update efforts in detail.

8.1 San Dieguito Valley Groundwater Model Update

8.1.1 Model Description

The groundwater flow model was developed using MODFLOW-NWT[7]. The San Dieguito Valley Groundwater Basin consists of an unconsolidated quaternary alluvial aquifer system flanked and underlain by low permeability Tertiary rocks. The San Dieguito Valley Groundwater Model is a five-layer model with a grid of 660 nodes (i.e., model cells) in the north-to-south direction (i-direction) and 920 nodes in the east-to-west direction (j-direction), for a total of 3,036,000 nodes (Figure 46). Each model cell of the San Dieguito Valley Groundwater Model represents an area of 50 ft by 50 ft.

For the purposes of this investigation, the Tertiary rocks surrounding the quaternary alluvial materials were assumed to be impermeable. As such, they were designated as no-flow boundaries in the groundwater model. The model boundary conditions are shown on Figure 47, where cells shown in green, blue, and red were used to simulate the underflow outflow to the ocean, recharge from streambed percolation and groundwater extraction, respectively.

8.1.2 Aquifer Properties

8.1.2.1 Model Layers

The initial conceptual groundwater model consisted of five layers: Layers 1 and 3 represent the shallow and deep aquifer, respectively, while Layers 2, 4, and 5 represent low permeability layers (e.g., aquitards). A three-dimensional representation of the original model layers is shown on Figure 48. During the recent

[7] MODFLOW-NWT is the Newton-Raphson formulation for MODFLOW-2005 which allows for an improved solution of unconfined groundwater flow problems (Niswonger, Panday, and Ibaraki 2011). MODFLOW-2005 a block-centered, finite-difference groundwater flow code developed by the USGS (Harbaugh 2005).

model update, following review of the Long-Term Pumping Test data, the bottom layer elevations for layers 1, 2 and 3 for the area close to the Test Well were refined based on the new lithologic information. In this report the shallow aquifer is referred to as Layer 1 and the deep aquifer as Layer 3. The intermediate zone between Layer 1 and Layer 3 is an aquitard, referenced as Layer 2.

8.1.2.2 Hydraulic Conductivity

Horizontal and vertical hydraulic conductivity was revised using data collected from the Long-Term Pump Test, and then were further adjusted during model recalibration. The recalibrated horizontal hydraulic conductivity values are shown on Figure 49 and range from less than 5 ft/day to 900 ft/day. Vertical hydraulic conductivity was assumed to be 10% of the horizontal hydraulic conductivity.

8.1.2.3 Storativity

Both specific yield and specific storage values were used in the San Dieguito Valley Groundwater Model. The type of storativity value used depended on the nature of the model layer through time (i.e., unconfined or confined). The model storativity values were refined based on the Long-Term pump test results for the area close to the Test Well and were further adjusted during the model recalibration. The recalibrated specific yield values are shown on Figure 50 and range from 0.01 to 0.2. Calibrated specific storage is shown on Figure 51 and ranges from 0.00001 ft^{-1} to 0.0001 ft^{-1}.

8.1.3 Recharge Terms

8.1.3.1 Deep Percolation from Precipitation and Mountain Front Runoff

The initial empirical estimates of deep percolation from precipitation and mountain front runoff for the extended modeling period (i.e., from 2016 to 2020) were estimated from PRISM precipitation data following the same approach described in the 2017 Feasibility Study and were iteratively adjusted during model recalibration. The recalibrated amount of recharge from the deep percolation of precipitation and mountain front runoff averages 1,090 acre-ft/yr during the model calibration period from 2001 through 2020.

8.1.3.2 Streambed Percolation

The recharge from streambed percolation is calculated by the groundwater model via the Stream Flow Routing Package using the input data of Hodge Dam release and spills provided by the OMWD, and runoff from precipitation, which was assumed to be 16% of the precipitation (DWR, 1949). The modeled average recharge from streambed percolation is approximately 1,900 acre-ft/yr during the model calibration period from 2001 through 2020. Streambed percolation is applied along the length of the river.

8.1.3.3 Recharge from Spreading

The recharge from spreading of 570 acre-ft/yr was used in the previous 2017 groundwater model for the combined spreading of the CSDs. For this model update, the same amount was assumed over the updated model calibration period of 2001 through 2020. Detailed approach to estimate the recharge from spreading can be found in the Feasibility Study Report (Woodard & Curran, 2017).

8.1.3.4 Return Flow

This model update used the same return flow amount in the 2017 groundwater model, which averages 1,100 acre-ft/yr. Return flow is the amount of applied irrigation water that moves past the root zone into the underlying aquifer. Detailed approach to estimate the return flow can be found in the Feasibility Study Report (Woodard & Curran, 2017).

8.1.3.5 Underflow Inflow

Underflow inflow to the groundwater basin was calculated by the model using a general head boundary (GHB). Underflow is the groundwater that flows into the basin in the aquifer from outside the basin. During the model, underflow comes from upstream through the alluvium and periodically from the ocean. The average annual model-calculated underflow inflow was approximately 200 acre-ft/yr for the updated model calibration period from 2001 through 2020.

8.1.4 Discharge Terms

8.1.4.1 Groundwater Pumping

Additional groundwater pumping for the extended modeling period was collected and assigned to the San Dieguito Valley Groundwater Model. Groundwater pumping was estimated by combining known groundwater extractions from wells with totalizing meters with an estimate of groundwater demand based on land use. The annual pumping for the updated model calibration period averaged 1,830 acre-ft/yr from 2001 through 2020, revised from the 2017 value of 2,100 acre-ft/yr.

8.1.4.2 Evapotranspiration

Evapotranspiration represents a model-calculated value. California Irrigation Management Information System (CIMIS) evapotranspiration rates were applied to the model area with an extinction depth of 15 ft. The model-calculated evapotranspiration averaged 2,580 acre-ft/yr for the updated calibration period from 2001 through 2020.

8.1.4.3 Discharge to Streams

Similar to streambed percolation, discharge to streams is also calculated by the groundwater model via the Stream Flow Routing Package, and the average discharge to streams during the updated calibration period is approximately 60 acre-ft/yr.

8.1.4.4 Underflow Outflow

Underflow outflow to the ocean was calculated by the model using a GHB. The average annual model-calculated underflow outflow was approximately 100 acre-ft/yr from 2001 through 2020.

8.2 San Dieguito Valley Groundwater Model Recalibration

8.2.1 Model Calibration

Calibration is the process of adjusting the model parameters and flux terms to produce the best fit between simulated and observed groundwater system responses. Properties adjusted during the model calibration include:

- Horizontal and vertical hydraulic conductivity,
- Storativity, and
- Deep percolation from precipitation and mountain front runoff.

The San Dieguito Valley Groundwater Model was recalibrated against 2,451 observed water level measurements from 41 target wells from January 2001 through December 2020 (Figure 52). Water level residual[8] statistics from the model calibration are summarized in the Table 8-1 below.

Table 8-1. Model Calibration Water Level Statistics

Model Calibration Water Level Statistics	
Residual Mean, ft	0.01
Residual Standard Deviation, ft	4.02
Minimum Residual, ft	-34.16
Maximum Residual, ft	22.31
Relative Error, %	6.8

The relative error (standard deviation of the residuals divided by the range) for the calibration period was 6.8%. Common modeling practice is to consider a good fit between measured and model-calculated water

[8] Measured minus model-calculated water levels.

levels if the relative error is below 10% (Spitz and Moreno 1996). Therefore, the updated San Dieguito Valley Groundwater Model performs within acceptable limits.

Figure 53 shows hydrographs for selected wells, which illustrates similar water level trends between the observed water level measurements and model-calculated water levels. This indicates that the model is performing well and can simulate realistic hydrologic response in the San Dieguito Valley Groundwater Basin.

Table 8-2 below summarizes the average annual water balance for the San Dieguito Valley Groundwater Basin from both the 2017 model calibration and updated 2021 model calibration. Comparing to the 2017 groundwater model results, the change in storage slightly decreased by 20 acre-ft/yr calculated by the updated groundwater model.

Table 8-2. Comparison of Water Budget Terms for Sustainable Yield Assessment

	Term	2017 Model Calibration (2001-2015)	2021 Model Calibration (2001-2020)
		acre-ft/yr	
INFLOW	Underflow Inflow	30	20
	Deep Percolation from Areal Precipitation and Mountain Front Runoff	1,020	1,090
	Streambed Percolation	1,790	1,900
	Recharge from Spreading	570	570
	Return Flow	1,090	1,100
OUTFLOW	Groundwater Pumping	2,090	1,830
	Evapotranspiration	2,180	2,580
	Rising Discharge to Streamflow	40	60
	Underflow Outflow to the Ocean	60	100
	Change in Storage	**130**	**110**

8.3 Model Scenarios

Once the San Dieguito Valley Groundwater Model was updated and recalibrated, it was used to run one scenario to evaluate the impact on the groundwater balance from the proposed Project groundwater pumping. The scenario assumption was developed based on one of the 2017 modeling scenarios and modified to incorporate the Desalter Test Well extraction. Table 8-3 lists the major assumptions for the scenario model run. The locations of Site 2 and 2A are depicted on Figure 54.

Table 8-3. Assumptions for Model Scenarios

Assumptions	2017 Assumptions	2021 Assumptions
Number of Wells	2 (Site 2 and Site 2A)	3 (Desalter Test Well, Site 2 and Site 2A)
Single Well Capacity	Site 2 = 500 gpm; Site 2A = 500 gpm	Desalter Test Well = 200 gpm; Site 2 = 400 gpm; Site 2A = 400 gpm
Total Pumping Capacity	1,000 gpm	1,000 gpm
Total Annual Pumping, AFY	1,600 AFY	1,600 AFY

The same hydrology and pumping by existing users from the recalibration period, 2001 through 2020, were used for the scenario model run. The water balance results are summarized in the following table and on Figure 55.

Table 8-4. Water Budget Terms for Model Scenarios

	Term	2017 Calibration Run (2001 - 2015)	2021 Calibration Run (2001 - 2020)	2017 Scenario Run	2021 Scenario Run
		acre-ft/yr			
INFLOW	Underflow Inflow	30	20	50	20
	Deep Percolation from Areal Precipitation and Mountain Front Runoff	1,020	1,090	1,020	1,090
	Streambed Percolation	1,790	1,900	1,860	2,020
	Recharge from Spreading	570	570	570	570
	Return Flow	1,090	1,100	1,090	1,100
OUTFLOW	Groundwater Pumping	2,090	1,830	3,690	3,430
	Evapotranspiration	2,180	2,580	1,090	1,400
	Rising Discharge to Streamflow	40	60	30	50
	Underflow Outflow to the Ocean	60	100	40	70
	Change in Storage	**130**	**110**	**-260**	**-150**

Feedwater extraction of 1,600 acre-ft./yr will result in 1,120 AFY of product water to the project (1 MGD) assuming a 70 percent desalination plant efficiency. Results from the updated scenario run indicated that pumping 1,600 acre-ft/yr at the Desalter Test Well, Site 2, and Site 2A would decrease the groundwater basin's storage by 150 acre-ft/yr, which is 110 acre-ft/yr less in decrease compared to the 2017 modeling results. The changes in groundwater elevations between the Project Scenario Run and Baseline Run for model layers 1 and 3 are depicted on Figures 56 and 57. As shown in Figure 57 (Layer 3), the Project operation may decrease the groundwater elevations at nearby Morgan Run pumping well sites, No. 3 Green North and GunR, by approximately 19 feet and 15 feet beyond the baseline pumping water levels. The cumulative drawdown after 20-year Project pumping at a rate of 1,600 acre-ft/yr, in the GunR and No. 3 Green North wells are predicted to remain approximately 27 feet above the present pump settings.

With the current modelled Project pumping configuration, assumed existing pumping conditions, and assumed Morgan Run pumping volumes, the water level at the No. 3 Green North well has the potential to reach the top of screen at 52 ft bgs. The model simulated a singular well pumping location of 800 gpm. Therefore, distribution of drawdown could be accomplished by multiple wells pumping at lower rates over a wider area. The modeled drawdown indicates that pump lifts may increase in area wells however this drawdown should not affect the overall production of these nearby wells. Depending on the pump installation depths of nearby wells, there may be a potential need to lower the pump elevations to maintain an adequate water level above the pump intake. During the Long-Term Pumping Test, the shallow aquifer (Layer 1) did not show any impacts from Desalter Test Well pumping, but it should be noted that the full-scale pumping project will have nearly five times the volume extracted from the planned desalter wells screened in the deep aquifer (Layer 3) and there will be drawdown in the shallow aquifer (Layer 1) through the aquitard (Layer 2) due to leakance. The modelling suggests that the increase in streambed percolation (river loss) is about 120 acre-ft/yr and a reduction in evapotranspiration of 1,180 acre-ft/yr and surface outflow at the Ocean of approximately 30 acre-ft/yr (See Table 8-4). This represents beneficial use of water that would otherwise flow to the ocean.

9.0 Findings

9.1 Long-Term Pumping Test

9.1.1 Desalter Test Well Test Pump Iron & Manganese Fouling & Filtration System Pilot Study

Pumped groundwater from the Desalter Test Well contained high concentrations of iron and manganese. Total iron was found to be as high as 0.881 mg/L, nearly three times the DDW secondary MCL of 0.3 mg/L. Total manganese results were high but relatively stable during the short- and long-term pumping tests, averaging 1.02 mg/L, or over twenty times DDW secondary MCL for manganese at 0.050 mg/L and twice the DDW notification level for unregulated chemicals. The effects of these elevated metal concentrations were noticeable within the discharge piping and test pump intake upon dismantling. Iron and manganese consuming bacteria deposits caused fouling and performance issues with the propeller style flow meter as shown in inset Figure 9-1 below. Iron and manganese bacterial treatment at the wellhead will likely be necessary and will need to be incorporated into future facility design plans.

Figure 9-1. Iron and Manganese fouling of the Desalter Test Well. A) Iron fouling of propeller style flow meter. B) Iron fouling deposits in discharge piping. C) Iron fouling on test pump intake. D) Iron (orange) and Manganese (black) fouling on screen located in discharge piping.

During the long-term pumping test, pumping water levels reached as low as 20 feet below the elevation of the Desalter Test Well top of screen causing a cascading water effect. This oxygenation of the less aerobic well water and upper screen section likely increased iron and manganese oxidizing bacteria population growth rates. It is recommended that future system pumping operations always maintain pumping water levels above the top of the well screen, as a transition from a de-oxygenated to oxygenated environment could contribute to bacteria growth and ultimately lead to fouling of the screens, maintenance downtime, and increased filtration and rehabilitation costs.

Figure 9-2. On site trailer housing Pilot Study equipment.

Iron and manganese bacterial treatment at the wellhead will be necessary and should be incorporated into future pretreatment design plans as these deposits will adversely impact the discharge piping and filtration efficiency of reverse osmosis membranes at the planned desalination facility. Woodard and Curran, Inc. contracted with Loprest (a division of WRT) to perform a site-specific pilot test (Figure 9-2) for manganese and iron removal on June 2 to 3, 2020 using greensand filtration equipment, a method in which manganese dioxide ore or coated filter media oxidizes iron and manganese upon contact. During this two-day test, specific system configurations (Figure 9-3) and two types of media were able to effectively reduce iron and manganese concentrations to levels below their respective DDW Secondary MCL's. A Technical Memorandum summarizing the findings of the Filtration System Pilot Study was issued to OMWD on August 26, 2020, and can be found in Appendix M of this report.

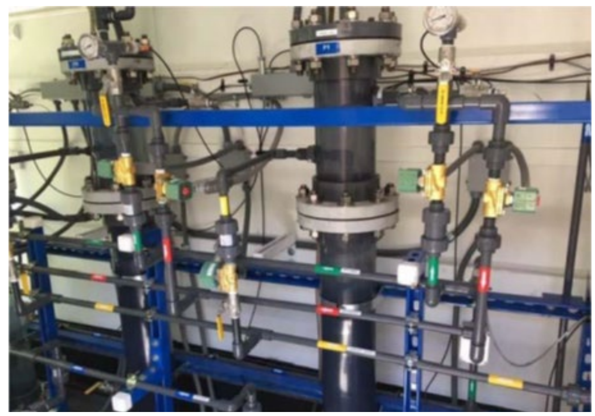


Figure 9-3. Pilot Study Filter Test Column Units setup.

9.1.2 Desalter Test Well Specific Capacity Calculations for Long-Term Pumping Test Period

Specific capacity is a function of water levels and well production. Section 4.4.3 – Specific Capacity and Well Efficiency describes the calculation of specific capacity at various times during the project. Figure 10 shows the specific capacity for the Desalter Test Well at a pumping rate of 200 gpm. However, specific capacity and thus well production will change with changing groundwater levels.

9.1.3 Desalter Test Well and Monitoring Network Long-Term Pumping Test Observations

9.1.3.1 Desalter Test Well Long-Term Pumping Observations

During the Desalter Test Well Long-Term Pumping Test groundwater samples were collected on three separate occasions to evaluate whether water quality changes would occur as a result of the pumping. As anticipated, ambient elevated concentrations of iron, manganese, sulfate, chloride, boron, calcium, sodium, TDS, EC, and turbidity were encountered in the Desalter Test Well during the 24-Hour Constant Rate Test and the Long-Term Pumping Test. See Sections 4.5 – Desalter Test Well Groundwater Quality and 6.3 – Water Quality During Long-Term Pumping Test for detailed water quality summaries and the constituents found to be over drinking water regulatory standards.

Odor observed in the 24-Hour Constant Rate Test sample over the DDW secondary MCL was potentially the result of the presence of hydrogen sulfide gas (H2S) as was also noted by the Loprest pilot study technician during the filtration system tests (see Appendix M). H2S concentrations were not measured, but the chemical's presence was inferred from the characteristic odor and higher chlorine oxidant demand during the test. Iron/manganese bacteria and sulfur bacteria in the groundwater can use iron and sulfur as an energy source to chemically change sulfates to produce H2S gas. During the Long-Term Pumping Test high levels of iron and sulfate were found to be in the Desalter Test Well with average concentrations of 0.81 mg/L and 765 mg/L respectively. However, future water quality analysis should include on-site H2S testing to confirm these assumptions.

Total iron and manganese results were found to be stable but in high concentrations. Iron and manganese bacteria produced orange and black slime within the discharge piping and flowmeter assembly and impacted the propeller-style meters rate and volume measurements, requiring dismantling and cleaning. Section 9.1.1 - Desalter Test Well Test Pump Iron & Manganese Fouling & Filtration System Pilot Study describes the iron and manganese fouling issues and the pilot study filtration system testing in more detail. The results and recommendations of the pilot study can be found in Appendix M. Iron and manganese pretreatment and pump operational recommendations will need to be implemented to reduce maintenance costs and prevent premature fouling of a future desalination systems reverse osmosis membranes.

Additionally, future water quality analyses might also include total organic carbon (TOC) and humic acids. Humic substances are naturally occurring organic compounds that result from the decomposition of plant, animal, and microbial matter. Colloidal natural organic matter (NOM) from reactions with humic substances with calcium and high TDS has the potential to cause fouling issues in reverse osmosis membranes (WRD, 2018).

9.1.3.2 Desalter Test Well Trends in Groundwater Elevation

Trends in groundwater levels in both the shallow and deeper aquifer are discussed in Section 5.2 - Baseline Monitoring of Water Levels and Water Quality in the Monitoring Network. Overall, the continuously monitored groundwater levels during the long-term pumping test showed no change in the shallow aquifer. Groundwater levels in the deeper aquifer were only locally affected by the Desalter Test Well. Changes in groundwater levels in the deeper aquifer were also affected by operations of the production wells in Morgan Run. The long-term test showed:

1. Pumping in the deeper aquifer does not affect groundwater surface water in the San Dieguito River at pumping rates used for the Long-Term Pumping Test.

2. Water levels declined the most during the dry portion of 2020 but saw complete recovery after the long-term test was completed.

This suggests that even during a single dry year, inflows into the basin can supply current groundwater uses.

9.1.3.3 Desalter Test Well Trends in Groundwater Quality & Specific Conductivity

The major cations and anions results from Desalter Test Well laboratory water quality samples collected during the short- and long-term pumping tests were plotted on a Trilinear Diagram (Piper Diagram) to determine the predominant water type (see Figure 33). The cations were found to be sodium and potassium type, with the prevailing anions of the chloride type. Ion clusters remained in relatively the same configuration throughout both pumping tests and the groundwater was determined to be sodium chloride type, as expected for marine and brackish groundwaters.

Most General Mineral and General Physical constituents reported for the Desalter Test Well during the Long-Term Pumping Test remained stable, and those with increasing or decreasing trends were unremarkable. Between April 2020 and December 2020, the water's hardness had increased by 180 mg $CaCO_3$/L. Elevated but stable boron concentrations were reported in the May 2019, April 2020, and September 2020 samples, but was found to be below the laboratory reporting limit near the end of the pumping test in December 2020. Chloride, magnesium, potassium had slight upward trends based on the reported lab results from the three samples collected during the long-term test. Nitrate as N, sulfate as SO_4, manganese, and fluoride were found to have slight decreasing trends. Table 6-3 and attached Table 2 contain a summary of all the laboratory water quality results from samples collected from the Desalter Test Well during the long-term pumping test.

Continuous depth-specific electrical conductivity (EC) was recorded in the Desalter Test Well at a depth of 117 ft bgs, within the screen portion of the well, using an In Situ AquaTROLL 200 data logger for the duration of the long-term pumping test. This data was recorded every 15 minutes and provided high frequency recordings to monitor EC changes. Quarterly laboratory "blended" (water contribution from the entirety of the screen) EC samples were also collected from the discharge line near the well head for comparison. The downhole data logger reported EC between 5,800 to 6,200 µS/cm @ 25°C for the majority of the long-term test, with a small increase of 200 to 400 µS/cm during the last quarter of the test. The three laboratory blended samples collected during the long-term test were 500 to 1,000 µS/cm lower than the corresponding depth-specific data logger EC values. This is expected in that mixing of waters through-out the well screen interval can result in different EC values. The lab samples indicate that there was a slight decreasing EC trend in the pumped test well water. Precipitation did not appear to have a noticeable effect on the desalter test well discharges which pumps from the deep aquifer. Figure 13 presents the specific conductivity recorded by the data logger and laboratory results, in addition to precipitation.

It is possible that basin pumping and desalting could result in improving water quality by allowing additional percolation of high-quality storm water during wet seasons and wet hydrological cycles. This potentially beneficial result cannot be assessed from the Long-Term Pumping test data discussed in this report, and it was not the purpose of the study. The Desalter Test Well pumping test rate and duration were not sufficient to make this long-term determination. Additional work and collection of controlled water quality data over a greater time period would be needed to analyze whether the amount of salts removed by the full-scale project would be more than the salts added to the groundwater through irrigation return flows. An initial analysis could be conducted using the calibrated groundwater model. But physical validation would require more significant pumping volumes and collection of water quality data for a period greater than one year.

9.1.3.4 Monitoring Network Trends in Groundwater Quality & Specific Conductivity

Specific conductivity acts as a surrogate for determination of TDS (see Appendix K). Laboratory conductivity remained consistent throughout the long-term test with the exception of Morgan Run P-11B. This suggests that the additional pumping from the Desalter Test Well and increased pumping from the Morgan Run wells did not increase the salinity in the middle basin where pumping occurred.

Of the 6 observation wells equipped with depth-specific electrical conductivity data loggers, Valley 7 Well and Morgan Run Test Well were the only locations to present slight changes in their EC signatures after the Desalter Test Well pump was turned on or off (see Figure 27). These influences were expected due to their proximity to the pumping well and their deep aquifer screen completions. The point of influence in the EC Figure mimics the observation well water level effects from the desalter well pumping seen in Figure 19.

9.1.3.5 Trends in Groundwater Quality in Morgan Run P-11B

Piezometer P-11B showed a significant increase in TDS in the second sampling period (4,690 mg/L). The TDS concentration in the third sampling period (2,517 mg/L) was less than the second period, but still significantly higher than the first sampling period (1,080 mg/L).

The well screen in P-11B crosses the aquitard which separates the shallow and deeper aquifer. Groundwater levels in the shallow aquifer are slightly higher than the deeper aquifer. During the long-term test, it is likely that higher salinity water in the shallow aquifer moved downward into P-11B. This piezometer should be considered for destruction to eliminate a pathway during long-term operations.

9.2 San Dieguito Valley Groundwater Model Update and Recalibration Findings

- San Dieguito Valley Groundwater Model was updated and recalibrated to 2020 using recent data collected from the construction of the Desalter Test Well and long-term pumping test, which improved the accuracy of the model simulation, especially for the area close to the Test Well.

- The annual average water balance for the calibration period calculated by the updated groundwater model was similar to previous 2017 modeling results. The change in storage calculated by the updated groundwater model for the calibration period only decreased by 20 acre-ft/yr (from 130 acre-ft/yr to 110 acre-ft/yr) comparing to the 2017 modeling results.
- The results of the updated scenario run indicate that the proposed extraction of 1,600 acre-ft/yr at the Desalter Test Well, Sites 2 and 2A will create a minor decrease in storage of 150 acre-ft/yr based on the hydrology of the modeling period and current (2020) groundwater in storage. Comparing to the 2017 scenario run results, which has a decrease in storage of 260 acre-ft/yr, the updated model results indicate an increase in change in storage by 110 acre-ft/yr.
- Full scale production will result in a drawdown in both the shallow and deep aquifers. Wider distribution of Project pumping will lessen the impacts on the Morgan Run pumping wells and other nearby wells. Some area wells may require lowering of pumps depending on proximity to future desalter test wells.

The modelling suggests that the increase in streambed percolation (river loss) is about 120 acre-ft/yr and a reduction in evapotranspiration of 1,180 acre-ft/yr and surface outflow at the Ocean ofapproximately 30 acre-ft/yr. This represents beneficial use of water that would otherwise flow to the ocean. Figure 55 summarizes the groundwater budget for all the calibration model runs and scenario model runs in performed during the 2017 feasibility study and this model update. The blue arrows in the figure indicate inflows into the groundwater basin. Yellow arrows indicate outflow from the basin. The yellow arrow for change in storage indicates a decrease in basin storage under the project extraction of 1,600 acre-ft/yr at the Desalter Test Well, Site 2 and Site 2A.

The decrease in basin storage of 150 acre-ft/yr from pumping 1,600 acre-ft/yr over 20 years represents less than 1% of basin storage. It should be noted that the base period used for modeling (2001 – 2020) was selected because of the maximum availability of data but represents a drier than average period.

During above average rainfall periods, it is likely that groundwater storage will be replenished as is typical for many shallow basins in Southern California.

10.0 References

ASTM (American Society for Testing and Materials). 1994. ASTM Standards on Ground Water and Vadose Zone Investigations. 2nd Edition.

CH2MHill, 1995. Final Report San Dieguito Basin Groundwater Model.

DLM (DLM Engineering, Inc.). 2016. 2015 Urban Water Management Plan. Prepared for Olivenhain Municipal Water District. Dated June 2016.

———. 2021. 2020 Urban Water Management Plan. Prepared for Olivenhain Municipal Water District. Dated June 2021.

DWR (California Department of Water Resources). 1949. San Dieguito and San Diego Rivers Investigation. State of California Department of Public Works: Bulletin No. 55.

———. 1959. San Dieguito River Investigation. State of California Department of Water Resources: Bulletin No. 72.

Eakin, T.E. 1966. "A Regional Interbasin Groundwater System in the White River Area, Southeastern Nevada." Water Resources Research 2 (2): 251-271.Harbaugh, A.W. 2005. MODFLOW-2005, the U.S. Geological Survey Modular Ground-Water Model – The Ground-Water Flow Process: U.S. Geological Survey Techniques and Methods 6-A16.

Geoscience (Geoscience Support Services, Inc.) 2017a. Hydrogeologic Investigation for the San Dieguito Valley Brackish Groundwater Desalination Study – Technical Memorandum. Prepared for Olivenhain Municipal Water District.

———. 2017b. Hydrogeologic Study of the San Dieguito Valley Brackish Groundwater Desalination Study Sustainable Yield Assessment. Prepared for Olivenhain Municipal Water District.

Hargis (Hargis + Associates, Inc.). 2004. Hydrogeologic Report – Aquifer Storage and Recovery Project San Dieguito Basin San Diego, California. Prepared for Olivenhain Municipal Water District. Dated August 17, 2004. Kennedy, Michael P. and Siang S. Tan. 2007. Geologic Map of the Oceanside 30' x 60' Quadrangle, California

———. 2008. Geologic Map of the San Diego 30' x 60' Quadrangle, California

Maxey, G.B. and T.E. Eakin. 1949. Ground Water in White River Valley, White Pine, NYE, and Lincoln Counties, Nevada. Water Resources Bulletin No. 8. Carson City: State of Nevada Office of the State Engineer.

Niswonger, R.G., S. Panday, and M. Ibaraki. 2011. MODFLOW-NWT, a Newton Formulation of MODFLOW-2005: U.S. Geological Survey Techniques and Methods 6-A37.

OMWD. 2017. San Dieguito Valley Brackish Groundwater Desalination Study

———. 2018. San Dieguito Valley Groundwater Desalination Design Pilot Initial Study / Mitigated Negative Declaration. August 2018.

PRISM (PRISM Climate Group). 2021. Oregon State University. Created February 4, 2004. http://prism.oregonstate.edu

RMC. 2016. Hodges Reservoir Balance and Overflows. Draft, dated November 16, 2016.

SANDAG (San Diego Association of Governments). 2014. Land Use 2013. San Diego Region, polygon shapefile. Downloaded from the Regional GIS Data Warehouse.

SMC (Stoney-Miller Consultants, Inc.). 2015. San Elijo Valley Groundwater Project. Prepared for Olivenhain Municipal Water District.

Spitz, K. and J. Moreno. 1996. *A Practical Guide to Groundwater and Solute Transport Modeling*. Oxford University Press, Inc.

Stetson (Stetson Engineers, Inc.). 2016. Return Flow Calculation from Applied Water in PRMS Model Area. Dated September 23, 2016. Updated from Water Use Factors and Return Flow Rates Applied to Land Use Coverage within PRMS Model. Prepared for the Santa Margarita River Groundwater Model Working Group. Dated September 20, 2016.

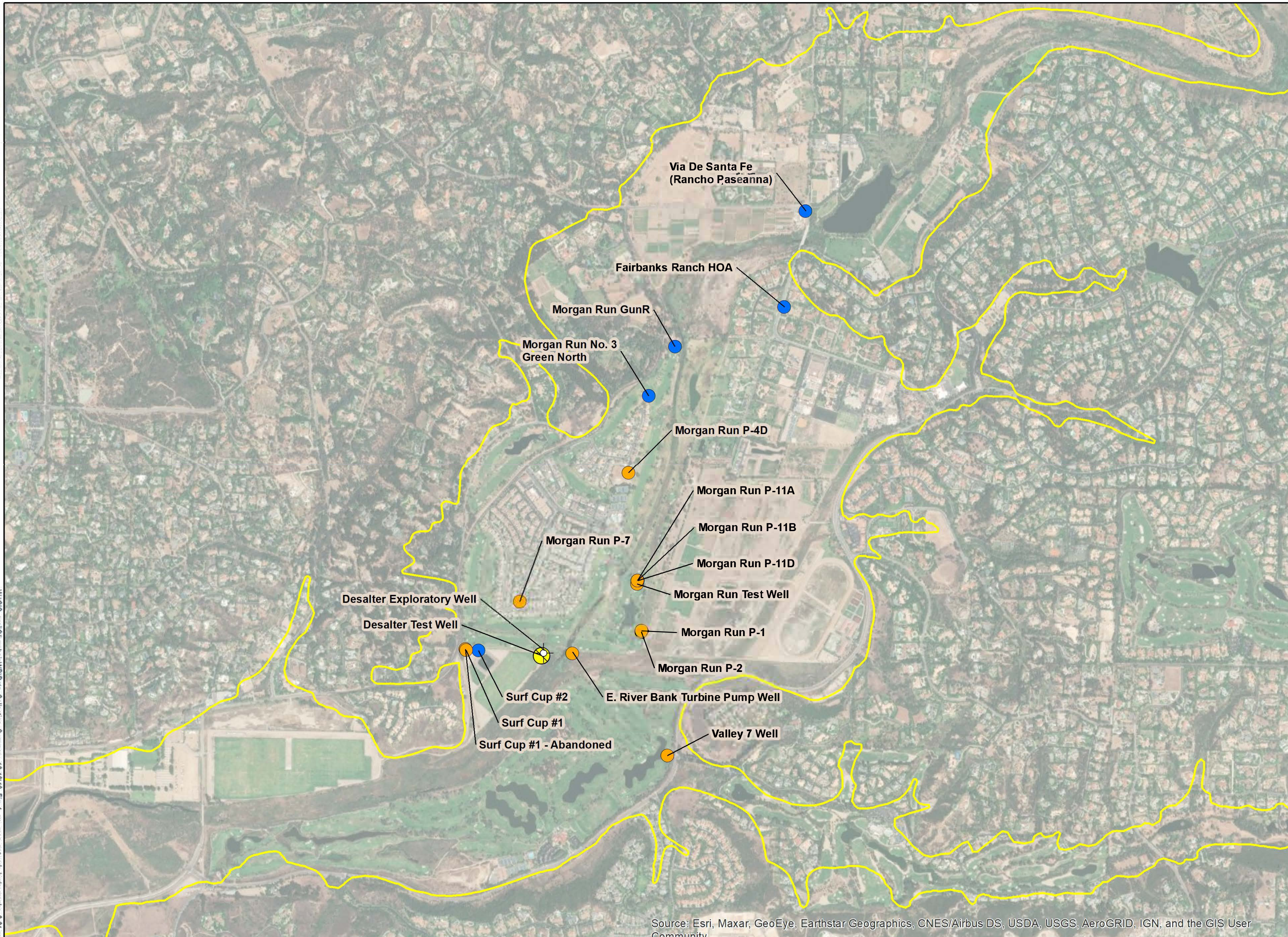
Todd, D.K., 1980. *Groundwater Hydrology*, 2nd ed., John Wiley & Sons, New York, 535p.

USGS (United States Geological Survey). 1983. Evaluation of the San Dieguito, San Elijo, and San Pasqual Hydrologic Subareas for Reclaimed Water Use, San Diego County, California, Water Resource Investigation 83-4044.

Woodard & Curran. 2020. San Dieguito Valley Brackish Groundwater Desalination Design Pilot – Refined Manganese Treatment Design Criteria Report. Prepared for Olivenhain Municipal Water District. August 26, 2020.

WRD (Water Replenishment District of Southern California). 2018. Inland Brackish Groundwater Reclamation Program in the West Coast Basin, Central Los Angeles County, CA. Ted Johnson's Presentation to Groundwater Resources Association. August 1, 2018.

FIGURES



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EXPLANATION

Desalter Well

Desalter Exploratory Borehole

Pumping Well

Non-Pumping Well

San Dieguito Groundwater Basin Boundary (GEOSCIENCE, 2016)

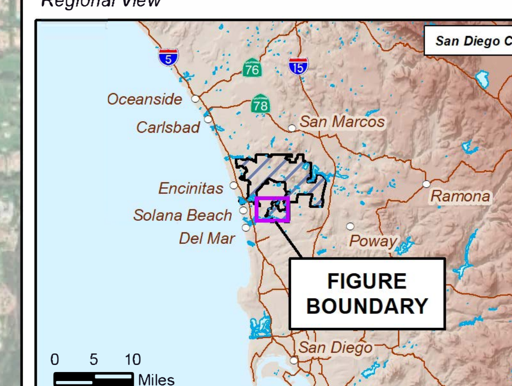
Note: Green Vertical line in chart represents the start of the long-term pumping test. Red Vertical line represents the end.

N

0 1,500 3,000

Feet

Regional View



OMWD DESALTER TEST WELL PROJECT LOCATION AND MONITORING NETWORK

Aug-21

OLIVENHAIN MUNICIPAL WATER DISTRICT

FIGURE 1

REPORT OF DESIGN PILOT TESTING FOR THE SAN DIEGUITO VALLEY BRACKISH GROUNDWATER DESALINATION DESIGN PROJECT

GEOSCIENCE

Olivenhain Municipal Water District
Report of Design Pilot Testing for the San Dieguito Valley
Brackish Groundwater Desalination Project

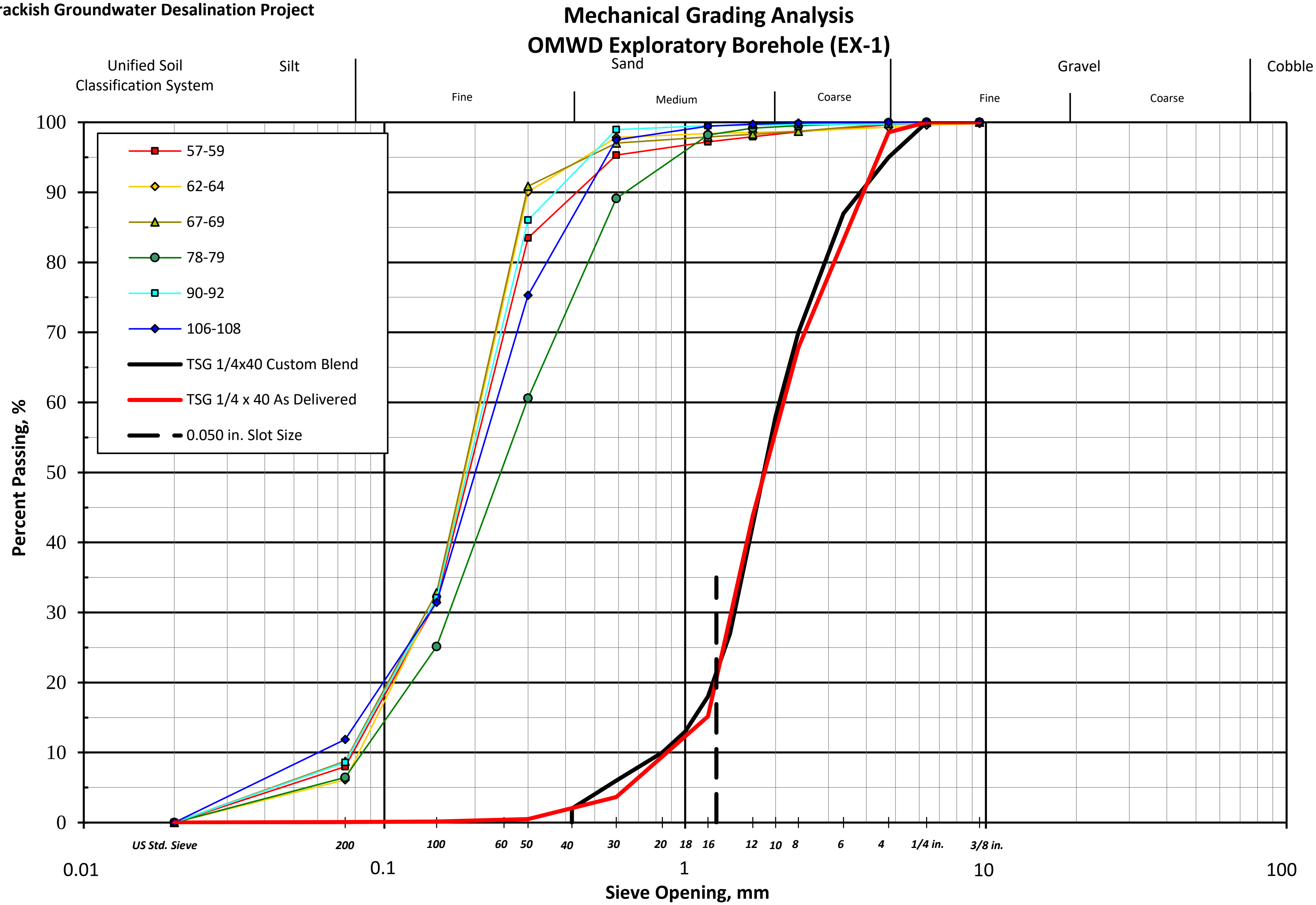
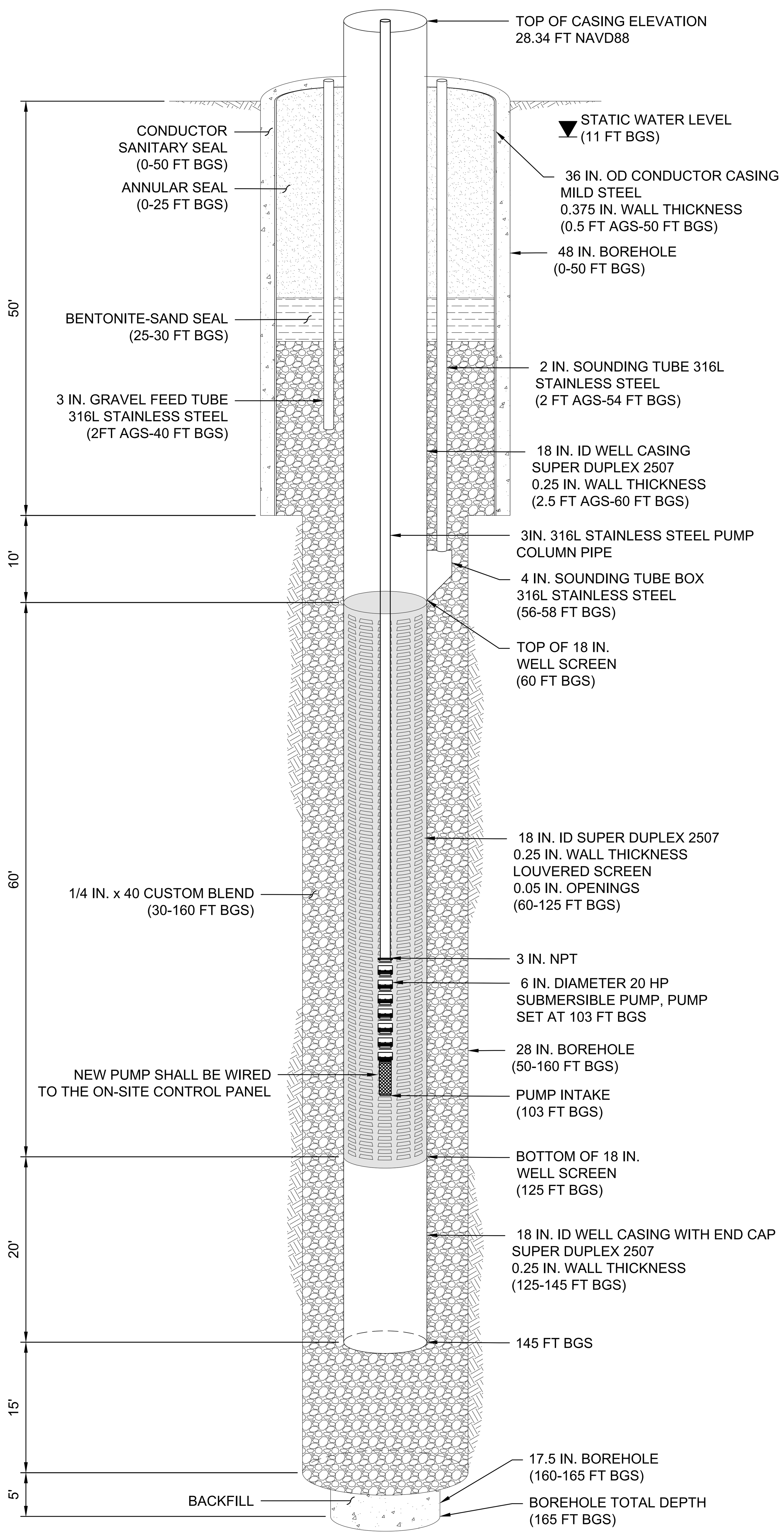


Figure 2



DESALTER TEST WELL PROFILE AND SUBMERSIBLE PUMP
NOT TO SCALE

WELL INFORMATION	
OWNER	OLIVEHAIN MUNICIPAL WATER DISTRICT
OWNER ADDRESS	1966 OLIVEHAIN RD, ENCINITAS, CALIFORNIA
WELL NAME	DESALTER TEST WELL
WELL LOCATION	14989 VIA DE LA VALLE, DEL MAR, CALIFORNIA (SURF CUP SPORTS PARK)
CALIFORNIA STATE WELL NUMBER	TBD
LATITUDE (NAD83)	32.985331 N
LONGITUDE (NAD83)	-117.212779 W
LAND SURFACE ELEVATION (NAD83)	28
WELL USE	TEST WELL

BOREHOLE			
	CONDUCTOR BOREHOLE	PILOT BOREHOLE	FINAL BOREHOLE
DRILLING CONTRACTOR	JENSEN DRILLING COMPANY		
DRILL BIT TYPE	SOLID STEM AUGER	TRICONE MILL TOOTH	ROLLER CONE HOLE OPENER
DRILLING METHOD	SOLID STEM AUGER	FLUID REVERSE	FLUID REVERSE
DRILLING FLUID COMPOSITION	WATER	WATER/BENTONITE	WATER/BENTONITE
DRILLING PASS NUMBER 1:	-		
DIAMETER (IN.)	48	17.5	35.25 (CONDUCTOR)
TOTAL DEPTH (FT BGS)	50	165	50
DRILLING PASS NUMBER 2:	-		
DIAMETER (IN.)	-	-	28
TOTAL DEPTH (FT BGS)	-	-	160

CASING AND SCREEN SCHEDULE				
	CONDUCTOR CASING	WELL CASING DIAMETER 1	WELL CASING DIAMETER 2	WELL SCREEN
SUPPLIER	ROSCOE MOSS CO.	ROSCOE MOSS CO.		
MATERIAL	MILD STEEL	SUPER DUPLEX 2507		
OUTER DIAMETER (IN.)	36	18.50	18.50	18.50
INNER DIAMETER (IN.)	35.25	18	18	18
WALL THICKNESS (IN.)	0.375	0.250	0.250	0.250
TOTAL INSTALLED LENGTH (FT)	50.5	57.5	20	65
INSTALLED INTERVALS (FT BGS) AND LENGTH (FT)				
INTERVAL 1	0.5 FT AGS - 50 FT BGS (50.5 FT TOTAL)	2.5 FT AGS - 60 FT BGS (57.5 FT TOTAL)	125 FT BGS - 145 FT BGS (20 FT TOTAL)	60 FT BGS - 125 FT BGS (65 FT TOTAL)
SCREEN PERFORATION TYPE	-	-	-	HORIZONTAL FUL-FLO LOUVERED PATTERN
SCREEN PERFORATION OPENING (IN.)	-	-	-	0.050
CONNECTION TYPE	BUTT WELD	WELDED COLLAR CONNECTION TWO-PASS WELD		
CASING BOTTOM CAP	-	SUPER DUPLEX 2507		
CENTRALIZER MATERIAL	MILD STEEL	SUPER DUPLEX 2507		
CENTRALIZER ANNGULAR SPACING	90°	90°		
CENTRALIZER VERTICAL SPACING	-	120 FT		

SUBMERSIBLE PUMP DESIGN	
PUMP TYPE	GRUNDFOS SP 230S
TOTAL DYNAMIC HEAD (FT)	200
MOTOR VOLTS (V)	460
MOTOR HORSE POWER (HP)	20
PUMP DIAMETER (IN.)	6
PUMP MATERIAL	304 STAINLESS STEEL
COLUMN PIPE DIAMETER (IN.)	3
COLUMN PIPE MATERIAL	316L STAINLESS STEEL

GROUTING AND SEALING		
	CONDUCTOR CASING	WELL CASING
MATERIAL	10.3 SACK SAND-CEMENT SLURRY	10.3 SACK SAND-CEMENT SLURRY
DEPTH (FT BELOW GROUND SURFACE)	0 - 50	0 - 25
CALCULATED VOLUME (CUBIC YD)	10.5	5
MAXIMUM LIFT HEIGHT (FT)	50	25
NUMBER OF LIFTS	1	1

ANCILLARY WELL EQUIPMENT		
	GRAVEL FEED PIPE	SOUNDING TUBE
PLACEMENT (QUADRANT)	NW	SW
MATERIAL	316L STAINLESS STEEL	
NOMINAL PIPE DIAMETER	3	2
PIPE SCHEDULE	40	40
INSTALLED LENGTH (FT)	40	58
CONNECTION METHOD	WELD	WELD
CENTRALIZER ANGULAR SPACING (DEGREES)	-	-
LENGTH OF OPENING FOR SOUNDING TUBE	-	3 IN. x 3 IN. x 2 FT

FILTER PACK DESIGN	
FILTER PACK SUPPLIER	TACNA SAND AND GRAVEL
SUPPLIER'S PRODUCT DESIGNATION	1/4 IN. X 40 CUSTOM BLEND
ESTIMATED FILTER PACK VOLUME (CU. YDS.)	14
FLUID TO BE ADDED TO FILTER PACK	WATER
CHLORINE TO BE ADDED TO FILTER PACK (GAL/% CHLORINE)	1-2 GALLONS (12.5% SODIUM HYPOCHLORITE) PER CUBIC YARD FILTER PACK
FILTER PACK INTERVAL (FT BGS)	30 - 160
BENTONITE-SAND LAYER (FT BGS)	25 - 30

MECHANCIAL GRADING ANALYSIS OF FILTER PACK			
U.S. STANDARD SIEVE SIZE	OPENINGS (IN.)	OPENINGS (MM)	CUMULATIVE PERCENT PASSING
1/4"	0.250	6.35	100.0
4	0.187	4.75	95.0
6	0.132	3.36	87.0
8	0.094	2.38	70.0
10	0.079	2.00	58.0
14	0.056	1.41	27.0
16	0.047	1.19	18.0
18	0.039	1.00	13.0
20	0.033	0.84	10.0
30	0.023	0.59	6.0
40	0.017	0.42	2.0

ABBREVIATIONS LIST:

AGS ABOVE GROUND SURFACE
BGS BELOW GROUND SURFACE
ID INSIDE DIAMETER
OD OUTSIDE DIAMETER

GEOSCIENCE
The First Name in Groundwater

811 CALL 811 AT LEAST TWO DAYS BEFORE YOU DIG
Know what's below. Call before you dig.
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV.	DATE	BY	DESCRIPTION
1			
2			
3			
4			

LINE IS 2 INCHES AT FULL SCALE (IF NOT 2" - SCALE ACCORDINGLY)
DESIGNED: TC
DRAWN: JF
CHECKED: MW
DATE:

REGISTERED PROFESSIONAL ENGINEER MARK D. WILLIAMS No. 68138 Exp. 06-30-21 CIVIL STATE OF CALIFORNIA

DISTRICT ENGINEER:
________, P.E. DATE
R.C.E. NO. ________ EXP. DATE: ________
PREPARED UNDER THE SUPERVISION OF:
MARK WILLIAMS DATE
PE NO. 68138 EXP. DATE: 6/30/21

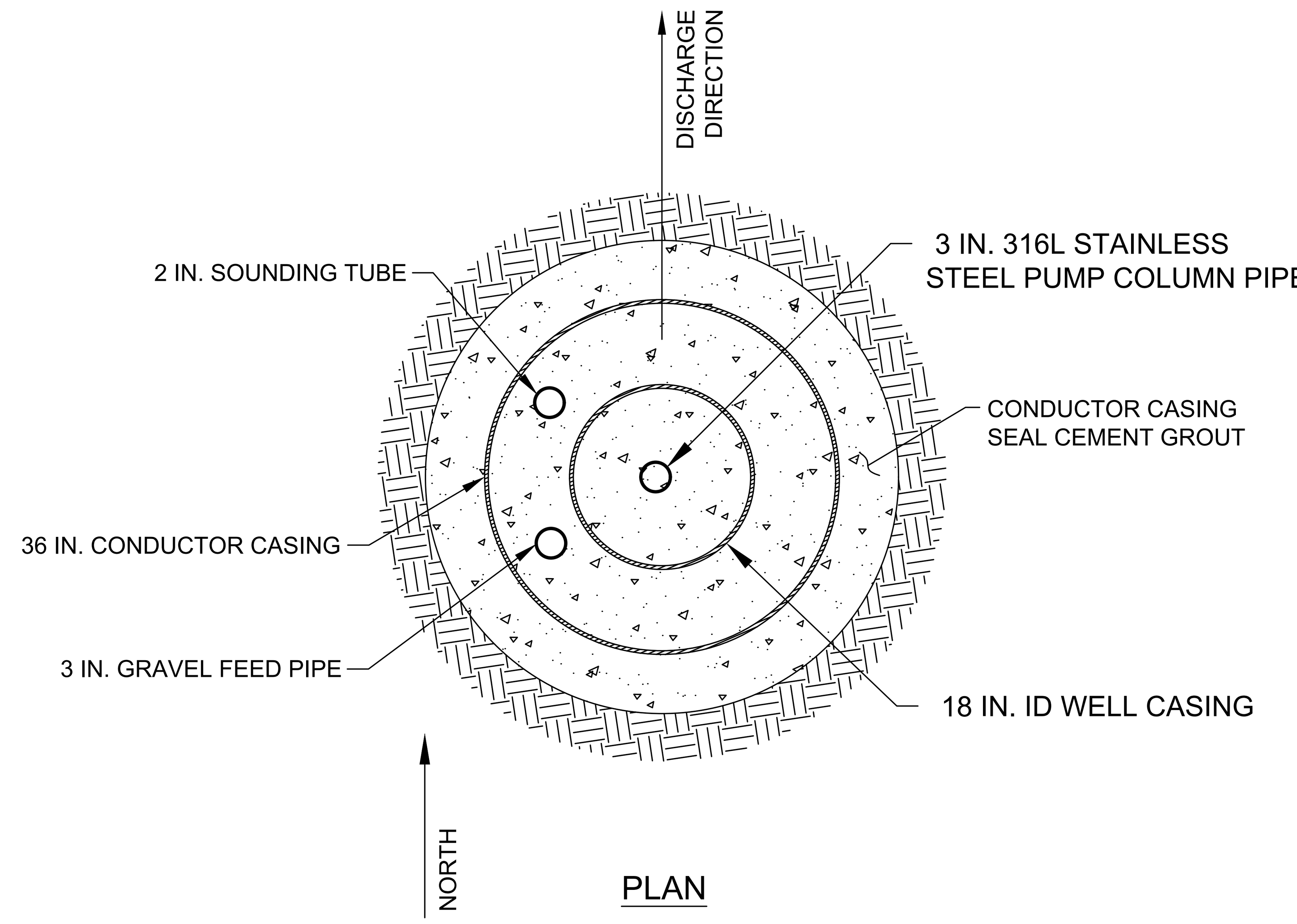
OLIVENHAIN Municipal Water District

OLIVENHAIN MUNICIPAL WATER DISTRICT
DESALTER TEST WELL

AS-BUILT WELL PROFILE AND COMPLETION DETAILS

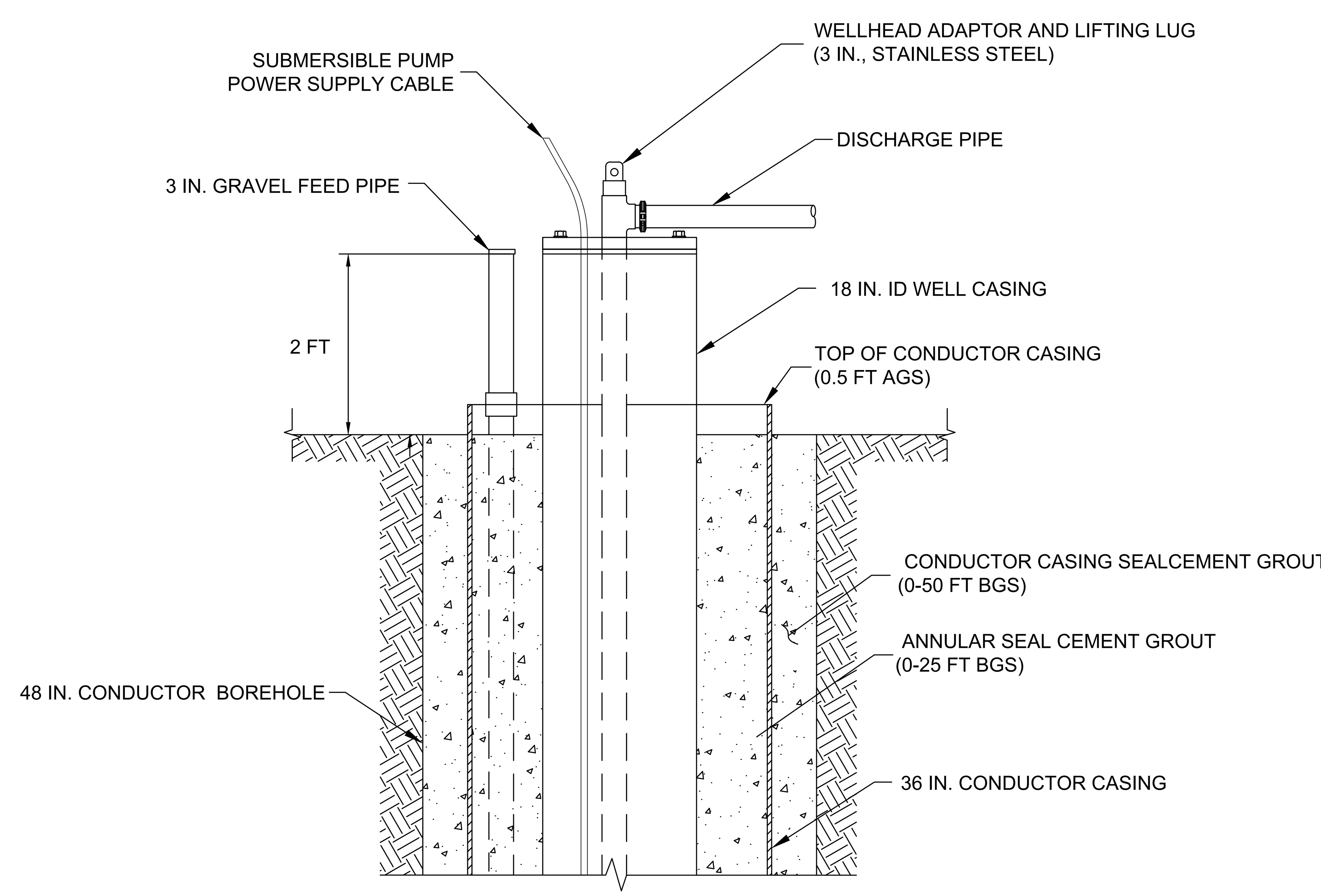
FIGURE NO.
3

X:\Projects\CAD\As-Builts\OMWD\Desalination Test Pump\Drawing\OMWD - Desalination Test Pump.dwg, 6/7/2021



PLAN

WELL CASING AND CONDUCTOR CASING DETAIL
NOT TO SCALE



PROFILE

WELLHEAD COMPLETION DETAIL
NOT TO SCALE

ABBREVIATIONS LIST:

AGS ABOVE GROUND SURFACE
BGS BELOW GROUND SURFACE
ID INSIDE DIAMETER
OD OUTSIDE DIAMETER

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The First Name in Groundwater

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REV.	DATE	BY	DESCRIPTION
1			
2			
3			
4			

LINE IS 2 INCHES AT FULL SCALE (IF NOT 2" - SCALE ACCORDINGLY)
DESIGNED: TC
DRAWN: JF
CHECKED: MW
DATE:

REGISTERED PROFESSIONAL ENGINEER MARK D. WILLIAMS No. 68138 Exp. 06-30-21 CIVIL STATE OF CALIFORNIA

DISTRICT ENGINEER:
__________, P.E. DATE
R.C.E. NO. ______ EXP. DATE: ______
PREPARED UNDER THE SUPERVISION OF:
MARK WILLIAMS DATE
PE NO. 68138 EXP. DATE: 6/30/21

OLIVENHAIN Municipal Water District

OLIVENHAIN MUNICIPAL WATER DISTRICT
DESALTER TEST WELL

AS-BUILT WELL SECTION AND COMPLETION DETAILS

FIGURE NO.
4

X:\Projects\CAD\As-Builts\OMWD\Desalination Test Pump\Drawing\OMWD - Desalination Test Pump.dwg, 6/7/2021

Step Drawdown Pumping Test
OMWD Desalter Test Well

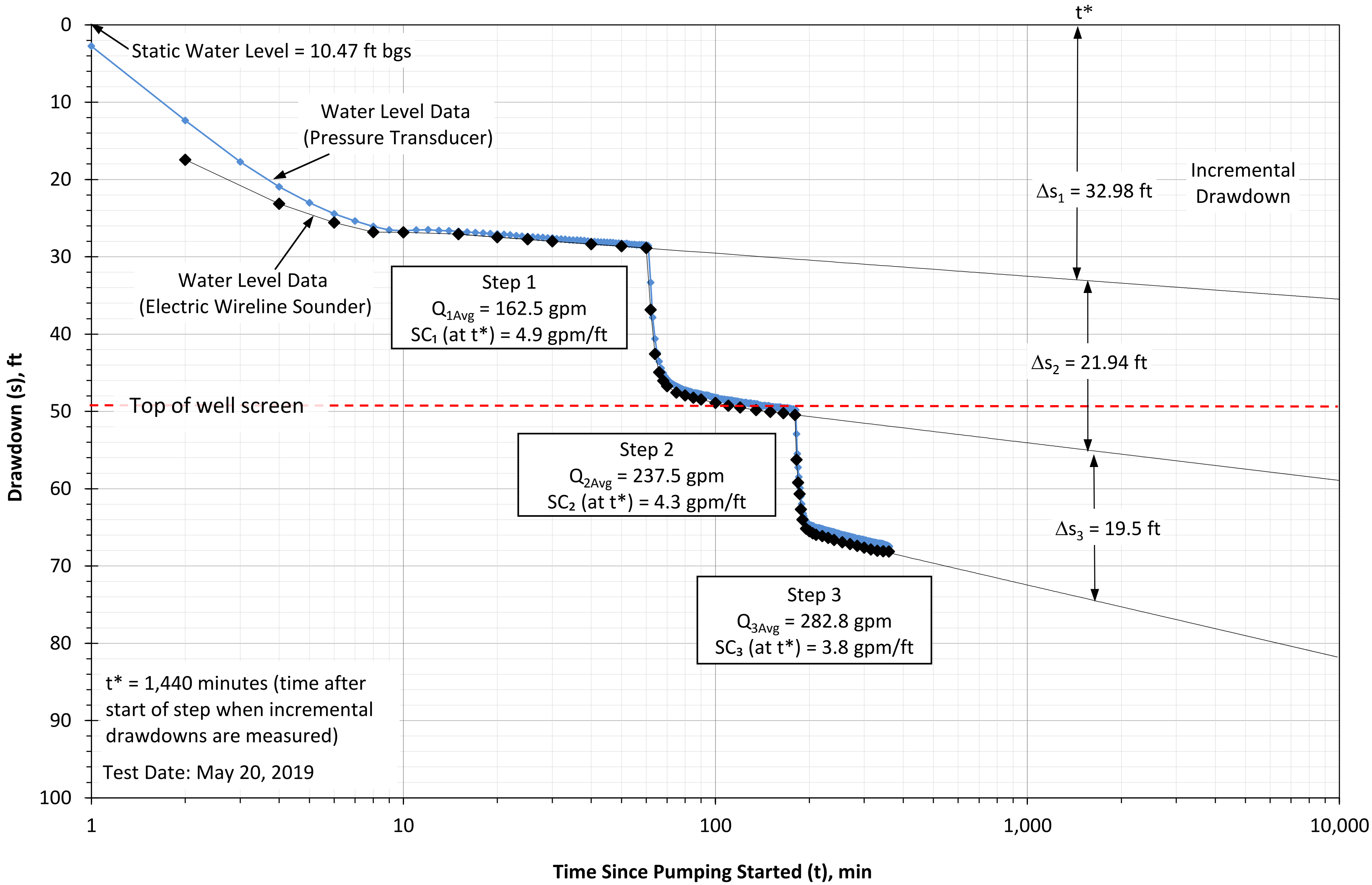


Figure 5

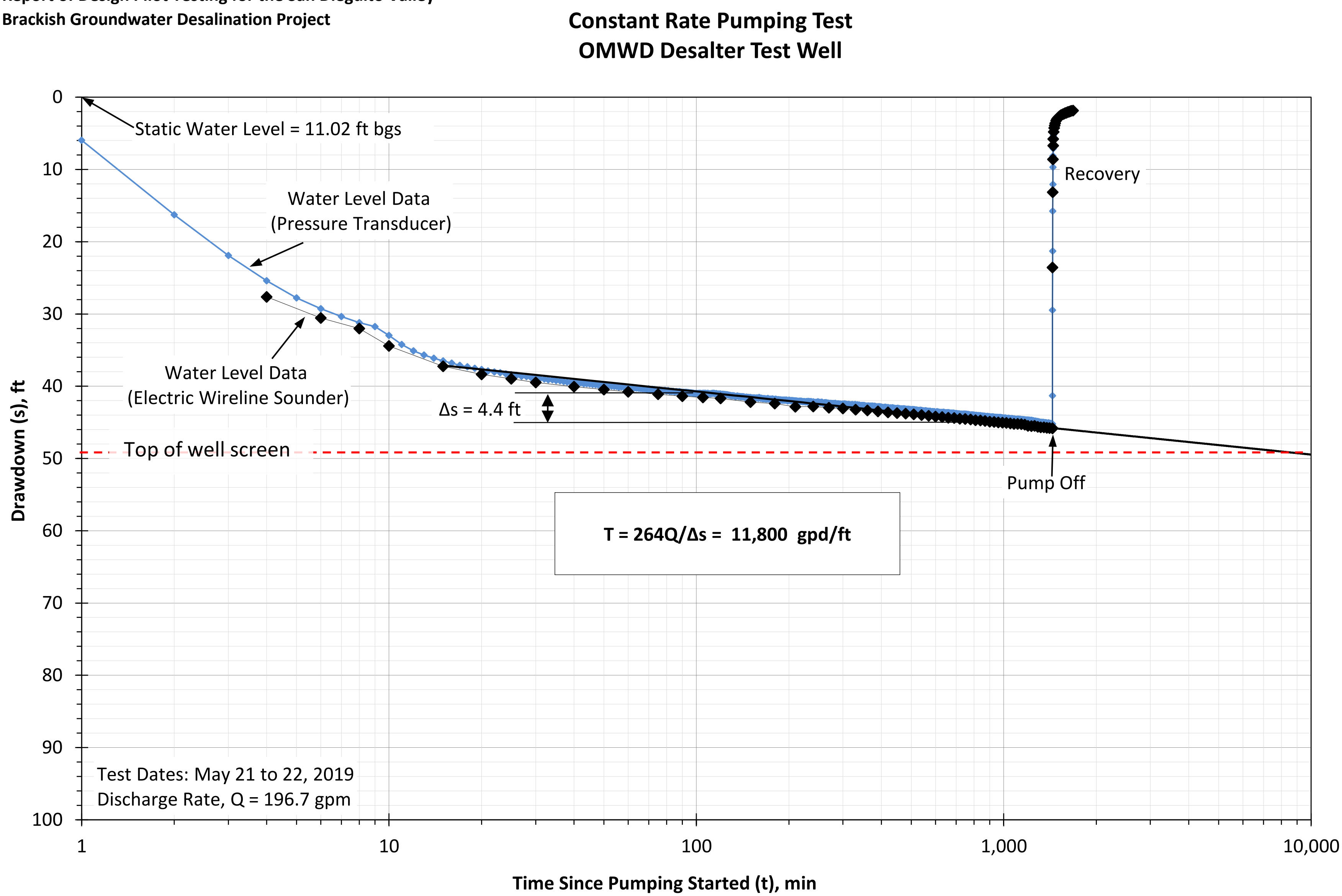

Constant Rate Pumping Test
OMWD Desalter Test Well
Static Water Level = 11.02 ft bgs
Water Level Data
(Pressure Transducer)
Water Level Data
(Electric Wireline Sounder)
Recovery
Δs = 4.4 ft
Top of well screen
Pump Off
T = 264Q/Δs = 11,800 gpd/ft
Test Dates: May 21 to 22, 2019
Discharge Rate, Q = 196.7 gpm
Drawdown (s), ft
Time Since Pumping Started (t), min
0
10
20
30
40
50
60
70
80
90
100
1
10
100
1,000
10,000

Figure 6

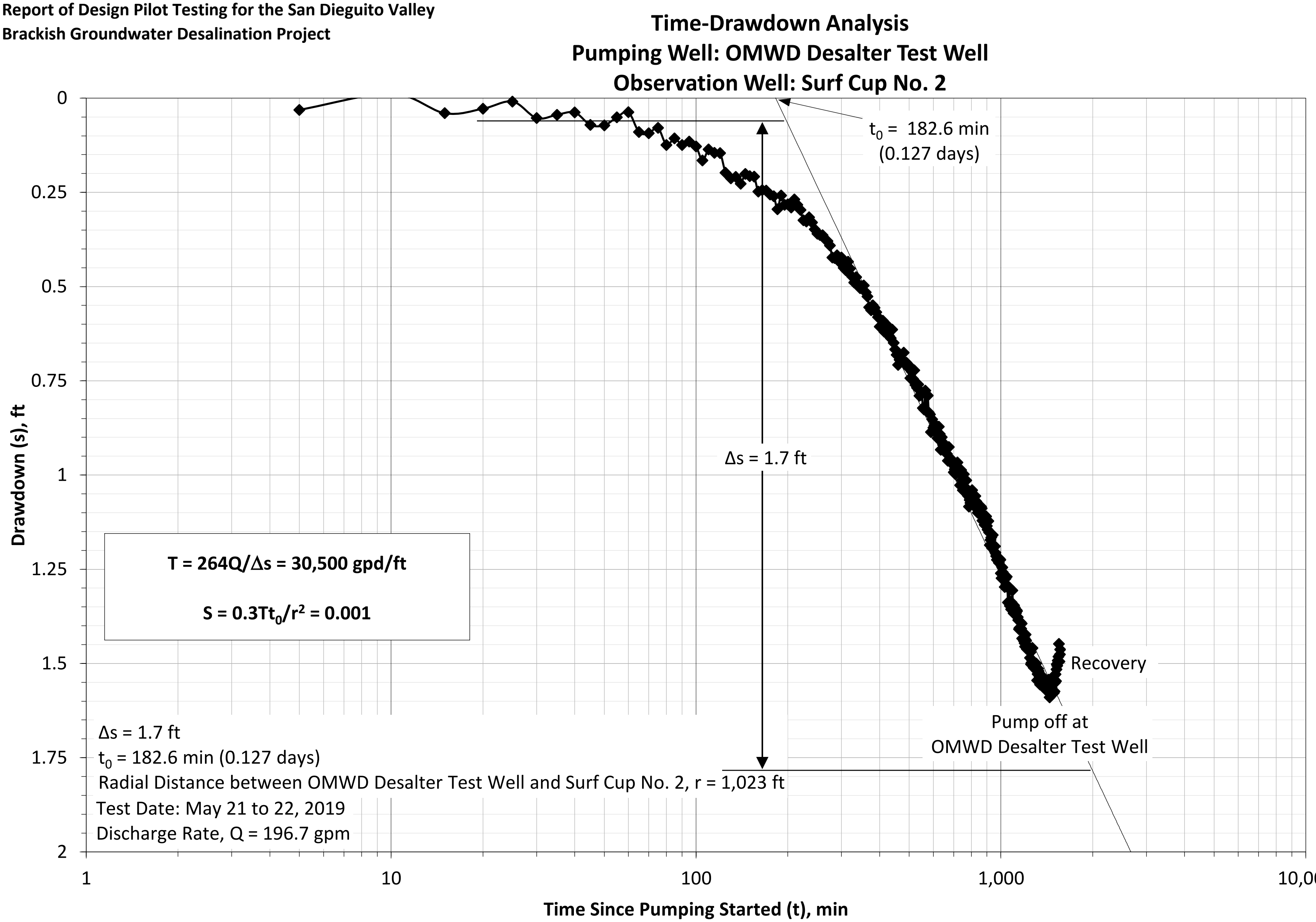

Time-Drawdown Analysis
Pumping Well: OMWD Desalter Test Well
Observation Well: Surf Cup No. 2
t_0 = 182.6 min
(0.127 days)
Δs = 1.7 ft
T = 264Q/Δs = 30,500 gpd/ft
S = 0.3Tt$_0$/r^2 = 0.001
Recovery
Pump off at
OMWD Desalter Test Well
Δs = 1.7 ft
t_0 = 182.6 min (0.127 days)
Radial Distance between OMWD Desalter Test Well and Surf Cup No. 2, r = 1,023 ft
Test Date: May 21 to 22, 2019
Discharge Rate, Q = 196.7 gpm
Drawdown (s), ft
0
0.25
0.5
0.75
1
1.25
1.5
1.75
2
1
10
100
1,000
10,000
Time Since Pumping Started (t), min

Figure 7

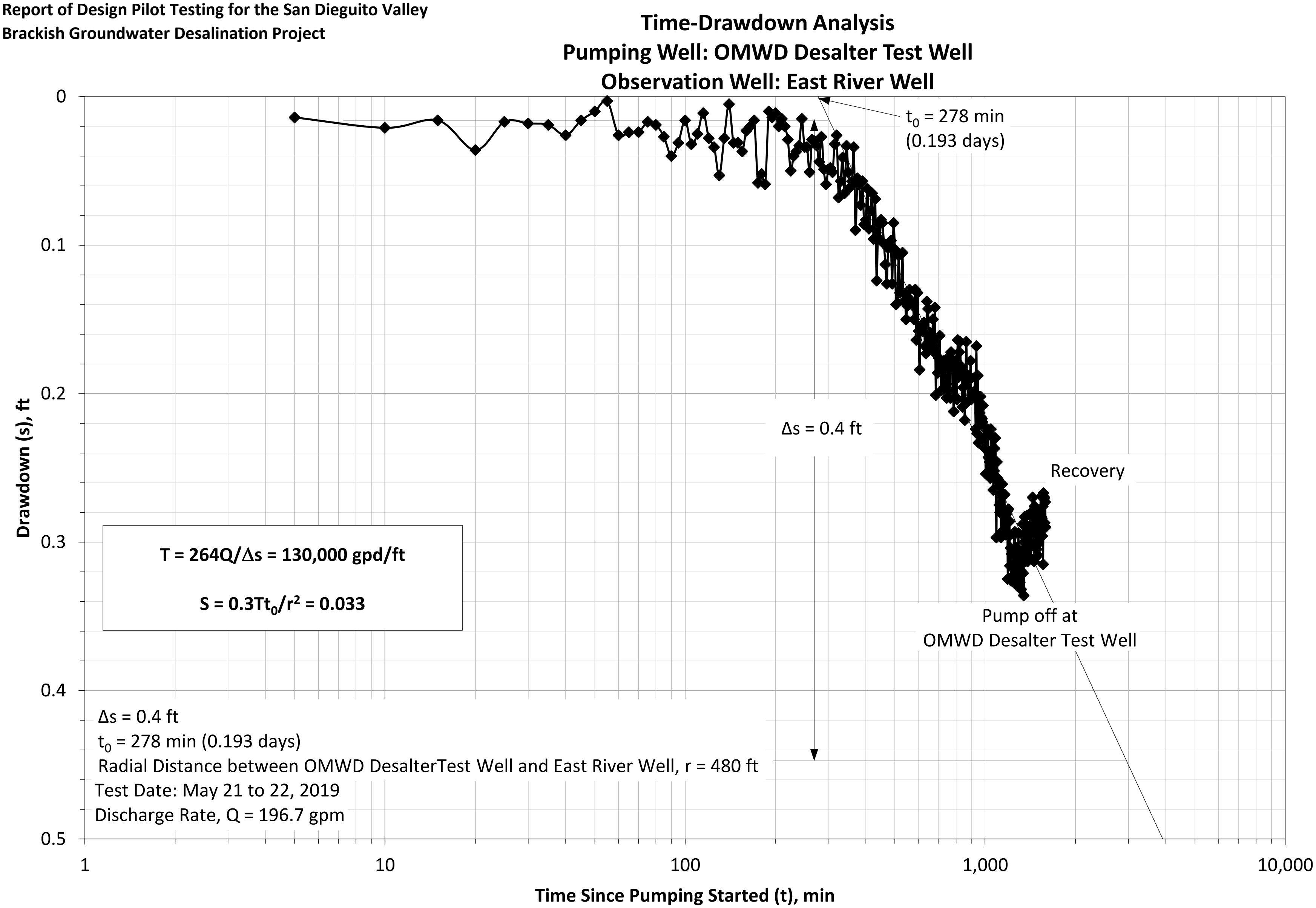

Time-Drawdown Analysis
Pumping Well: OMWD Desalter Test Well
Observation Well: East River Well
t_0 = 278 min
(0.193 days)
Δs = 0.4 ft
Recovery
T = 264Q/Δs = 130,000 gpd/ft
S = $0.3Tt_0/r^2$ = 0.033
Pump off at
OMWD Desalter Test Well
Δs = 0.4 ft
t_0 = 278 min (0.193 days)
Radial Distance between OMWD DesalterTest Well and East River Well, r = 480 ft
Test Date: May 21 to 22, 2019
Discharge Rate, Q = 196.7 gpm
Drawdown (s), ft
0
0.1
0.2
0.3
0.4
0.5
1
10
100
1,000
10,000
Time Since Pumping Started (t), min

Figure 8

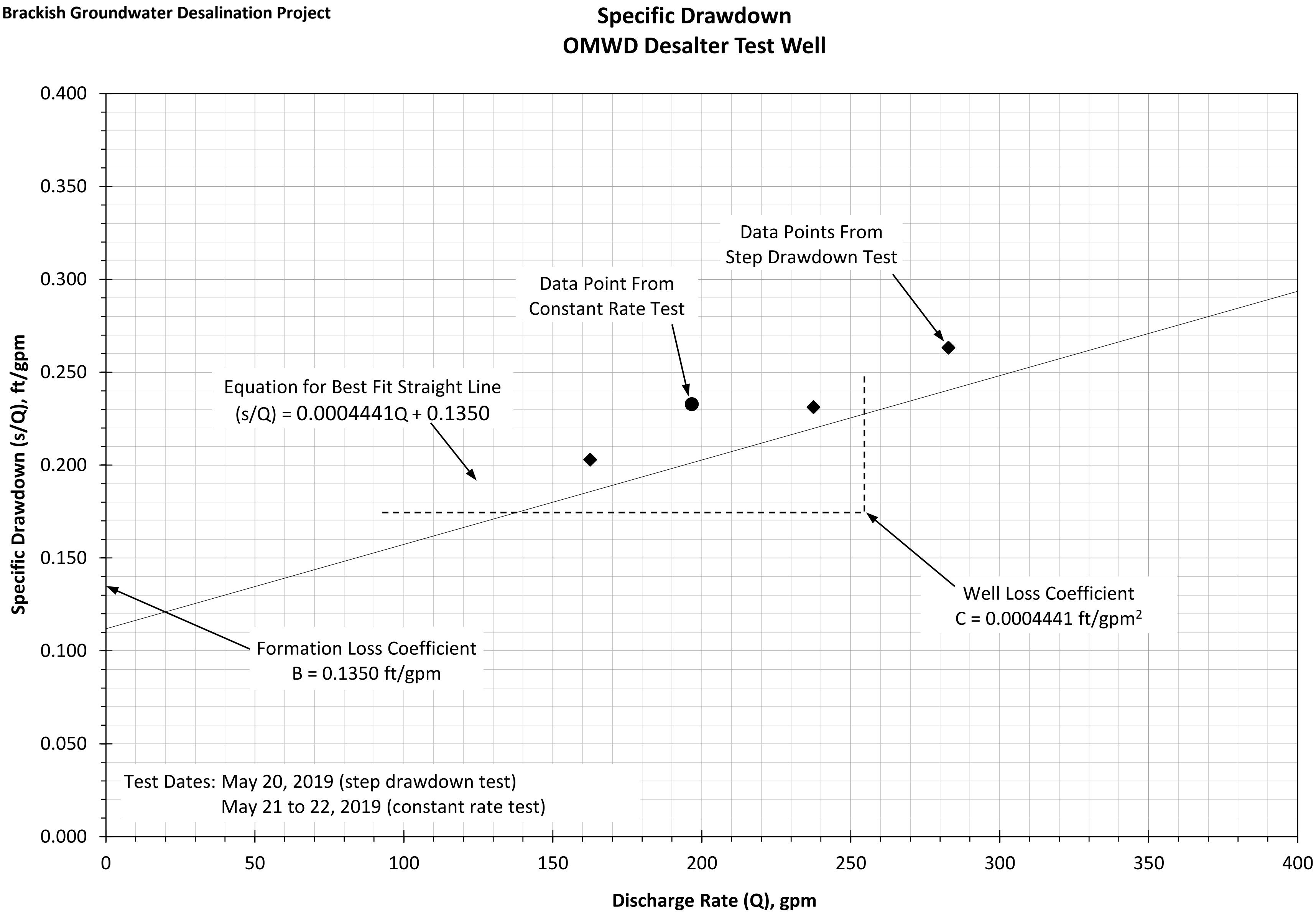

Specific Drawdown
OMWD Desalter Test Well
Specific Drawdown (s/Q), ft/gpm
0.400
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
0
50
100
150
200
250
300
350
400
Discharge Rate (Q), gpm
Data Points From
Step Drawdown Test
Data Point From
Constant Rate Test
Equation for Best Fit Straight Line
(s/Q) = 0.0004441Q + 0.1350
Well Loss Coefficient
C = 0.0004441 ft/gpm2
Formation Loss Coefficient
B = 0.1350 ft/gpm
Test Dates: May 20, 2019 (step drawdown test)
May 21 to 22, 2019 (constant rate test)

Figure 9

Specific Capacity and Well Efficiency Diagram
OMWD Desalter Test Well

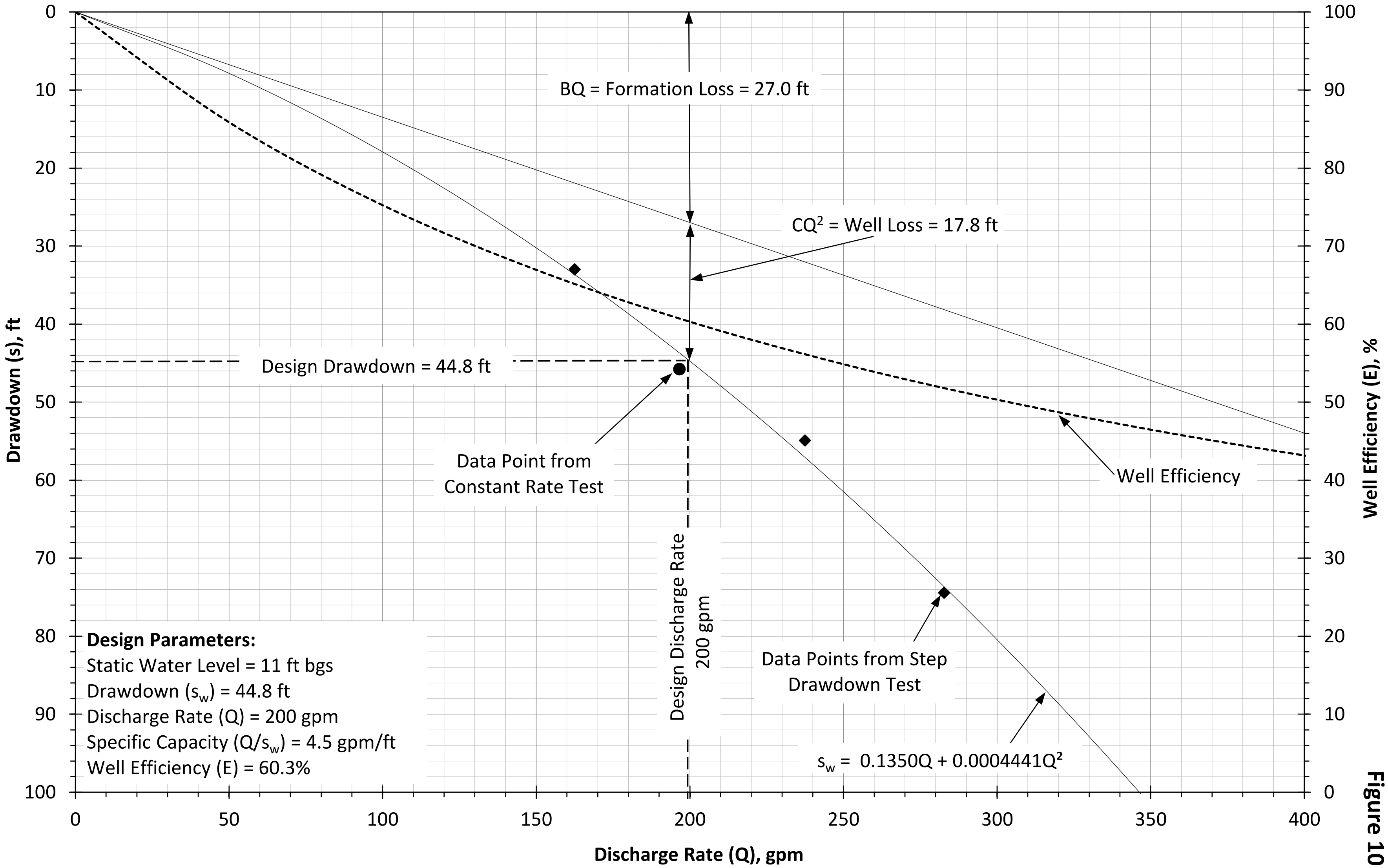


Figure 10

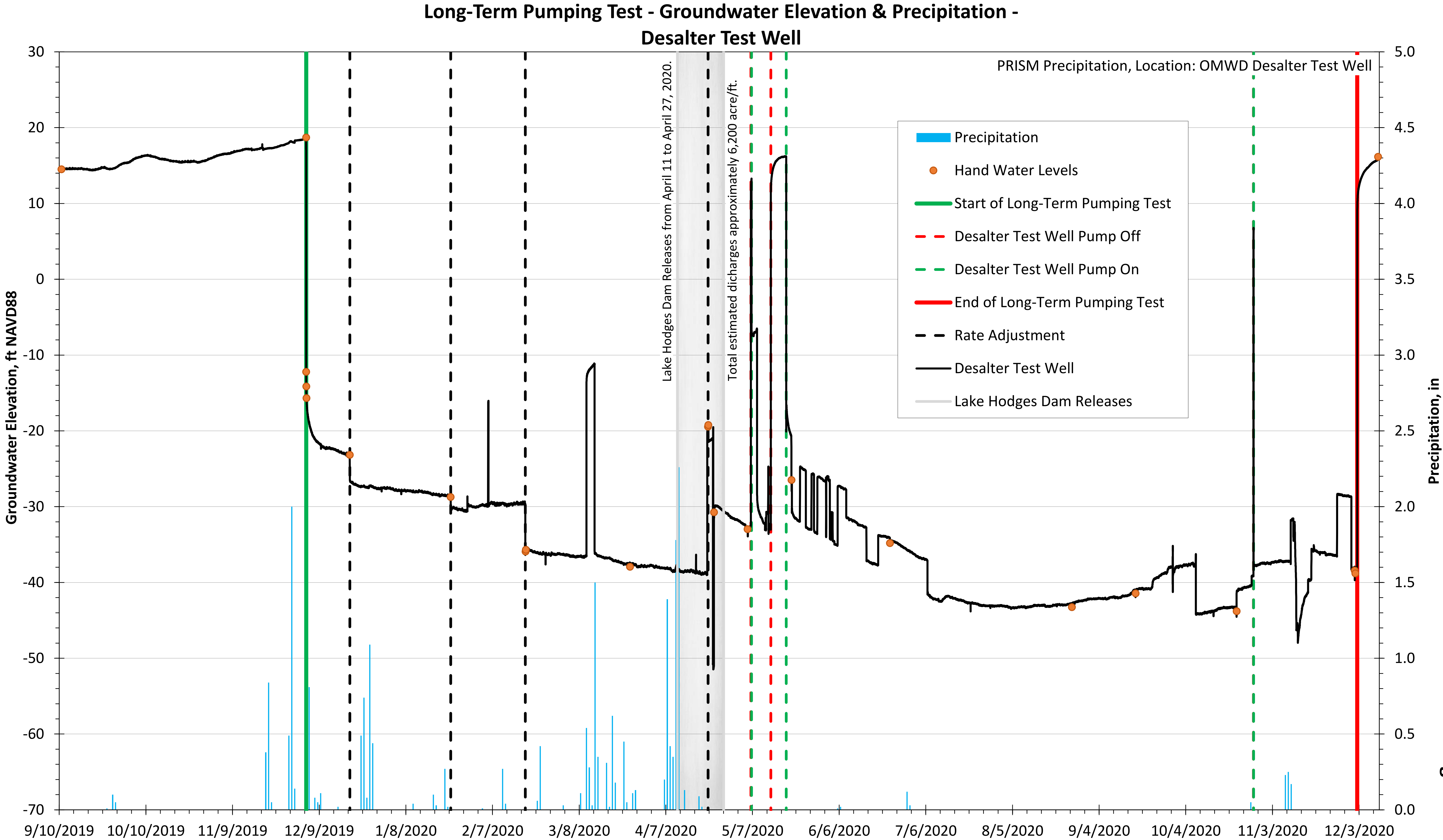

Long-Term Pumping Test - Groundwater Elevation & Precipitation - Desalter Test Well
PRISM Precipitation, Location: OMWD Desalter Test Well
Precipitation
Hand Water Levels
Start of Long-Term Pumping Test
Desalter Test Well Pump Off
Desalter Test Well Pump On
End of Long-Term Pumping Test
Rate Adjustment
Desalter Test Well
Lake Hodges Dam Releases
Lake Hodges Dam Releases from April 11 to April 27, 2020.
Total estimated dicharges approximately 6,200 acre/ft.
Groundwater Elevation, ft NAVD88
Precipitation, in
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9/10/2019
10/10/2019
11/9/2019
12/9/2019
1/8/2020
2/7/2020
3/8/2020
4/7/2020
5/7/2020
6/6/2020
7/6/2020
8/5/2020
9/4/2020
10/4/2020
11/3/2020
12/3/2020

Figure 11

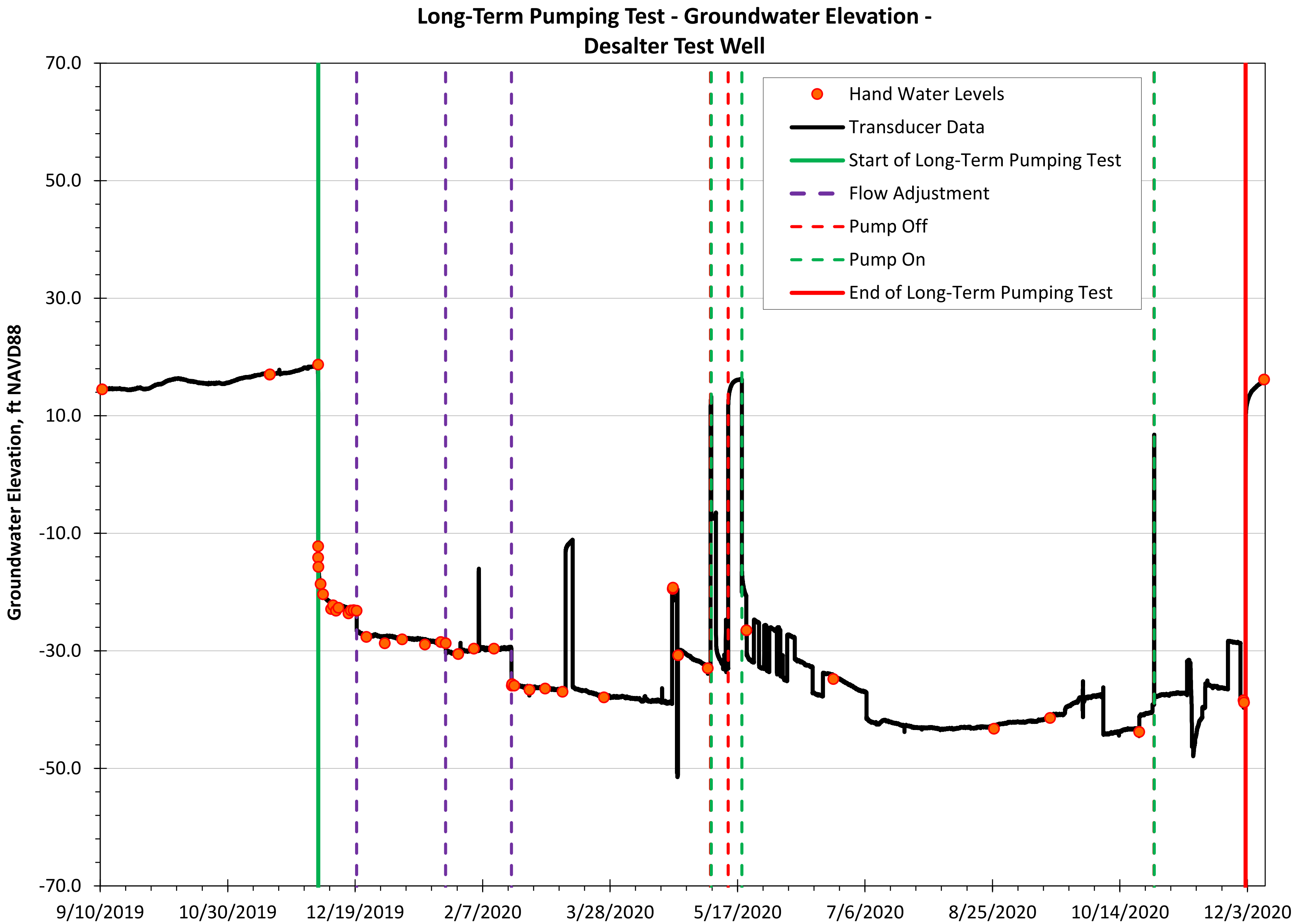

Long-Term Pumping Test - Groundwater Elevation -
Desalter Test Well
Groundwater Elevation, ft NAVD88
70.0
50.0
30.0
10.0
-10.0
-30.0
-50.0
-70.0
9/10/2019
10/30/2019
12/19/2019
2/7/2020
3/28/2020
5/17/2020
7/6/2020
8/25/2020
10/14/2020
12/3/2020
Hand Water Levels
Transducer Data
Start of Long-Term Pumping Test
Flow Adjustment
Pump Off
Pump On
End of Long-Term Pumping Test

Figure 12

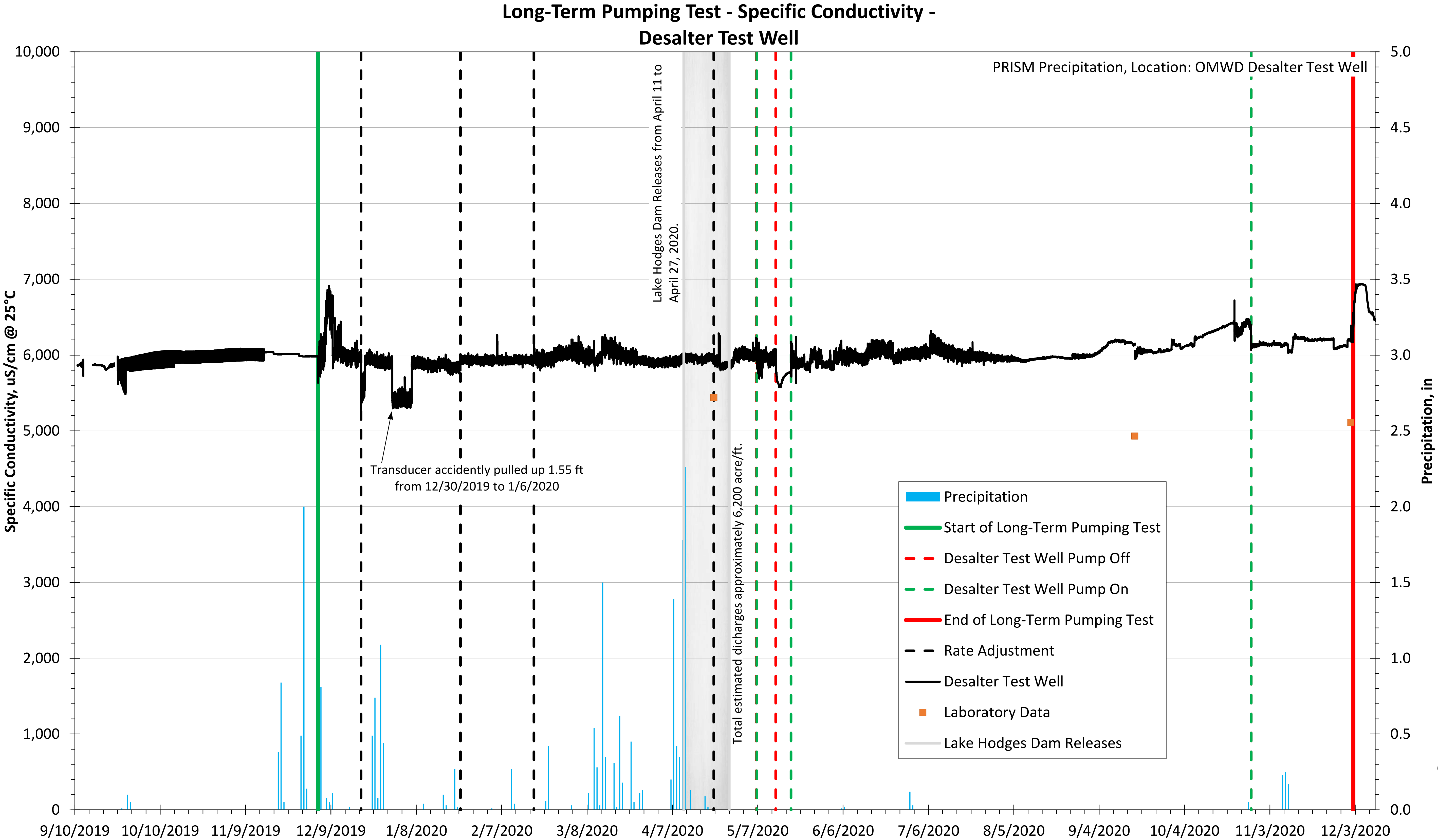

Long-Term Pumping Test - Specific Conductivity - Desalter Test Well
PRISM Precipitation, Location: OMWD Desalter Test Well
Specific Conductivity, uS/cm @ 25°C
Precipitation, in
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9/10/2019
10/10/2019
11/9/2019
12/9/2019
1/8/2020
2/7/2020
3/8/2020
4/7/2020
5/7/2020
6/6/2020
7/6/2020
8/5/2020
9/4/2020
10/4/2020
11/3/2020
12/3/2020
Lake Hodges Dam Releases from April 11 to April 27, 2020.
Total estimated dicharges approximately 6,200 acre/ft.
Transducer accidently pulled up 1.55 ft from 12/30/2019 to 1/6/2020
Precipitation
Start of Long-Term Pumping Test
Desalter Test Well Pump Off
Desalter Test Well Pump On
End of Long-Term Pumping Test
Rate Adjustment
Desalter Test Well
Laboratory Data
Lake Hodges Dam Releases

Figure 13

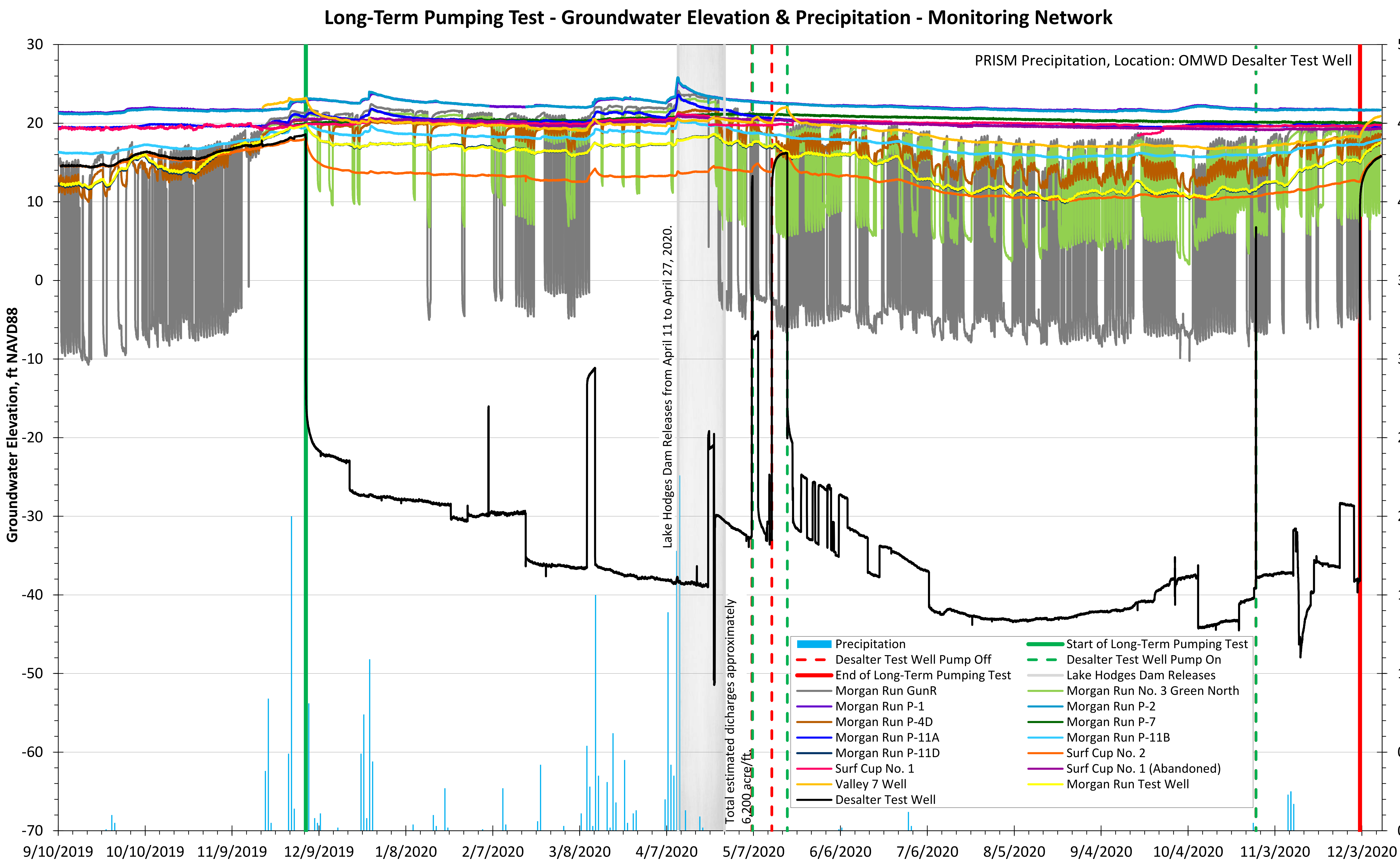
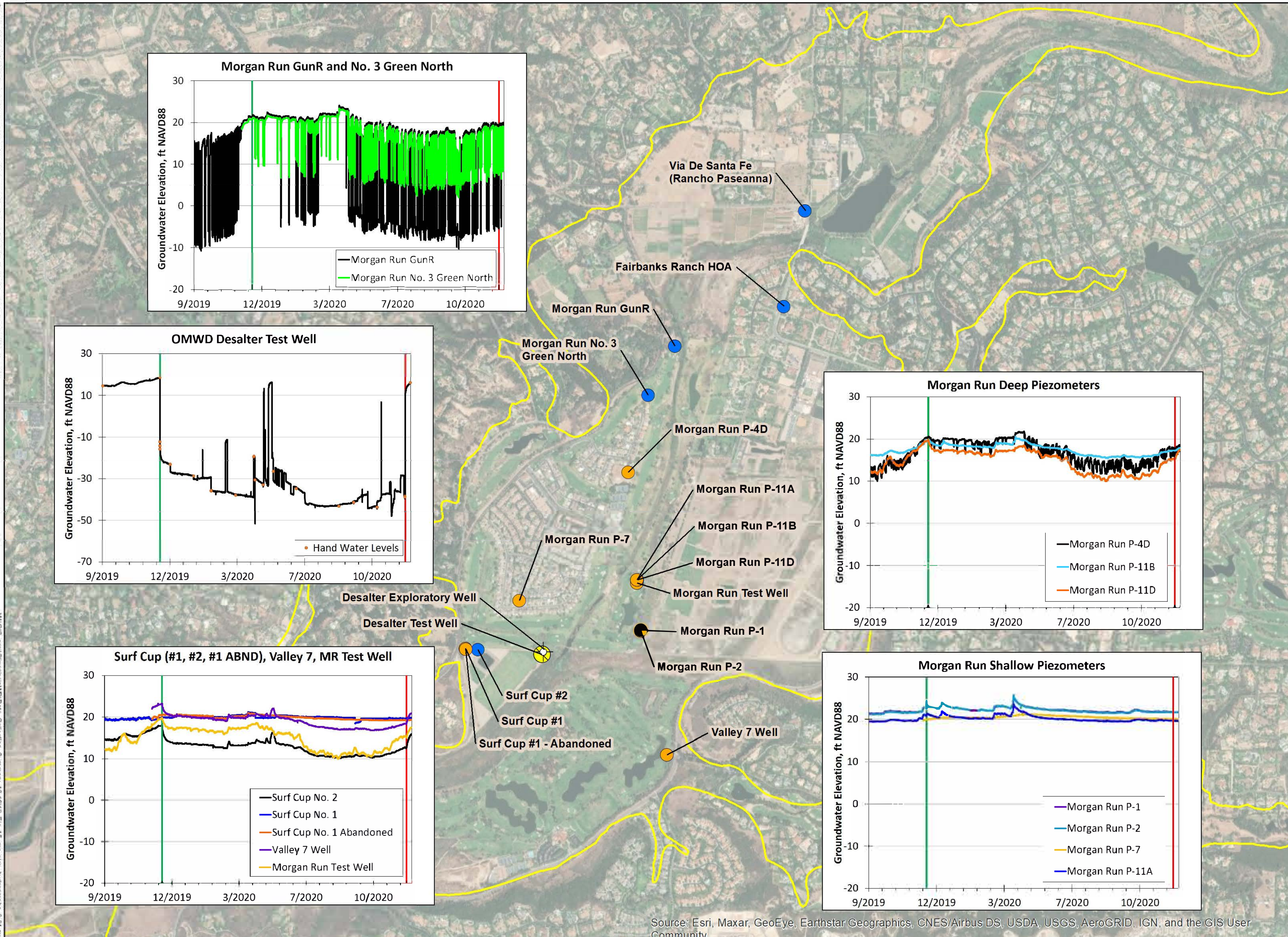

Long-Term Pumping Test - Groundwater Elevation & Precipitation - Monitoring Network
PRISM Precipitation, Location: OMWD Desalter Test Well
Groundwater Elevation, ft NAVD88
Precipitation, in
Lake Hodges Dam Releases from April 11 to April 27, 2020.
Total estimated dicharges approximately 6,200 acre/ft.
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9/10/2019
10/10/2019
11/9/2019
12/9/2019
1/8/2020
2/7/2020
3/8/2020
4/7/2020
5/7/2020
6/6/2020
7/6/2020
8/5/2020
9/4/2020
10/4/2020
11/3/2020
12/3/2020
Precipitation
Desalter Test Well Pump Off
End of Long-Term Pumping Test
Morgan Run GunR
Morgan Run P-1
Morgan Run P-4D
Morgan Run P-11A
Morgan Run P-11D
Surf Cup No. 1
Valley 7 Well
Desalter Test Well
Start of Long-Term Pumping Test
Desalter Test Well Pump On
Lake Hodges Dam Releases
Morgan Run No. 3 Green North
Morgan Run P-2
Morgan Run P-7
Morgan Run P-11B
Surf Cup No. 2
Surf Cup No. 1 (Abandoned)
Morgan Run Test Well

Figure 14



EXPLANATION

- Desalter Well
- Desalter Exploratory Borehole
- Pumping Well
- Non-Pumping Well
- San Dieguito Groundwater Basin Boundary (GEOSCIENCE, 2016)

Note: Green Vertical line in chart represents the start of the long-term pumping test. Red Vertical line represents the end.

N

0 1,500 3,000

Feet

GROUNDWATER ELEVATIONS DURING LONG-TERM PUMPING TEST - OMWD MONITORING NETWORK

Aug-21

OLIVENHAIN MUNICIPAL WATER DISTRICT

FIGURE 15

REPORT OF DESIGN PILOT TESTING FOR THE SAN DIEGUITO VALLEY BRACKISH GROUNDWATER DESALINATION DESIGN PROJECT

GEOSCIENCE

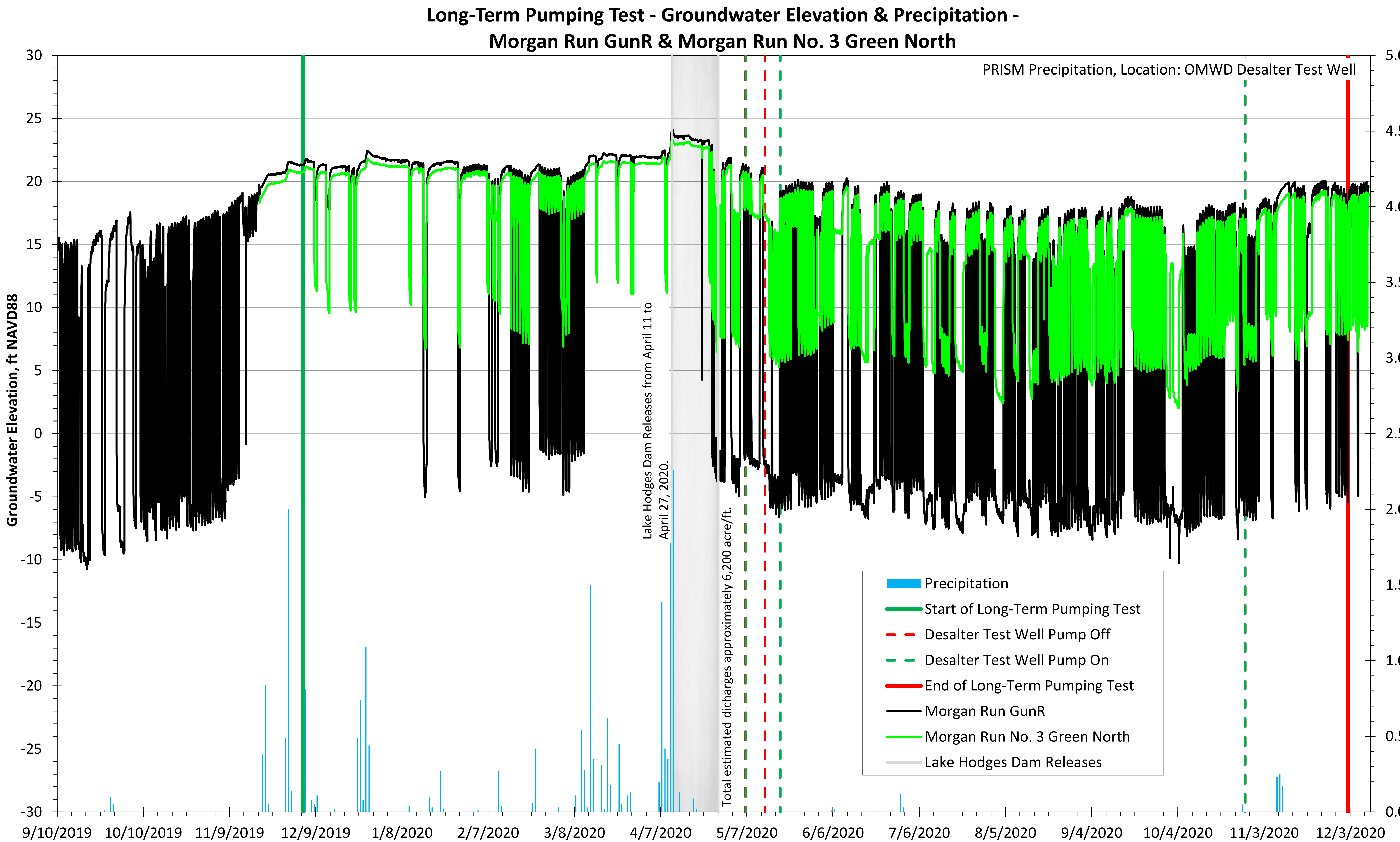

Long-Term Pumping Test - Groundwater Elevation & Precipitation -
Morgan Run GunR & Morgan Run No. 3 Green North
PRISM Precipitation, Location: OMWD Desalter Test Well
Groundwater Elevation, ft NAVD88
Precipitation, in
Lake Hodges Dam Releases from April 11 to April 27, 2020.
Total estimated discharges approximately 6,200 acre/ft.
Precipitation
Start of Long-Term Pumping Test
Desalter Test Well Pump Off
Desalter Test Well Pump On
End of Long-Term Pumping Test
Morgan Run GunR
Morgan Run No. 3 Green North
Lake Hodges Dam Releases
30
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9/10/2019
10/10/2019
11/9/2019
12/9/2019
1/8/2020
2/7/2020
3/8/2020
4/7/2020
5/7/2020
6/6/2020
7/6/2020
8/5/2020
9/4/2020
10/4/2020
11/3/2020
12/3/2020

Figure 16

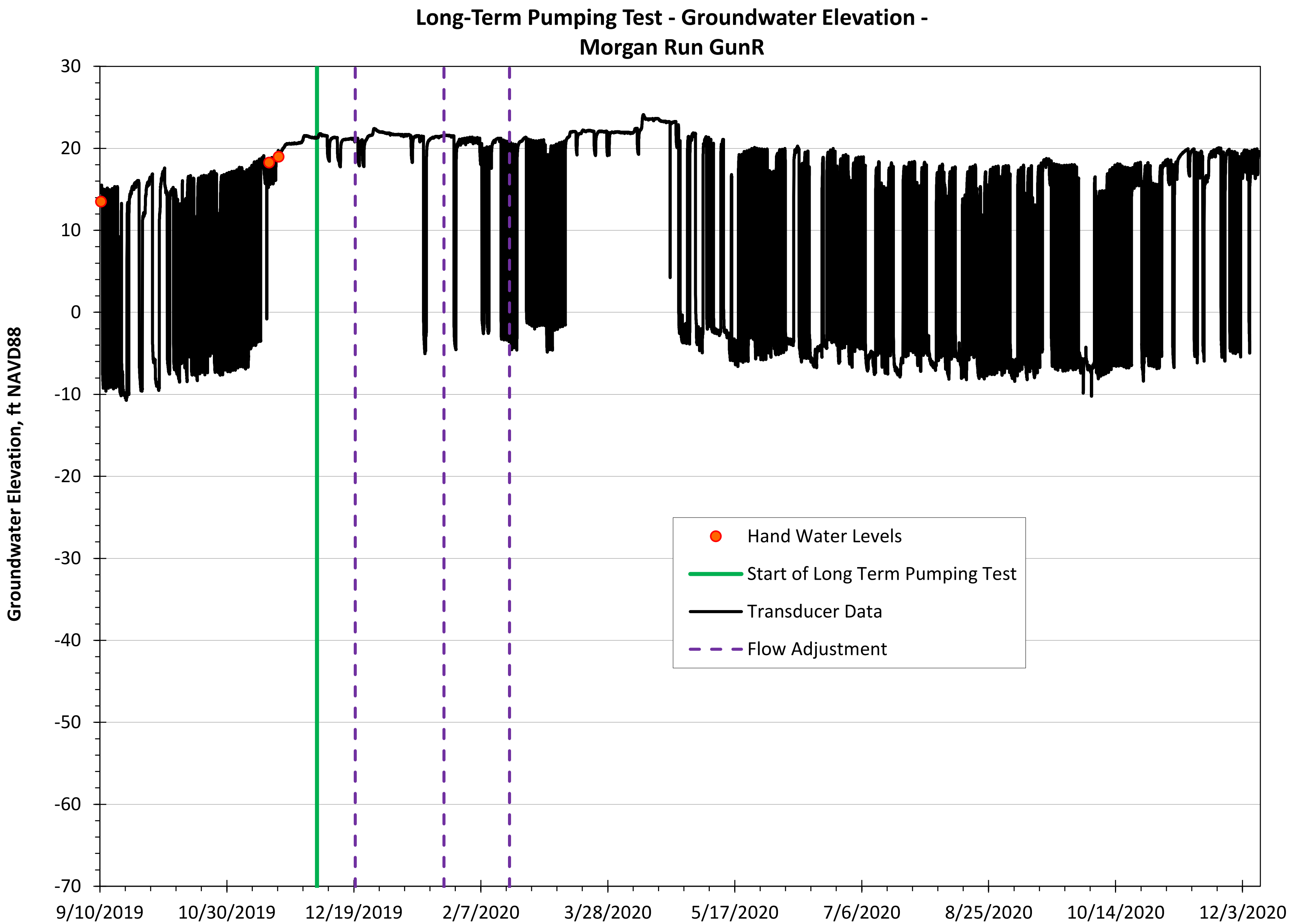

Long-Term Pumping Test - Groundwater Elevation -
Morgan Run GunR
Groundwater Elevation, ft NAVD88
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
9/10/2019
10/30/2019
12/19/2019
2/7/2020
3/28/2020
5/17/2020
7/6/2020
8/25/2020
10/14/2020
12/3/2020
Hand Water Levels
Start of Long Term Pumping Test
Transducer Data
Flow Adjustment

Figure 17

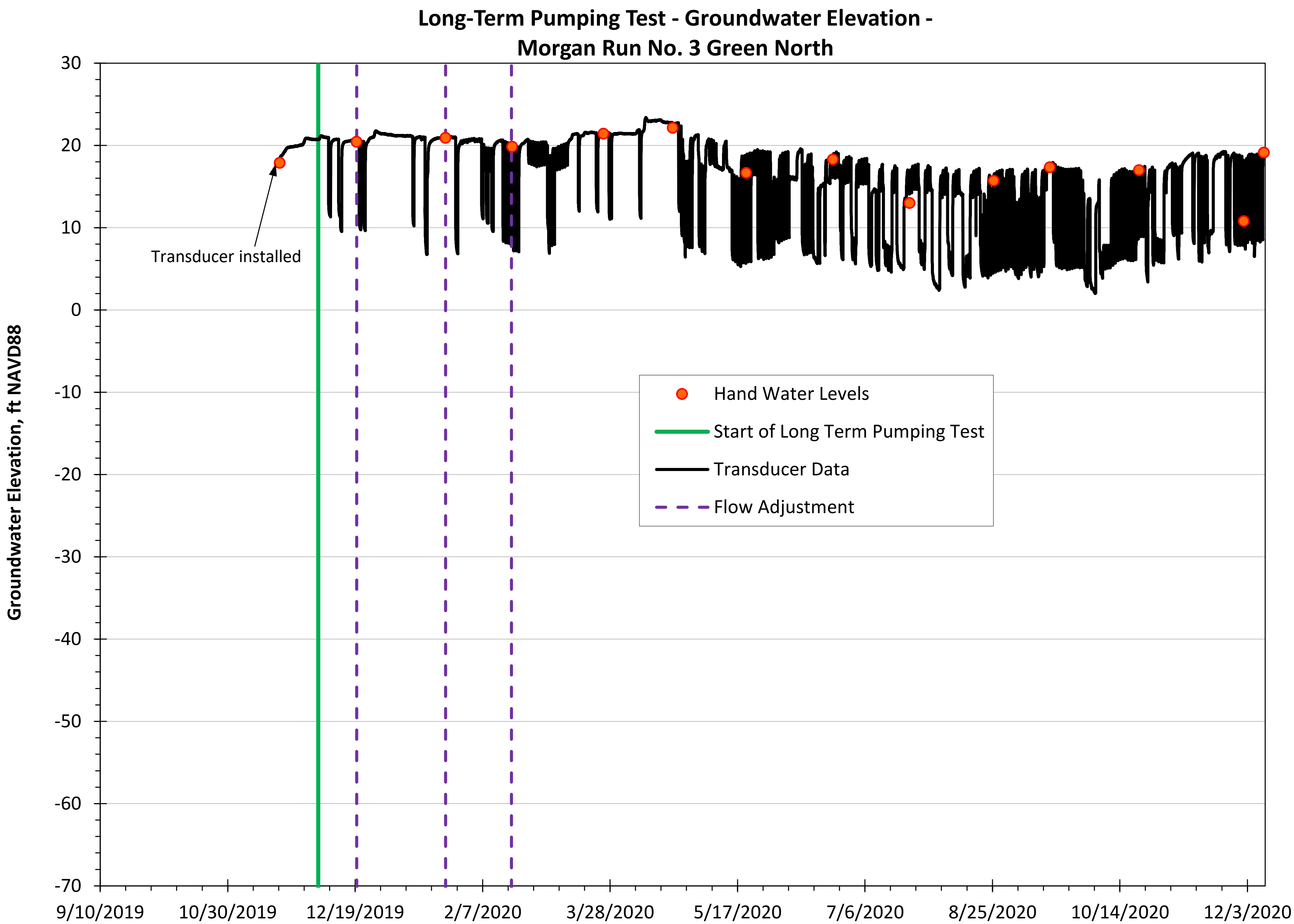

Long-Term Pumping Test - Groundwater Elevation -
Morgan Run No. 3 Green North
Groundwater Elevation, ft NAVD88
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
9/10/2019
10/30/2019
12/19/2019
2/7/2020
3/28/2020
5/17/2020
7/6/2020
8/25/2020
10/14/2020
12/3/2020
Transducer installed
Hand Water Levels
Start of Long Term Pumping Test
Transducer Data
Flow Adjustment

Figure 18

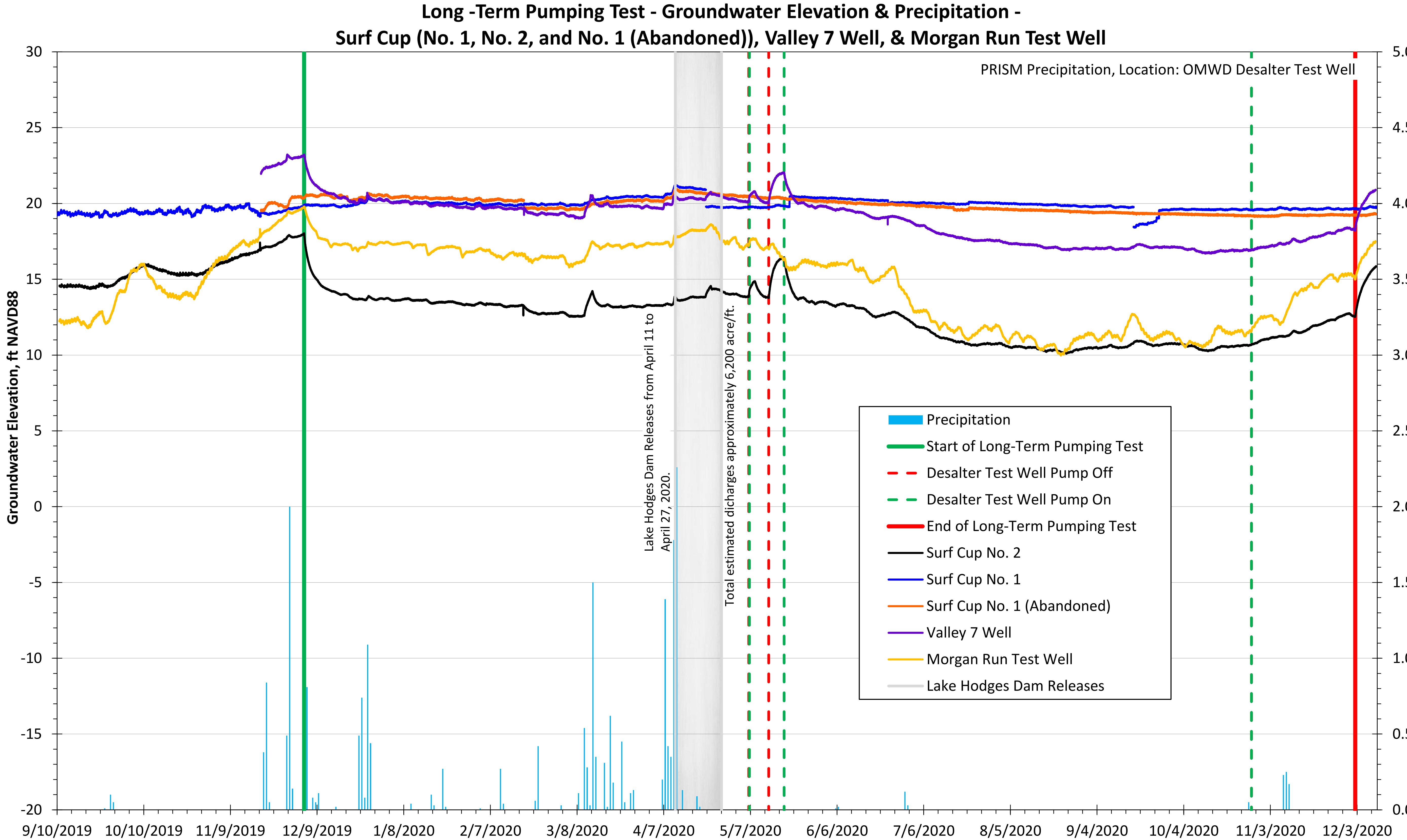

Long -Term Pumping Test - Groundwater Elevation & Precipitation -
Surf Cup (No. 1, No. 2, and No. 1 (Abandoned)), Valley 7 Well, & Morgan Run Test Well
PRISM Precipitation, Location: OMWD Desalter Test Well
Groundwater Elevation, ft NAVD88
Precipitation, in
30
25
20
15
10
5
0
-5
-10
-15
-20
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9/10/2019
10/10/2019
11/9/2019
12/9/2019
1/8/2020
2/7/2020
3/8/2020
4/7/2020
5/7/2020
6/6/2020
7/6/2020
8/5/2020
9/4/2020
10/4/2020
11/3/2020
12/3/2020
Lake Hodges Dam Releases from April 11 to April 27, 2020.
Total estimated dicharges approximately 6,200 acre/ft.
Precipitation
Start of Long-Term Pumping Test
Desalter Test Well Pump Off
Desalter Test Well Pump On
End of Long-Term Pumping Test
Surf Cup No. 2
Surf Cup No. 1
Surf Cup No. 1 (Abandoned)
Valley 7 Well
Morgan Run Test Well
Lake Hodges Dam Releases

Figure 19

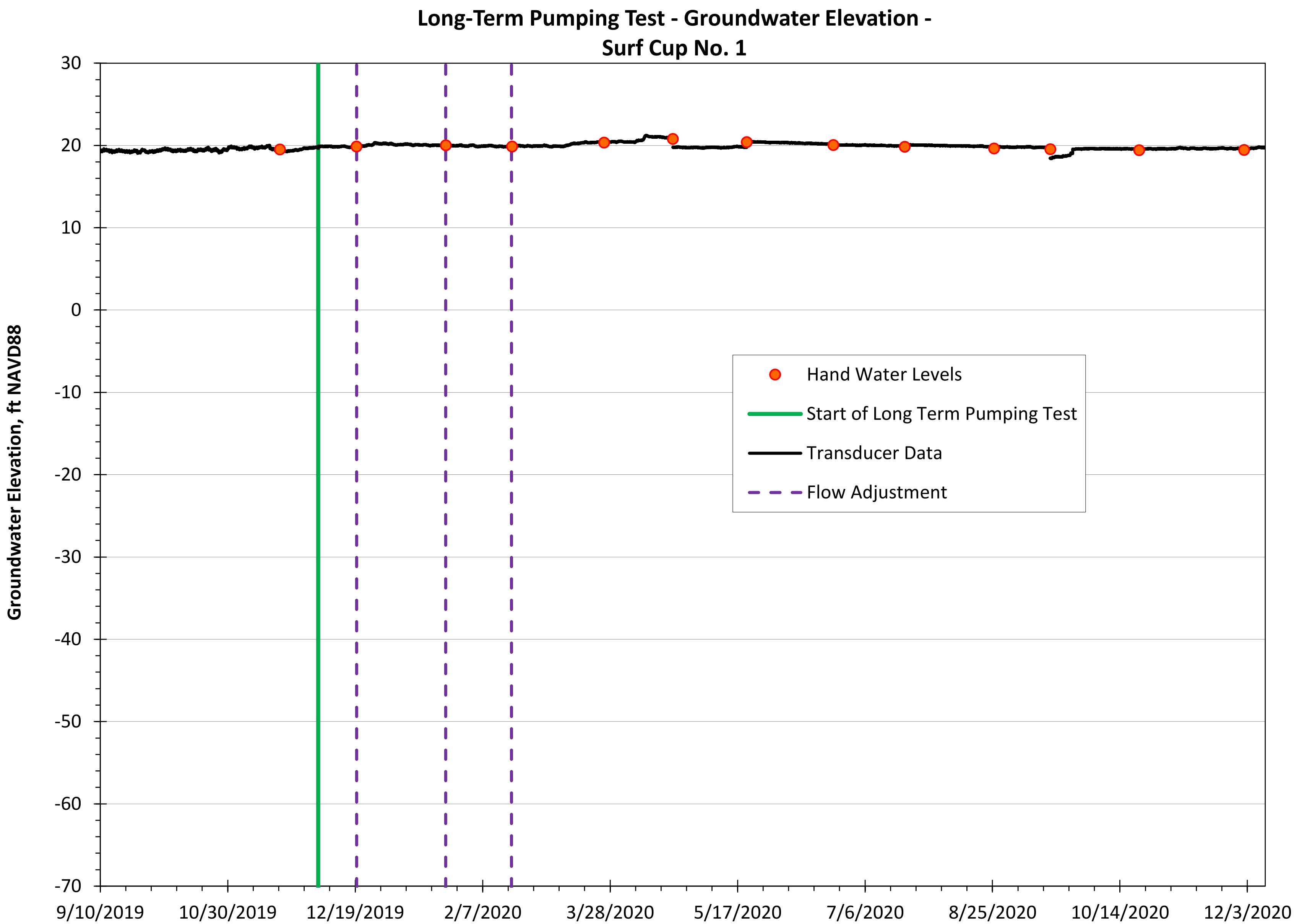

Long-Term Pumping Test - Groundwater Elevation -
Surf Cup No. 1
Groundwater Elevation, ft NAVD88
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
9/10/2019
10/30/2019
12/19/2019
2/7/2020
3/28/2020
5/17/2020
7/6/2020
8/25/2020
10/14/2020
12/3/2020
Hand Water Levels
Start of Long Term Pumping Test
Transducer Data
Flow Adjustment

Figure 20

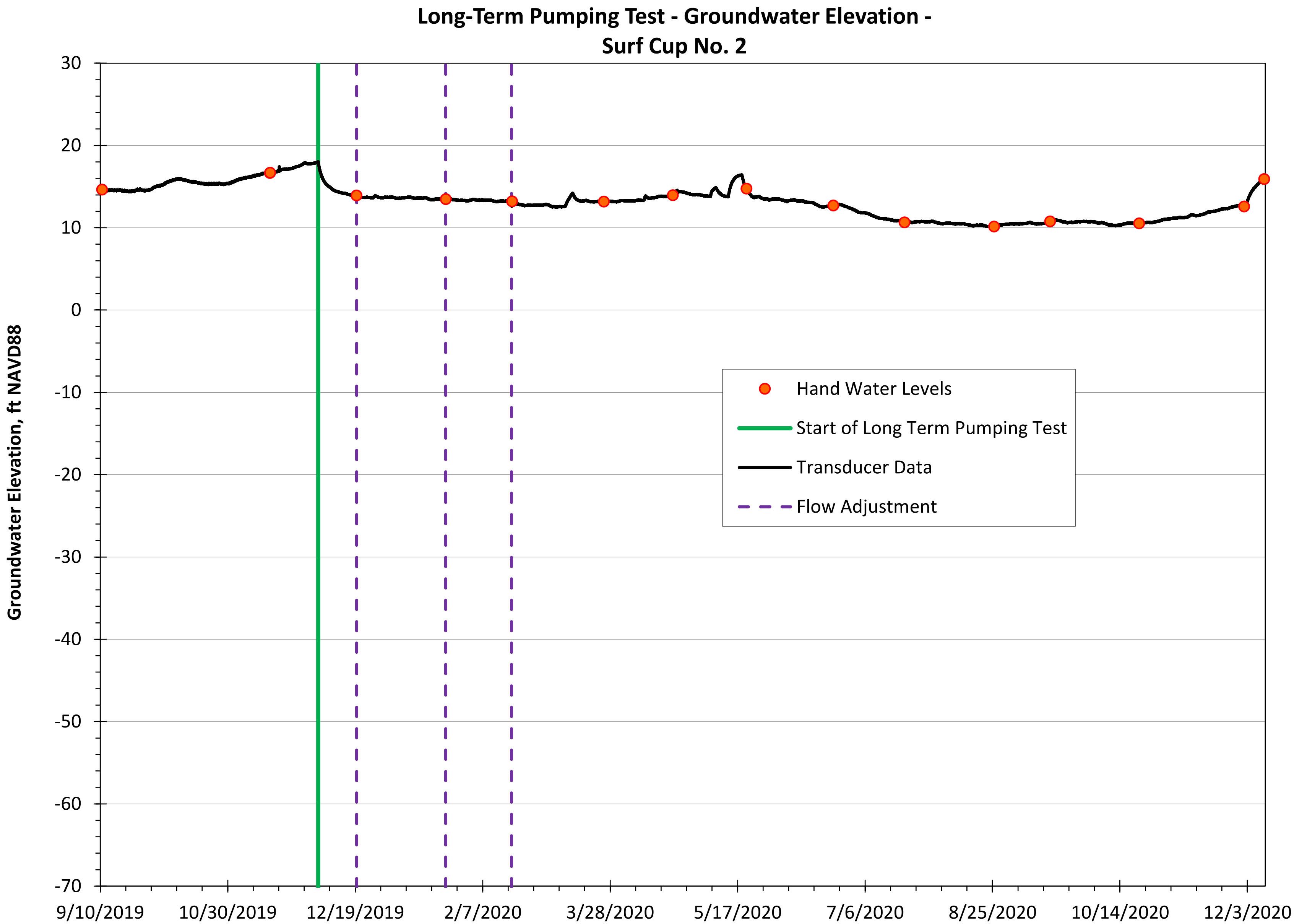

Long-Term Pumping Test - Groundwater Elevation -
Surf Cup No. 2
Groundwater Elevation, ft NAVD88
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
9/10/2019
10/30/2019
12/19/2019
2/7/2020
3/28/2020
5/17/2020
7/6/2020
8/25/2020
10/14/2020
12/3/2020
Hand Water Levels
Start of Long Term Pumping Test
Transducer Data
Flow Adjustment

Figure 21

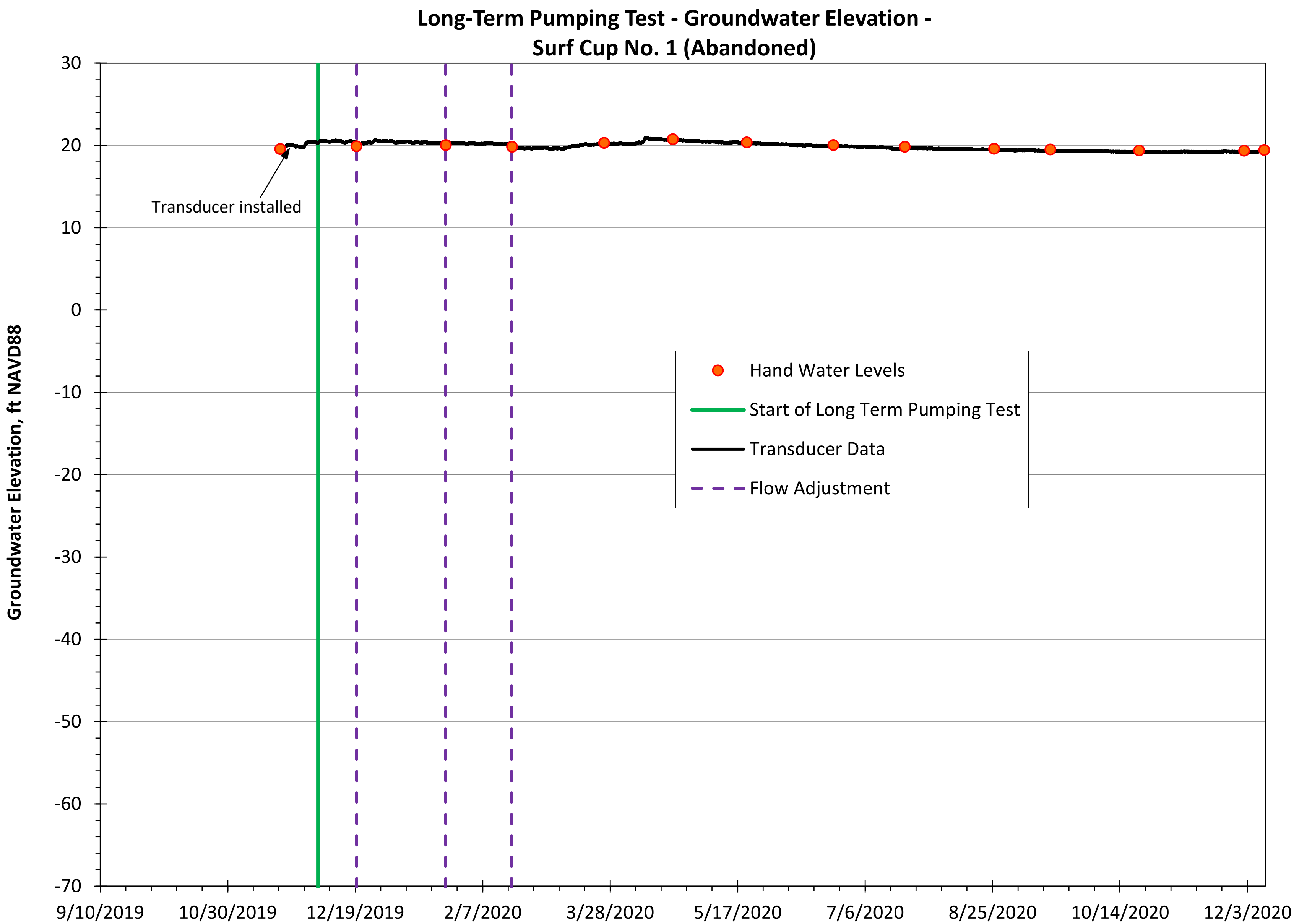

Long-Term Pumping Test - Groundwater Elevation -
Surf Cup No. 1 (Abandoned)
Groundwater Elevation, ft NAVD88
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
9/10/2019
10/30/2019
12/19/2019
2/7/2020
3/28/2020
5/17/2020
7/6/2020
8/25/2020
10/14/2020
12/3/2020
Transducer installed
Hand Water Levels
Start of Long Term Pumping Test
Transducer Data
Flow Adjustment

Figure 22

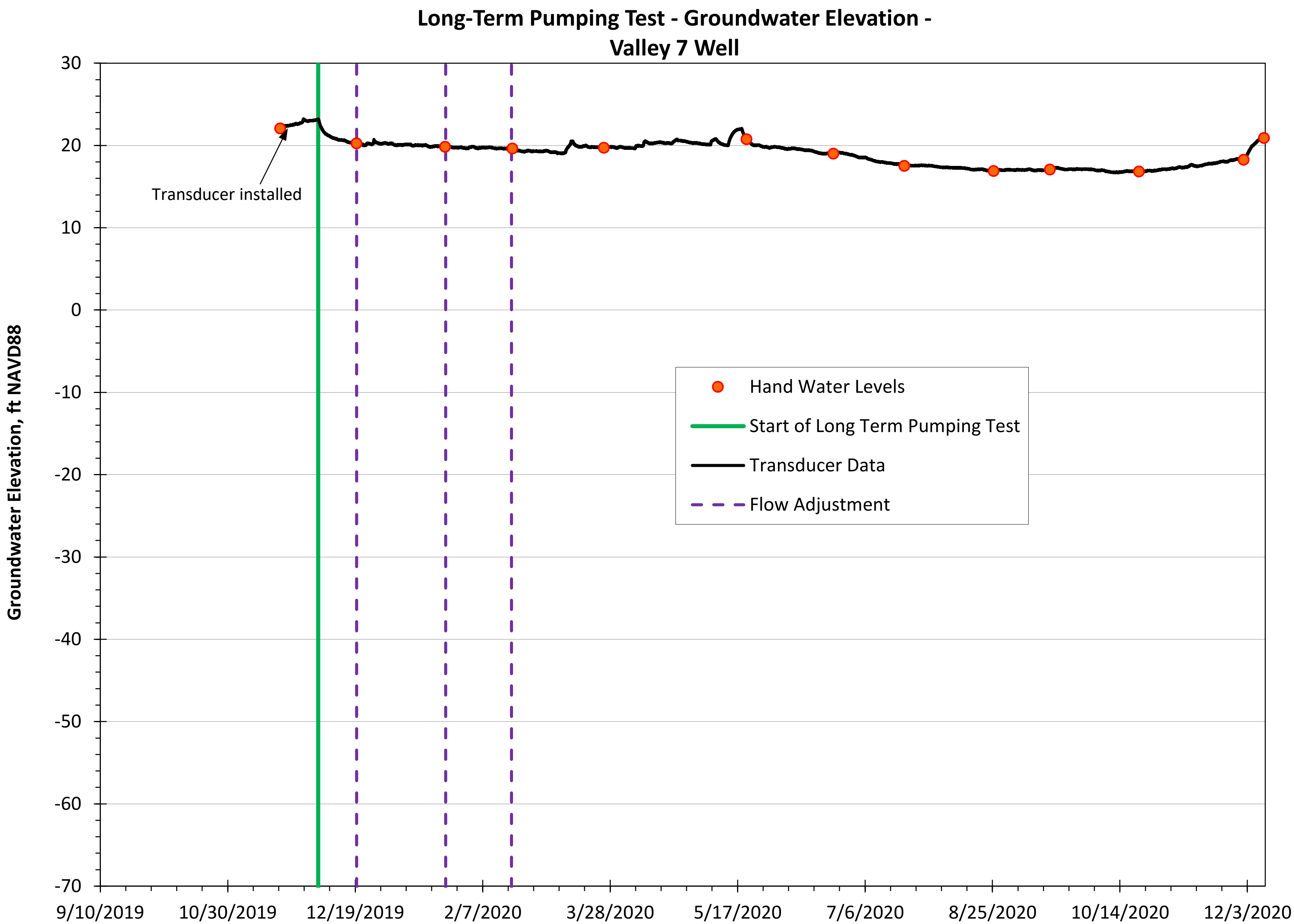

Long-Term Pumping Test - Groundwater Elevation -
Valley 7 Well
Groundwater Elevation, ft NAVD88
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
9/10/2019
10/30/2019
12/19/2019
2/7/2020
3/28/2020
5/17/2020
7/6/2020
8/25/2020
10/14/2020
12/3/2020
Transducer installed
Hand Water Levels
Start of Long Term Pumping Test
Transducer Data
Flow Adjustment

Figure 23

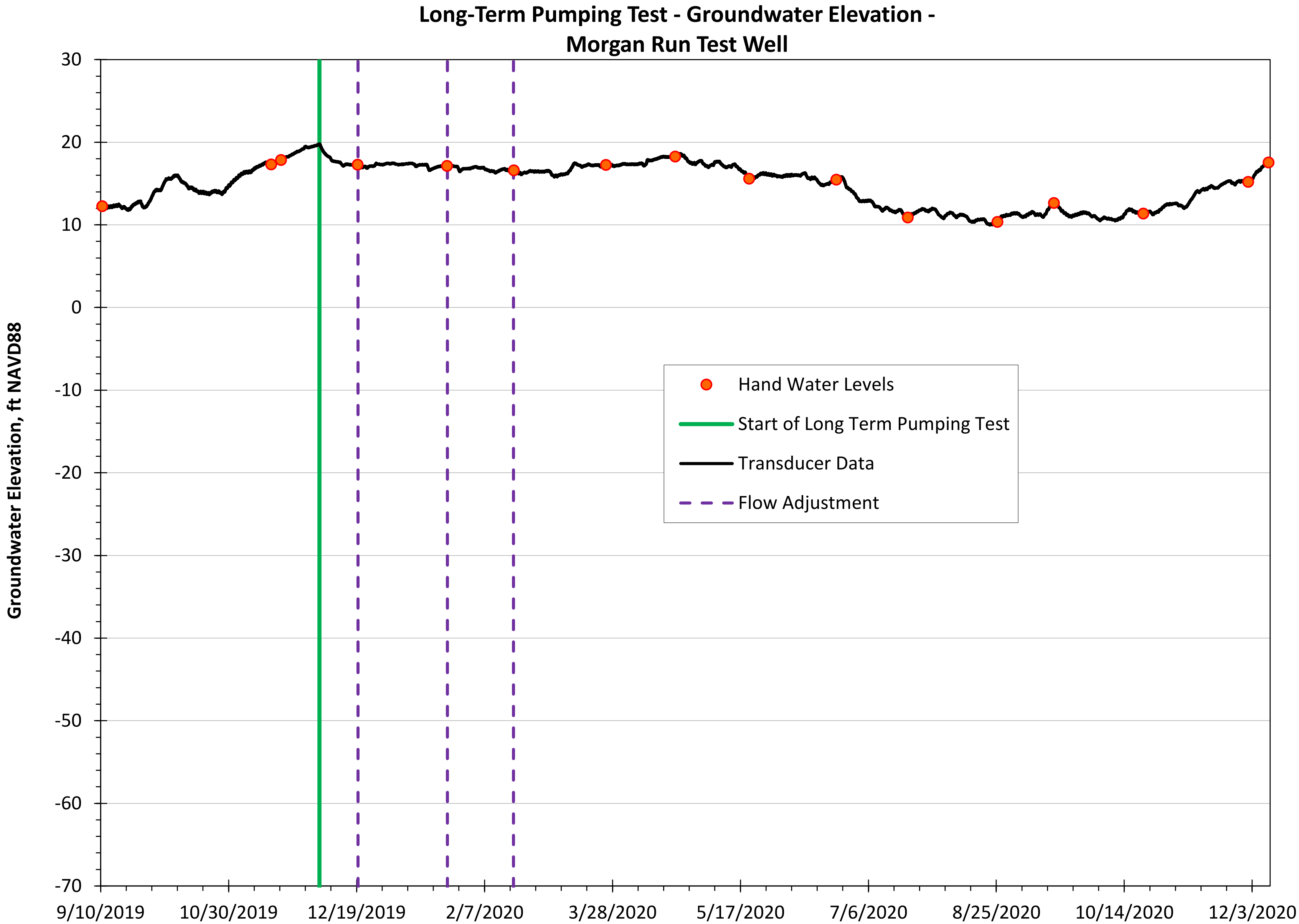
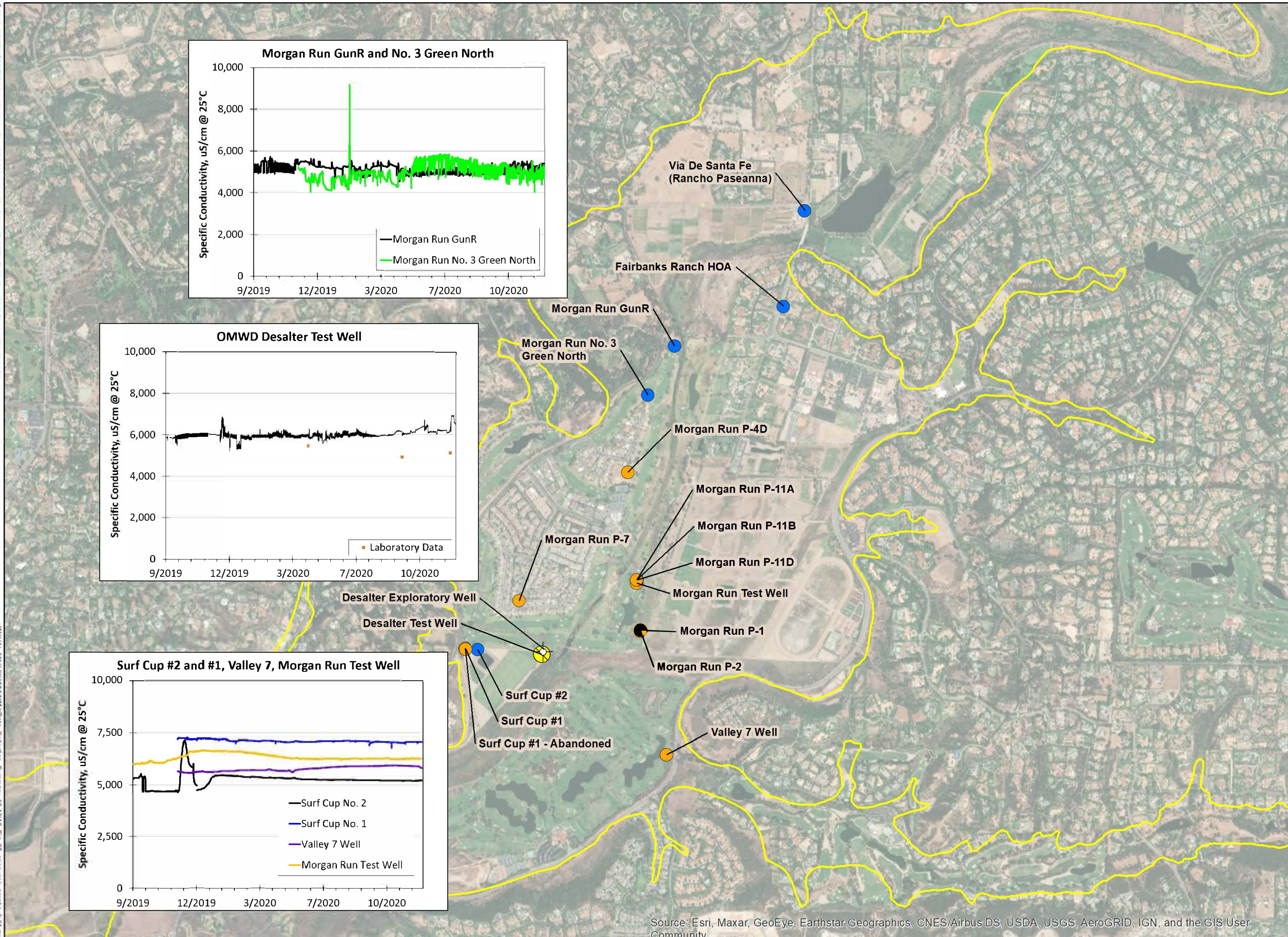

Long-Term Pumping Test - Groundwater Elevation -
Morgan Run Test Well
Groundwater Elevation, ft NAVD88
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
9/10/2019
10/30/2019
12/19/2019
2/7/2020
3/28/2020
5/17/2020
7/6/2020
8/25/2020
10/14/2020
12/3/2020
Hand Water Levels
Start of Long Term Pumping Test
Transducer Data
Flow Adjustment

Figure 24



EXPLANATION

Desalter Well

Desalter Exploratory Borehole

Pumping Well

Non-Pumping Well

San Dieguito Groundwater Basin Boundary (GEOSCIENCE, 2016)

N

0 1,500 3,000

Feet

SPECIFIC CONDUCTIVITY DURING LONG-TERM PUMPING TEST - OMWD MONITORING NETWORK

Aug-21

Long-Term Pumping Test - Specific Conductivity - Morgan Run GunR & Morgan Run No. 3 Green North

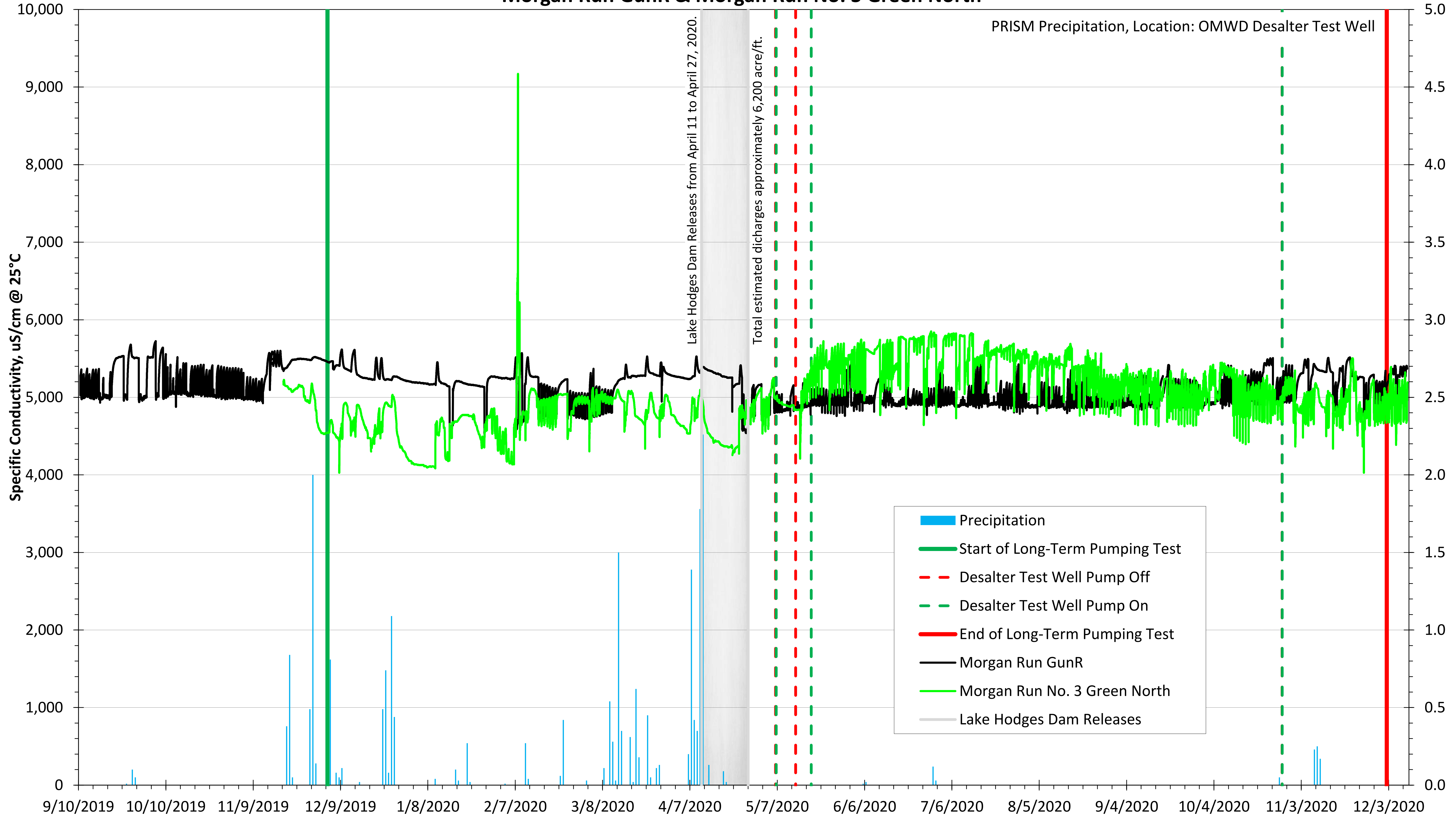


Figure 26

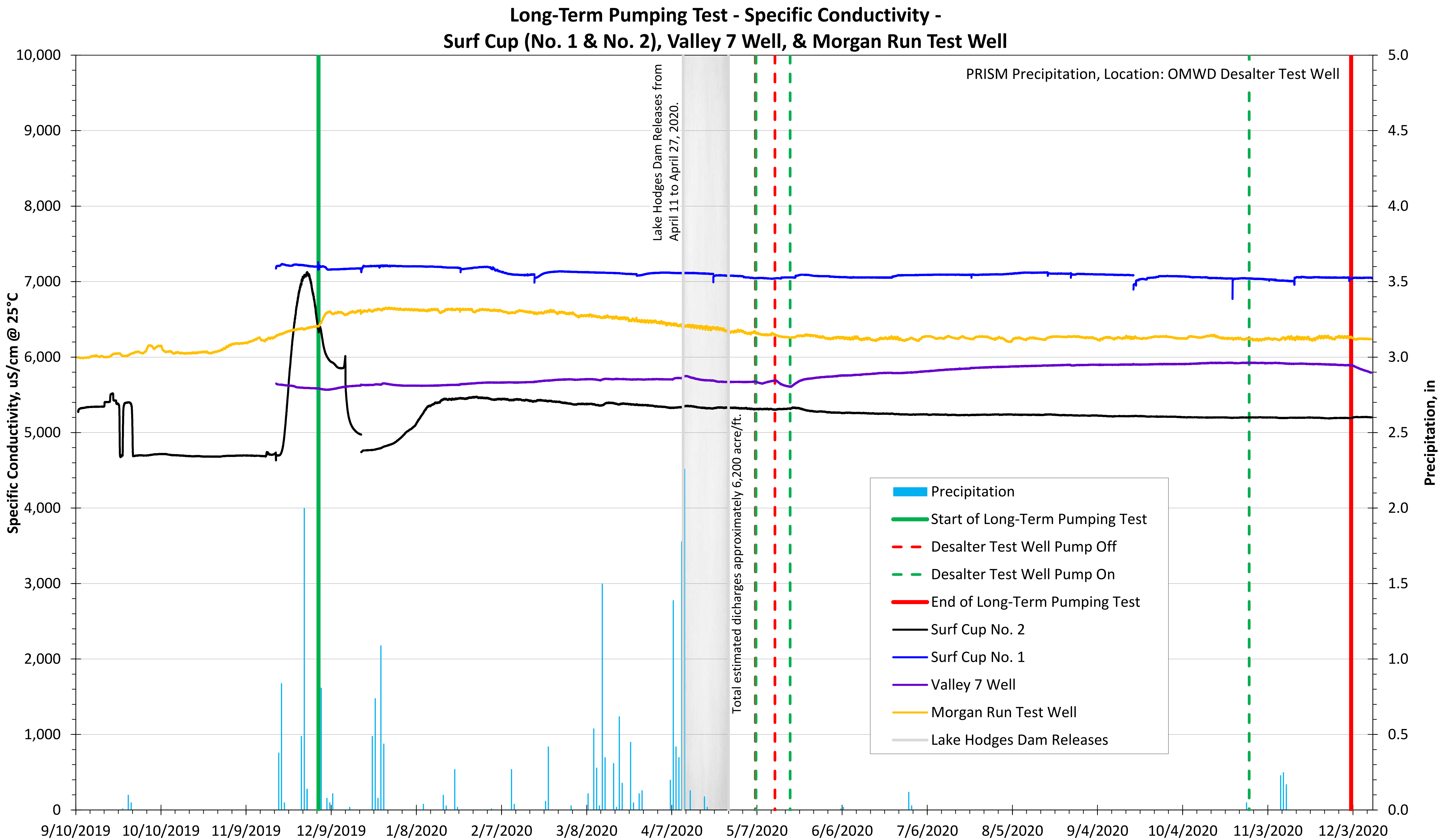

Long-Term Pumping Test - Specific Conductivity -
Surf Cup (No. 1 & No. 2), Valley 7 Well, & Morgan Run Test Well
PRISM Precipitation, Location: OMWD Desalter Test Well
Lake Hodges Dam Releases from April 11 to April 27, 2020.
Total estimated dicharges approximately 6,200 acre/ft.
Specific Conductivity, uS/cm @ 25°C
Precipitation, in
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9/10/2019
10/10/2019
11/9/2019
12/9/2019
1/8/2020
2/7/2020
3/8/2020
4/7/2020
5/7/2020
6/6/2020
7/6/2020
8/5/2020
9/4/2020
10/4/2020
11/3/2020
12/3/2020
Precipitation
Start of Long-Term Pumping Test
Desalter Test Well Pump Off
Desalter Test Well Pump On
End of Long-Term Pumping Test
Surf Cup No. 2
Surf Cup No. 1
Valley 7 Well
Morgan Run Test Well
Lake Hodges Dam Releases

Figure 27

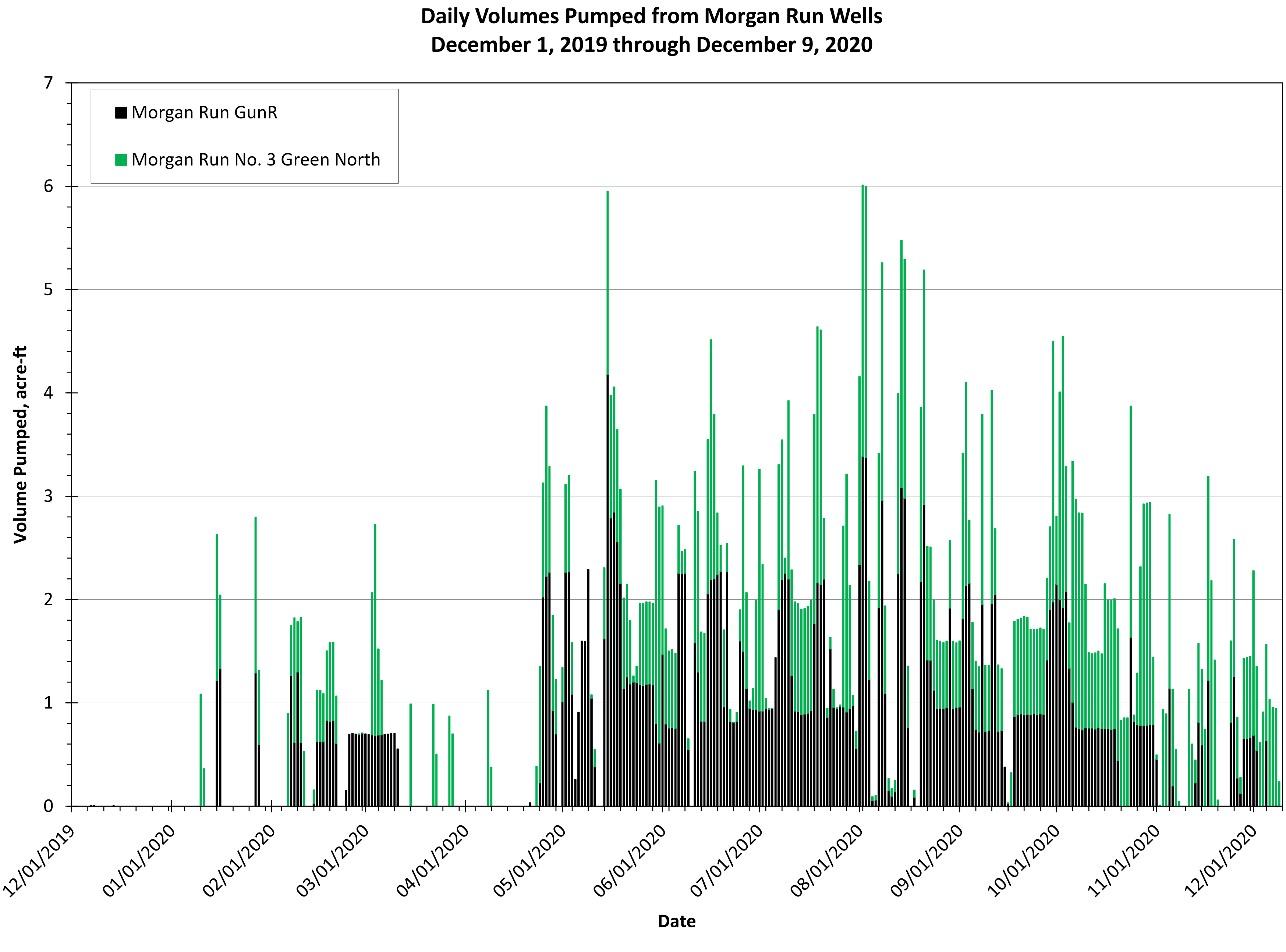

Daily Volumes Pumped from Morgan Run Wells
December 1, 2019 through December 9, 2020
Morgan Run GunR
Morgan Run No. 3 Green North
Volume Pumped, acre-ft
0
1
2
3
4
5
6
7
12/01/2019
01/01/2020
02/01/2020
03/01/2020
04/01/2020
05/01/2020
06/01/2020
07/01/2020
08/01/2020
09/01/2020
10/01/2020
11/01/2020
12/01/2020
Date

Figure 28

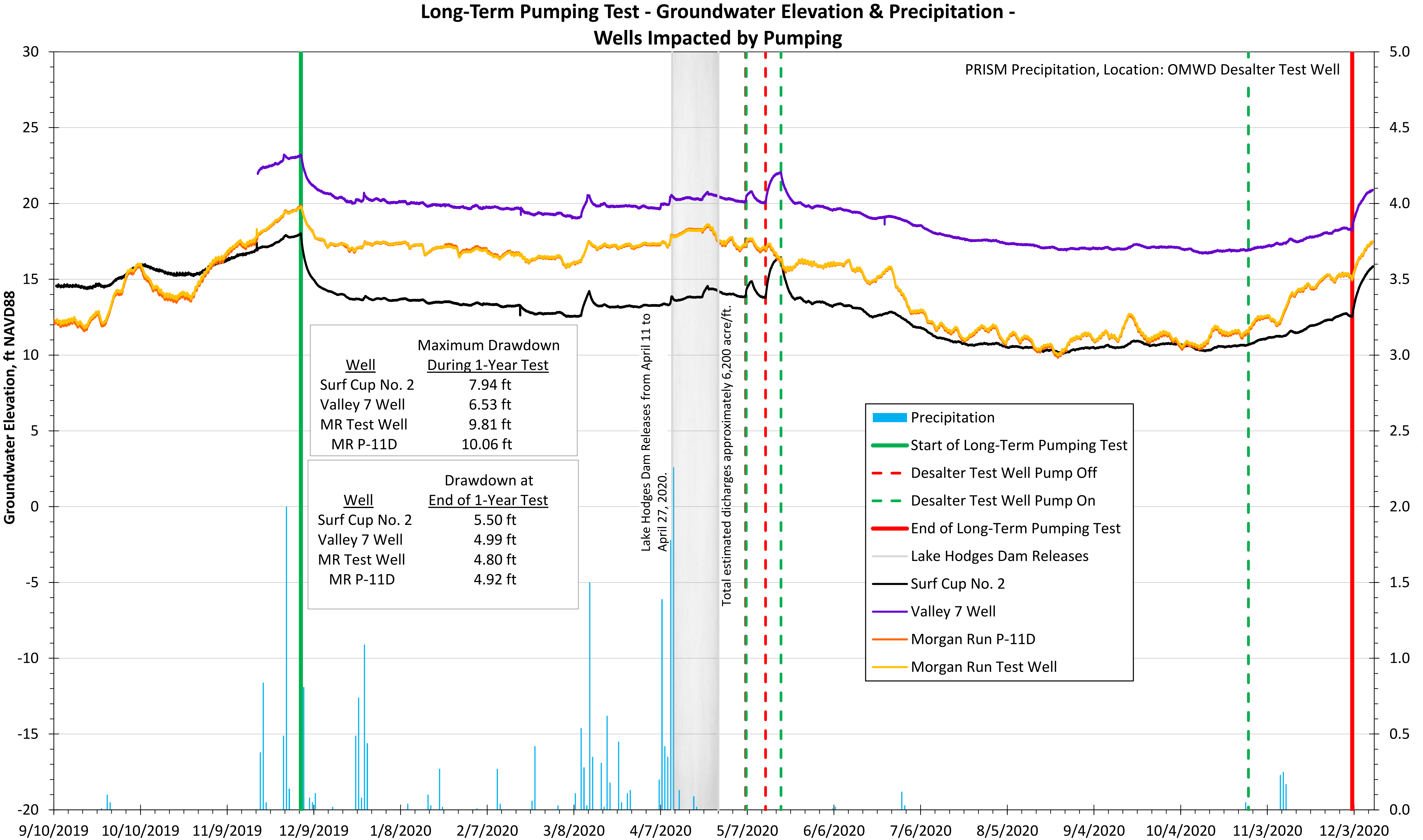

Long-Term Pumping Test - Groundwater Elevation & Precipitation -
Wells Impacted by Pumping
PRISM Precipitation, Location: OMWD Desalter Test Well
Groundwater Elevation, ft NAVD88
Precipitation, in
Lake Hodges Dam Releases from April 11 to April 27, 2020.
Total estimated dicharges approximately 6,200 acre/ft.
Maximum Drawdown During 1-Year Test
Well
Surf Cup No. 2 7.94 ft
Valley 7 Well 6.53 ft
MR Test Well 9.81 ft
MR P-11D 10.06 ft
Drawdown at End of 1-Year Test
Well
Surf Cup No. 2 5.50 ft
Valley 7 Well 4.99 ft
MR Test Well 4.80 ft
MR P-11D 4.92 ft
Precipitation
Start of Long-Term Pumping Test
Desalter Test Well Pump Off
Desalter Test Well Pump On
End of Long-Term Pumping Test
Lake Hodges Dam Releases
Surf Cup No. 2
Valley 7 Well
Morgan Run P-11D
Morgan Run Test Well
9/10/2019
10/10/2019
11/9/2019
12/9/2019
1/8/2020
2/7/2020
3/8/2020
4/7/2020
5/7/2020
6/6/2020
7/6/2020
8/5/2020
9/4/2020
10/4/2020
11/3/2020
12/3/2020

Figure 29

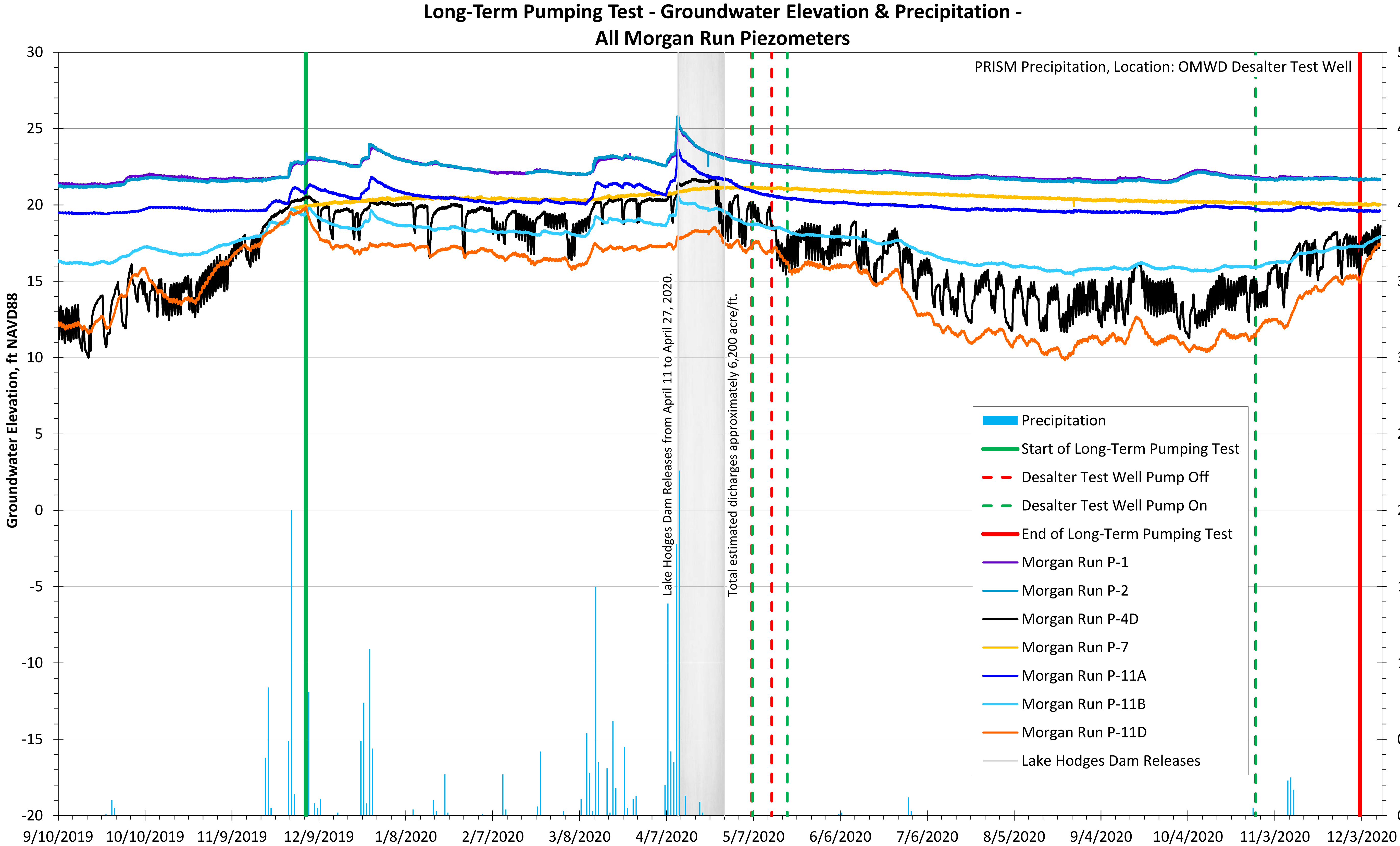

Long-Term Pumping Test - Groundwater Elevation & Precipitation -
All Morgan Run Piezometers
PRISM Precipitation, Location: OMWD Desalter Test Well
Groundwater Elevation, ft NAVD88
Precipitation, in
Lake Hodges Dam Releases from April 11 to April 27, 2020.
Total estimated dicharges approximately 6,200 acre/ft.
Precipitation
Start of Long-Term Pumping Test
Desalter Test Well Pump Off
Desalter Test Well Pump On
End of Long-Term Pumping Test
Morgan Run P-1
Morgan Run P-2
Morgan Run P-4D
Morgan Run P-7
Morgan Run P-11A
Morgan Run P-11B
Morgan Run P-11D
Lake Hodges Dam Releases
30
25
20
15
10
5
0
-5
-10
-15
-20
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
9/10/2019
10/10/2019
11/9/2019
12/9/2019
1/8/2020
2/7/2020
3/8/2020
4/7/2020
5/7/2020
6/6/2020
7/6/2020
8/5/2020
9/4/2020
10/4/2020
11/3/2020
12/3/2020

Figure 30

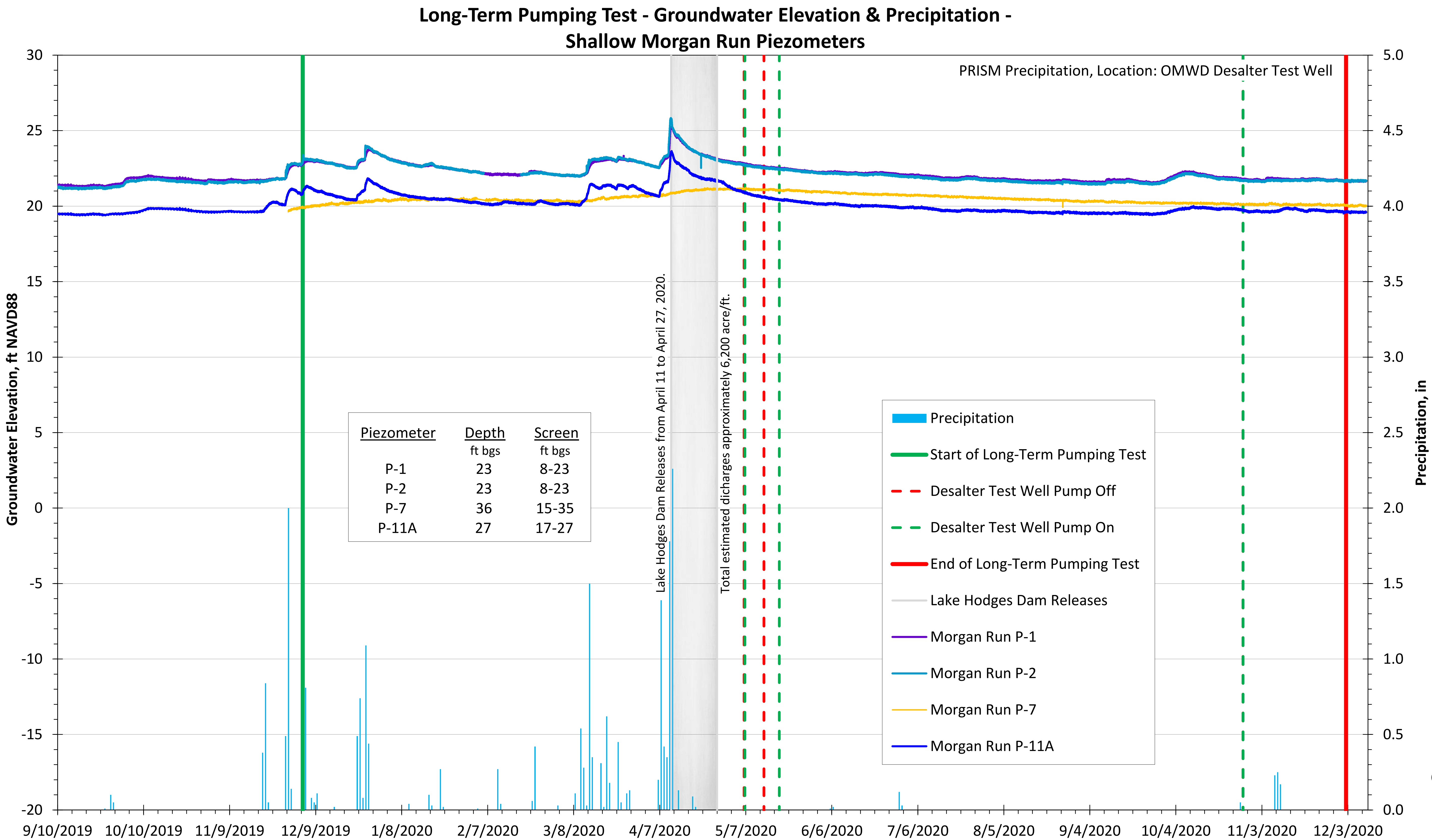
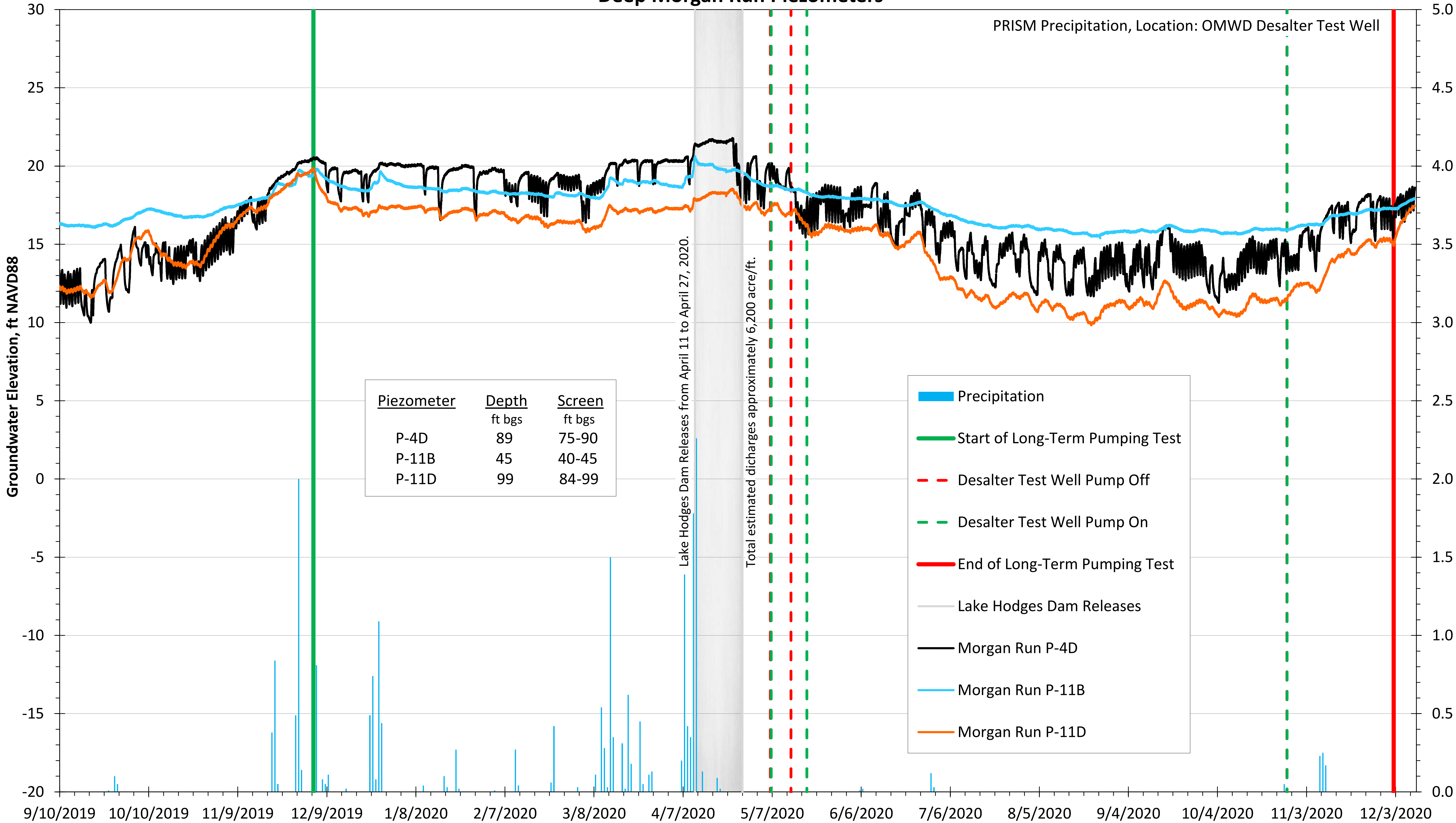

Long-Term Pumping Test - Groundwater Elevation & Precipitation -
Shallow Morgan Run Piezometers
PRISM Precipitation, Location: OMWD Desalter Test Well
Groundwater Elevation, ft NAVD88
Precipitation, in
Lake Hodges Dam Releases from April 11 to April 27, 2020.
Total estimated dicharges approximately 6,200 acre/ft.
Piezometer | Depth ft bgs | Screen ft bgs
P-1 | 23 | 8-23
P-2 | 23 | 8-23
P-7 | 36 | 15-35
P-11A | 27 | 17-27
Precipitation
Start of Long-Term Pumping Test
Desalter Test Well Pump Off
Desalter Test Well Pump On
End of Long-Term Pumping Test
Lake Hodges Dam Releases
Morgan Run P-1
Morgan Run P-2
Morgan Run P-7
Morgan Run P-11A
9/10/2019
10/10/2019
11/9/2019
12/9/2019
1/8/2020
2/7/2020
3/8/2020
4/7/2020
5/7/2020
6/6/2020
7/6/2020
8/5/2020
9/4/2020
10/4/2020
11/3/2020
12/3/2020

Figure 31

Long-Term Pumping Test - Groundwater Elevation & Precipitation - Deep Morgan Run Piezometers



Piezometer	Depth ft bgs	Screen ft bgs
P-4D	89	75-90
P-11B	45	40-45
P-11D	99	84-99

Figure 32

Trilinear Diagram
Completed Well & Long Term Testing Water Chemistry
OMWD Desalter Test Well

Water quality results from:
Eurofins Eaton Analytical LLC of Monrovia, California (Completed Well)
EnviroMatrix Analytical Inc of San Diego, California (Long Term Pumping Samples)

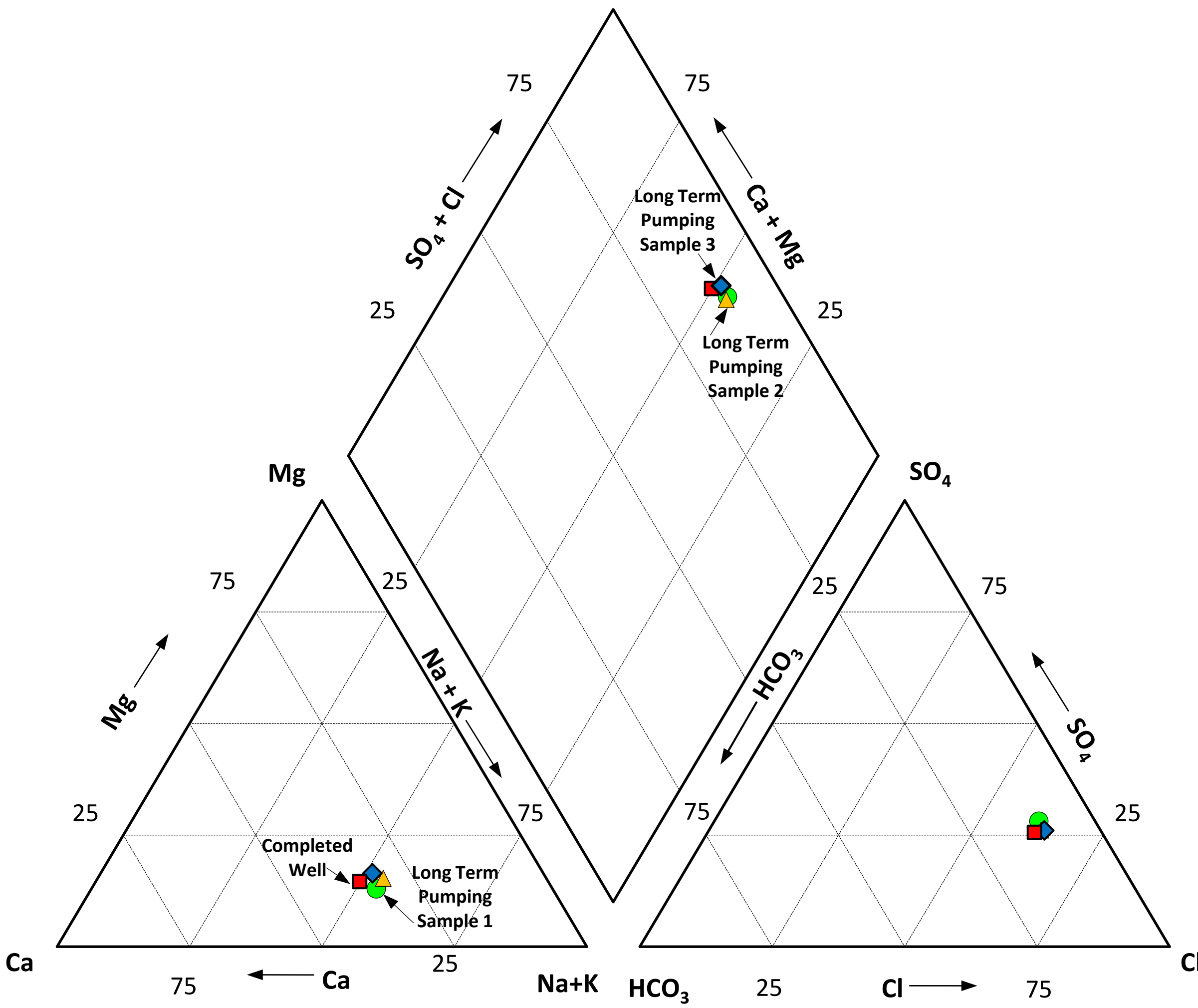
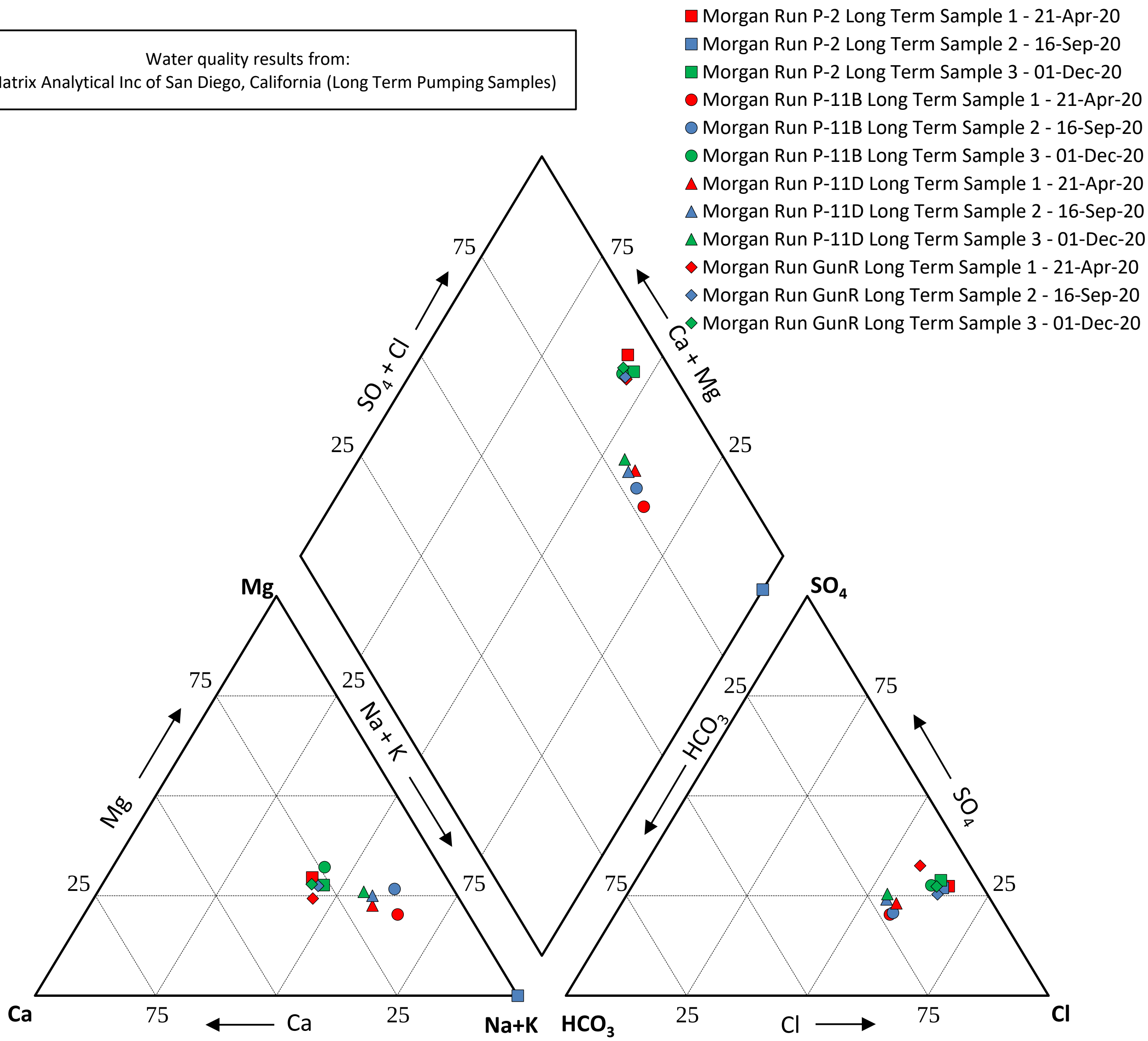


Figure 34

Trilinear Diagram
Long Term Testing Water Chemistry
Select Monitoring Wells

Water quality results from:
EnviroMatrix Analytical Inc of San Diego, California (Long Term Pumping Samples)



Olivenhain Municipal Water District
Report of Design Pilot Testing for the San Dieguito Valley
Brackish Groundwater Desalination Project

Long-Term Pumping Test - 1-Day Plot
OMWD Desalter Test Well

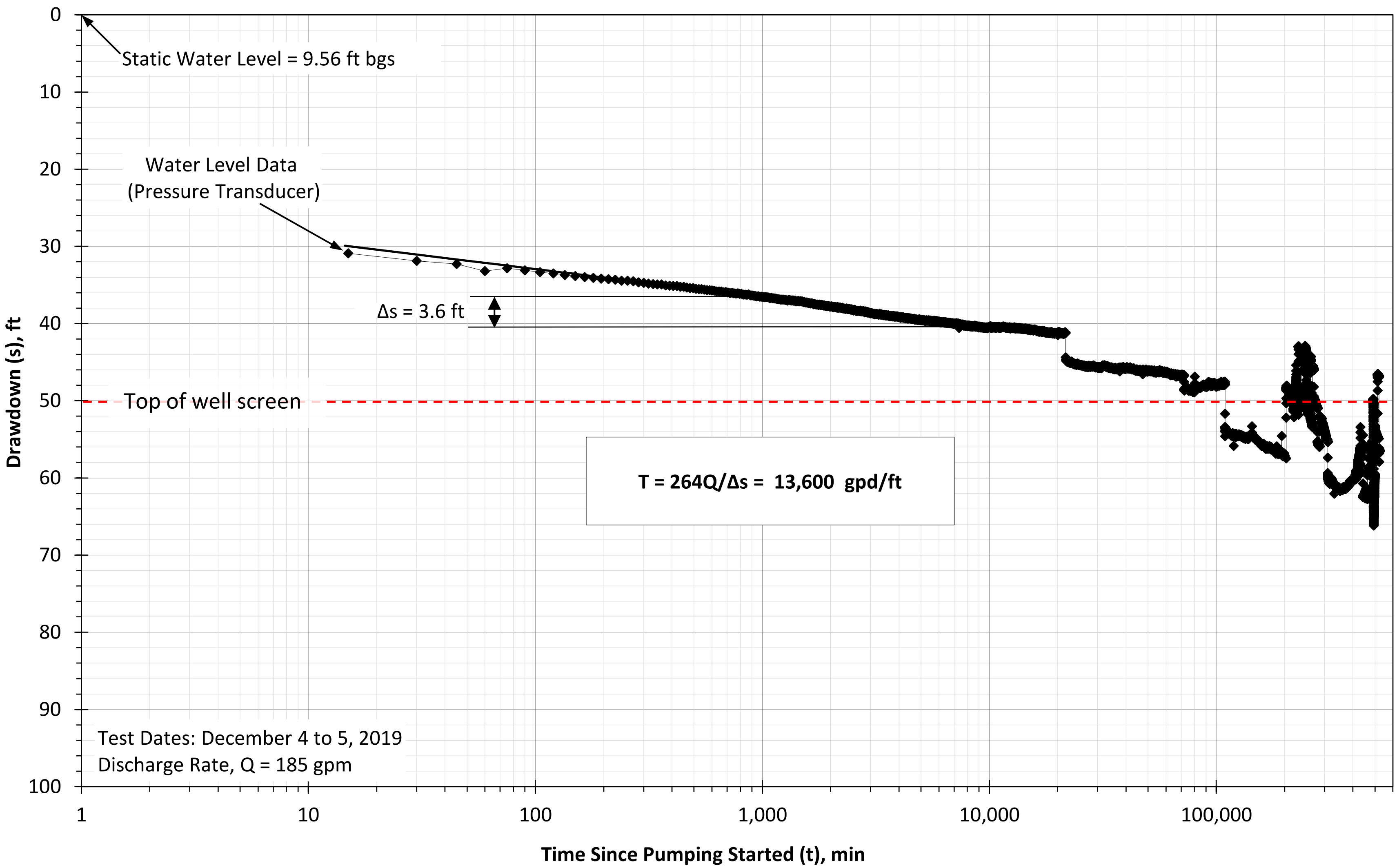


Figure 35

Long-Term Pumping Test - First 14-Days Plot
OMWD Desalter Test Well

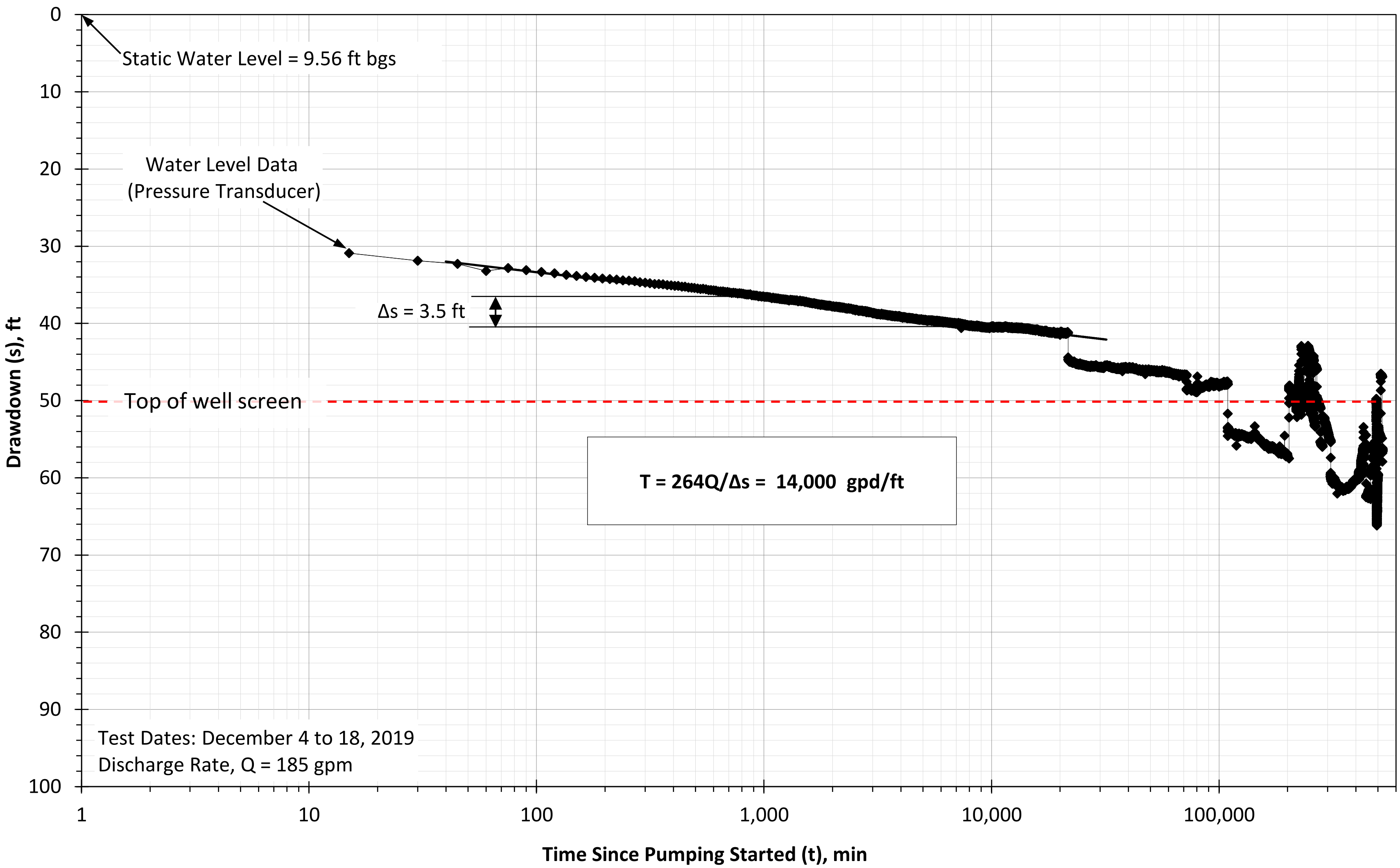


Figure 36

Long-Term Pumping Test - Start of Test to Mid-Way Plot
OMWD Desalter Test Well

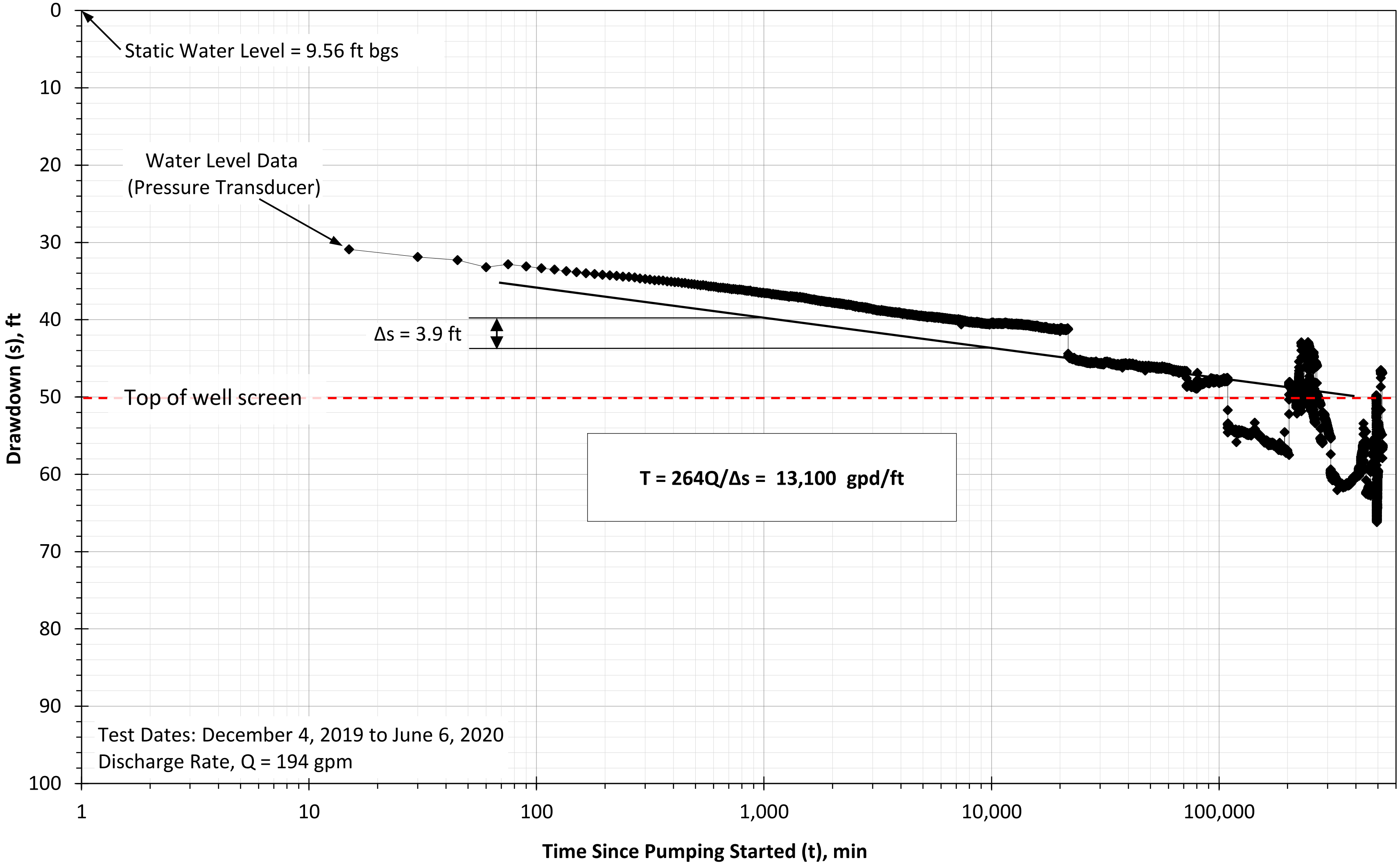


Figure 37

Long-Term Pumping Test - Entire Test Plot
OMWD Desalter Test Well

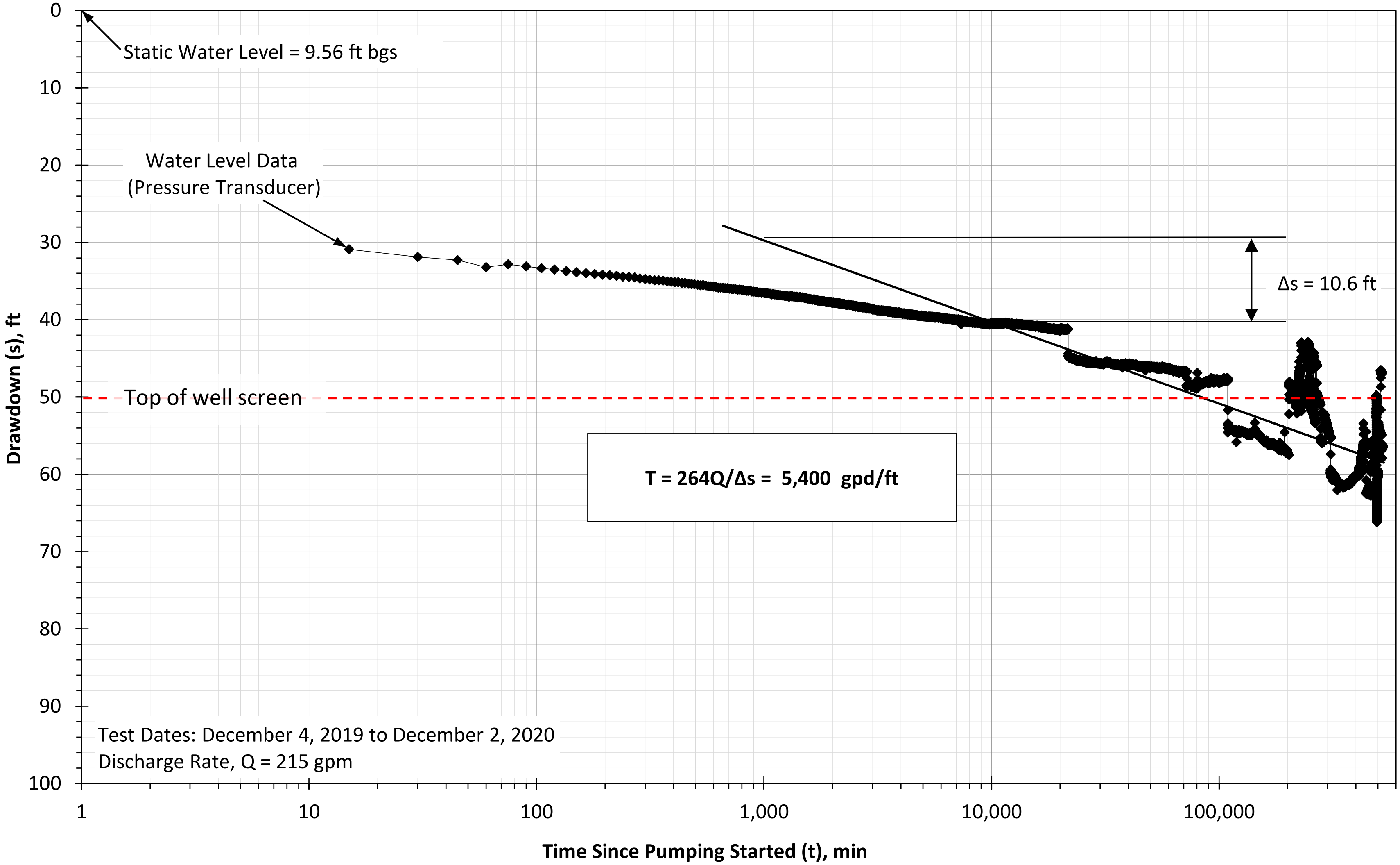


Figure 38

Time-Drawdown Analysis
Pumping Well: OMWD Desalter Test Well
Observation Well: Surf Cup No. 2

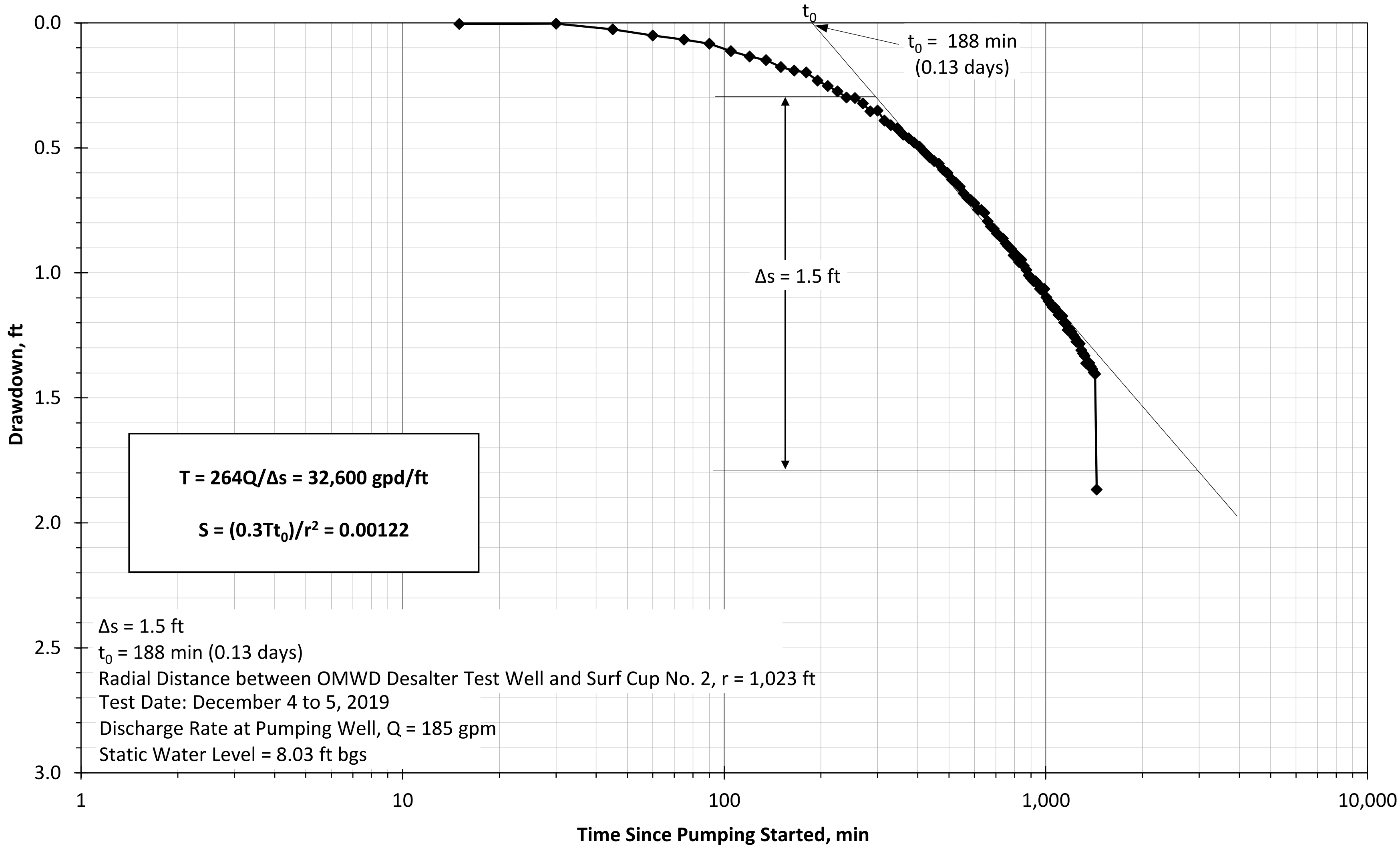


Figure 39

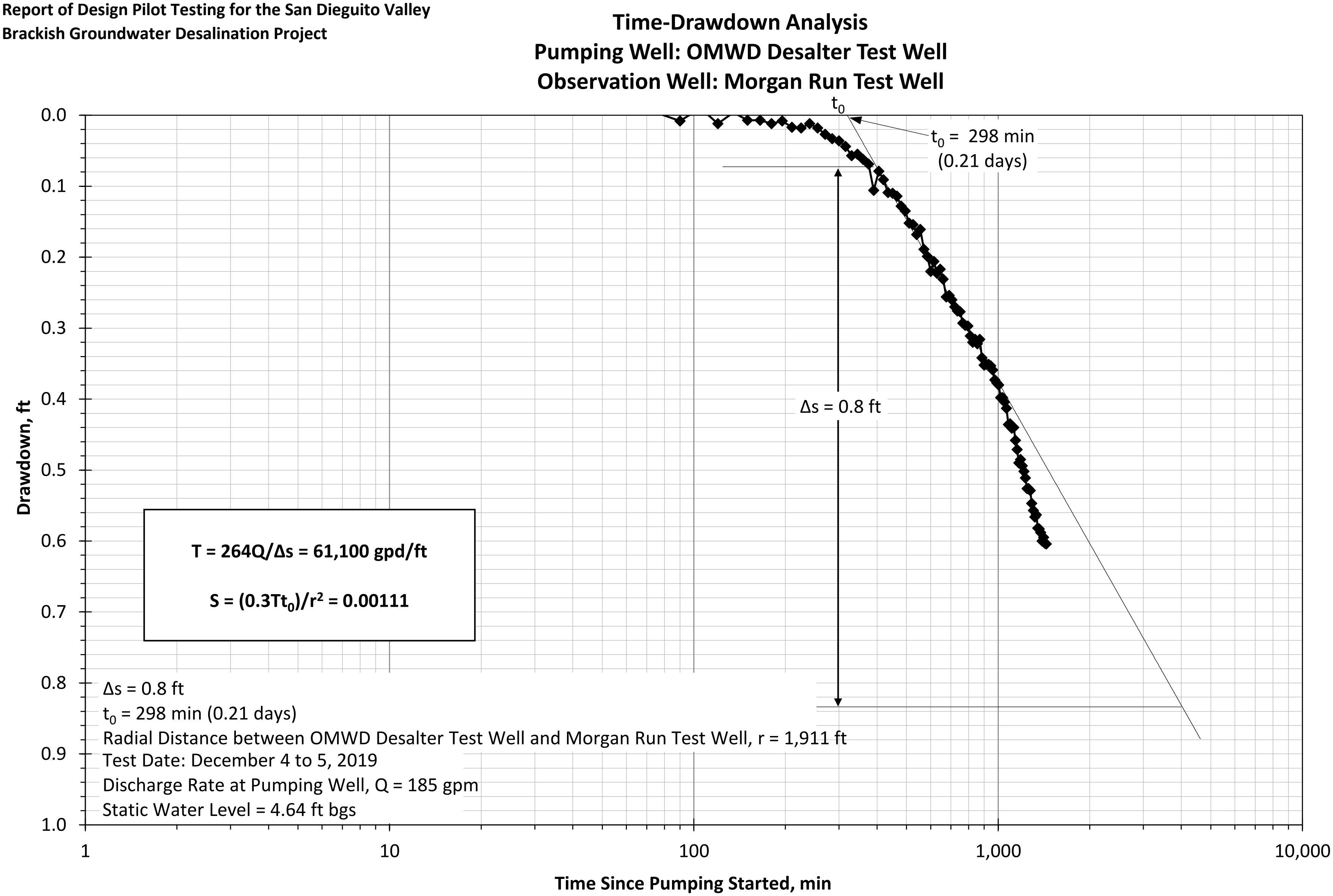

Time-Drawdown Analysis
Pumping Well: OMWD Desalter Test Well
Observation Well: Morgan Run Test Well
t_0
t_0 = 298 min
(0.21 days)
Δs = 0.8 ft
T = 264Q/Δs = 61,100 gpd/ft
S = $(0.3Tt_0)/r^2$ = 0.00111
Δs = 0.8 ft
t_0 = 298 min (0.21 days)
Radial Distance between OMWD Desalter Test Well and Morgan Run Test Well, r = 1,911 ft
Test Date: December 4 to 5, 2019
Discharge Rate at Pumping Well, Q = 185 gpm
Static Water Level = 4.64 ft bgs
Drawdown, ft
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1
10
100
1,000
10,000
Time Since Pumping Started, min

Figure 40

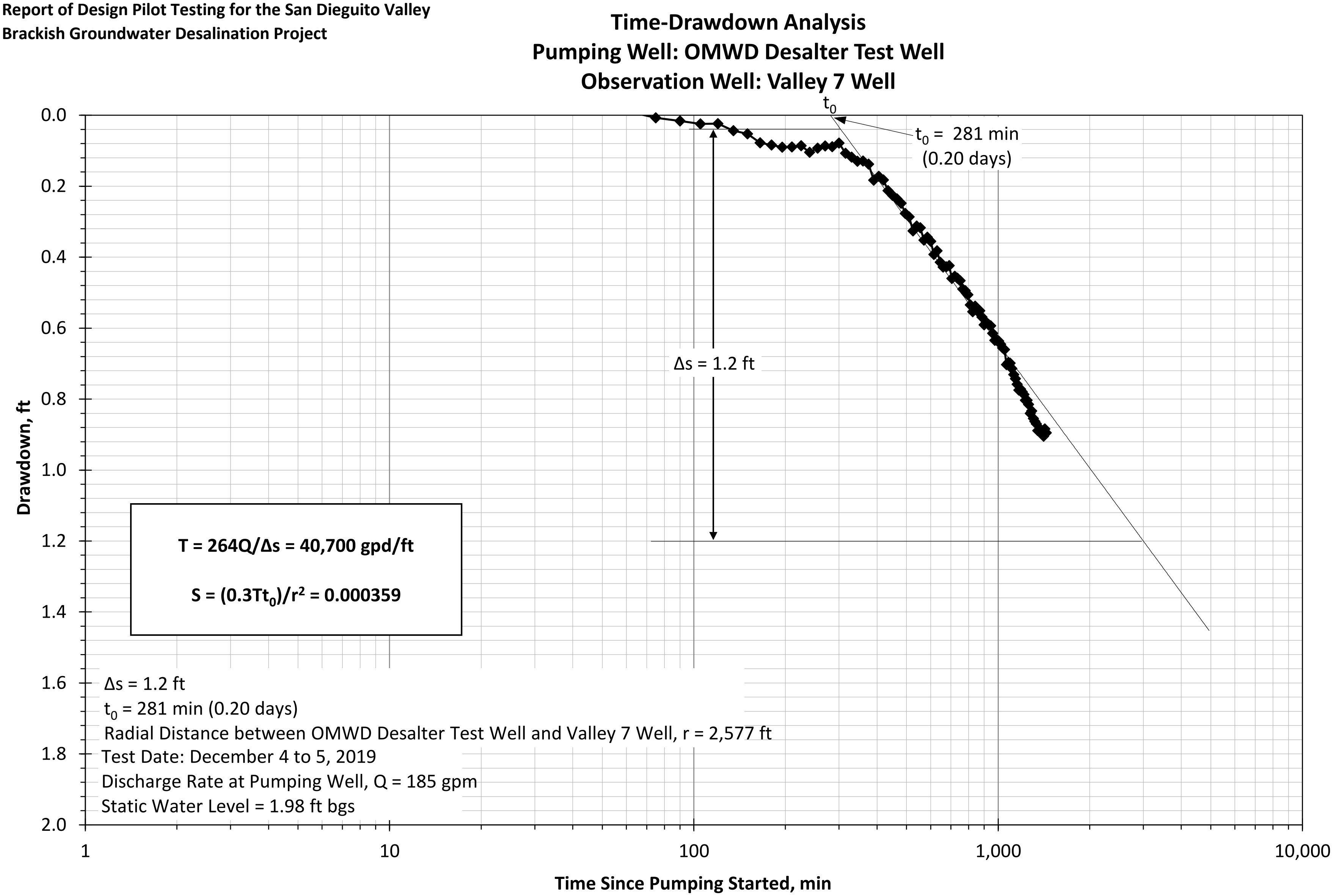

Time-Drawdown Analysis
Pumping Well: OMWD Desalter Test Well
Observation Well: Valley 7 Well
t0
t0 = 281 min
(0.20 days)
Δs = 1.2 ft
T = 264Q/Δs = 40,700 gpd/ft
S = (0.3Tt0)/r2 = 0.000359
Δs = 1.2 ft
t0 = 281 min (0.20 days)
Radial Distance between OMWD Desalter Test Well and Valley 7 Well, r = 2,577 ft
Test Date: December 4 to 5, 2019
Discharge Rate at Pumping Well, Q = 185 gpm
Static Water Level = 1.98 ft bgs
Drawdown, ft
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
1
10
100
1,000
10,000
Time Since Pumping Started, min

Figure 41

Long-Term Pumping Test – Recovery Analysis
Desalter Test Well

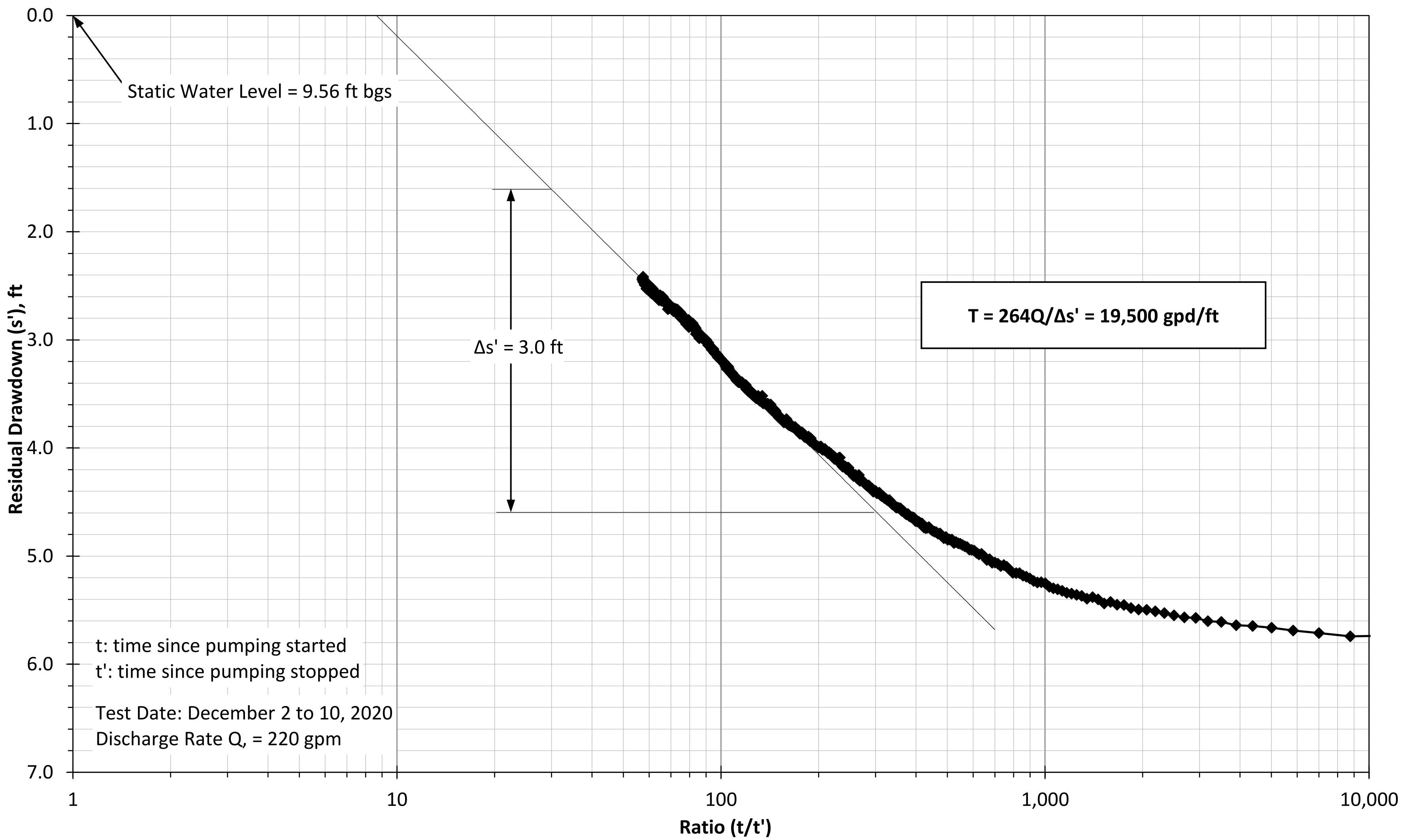


Figure 42

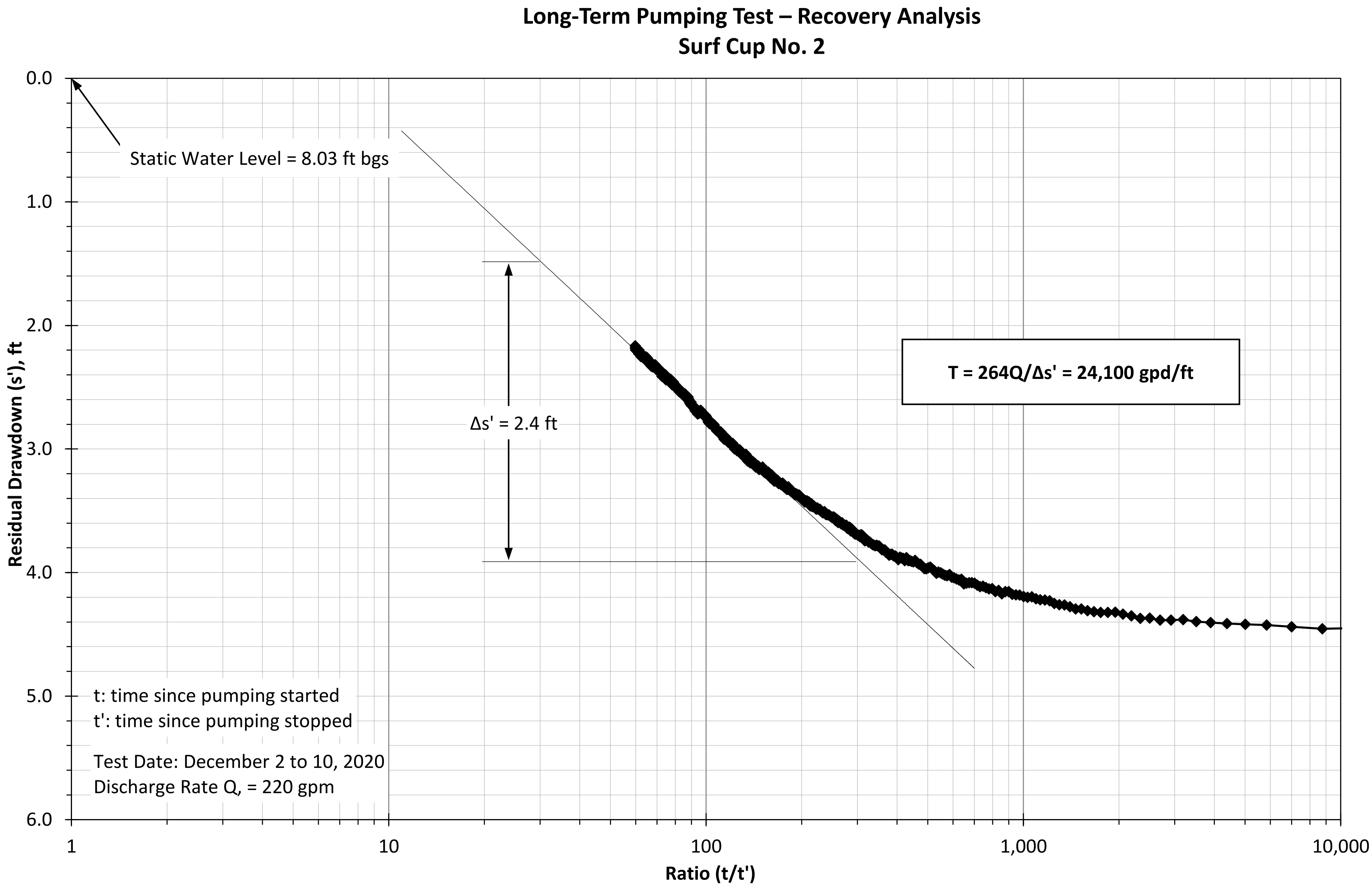

Long-Term Pumping Test – Recovery Analysis
Surf Cup No. 2
Static Water Level = 8.03 ft bgs
Δs' = 2.4 ft
T = 264Q/Δs' = 24,100 gpd/ft
t: time since pumping started
t': time since pumping stopped
Test Date: December 2 to 10, 2020
Discharge Rate Q, = 220 gpm
Residual Drawdown (s'), ft
Ratio (t/t')
0.0
1.0
2.0
3.0
4.0
5.0
6.0
1
10
100
1,000
10,000

Figure 43

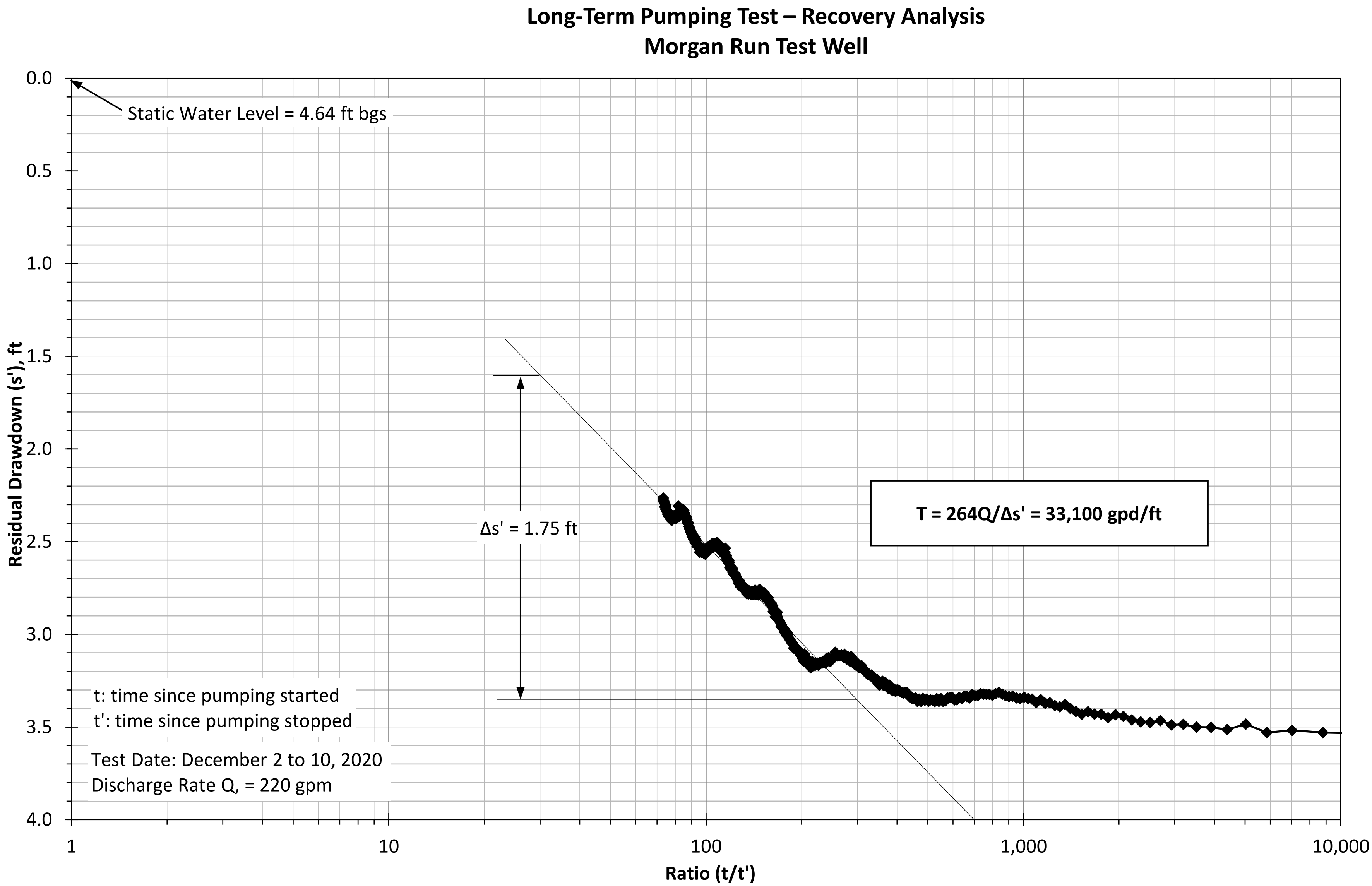

Long-Term Pumping Test – Recovery Analysis
Morgan Run Test Well
Static Water Level = 4.64 ft bgs
Δs' = 1.75 ft
T = 264Q/Δs' = 33,100 gpd/ft
t: time since pumping started
t': time since pumping stopped
Test Date: December 2 to 10, 2020
Discharge Rate Q, = 220 gpm
Residual Drawdown (s'), ft
Ratio (t/t')
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
1
10
100
1,000
10,000

Figure 44

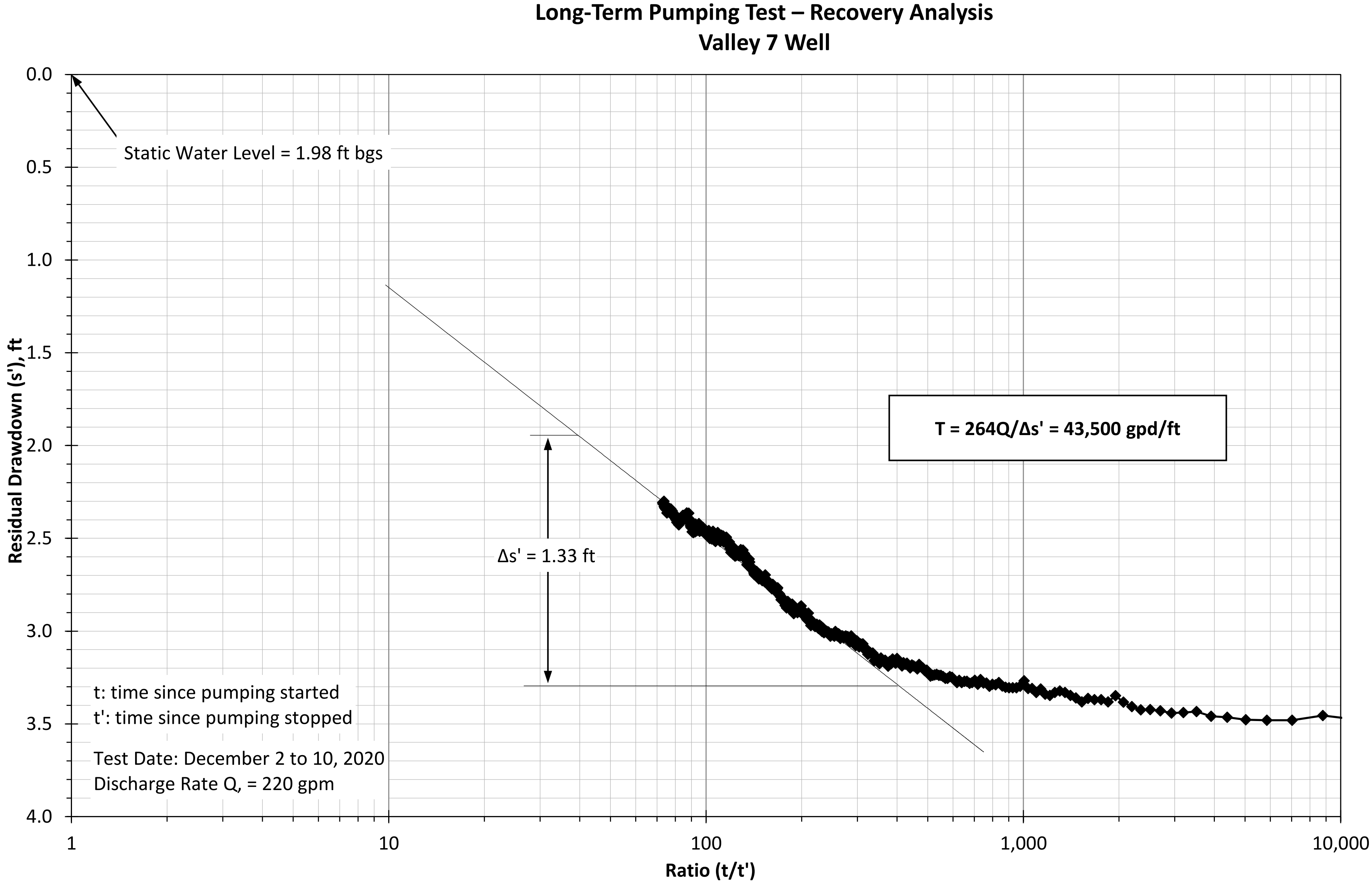
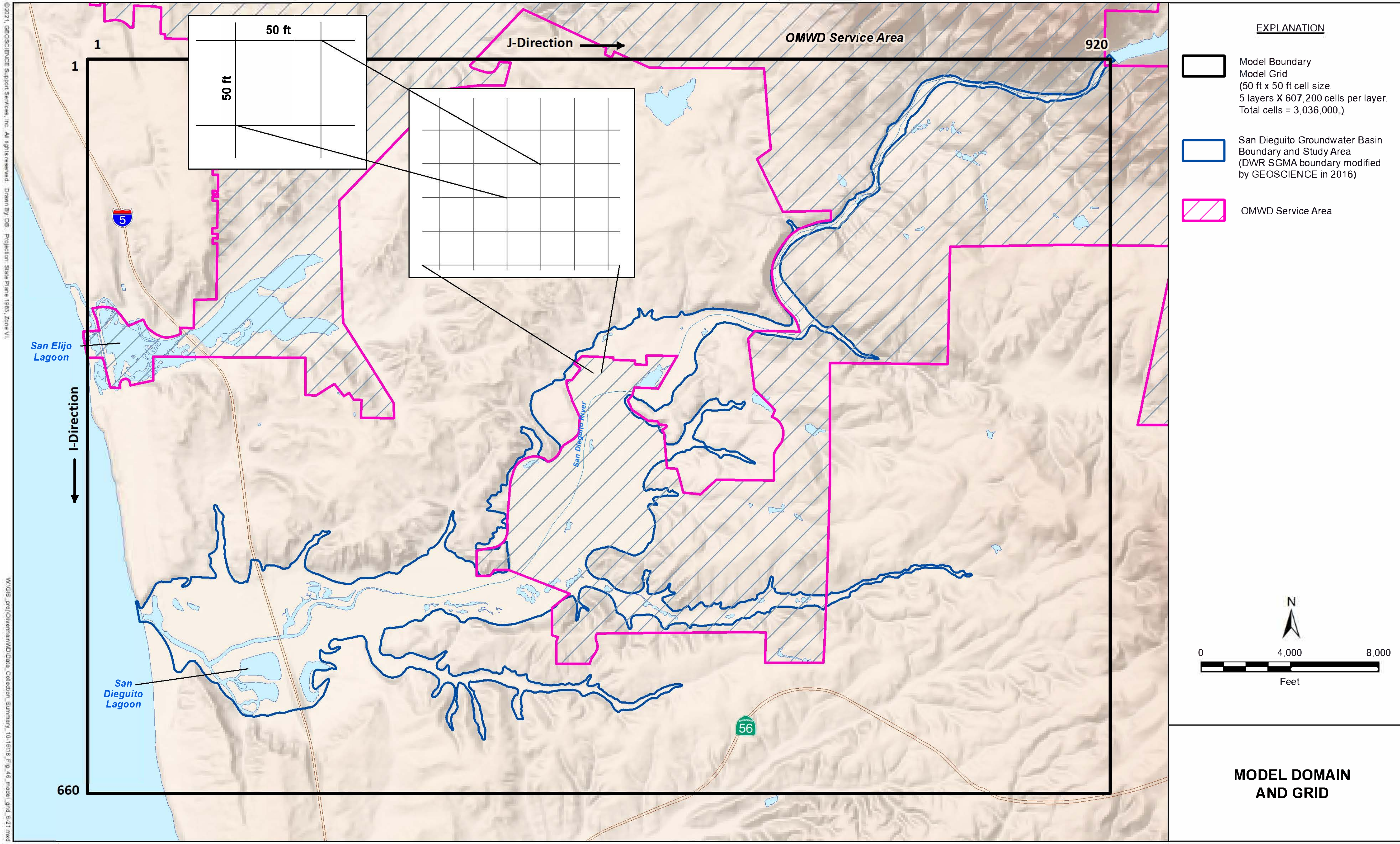

Long-Term Pumping Test – Recovery Analysis
Valley 7 Well
Static Water Level = 1.98 ft bgs
T = 264Q/Δs' = 43,500 gpd/ft
Δs' = 1.33 ft
t: time since pumping started
t': time since pumping stopped
Test Date: December 2 to 10, 2020
Discharge Rate Q, = 220 gpm
Residual Drawdown (s'), ft
Ratio (t/t')
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
1
10
100
1,000
10,000

Figure 45



Aug-21

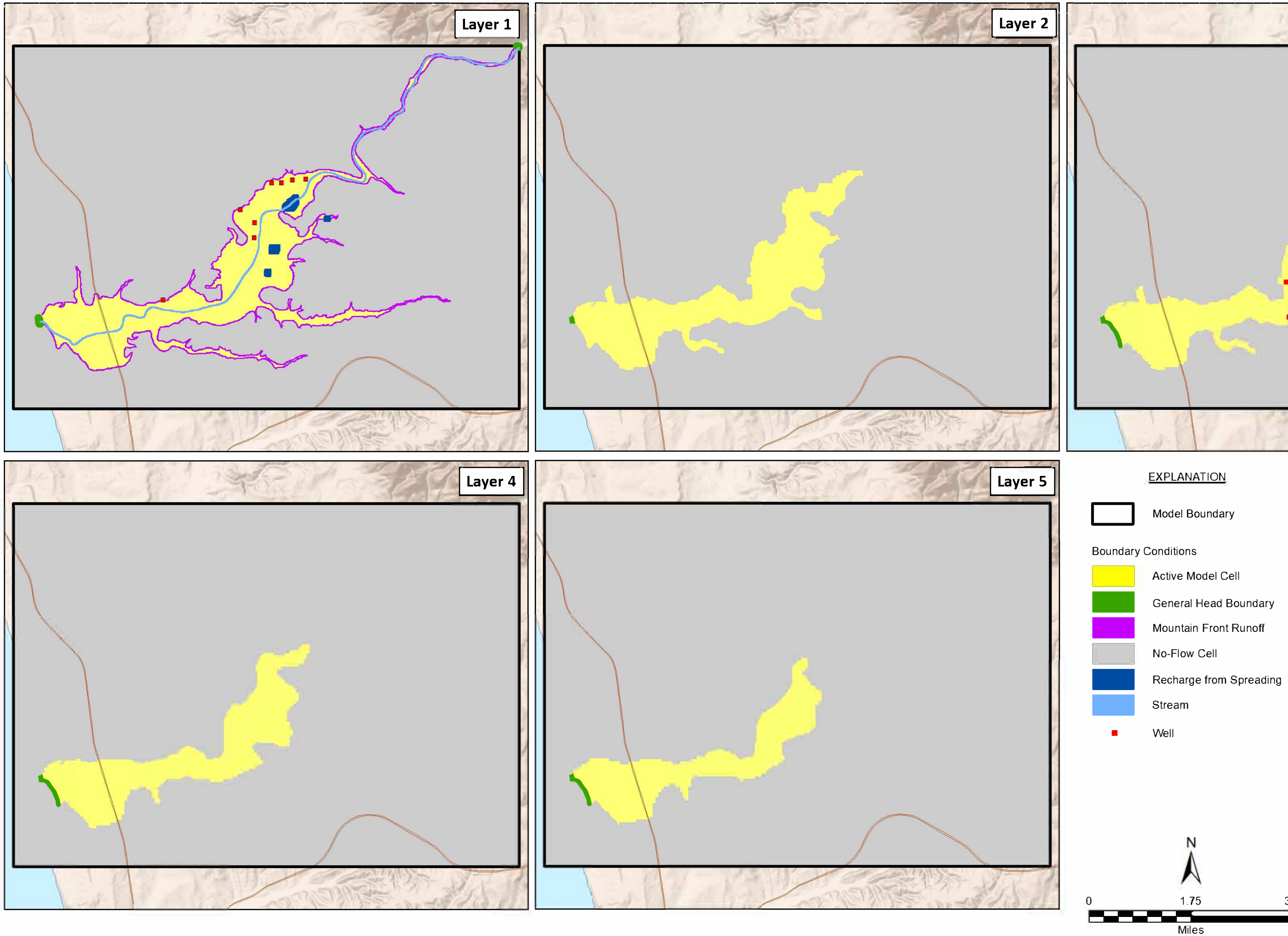
MODEL DOMAIN AND GRID

FIGURE 46

OLIVENHAIN MUNICIPAL WATER DISTRICT

REPORT OF DESIGN PILOT TESTING FOR THE SAN DIEGUITO VALLEY BRACKISH GROUNDWATER DESALINATION DESIGN PROJECT

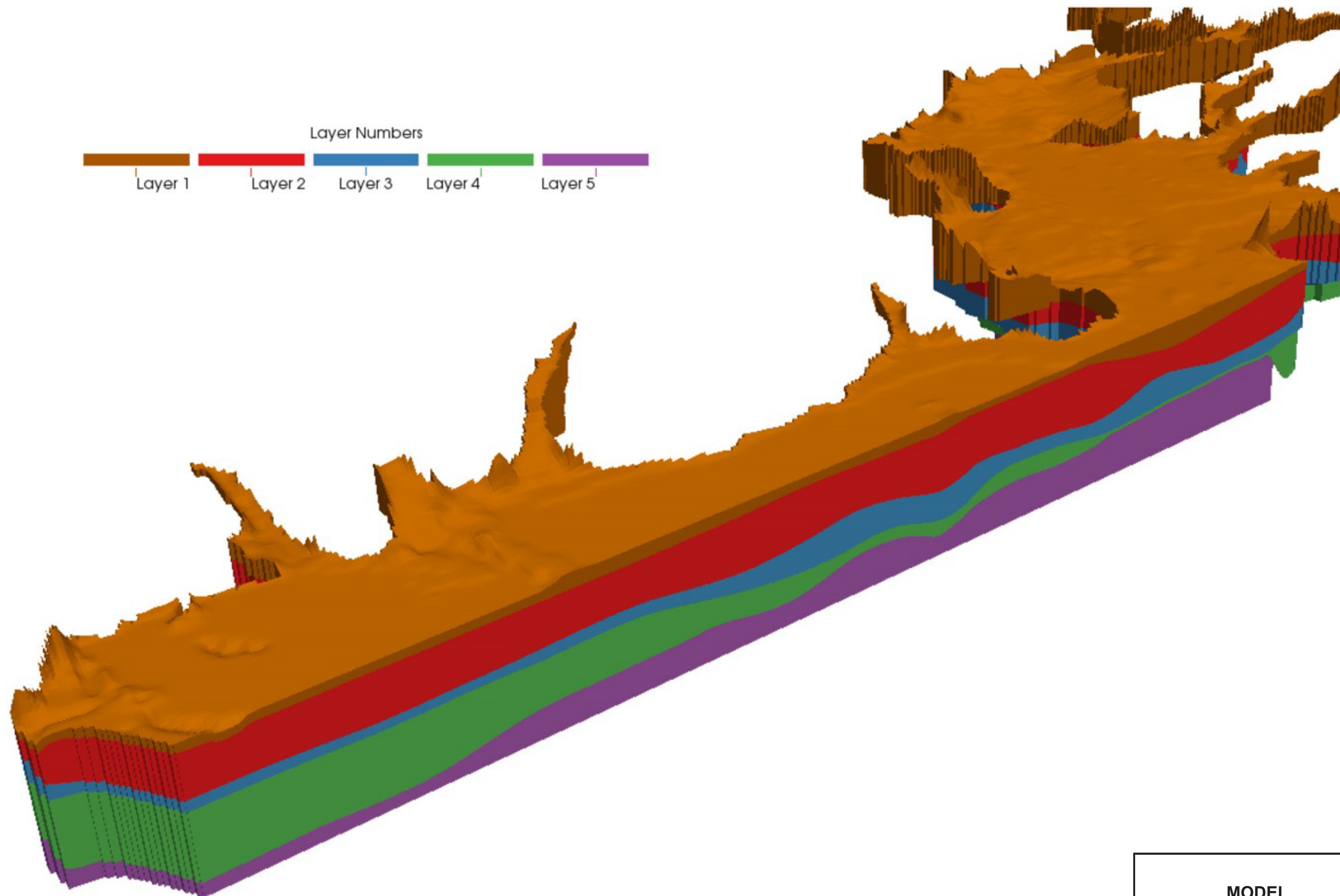
GEOSCIENCE



MODEL BOUNDARY CONDITIONS

W:\GIS_proj\OlivenhainWD\Data_Collection_Summary_10-18\18_Fig_47_bndy_cond_6-21.mxd

Aug-21



MODEL LAYERS

W:\GIS_proj\OlivenhainWD\Data_Collection_Summary_10-16\18_Fig_48_Model_Layers_8x11_6-21.ai

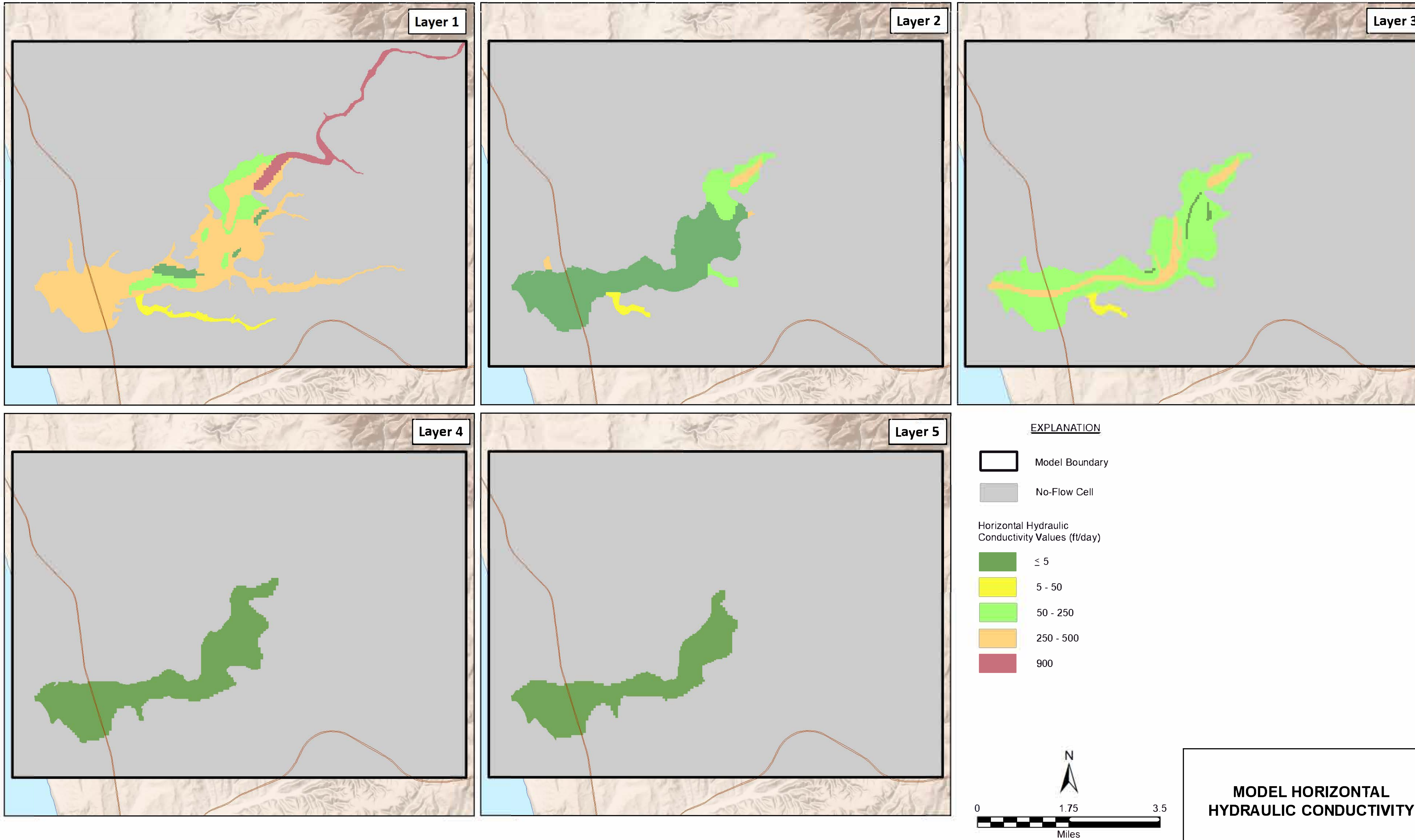
Aug-21

OLIVENHAIN MUNICIPAL WATER DISTRICT

FIGURE 48

REPORT OF DESIGN PILOT TESTING FOR THE SAN DIEGUITO VALLEY BRACKISH GROUNDWATER DESALINATION DESIGN PROJECT

GEOSCIENCE



MODEL HORIZONTAL HYDRAULIC CONDUCTIVITY

W:\GIS_proj\OlivenhainMWD\Data_Collection_Summary_10-1618_Fig_49_horiz_hyd_cond_8-21.mxd

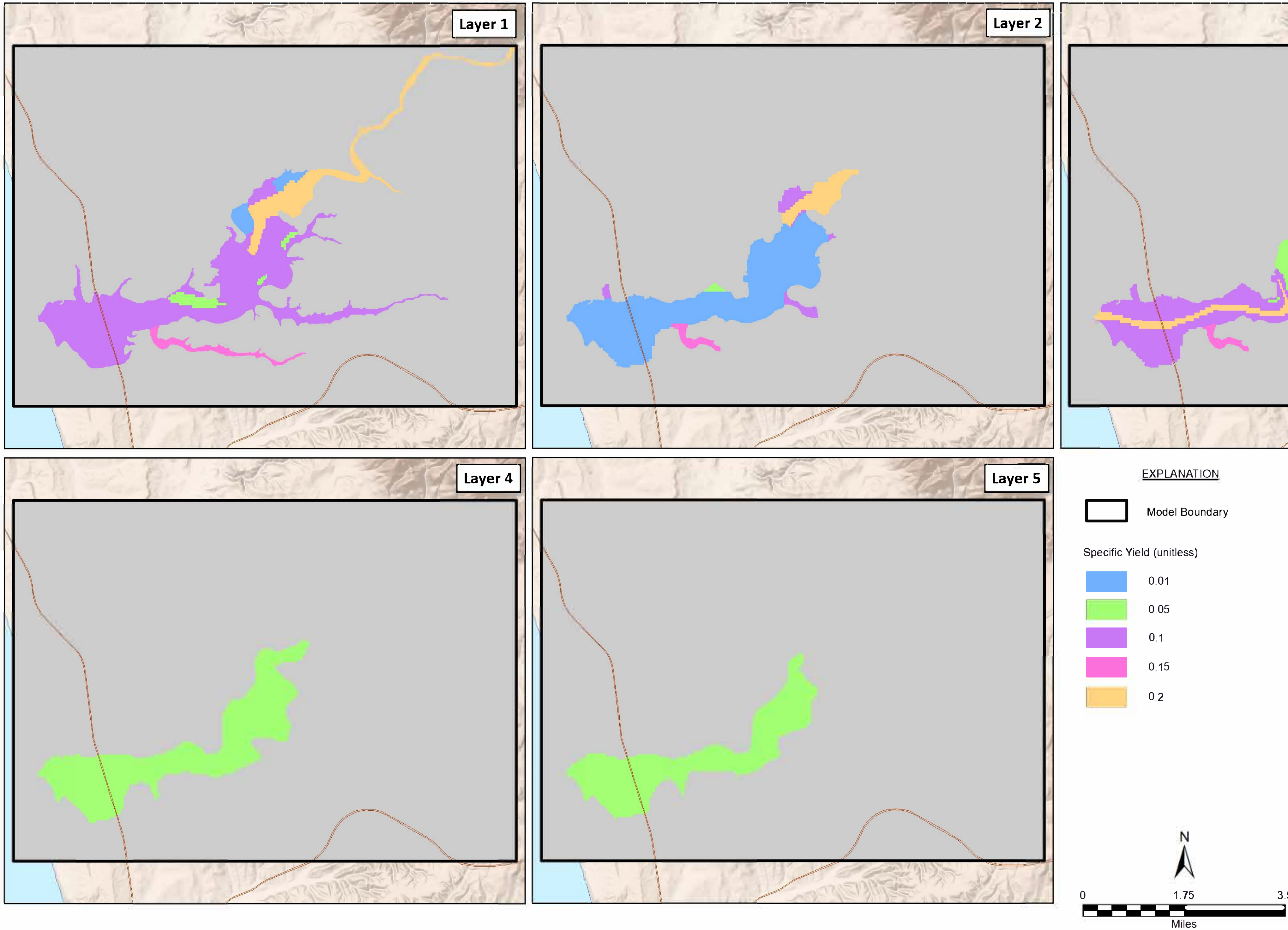
Aug-21

OLIVENHAIN MUNICIPAL WATER DISTRICT

FIGURE 49

REPORT OF DESIGN PILOT TESTING FOR THE SAN DIEGUITO VALLEY BRACKISH GROUNDWATER DESALINATION DESIGN PROJECT

GEOSCIENCE



MODEL
SPECIFIC YIELD

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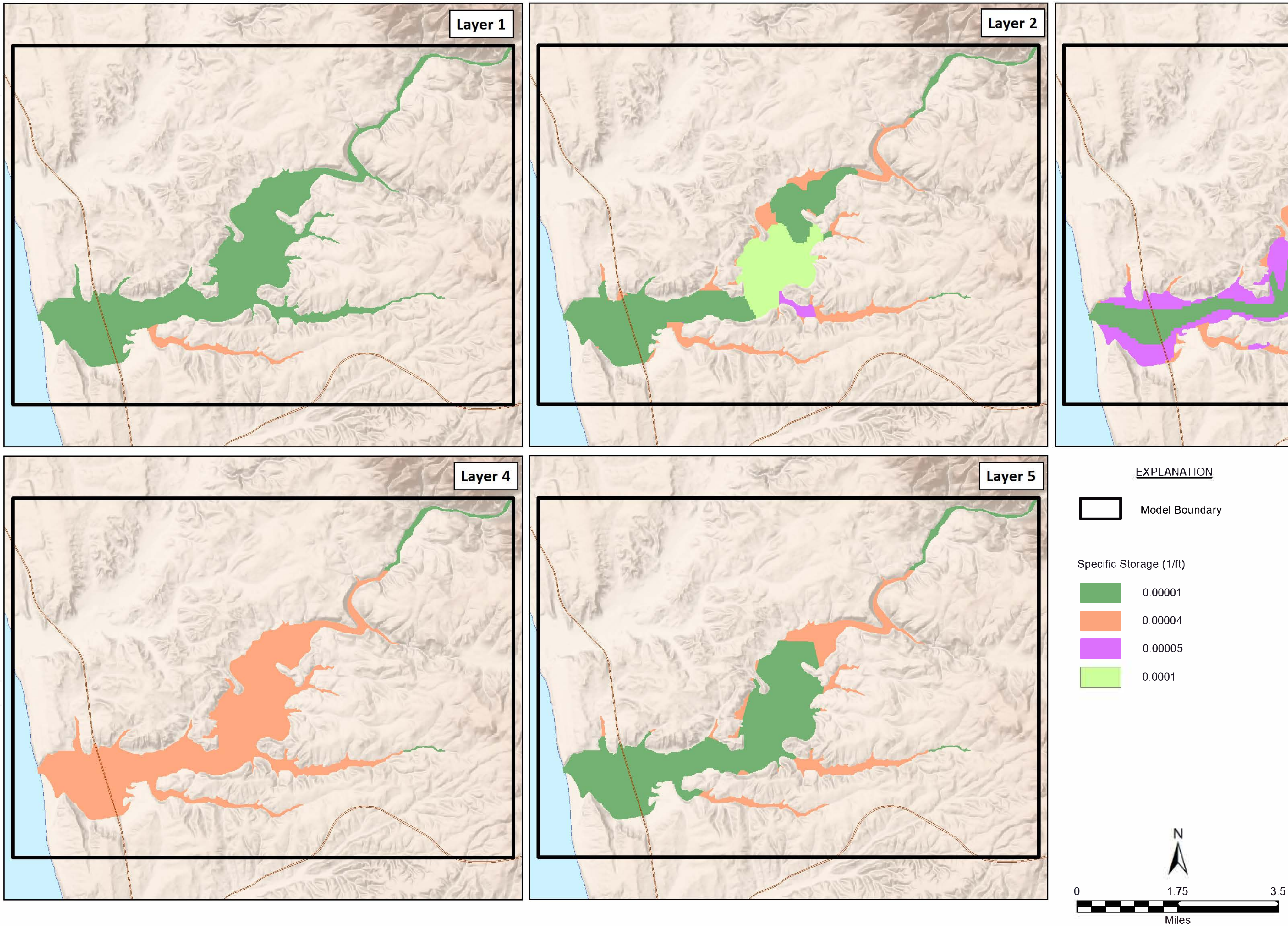

MODEL SPECIFIC STORAGE

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FIGURE 51

REPORT OF DESIGN PILOT TESTING FOR THE SAN DIEGUITO VALLEY BRACKISH GROUNDWATER DESALINATION DESIGN PROJECT

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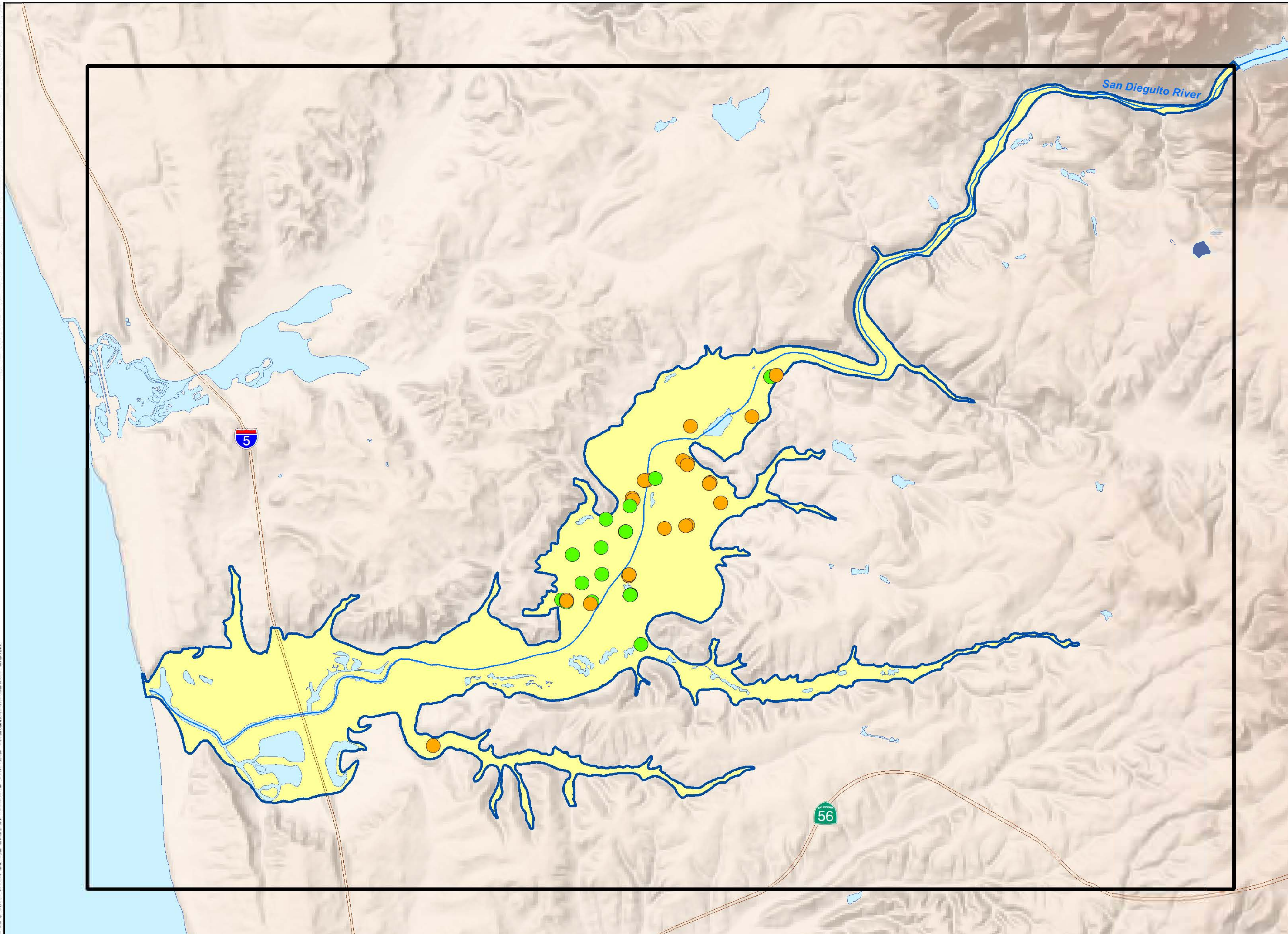

EXPLANATION

- Target Well - Model Layer 1
- Target Well - Model Layer 3
- Model Boundary
- San Dieguito Groundwater Basin Boundary and Study Area (DWR SGMA boundary modified by GEOSCIENCE in 2016)

N

0 4,000 8,000

Feet

TARGET WELLS USED FOR MODEL CALIBRATION

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FIGURE 52

REPORT OF DESIGN PILOT TESTING FOR THE SAN DIEGUITO VALLEY BRACKISH GROUNDWATER DESALINATION DESIGN PROJECT

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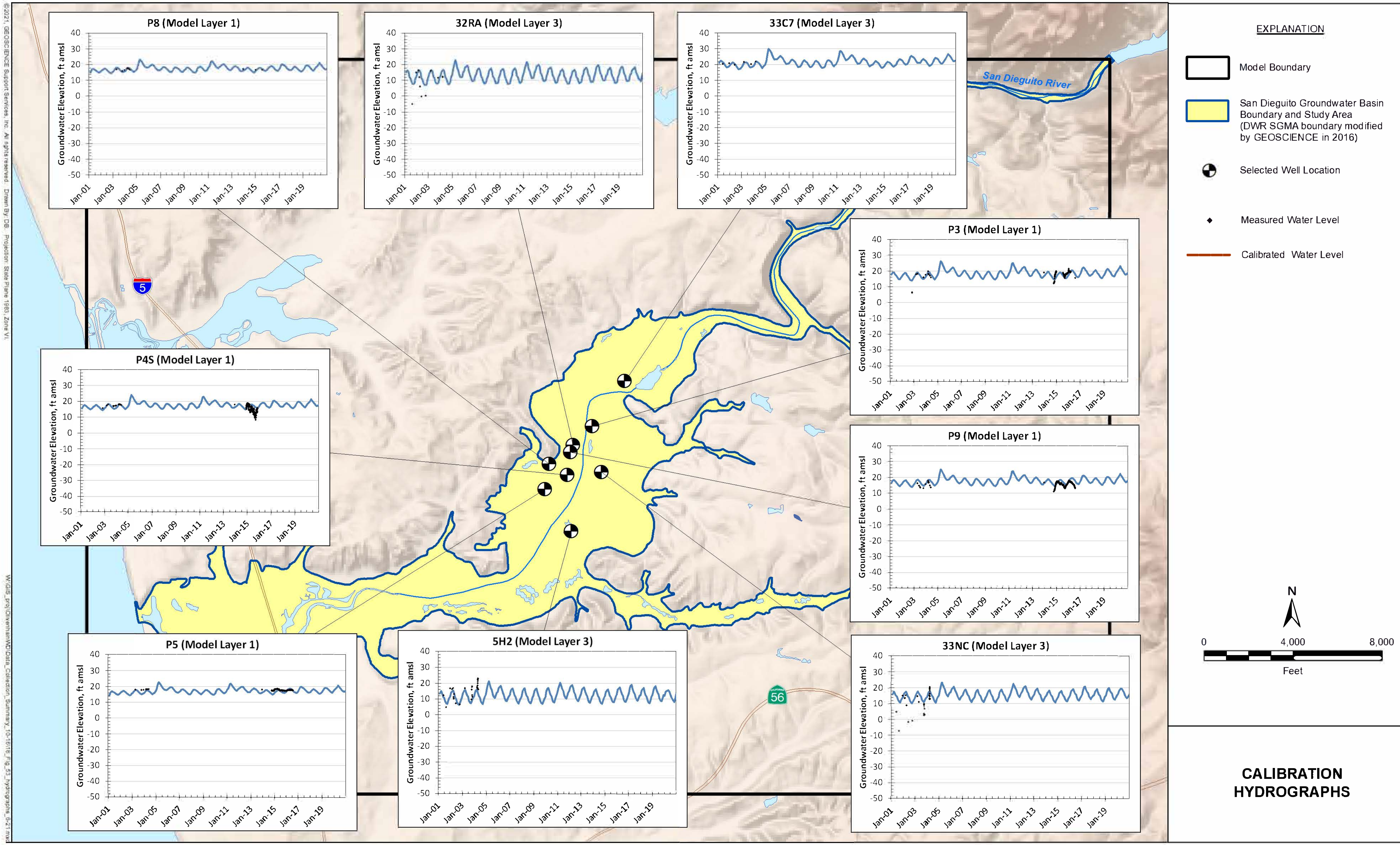

CALIBRATION HYDROGRAPHS

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FIGURE 53

REPORT OF DESIGN PILOT TESTING FOR THE SAN DIEGUITO VALLEY BRACKISH GROUNDWATER DESALINATION DESIGN PROJECT

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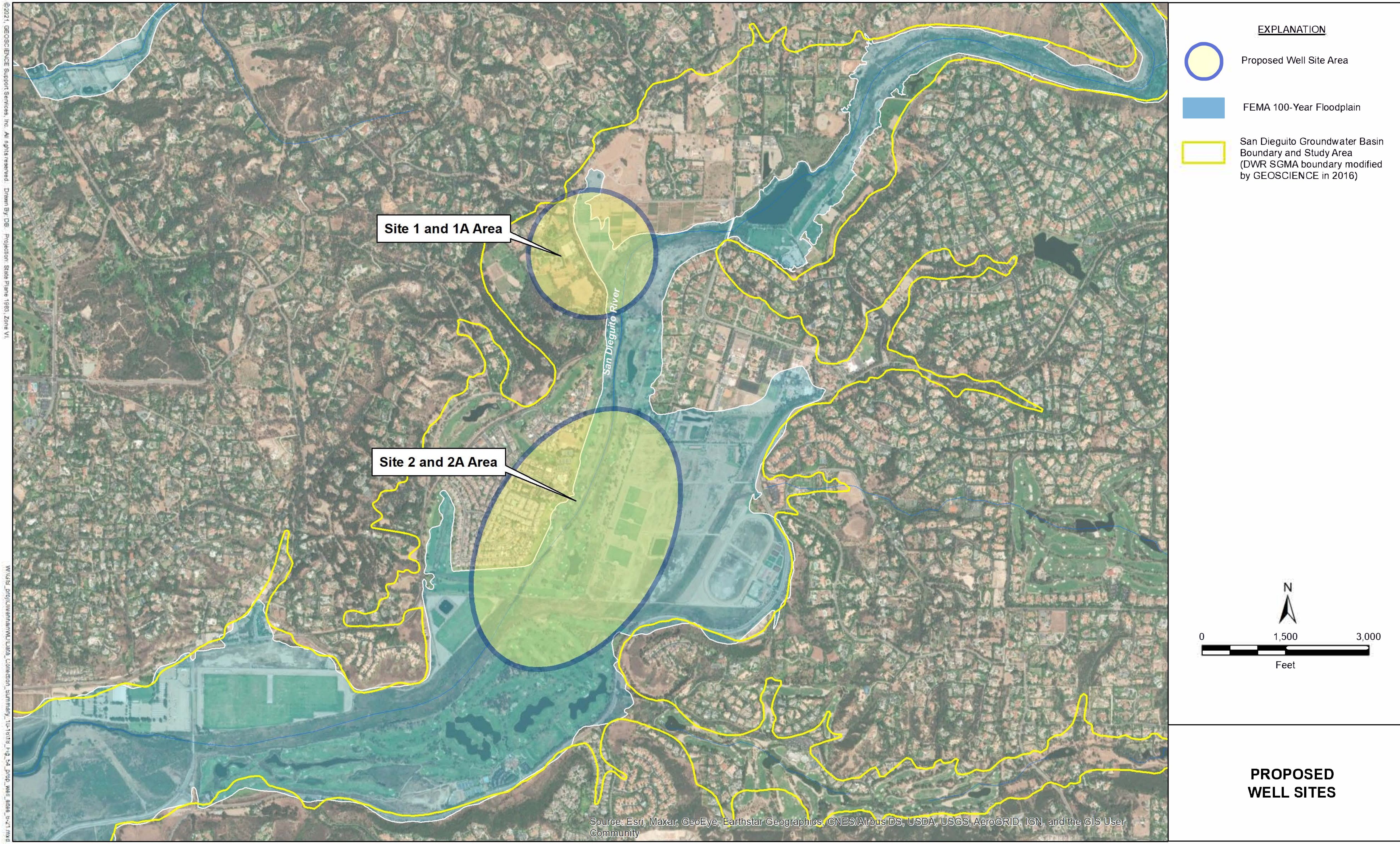

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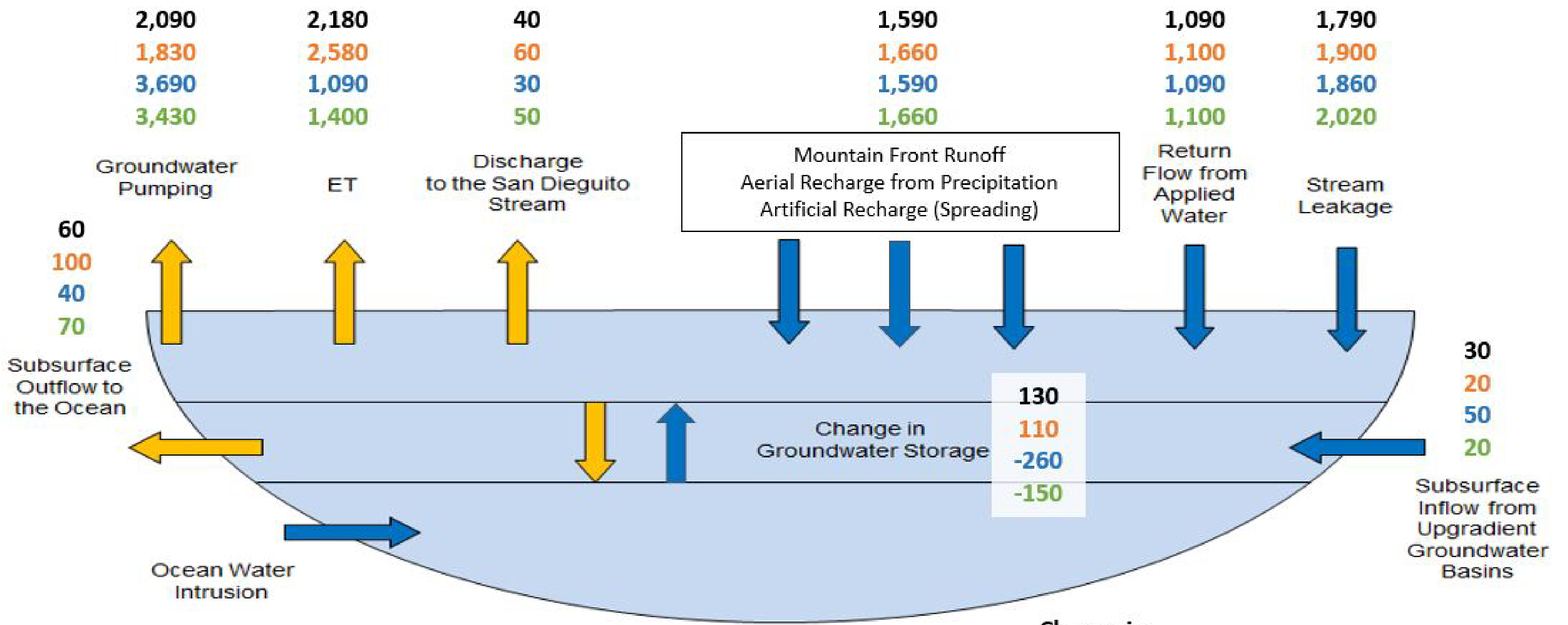
PROPOSED WELL SITES

FIGURE 54



	Inflow	Outflow	Change in Storage
2017 Calibration Run	4,500	4,370	+130
2021 Calibration Run	4,680	4,570	+110
2017 Scenario Run	4,590	4,850	-260
2021 Scenario Run	4,800	4,950	-150

GROUNDWATER BUDGETS FOR PREDICTIVE MODEL SCENARIOS

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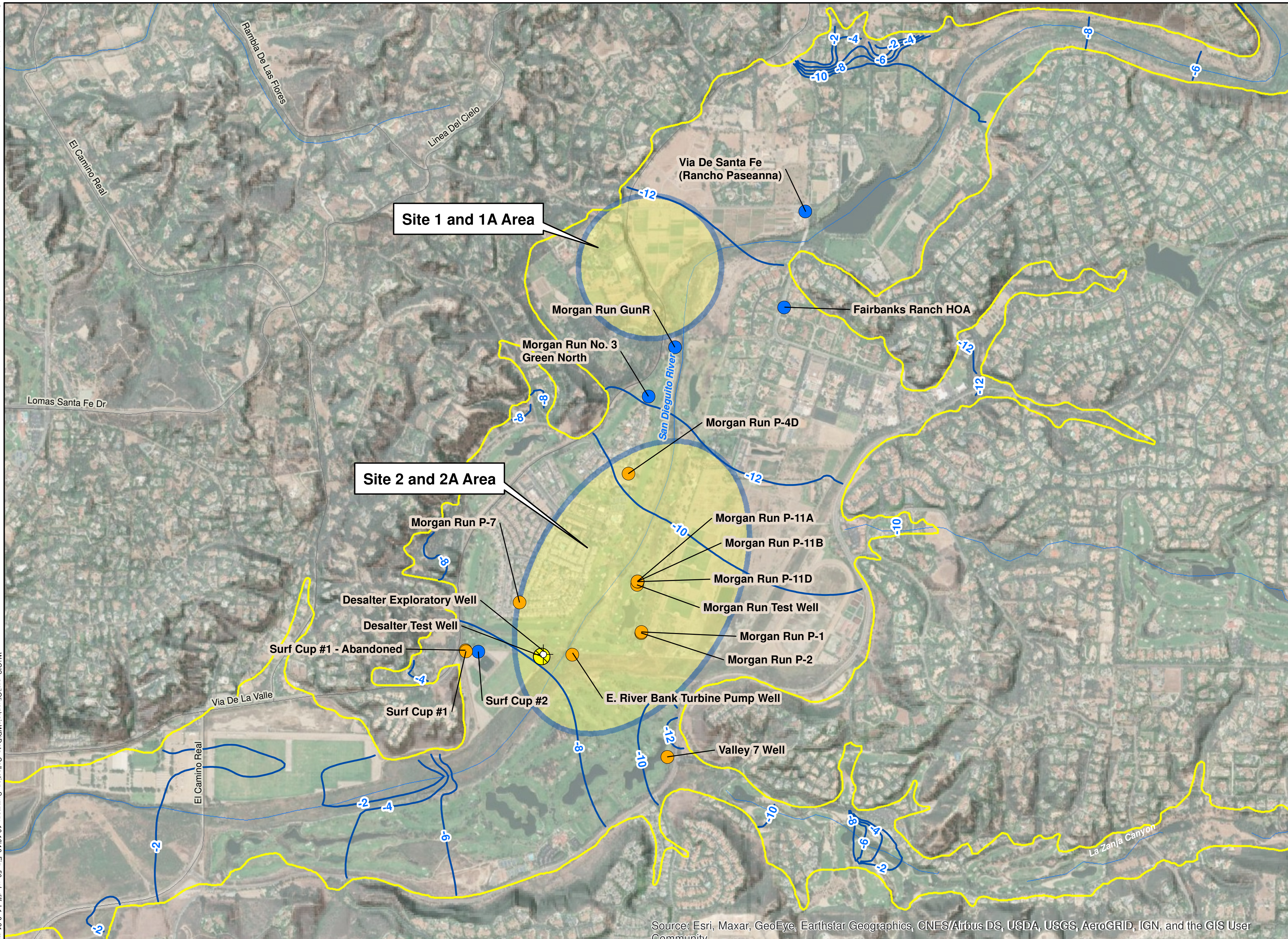

EXPLANATION

-10 Difference in Groundwater Elevations Between Scenario and Baseline Model Run (ft)

Proposed Well Site Area

Desalter Test Well

Desalter Exploratory Borehole

Pumping Well

Non-Pumping Well

San Dieguito Groundwater Basin Boundary (GEOSCIENCE, 2016)

N

0 1,500 3,000

Feet

DIFFERENCE IN GROUNDWATER ELEVATIONS BETWEEN SCENARIO AND BASELINE MODEL RUN FOR MODEL LAYER 1

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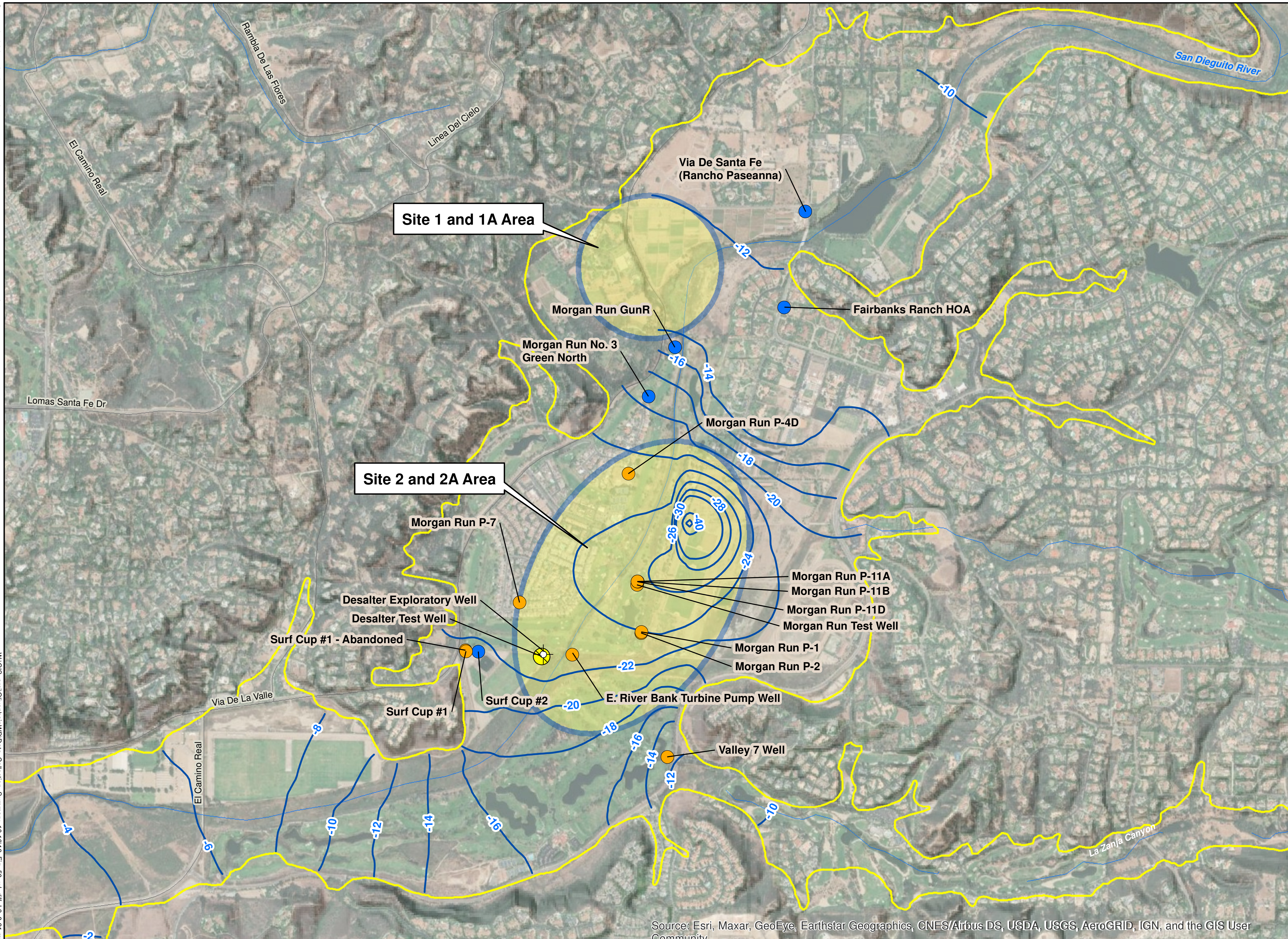

 Drawn By: DB. Projection: State Plane 1983, Zone VI.

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EXPLANATION

-10 Difference in Groundwater Elevations Between Scenario and Baseline Model Run (ft)

Proposed Well Site Area

Desalter Test Well

Desalter Exploratory Borehole

Pumping Well

Non-Pumping Well

San Dieguito Groundwater Basin Boundary (GEOSCIENCE, 2016)

N

0 1,500 3,000

Feet

DIFFERENCE IN GROUNDWATER ELEVATIONS BETWEEN SCENARIO AND BASELINE MODEL RUN FOR MODEL LAYER 3

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OLIVENHAIN MUNICIPAL WATER DISTRICT

FIGURE 57

REPORT OF DESIGN PILOT TESTING FOR THE SAN DIEGUITO VALLEY BRACKISH GROUNDWATER DESALINATION DESIGN PROJECT

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TABLES

Table 1: Summary of Desalter Test Well and Monitoring Network

Well Name	Well Type	Status	Year Constructed	Total Depth Measured	Well Depth	Reference Point Elevation	Screen Intervals	Screen Thickness	Pump Depth	Location Relative to Desalter Test Well	Approximate Distance from Desalter Test Well	Details of Installed Transducers: Model	Vented/ Non-vented	Level/Level+EC/ Air Pressure	Recording Frequency	Installation Depth	2019 Transducer Installations
				ft bgs	ft	ft NAVD88	ft bgs	ft	ft		ft					ft bgs	
Morgan Run P-1	Monitoring	-	2002	-	23	26.76	8 - 23	15	-	East Northeast	1,646	Solinst Levelogger	Non-vented	Level	15	-	-
Morgan Run P-2	Monitoring	-	2002	-	23	26.5	8 - 23	15	-	East Northeast	1,641	TD-Diver	Non-vented	Level	15	-	-
Morgan Run P-4D	Monitoring	-	2002	-	89	33.93	74.5 - 89.5	15	-	North Northeast	3,215	Solinst Levelogger	Non-vented	Level	15	-	-
Morgan Run P-7	Monitoring	-	2003	-	36	30.86	15 - 35	20	-	North West	906	In-Situ Aqua Troll 400	Non-vented	Level	15	-	11/19/19
Morgan Run P-11A	Monitoring	-	2003	-	27	24.26	17 - 27	10	-	North East	1,935	Solinst Levelogger	Non-vented	Level	15	-	-
Morgan Run P-11B	Monitoring	-	2003	-	45	24.22	40 - 45	5	-	North East	1,935	Mini-Diver	Non-vented	Level	15	-	-
Morgan Run P-11D	Monitoring	-	2003	-	99	24.28	84 - 99	15	-	North East	1,939	TD-Diver	Non-vented	Level	15	-	-
Morgan Run Test Well	Monitoring	-	2003	133.5	137	24.42	87 - 137	50	-	North East	1,900	In-Situ Aqua Troll 200	Non-vented	Level+EC	15	115.6	09/10/19
Morgan Run GunR	Irrigation	Inactive	2001	89.6	100+	34.32	81.3 - 120.8	39.5	80	North Northeast	5,367	In-Situ Aqua Troll 200	Non-vented	Level+EC	15	89.1	09/10/19
Morgan Run No. 3 Green North	Irrigation	Active	1995	80.2	120	40.89	-	-	80[1]	North Northeast	4,476	In-Situ Aqua Troll 200	Non-vented	Level+EC	15	-	11/19/19
OMWD Desalter Test Well	Test Well	Active	2019	-	145	29.88	60 - 125	65	130[2]	-	-	In-Situ Aqua Troll 200	Non-vented	Level+EC	15	119.1	09/10/19
Valley 7 Well	Unused	Inactive	-	123.5	-	25.19	-	-	-	South East	2,598	In-Situ Aqua Troll 200	Non-vented	Level+EC	15	-	11/19/19
Surf Cup No. 1	Irrigation	Active	1986	61.9	-	26.11	-	-	-	West	1,207	In-Situ Aqua Troll 200	Non-vented	Level+EC	15	-	11/19/19
												In-Situ BaroTroll	Non-vented	Air Pressure	15	-	11/19/19
												Baro-Diver	Non-vented	Air Pressure	15	-	-
Surf Cup No. 1 (Abandoned)	Irrigation	Abandoned	-	-	65	27.15	-	-	-	West	1,216	In-Situ Aqua Troll 400	Non-vented	Level	15	-	11/19/19
Surf Cup No. 2	Irrigation	Active	2001	99.6	110	26.06	50 - 110	60	-	West	1,011	In-Situ Aqua Troll 200	Non-vented	Level+EC	15	81.6	09/10/19
Rancho Paseana Well	Irrigation	Active	1983	-	101	-	68 - 98	30	-	North Northeast	8,251	-	-	-	-	-	-
Fairbanks Ranch HOA Well	Irrigation	Active	-	-	-	-	-	-	-	North East	6,765	-	-	-	-	-	-

[1]Morgan Run No. 3 Green North pump depth is approximated based on the known pump depth of Morgan Run GunR.

[2]Test Pump Installation depth. Permanent pump installed to 103 ft bgs.

Table 2: Summary of Desalter Test Well and Observation Well Laboratory Water Quality Results During the Long-Term Pumping Test

		Well or Piezometer Name:	Desalter Test Well			Morgan Run P-2			Morgan Run P-11B			Morgan Run P-11D			Morgan Run GunR			Regulatory Standard(s)
		Sample Collection Date:	21-Apr-20	16-Sep-20	1-Dec-20	21-Apr-20	16-Sep-20	1-Dec-20	21-Apr-20	16-Sep-20	1-Dec-20	21-Apr-20	16-Sep-20	1-Dec-20	21-Apr-20	16-Sep-20	1-Dec-20	
Constituent	Method	Units	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	
Ammonia as N	EPA 350.1	mg/L	0.99	0.95	1.06	0.35	0.08	0.14	4.52	6.26	1.44	2.05	2.16	2.17	0.08	0.23	0.22	NA[5]
Barium, Total	EPA 200.8	mg/L	0.132	0.132	0.126	0.064	0.070	0.063	0.185	0.348	0.308	0.348	0.357	0.362	0.099	0.093	0.094	1.0[1]
Bicarbonate Alkalinity	SM2320B	mg CaCO3/L	384	408	386	404	556	496	260	452	520	380	408	390	346	340	330	NA[5]
Boron, Total	EPA 200.7	mg/L	*0.95*	*0.96*	ND	0.46	0.76	0.65	0.54	0.73	0.51	0.47	0.53	ND	0.36	0.38	ND	1.0[3]
Calcium, Total	EPA 200.7	mg/L	*452*	*457*	*462*	*546*	ND	*624*	68.0	107	*468*	145	142	142	*403*	369	382	NA[5]
Carbonate Alkalinity	SM2320B	mg CaCO3/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA[5]
Chloride	SM4500 C1 B	mg/L	**1,290**	**1,330**	**1,340**	**2,200**	**2,480**	**2,320**	**380**	**690**	**1,790**	**630**	**600**	**590**	**1,110**	**1,230**	**1,270**	250 - 500[2]
Chromium, Hexavalent	EPA 218.6	µg/L	0.36	ND	ND	0.25	ND	ND	0.37	ND	ND	0.28	ND	ND	0.39	ND	ND	50[6]
Chromium, Total	EPA 200.8	mg/L	0.0003	ND	0.0002	0.0003	0.0002	ND	0.0009	0.0002	0.0005	0.0006	ND	0.0002	0.0004	ND	ND	0.050[1]
Copper, Total	EPA 200.8	mg/L	0.002	0.001	0.002	0.002	0.004	0.004	0.002	0.0008	0.005	0.003	0.0008	0.003	0.010	0.002	0.005	1.0[2]
Fluoride	SM4500 F C	mg/L	0.275	0.253	0.243	0.277	0.408	0.424	0.405	0.616	0.469	0.298	0.303	0.294	0.271	0.292	0.277	2[1]
Hardness (Dissolved)	EPA 200.7	mg CaCO3/L	1,570	1,710	1,750	2,830	ND	3,210	406	858	2,750	800	860	844	1,820	1,840	1,880	NA[5]
Hydroxide Alkalinity	SM2320B	mg CaCO3/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA[5]
Iron, Total	EPA 200.8	mg/L	**0.858**	**0.700**	**0.881**	0.035	**0.453**	*0.283*	**0.490**	**0.305**	**2.04**	**0.820**	**1.15**	**1.12**	*0.262*	0.195	0.185	0.3[2]
Magnesium, Total	EPA 200.7	mg/L	107	139	144	355	ND	400	57.3	143	383	106	123	119	197	224	226	NA[5]
Manganese, Total	EPA 200.8	mg/L	**1.07**	**1.00**	**0.918**	**4.86**	**3.36**	**3.03**	**0.095**	**0.127**	**1.91**	**0.464**	**0.476**	**0.450**	**2.29**	**1.99**	**1.81**	0.050[2] / 0.5[3]
Nitrate as N	EPA 353.2	mg/L	0.05	0.02	0.01	1.41	4.25	2.05	0.03	0.02	0.03	0.04	0.02	0.02	0.70	1.84	1.73	10[1]
Nitrite as N	SM4500 NO2 B	mg/L	ND	ND	ND	0.13	0.45	0.30	ND	ND	ND	ND	ND	ND	0.009	0.02	0.01	1[1]
Orthophosphate as P	SM4500 P E	mg/L	0.33	0.31	0.27	3.72	0.62	0.47	1.88	0.74	0.51	0.68	0.44	0.37	0.11	0.11	0.08	NA[5]
pH at 25 deg C	SM4500-H+ B	pH Units	7.04	6.96	6.99	7.03	7.07	7.08	7.54	7.49	7.17	7.37	7.30	7.34	7.19	6.83	6.77	6.5 - 8.5[4]
Phosphorus, Total	EPA 365.1	mg/L	0.32	0.33	0.34	2.08	0.58	0.50	1.76	0.69	0.62	0.66	0.46	0.42	0.10	0.11	0.08	NA[5]
Potassium, Total	EPA 200.7	mg/L	31.5	34.0	40.0	17.0	5.22	4.70	41.1	70.0	15.6	27.4	30.5	3.03	11.5	13.0	16.6	NA[5]
Silicon, Total	EPA 200.7	mg/L	16	17	15	20	11	19	16	20	19	14	15	14	15	16	15	NA[5]
Sodium, Total	EPA 200.7	mg/L	820	900	822	954	2.78	1,250	321	576	976	504	514	474	688	682	652	NA[5]
Specific Conductance (EC)	SM2510 B	µmhos/cm	**5,440**	**4,930**	**5,110**	**8,330**	**8,060**	**7,800**	**1,950**	**2,920**	**6,030**	**3,150**	**2,850**	**2,810**	**5,190**	**4,150**	**4,750**	900 - 1,600[2]
Strontium, Total	EPA 200.7	mg/L	2.1	2.2	2.1	3.5	1.7	3.1	0.60	1.1	3.0	1.0	1.0	0.97	1.8	1.7	1.7	NA[5]
Sulfate as SO4	SM4500 SO4 E	mg/L	**802**	**748**	**746**	**1,240**	**1,400**	**1,430**	183	**337**	**1,080**	**346**	**359**	**376**	**853**	**657**	**743**	250 - 500[2]
Total Alkalinity	SM2320B	mg CaCO3/L	384	408	386	404	556	496	260	452	520	380	408	390	346	340	330	NA[5]
Total Dissolved Solids	SM2540 C	mg/L	**3,500**	**3,590**	**3,580**	**5,460**	**5,990**	**5,840**	**1,080**	**1,780**	**4,690**	**1,890**	**1,870**	**1,850**	**3,320**	**3,210**	**3,330**	500 - 1,000[2]
Turbidity	SM2130 B	NTU	**6.50**	**6.40**	**6.90**	**50.0**	**5.00**	1.10	1.30	1.30	**18.0**	4.10	**10.0**	**8.40**	1.60	1.40	1.20	5[2]
Zinc, Total	EPA 200.8	mg/L	0.039	0.006	0.015	0.003	0.004	0.006	0.010	0.002	0.012	0.004	0.001	0.009	0.009	0.003	0.011	5[2]

Notes:

[1] California Division of Drinking Water (DDW) primary maximum contaminant level (MCL).
[2] DDW secondary MCL.
[3] DDW notification level for unregulated chemicals.
[4] United States Environmental Protection Agency (USEPA) secondary standard for pH.
[5] Not Applicable - no current MCL.
[6] Chromium-6 is currently regulated under the 50-µg/L DDW primary MCL for total chromium.

mg/L = Milligrams per Liter
NTU = Nephelometric Turbidity Units
µg/L = Micrograms per Liter
µmhos/cm = Micromhos per Centimeter
BOLD Equal to or above current DDW MCLs or Notification Levels
Italic Elevated, but not above current DDW MCLs or Notification Levels
RED Possible erroneous reading

APPENDICES

GEOSCIENCE

APPENDIX A

Exploratory Borehole (EX-1)

Borehole Lithologic Log

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Claremont, CA 91711
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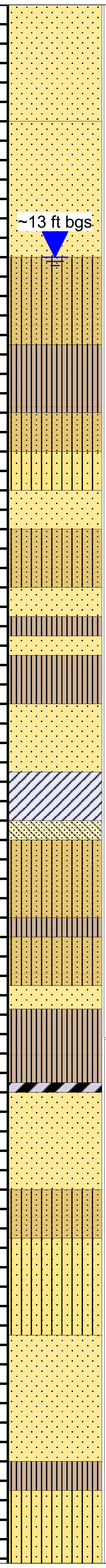
Appendix A

Exploratory Borehole (EX-1) Lithology
Olivenhain Municipal Water District (OMWD)
Report of Design Pilot Testing for the San Dieguito Valley
Brackish Groundwater Desalination Project

Note: Grain size distribution percentages are approximate. Material code (e.g. SP) reference United Soil Classification visual method. Color code (e.g. 10YR 5/2) reference Munsell Soil Color Charts



Depth (ft bgs)	Blows (per 6-inches)*	Lithology Descriptions
0		SAND WITH GRAVEL (SP): brown (7.5YR 4/3); 70% fine-coarse, subangular-subrounded sand; 30% fine-coarse, subangular-subrounded gravel up to 70mm ; trace fines; very loose, dry,, trace cobbles max 120mm
5	5ft 10,8,8	SAND (SP): brown (7.5YR 4/2); 100% fine-medium grained sand; trace fines; loose, moist, mottled, micaceous
10	10ft 4,4,6	
15	15ft 2,2,2	SILTY SAND (SM): brown (10YR 4/3); 80% fine-medium grained sand; 20% silt; trace fine-coarse, subangular-subrounded gravel up to 20mm; loose, wet, laminated, micaceous
		SILT WITH SAND (ML): dark brown (10YR 3/3); 75% silt; 5% clay; 20% fine grained sand; soft, saturated, micaceous
20	20ft 2,1,1	SILTY SAND (SM): very dark grayish brown (2.5Y 3/2); 60% fine-coarse grained sand; 40% silt; trace fine, subangular-subrounded gravel up to 5mm; traec clay; loose, saturated, micaceous
		SAND WITH SILT (SP-SM): very dark gray (2.5Y 3/1); 90% fine-medium grained sand; 10% silt; trace clay; loose, saturated, laminated, micaceous
25	25ft 2,5,7	SAND (SP): very dark grayish brown (2.5Y 3/2); 95% fine-coarse, subangular-subrounded sand; 5% silt; trace fine, subangular-subrounded gravel up to 5mm; trace clay; loose, saturated, micaceous
		SILTY SAND (SM): black (2.5Y 2.5/1); 65% fine-medium grained sand; 35% silt; trace clay; loose, saturated, mottled, micaceous, with pink shell fragments
30	30ft 4,6,5	SAND (SP): black (2.5Y 2.5/1); 95% fine-medium grained sand; 5% silt; loose, saturated, micaceous, with pink shell fragments
		SILT WITH SAND (ML): black (2.5Y 2.5/1); 75% silt; 25% fine-medium grained sand; tracy clay; soft, saturated, micaceous, laminated, with pink shell fragments
		SAND (SP): black (2.5Y 2.5/1); 95% sand; 5% silt; trace clay; loose, saturated, micaceous
35	35ft 4,3,3	SANDY SILT (ML): black (2.5Y 2.5/1); 55% silt; 45% fine-medium grained sand; trace clay; soft, saturated, interbedded CLAYS, SILTS, and SANDS ~4-6"; micaceous, (See descriptions above)
		SAND (SP): black (2.5Y 2.5/1); 95% fine-medium grained sand; 5% silt; trace clay; loose, saturated, micaceous, with smashed and layered cream colored shell fragments
40	40ft 2,2,6	CLAY(CL): black (2.5Y 2.5/1); 90% clay; 40% silt; 10% fine grained sand; soft, saturated, organic material (roots?); iron staining
		CLAYEY SAND (SC): black (2.5Y 2.5/1); 80% fine-medium grained sand; 15% clay; 5% silt; loose, saturated, micaceous, with shell fragments
45	45ft 2,2,4	SILTY SAND (SM): black (2.5Y 2.5/1); 85% fine-medium grained sand; 15% silt; loose, saturated, micaceous, with shell fragments increasing downward and coarseness
		SILT WITH SAND (ML): black (2.5Y 2.5/1); 85% silt; 20% clay; 15% fine grained sand; soft, saturated, micaceous, with shell fragments
50	50ft 2,3,4	SILTY SAND (SM): black (2.5Y 2.5/1); 75% fine grained sand; 20% silt; 5% clay; loose, saturated, laminated clays blueish-green; micaceous, with shell fragments
		SAND (SP): black (2.5Y 2.5/1); 95% fine-medium grained sand; 5% silt; loose, saturated, micaceous, with shell fragments
		SILT WITH SAND (ML): black (2.5Y 2.5/1); 80% silt; 15% fine-medium grained sand; 5% clay; soft, saturated, laminated; micaceous; with pink and cream shell fragments
55		FAT CLAY (CH): black (2.5Y 2.5/1); 100% clay; trace fine grained sand; trace silt; soft, saturated, moderately plastic
		SAND (SP): black (2.5Y 2.5/1); 95% fine grained sand; 5% silt; trace clay; loose, saturated, micaceous
60		SILTY SAND (SM): black (2.5Y 2.5/1); 85% fine-medium grained sand; 15% silt; trace clay; loose, saturated, micaceous, with shell fragments
65		SAND WITH SILT (SP-SM): black (2.5Y 2.5/1); 90% fine-medium grained sand; 10% silt; loose, saturated, micaceous, with little shell fragments
70		SAND (SP): black (2.5Y 2.5/1); 95% fine-medium grained sand; 5% silt; trace clay; loose, saturated, micaceous, with few shell fragments
75		SILT WITH SAND (ML): black (2.5Y 2.5/1); 70% silt; 25% fine grained sand; 5% clay; soft, saturated, laminated; micaceous, with shell fragments
80		SAND WITH SILT (SP-SM): black (2.5Y 2.5/1); 90% fine-medium grained sand; 10% silt; trace fine-coarse, subangular-subrounded

LITHOLOGY KEY

CL	ML	SP	CH
SANDSTONE	SC	SM	GP
MUDSTONE	SP-SM		

***SPT Samples were collected every 5 feet beginning at 5 feet bgs. Samples were driven 18-inches (i.e., from 5ft bgs to 6.5 ft bgs) with a pneumatic hammer. Each 6-inch interval hamer blows were counted and recorded. (i.e., 10, 8, 6)**

Aug-21

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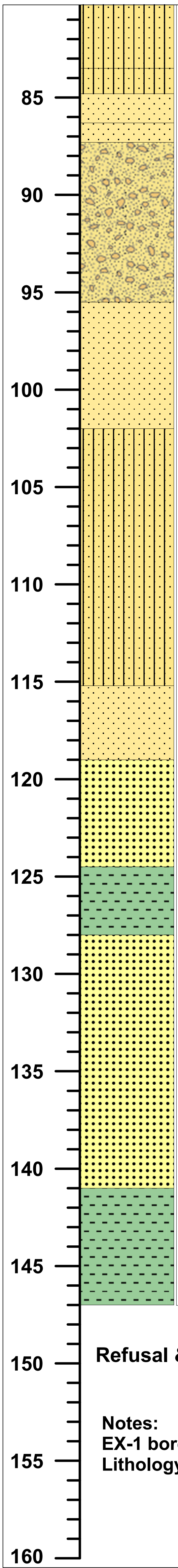
The First Name in Groundwater
P.O. Box 220
Claremont, CA 91711
Telephone: (909) 451-6650
Fax: (909) 451-6638
www.gssiwater.com

Appendix A

Exploratory Borehole (EX-1) Lithology
Olivenhain Municipal Water District (OMWD)
Report of Design Pilot Testing for the San Dieguito Valley
Brackish Groundwater Desalination Project

Depth (ft bgs) | **Blows (per 6-inches)*** | **Lithology Descriptions**

Note: Grain size distribution percentages are approximate. Material code (e.g. SP) reference United Soil Classification visual method. Color code (e.g. 10YR 5/2) reference Munsell Soil Color Charts



gravel up to 53mm; loose, saturated, laminated; micaceous; iron stained

SAND WITH SILT (SP-SM): very dark grayish brown (2.5Y 3/2); 90% fine-medium grained sand; 10% silt; trace clay; loose, saturated, micaceous

SAND (SP): very dark grayish brown (2.5Y 3/2); 95% fine-medium grained sand; 5% silt; loose, saturated, mottled; laminated; micaceous

SAND WITH GRAVEL (SP): very dark grayish brown (2.5Y 3/2); 65% fine-coarse grained sand; 30% fine-coarse grained gravel; 5% silt; loose, saturated

GRAVEL (GP): olive yellow (2.5Y 6/6); 90% fine-coarse, subangular-subrounded gravel; 5% fine-coarse, subangular-subrounded sand; 5% clay; trace silt; loose, saturated, max gravel 63mm

SAND WITH GRAVEL (SP): olive (5Y 4/3); 70% fine-coarse, subangular-subrounded sand; 25% fine-coarse, subangular-subrounded gravel up to 72 mm; 5% silt; trace clay; loose, saturated, trace cobbles max 90mm.

SAND WITH SILT (SP-SM): dark olive gray (5Y 3/2); 90% fine-coarse, subangular-subrounded sand; 10% silt; trace clay; loose, saturated, mottled; laminated; with some iron staining

SAND WITH GRAVEL (SP): olive gray (5Y 4/2); 60% fine-coarse,subangular-subrounded sand; 35% fine-coarse, subangular-subrounded gravel, Max Gravel 72mm; 5% clay, trace silt; loose, saturated, Few Cobbles (drilled through) max 83mm;

SED ROCK (SANDSTONE): greenish gray (5GY 5/1); medium grained sand, moderately bedded, decomposed, very soft, saturated, bands of more yellowish sandstone; highly weathered

SED ROCK (MUDSTONE): greenish gray (5G 5/1); thickly bedded, slightly weathered, very hard, moist, red and yellow laminations of clay

SED ROCK (SANDSTONE): greenish gray (5G 5/1); very thickly bedded, moderately weathered, moderately hard, wet, bands of yellowish sandstone

SED ROCK (MUDSTONE): greenish gray (5G 5/1); massive, slightly weathered, hard, dry

Refusal & Bottom of Borehole
147 ft bgs

Notes:
EX-1 borehole drilled by Jensen Drilling Co. to 147 ft bgs between September 6 to 12, 2018.
Lithology was used for OMWD Desalter Test Well design.

LITHOLOGY KEY

CL | ML | SP | CH
SANDSTONE | SC | SM | GP
MUDSTONE | SP-SM

***SPT Samples were collected every 5 feet beginning at 5 feet bgs.**
Samples were driven 18-inches (i.e., from 5ft bgs to 6.5 ft bgs) with a pneumatic hammer.
Each 6-inch interval hamer blows were counted and recorded. (i.e., 10, 8, 6)

APPENDIX B

Permits

GEOSCIENCE

PERMIT #: LMWP-003615
A.P.N.: 760-146-07
EST #: None

COUNTY OF SAN DIEGO
DEPARTMENT OF ENVIRONMENTAL HEALTH
LAND AND WATER QUALITY DIVISION
MONITORING WELL PROGRAM

GEOTECHNICAL BORING CONSTRUCTION PERMIT

SITE NAME: SURF CUP

SITE ADDRESS: 14989 VIA DE LA VALLE, DEL MAR 92014

PERMIT FOR: **CONSTRUCTION OF GEOTECHINCAL BORING (1)**

PERMIT APPROVAL DATE: 9/6/2018

PERMIT EXPIRES ON: 12/4/2018

RESPONSIBLE PARTY: OLIVEHAIN (Joseph Randall)

PERMIT CONDITIONS:

1. All borings must be sealed from the bottom of the boring to the ground surface with an approved sealing material as specified in California Well Standards Bulletin 74-90, Part III, Section 19.D. **Drill cuttings are not an acceptable fill material. Bentonite slurries are not an acceptable fill material in the unsaturated zone.**

2. All borings must be properly destroyed within 24 hours of drilling.

3. Placement of any sealing material at a depth greater than 30 feet must be done using the tremie method.

4. This work is not connected to any known unauthorized release of hazardous substances. Any contamination found in the course of drilling and sampling must be reported to DEH. All water and soil resulting from the activities covered by this permit must be managed, stored and disposed of as specified in the SAM Manual in Section 5, II, D-4. (http://www.sdcounty.ca.gov/deh/lwq/sam/manual_guidelines.html) In addition, drill cuttings must be properly handled and disposed in compliance with the Stormwater Best Management Practices of the local jurisdiction.

5. Within 60 days of completing work, submit a well/boring construction report, including all well and/or boring logs and laboratory data to the Well Permit Desk. This report must include all items required by the SAM Manual, Section 5, Pages 6 & 7.

6. This office must be given 24-hour notice of any drilling activity on this site and advanced notification of drilling cancellation. Please contact the Well Permit Desk at (858) 505-6688.

APPROVED BY: ______________________________ DATE: 9/6/2018

Jon Senaha

PERMIT APPLICATION
GROUNDWATER
AND VADOSE MONITORING WELLS
AND EXPLORATORY OR TEST BORINGS

OFFICE USE ONLY
PERMIT LMWP# 003615
SAM CASE Y/N # None
DATE RECEIVED: 9/4/2018
FEE PAID: $235.00
CHECK # Online

A. RESPONSIBLE PARTY E-mail jrandall@olivehain.com
(The person, persons, or company responsible for the construction, maintenance, and destruction of the proposed borings and/or wells.)
Mailing Address 1966 Olivehain Road City Encinitas State CA Zip 92024
Contact Person Joseph Randall Phone 760-753-6466 Ext.____

B. SITE ASSESSMENT PROJECT NUMBER – IF APPLICABLE # ____

C. CONSULTING FIRM GEOSCIENCE Support Services, Inc
Mailing Address PO Box 220 City Claremont State CA Zip 91711
Registered Professional Terry Watkins Phone 9094516550 Registration #9046(PG)
E-mail twatkins@geoscience-water.com
Contact Person Terry Watkins Phone 9094516550 Ext____ Email ____

D. DRILLING COMPANY Jensen Drilling C57# 340115
Contact Name Chris Humphries E-mail chris@jensendrilling.com
Mailing Address 1775 Henderson Ave City Eugene State OR Zip 97403
Phone 541-912-0907 Ext.____

E. CONSTRUCTION INFORMATION

TYPE OF WELLS/ BORINGS TO BE CONSTRUCTED #
- ☐ Groundwater ___
- ☐ Vadose ___
- ☒ Boring 1
- ☐ Other ___

NUMBER OF WELLS TO BE DESTROYED
- ☐ Destruction ___

MATERIALS TO BE USED

CASING
Not Applicable X
Type ____
Gauge ____
Diameter ____
Screen Size ____
Filter Pack ____

SEAL/BORING BACKFILL
- ☒ Neat Cement
- ☐ Cement & Bentonite
- ☐ Sand-Cement
- ☐ Bentonite
- ☐ Other

Borehole diameter 8"

Drilling Method
- ☐ Auger
- ☐ Direct Push
- ☐ Other ____
- ☐ Air Rotary
- ☒ Sonic
- ☐ Percussion

PROPOSED CONSTRUCTION
Estimated Groundwater Depth: 12 ft.
Estimated Depth of Boring: 200 ft.
Concrete Seal: 0 to 3
Annular Seal: ____to____
Filter Pack: ____to____
Perforation: ____to____

NOTE: Attach a well construction diagram

I agree to comply with the requirements of the current Site Assessment and Mitigation Manual, and with all ordinances and laws of the County of San Diego and the State of California pertaining to well/boring construction and destruction.

DRILLER'S SIGNATURE ______________ DATE 8/31/18

Within 60 days of completion, I will furnish the Monitoring Well Permit Desk (858) 505-6688 with a complete well/boring log. I will certify the design and construction or destruction of the well/borings in accordance with the permit application.

PG/RCE/CEG SIGNATURE ______________ DATE 8/30/2018

F. SITE INFORMATION - A Property Owner Consent agreement is required for all applications, except for onsite, open LOP/SAM site assessment cases, Caltrans properties and military properties. Submit a separate sheet for additional parcels.

1. ASSESSOR'S PARCEL NUMBER 760-146-07- 00

Site Name Surf Cup

Site Address 14989 Via De La Valle, Del Mar, CA 92014 City Del Mar Zip 92014

PROPERTY OWNER Surf Cup Sports, LLC

Phone (925) 263-2200 Ext. _____ Fax _____

Mailing Address 2631 Via de la Valle City Del Mar State CA Zip92014

NUMBER OF WELLS 1 **TYPE OF WELLS** Borehole

2. ASSESSOR'S PARCEL NUMBER _____

Site Address _____ City _____ Zip _____

PROPERTY OWNER _____

Phone _____ Ext. _____ Fax _____

Mailing Address _____ City _____ State _____ Zip _____

NUMBER OF WELLS _____ **TYPE OF WELLS** _____

G. QUESTIONNAIRE: Please answer all applicable questions completely *and submit any required supportive documentation.*

1. What is the purpose of the well/boring investigation?

☐ a. Part of an ongoing site assessment case in which a government regulator is the lead agency. If yes, indicate which government regulator is the lead agency and the case number.

_____ DEH _____ RWQCB _____ DTSC

☐ b. Part of a Phase I investigation for property ownership transfer.

☒ c. Geotechnical investigation for proposed construction or land stabilization.

☐ d. Other: _____

2. If wells are to be destroyed, provide a description of method of destruction Borehole will be backfilled with neat cement

3. Are you proposing a variation from current SAM Manual Requirements for the construction or destruction of borings, Vadose and/or Groundwater Monitoring Wells? If yes, specify these variations and include a well construction diagram and all required supporting documentation. Refer to the SAM Manual Appendix B for monitoring well guidelines (www.sdcdeh.org). Yes ☐ No ☒

_____

H. FEES

ACTIVITY	FEE SCHEDULE	AMOUNT	
Permit for Well Installations Only *(Groundwater Monitoring Wells, Vadose, Vapor Extraction Wells)*	$351.00 for the first monitoring well	**$351.00**	_____
	$224.00 for each additional well installation	_____**x $224.00**	_____
Permit for Borings Only *(CPT's, Hydropunch, Geoprobes, Temporary Well Points, etc.)*	$235.00 for the first boring	**$235.00**	235.00
	$62.00 for each additional boring	_____**x $ 62.00**	_____
Permit for Well Destructions Only	$235.00 for the first destruction	**$235.00**	_____
	$143.00 for each additional destruction	_____**x $143.00**	_____
Permit for any Combination of Well Installations, Borings, & Destructions *(Except Enhanced Leak Detection & Soil Vapor Survey)*	First Activity: $351.00 (if monitoring wells will be installed) OR $235.00 (for borings and destructions only)	**$351.00** **OR** **$235.00**	_____ _____
	$224.00 for each additional well	_____**x $224.00**	_____
	$ 62.00 for each additional boring	_____**x $ 62.00**	_____
	$143.00 for each additional well destruction	_____**x $143.00**	_____
Permit for Soil Vapor Survey	$388.00 (flat fee per site)	**$388.00**	_____
Permit for Enhanced Leak Detection	$235.00 for the first boring	**$368.00**	_____
	TOTAL COST OF PERMIT		$235.00

JACK MILLER
DIRECTOR

County of San Dieg

ELIZABETH POZZEBON
ASSISTANT DIRECTOR

DEPARTMENT OF ENVIRONMENTAL HEALTH
LAND AND WATER QUALITY DIVISION
P.O. BOX 129261, SAN DIEGO, CA 92112-9261
(858)505-6688
www.sdcdeh.org

PROPERTY OWNER CONSENT

Proposed locations for subsurface work:

Property Address: 14989 Via De La Valle, Del Mar, CA 92014

Assessor's Parcel Number (APN): 760-146-07-00

I, Robert Haskell, owner of the property/properties listed above, give my permission to GEOSCIENCE Support Services, Inc. and Jensen Drilling (consulting company, contractor) to conduct the following work at the locations stated above.

☐ Install _____ monitoring wells ☐ Destroy _____ monitoring wells ☒ Drill 1 soil borings

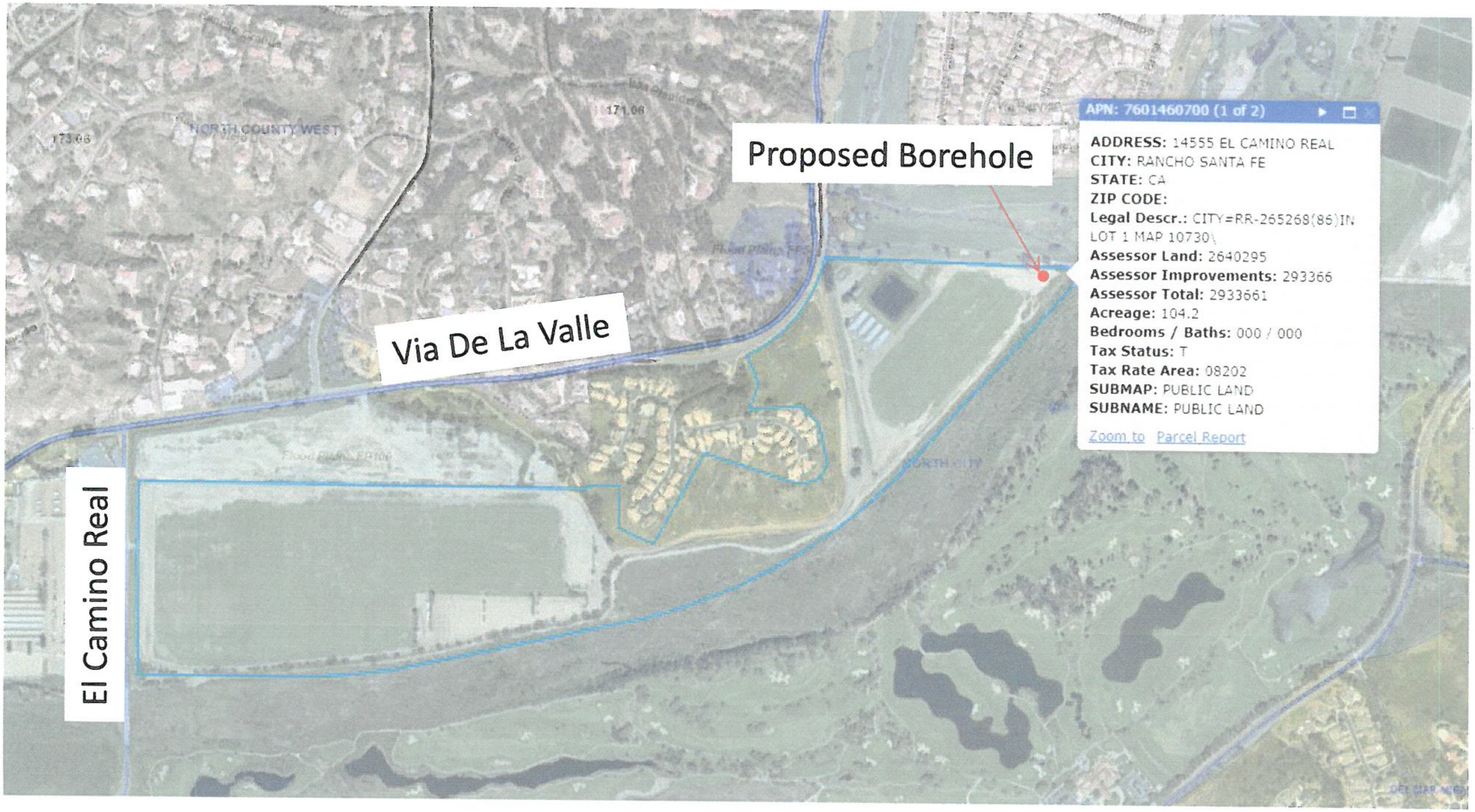
I understand that Terry Watkins, PG (registered professional) of GEOSCIENCE Support Servises, Inc. (consulting company) and an authorized signer for Jensen Drilling Co. (drilling company) have submitted a signed application to the Department of Environmental Health in which they have agreed to complete the above-stated work according the requirements of the current SAM Manual, all ordinances and laws of the County of San Diego and the State of California pertaining to well/boring construction and destruction. I have arranged with the Responsible Party, the person who causes to have monitoring wells/borings installed or existing wells destroyed on this property, to ensure proper closure of the monitoring wells/borings.

Property Owner Signature: [signature] Date: 8/30/18

Print Name: Robert Haskell Title: President

Company: Surf Cup Sports, LLC

Mailing Address: 2631 Via de la Valle, Del Mar, CA 92014



APN: 7601460700 (1 of 2)
ADDRESS: 14555 EL CAMINO REAL
CITY: RANCHO SANTA FE
STATE: CA
ZIP CODE:
Legal Descr.: CITY=RR-265268(86)IN LOT 1 MAP 10730\
Assessor Land: 2640295
Assessor Improvements: 293366
Assessor Total: 2933661
Acreage: 104.2
Bedrooms / Baths: 000 / 000
Tax Status: T
Tax Rate Area: 08202
SUBMAP: PUBLIC LAND
SUBNAME: PUBLIC LAND
Zoom to
Parcel Report
Proposed Borehole
Via De La Valle
El Camino Real
NORTH COUNTY WEST
171.06
173.06

COUNTY OF SAN DIEGO
DEPARTMENT OF ENVIRONMENTAL HEALTH
LAND AND WATER QUALITY DIVISION

WATER WELL PERMIT APPLICATION

DEH USE ONLY
DEH2019-LWELL-002249
PERMIT #
FEE: $ 627.00 3/8/19
WATER DIST:

1. Property Owner: Olivenhain Municipal Water District Phone: 760-753-6466
Mailing Address: 1966 Olivenhain Road City: Encinitas State: CA Zip: 92024

2. Well Location – Assessor's Parcel Number: 760-146-07-00
GPS Coordinates (WGS-84 Decimal Degrees): 32.98507222 / -117.21284167 Elevation: 25 ft
Site Address: 14989 Via De La Valle City: Del Mar State: CA Zip: 92014

3. Well Contractor/Driller: Chris Humphries Company Name: Jensen Drilling Company
Mailing Address: 1775 Henderson Ave City: Eugene State: OR Zip: 97403
Email Address: ~~chirs~~ Chris @jensendrilling.cc Phone: 541-726-7435 C-57 License No: 340115

4. Use: ☐ Private ☐ Public ☐ Industrial ☒ Other: Feasibility Test Well

5. Type of Work: ■ New ☐ Reconstruction ☐ Destruction Time Extension: ☐ 1st ☐ 2nd

6. Type of Equipment: Bucket Auger & Flood Reverse Circulation Drill

7. Depth of Well: Proposed: 160 Existing:

8: Proposed:

Casing	Conductor Casing	Filter/Filler Material	Perforations
Type: Super Duplex 2507	■ Yes ☐ No	☒ Yes ☐ No	From: 60 To: 125
Depth: 145	Depth: 50	From: 30 To: 160	From: To:
Diameter: 18 in.	Diameter: 36 in.	Type: Gravel Pack	From: To:
Wall/Gauge: 0.250	Wall/Gauge: 0.375		

9. Annular Seal: Depth: 50 ft. Sealing Material: 10.3 sac cement
Borehole Diameter: 42 in. Conductor Diameter: 36 in. Annular Thickness: ~~6~~ 3 in.

10: Best Management Plan for confining well drilling waste on the project site provided? ■ Yes ☐ No

11. Date of Work: Start: 3/18/19 Complete: 4/30/19

On sites served by public water, contact the local water agency for meter protection requirements.

I hereby agree to comply with all regulations of the Department of Environmental Health, and with all ordinances and laws of the County of San Diego and the State of California pertaining to well construction, repair, modification and destruction. Immediately upon completion of work, I will furnish the Department of Environmental Health with a complete and accurate log of the well (well driller's report). I accept responsibility for all work done as part of this permit and all work will be performed under my direct supervision.

Contractor's Signature: Chris Humphries Digitally signed by Chris Humphries Date:

DISPOSITION OF APPLICATION (Department of Environmental Health Use Only)

☐ **DENIED**

☑ **APPROVED**

This approval is valid for 120 days. A maximum of two extensions, each 120 days in length can be requested.

Special Conditions: Grading and clearing associated with access to, or the construction, maintenance, or destruction of water wells, may require additional permits from the County of San Diego and/or other agencies.

Specialist: Jenna Poitras **Date:** 4/3/2019

COUNTY OF SAN DIEGO
DEPARTMENT OF ENVIRONMENTAL HEALTH
LAND AND WATER QUALITY DIVISION
WATER WELL PERMIT APPLICATION

DEH USE ONLY
PERMIT # ____
APN: ____

SITE PLAN

Indicate below the vicinity and exact location of the well with respect to, and including, the following items: property lines, transmission lines, water bodies/courses (ponds, lakes, and streams within 300 ft), drainage pattern, roads, existing wells, sewer laterals, existing or proposed septic systems, livestock/fowl enclosures, and otherpotential contamination sources. Please include lot dimensions, and please draw the plot plan to a standard engineer's scale.

Please see attached


Morgan Run Club & Resort
Morgan Run Club & Resort
Proposed Test Well
Ground Elevation: 25 ft
Water Surface: 14.5 ft
River Bottom: 9.6 ft
Irrigation Basin
Surf Cup
Sports Park
San Dieguito River
Fairbanks Ranch
Country Club

COUNTY OF SAN DIEGO
DEPARTMENT OF ENVIRONMENTAL HEALTH
LAND AND WATER QUALITY DIVISION

SUPPLEMENTAL WATER WELL PERMIT APPLICATION*
(For Water Wells in SGMA-mandated basins)

DEH USE ONLY
PERMIT # DEH2019 - WELL-224C
APN: 760-146-07

1. Proposed Water Use (e.g. irrigation, stock, domestic, industrial, etc.): Municipal

2. Estimated Annual Extraction Volume: 968 Acre-ft
If more than 2 acre-feet per year, complete items 3 through 6 and do not complete number 7 (declaration).
If less than 2 acre-feet per year and well will be used for domestic purposes, continue to number 7 (declaration).

3. Area Served by Well (acres): 31,114 acres

4. Proposed Production Capacity: 600 gpm Estimated Pumping Rate: 600 gpm

   Cumulative Extraction Volume before 1/1/2020: 887 acre-ft

   Anticipated Pumping Schedule: 24/7 operation

5. Estimated Water Table Depth: 20 ft bgs Estimated Seasonal Groundwater Fluctuations: TBD

   Recharge Area (if known): NA Recharge Rate (if known): NA

   Location relative to flood plain: Inside 100-year flood plane

6. Existing Well(s) on Property (if more than one, attach a separate page with the following information for each well):

   Use: SEE ATTACHED SHEET WITH WELL INFORMATION

   Depth: ____________ Diameter: ____________ Screen Interval: ____________

   Pumping Rate: ____________

   Annual Extraction Volume: ____________ Measured ____________ Estimated

   Specific Production Capacity (if available): ____________

   Results of Pumping Tests (if available): ____________

7. DECLARATION OF DE MINIMIS EXTRACTOR STATUS

I, Chris Humphries, declare that I understand the definition of a de minimis extractor, as
(Name of owner or legally authorized representative)
defined in the California Water Code, Division 6, Part 2.74, Chapter 2, Section 10721(e), to mean "*a person who extracts, for domestic purposes, two acre-feet or less per year*". I further understand that the Water Code and the Sustainable Groundwater Management Act (SGMA) exclude an applicant for a new water well who would be a de minimis extractor from the requirements for new wells in critically overdrafted groundwater basins and SGMA-mandated basins.

Furthermore, I declare that I understand that San Diego County Code of Regulatory Ordinances, Title 6, Division 7, Chapter 4, Article 5, Section 67.446 states, "*a permit may be revoked or suspended by the Director if he/she determines that the person to who any permit was issued pursuant to this chapter has obtained the same by fraud or misrepresentation*".

In recognition of the above, I declare that the proposed water well is for domestic purposes and I will not extract more than two acre-feet of water per year.

Signature: Chris Humphries Digitally signed by Chris Humphries DN: cn=Chris Humphries o=Jensen Drilling Company ou email=chris@jensendrilling.com c=US Date: 2019.03.01 09:26:18 -08'00' Date: ____________

*This application is for informational purposes only. It has no bearing on the application approval process.

Surf Cup Property Well Information

Surf Cup #1	
Use	Irregation
Depth (ft bgs)	60?
Diameter (in)	10
Screen interval (ft bgs)	NA
Pumping rate (gpm)	120
Annual Extraction Volume (Estimated acre-ft)	NA Not metered
Measured (acre-ft)	NA
Estimated (acre-ft)	NA
Specific Production Capacity (if available)	NA
Results of Pump Test (if available)	NA

Surf Cup #2	
Use	Irregation
Depth (ft bgs)	110
Diameter (in)	10
Screen interval (ft bgs)	50-110
Pumping rate (gpm)	120
Annual Extraction Volume (Estimated acre-ft)	NA Not metered
Measured (acre-ft)	NA
Estimated (acre-ft)	NA
Specific Production Capacity (if available)	~6 (calculated from DWR log)
Results of Pump Test (if available)	NA

RSF Club Polo No. 1_Abandoned	
Use	Irregation (Abandond)
Depth (ft bgs)	57.2
Diameter (in)	12
Screen interval (ft bgs)	NA
Pumping rate (gpm)	NA
Annual Extraction Volume (acre-ft)	NA
Measured (acre-ft)	NA
Estimated (acre-ft)	NA
Specific Production Capacity (if available)	NA
Results of Pump Test (if available)	NA

RSF Club Polo No. 2_Abandoned	
Use	Irregation (Abandond)
Depth (ft bgs)	98
Diameter (in)	10
Screen interval (ft bgs)	NA
Pumping rate (gpm)	NA
Annual Extraction Volume (acre-ft)	NA
Measured (acre-ft)	NA
Estimated (acre-ft)	NA
Specific Production Capacity (if available)	NA
Results of Pump Test (if available)	NA

County of San Diego
Department of Environmental Health
Land and Water Quality Division
5500 Overland Ave, Suite 210, San Diego, CA 92123
(858) 565-5173
www.sdcdeh.org

STORMWATER & DISCHARGE MANAGEMENT PLAN FOR WATER WELLS

Well Permit Number: LWELL- 002249	Assessor's Parcel Number: 760-146-07-00

GPS Coordinates: (map datum: WGS84, units: HDD) N: 32.98507222 W: -117.21284167

Section 1: Required Information from the Well Driller:

1. Are there any watercourses or water bodies within 50 feet of the limits of soil disturbance? YES ☐ NO ☒
2. Does the plat show the project boundaries? (a "detail inset" is acceptable for a large parcel) YES ☒ NO ☐
3. Does the plat show footprints of any existing structures and facilities within 100 feet of the wellhead position? YES ☒ NO ☐
4. Does the plat show locations where run-off may enter storm drains, drainage courses and/or receiving waters? YES ☒ NO ☐
5. Is grading required to access site or install well? YES ☐ NO ☒
6. Does the project conform to the local grading ordinance? YES ☒ NO ☐
7. Will drilling additives be used to drill the well? YES ☒ NO ☐
8. Are the Best Management Practices attached to this permit application? YES ☒ NO ☐

Section 2: Best Management Practices

The goal of stormwater and discharge control management planning while drilling and installing wells is to reduce pollution to the maximum extent practicable using Best Management Practices (BMPs). Construction related materials, sediments, chemical residues such as drilling foam, wastes, and spills must be retained within the property boundaries to eliminate transport from the site to nearby streets, drainage courses, receiving waters and adjacent properties. It is the responsibility of the property owner and the contractor to determine which BMPs will be used in order to ensure that all contaminants are retained on-site.

Examples of Best Management Practices to contain well installation run-off include, but are not limited to, installation of a sediment basin to contain run-off, using geotextile fabric to contain sediments and drilling mud, or eliminating the use of drilling foam. (Website information is available at www.projectcleanwater.org)

Section 3: Certification- I have read and understand the following: (Please check each box after concurrence.)

☒ Selected BMP's will be implemented so that water quality is not negatively impacted by well construction activities.

☒ I am aware the selected BMP's must be installed, maintained, monitored and revised as necessary so they are effective.

☒ I understand that non-compliance with the San Diego County Watershed Protection Ordinance may result in enforcement actions by the County. These may include fines, citations, stop-work orders, or other actions.

☒ DEH inspectors and personnel from other regulatory agencies are authorized to enter my property at any time for purposes associated with this well permit until such time the well is completed to the satisfaction of DEH.

☒ Should DEH determine during the field review that the well installation procedures contradict this Discharge Management Plan or the well permit application, the well drilling permit may be suspended or revoked. Further activity will require a new permit fee and amendment to the existing permit.

Signatures:

Contractor: [signature] Date 3/1/19

Property Owner: [signature] Date 2/27/19

Reviewed by DEH: Jenna. Postras Date 3/29/19

Olivenhain Well Best Management Practices (BMPs) Guidelines

General

Jensen Drilling Company (JDC) will employ Best Management Practices (BMPs) for Test Well construction activities. Drilling activities shall be conducted in such a way as to prevent the introduction of pollutants to the ground surface or off-site drainages or public rights-of-way during construction. Accordingly, any equipment and/or materials brought to the project area must be managed in accordance with the following procedures:

- Plastic sheeting that is bermed or drip pans will be used to catch leaks and residual material in hoses and spigots under all stationary equipment. The plastic sheeting or drip pans will be checked daily and emptied or replaced as needed by reusing the substance or proper disposal.
- Spilled hazardous materials will be contained immediately using sand, dirt, and/or absorbent materials. Such spills will be cleaned up promptly along with the contaminant material and will be disposed of properly.
- Outdoor storage of all fuels, oils, solvents, cleaners and other liquid materials shall be within secondary containment at either the drilling site or materials storage and staging area. When not immediately in use, materials shall be properly stored and protected at the designated materials storage and staging area, and covered, as necessary, to prevent storm water accumulation in the containment.
- Bentonite, cement, and any other powdered product shall be stored on pallets and away from any drainage path. The storage area should be covered and protected, if necessary, to prevent pollution runoff by wind or storm water.
- Chemicals, bagged material, or drums shall be stored on pallets within secondary containment.

Waste products generated during the drilling/construction work must be managed in accordance with the following procedures and shall not be allowed to mobilize beyond the confines of the work area:

- Containerized waste will not be allowed to overflow. Any waste that requires storage in containers shall be removed from the project areas on a regular basis and disposed of at an approved facility.
- Waste material (i.e., drill cuttings) shall be stored within watertight and covered containers, protected and maintained to prevent runoff of materials to nearby work areas, storm drains, or pubic right-of-way. This may include lining and/or covering of cuttings piles/containers with plastic sheeting to prevent transportation by the forces of wind or water.
- Cleaning of the drilling rigs, tremie pipe and any other equipment shall be conducted only at the designated materials storage and staging area.
- Waste drilling additives or cement must be removed from the project areas prior to completion of the Work.

The use and maintenance of drilling rigs and support vehicles shall be in accordance with the following procedures:

- No fueling of vehicles or equipment that can be moved to a commercial fueling station and filled there is allowed.
- If the vehicles or equipment cannot be filled at a commercial fueling station, fueling will be performed on site at designated areas. During fueling operations, drip pans or bermed plastic sheeting will be used to catch leaks. "Topping off" of fuel tanks is not allowed.
- Maintenance of vehicles will be performed within designated areas. Drip pans will be used during maintenance activities to catch any leaks.
- Daily inspections of drilling rigs and support vehicles and equipment will be made to check for leaks. Any leaks detected shall be reported and fixed immediately.
- All Contractor employees and subcontractors shall be educated in the proper handling and storage of construction materials used during the project.
- All spills shall be soaked up using absorbent materials and disposed of properly at the Contractor's expense. Washing down or burial of spills is not allowed. Any spill, no matter how small, is to be reported.
- If required, steam cleaning of the drilling rigs and support equipment must be carried out within the designated materials storage and staging area. The cleaning area shall be contained to prevent runoff to storm drains. All wastewater generated from cleaning equipment must be containerized and disposed of at the Contractor's expense. Any soap used during cleaning must be phosphate-free and biodegradable.

Disposal of all wastewater and drill cuttings shall be by such manner and to such locations that nuisance or damage to environment, structures, roads, or utilities or interference with other construction projects will be prevented.

Sediment Control

Sediment control is not anticipated to be a significant impact within the project area as the site is in an area covered with asphalt. However, the project will incorporate minimum temporary sediment control requirements and other measures selected by the JDC. Sediment control BMPs consisting of temporary fiber rolls and gravel bag berm will be installed at all appropriate locations along the site perimeter and at all operational internal inlets to the storm drain system. Temporary sediment control materials will be maintained onsite throughout the duration of the project for implementation in the event of predicted rain, rapid response to failures or emergencies, in conformance with other requirements. Should sediment become mobilized to paved area beyond the immediate work area, JDC will employ street sweeping to prevent further mobilization of sediment. Additionally, street sweeping will be employed during soil hauling to keep streets clear of tracked material and debris. Washing of sediment tracked onto streets into storm drains will not occur.

Non-Stormwater Management Pollution Control

Construction site management shall consist of controlling potential sources of water pollution before they come in contact with water systems or watercourses. JDC shall control material pollution and manage waste and non-storm water existing at the construction site by implementing effective handling, storage, use, and disposal practices. Non-Stormwater discharges into drainage systems or waterways, which are not authorized and shall be prohibited.

Several types of vehicles and equipment will be used onsite throughout the project, including drill rigs, trucks and trailers, forklifts, generators, and compressors. Vehicle and Equipment Fueling, and Vehicle and Equipment Maintenance BMPs will be utilized to prevent discharges of fuel and other vehicle fluids. Vehicle cleaning will not be performed onsite.

Aside from the drilling, compressors, and forklifts all wheeled vehicles shall be fueled offsite or at the temporary staging area. Fuel trucks, each equipped with absorbent spill clean-up materials, shall be used for all onsite fueling, whether at the temporary fueling area or for mobile fueling elsewhere. Drip pans shall be used during all mobile fueling. Drip pans or absorbent pads shall be used during all vehicle and equipment maintenance activities that involve grease, oil, solvents, or other vehicle fluids.

Materials Storage and Handling

In general, BMPs shall be implemented to help prevent discharges of construction materials during delivery, storage, and use. The material storage and temporary staging area shall be located within the project site boundary. Watertight containers shall be used to store hand tools, small parts, and most construction materials that can be carried by hand, such as paint cans, solvents and grease.

Stockpile Management shall be implemented to reduce or eliminate pollution of stormwater from stockpiles of soil cuttings. Stockpiles shall be surrounded with sediment controls (i.e., temporary fiber rolls and gravel bag berms) and plastic covers in advance of rainy precipitation.

Sanitary Facilities

Jensen Drilling Company shall implement Sanitary and Septic Waste Management BMPs consisting of portable toilets located and maintained at the drilling site for the duration of the project. Weekly maintenance shall be provided by a professional waste management service and shall be disposed offsite.

State Water Resources Control Board

AUG 27 2018

Ms. Kimberly Thorner
Olivenhain Municipal Water District
1966 Olivenhain Road
Encinitas, CA 92024

AMENDED NOTICE OF APPLICABILITY INCORPORATING GROUNDWATER TEST PROJECT; OLIVENHAIN MUNICIPAL WATER DISTRICT; STATEWIDE GENERAL PERMIT FOR DRINKING WATER SYSTEM DISCHARGES TO WATERS OF THE UNITED STATES

Dear Ms. Thorner:

Thank you for submitting the May 22, 2018 information requesting an amendment to your July 1, 2016 approved coverage under the Statewide Drinking Water Systems Discharge Permit,[1] adopted by the State Water Resources Control Board (State Water Board) in November 2014. The Statewide Drinking Water Systems Discharge Permit provides Clean Water Act regulatory coverage for: (1) discharges resulting from essential operations and maintenance activities of drinking water systems undertaken to comply with the federal Safe Drinking Water Act, California Health and Safety Code, and State Water Board's Division of Drinking Water permitting requirements; and (2) emergency discharges.

Amended Notice of Applicability
The information submitted in the initial August 4, 2015 application package, and the May 22, 2018 amendment information, satisfies the requirements for application of an amended Notice of Applicability. This Amended Notice of Applicability continues to implement regulatory coverage under the Statewide Drinking Water Systems Discharge Permit for the water system described below, effective as of July 1, 2016. This amended Notice of Applicability (NOA) ads discharges from a pilot groundwater test. The original waste discharge identification number of 4DW0412 identifies this amended coverage.

Discharge Description
The Olivenhain Municipal Water District (District) Water System is a community drinking water system with 21,890 connections that serves a population of approximately 82,351 in Carlsbad, Encinitas, San Diego, San Marcos, Solana Beach, and neighboring communities in San Diego County. The source of water for the system is treated surface water and purchased treated water from the San Diego County Water Authority.

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[1] Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for Drinking Water System Discharges to Waters of the United States; State Water Board Order 2014-0194-DWQ (see http://www.waterboards.ca.gov/water_issues/programs/npdes/docs/drinkingwater/final_statewide_wqo2014_0194_dwq.pdf)

The District plans to conduct a pilot groundwater test project to assess groundwater quality as a future drinking water supply source. The pilot groundwater test project is the second phase of the San Dieguito Valley Brackish Groundwater Desalination Study. The pilot project includes exploratory well boring(s), testing the well construction, conducting a long-term pump test, and piloting the manganese pretreatment system. The pump test will be operated at up to 600 gallons per minute for up to a 10-month duration. During dry-weather months, the majority of water from the pump test will be provided to large irrigation customers in the adjacent vicinity, such as the Surf Cup Soccer Fields. During wet weather months when irrigation demands are minimal, pump test water may be discharged to a drainage swale that is tributary to the San Dieguito River. Other waterbodies that the District's system discharges into include Encinitas Creek, Escondido Creek, Lusardi Creek, San Elijo Lagoon, and San Marcos Creek. Solids from testing procedures will be disposed of at the local water reclamation facility.

Some of the receiving waterbodies are tributary to the Pacific Ocean Shoreline within the San Dieguito Hydrologic Unit. There are applicable total maximum daily loads for the bacteria indicators of E. coli, enterococci, and fecal coliforms in the Pacific Ocean Shoreline of the San Dieguito HU. The supplemental monitoring data submitted with the Application Package demonstrates that discharges from the system do not contribute to the impairment of the Pacific Ocean Shoreline in the San Dieguito Hydrologic Unit.

General Requirements
To comply with the Statewide Drinking Water Systems Discharge Permit, the District shall:

a. Establish and implement appropriate best management practices.

b. Ensure that all planned discharges comply with the terms and requirements of the Statewide Drinking Water Systems Discharge Permit including applicable effluent limitations for chlorine residual and turbidity.

c. Take all necessary steps to review and update the effectiveness and adequacy of the control measures and best management practices.

d. Keep control measures and best management practices plan updated and available onsite for all system operators.

e. Conduct monitoring and reporting in compliance with the provisions and requirements in the Monitoring and Reporting Program, Attachment E of the Statewide Drinking Water Systems Discharge Permit.

f. Maintain self-monitoring reports including compliant and non-compliant discharge monitoring information at the system's main office and make them available upon request of State Water Board and San Diego Regional Water Quality Control Board (San Diego Water Board) staff.

g. Submit an annual report and all reporting information required by the Monitoring and Reporting Program to the following address:

State Water Resources Control Board
Division of Water Quality
NPDES Wastewater Unit
1001 I Street, 15th Floor
Sacramento, CA 95814

Include the following certification in the annual monitoring report:

"I certify under penalty of law that this document and all enclosures were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

If you prefer to submit an electronic copy of the report, you can do so by sending it to the following e-mail: DMR@waterboards.ca.gov and title the e-mail "DWS No. 3710029 Annual Report."

h. Notify the San Diego Water Board per notification requirements in the Statewide Drinking Water Systems Discharge Permit's Monitoring and Reporting Program. The staff contact at the San Diego Water Board is Mr. Ben Neill who may be contacted at (619) 521-3376 or Ben.Neill@waterboards.ca.gov.

Previous Permitting Coverage
Based on your application package and staff review of the California Integrated Water Quality System database, the District's Water System no longer has previous regulatory coverage for its discharges under any San Diego Water Board order.

If you have any questions regarding this Notice of Applicability or the Statewide Drinking Water Systems Discharge Permit, please contact Mr. Renan Jauregui in the NPDES Wastewater Unit of the Division of Water Quality at (916) 341-5505 or renan.jauregui@waterboards.ca.gov.

Sincerely,

Karen Mogus

Karen Mogus, Deputy Director
Division of Water Quality

cc: Next Page

cc: [via email]

Pascal Mues
NPDES Permits Office
U.S. EPA Region 9, WTR-5
75 Hawthorne Street
San Francisco, CA 94105
Mues.pascal@epa.gov

Brandi Outwin-Beals, Senior Water Resource Control Engineer
San Diego Regional Water Quality Control Board
2375 Northside Drive, #100
San Diego, CA 92108
Brandi.Outwin-Beals@waterboards.ca.gov

Ben Neill, Water Resource Control Engineer
San Diego Regional Water Quality Control Board
2375 Northside Drive, #100
San Diego, CA 92108
Ben.Neill@waterboards.ca.gov

OLIVENHAIN
Municipal Water District

May 22, 2018

Mr. Renan Jauregui
State Water Resources Control Board
Division of Water Quality
NPDES Unit, 15th Floor
P.O. Box 100
Sacramento, CA 95812-0100

VIA EMAIL: renan.jauregui@waterboards.ca.gov

Subject: NOI Amendment under Statewide NPDES Permit for Drinking Water System Discharges Order 2014-0194-DWQ – Olivenhain Municipal Water District

Dear Mr. Jauregui,
Pursuant to our discussion on April 18, 2018, Olivenhain Municipal Water District (OMWD) is seeking coverage under the Statewide NPDES Permit for Drinking Water System Discharge Order 2014-0194-DWQ to be amended to include the pilot groundwater test project.

The pilot groundwater test project is the second phase of the San Dieguito Valley Brackish Groundwater Desalination Study. OMWD recently completed the Feasibility Study in December 2017 in partnership with California Department of Water Resources (DWR) funding to analyze extracting 1.2 million gallons per day (mgd) of brackish groundwater in the San Dieguito Valley groundwater basin. The next phase of the study, also in partnership with DWR funding, is to pilot the well with exploratory boring(s), test well construction, a long-term pump test, and pilot the manganese pretreatment system. Solids from the pre-treatment system testing will be collected and disposed of at the local water reclamation facility. The pump test is proposed at 600 gallons per minute (gpm) for up to a 10-month duration.

The vast majority of discharge flows from the test well will be used beneficially by large irrigation customers in the adjacent vicinity. OMWD has been working with Surf Cup Soccer Fields in preparation for this project. Demands for Surf Cup Soccer Fields peak at 1,200 gpm in dry-weather months and they have committed to irrigating as much as possible to minimize discharges outside their property. However, during the wet weather seasonality when irrigation demands are minimal, the well test flows may need to be discharged. See Attachment 1 for potential irrigation demand seasonality and likelihood of discharge. Analysis estimates up to 61 acre-feet (AF) could be discharged in a wet-weather month based on 2017 historic precipitation and local evapotranspiration values. 72% of flows will be used for beneficial irrigation. Any discharge will need to comply with chlorine and turbidity levels as well as manage erosion.

OMWD has developed a comprehensive approach to ensure compliance year round for this test well project:

a. Expected duration of discharge: In wet-weather months (October-March), up to 61 AF/month for peak month. 72% of flows will be used for beneficial irrigation. During dry-weather months, zero discharge will be expected to occur.

b. Monitoring and sampling frequency: OMWD will complete weekly sampling at the discharge to verify chlorine levels less than 0.019 mg/L and turbidity less than 100 NTU. Compliance point shall be at end of pipe as shown in Attachment 2. Water quality will also be sampled daily at the wellhead as part of the test pilot work. Flow volume will be monitored at wellhead, at turnout to beneficial use(s), and at discharge to compliance point. As part of weekly sampling, discharge flowrate to creek will be visually estimated, if any, and documented. In the event sampling indicates exceedance of allowed limits, the well can be shut down and retested until compliance is confirmed. Attachment 3 provides a summary of sampled groundwater quality in the San Dieguito Valley Basin.

c. Amount of discharge that would go to beneficial reuse: See Attachment 1 for chart showing seasonal demand. Estimate 72% of flows to beneficial irrigation uses.

d. Circumstance when it would go directly to the creek via drainage system: In a wet weather event when there is zero irrigation demand possible, flows would be discharged to the drainage swale. Assuming drainage swale is flowing at full capacity, discharge from the well would reach the creek after traveling through the 1,200-foot long drainage swale.

e. Appropriate BMPs:

   1) Well development will take 4 days with a total of 5.8 AF produced over the 4 day development period. This flow, that may be high in turbidity, will not be discharged to the creek. All flows during well development will be utilized for beneficial use. This will be accomplished by scheduling well development during peak dry-weather months and working with the local irrigation users to make sure they can accommodate all flows during well development.

   2) If flows are discharged in a wet-weather event, flows will enter the onsite drainage swale. Chlorine and turbidity will still be sampled at the pipe end (compliance point).

      (a) If turbidity exceeds 100 NTU at the monitoring compliance point and the drainage swale is submerged, the well will be shut off until compliance is confirmed.

      (b) If turbidity exceeds 100 NTU at the monitoring compliance point and the drainage swale is not submerged, the well will continue to operate and sampling increased to daily being taken at swale discharge to the creek to verify turbidity levels less than 100 NTU. If no flows are leaving the drainage swale, no additional sampling is required.

f. Map or schematic of the location of the project and discharge: See Attachment 2.

g. Location map in reference to the entire water system boundaries: See Attachment 4.

We appreciate your consideration of this amendment request and look forward to discussing the project further with you. Please contact Joey Randall, OMWD Assistant General Manager, at 760-753-6466 with any questions or for additional information.

Sincerely,

Kimberly A Thorner

Kimberly A. Thorner
General Manager

Attachments:

-- Notice of Intent
1. Planned beneficial use of well supply vs discharge
2. Map of proposed project and compliance point for sampling
3. Groundwater quality table
4. Location map with OMWD boundaries

The City of SAN DIEGO

Development Services Department
Engineering Division
1222 First Avenue, 5th Floor
San Diego, CA 92101-4101
Tel (619) 446-5152

NOISE PERMIT APPLICATION

Counter Service Hours: 8:00 AM - 3:00 PM Monday through Thursday.
10:00 AM - 3:00 PM Friday
For Your Appointment Call: (619) 446-5152

JOB LOCATION: 14989 Via de la Valle, San Diego, CA 92014

Address Zip Code

START DATE: May 13, 2019 **END DATE:** May 17, 2019

FROM: 7:00 AM **TO:** 6:59 AM

DESCRIPTION OF CONSTRUCTION TYPE: Operation of the temporary groundwater pilot well during constant rate pump test over a 24-hour period. During one (1) night, generator will be run to power the test well pump. Noise levels will be limited to 65-dBA at 23-feet.

NOISE SOURCE (Construction equipment, jack hammer, etc.):

Generator, crew trucks

Applicant's Name *(Please print):* Joey Randall, Assistant General Manager

Name of Company or Organization: Olivenhain Municipal Water District

Applicant Address: 1966 Olivenhain Road Encinitas, CA 92024

City, State and Zip Code

Daytime Phone: (760) 230-2572 Evening Contact: (760) 632-4648

Email Address: JRandall@olivenhain.com

Applicant Signature Today's Date

Please mail this application or drop it off at our office located at 1222 First Avenue, 5th Floor, San Diego, CA 92101. We will notify you when the permit is ready for pick-up. The fee is $~~149.00~~162.36. Make Checks payable to the City Treasurer.

Complete this portion of the application if your construction job site is in a residential area and will affect others. **For construction between 7:00 PM and 7:00 AM, all residents within 500 feet of the job site** are to sign the application below and indicate if they AGREE or DISAGREE with the issuance of a Noise Permit for the specified job. **Please include a color map marking the 500 foot radius.** Attach additional page(s) if necessary.

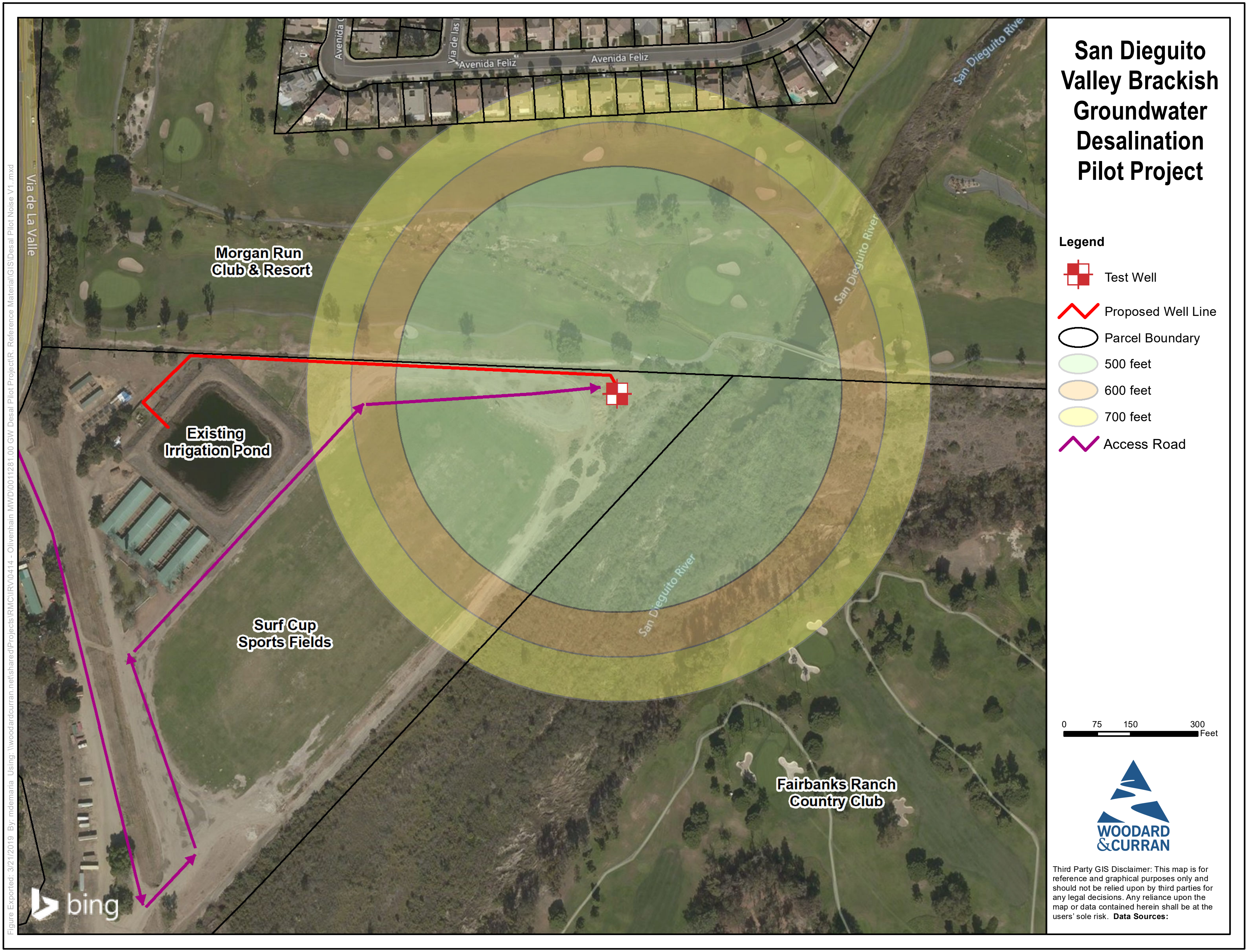
Event Description	Start Date	End Date	From	To
Temporary groundwater pilot well operation	5/13/19	5/17/19	7:00 AM	6:59 A.M

The following residents are within 700 feet of the job site; see map attached.

Name	Address	Phone	Agree or Disagree
	3797 Avenida Feliz		notified
	3805 Avenida Feliz		notified
	3811 Avenida Feliz		notified
	3817 Avenida Feliz		notified
	3823 Avenida Feliz		notified
	3829 Avenida Feliz		notified
	3835 Avenida Feliz		notified
	3841 Avenida Feliz		notified
	3847 Avenida Feliz		notified
	3853 Avenida Feliz		notified
	3859 Avenida Feliz		notified
	3865 Avenida Feliz		notified

I certify that the above signatures are valid and that they represent all affected properties within a 500 foot radius of the construction site.

______________________________________ Signature of Applicant



San Dieguito Valley Brackish Groundwater Desalination Pilot Project
Legend
Test Well
Proposed Well Line
Parcel Boundary
500 feet
600 feet
700 feet
Access Road
0 75 150 300 Feet
WOODARD &CURRAN
Third Party GIS Disclaimer: This map is for reference and graphical purposes only and should not be relied upon by third parties for any legal decisions. Any reliance upon the map or data contained herein shall be at the users' sole risk. Data Sources:
Morgan Run Club & Resort
Existing Irrigation Pond
Surf Cup Sports Fields
Fairbanks Ranch Country Club
San Dieguito River
San Dieguito River
San Dieguito River
Avenida Feliz
Avenida Feliz
Via de las
Via de La Valle
bing
Figure Exported: 3/21/2019 By: mdemaria Using: \\woodardcurran.net\shared\Projects\RMC\IRV\0414 - Olivenhain MWD\0011281.00 GW Desal Pilot Project\R. Reference Material\GIS\Desal Pilot Noise V1.mxd

APPENDIX C

Desalter Test Well

Chronology of Construction and Testing & Long-Term Pumping Test

GEOSCIENCE

Desalter Test Well Construction and Long-Term Pumping Test Chronology

Date(s)	Desalter Test Well Construction Phases and Long-Term Pumping Test Events
September 6 through September 12, 2018	Exploratory Borehole (EX-1) Drilling and Backfilling (Lithology used to create Desalter Test Well Design)
April 1 to April 17, 2019	Set up, Conductor Install & Pilot Borehole Drilling to 165 ft bgs
April 18, 2019	Pilot Borehole Geophysical Logs
April 19, 2019	Installation of 18-inch Well Screen, Well Casing, and Filter Pack
April 22, 2019	Installation of Sanitary Seal
April 23 through April 29, 2019	Initial Development by Swabbing and Airlifting
May 1, 2019	Installation of Test Pump
May 2 through May 17, 2019	Well Development
May 20, 2019	Transducer Installation
May 20, 2019	Step-Drawdown Pumping Test
May 21 through May 22, 2019	1-Day Constant Rate Pumping Test and 4-Hour Recovery Test
May 22, 2019	Desalter Test Well Water Quality Sampling
May 23, 2019	Desalter Test Well Video Survey & Gyroscopic Survey
September 10, 2019	Reinstallation of Desalter Test Well Transducer
September 10, 2019	First Round of Monitoring Network Transducer Installations
November 19, 2019	Second Round of Monitoring Network Transducer Installations
December 4, 2019	Start of Long-Term Pumping Test
April 21, 2020	First Quarterly Water Quality Sampling Event
May 5, 2020	Desalter Test Well Flow Tests
May 6, 2020	Desalter Test Well Pump Off due to Installtion of Secondary 6-inch flowmeter
May 13 through May 18, 2020	Desalter Test Well Pump Off due to Leaky Discharge Pipe
June 1 through June 5, 2020	Manganese Pre-Treatment System Test
September 16, 2020	Second Quarterly Water Quality Sampling Event
October 27, 2020	Desalter Test Well Pump Off due to Cleaning of Iron and Manganese fouling from Flowmeter 2
December 1, 2020	Third Quarterly Water Quality Sampling Event
December 2, 2020	End of Long-Term Pumping Test
March 9, 2021	Permanent Pump Installation and Test

APPENDIX D

Desalter Test Well

Borehole Lithologic and Well Construction Log

GEOSCIENCE
The First Name in Groundwater
P.O. Box 220
Claremont, CA 91711
Telephone: (909) 451-6650
Fax: (909) 451-6638
www.gssiwater.com

Appendix D

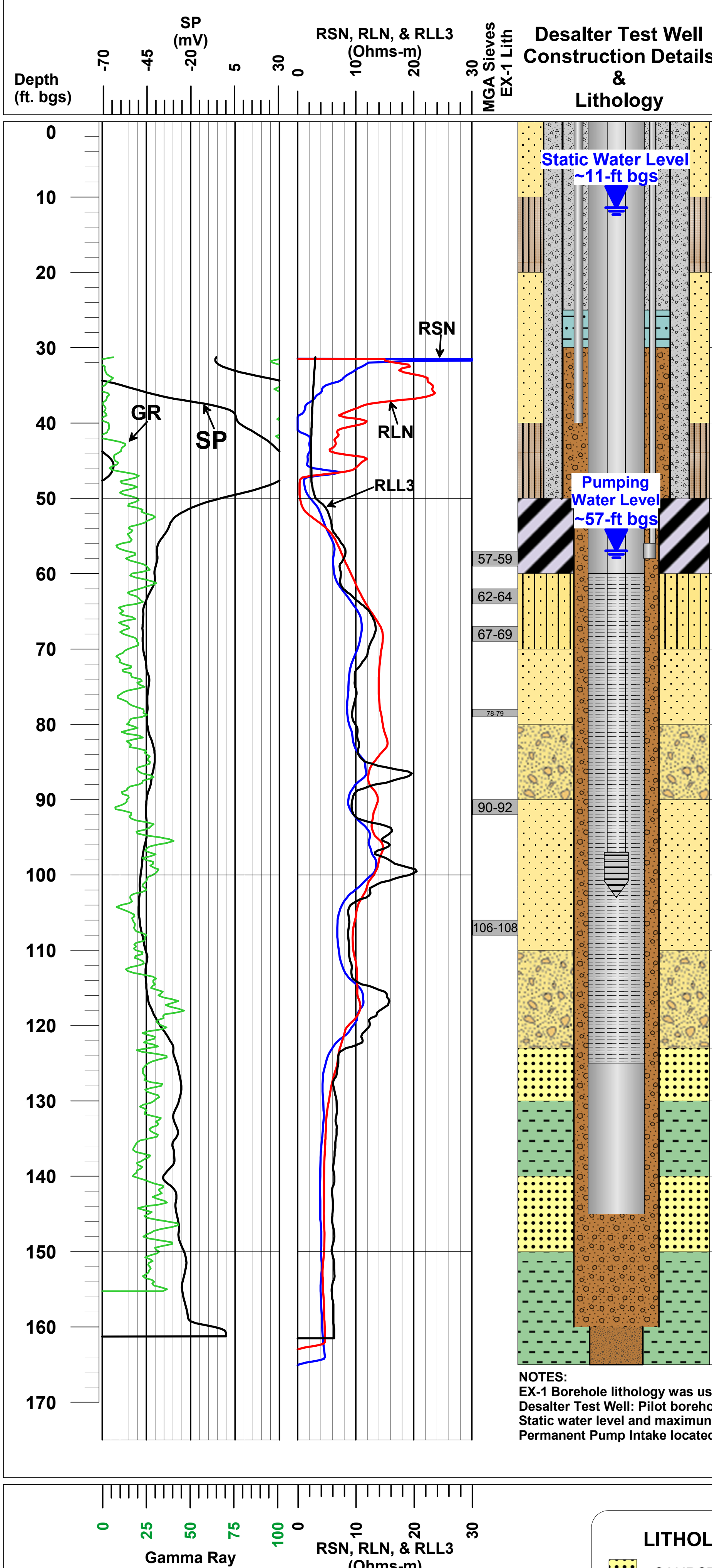
Desalter Test Well Borehole Lithologic & Well Construction Log
Olivenhain Municipal Water District (OMWD)
Report of Design Pilot Testing for the San Dieguito Valley
Brackish Groundwater Desalination Project

WELL NUMBER: OMWD Desalter Test Well
CLIENT: Olivenhain Municipal Water District
PROJECT NUMBER: 16051-18
REPORT DATE: June-21

LOCATION: Surf Cup Sports Park at 14989 Via De La Valle, Del Mar, California
DRILLING CONTRACTOR: Jensen Drilling Company
DRILLING METHOD: Fluid Reverse Circulation Rotary
DRILLER: Mike Brown & Sam Mingo **LOGGED BY:** Logan Wicks

SAMPLING METHOD: Grab
BOREHOLE DIAMETER: 48 IN, 35.25 IN, 28 IN
SURFACE ELEVATION: 28 ft amsl
DRILLING BEGIN/END DATES: 04/09/2019 - 05/23/2019

CASING SECTION	TOP DEPTH (ft bgs)	BOTTOM DEPTH (ft bgs)	LENGTH (ft)	MATERIAL	WALL THICKNESS (in)	DIAMETER (in)	SCREEN TYPE	PERF. SIZE (in)
Conductor	+0.5	50	50.5	ASTM A139 Grade B Mild Steel	0.375	36/OD	-	-
Blank	+2.5	60	57.5	Super Duplex 2507	0.250	18/ID	-	-
Screen	60	125	65	Super Duplex 2507	0.250	18/ID	Ful-Flo Louvered	0.050
End Cap	125	145	20	Super Duplex 2507	0.250	18/ID	-	-



Lithologic Descriptions

Note: Grain size distribution percentages are approximate. Material code (e.g. SP) reference United Soil Classification visual method. Color code (e.g. 10YR 5/2) reference Munsell Soil Color Charts

Depth (ft bgs)	Description
0–10	SAND (SP): dark olive brown (2.5Y 3/3); 100% fine-coarse, subangular-subrounded sand; trace silt; contains quartz, feldspar, and mica; loose, moist, mottled, micaceous. Top 5 ft is soft fill material.
10–20	SANDY SILT (ML): dark olive brown (2.5Y 3/3); 45% non to low plasticity silt; 40% medium-coarse, subangular-subrounded sand; 5% clay; contains quartz, feldspar, and mica; micaceous.
20–30	SAND (SP): black (2.5Y 2.5/1); 95% fine grained sand; 5% silt; trace clay; contains quartz, feldspar, and mica; micaceous.
30–40	SAND (SP): black (2.5Y 2.5/1); 100% fine grained sand; trace silt; contains quartz, feldspar, and mica; micaceous.
40–50	SANDY SILT (ML): black (2.5Y 2.5/1); 45% non to low plasticity silt; 55% fine grained sand; trace clay; contains quartz, feldspar, and mica; micaceous, shell fragments at ~45 ft bgs.
50–60	FAT CLAY (CL): black (2.5Y 2.5/1); 90% low to medium plasticity clay; 10% fine grained sand; trace silt; contains quartz, feldspar, and mica; micaceous, shell fragments.
60–70	SAND WITH SILT (SP-SM): black (2.5Y 2.5/1); 90% fine-medium grained sand; 10% silt; trace clay; contains quartz, feldspar, and mica; micaceous, shell fragments, trace clay balls.
70–80	SAND (SP): very dark grayish brown (2.5Y 3/2); 95% fine-coarse, subangular-subrounded sand; 5% silt; trace fine-coarse, subangular-subrounded gravel up to 47mm; trace clay; contains quartz, feldspar, and mica; micaceous, shell fragments, trace clay balls.
80–90	GRAVEL (GP): very dark grayish brown (2.5Y 3/2); 90% fine-coarse, subangular-subrounded gravel up to 6-inches; 5% fine-coarse, subangular-subrounded sand; 5% silt; trace clay; contains quartz, feldspar, and mica; micaceous, shell fragments, trace clay bal
90–100	SAND WITH GRAVEL (SP): very dark grayish brown (2.Y 3/2); 70% fine-coarse, subangular-subrounded sand; 30% fine-coarse, subangular-subrounded gravel up to 46mm; trace silt; trace clay; contains quartz, feldspar, and mica; trace shell fragments, trace clay
100–110	SAND (SP): olive gray (5Y 4/2); 90% fine-coarse, subangular-subrounded sand; 5% fine grained, subangular-subrounded gravel up to 17mm; 5% silt; trace clay; contains quartz, feldspar, and mica.
110–120	GRAVEL WITH SAND (GP): olive gray (5Y 4/2); 60% fine-coarse, subangular-subrounded gravel up to 48mm; 40% fine-coarse, subangular-subrounded sand; trace silt; trace clay; contains quartz, feldspar, and mica; micaceous, freshly broken cobbles.
120–127	SED ROCK (SANDSTONE): greenish gray (5GY 5/1); medium grained sand, moderately bedded, decomposed, very soft, saturated, bands of more yellowish sandstone; highly weathered.
127–140	SED ROCK (MUDSTONE): greenish gray (5G 5/1); thickly bedded, slightly weathered, very hard, moist, red and yellow laminations of clay.
140–150	SED ROCK (SANDSTONE): greenish gray (5G 5/1); very thickly bedded, moderately weathered, moderately hard, wet, bands of yellowish sandstone.
150–165	SED ROCK (MUDSTONE): greenish gray (5G 5/1); massive, slightly weathered, hard, dry.

NOTES:
EX-1 Borehole lithology was used for Desalter Test Well Design.
Desalter Test Well: Pilot borehole to 165 ft bgs. Reamed borehole to 160 ft bgs.
Static water level and maximun Pumping water level are from Constant Rate Test perfomed May 21 to 22, 2019.
Permanent Pump Intake located at 103 ft bgs.

LITHOLOGY KEY
- SANDSTONE
- MUDSTONE
- ML
- SP-SM
- SP
- CH
- GP

CONSTRUCTION DESIGN KEY
- Backfill
- Bentonite
- Blank Casing
- Concrete
- End Cap
- Filter Pack
- Gravel Tube
- Pump
- Pump Column
- Screen
- Sounding Tube
- Sounding Tube Box
- Conductor

Note: Well Schematic is for Illustration purposes only.
For actual well as-built see Construction Sheets for more details.

APPENDIX E

Desalter Test Well

Geophysical Borehole Logs, Caliper Log, Gyroscopic Survey, and Video Survey DVDs

GEOSCIENCE

PACIFIC SURVEYS

ELECTRIC LOG
LATEROLOG 3
GAMMA-RAY

Job No. 25439	Company	JENSEN DRILLING COMPANY
	Well	OMWD SAN DIEGUITO DESALTER TEST WELL
	Field	DEL MAR
File No.	County	SAN DIEGO State CA

Location:

NEAR 14955 VIA DE LA VALLE
GPS: 32.9853 -117.2128

Sec. Twp. Rge.

Other Services:

LL3/GR
SNC/VDL

Permanent Datum	G.L.	Elevation	Elevation
Log Measured From	G.L. 0'	above perm. datum	K.B.
Drilling Measured From	G.L.		D.F.
			G.L.

Date	04/18/2019		
Run Number	ONE		
Depth Driller	165'		
Depth Logger	165'		
Bottom Logged Interval	165'		
Top Log Interval	30'		
Casing Driller	36" @ 50'		
Casing Logger	50'		
Bit Size	17.5"		
Type Fluid in Hole	EASY MUD		
Density / Viscosity	8.75 / 36		
pH / Fluid Loss	8.5 / 13		
Source of Sample	PIT		
Rm @ Meas. Temp	3.60 @ 58.4 F		
Rmf @ Meas. Temp	3.33 @ 58.4 F		
Rmc @ Meas. Temp	N/A		
Source of Rmf / Rmc	MEASURE		
Rm @ BHT	N/A		
Time Circulation Stopped	8:42 PM		
Time Logger on Bottom	12:15 AM		
Max. Recorded Temperature	N/A		
Equipment Number	PS-10		
Location	LA		
Recorded By	E. AFOH		
Witnessed By	E. HERNANDEZ		

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Comments

Calibration Report

Database File	25439.db
Dataset Pathname	elog1.1
Dataset Creation	Thu Apr 18 01:18:55 2019

ELOG Calibration Report

Serial:	PS_10
Model:	DTQ
Shop Calibration Performed:	Fri May 04 13:28:36 2018
Before Survey Verification Performed:	Fri May 04 13:30:37 2018
After Survey Verification Performed:	Fri May 04 13:31:06 2018

Shop Calibration

	Readings			References			Results	
	Zero	Cal		Zero	Cal		Gain	Offset
Short	0.689	51.211		0.500	50.000	Ohm-m	0.980	-0.176
Long	2.520	205.133		2.000	200.000	Ohm-m	0.977	-0.463
IEE	32.360	7355.900	counts	0.035	8.050	A		
VSN	94.540	8338.720	counts	1.803	159.051	V		
VLN	10.280	2095.160	counts	0.196	39.963	V		

Before Survey Verification

	Readings			References			Results	
	Zero	Cal		Zero	Cal		Gain	Offset
Short	278.454	100.945		260.034	100.899	Ohm-m	0.896	10.403
Long	149.317	101.496		113.102	101.406	Ohm-m	0.245	76.582
IEE	31.140	7360.440	counts	0.034	8.055	A		
VSN	97.420	8347.680	counts	1.858	159.222	V		
VLN	13.060	2098.300	counts	0.249	40.023	V		

After Survey Verification

	Readings			References			Results	
	Zero	Cal		Zero	Cal		Gain	Offset
Short	279.744	100.952		278.454	100.945	Ohm-m	0.993	0.717
Long	167.157	101.542		149.317	101.496	Ohm-m	0.729	27.490
IEE	31.480	7364.160	counts	0.034	8.059	A		
VSN	98.940	8352.460	counts	1.887	159.313	V		
VLN	14.780	2100.320	counts	0.282	40.061	V		

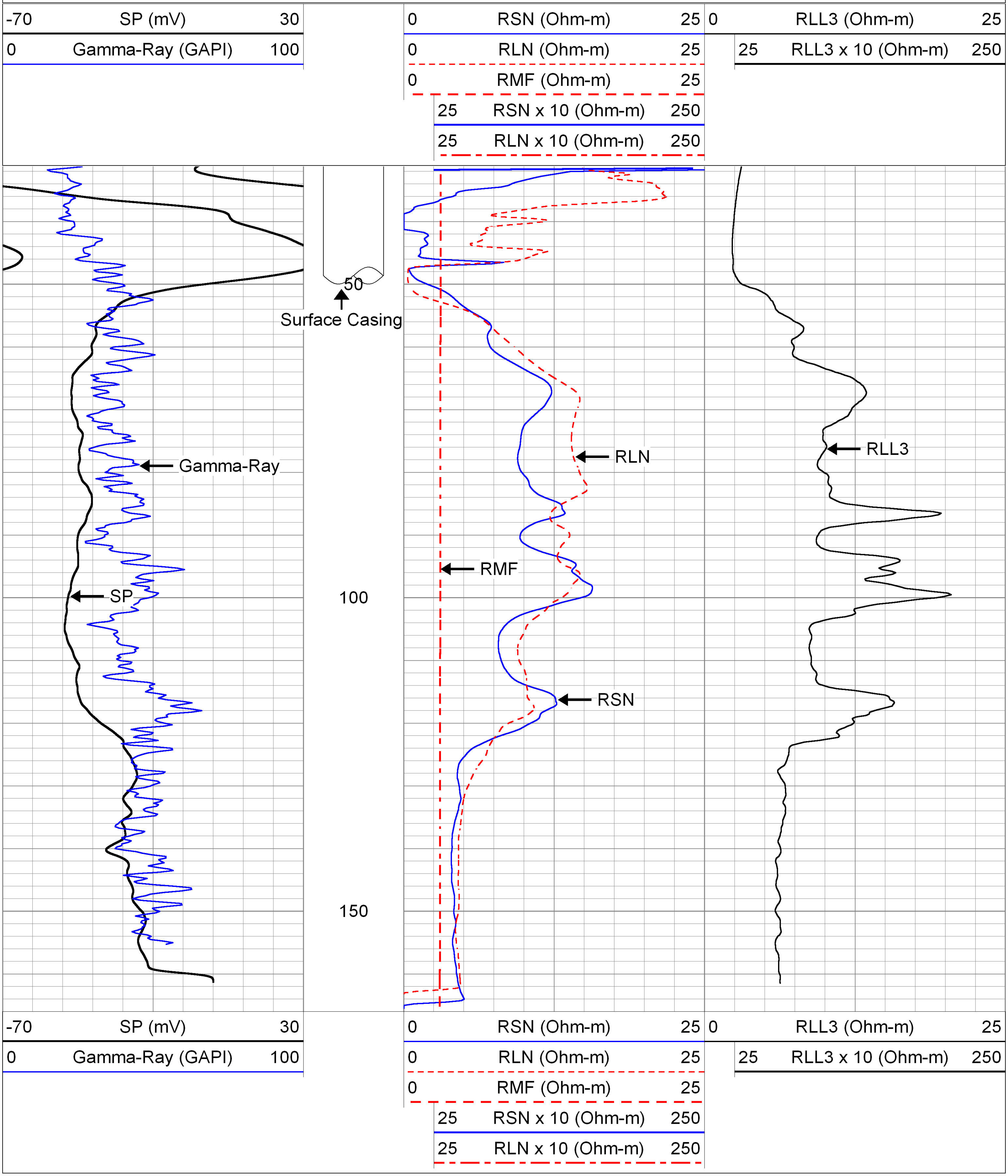
After Survey Verification compared to Before Survey Calibration

	Zero			Cal		
	Before	After		Before	After	
Short	260.034	278.454	Ohm-m	100.899	100.945	Ohm-m
Long	113.102	149.317	Ohm-m	101.406	101.496	Ohm-m

Gamma Ray Calibration Report

Serial Number:	D4	
Tool Model:	ELOG	
Performed:	Mon Nov 06 17:17:41 2017	
Calibrator Value:	162.0	GAPI
Background Reading:	101.7	cps
Calibrator Reading:	326.7	cps
Sensitivity:	0.7200	GAPI/cps

Database File	25439.db
Dataset Pathname	elog1.1
Presentation Format	elog_cwa
Dataset Creation	Thu Apr 18 01:18:55 2019
Charted by	Depth in Feet scaled 1:240



Log Variables DatabaseC:\ProgramData\Warrior\Data\25439.db

Log Variables

Dataset field/well/run1/elog1.1/_vars_

Top - Bottom

BOREID in	BOTTEMP degF	CASEOD in	CASETHCK in	PERFS	RM_MEAS_R Ohm-m	RM_MEAS_T degF
17.5	65.68	0	0	0	3.6	58.4

RMF Ohm-m	RSH Ohm-m	SPSHIFT mV	SRFTEMP degF	TDEPTH ft	TempGrad DegF/ft
3.33	20	0	63.65	165	0.01235

PACIFIC SURVEYS

LATEROLOG 3 GAMMA-RAY

Job No.	25439
File No.	
Company	JENSEN DRILLING COMPANY
Well	OMWD SAN DIEGUITO DESALTER TEST WELL
Field	DEL MAR
County	SAN DIEGO
State	CA
Location:	NEAR 14955 VIA DE LA VALLE GPS: 32.9853 -117.2128
Other Services:	ELOG SNC/VDL
Sec.	Twp. / Rge.
Permanent Datum	G.L. — Elevation
Log Measured From	G.L. 0' above perm. datum
Drilling Measured From	G.L.
Elevation	K.B. / D.F. / G.L.

Date	04/18/2019		
Run Number	ONE		
Depth Driller	165'		
Depth Logger	165'		
Bottom Logged Interval	165'		
Top Log Interval	30'		
Casing Driller	36" @ 50'		
Casing Logger	50'		
Bit Size	17.5"		
Type Fluid in Hole	EASY MUD		
Density / Viscosity	8.75 / 36		
pH / Fluid Loss	8.5 / 13		
Source of Sample	PIT		
Rm @ Meas. Temp	3.60 @ 58.4 F		
Rmf @ Meas. Temp	3.33 @ 58.4 F		
Rmc @ Meas. Temp	N/A		
Source of Rmf / Rmc	MEASURE		
Rm @ BHT	N/A		
Time Circulation Stopped	8:42 PM		
Time Logger on Bottom	12:15 AM		
Max. Recorded Temperature	N/A		
Equipment Number	PS-10		
Location	LA		
Recorded By	E. AFOH		
Witnessed By	E. HERNANDEZ		

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Comments

Calibration Report

Database File	25439.db
Dataset Pathname	ll3
Dataset Creation	Thu Apr 18 00:41:28 2019

Gamma Ray Calibration Report

Serial Number:	12	
Tool Model:	GROH	
Performed:	Tue Sep 08 16:48:35 2015	
Calibrator Value:	162.0	GAPI
Background Reading:	54.1	
Calibrator Reading:	193.3	
Sensitivity:	1.1641	GAPI/

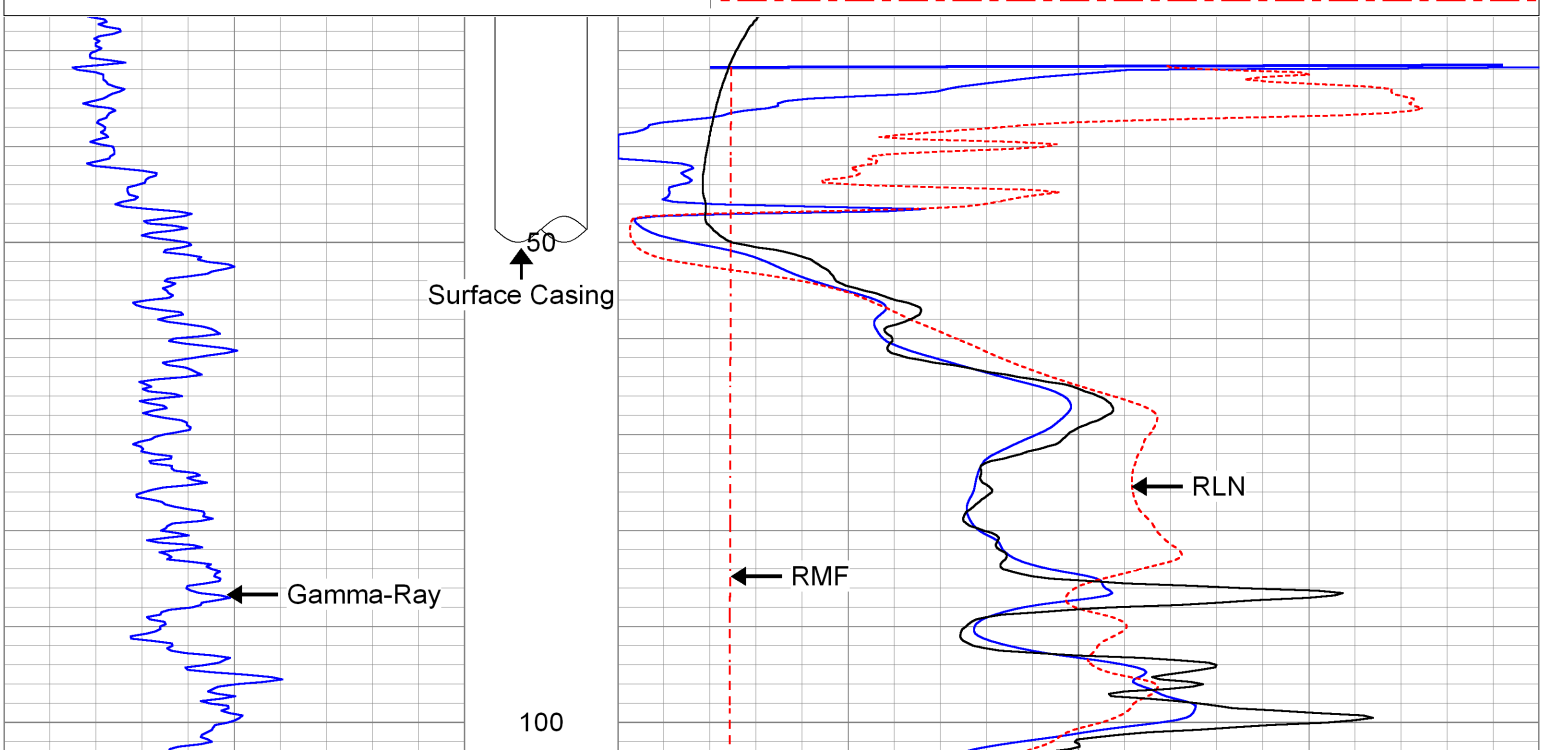
RLL3 (Resistivity Laterolog 3) Calibration Report:

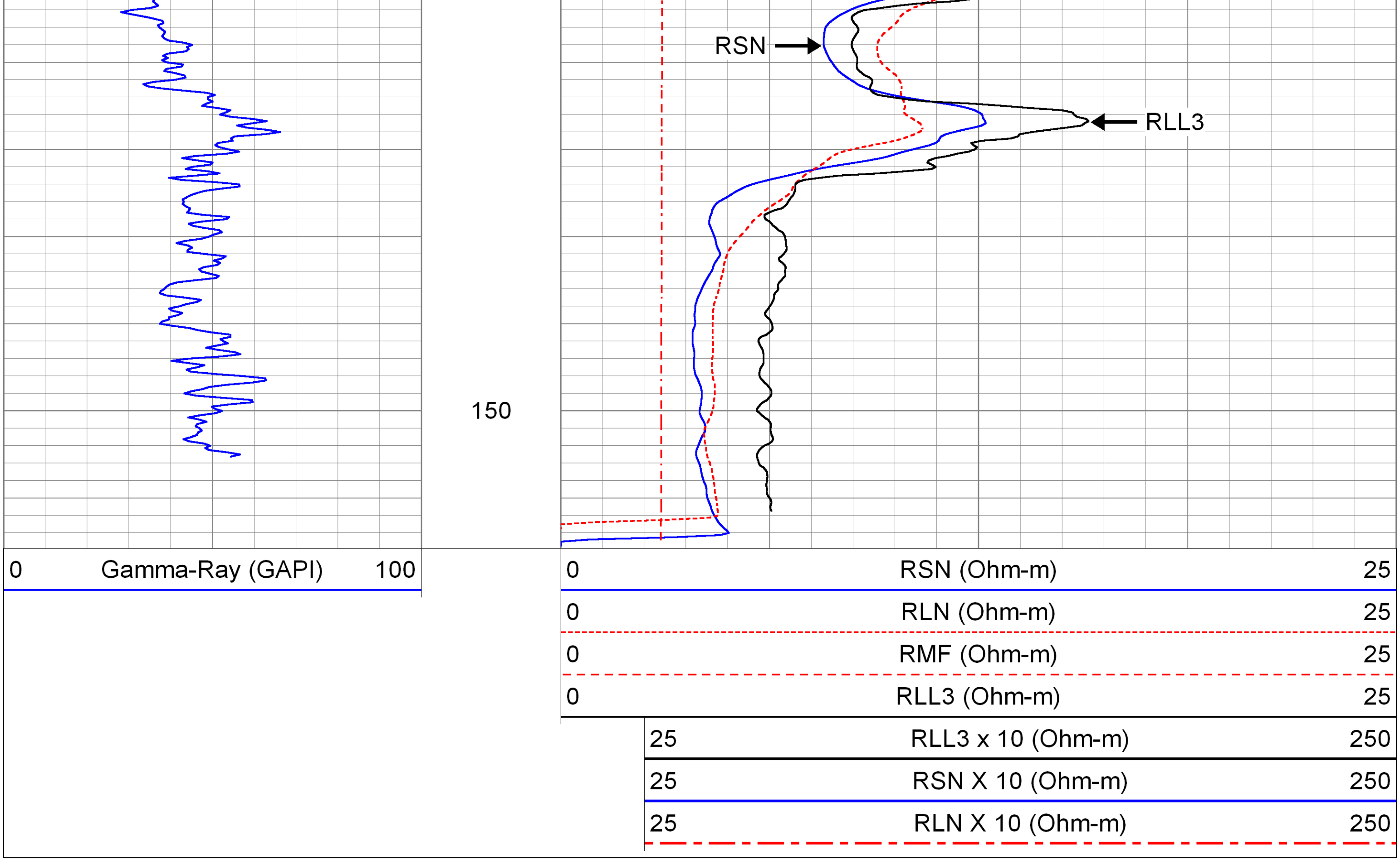
Serial Number:	883
Tool Model:	M&W
Performed:	Mon Nov 13 11:43:06 2017

System Reading	Calibration Reference	
0.013	2.500	Ohm-m
0.022	5.000	
0.212	50.000	
1.063	250.000	
2.139	500.000	

Database File	25439.db
Dataset Pathname	ll3
Presentation Format	guard
Dataset Creation	Thu Apr 18 00:41:28 2019
Charted by	Depth in Feet scaled 1:240

0	Gamma-Ray (GAPI)	100
0	RSN (Ohm-m)	25
0	RLN (Ohm-m)	25
0	RMF (Ohm-m)	25
0	RLL3 (Ohm-m)	25
25	RLL3 x 10 (Ohm-m)	250
25	RSN X 10 (Ohm-m)	250
25	RLN X 10 (Ohm-m)	250





Log Variables

DatabaseC:\ProgramData\Warrior\Data\25439.db
Dataset field/well/run1/elog1.1/_vars_

Top - Bottom

BOREID	BOTTEMP	CASEOD	CASETHCK	PERFS	RM_MEAS_R	RM_MEAS_T
in	degF	in	in		Ohm-m	degF
17.5	65.68	0	0	0	3.6	58.4
RMF	RSH	SPSHIFT	SRFTEMP	TDEPTH	TempGrad	
Ohm-m	Ohm-m	mV	degF	ft	DegF/ft	
3.33	20	0	63.65	165	0.01235	

PACIFIC SURVEYS

SONIC VELOCITY
VARIABLE DENSITY

Job No. 25439	Company	JENSEN DRILLING COMPANY
	Well	OMWD SAN DIEGUITO DESALTER TEST WELL
File No.	Field	DEL MAR
	County	SAN DIEGO State CA

Location:

NEAR 14955 VIA DE LA VALLE
GPS: 32.9853 -117.2128

Sec. Twp. Rge.

Other Services:

ELOG
LL3/GR

Permanent Datum	G.L.	Elevation above perm. datum	Elevation
Log Measured From	G.L. 0'		K.B.
Drilling Measured From	G.L.		D.F.
			G.L.

Date	04/18/2019		
Run Number	ONE		
Depth Driller	165'		
Depth Logger	165'		
Bottom Logged Interval	165'		
Top Log Interval	0'		
Casing Driller	36" @ 50'		
Casing Logger	50'		
Bit Size	17.5"		
Type Fluid in Hole	EASY MUD		
Density / Viscosity	8.75 / 36		
pH / Fluid Loss	8.5 / 13		
Source of Sample	PIT		
Rm @ Meas. Temp	3.60 @ 58.4 F		
Rmf @ Meas. Temp	3.33 @ 58.4 F		
Rmc @ Meas. Temp	N/A		
Source of Rmf / Rmc	MEASURE		
Rm @ BHT	N/A		
Time Circulation Stopped	8:42 PM		
Time Logger on Bottom	12:15 AM		
Max. Recorded Temperature	N/A		
Equipment Number	PS-10		
Location	LA		
Recorded By	E. AFOH		
Witnessed By	E. HERNANDEZ		

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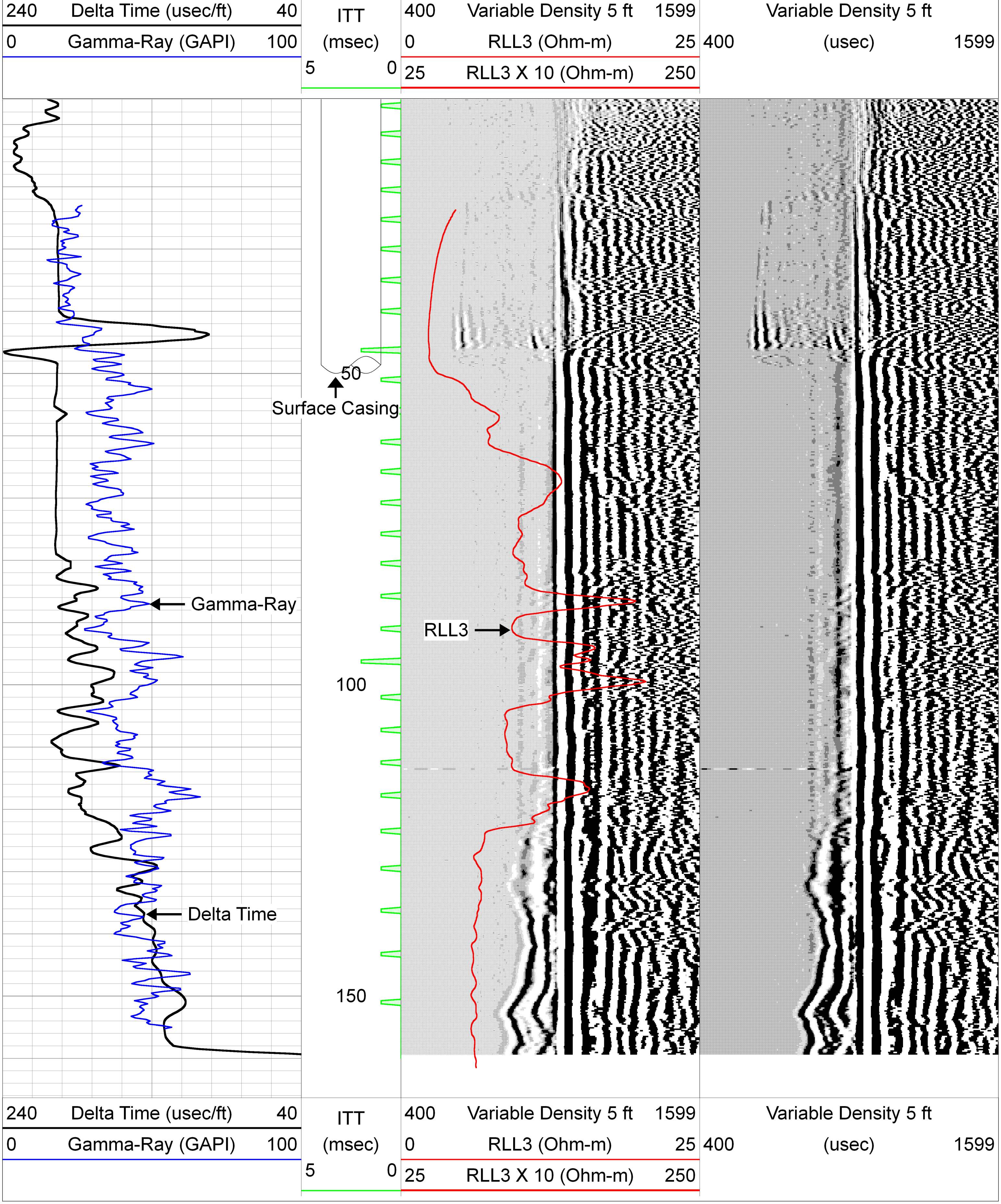
Comments

Database File	25439.db
Dataset Pathname	snc
Presentation Format	slt
Dataset Creation	Thu Apr 18 01:09:58 2019
Charted by	Depth in Feet scaled 1:240



Log Variables

DatabaseC:\ProgramData\Warrior\Data\25439.db
Dataset field/well/run1/snc/_vars_

Top - Bottom

BOREID in	BOTTEMP degF	CASEOD in	CASETHCK in	COMPACT	FloatGate	PERFS

17.5	65.68	0	0	1	0	0
RM_MEAS_R Ohm-m 5.9	RM_MEAS_T degF 58.4	RMF Ohm-m 5.65	RSH Ohm-m 20	SPSHIFT mV 0	SRFTEMP degF 63.65	SVFLUID usec/ft 189
SVMATRIX usec/ft 47.6	TDEPTH ft 165	TempGrad DegF/ft 0.01235				

PACIFIC SURVEYS

CALIPER
BOREHOLE VOLUMES

Job No. 25453	Company	JENSEN DRILLING COMPANY
	Well	OMWD SAN DIEGUITO DESALTER TEST WELL
File No.	Field	DEL MAR
	County	SAN DIEGO State CA

Location:

NEAR 14955 VIA DE LA VALLE
GPS: 32.9853 -117.2128

Sec. Twp. Rge.

Other Services:

NONE

Permanent Datum	G.L.	Elevation	Elevation K.B.
Log Measured From	G.L. 0'	above perm. datum	D.F.
Drilling Measured From	G.L.		G.L.

Date	04/19/2019		
Run Number	ONE		
Depth Driller	160'		
Depth Logger	164.9'		
Bottom Logged Interval	164.9'		
Top Log Interval	0'		
Type Caliper	3 ARM		
Type Fluid in Hole	EASY MUD		
Density / Viscosity	8.75 / 29		
Max. Recorded Temp.	N/A		
pH/Fluid Loss	8.5 / 13		
Time Well Ready	4:45 AM		
Time Logger on Bottom	5:10 AM		
Equipment Number	PS-10		
Location	LA		
Recorded By	E. AFOH		
Witnessed By	E. HERNANDEZ		

Borehole Record				Gravel Feed/Tubing Schedule			
Run Number	Bit	From	To	Size	Type	From	To
ONE	28"	0'	160'	3"	GRTAVEL	0'	40'
				2"	SOUNDING	0'	54'
				4"	SOUNDING	0'	58'

Casing Schedule	Size	Wgt/Ft	Top	Bottom
Surface String	36" OD	0.375" WALL	0'	50'
Production String	18" ID	0.250" WALL	0'	145'
Production String				
Production String				
Production String				

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All interpretations are opinions based on inferences from electrical or other measurements and Pacific Surveys cannot and do not guarantee the accuracy or correctness of any 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 any of our officers, agents or employees. These interpretations are also subject to Pacific Surveys' general terms and conditions set out in our current Price Schedule.

Comments

Calibration Report

Database File	25453.db
Dataset Pathname	cal
Dataset Creation	Fri Apr 19 05:09:33 2019

XY Caliper Calibration Report

XY Caliper Calibration Report

Serial Number/Model: Cal-4 Long-Comprobe
Performed: Tue Feb 26 09:30:09 2019

Ring			X Caliper		Y Caliper	
1:	14	in	808.492	cps	808.492	cps
2:	20	in	1078.5	cps	1078.5	cps
3:	26	in	1327.73	cps	1327.73	cps
4:	32	in	1576.95	cps	1576.95	cps
5:	38	in	1837.79	cps	1837.79	cps
6:	44	in	2116.87	cps	2116.87	cps
7:		in		cps		cps
8:		in		cps		cps
9:		in		cps		cps
10:		in		cps		cps

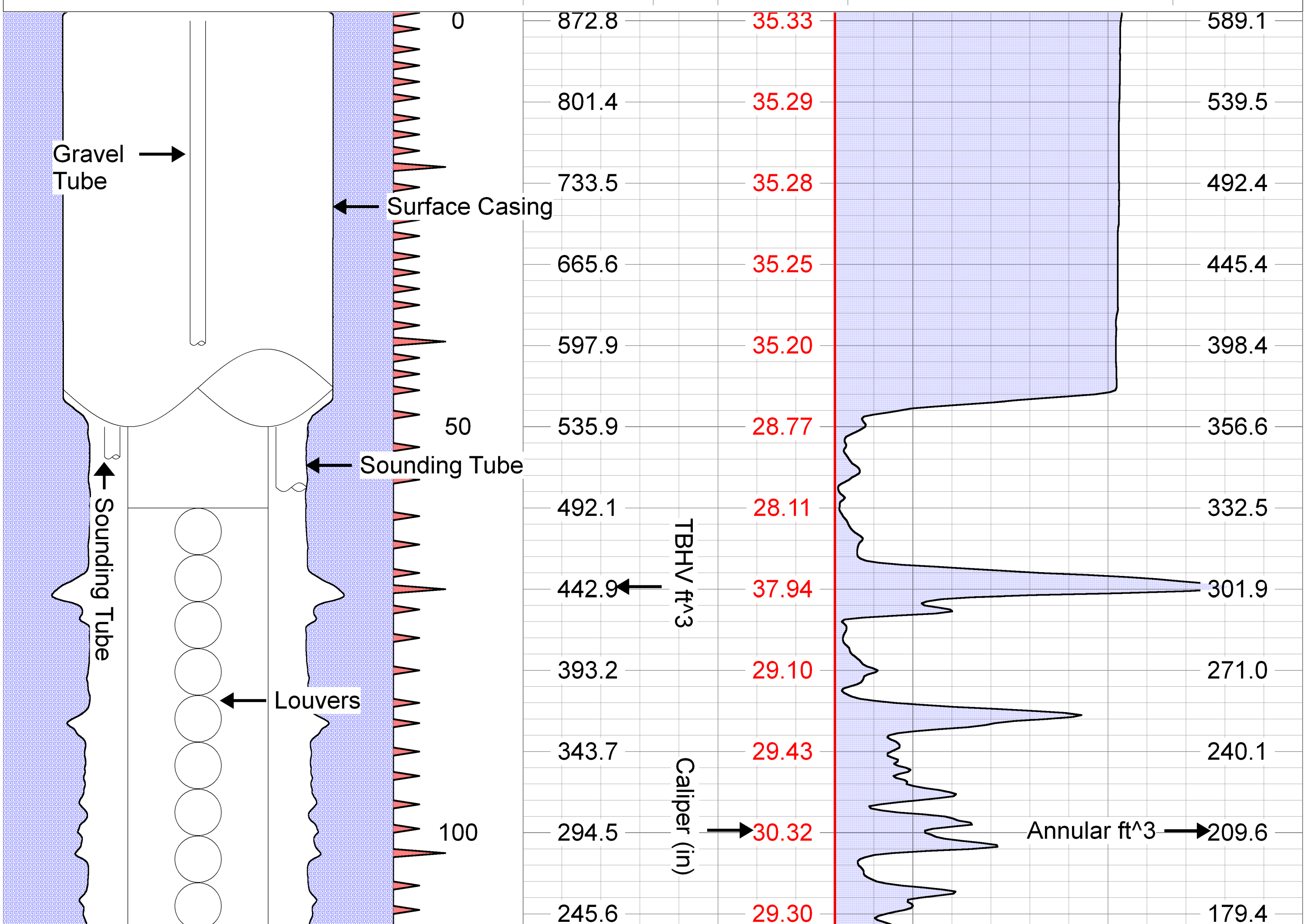
Database File	25453.db
Dataset Pathname	cal
Presentation Format	xyc_gph_final
Dataset Creation	Fri Apr 19 05:09:33 2019
Charted by	Depth in Feet scaled 1:240

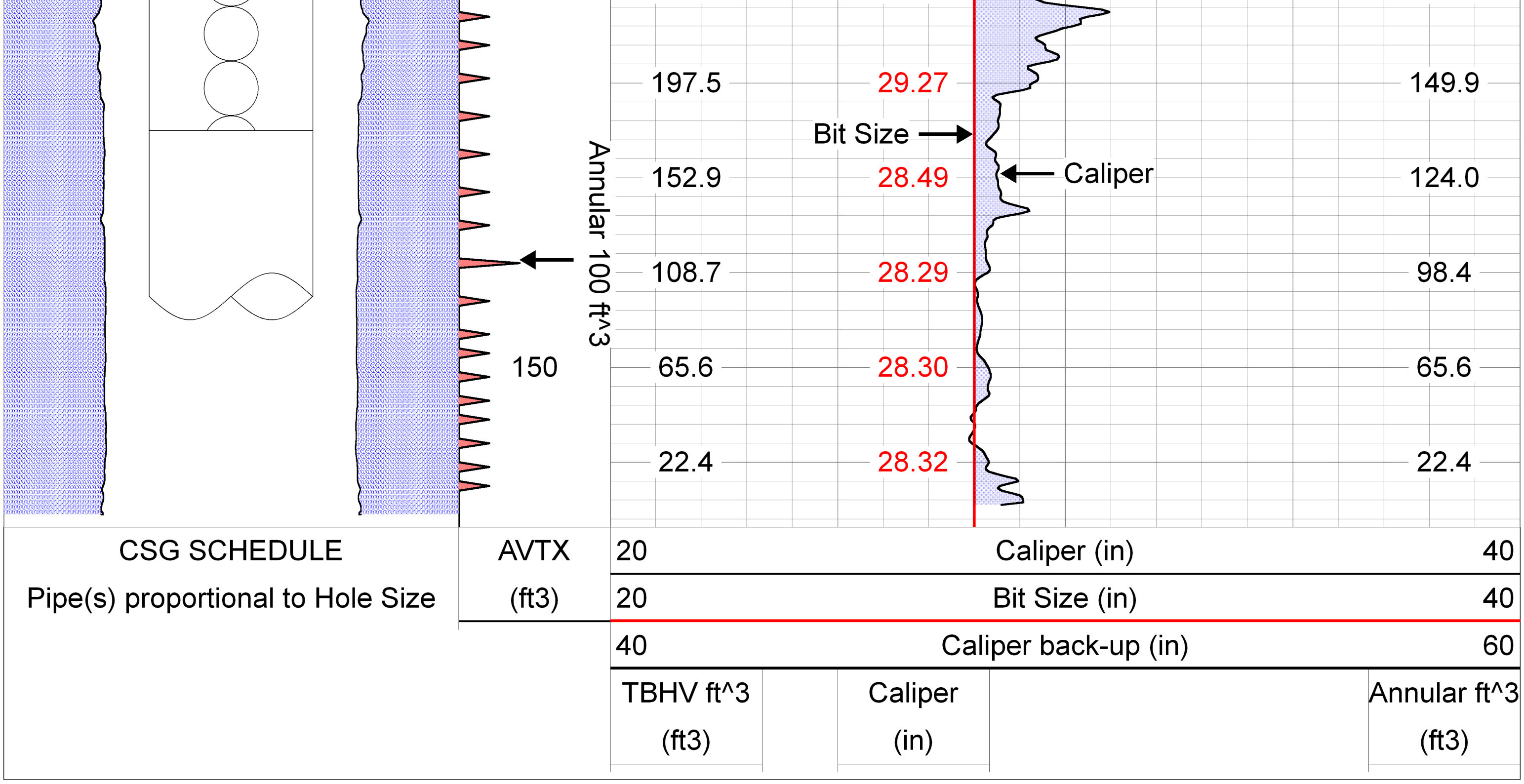
CSG SCHEDULE
Pipe(s) proportional to Hole Size

AVTX (ft3)

20 Caliper (in) 40
20 Bit Size (in) 40
40 Caliper back-up (in) 60

TBHV ft^3 (ft3) | Caliper (in) | Annular ft^3 (ft3)





Log Variables

DatabaseC:\ProgramData\Warrior\Data\25453.db
Dataset field/well/run1/cal/_vars_

Top - 40.00 ft

BOREID in	BOTTEMP degF	CASEOD in	CASETHCK in	PERFS	SRFTEMP degF	TDEPTH ft
28	65.6	19.5192	0	0	63.65	160

40.00 ft - 54.00 ft

BOREID in	BOTTEMP degF	**CASEOD in**	CASETHCK in	PERFS	SRFTEMP degF	TDEPTH ft
28	65.6	**19.2029**	0	0	63.65	160

54.00 ft - 58.00 ft

BOREID in	BOTTEMP degF	**CASEOD in**	CASETHCK in	PERFS	SRFTEMP degF	TDEPTH ft
28	65.6	**19.0394**	0	0	63.65	160

58.00 ft - 145.00 ft

BOREID in	BOTTEMP degF	**CASEOD in**	CASETHCK in	PERFS	SRFTEMP degF	TDEPTH ft
28	65.6	**18.5**	0	0	63.65	160

145.00 ft - Bottom

BOREID in	BOTTEMP degF	**CASEOD in**	CASETHCK in	PERFS	SRFTEMP degF	TDEPTH ft
28	65.6	**0**	0	0	63.65	160

PACIFIC SURVEYS

DEVIATION SURVEY

Job No. 25655

Company	JENSEN DRILLING COMPANY
Well	OMWD SAN DIEGUITO DESALTER TEST WELL
Field	DEL MAR
County	SAN DIEGO
State	CA

Location:

NEAR 14955 VIA DE LA VALLE
GPS: 32.9853 -117.2128

Sec. Twp. Rge.

Other Services:

VIDEO SURVEY

Permanent Datum	G.L.	Elevation	Elevation
Log Measured From	G.L. 0'	above perm. datum	K.B.
Drilling Measured From	G.L.		D.F.
			G.L.

Date	05/23/2019		
Run Number	ONE		
Depth Driller	145'		
Depth Logger	144.7'		
Bottom Logged Interval	140'		
Top Log Interval	0'		
Pump Set @	N/A		
Time Pumping Prior to Survey	N/A		
Density / Viscosity	N/A		
Max. Recorded Temp.	N/A		
Pump Rate (GPM)	N/A		
Time Well Ready	8:00 AM		
Time Logger on Bottom	9:00 AM		
Equipment Number	PS-9		
Location	LA		
Recorded By	E. AFOH		
Witnessed By	E. HERNANDEZ		

Borehole Record				Tubing Record			
Run Number	Bit	From	To	Size	Weight	From	To
ONE	28"	0'	160'	3"	GRAVEL	0'	40'
				4"	SOUNDING	0'	58'

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String	36" OD	0.375" WALL	0'	50'
Prot. String				
Production String	18" ID	0.250" WALL	0'	145'
Liner				

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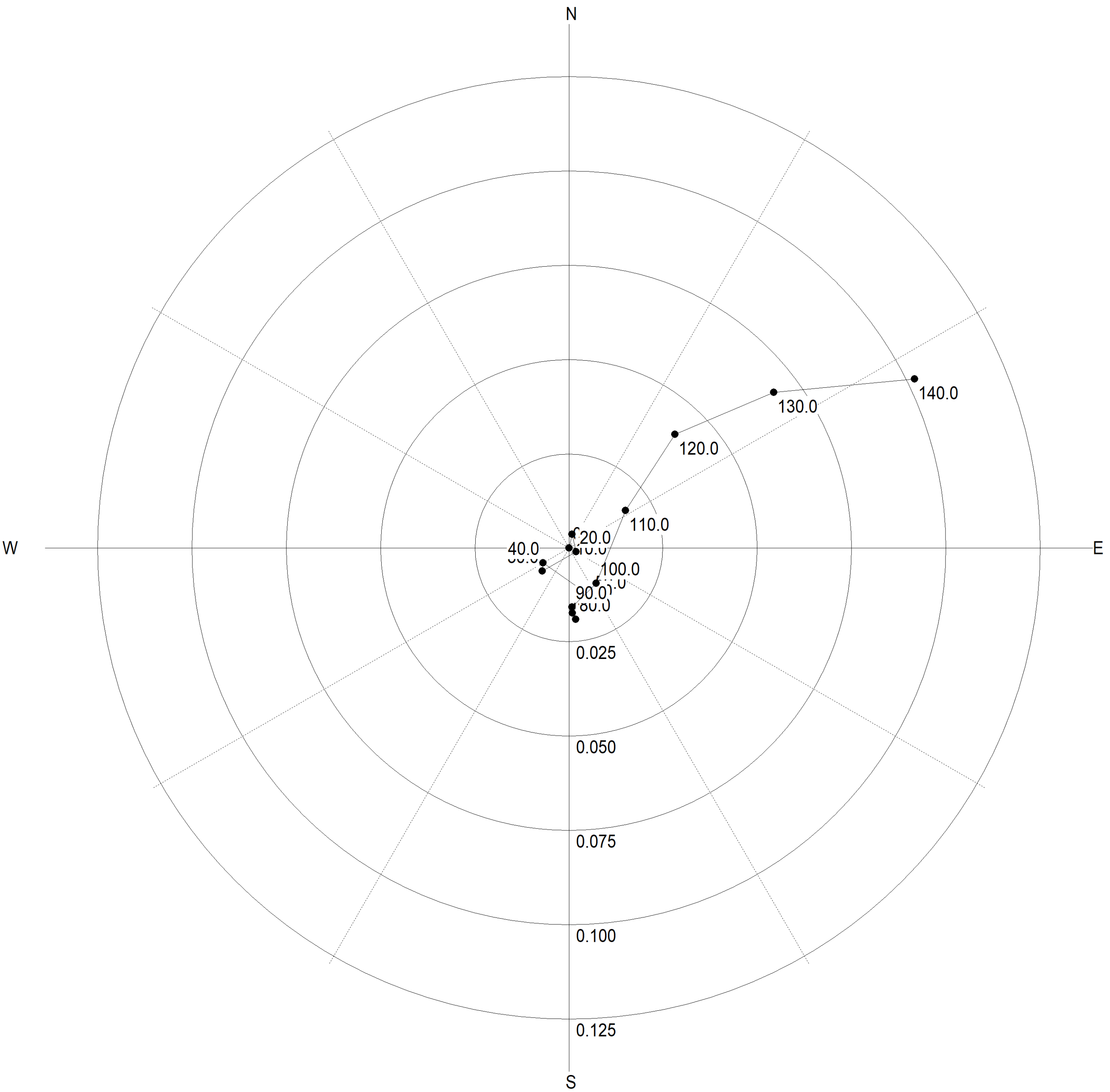
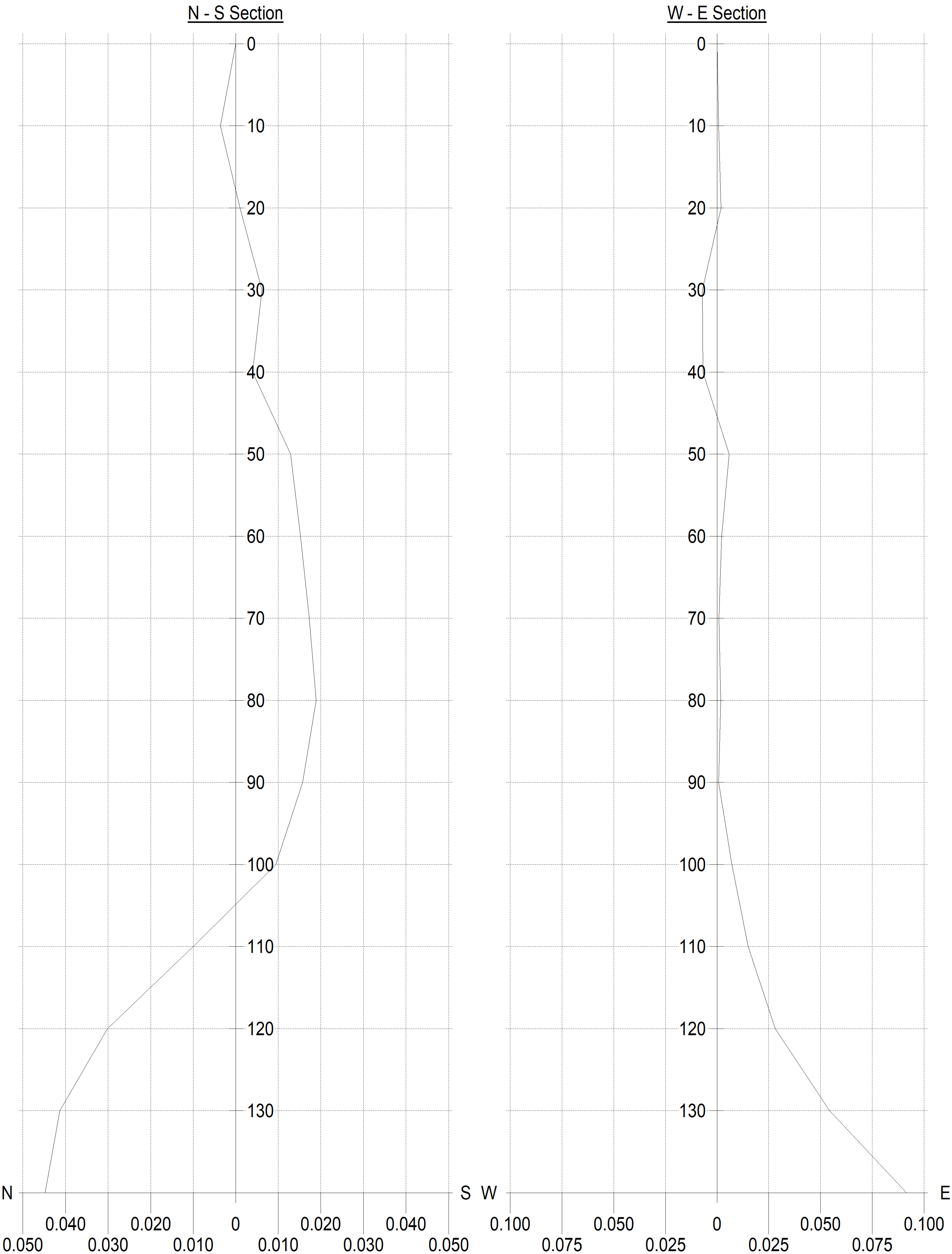
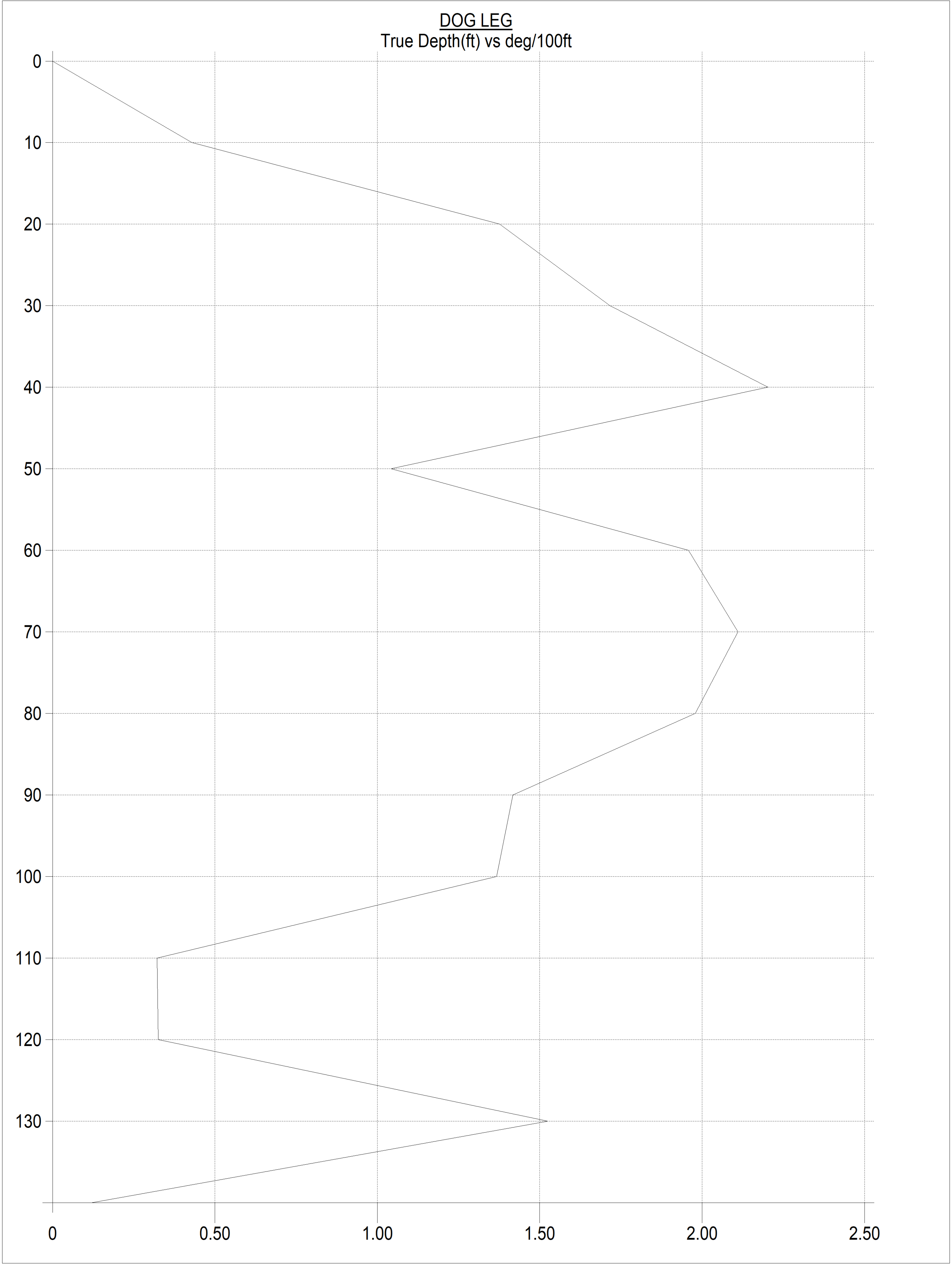
Comments

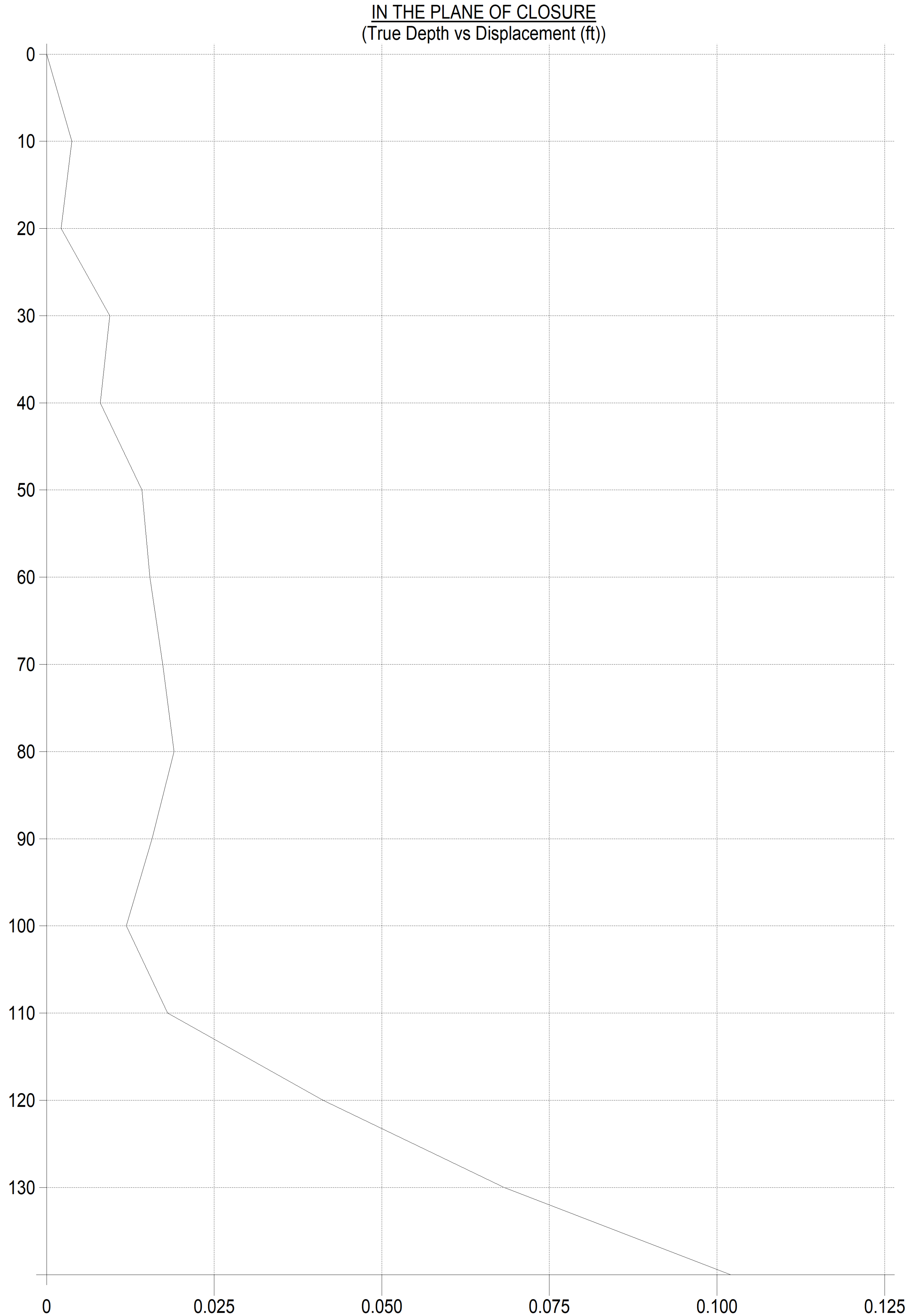
CROSS SECTION
(Displacement (ft))



CLOSURE SECTIONS
(True Depth vs Displacement (ft))




DOG LEG
True Depth(ft) vs deg/100ft
0
10
20
30
40
50
60
70
80
90
100
110
120
130
0
0.50
1.00
1.50
2.00
2.50



IN THE PLANE OF CLOSURE
(True Depth vs Displacement (ft))
0
10
20
30
40
50
60
70
80
90
100
110
120
130
0
0.025
0.050
0.075
0.100
0.125

TVD Report (Minimum Curvature Method)

Database File 25655.db
Dataset Pathname ./././_tvd_/1
Dataset Creation Thu May 23 10:20:51 2019

Meas. Depth (ft)	Incline (deg)	Azimuth (deg)	TVD (ft)	North (ft)	East (ft)	Dog Leg (deg/100ft)	Closure Dis (ft)	Closure Dir (deg)	Vert. Sec. (ft)
		Vertical Section Direction 0.00							
0.0	0.00	12.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.0	0.04	13.05	10.00	0.00	0.00	0.43	0.00	13.05	0.00
20.0	0.10	178.46	20.00	-0.00	0.00	1.38	0.00	-61.17	-0.00
30.0	0.11	289.16	30.00	-0.01	-0.01	1.72	0.01	49.14	-0.01
40.0	0.11	96.32	40.00	-0.00	-0.01	2.20	0.01	60.11	-0.00
50.0	0.10	156.34	50.00	-0.01	0.01	1.04	0.01	-24.73	-0.01
60.0	0.10	307.87	60.00	-0.02	0.00	1.96	0.02	-8.47	-0.02
70.0	0.11	142.87	70.00	-0.02	0.00	2.11	0.02	-2.99	-0.02
80.0	0.09	321.08	80.00	-0.02	0.00	1.98	0.02	-5.48	-0.02
90.0	0.05	126.10	90.00	-0.02	0.00	1.42	0.02	-2.91	-0.02
100.0	0.11	16.23	100.00	-0.01	0.01	1.37	0.01	-37.65	-0.01
110.0	0.13	26.41	110.00	0.01	0.02	0.32	0.02	56.42	0.01
120.0	0.14	38.99	120.00	0.03	0.03	0.33	0.04	43.02	0.03
130.0	0.21	85.57	130.00	0.04	0.05	1.53	0.07	52.72	0.04
140.0	0.22	83.81	140.00	0.04	0.09	0.12	0.10	63.94	0.04

APPENDIX F

Desalter Test Well

Video Survey Report

GEOSCIENCE

Pacific Surveys

a full service geophysical well logging company

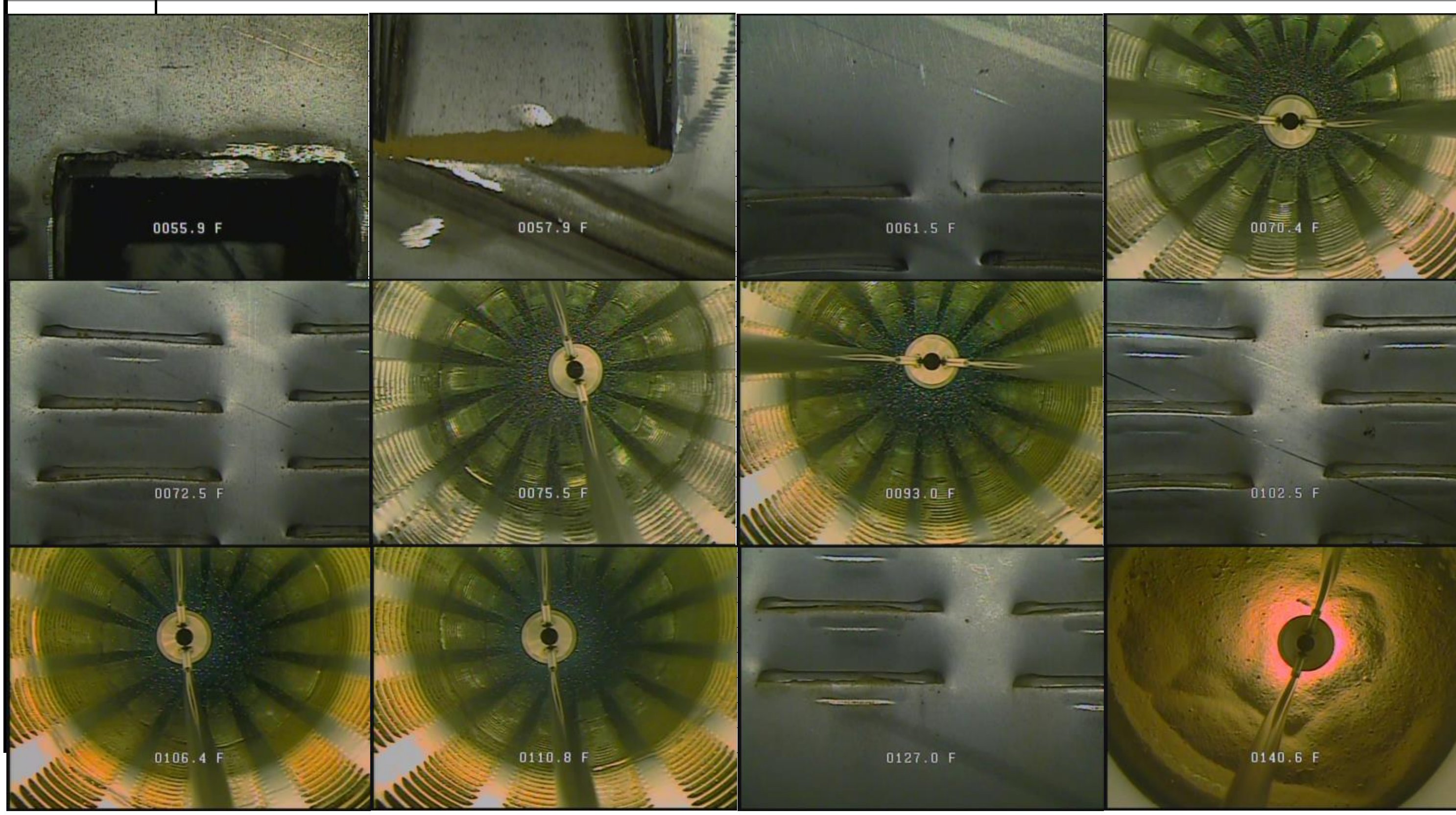
Video Survey Report

Company:	Jensen Drilling Company	**Date:**	23-May-19		
Well:	OMWD San Dieguito Desalter Test Well	**Run No.**	One	**Truck**	PS-9
Field:	Del Mar	**Job Ticket:**	25655		
State:	California	**Total Depth:**	144.7 ft		
Location:	Near 14955 Via De La Valle	**Water Level:**	11.0 ft	SWL	
		Oil on Water:	No	**Amount:**	N/A
GPS:	32.9853 -117.2128	**Operator:**	Afoh		
Zero Datum:	Ground Level **Tool Zero:** Side-Scan			**Dead Space**	2.50 ft
Reason for Survey:	New Well Construction	**Guides Set @**	16.5 inches		

Depth	Observations
0.0 ft	Begin survey from ground level.
11.0 ft	SWL: water is cloudy. Visibility is poor.
44.0 ft	Water column begins to clear.
48.0 ft	Water column becomes clear. Visibility is good.
55.9 ft	Top of sounding tube. Bottom is at 57.9 ft.
61.5 ft	Top of perfs: open with some gravel pack visible behind the casing wall.
127.0 ft	Bottom of perfs: entire interval is open with some gravel pack visible behind the casing wall.
143.1 ft	Top of soft fill.
144.7 ft	Hard fill encountered, end survey.

Well Details

Perforation:		As-Built
Ful-Flo Louvers		60.0 ft to 125.0 ft
Casing Size (in):		**As-Built**
O.D.	**I.D.**	
18.500	18.00	0 ft to 145.0 ft
Casing Material		SST
Screen Material		SST



800.919.7555
909.625.6262

1785 w. arrow rte., bdlg. d, ste. 3,4
upland, ca 91786
www.pacificsurveys.com

fax: 909.399.3180

APPENDIX G

Desalter Test Well

DWR Well Completion Report

State of California

Well Completion Report

Form DWR 188 Submitted 6/26/2019

WCR2019-008761

Owner's Well Number	OMWD Desal Test Well	Date Work Began	04/09/2019	Date Work Ended	05/21/2019
Local Permit Agency	County of San Diego DEH/LWQD Land Water and Quality Division, Land Use Program				
Secondary Permit Agency		Permit Number	LWELL-002249	Permit Date	03/08/2019

Well Owner (must remain confidential pursuant to Water Code 13752)

Name: OLIVENHAIN MUNICIPAL WATER DISTRICT,

Mailing Address: 1966 Olivenhain Road

City: Encinitas State: CA Zip: 92024

Planned Use and Activity

Activity: New Well

Planned Use: Water Supply Public

Well Location

Address	14989 Via DE La Valle								
City	Del Mar	Zip	92024	County	San Diego				
Latitude	32 Deg.	59 Min.	6.2638 Sec.	N	Longitude	-117 Deg.	12 Min.	46.2297 Sec.	W
Dec. Lat.	32.9850733				Dec. Long.	-117.2128416			
Vertical Datum	NAVD88				Horizontal Datum	WGS84			
Location Accuracy	10 Ft				Location Determination Method	GPS			

APN	760-146-07-00
Township	14 S
Range	03 W
Section	05
Baseline Meridian	San Bernardino
Ground Surface Elevation	25
Elevation Accuracy	1 Ft
Elevation Determination Method	GPS

Borehole Information

Orientation: Vertical Specify:

Drilling Method: Dual-wall Reverse Circulation Drilling Fluid: Bentonite

Total Depth of Boring: 165 Feet

Total Depth of Completed Well: 145 Feet

Water Level and Yield of Completed Well

Depth to first water: 11 (Feet below surface)

Depth to Static Water Level: 11 (Feet) Date Measured: 05/21/2019

Estimated Yield*: 200 (GPM) Test Type: Pump

Test Length: 24 (Hours) Total Drawdown: 45 (feet)

*May not be representative of a well's long term yield.

Geologic Log - Free Form

Depth from Surface Feet to Feet		Description
0	6	POORLY GRADED SAND WITH GRAVEL
6	13	POORLY GRADED SAND
13	18	SILTY SAND
18	21	SILT WITH SAND
21	23	SILTY SAND
23	25	POORLY GRADED SAND WITH SILT
25	27	POORLY GRADED SAND
27	30	SILTY SAND
30	40	POORLY GRADED SAND
40	43	LEAN CLAY
43	47	SILTY SAND
47	48	SILT WITH SAND
48	51	SILTY SAND
51	52	POORLY GRADED SAND

52	56	SILT WITH SAND
56	57	FAT CLAY
57	61	POORLY GRADED SAND
61	63	SILTY SAND
63	69	POORLY GRADED SAND WITH SILT
69	75	POORLY GRADED SAND
75	77	SILT WITH SAND
77	87	POORLY GRADED SAND WITH SILT
87	105	POORLY GRADED SAND WITH GRAVEL
105	115	POORLY GRADED SAND WITH SILT
115	122	POORLY GRADED SAND WITH GRAVEL
122	124	SANDSTONE
124	128	MUDSTONE
128	141	SANDSTONE
141	165	MUDSTONE

Casings

Casing #	Depth from Surface Feet to Feet		Casing Type	Material	Casings Specificatons	Wall Thickness (inches)	Outside Diameter (inches)	Screen Type	Slot Size if any (inches)	Description
1	0	50	Conductor or Fill Pipe	Low Carbon Steel	Grade: ASTM A53	0.375	36			
2	0	60	Blank	Spiral Weld Stainless Steel	Nominal Size: 18 in. | Thickness: 1/4 in. | OD: 18-5/8 in.	0.25	18.625			
2	60	125	Screen	Spiral Weld Stainless Steel	Nominal Size: 18 in. | Thickness: 1/4 in. | OD: 18-5/8 in.	0.25	18.625	Louver	0.05	
2	125	145	Blank	Spiral Weld Stainless Steel	Nominal Size: 18 in. | Thickness: 1/4 in. | OD: 18-5/8 in.	0.25	18.625			

Annular Material

Depth from Surface Feet to Feet		Fill	Fill Type Details	Filter Pack Size	Description
0	50	Cement	10.3 Sack Mix		Conductor Seal
0	25	Cement	10.3 Sack Mix		Anulus between 18inch and conductor
25	30	Bentonite	High Solids		
30	165	Filter Pack	Other Gravel Pack	1/4 X 40	Tacna Sand

Other Observations:

Borehole Specifications

Depth from Surface Feet to Feet		Borehole Diameter (inches)
0	50	48
50	165	28

Certification Statement

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

Name JENSEN DRILLING COMPANY
Person, Firm or Corporation

1775 HENDERSON AVENUE	EUGENE	OR	97403
Address	City	State	Zip

Signed *electronic signature received* — 06/26/2019 — 340115
C-57 Licensed Water Well Contractor — Date Signed — C-57 License Number

Attachments

Pages from OMWD_Construction_Drawings_Sheets 1-8_11x17 (1).pdf - Well Construction Diagram

Map.pdf - Location Map

DWR Use Only

CSG #	State Well Number	Site Code	Local Well Number

N — Latitude Deg/Min/Sec

W — Longitude Deg/Min/Sec

TRS:

APN:

APPENDIX H

Desalter Test Well

Aquifer Pump Testing Data

GEOSCIENCE

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GEOSCIENCE Support Services, Inc.
P.O. Box 220, Claremont, CA 91711
Tel: (909) 451-6650 Fax: (909) 451-6638
www.gssiwater.com

PUMPING TEST DATA

Test Date: May 20, 2019
Well Name/Number: OMWD Desalter Test Well
Circle Well Type: Pumping Observation (r = ft)
Circle Test Type: Step Drawdown Constant Rate Recovery Development
Static Water Level Depth: 10.47 ft bgs Reference Point Elevation: 4.0 ft ags

Time of Day	Time Step [min]	Time Total [min]	Depth to Water [ft brp]	Draw-down [ft]	Pumping Rate [gpm]	Sand Content [ppm]	Totalizer [galx100]	Remarks and Other Data
9:20	0	0	14.47	0.00	0	-	8,854.00	Pump on to ~160 gpm
9:22	2	2	31.91	17.44	200	-	8,858.00	
9:24	4	4	37.62	23.15	175	-	8,861.50	
9:26	6	6	40.04	25.57	175	5.28	8,865.00	0-5 min sand = 5.28 ppm
9:28	8	8	41.26	26.79	175	trace	8,868.50	
9:30	10	10	41.32	26.85	175	trace	8,872.00	5-10 min sand = Trace
9:35	15	15	41.55	27.08	160	0.00	8,880.00	
9:40	20	20	41.94	27.47	160	0.00	8,888.00	15-20 min sand = 0 mL
9:45	25	25	42.21	27.74	150	0.00	8,895.50	
9:50	30	30	42.48	28.01	160	0.00	8,903.50	
10:00	40	40	42.84	28.37	160	0.00	8,919.50	
10:10	50	50	43.11	28.64	160	0.00	8,935.50	
10:20	60	60	43.34	28.87	160	0.00	8,951.50	Q_1 Avg = 162.5 gpm/SC_1 = 5.63 gpm/ft
10:22	2	62	51.32	36.85	225	0.00	8,956.00	Q↑ = 240 gpm
10:24	4	64	57.06	42.59	250	0.00	8,961.00	
10:26	6	66	59.40	44.93	250	0.00	8,966.00	0-5 min sand = 0 mL
10:28	8	68	60.51	46.04	250	0.00	8,971.00	
10:30	10	70	61.19	46.72	225	0.00	8,975.50	5-10 min sand = 0 mL
10:35	15	75	62.02	47.55	240	0.00	8,987.50	
10:40	20	80	62.39	47.92	240	0.00	8,999.50	15-20 min sand = 0 mL
10:45	25	85	62.71	48.24	240	0.00	9,011.50	
10:50	30	90	62.94	48.47	240	0.00	9,023.50	
11:00	40	100	63.38	48.91	235	0.00	9,047.00	
11:10	50	110	63.74	49.27	240	0.00	9,071.00	
11:20	60	120	63.97	49.50	235	0.00	9,094.50	
11:35	75	135	64.31	49.84	237	0.00	9,130.00	
11:50	90	150	64.53	50.06	237	0.00	9,165.50	
12:05	105	165	64.70	50.23	237	0.00	9,201.00	
12:20	120	180	64.93	50.46	237	0.00	9,236.50	Q_2 Avg = 237.5 gpm/SC_2 = 4.71 gpm/ft
12:22	2	182	70.73	56.26	275	0.00	9,242.00	Q↑ = 280 gpm
12:24	4	184	73.69	59.22	275	0.00	9,247.50	
12:26	6	186	75.14	60.67	275	0.00	9,253.00	0-5 min sand = 0 mL
12:28	8	188	77.13	62.66	300	0.00	9,259.00	
12:30	10	190	78.47	64.00	275	0.00	9,264.50	5-10 min sand = 0 mL
12:35	15	195	79.65	65.18	290	0.00	9,279.00	
12:40	20	200	79.98	65.51	290	0.00	9,293.50	15-20 min sand = 0 mL
12:45	25	205	80.23	65.76	280	0.00	9,307.50	
12:50	30	210	80.44	65.97	290	0.00	9,322.00	
13:00	40	220	80.60	66.13	280	0.00	9,350.00	
13:10	50	230	80.83	66.36	285	0.00	9,378.50	
13:20	60	240	81.11	66.64	285	0.00	9,407.00	
13:35	75	255	81.41	66.94	283	0.00	9,449.50	

GEOSCIENCE

GEOSCIENCE Support Services, Inc.
P.O. Box 220, Claremont, CA 91711
Tel: (909) 451-6650 Fax: (909) 451-6638
www.gssiwater.com

PUMPING TEST DATA

Test Date: May 20, 2019

Well Name/Number: OMWD Desalter Test Well

Circle Well Type: Pumping   Observation (r = ft)

Circle Test Type: Step Drawdown   Constant Rate   Recovery   Development

Static Water Level Depth: 10.47 ft bgs   Reference Point Elevation: 4.0 ft ags

Time of Day	Time Step [min]	Time Total [min]	Depth to Water [ft brp]	Draw-down [ft]	Pumping Rate [gpm]	Sand Content [ppm]	Totalizer [galx100]	Remarks and Other Data
13:50	90	270	81.62	67.15	283	0.00	9,492.00	
14:05	105	285	81.87	67.40	280	0.00	9,534.00	
14:20	120	300	82.10	67.63	283	0.00	9,576.50	
14:35	135	315	82.32	67.85	283	0.00	9,619.00	
14:50	150	330	82.50	68.03	280	0.00	9,661.00	
15:05	165	345	82.58	68.11	280	0.00	9,703.00	
15:20	180	360	82.59	68.12	283	0.00	9,745.50	Q_3 Avg = 282.8 gpm/SC_3 = 4.15 gpm/ft
								Pump Off

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P.O. Box 220, Claremont, CA 91711
Tel: (909) 451-6650 Fax: (909) 451-6638
www.gssiwater.com

PUMPING TEST DATA

Test Date: May 21 to 22, 2019

Well Name/Number: OMWD Desalter Test Well

Circle Well Type: Pumping | Observation (r = ft)

Circle Test Type: Step Drawdown | Constant Rate | Recovery | Development

Static Water Level Depth: 11.02 ft bgs | Reference Point Elevation: 4.0 ft ags

Time of Day	Time Step [min]	Time Total [min]	Depth to Water [ft brp]	Draw-down [ft]	Pumping Rate [gpm]	Sand Content [ppm]	Totalizer [galx100]	Remarks and Other Data
7:40	0	0	15.02	0.00	0	-	9,749.00	Pump on
7:42	2	2	36.07	21.05	200	trace	9,753.00	
7:44	4	4	42.65	27.63	200	trace	9,757.00	
7:46	6	6	45.58	30.56	200	0.00	9,761.00	0-5 min sand = 0 mL
7:48	8	8	47.03	32.01	200	0.00	9,765.00	
7:50	10	10	49.45	34.43	200	0.00	9,769.00	5-10 min sand = 0 mL
7:55	15	15	52.27	37.25	200	0.00	9,779.00	
8:00	20	20	53.38	38.36	200	0.00	9,789.00	15-20 min sand = 0 mL
8:05	25	25	54.00	38.98	200	0.00	9,799.00	
8:10	30	30	54.49	39.47	200	0.00	9,809.00	
8:20	40	40	55.07	40.05	200	0.00	9,829.00	
8:30	50	50	55.50	40.48	200	0.00	9,849.00	
8:40	60	60	55.79	40.77	200	0.00	9,869.00	
8:55	75	75	56.12	41.10	200	0.00	9,899.00	
8:30	90	90	56.40	41.38	200	0.00	9,929.00	
9:25	105	105	56.56	41.54	200	0.00	9,959.00	
9:40	120	120	56.71	41.69	200	0.00	9,989.00	
10:10	150	150	57.21	42.19	207	0.00	10,051.00	
10:40	180	180	57.43	42.41	190	0.00	10,108.00	
11:10	210	210	57.85	42.83	200	0.00	10,168.00	
11:40	240	240	57.84	42.82	200	0.00	10,228.00	
12:10	270	270	57.98	42.96	197	0.00	10,287.00	
12:40	300	300	58.10	43.08	200	0.00	10,347.00	
13:10	330	330	58.27	43.25	197	0.00	10,406.00	
13:40	360	360	58.37	43.35	197	0.00	10,465.00	
14:10	390	390	58.50	43.48	197	0.00	10,524.00	
14:40	420	420	58.63	43.61	197	0.00	10,583.00	
15:10	450	450	58.73	43.71	200	0.00	10,643.00	
15:40	480	480	58.81	43.79	197	0.00	10,702.00	
16:10	510	510	58.91	43.89	197	0.00	10,761.00	
16:40	540	540	59.03	44.01	197	0.00	10,820.00	
17:10	570	570	59.13	44.11	197	0.00	10,879.00	
17:40	600	600	59.21	44.19	197	0.00	10,938.00	
18:10	630	630	59.27	44.25	197	0.00	10,997.00	
18:40	660	660	59.37	44.35	197	0.00	11,056.00	
19:10	690	690	59.41	44.39	197	0.00	11,115.00	
19:40	720	720	59.51	44.49	197	0.00	11,174.00	
20:10	750	750	59.55	44.53	193	0.00	11,232.00	
20:40	780	780	59.64	44.62	197	0.00	11,291.00	
21:10	810	810	59.74	44.72	197	0.00	11,350.00	
21:40	840	840	59.77	44.75	197	0.00	11,409.00	
22:10	870	870	59.84	44.82	197	0.00	11,468.00	

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PUMPING TEST DATA

Test Date: May 21 to 22, 2019

Well Name/Number: OMWD Desalter Test Well

Circle Well Type: Pumping | Observation (r = ft)

Circle Test Type: Step Drawdown | Constant Rate | Recovery | Development

Static Water Level Depth: 11.02 ft bgs | Reference Point Elevation: 4.0 ft ags

Time of Day	Time Step [min]	Time Total [min]	Depth to Water [ft brp]	Draw-down [ft]	Pumping Rate [gpm]	Sand Content [ppm]	Totalizer [galx100]	Remarks and Other Data
22:40	900	900	59.92	44.90	193	0.00	11,526.00	
23:10	930	930	59.98	44.96	197	0.00	11,585.00	
23:40	960	960	60.04	45.02	193	0.00	11,643.00	
0:10	990	990	60.07	45.05	197	0.00	11,702.00	
0:40	1,020	1,020	60.11	45.09	197	0.00	11,761.00	
1:10	1,050	1,050	60.16	45.14	197	0.00	11,820.00	
1:40	1,080	1,080	60.23	45.21	193	0.00	11,878.00	
2:10	1,110	1,110	60.25	45.23	197	0.00	11,937.00	
2:40	1,140	1,140	60.28	45.26	193	0.00	11,995.00	
3:10	1,170	1,170	60.34	45.32	197	0.00	12,054.00	
3:40	1,200	1,200	60.50	45.48	197	0.00	12,113.00	
4:10	1,230	1,230	60.53	45.51	193	0.00	12,171.00	
4:40	1,260	1,260	60.51	45.49	197	0.00	12,230.00	
5:10	1,290	1,290	60.63	45.61	193	0.00	12,288.00	
5:40	1,320	1,320	60.70	45.68	197	0.00	12,347.00	
6:10	1,350	1,350	60.70	45.68	193	0.00	12,405.00	
6:40	1,380	1,380	60.77	45.75	197	0.00	12,464.00	
7:10	1,410	1,410	60.80	45.78	197	0.00	12,523.00	
7:40	1,440	1,440	60.83	45.81	193	0.00	12,581.00	Q_{avg} = 196.7 gpm/SC = 4.3 gpm/ft
								Pump Off

GEOSCIENCE
GEOSCIENCE Support Services, Inc.
P.O. Box 220, Claremont, CA 91711
Tel: (909) 451-6650 Fax: (909) 451-6638
www.gssiwater.com

PUMPING TEST DATA

Test Date: May 22, 2019

Well Name/Number: OMWD Desalter Test Well

Circle Well Type: Pumping   Observation (r = ft)

Circle Test Type: Step Drawdown   Constant Rate   Recovery   Development

Static Water Level Depth: 11.02 ft bgs   Reference Point Elevation: 4.00 ft ags

Time of Day	Time Step [min]	Time Total [min]	Depth to Water [ft]	Draw-down [ft]	Pumping Rate [gpm]	Sand Content [ppm]	Totalizer [galx100]	Remarks and Other Data
7:40	0	1,440	60.83	45.81	-	-	12,581.00	Pump off
7:42	2	1,442	38.58	23.56	-	-	-	
7:44	4	1,444	28.18	13.16	-	-	-	
7:46	6	1,446	23.64	8.62	-	-	-	
7:48	8	1,448	21.73	6.71	-	-	-	
7:50	10	1,450	20.80	5.78	-	-	-	
7:55	15	1,455	19.81	4.79	-	-	-	
8:00	20	1,460	19.29	4.27	-	-	-	
8:05	25	1,465	18.94	3.92	-	-	-	
8:10	30	1,470	18.65	3.63	-	-	-	
8:20	40	1,480	18.28	3.26	-	-	-	
8:30	50	1,490	18.05	3.03	-	-	-	
8:40	60	1,500	17.89	2.87	-	-	-	
8:50	70	1,510	17.77	2.75	-	-	-	
9:00	80	1,520	17.67	2.65	-	-	-	
9:10	90	1,530	17.57	2.55	-	-	-	
9:20	100	1,540	17.50	2.48	-	-	-	
9:35	115	1,555	17.40	2.38	-	-	-	
9:50	130	1,570	17.31	2.29	-	-	-	
10:05	145	1,585	17.23	2.21	-	-	-	
10:20	160	1,600	17.19	2.17	-	-	-	
10:35	175	1,615	17.09	2.07	-	-	-	
10:50	190	1,630	17.04	2.02	-	-	-	
11:05	205	1,645	16.98	1.96	-	-	-	
11:20	220	1,660	16.90	1.88	-	-	-	
11:40	240	1,680	16.86	1.84	-	-	-	End Test

APPENDIX I

Desalter Test Well Completed Well &

Desalter Test Well & Select Monitoring Wells Long-Term Testing

Water Chemistry Laboratory Reports

GEOSCIENCE

750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
Tel: (626) 386-1100
Fax: (866) 988-3757
1 800 566 LABS (1 800 566 5227)

AT-1807

Laboratory Report

for

David C. McCollum Water Treatment Plant
1966 Olivenhain Rd.
Encinitas, CA 92024
Attention: Tom Arellano
Fax: 760-740-1702

REPORT REVISED,
replaces the original report.

Utah ELCP CA00006

Date of Issue
07/24/2019
EUROFINS EATON ANALYTICAL, LLC

Report:806101
Project:SPECIAL
Group:desal pilot

YOM: Yolanda.O.Martin
Project Manager

* Accredited in accordance with TNI 2016 and ISO/IEC 17025:2017.
* Laboratory certifies that the test results meet all **TNI 2016 and ISO/IEC 17025:2017** requirements unless noted under the individual analysis.
* Following the cover page are State Certification List, ISO/IEC 17025:2017 Accredited Method List, Acknowledgement of Samples Received, Comments, Hits Report, Data Report, QC Summary, QC Report and Regulatory Forms, as applicable.
* Test results relate only to the sample(s) tested.
* Test results apply to the sample(s) as received, unless EEA-M collected and analyzed the sample(s) as noted in the COC and final report.
* This report shall not be reproduced except in full, without the written approval of the laboratory.
* This report includes ISO/IEC 17025:2017 and non-ISO/IEC 17025:2017 accredited methods.

eurofins | Eaton Analytical

STATE CERTIFICATION LIST

State	Certification Number	State	Certification Number
Alabama	41060	**Montana**	Cert 0035
Arizona	AZ0778	**Nebraska**	Certified
Arkansas	Certified	**Nevada**	CA000062018
California	2813	**New Hampshire ***	2959
Colorado	Certified	**New Jersey ***	CA 008
Connecticut	PH-0107	**New Mexico**	Certified
Delaware	CA 006	**New York ***	11320
Florida *	E871024	**North Carolina**	06701
Georgia	947	**North Dakota**	R-009
Guam	18-005R	**Oregon ***	CA200003-005
Hawaii	Certified	**Pennsylvania ***	68-565
Idaho	Certified	**Puerto Rico**	Certified
Illinois *	200033	**Rhode Island**	LAO00326
Indiana	C-CA-01	**South Carolina**	87016
Iowa - Asbestos	413	**South Dakota**	Certified
Kansas *	E-10268	**Tennessee**	TN02839
Kentucky	90107	**Texas ***	T104704230-18-15
Louisiana *	LA180000	**Utah (Primary AB) ***	CA00006
Maine	CA0006	**Vermont**	VT0114
Maryland	224	**Virginia ***	460260
Commonwealth of Northern Marianas Is.	MP0004	**Washington**	C838
Massachusetts	M-CA006	**EPA Region 5**	Certified
Michigan	9906	**Los Angeles County Sanitation Districts**	10264
Mississippi	Certified		

* NELAP/TNI Recognized Accreditation Bodies

Eurofins Eaton Analytical, LLC
750 Royal Oaks Drive, Suite 100
Monrovia, CA 91016-3629
T | 626-386-1100
F | 866-988-3757
www.EurofinsUS.com/Eaton

The tests listed below are accredited and meet the requirements of ISO/IEC 17025 as verified by the ANSI-ASQ National Accreditation Board/ANAB.
Refer to Certificate and scope of accreditation (AT 1807) found at: https://www.eurofinsus.com/Eaton

SPECIFIC TESTS	METHOD OR TECHNIQUE USED	Environ-mental (Drinking Water)	Environ-mental (Waste Water)	Water as a Component of Food and Bev/Bev/ Bottled Water
1,2,3-TCP (5 PPT & 0.5 PPT)	CA SRL 524M-TCP	x		x
1,4-Dioxane	EPA 522	x		x
2,3,7,8-TCDD	Modified EPA 1613B	x		x
Acrylamide	In House Method (2440)	x		x
Algal Toxins/Microcystin	In House Method (3570)			
Alkalinity	SM 2320B	x	x	x
Ammonia	EPA 350.1		x	x
Ammonia	SM 4500-NH3 H		x	x
Anions and DBPs by IC	EPA 300.0	x	x	x
Anions and DBPs by IC	EPA 300.1	x		x
Asbestos	EPA 100.2	x	x	
BOD / CBOD	SM 5210B		x	x
Bromate	In House Method (2447)	x		x
Carbamates	EPA 531.2	x		x
Carbonate as CO3	SM 2330B	x	x	x
Carbonyls	EPA 556	x		x
COD	EPA 410.4 / SM 5220D		x	
Chloramines	SM 4500-CL G	x	x	x
Chlorinated Acids	EPA 515.4	x		x
Chlorinated Acids	EPA 555	x		x
Chlorine Dioxide	SM 4500-CLO2 D Palin Test	x		x
Chlorine -Total/Free/ Combined Residual	SM 4500-Cl G	x	x	x
Conductivity	EPA 120.1		x	
Conductivity	SM 2510B	x	x	x
Corrosivity (Langelier Index)	SM 2330B	x		x
Cyanide, Amenable	SM 4500-CN G	x	x	
Cyanide, Free	SM 4500CN F	x	x	x
Cyanide, Total	EPA 335.4	x	x	x
Cyanogen Chloride (screen)	In House Method (2470)	x		x
Diquat and Paraquat	EPA 549.2	x		x
DBP/HAA	SM 6251B	x		x
Dissolved Oxygen	SM 4500-O G		x	x
DOC	SM 5310C	x		x
E. Coli	(MTF/EC+MUG)	x		x
E. Coli	CFR 141.21(f)(6)(i)	x		x
E. Coli	SM 9223		x	
E. Coli (Enumeration)	SM 9221B.1/ SM 9221F	x		x
E. Coli (Enumeration)	SM 9223B	x		x
EDB/DCBP	EPA 504.1	x		
EDB/DBCP and DBP	EPA 551.1	x		x
EDTA and NTA	In House Method (2454)	x		x
Endothall	EPA 548.1	x		x
Endothall	In-house Method (2445)	x		x
Enterococci	SM 9230B	x	x	
Fecal Coliform	SM 9221 E (MTF/EC)	x		
Fecal Coliform	SM 9221C, E (MTF/EC)		x	
Fecal Coliform (Enumeration)	SM 9221E (MTF/EC)	x		x
Fecal Coliform with Chlorine Present	SM 9221E		x	
Fecal Streptococci	SM 9230B	x	x	
Fluoride	SM 4500-F C	x	x	x
Glyphosate	EPA 547	x		x
Glyphosate + AMPA	In House Method (3618)	x		x
Gross Alpha/Beta	EPA 900.0	x	x	x
Gross Alpha Coprecipitation	SM 7110 C	x	x	x
Hardness	SM 2340B	x	x	x
Heterotrophic Bacteria	In House Method (2439)	x		x
Heterotrophic Bacteria	SM 9215 B	x		x
Hexavalent Chromium	EPA 218.6	x	x	x

SPECIFIC TESTS	METHOD OR TECHNIQUE USED	Environ-mental (Drinking Water)	Environ-mental (Waste Water)	Water as a Component of Food and Bev/Bev/ Bottled Water
Hexavalent Chromium	EPA 218.7	x		x
Hexavalent Chromium	SM 3500-Cr B		x	
Hormones	EPA 539	x		x
Hydroxide as OH Calc.	SM 2330B	x		x
Kjeldahl Nitrogen	EPA 351.2		x	
Legionella	Legiolert	x		x
Mercury	EPA 245.1	x	x	x
Metals	EPA 200.7 / 200.8	x	x	x
Microcystin LR	ELISA (2360)	x		x
Microcystin, Total	EPA 546	x		x
NDMA	EPA 521 In house method (2425)	x		x
Nitrate/Nitrite Nitrogen	EPA 353.2	x	x	x
OCL, Pesticides/PCB	EPA 505	x		x
Ortho Phosphate	EPA 365.1	x	x	x
Ortho Phosphorous	SM 4500P E	x		x
Oxyhalides Disinfection Byproducts	EPA 317.0	x		x
Perchlorate	EPA 331.0	x		x
Perchlorate (low and high)	EPA 314.0	x		x
Perfluorinated Alkyl Acids	EPA 537	x		x
Perfluorinated Polutant	In house Method (2434)	x		x
pH	EPA 150.1	x		
pH	SM 4500-H+B	x	x	x
Phenylurea Pesticides/ Herbicides	In House Method, based on EPA 532 (2448)	x		x
Pseudomonas	IDEXX Pseudalert (2461)	x		x
Radium-226	GA Institute of Tech	x		x
Radium-228	GA Institute of Tech	x		x
Radon-222	SM 7500RN	x		x
Residue, Filterable	SM 2540C	x	x	x
Residue, Non-filterable	SM 2540D		x	
Residue, Total	SM 2540B		x	x
Residue, Volatile	EPA 160.4		x	
Semi-VOC	EPA 525.2	x		x
Silica	SM 4500-Si D	x	x	
Silica	SM 4500-SiO2 C	x	x	
Sulfide	SM 4500-$S^=$ D		x	
Sulfite	SM 4500-SO^3B	x	x	x
Surfactants	SM 5540C	x	x	x
Taste and Odor Analytes	SM 6040E	x		x
Total Coliform (P/A)	SM 9221 A, B	x		x
Total Coliform (Enumeration)	SM 9221 A, B, C	x		x
Total Coliform / E. coli	Colisure SM 9223	x		x
Total Coliform	SM 9221B		x	
Total Coliform with Chlorine Present	SM 9221B		x	
Total Coliform / E.coli (P/A and Enumeration)	SM 9223	x		x
TOC	SM 5310C	x	x	x
TOX	SM 5320B		x	
Total Phenols	EPA 420.1		x	
Total Phenols	EPA 420.4	x	x	x
Total Phosphorous	SM 4500 P E		x	
Triazine Pesticides & Degradates	In House (3617)	x		x
Turbidity	EPA 180.1	x	x	x
Turbidity	SM 2130B	x	x	
Uranium by ICP/MS	EPA 200.8	x		x
UV 254	SM 5910B	x		
VOC	EPA 524.2	x		x
VOC	In House Method (2411)	x		x
Yeast and Mold	SM 9610	x		x
Field Sampling	N/A			

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Acknowledgement of Samples Received

Addr:	**David C. McCollum Water Treatment Plant** 1966 Olivenhain Rd. Encinitas, CA 92024	Client ID: Folder #: Project: Sample Group:	OLIVENHAIN 806101 SPECIAL desal pilot
Attn: Phone:	Tom Arellano 760-740-1385 x183	Project Manager: Phone:	Yolanda.O.Martin (626)-386-1104

The following samples were received from you on **May 22, 2019** at **1433**. They have been scheduled for the tests listed below each sample. If this information is incorrect, please contact your service representative. Thank you for using Eurofins Eaton Analytical, LLC.

Sample #	Sample ID	Sample Date
201905200220	Test Well	05/22/2019 0515

@ANIONS28	@ICP	@ICPMS
Agressiveness Index-Calculated	Alkalinity in CaCO3 units	Anion Sum - Calculated
Bicarb.Alkalinity as HCO3,calc	Carbon Dioxide,Free(25C)-Calc.	Carbonate as CO3, Calculated
Cation Sum - Calculated	Cation/Anion Difference	Fluoride
Hydroxide as OH, Calculated	Langelier Index - 25 degree	Langlier Index at 60 degrees C
Mercury	PH (H3=past HT not compliant)	pH of CaCO3 saturation(25C)
pH of CaCO3 saturation(60C)	Specific Conductance	Surfactants
Total Dissolved Solid (TDS)	Total Hardness as CaCO3 by ICP	Apparent Color
Odor at 60 C (TON)	Turbidity	@ICPMS
Uranium by ICPMS as pCi/L	@525PLUS	@537
@BETA	@CLO4-MS	@DIQUAT
@DIQUAT-LOW	@EDB-DBC	@ML505
@ML515.4	@ML531.2	@RN
@TCP-524	@VOASDWA	Asbestos (Subbed)_CA cert
Boron Total ICAP	Cyanide by manual distillation	2,3,7,8-TCDD
Endothal_LOW	Endothall	Glyphosate
Glyphosate by LCMS	Gross Alpha by Co-precipitation	Hexavalent Chromium by 218.6
Mercury by ICAP/MS	Nitrate as Nitrogen by IC	Nitrate as NO3 (calc)
Nitrite Nitrogen by RFA	Silica	Vanadium Total ICAP/MS

Sample #	Sample ID	Sample Date
201905200221	Travel Blank - HOLD	05/22/2019 0515

@EDB-DBC TB	@TCP-524 TB	@VOASDWA TB

Sample #	Sample ID	Sample Date
201905230398	Field Blank (201905200221)	05/22/2019 0515

@537 FB

Test Description

@ANIONS28 -- Chloride, Sulfate by EPA 300.0

@ICP -- ICP Metals

@ICPMS -- ICPMS Metals

@ICPMS -- ICPMS Metals

@525PLUS -- Semivolatiles by GCMS

@537 -- Perfluorinated Alkyl Acids EPA 537 rev 1.1

@537 FB -- Perfluorinated Alkyl Acids EPA 537 rev 1.1

750 Royal Oaks Drive, Suite 100, Monrovia, CA 91016 Tel (626) 386-1100 Fax (866) 988-3757 www.EurofinsUS.com/Eaton

Acknowledgement of Samples Received

Addr: **David C. McCollum Water Treatment Plant**
1966 Olivenhain Rd.
Encinitas, CA 92024

Attn: Tom Arellano
Phone: 760-740-1385 x183

Client ID: OLIVENHAIN
Folder #: 806101
Project: SPECIAL
Sample Group: desal pilot

Project Manager: Yolanda.O.Martin
Phone: (626)-386-1104

The following samples were received from you on **May 22, 2019** at **1433**. They have been scheduled for the tests listed below each sample. If this information is incorrect, please contact your service representative. Thank you for using Eurofins Eaton Analytical, LLC.

Sample #	Sample ID	Sample Date
	@BETA -- Gross Alpha/Beta Radiation	
	@CLO4-MS -- Perchlorate by LCMS	
	@DIQUAT -- Diquat and Paraquat	
	@DIQUAT-LOW -- DIQUAT-LOW 0.1ppb	
	@EDB-DBC -- EPA Method 504.1	
	@EDB-DBC TB -- EPA Method 504.1	
	@ML505 -- Organochlorine Pesticides/PCBs	
	@ML515.4 -- Chlorophenoxy Herbicides	
	@ML531.2 -- Aldicarbs	
	@RN -- Radon 222	
	@TCP-524 -- 1,2,3-Trichloropropane (SIM)	
	@TCP-524 TB -- 1,2,3-Trichloropropane (SIM)	
	@VOASDWA -- Volatile Organics by GCMS	
	@VOASDWA TB -- Volatile Organics by GCMS	

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CHAIN OF CUSTODY RECORD

826/01

750 Royal Oaks Drive, Suite 100
Monrovia, CA 91016-3629

Phone: 626 386 1100
Fax: 626 386 1101

800 566 LABS (800 566 5227)

Website: www.EatonAnalytical.com

EUROFINS EATON ANALYTICAL USE ONLY:

LOGIN COMMENTS:

SAMPLES CHECKED AGAINST COC BY: CO

SAMPLES LOGGED IN BY: RL

SAMPLE TEMP RECEIVED AT:

SAMPLES REC'D DAY OF COLLECTION? [X] (check for yes)

[ ] ______ (Other) IR Gun ID = ______ (Observation= ______ °C) (Corr.Factor ______ °C) (Final = ______ °C)

[X] Monrovia IR Gun ID = 616A (Observation= 3.0 °C) (Corr.Factor -0.1 °C) (Final = 2.9 °C)

Compliance Acceptance Criteria: (Chemistry: 4 ± 2 °C) (Microbiology: < 10°C)

TYPE OF ICE: Real X Synthetic ____ No Ice ____ **CONDITION OF ICE:** Frozen X Partially Frozen ____ Thawed ____ N/A ____

METHOD OF SHIPMENT: Pick-Up / Walk-In / FedEx / UPS / DHL / Area Fast / Top Line / Other: ______

TO BE COMPLETED BY SAMPLER:

COMPANY/AGENCY NAME: Olivenhain Municipal Water District

PROJECT CODE: Special

EEA CLIENT CODE: Olivenhain/CA 3710029-008

COC ID:

SAMPLE GROUP: Desal Pilot

TAT requested: rush by adv notice only STD X 1 wk ___ 3 day ___ 2 day ___ 1 day ___

COMPLIANCE SAMPLES [ ] (check for yes) - Requires state forms [ ]

NON-COMPLIANCE SAMPLES [ ] (check for yes) REGULATION INVOLVED: ______ (eg. SDWA, NPDES, etc.)

Type of samples (circle one): ROUTINE **SPECIAL** CONFIRMATION

SEE ATTACHED KIT ORDER FOR ANALYSES [X] (check for yes), ***OR***

List ALL ANALYSES REQUIRED (enter number of bottles sent for each test for each sample)

SAMPLE DATE	SAMPLE TIME	SAMPLE ID	CLIENT LAB ID	MATRIX *	FIELD DATA	FIELD DATA	ANALYSES	SAMPLER COMMENTS
5/22/19	05:15	Desal Pilot / Test Well	Olivenhain	RGW			4U92 1501 05/22/19	Please cc results to Terry Watkins twatkins@geoscience-water.com
								Water Quality Parameters:
								pH: 7.26
								Temp (C): 19.8
								Turb. (NTU): 0.81
								SC (uS): 5410
								TDS (ppm): 4237
								Pump Rate: 196 gpm

*** MATRIX TYPES: RSW** = Raw Surface Water **RGW** = Raw Ground Water **CFW** = Chlor(am)inated Finished Water **FW** = Other Finished Water **SEAW** = Sea Water **WW** = Waste Water **BW** = Bottled Water **SW** = Storm Water **SO** = Soil **SL** = Sludge **O** = Other - Please Identify

	SIGNATURE	PRINT NAME	COMPANY/TITLE	DATE	TIME
SAMPLED BY:	Alexander Arita	Alexander Arita	GEOSCIENCE / Staff Geohydrologist	5/22/19	05:15
RELINQUISHED BY:	Alexander Arita	Alexander Arita	GEOSCIENCE / Staff Geohydrologist	5/22/19	14:33
RECEIVED BY:	Chuck Brooks	Chuck Brooks	EEA	5-22-19	1433
RELINQUISHED BY:					
RECEIVED BY:					

QA FO 0029.2 (Version 2) (08/28/2014)

PAGE 1 OF 1

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Kit Order for Olivenhain Municipal Water District

Yolanda.O.Martin is your Eurofins Eaton Analytical, LLC Service Manager

750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
(626) 386-1100 FAX (866) 988-3757

Note: Sampler Please return this paper with your samples

Kit #: 234571

Created By: Irene Trang - [WBN6]
Deliver By: 05/21/2019
STG: Bottle Orders
Ice Type: W
Pre Registered

Client ID: OLIVENHAIN/CA3710029-008
Project Code: SPECIAL Bottle Orders
Group Name: desal pilot
PO#/JOB#:
Description: No Schedule

Ship Sample Kits to
Olivenhain Municipal Water District
19090 Via Ambiente Rd.
Escondido, CA 92029

Attn: Evan DeWindt
Phone: 760-740-1385
Fax: 760-740-1702

Send Report to
David C. McCollum Water Treatment Plant
1966 Olivenhain Rd.
Encinitas, CA 92024

Attn: Tom Arellano
Phone: 760-740-1385 x183
Fax: 760-740-1702

Billing Address
David C. McCollum Water Treatment Plant
1966 Olivenhain Rd.
Encinitas, CA 92024

Attn: Tom Arellano
Phone: 760-740-1385 x183
Fax: 760-740-1702

# of Sample	Tests		Bottle Qty - Type [preservative information]	Total	UN DOT #
1	Glyphosate		1 - 125ml amber glass [no preservative]	1	
1	Hexavalent Chromium by 218.6		1 - 125ml poly [1.25 ml NH4SO4/NH4OH buffer]	1	
1	@ANIONS28, @ANIONS48	CB	1 - 125ml poly [no preservative]	1	
1	Perchlorate by LCMS		1 - 125ml poly [no preservative]	1	
1	@2378-TCDD_Dioxin		2 - 1L amber glass [1 ml Thio 8%]	2	
1	@525PLUS		2 - 1L amber glass [2 ml of 6N HCL]	2	
1	Apparent Color, Odor at 60 C (TON), Turbidity	CB	1 - 1L amber glass [no preservative]	1	
1	@DIQUAT		1 - 1L amber poly [no preservative]	1	
1	Asbestos by TEM - >10 microns	CB	1 - 1L poly sonicated [no preservative]	1	
1	Cyanide		1 - 250 ml poly [2 ml NaOH (30%)+6 scoops AA]	1	
1	Fluoride		1 - 250 ml poly [no preservative]	1	
1	Endothall		1 - 250ml amber glass [no preservative]	1	
1	Alkalinity in CaCO3 units, PH (H3=past HT not compliant), Specific Conductance		1 - 250ml poly [no preservative]	1	
1	@537		2 - 275 ml polypro w polypro cap [1.4 g Trisma]	2	
1	@537 TB	EMPTY	1 - 275 ml polypro w polypro cap [1.4g Trisma + H2O]	1	
1	@537 FB		1 - 275 ml polypro w polypro cap [no preservative]	1	
1	@ML531.2		2 - 40ml amber glass vial [0.37g KH2Citrate+6mg ThioSO4]	2	
1	@ML505		4 - 40ml amber glass vial [1 drop Thio (8%)]	4	
1	@TCP-524 TB		2 - 40ml amber glass vial [4 drops 1:1 HCL + H2O]	2	UN1789
1	@TCP-524		4 - 40ml amber glass vial [4 drops of 1:1 HCL]	4	UN1789
1	@VOASDWA		3 - 40ml amber glass vial [4drops 6N HCL (36%)]	3	UN1789
1	@VOASDWA TB		2 - 40ml amber glass vial [4drops of 1:1 HCL + H2O]	2	UN1789
1	@EDB-DBC		3 - 40ml amber glass vial [no preservative]	3	
1	@RN	CB	2 - 40ml amber glass vial [no preservative]	2	
1	@EDB-DBC TB		2 - 40ml amber glass vial [no preservative + H20]	2	

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Kit Order for Olivenhain Municipal Water District

Yolanda.O.Martin is your Eurofins Eaton Analytical, LLC Service Manager

750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
(626) 386-1100 FAX (866) 988-3757

Note: Sampler Please return this paper with your samples

Kit #: 234571

Created By: Irene Trang - [WBN6]
Deliver By: 05/21/2019
STG: Bottle Orders
Ice Type: W
Pre Registered

Client ID: OLIVENHAIN
Project Code: SPECIAL Bottle Orders
Group Name: desal pilot
PO#/JOB#:
Description: No Schedule

Ship Sample Kits to	Send Report to	Billing Address
Olivenhain Municipal Water District 19090 Via Ambiente Rd. Escondido, CA 92029 Attn: Evan DeWindt Phone: 760-740-1385 Fax: 760-740-1702	David C. McCollum Water Treatment Plant 1966 Olivenhain Rd. Encinitas, CA 92024 Attn: Tom Arellano Phone: 760-740-1385 x183 Fax: 760-740-1702	David C. McCollum Water Treatment Plant 1966 Olivenhain Rd. Encinitas, CA 92024 Attn: Tom Arellano Phone: 760-740-1385 x183 Fax: 760-740-1702

# of Sample	Tests	Bottle Qty - Type [preservative information]	Total	UN DOT #
1	@ICP, @ICPMS, Mercury, Boron Total ICAP, Mercury by ICAP/MS, Silica, Vanadium Total ICAP/MS	1 - 500ml acid poly [2ml HNO3 (18%)]	1	UN2031
1	@RAD	2 - 500ml poly [2ml 18%HNO3+125ml poly/no pres]	2	UN2031
1	Surfactants CB	1 - 500ml poly [no preservative]	1	
1	Total Dissolved Solid (TDS)	1 - 500ml poly [no preservative]	1	
1	@ML515.4	4 - 60ml amber glass [3 mg NaSulfite]	4	
1	@CLO4-MS	1 - sterile 125mL poly [Sterile filter + syringe and instructions]	1	

Sum Tests: 31

Sum Bottles: 53

Comments

Include any available sampling instructions

Code	Status	Date Shipped	Via	Tracking #	# of Coolers	Prepared By

Table 1

Completed Well Required Water Quality Analyses

Constituent	Units	Minimum Reporting Level
General Physical Properties		
Color	Color unit	3
Odor	Odor unit	1
Turbidity	NTU[1]	0.2
MBAS	mg/L[2]	0.05
General Minerals		
Total Hardness	mg/L	3
Calcium	mg/L	1
Magnesium	mg/L	1
Sodium	mg/L	1
Potassium	mg/L	1
Total Alkalinity, as $CaCO_3$	mg/L	3
Hydroxide	mg/L	3
Carbonate	mg/L	3
Bicarbonate	mg/L	3
Sulfate	mg/L	0.5
Chloride	mg/L	1
pH	pH unit	1
Iron	µg/L	20.0
Zinc	µg/L	10.0
Manganese	µg/L	10.0
Copper	µg/L	10.0
Specific Conductance	umhos/cm[3]	1
Total Dissolved Solids (TDS)	mg/L	20
Aggressive Index	-	-
Langlier Index	-	-
Inorganic Chemicals		
Aluminum	µg/L[4]	50.0
Antimony	µg/L	6.0
Arsenic	µg/L	2.0
Barium	µg/L	100.0
Beryllium	µg/L	1.0
Cadmium	µg/L	1.0
Chromium (Total)	µg/L	1.0
Chromium, hexavalent (CrVI)	µg/L	1.0
Cyanide	mg/L	0.1
Fluoride	mg/L	0.1
Lead	µg/L	5.0
Mercury	µg/L	1.0
Nickel	µg/L	10.0
Nitrate, as NO_3	mg/L	1.0
Nitrate, as N	mg/L	0.2
Nitrite, as N	mg/L	0.1
Perchlorate (EPA 332.0)	µg/L	0.1

Completed Well Required Water Quality Analyses

Constituent	Units	Minimum Reporting Level
Selenium	µg/L	5.0
Silver	µg/L	10.0
Thallium	µg/L	1.0
EPA Organic Methods		
Volatiles (EPA 524.2) - includes MTBE	µg/L	various
EDB and DBCP (EPA 504.1)	µg/L	various
Nitrogen & Phosphorus Pesticides (EPA 507)	µg/L	various
Chlorinated Pesticides & PCB's as DCP (EPA 508)	µg/L	various
Chlorinated Acid Herbicides (EPA 515.3)	µg/L	various
DEHP, DEHA, Benzo(a)Pyrene (EPA 525.2)	µg/L	various
Carbamates (EPA 531.1)	µg/L	various
Glyphosate (EPA 547)	µg/L	25.0
Endothall (EPA 548.1)	µg/L	45.0
Diquat (EPA 549.1)	µg/L	4.0
Dioxin (2,3,7,8 TCDD) (EPA 1613)	µg/L	0.000005
Additional Analysis		
1,2,3-Trichloropropane (1,2,3-TCP)	µg/L	0.005
Boron	µg/L	100.0
Vanadium	µg/L	3.0
Radioactivity (Gross Alpha and Gross Beta)	pCi/L[5]	3
Radon	pCi/L	10
Silica (Total)	mg/L	1.0
Asbestos	MFL[6]	0.2
UCMR4 Analyses		
UCMR4 Metals (EPA 200.8)	µg/L	various
UCMR4 Pesticides (EPA 525.3)	µg/L	various
UCMR4 Semivolatiles (EPA 530)	µg/L	various
UCMR4 Alcohols (EPA 541)	µg/L	various
UCMR4 Microcystins & Nodularin (EPA 544)	µg/L	various
UCMR4 Anatoxin & Cylindrospermopsin (EPA 545)	µg/L	various
UCMR4 Total Microsystin [ELISA] (EPA 546)	µg/L	0.3
UCMR4 Haloacetic Acids [HAA9] (EPA 552.3)	µg/L	various
Total Organic Carbon (SM 5310B)	mg/L	0.1
Bromide (EPA 300.1)	µg/L	10

[1] nephelometric turbidity units
[2] milligrams per liter
[3] micromhos per centimeter
[4] micrograms per liter
[5] picocuries per liter
[6] million fibers per liter

Tel: (626) 386-1100
Fax: (866) 988-3757
1 800 566 LABS (1 800 566 5227)

Laboratory Comments

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant
Tom Arellano
1966 Olivenhain Rd.
Encinitas, CA 92024

Folder Comments

Results for Asbestos are submitted by Eurofins CEI in Gary SC

Analytical results for 2378-TCDD by 1613 are submitted Eurofins Lancaster Laboratories,
Lancaster PA CAELAP 2792 exp 1-31-2020

Report revised to report Asbestos down to <0.2 MFL. Y.Martin 7/24/19

Flags Legend:

B4 - Target analyte detected in blank at or above method acceptance criteria. ND data is reportable and valid for compliance.

Result Comments

Odor at 60 C (TON)

201905200220: SULFUR

The Comments Report may be blank if there are no comments for this report.

eurofins Eaton Analytical

Tel: (626) 386-1100
Fax: (866) 988-3757
1 800 566 LABS (1 800 566 5227)

Laboratory Hits

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant
Tom Arellano
1966 Olivenhain Rd.
Encinitas, CA 92024

Samples Received on:
05/22/2019 1433

Analyzed	Analyte	Sample ID	Result	Federal MCL	Units	MRL
	201905200220	**Test Well**				
05/24/2019 16:31	Agressiveness Index-Calculated		14		None	0.10
05/23/2019 03:51	Alkalinity in CaCO3 units		380		mg/L	20
05/29/2019 22:33	Anion Sum - Calculated		60		meq/L	0.0010
05/23/2019 18:10	Apparent Color		10	15	ACU	3.0
05/24/2019 12:38	Arsenic Total ICAP/MS		5.7	10	ug/L	1.0
05/24/2019 12:38	Barium Total ICAP/MS		130	2000	ug/L	2.0
06/11/2019 18:00	Beta, Gross		35		pCi/L	3.0
05/24/2019 16:31	Bicarb.Alkalinity as HCO3calc		460		mg/L	2.0
05/23/2019 14:57	Boron Total ICAP		0.81		mg/L	0.050
05/23/2019 14:57	Calcium Total ICAP		400		mg/L	1.0
05/24/2019 16:31	Carbon Dioxide,Free(25C)-Calc.		12		mg/L	2.0
05/23/2019 17:23	Cation Sum - Calculated		57		meq/L	0.0010
05/24/2019 23:56	Chloride		1300	250	mg/L	25
05/22/2019 23:36	Fluoride		0.27	4	mg/L	0.050
06/20/2019 17:50	Gross Alpha + adjusted error		11		pCi/L	3.0
06/20/2019 17:50	Gross Alpha by Coprecipitation		11	15	pCi/L	3.0
05/23/2019 14:57	Iron Total ICAP		0.63	0.3	mg/L	0.020
05/24/2019 16:31	Langelier Index - 25 degree		1.6		None	-14
05/24/2019 16:31	Langelier Index at 60 degrees C		2.0		None	-14
05/23/2019 14:57	Magnesium Total ICAP		100		mg/L	0.10
05/24/2019 12:38	Manganese Total ICAP/MS		1100	50	ug/L	2.0
05/22/2019 17:59	Odor at 60 C (TON)		8.0	3	TON	1.0
06/07/2019 2:30	Perfluorohexanesulfonic acid		0.0062		ug/L	0.0020
06/07/2019 2:30	Perfluorooctanesulfonic acid		0.010		ug/L	0.0020
06/07/2019 2:30	Perfluorooctanoic acid		0.0032		ug/L	0.0020
05/23/2019 03:51	PH (H3=past HT not compliant)		7.8		Units	0.10
05/24/2019 22:34	pH of CaCO3 saturation(25C)		6.2		Units	0.10
05/23/2019 17:22	pH of CaCO3 saturation(60C)		5.7		Units	0.10
05/23/2019 14:57	Potassium Total ICAP		39		mg/L	1.0
05/23/2019 03:44	Radon 222		240		pCi/L	50
05/23/2019 14:57	Silica		31		mg/L	0.50
05/23/2019 14:57	Sodium Total ICAP		620		mg/L	1.0
05/23/2019 03:51	Specific Conductance, 25 C		5500		umho/cm	10
05/22/2019 21:37	Sulfate		730	250	mg/L	5.0
05/23/2019 08:03	Surfactants		0.19	0.5	mg/L	0.10
05/28/2019 21:09	Total Dissolved Solids (TDS)		3200	500	mg/L	10

SUMMARY OF POSITIVE DATA ONLY

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Laboratory Hits

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant
Tom Arellano
1966 Olivenhain Rd.
Encinitas, CA 92024

Samples Received on:
05/22/2019 1433

Analyzed	Analyte	Sample ID	Result	Federal MCL	Units	MRL
05/23/2019 17:23	Total Hardness as CaCO3 by ICP (calc)		1400		mg/L	3.0
05/23/2019 13:46	Turbidity		5.4	5	NTU	0.10
06/27/2019 12:31	Uranium by ICPMS as pCi/L		14		pCi/L	0.70
06/27/2019 11:06	Uranium ICAP/MS		21	30	ug/L	1.0

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Samples Received on:
05/22/2019 1433

Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
Test Well (201905200220)						**Sampled on 05/22/2019 0515**			
		EPA 200.8 - ICPMS Metals							
05/23/19	05/24/19 12:38	1173450	1173831	(EPA 200.8)	Aluminum Total ICAP/MS	ND	ug/L	20	1
05/23/19	05/24/19 12:38	1173450	1173831	(EPA 200.8)	Antimony Total ICAP/MS	ND	ug/L	1.0	1
05/23/19	05/24/19 12:38	1173450	1173831	(EPA 200.8)	Arsenic Total ICAP/MS	5.7	ug/L	1.0	1
05/23/19	05/24/19 12:38	1173450	1173831	(EPA 200.8)	Barium Total ICAP/MS	130	ug/L	2.0	1
05/23/19	05/24/19 12:38	1173450	1173831	(EPA 200.8)	Beryllium Total ICAP/MS	ND	ug/L	1.0	1
05/23/19	05/24/19 12:38	1173450	1173831	(EPA 200.8)	Cadmium Total ICAP/MS	ND	ug/L	0.50	1
05/23/19	05/24/19 12:38	1173450	1173831	(EPA 200.8)	Chromium Total ICAP/MS	ND	ug/L	1.0	1
05/23/19	05/24/19 12:38	1173450	1173831	(EPA 200.8)	Copper Total ICAP/MS	ND	ug/L	2.0	1
05/23/19	05/24/19 12:38	1173450	1173831	(EPA 200.8)	Lead Total ICAP/MS	ND	ug/L	0.50	1
05/23/19	05/24/19 12:38	1173450	1173831	(EPA 200.8)	Manganese Total ICAP/MS	1100	ug/L	2.0	1
05/23/19	06/04/19 19:06	1173450	1176125	(EPA 200.8)	Mercury Total ICAP/MS	ND	ug/L	0.20	1
05/23/19	05/24/19 12:38	1173450	1173831	(EPA 200.8)	Nickel Total ICAP/MS	ND	ug/L	5.0	1
05/23/19	05/24/19 12:38	1173450	1173831	(EPA 200.8)	Selenium Total ICAP/MS	ND	ug/L	5.0	1
05/23/19	06/04/19 15:56	1173450	1175821	(EPA 200.8)	Silver Total ICAP/MS	ND	ug/L	0.50	1
05/23/19	05/24/19 12:38	1173450	1173831	(EPA 200.8)	Thallium Total ICAP/MS	ND	ug/L	1.0	1
05/23/19	06/27/19 11:06	1173450	1180365	(EPA 200.8)	Uranium ICAP/MS	21	ug/L	1.0	1
05/23/19	05/24/19 12:38	1173450	1173831	(EPA 200.8)	Vanadium Total ICAP/MS	ND	ug/L	3.0	1
05/23/19	05/24/19 12:38	1173450	1173831	(EPA 200.8)	Zinc Total ICAP/MS	ND	ug/L	20	1
		EPA 200.7 - ICP Metals							
05/23/19	05/23/19 14:57	1173450	1173798	(EPA 200.7)	Boron Total ICAP	0.81	mg/L	0.050	1
05/23/19	05/23/19 14:57	1173450	1173798	(EPA 200.7)	Calcium Total ICAP	400	mg/L	1.0	1
05/23/19	05/23/19 14:57	1173450	1173798	(EPA 200.7)	Iron Total ICAP	0.63	mg/L	0.020	1
05/23/19	05/23/19 14:57	1173450	1173798	(EPA 200.7)	Magnesium Total ICAP	100	mg/L	0.10	1
05/23/19	05/23/19 14:57	1173450	1173798	(EPA 200.7)	Potassium Total ICAP	39	mg/L	1.0	1
05/23/19	05/23/19 14:57	1173450	1173798	(EPA 200.7)	Silica	31	mg/L	0.50	1
05/23/19	05/23/19 14:57	1173450	1173798	(EPA 200.7)	Sodium Total ICAP	620	mg/L	1.0	1
		EPA 245.1 - Mercury Total							
05/31/19	05/31/19 16:26	1175223	1175326	(EPA 245.1)	Mercury	ND	ug/L	0.20	1
		SM2330B - Hydroxide as OH, Calculated							
	05/24/19 16:31			(SM2330B)	Hydroxide as OH Calculated	ND (c)	mg/L	2.0	1
		SM 2330B - pH of CaCO3 saturation(60C)							
	05/23/19 17:22			(SM 2330B)	pH of CaCO3 saturation(60C)	5.7 (c)	Units	0.10	1
		EPA 200.8 - Uranium by ICPMS as pCi/L							
	06/27/19 12:31			(EPA 200.8)	Uranium by ICPMS as pCi/L	14 (c)	pCi/L	0.70	1
		SM4500-CO2-D - Carbon Dioxide,Free(25C)-Calc.							

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05/22/2019 1433

Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
	05/24/19 16:31			(SM4500-CO2-D)	Carbon Dioxide,Free(25C)-Calc.	12 (c)	mg/L	2.0	1
		SM 2330B - Langelier Index - 25 degree							
	05/24/19 16:31			(SM 2330B)	Langelier Index - 25 degree	1.6 (c)	None	-14	1
		SM2330B - Carbonate as CO3, Calculated							
	05/24/19 22:34			(SM2330B)	Carbonate as CO3, Calculated	ND (c)	mg/L	2.0	1
		SM 2340B - Total Hardness as CaCO3 by ICP							
	05/23/19 17:23			(SM 2340B)	Total Hardness as CaCO3 by ICP (calc)	1400 (c)	mg/L	3.0	1
		SM 1030E - Anion Sum - Calculated							
	05/29/19 22:33			(SM 1030E)	Anion Sum - Calculated	60 (c)	meq/L	0.0010	1
		SM 1030E - Cation Sum - Calculated							
	05/23/19 17:23			(SM 1030E)	Cation Sum - Calculated	57 (c)	meq/L	0.0010	1
		SM 2330B - pH of CaCO3 saturation(25C)							
	05/24/19 22:34			(SM 2330B)	pH of CaCO3 saturation(25C)	6.2 (c)	Units	0.10	1
		SM2330B - Bicarb.Alkalinity as HCO3,calc							
	05/24/19 16:31			(SM2330B)	Bicarb.Alkalinity as HCO3calc	460 (c)	mg/L	2.0	1
		SM 2330 - Agressiveness Index-Calculated							
	05/24/19 16:31			(SM 2330)	Agressiveness Index-Calculated	14 (c)	None	0.10	1
		SM 2330B - Langlier Index at 60 degrees C							
	05/24/19 16:31			(SM 2330B)	Langelier Index at 60 degrees C	2.0 (c)	None	-14	1
		SM 1030E - Cation/Anion Difference							
	05/30/19 22:33			(SM 1030E)	Cation/Anion Difference	2.7 (c)	%		1
		EPA 505 - Organochlorine Pesticides/PCBs							
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	Alachlor (Alanex)	ND	ug/L	0.10	1
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	Aldrin	ND	ug/L	0.010	1
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	Chlordane	ND	ug/L	0.10	1
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	Dieldrin	ND	ug/L	0.0100	1
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	Endrin	ND	ug/L	0.010	1
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	Heptachlor	ND	ug/L	0.010	1
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	Heptachlor Epoxide	ND	ug/L	0.010	1
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	Lindane (gamma-BHC)	ND	ug/L	0.010	1
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	Methoxychlor	ND	ug/L	0.050	1
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	PCB 1016 Aroclor	ND	ug/L	0.080	1
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	PCB 1221 Aroclor	ND	ug/L	0.10	1
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	PCB 1232 Aroclor	ND	ug/L	0.10	1
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	PCB 1242 Aroclor	ND	ug/L	0.10	1
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	PCB 1248 Aroclor	ND	ug/L	0.10	1
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	PCB 1254 Aroclor	ND	ug/L	0.10	1

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David C. McCollum Water Treatment Plant
Tom Arellano
1966 Olivenhain Rd.
Encinitas, CA 92024

Samples Received on:
05/22/2019 1433

Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	PCB 1260 Aroclor	ND	ug/L	0.10	1
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	Total PCBs	ND	ug/L	0.10	1
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	Toxaphene	ND	ug/L	0.50	1
05/29/19	05/29/19 22:08	1174471	1175303	(EPA 505)	Tetrachlorometaxylene	83	%		1
		EPA 515.4 - Chlorophenoxy Herbicides							
06/05/19	06/07/19 15:24	1175936	1176585	(EPA 515.4)	2,4,5-T	ND	ug/L	0.20	1
06/05/19	06/07/19 15:24	1175936	1176585	(EPA 515.4)	2,4,5-TP (Silvex)	ND	ug/L	0.20	1
06/05/19	06/07/19 15:24	1175936	1176585	(EPA 515.4)	2,4-D	ND	ug/L	0.10	1
06/05/19	06/07/19 15:24	1175936	1176585	(EPA 515.4)	2,4-DB	ND	ug/L	2.0	1
06/05/19	06/07/19 15:24	1175936	1176585	(EPA 515.4)	3,5-Dichlorobenzoic acid	ND	ug/L	0.50	1
06/05/19	06/07/19 15:24	1175936	1176585	(EPA 515.4)	Acifluorfen	ND	ug/L	0.20	1
06/05/19	06/07/19 15:24	1175936	1176585	(EPA 515.4)	Bentazon	ND	ug/L	0.50	1
06/05/19	06/07/19 15:24	1175936	1176585	(EPA 515.4)	Dalapon	ND	ug/L	1.0	1
06/05/19	06/07/19 15:24	1175936	1176585	(EPA 515.4)	Dicamba	ND	ug/L	0.10	1
06/05/19	06/07/19 15:24	1175936	1176585	(EPA 515.4)	Dichlorprop	ND	ug/L	0.50	1
06/05/19	06/07/19 15:24	1175936	1176585	(EPA 515.4)	Dinoseb	ND	ug/L	0.20	1
06/05/19	06/07/19 15:24	1175936	1176585	(EPA 515.4)	Pentachlorophenol	ND	ug/L	0.040	1
06/05/19	06/07/19 15:24	1175936	1176585	(EPA 515.4)	Picloram	ND	ug/L	0.10	1
06/05/19	06/07/19 15:24	1175936	1176585	(EPA 515.4)	Tot DCPA Mono&Diacid Degradate	ND	ug/L	0.10	1
06/05/19	06/07/19 15:24	1175936	1176585	(EPA 515.4)	2,4-Dichlorophenyl acetic acid	114	%		1
06/05/19	06/07/19 15:24	1175936	1176585	(EPA 515.4)	4,4-Dibromooctafluorobiphenyl	102	%		1
		EPA 504.1 - EPA Method 504.1							
06/04/19	06/04/19 19:04	1175496	1175953	(EPA 504.1)	Dibromochloropropane (DBCP)	ND	ug/L	0.010	1
06/04/19	06/04/19 19:04	1175496	1175953	(EPA 504.1)	Ethylene Dibromide (EDB)	ND	ug/L	0.010	1
06/04/19	06/04/19 19:04	1175496	1175953	(EPA 504.1)	1,2-Dibromopropane	97	%		1
		EPA 525.2 - Semivolatiles by GCMS							
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	2,4-DDD	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	2,4-DDE	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	2,4-DDT	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	2,4-Dinitrotoluene	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	2,6-Dinitrotoluene	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	4,4-DDD	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	4,4-DDE	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	4,4-DDT	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Acenaphthene	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Acenaphthylene	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Acetochlor	ND	ug/L	0.10	1

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06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Alachlor	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Aldrin	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Alpha-BHC	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	alpha-Chlordane	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Anthracene	ND	ug/L	0.020	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Atrazine	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Benz(a)Anthracene	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Benzo(a)pyrene	ND	ug/L	0.020	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Benzo(b)Fluoranthene	ND	ug/L	0.020	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Benzo(g,h,i)Perylene	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Benzo(k)Fluoranthene	ND	ug/L	0.020	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Beta-BHC	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Bromacil	ND	ug/L	0.20	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Butachlor	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Butylbenzylphthalate	ND	ug/L	0.50	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Caffeine by method 525mod	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Chlorobenzilate	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Chloroneb	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Chlorothalonil(Draconil,Bravo)	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Chlorpyrifos (Dursban)	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Chrysene	ND	ug/L	0.020	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Delta-BHC	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Di-(2-Ethylhexyl)adipate	ND	ug/L	0.60	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Di(2-Ethylhexyl)phthalate	ND	ug/L	0.60	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Diazinon (Qualitative)	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Dibenz(a,h)Anthracene	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Dichlorvos (DDVP)	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Dieldrin	ND	ug/L	0.20	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Diethylphthalate	ND	ug/L	0.50	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Dimethoate	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Dimethylphthalate	ND	ug/L	0.50	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Di-n-Butylphthalate	ND	ug/L	1.0	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Di-N-octylphthalate	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Endosulfan I (Alpha)	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Endosulfan II (Beta)	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Endosulfan Sulfate	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Endrin	ND	ug/L	0.20	1

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1 800 566 LABS (1 800 566 5227)

Laboratory Data

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant
Tom Arellano
1966 Olivenhain Rd.
Encinitas, CA 92024

Samples Received on:
05/22/2019 1433

Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Endrin Aldehyde	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	EPTC	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Fluoranthene	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Fluorene	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	gamma-Chlordane	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Heptachlor	ND	ug/L	0.040	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Heptachlor Epoxide (isomer B)	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Hexachlorobenzene	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Hexachlorocyclopentadiene	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Indeno(1,2,3,c,d)Pyrene	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Isophorone	ND	ug/L	0.50	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Lindane	ND	ug/L	0.040	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Malathion	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Methoxychlor	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Metolachlor	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Metribuzin	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Molinate	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Naphthalene	ND	ug/L	0.30	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Parathion	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Pendimethalin	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Permethrin (mixed isomers)	ND	ug/L	0.20	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Phenanthrene	ND	ug/L	0.040	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Propachlor	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Pyrene	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Simazine	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Terbacil	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Terbuthylazine	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Thiobencarb (ELAP)	ND	ug/L	0.20	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	trans-Nonachlor	ND	ug/L	0.050	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Trifluralin	ND	ug/L	0.10	1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	1,3-Dimethyl-2-nitrobenzene	97	%		1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Acenaphthene-d10	92	%		1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Chrysene-d12	96	%		1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Perylene-d12	92	%		1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Phenanthrene-d10	99	%		1
06/05/19	06/12/19 12:20	1176017	1177380	(EPA 525.2)	Triphenylphosphate	108	%		1

EPA 548.1 - Endothall

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Report: 806101
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David C. McCollum Water Treatment Plant
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Samples Received on:
05/22/2019 1433

Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
05/28/19	05/31/19 8:18	1174382	1174900	(EPA 548.1)	Endothall	ND	ug/L	40	8
		EPA 547 - Glyphosate							
	05/29/19 0:52		1174458	(EPA 547)	Glyphosate	ND	ug/L	6.0	1
		EPA 531.2 - Aldicarbs							
	06/04/19 04:12		1175661	(EPA 531.2)	3-Hydroxycarbofuran	ND	ug/L	0.50	1
	06/04/19 04:12		1175661	(EPA 531.2)	Aldicarb (Temik)	ND	ug/L	0.50	1
	06/04/19 04:12		1175661	(EPA 531.2)	Aldicarb sulfone	ND	ug/L	0.50	1
	06/04/19 04:12		1175661	(EPA 531.2)	Aldicarb sulfoxide	ND	ug/L	0.50	1
	06/04/19 04:12		1175661	(EPA 531.2)	Baygon	ND	ug/L	0.50	1
	06/04/19 04:12		1175661	(EPA 531.2)	Carbaryl	ND	ug/L	0.50	1
	06/04/19 04:12		1175661	(EPA 531.2)	Carbofuran (Furadan)	ND	ug/L	0.50	1
	06/04/19 04:12		1175661	(EPA 531.2)	Methiocarb	ND	ug/L	0.50	1
	06/04/19 04:12		1175661	(EPA 531.2)	Methomyl	ND	ug/L	0.50	1
	06/04/19 04:12		1175661	(EPA 531.2)	Oxamyl (Vydate)	ND	ug/L	0.50	1
	06/04/19 04:12		1175661	(EPA 531.2)	4-Bromo-3,5-dimethylphenyl-N-methylcarbamate	104	%		1
		EPA 549.2 - Diquat and Paraquat							
05/28/19	05/29/19 18:49	1174432	1174443	(EPA 549.2)	Diquat	ND	ug/L	0.40	1
05/28/19	05/29/19 18:49	1174432	1174443	(EPA 549.2)	Paraquat	ND	ug/L	2.0	1
		EPA 300.0 - Nitrate, Nitrite by EPA 300.0							
	05/22/19 21:37		1173588	(EPA 300.0)	Nitrate as Nitrogen by IC	ND	mg/L	0.12	10
	05/22/19 21:37		1173588	(EPA 300.0)	Nitrate as NO3 (calc)	ND	mg/L	0.55	10
		EPA 300.0 - Chloride, Sulfate by EPA 300.0							
	05/24/19 23:56		1174171	(EPA 300.0)	Chloride	1300	mg/L	25	50
	05/22/19 21:37		1173590	(EPA 300.0)	Sulfate	730	mg/L	5.0	10
		EPA 218.6 - Hexavalent Chromium by 218.6							
	05/30/19 00:18		1174776	(EPA 218.6)	Hexavalent Chromium by 218.6	ND	ug/L	0.020	1
		EPA 331.0 - Perchlorate by LCMS							
	05/28/19 17:39		1174578	(EPA 331.0)	Perchlorate	ND	ng/L	50	1
	05/28/19 17:39		1174578	(EPA 331.0)	Oxygen Enriched Perchlorate	127	%		1
		EPA 537 - Perfluorinated Alkyl Acids EPA 537 rev 1.1							
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	N-ethyl Perfluorooctanesulfonamidoacetic acid	ND	ug/L	0.0020	1
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	N-methyl Perfluorooctanesulfonamidoacetic acid	ND	ug/L	0.0020	1
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	Perfluorobutanesulfonic acid	ND	ug/L	0.0020	1
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	Perfluorodecanoic acid	ND	ug/L	0.0020	1
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	Perfluorododecanoic acid	ND	ug/L	0.0020	1
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	Perfluoroheptanoic acid	ND	ug/L	0.0020	1

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Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	Perfluorohexanesulfonic acid	0.0062	ug/L	0.0020	1
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	Perfluorohexanoic acid	ND	ug/L	0.0020	1
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	Perfluorononanoic acid	ND	ug/L	0.0020	1
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	Perfluorooctanesulfonic acid	0.010	ug/L	0.0020	1
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	Perfluorooctanoic acid	0.0032	ug/L	0.0020	1
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	Perfluorotetradecanoic acid	ND	ug/L	0.0020	1
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	Perfluorotridecanoic acid	ND	ug/L	0.0020	1
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	Perfluoroundecanoic acid	ND	ug/L	0.0020	1
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	13C-PFDA	79	%		1
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	13C-PFHxA	87	%		1
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	13C-PFOA	115	%		1
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	13C-PFOS	97	%		1
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	d3-NMeFOSAA	89	%		1
06/03/19	06/07/19 2:30	1175545	1177011	(EPA 537)	d5-NEtFOSAA	97	%		1
	SM 7500RN - Radon 222								
	05/23/19 03:44		1173888	(SM 7500RN)	Radon 222	240	pCi/L	50	1
	05/23/19 03:44		1173888	(SM 7500RN)	Radon 222, Two Sigma Error	12	pCi/L		1
	EPA 900.0 - Gross Alpha/Beta Radiation								
05/29/19	06/11/19 18:00	1174743	1177411	(EPA 900.0)	Beta, Gross	35	pCi/L	3.0	1
05/29/19	06/11/19 18:00	1174743	1177411	(EPA 900.0)	Beta, Min Detectable Activity	8	pCi/L		1
05/29/19	06/11/19 18:00	1174743	1177411	(EPA 900.0)	Beta, Two Sigma Error	2.8	pCi/L		1
	SM 7110C - Gross Alpha by Co-precipitation								
06/07/19	06/20/19 17:50	1176539	1180088	(SM 7110C)	Alpha, Min Detectable Activity	0.2	pCi/L		1
06/07/19	06/20/19 17:50	1176539	1180088	(SM 7110C)	Alpha, Two Sigma Error	0.46	pCi/L		1
06/07/19	06/20/19 17:50	1176539	1180088	(SM 7110C)	Gross Alpha + adjusted error	11	pCi/L	3.0	1
06/07/19	06/20/19 17:50	1176539	1180088	(SM 7110C)	Gross Alpha by Coprecipitation	11	pCi/L	3.0	1
	EPA 353.2 - Nitrite Nitrogen by RFA								
	05/23/19 09:24		1173653	(EPA 353.2)	Nitrite Nitrogen by RFA	ND	mg/L	0.010	1
	EPA 335.4 - Cyanide by manual distillation								
06/05/19	06/05/19 12:09	1175983	1175985	(EPA 335.4)	Cyanide by manual distillation	ND (B4)	mg/L	0.0050	1
	EPA 1613B - 2,3,7,8-TCDD								
06/06/19	06/07/19 08:36			(EPA 1613B)	2,3,7,8-TCDD	ND (ND)	pg/L	3.9	1
	EPA 100.2 - Asbestos								
	06/04/19 00:00			(EPA 100.2)	Asbestos	<0.20	MFL	0.2	1
	EPA 524.2 - Volatile Organics by GCMS								
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,1,1,2-Tetrachloroethane	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,1,1-Trichloroethane	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,1,2,2-Tetrachloroethane	ND	ug/L	0.50	1

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Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,1,2-Trichloroethane	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,1-Dichloroethane	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,1-Dichloroethylene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,1-Dichloropropene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,2,3-Trichlorobenzene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,2,3-Trichloropropane	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,2,4-Trichlorobenzene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,2,4-Trimethylbenzene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,2-Dichloroethane	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,2-Dichloropropane	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,3,5-Trimethylbenzene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,3-Dichloropropane	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	2,2-Dichloropropane	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	2-Butanone (MEK)	ND	ug/L	5.0	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	4-Methyl-2-Pentanone (MIBK)	ND	ug/L	5.0	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Benzene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Bromobenzene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Bromochloromethane	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Bromodichloromethane	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Bromoethane	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Bromoform	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Bromomethane (Methyl Bromide)	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Carbon disulfide	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Carbon Tetrachloride	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Chlorobenzene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Chlorodibromomethane	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Chloroethane	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Chloroform (Trichloromethane)	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Chloromethane(Methyl Chloride)	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	cis-1,2-Dichloroethylene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	cis-1,3-Dichloropropene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Dibromomethane	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Dichlorodifluoromethane	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Dichloromethane	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Di-isopropyl ether	ND	ug/L	3.0	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Ethyl benzene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Hexachlorobutadiene	ND	ug/L	0.50	1

Rounding on totals after summation.
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1 800 566 LABS (1 800 566 5227)

Laboratory Data

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant
Tom Arellano
1966 Olivenhain Rd.
Encinitas, CA 92024

Samples Received on:
05/22/2019 1433

Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Isopropylbenzene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	m,p-Xylenes	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	m-Dichlorobenzene (1,3-DCB)	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Methyl Tert-butyl ether (MTBE)	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Naphthalene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	n-Butylbenzene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	n-Propylbenzene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	o-Chlorotoluene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	o-Dichlorobenzene (1,2-DCB)	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	o-Xylene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	p-Chlorotoluene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	p-Dichlorobenzene (1,4-DCB)	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	p-Isopropyltoluene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	sec-Butylbenzene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Styrene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	tert-amyl Methyl Ether	ND	ug/L	3.0	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	tert-Butyl Ethyl Ether	ND	ug/L	3.0	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	tert-Butylbenzene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Tetrachloroethylene (PCE)	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Toluene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Total 1,3-Dichloropropene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Total THM	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Total xylenes	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	trans-1,2-Dichloroethylene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	trans-1,3-Dichloropropene	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Trichloroethylene (TCE)	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Trichlorofluoromethane	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Trichlorotrifluoroethane(Freon 113)	ND	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Vinyl chloride (VC)	ND	ug/L	0.30	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,2-Dichloroethane-d4	99	%		1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	4-Bromofluorobenzene	97	%		1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Toluene-d8	96	%		1
		CASRL 524M-TCP - 1,2,3-Trichloropropane (SIM)							
05/23/19	05/23/19 15:44	1173899	1173900	(CASRL 524M-TCP)	1,2,3-Trichloropropane	ND	ug/L	0.00500	1
05/23/19	05/23/19 15:44	1173899	1173900	(CASRL 524M-TCP)	Toluene-d8	94	%		1
		SM 2150B - Odor at 60 C (TON)							
	05/22/19 17:59		1173647	(SM 2150B)	Odor at 60 C (TON)	8.0	TON	1.0	1

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Laboratory Data

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant
Tom Arellano
1966 Olivenhain Rd.
Encinitas, CA 92024

Samples Received on:
05/22/2019 1433

Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
		SM 4500F-C - Fluoride							
	05/22/19 23:36		1173613	(SM 4500F-C)	Fluoride	0.27	mg/L	0.050	1
		SM 2320B - Alkalinity in CaCO3 units							
	05/23/19 03:51		1173608	(SM 2320B)	Alkalinity in CaCO3 units	380	mg/L	20	1
		E160.1/SM2540C - Total Dissolved Solids (TDS)							
05/28/19	05/28/19 21:09	1174137	1174483	(E160.1/SM2540C)	Total Dissolved Solids (TDS)	3200	mg/L	10	1
		SM4500-HB - PH (H3=past HT not compliant)							
	05/23/19 03:51		1173609	(SM4500-HB)	PH (H3=past HT not compliant)	7.8	Units	0.10	1
		SM 5540C/EPA 425.1 - Surfactants							
	05/23/19 08:03		1173939	(SM 5540C/EPA 425.1)	Surfactants	0.19	mg/L	0.10	1
		EPA 180.1 - Turbidity							
	05/23/19 13:46		1173754	(EPA 180.1)	Turbidity	5.4	NTU	0.10	1
		SM2510B - Specific Conductance							
	05/23/19 03:51		1173610	(SM2510B)	Specific Conductance, 25 C	5500	umho/cm	10	1
		SM 2120B - Apparent Color							
	05/23/19 18:10		1173910	(SM 2120B)	Apparent Color	10	ACU	3.0	1

Travel Blank - HOLD (201905200221) — **Sampled on 05/22/2019 0515**

Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
		EPA 504.1 - EPA Method 504.1							
06/03/19	06/03/19 20:20	1175497	1175671	(EPA 504.1)	Dibromochloropropane (DBCP)	ND	ug/L	0.010	1
06/03/19	06/03/19 20:20	1175497	1175671	(EPA 504.1)	Ethylene Dibromide (EDB)	ND	ug/L	0.010	1
06/03/19	06/03/19 20:20	1175497	1175671	(EPA 504.1)	1,2-Dibromopropane	97	%		1
		EPA 524.2 - Volatile Organics by GCMS							
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,1,1,2-Tetrachloroethane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,1,1-Trichloroethane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,1,2,2-Tetrachloroethane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,1,2-Trichloroethane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,1-Dichloroethane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,1-Dichloroethylene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,1-Dichloropropene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,2,3-Trichlorobenzene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,2,3-Trichloropropane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,2,4-Trichlorobenzene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,2,4-Trimethylbenzene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,2-Dichloroethane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,2-Dichloropropane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,3,5-Trimethylbenzene	NA	ug/L	0.50	1

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Encinitas, CA 92024

Samples Received on:
05/22/2019 1433

Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,3-Dichloropropane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	2,2-Dichloropropane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	2-Butanone (MEK)	NA	ug/L	5.0	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	4-Methyl-2-Pentanone (MIBK)	NA	ug/L	5.0	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Benzene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Bromobenzene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Bromochloromethane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Bromodichloromethane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Bromoethane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Bromoform	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Bromomethane (Methyl Bromide)	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Carbon disulfide	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Carbon Tetrachloride	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Chlorobenzene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Chlorodibromomethane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Chloroethane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Chloroform (Trichloromethane)	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Chloromethane(Methyl Chloride)	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	cis-1,2-Dichloroethylene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	cis-1,3-Dichloropropene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Dibromomethane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Dichlorodifluoromethane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Dichloromethane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Di-isopropyl ether	NA	ug/L	3.0	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Ethyl benzene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Hexachlorobutadiene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Isopropylbenzene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	m,p-Xylenes	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	m-Dichlorobenzene (1,3-DCB)	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Methyl Tert-butyl ether (MTBE)	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Naphthalene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	n-Butylbenzene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	n-Propylbenzene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	o-Chlorotoluene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	o-Dichlorobenzene (1,2-DCB)	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	o-Xylene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	p-Chlorotoluene	NA	ug/L	0.50	1

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Samples Received on:
05/22/2019 1433

Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	p-Dichlorobenzene (1,4-DCB)	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	p-Isopropyltoluene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	sec-Butylbenzene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Styrene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	tert-amyl Methyl Ether	NA	ug/L	3.0	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	tert-Butyl Ethyl Ether	NA	ug/L	3.0	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	tert-Butylbenzene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Tetrachloroethylene (PCE)	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Toluene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Total 1,3-Dichloropropene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Total THM	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Total xylenes	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	trans-1,2-Dichloroethylene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	trans-1,3-Dichloropropene	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Trichloroethylene (TCE)	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Trichlorofluoromethane	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Trichlorotrifluoroethane(Freon 113)	NA	ug/L	0.50	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Vinyl chloride (VC)	NA	ug/L	0.30	1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	1,2-Dichloroethane-d4	NA	%		1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	4-Bromofluorobenzene	NA	%		1
05/28/19	05/28/19 23:22	1174664	1174669	(EPA 524.2)	Toluene-d8	NA	%		1
		CASRL 524M-TCP - 1,2,3-Trichloropropane (SIM)							
05/23/19	05/23/19 15:44	1173899	1173900	(CASRL 524M-TCP)	1,2,3-Trichloropropane	NA	ug/L	0.00500	1
05/23/19	05/23/19 15:44	1173899	1173900	(CASRL 524M-TCP)	Toluene-d8	NA	%		1

Field Blank (201905200221) (201905230398) **Sampled on 05/22/2019 0515**

Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
		EPA 537 - Perfluorinated Alkyl Acids EPA 537 rev 1.1							
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	N-ethyl Perfluorooctanesulfonamidoacetic acid	ND	ug/L	0.0020	1
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	N-methyl Perfluorooctanesulfonamidoacetic acid	ND	ug/L	0.0020	1
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	Perfluorobutanesulfonic acid	ND	ug/L	0.0020	1
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	Perfluorodecanoic acid	ND	ug/L	0.0020	1
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	Perfluorododecanoic acid	ND	ug/L	0.0020	1
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	Perfluoroheptanoic acid	ND	ug/L	0.0020	1
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	Perfluorohexanesulfonic acid	ND	ug/L	0.0020	1
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	Perfluorohexanoic acid	ND	ug/L	0.0020	1
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	Perfluorononanoic acid	ND	ug/L	0.0020	1
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	Perfluorooctanesulfonic acid	ND	ug/L	0.0020	1

Rounding on totals after summation.
(c) - indicates calculated results. Analysis is a calculated result. Reported results are not rounded until the final step before reporting. Therefore methods that use a test result with further calculation may have slight differences in final result than the component analyses.

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Laboratory Data

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant
Tom Arellano
1966 Olivenhain Rd.
Encinitas, CA 92024

Samples Received on:
05/22/2019 1433

Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	Perfluorooctanoic acid	ND	ug/L	0.0020	1
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	Perfluorotetradecanoic acid	ND	ug/L	0.0020	1
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	Perfluorotridecanoic acid	ND	ug/L	0.0020	1
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	Perfluoroundecanoic acid	ND	ug/L	0.0020	1
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	13C-PFDA	100	%		1
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	13C-PFHxA	114	%		1
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	13C-PFOA	115	%		1
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	13C-PFOS	106	%		1
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	d3-NMeFOSAA	104	%		1
06/04/19	06/07/19 22:01	1175640	1177054	(EPA 537)	d5-NEtFOSAA	100	%		1

Rounding on totals after summation.
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Laboratory QC Summary

Report: 806101
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Group: desal pilot

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Nitrate, Nitrite by EPA 300.0		
Analytical Batch: 1173588		**Analysis Date: 05/22/2019**
201905200220	Test Well	Analyzed by: TR7W
Chloride, Sulfate by EPA 300.0		
Analytical Batch: 1173590		**Analysis Date: 05/22/2019**
201905200220	Test Well	Analyzed by: TR7W
Alkalinity in CaCO3 units		
Analytical Batch: 1173608		**Analysis Date: 05/23/2019**
201905200220	Test Well	Analyzed by: BM2O
PH (H3=past HT not compliant)		
Analytical Batch: 1173609		**Analysis Date: 05/23/2019**
201905200220	Test Well	Analyzed by: BM2O
Specific Conductance		
Analytical Batch: 1173610		**Analysis Date: 05/23/2019**
201905200220	Test Well	Analyzed by: BM2O
Fluoride		
Analytical Batch: 1173613		**Analysis Date: 05/22/2019**
201905200220	Test Well	Analyzed by: BM2O
Odor at 60 C (TON)		
Analytical Batch: 1173647		**Analysis Date: 05/22/2019**
201905200220	Test Well	Analyzed by: AP6M
Nitrite Nitrogen by RFA		
Analytical Batch: 1173653		**Analysis Date: 05/23/2019**
201905200220	Test Well	Analyzed by: H5VG
Turbidity		
Analytical Batch: 1173754		**Analysis Date: 05/23/2019**
201905200220	Test Well	Analyzed by: T4ZB
ICP Metals		
Prep Batch: 1173450	**Analytical Batch: 1173798**	**Analysis Date: 05/23/2019**
201905200220	Test Well	Analyzed by: 6Q4
ICPMS Metals		
Prep Batch: 1173450	**Analytical Batch: 1173831**	**Analysis Date: 05/24/2019**
201905200220	Test Well	Analyzed by: LUPE
Radon 222		
Analytical Batch: 1173888		**Analysis Date: 05/23/2019**
201905200220	Test Well	Analyzed by: EAE5
1,2,3-Trichloropropane (SIM)		
Prep Batch: 1173899	**Analytical Batch: 1173900**	**Analysis Date: 05/23/2019**
201905200220	Test Well	Analyzed by: TG9W

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201905200221	Travel Blank - HOLD	Analyzed by: TG9W

Apparent Color

Analytical Batch: 1173910		**Analysis Date: 05/23/2019**
201905200220	Test Well	Analyzed by: AP6M

Surfactants

Analytical Batch: 1173939		**Analysis Date: 05/23/2019**
201905200220	Test Well	Analyzed by: K4TY

Chloride, Sulfate by EPA 300.0

Analytical Batch: 1174171		**Analysis Date: 05/24/2019**
201905200220	Test Well	Analyzed by: TR7W

Diquat and Paraquat

Prep Batch: 1174432	**Analytical Batch: 1174443**	**Analysis Date: 05/29/2019**
201905200220	Test Well	Analyzed by: XWO

Glyphosate

Analytical Batch: 1174458		**Analysis Date: 05/29/2019**
201905200220	Test Well	Analyzed by: DYM

Total Dissolved Solids (TDS)

Prep Batch: 1174137	**Analytical Batch: 1174483**	**Analysis Date: 05/28/2019**
201905200220	Test Well	Analyzed by: TJ52

Perchlorate by LCMS

Analytical Batch: 1174578		**Analysis Date: 05/28/2019**
201905200220	Test Well	Analyzed by: PHK

Volatile Organics by GCMS

Prep Batch: 1174664	**Analytical Batch: 1174669**	**Analysis Date: 05/28/2019**
201905200220	Test Well	Analyzed by: TG9W
201905200221	Travel Blank - HOLD	Analyzed by: TG9W

Hexavalent Chromium by 218.6

Analytical Batch: 1174776		**Analysis Date: 05/30/2019**
201905200220	Test Well	Analyzed by: TLH

Glyphosphate by LCMS

Analytical Batch: 1174843		**Analysis Date: 05/30/2019**
201905200220	Test Well	Analyzed by: SZZ

DIQUAT-LOW 0.1ppb

Prep Batch: 1173964	**Analytical Batch: 1174886**	**Analysis Date: 05/29/2019**
201905200220	Test Well	Analyzed by: XWO

Endothal_LOW-LCMS

Analytical Batch: 1174892		**Analysis Date: 05/29/2019**
201905200220	Test Well	Analyzed by: SZZ

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Laboratory QC Summary

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

Endothall

Prep Batch: 1174382	**Analytical Batch: 1174900**	**Analysis Date: 05/31/2019**
201905200220	Test Well	Analyzed by: X8AA

Organochlorine Pesticides/PCBs

Prep Batch: 1174471	**Analytical Batch: 1175303**	**Analysis Date: 05/29/2019**
201905200220	Test Well	Analyzed by: LRL

Mercury Total

Prep Batch: 1175223	**Analytical Batch: 1175326**	**Analysis Date: 05/31/2019**
201905200220	Test Well	Analyzed by: AZS

Aldicarbs

Analytical Batch: 1175661		**Analysis Date: 06/04/2019**
201905200220	Test Well	Analyzed by: XWO

EPA Method 504.1

Prep Batch: 1175497	**Analytical Batch: 1175671**	**Analysis Date: 06/03/2019**
201905200221	Travel Blank - HOLD	Analyzed by: DYM

ICPMS Metals

Prep Batch: 1173450	**Analytical Batch: 1175821**	**Analysis Date: 06/04/2019**
201905200220	Test Well	Analyzed by: NINA

EPA Method 504.1

Prep Batch: 1175496	**Analytical Batch: 1175953**	**Analysis Date: 06/04/2019**
201905200220	Test Well	Analyzed by: DYM

Cyanide by manual distillation

Prep Batch: 1175983	**Analytical Batch: 1175985**	**Analysis Date: 06/05/2019**
201905200220	Test Well	Analyzed by: H5VG

ICPMS Metals

Prep Batch: 1173450	**Analytical Batch: 1176125**	**Analysis Date: 06/04/2019**
201905200220	Test Well	Analyzed by: AZS

Chlorophenoxy Herbicides

Prep Batch: 1175936	**Analytical Batch: 1176585**	**Analysis Date: 06/07/2019**
201905200220	Test Well	Analyzed by: A4H

Perfluorinated Alkyl Acids EPA 537 rev 1.1

Prep Batch: 1175545	**Analytical Batch: 1177011**	**Analysis Date: 06/07/2019**
201905200220	Test Well	Analyzed by: KAM

Perfluorinated Alkyl Acids EPA 537 rev 1.1

Prep Batch: 1175640	**Analytical Batch: 1177054**	**Analysis Date: 06/07/2019**
201905230398	Field Blank (201905200221)	Analyzed by: KAM

Semivolatiles by GCMS

Prep Batch: 1176017	**Analytical Batch: 1177380**	**Analysis Date: 06/12/2019**
201905200220	Test Well	Analyzed by: KDT

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Gross Alpha/Beta Radiation

Prep Batch: 1174743 Analytical Batch: 1177411 **Analysis Date: 06/11/2019**

201905200220 Test Well Analyzed by: EAE5

Gross Alpha by Co-precipitation

Prep Batch: 1176539 Analytical Batch: 1180088 **Analysis Date: 06/20/2019**

201905200220 Test Well Analyzed by: EAE5

ICPMS Metals

Prep Batch: 1173450 Analytical Batch: 1180365 **Analysis Date: 06/27/2019**

201905200220 Test Well Analyzed by: LUPE

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David C. McCollum Water Treatment Plant

Nitrate, Nitrite by EPA 300.0 by EPA 300.0

Analytical Batch: 1173588 **Analysis Date: 05/22/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Nitrate as Nitrogen by IC		2.5	2.63	mg/L	105	(90-110)		
LCS2	Nitrate as Nitrogen by IC		2.5	2.63	mg/L	105	(90-110)	20	0.0
MBLK	Nitrate as Nitrogen by IC			<0.05	mg/L				
MRL_CHK	Nitrate as Nitrogen by IC		0.05	0.0517	mg/L	103	(50-150)		
MRLLW	Nitrate as Nitrogen by IC		0.013	0.0133	mg/L	106	(50-150)		
MS_201812290130	Nitrate as Nitrogen by IC	0.92	13	14.2	mg/L	106	(80-120)		
MS_201905200220	Nitrate as Nitrogen by IC	ND	13	13.4	mg/L	107	(80-120)		
MSD_201812290130	Nitrate as Nitrogen by IC	0.92	13	14.1	mg/L	106	(80-120)	20	0.75
MSD_201905200220	Nitrate as Nitrogen by IC	ND	13	13.5	mg/L	108	(80-120)	20	0.91

Chloride, Sulfate by EPA 300.0 by EPA 300.0

Analytical Batch: 1173590 **Analysis Date: 05/22/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Chloride		25	26.1	mg/L	104	(90-110)		
LCS2	Chloride		25	26.2	mg/L	105	(90-110)	20	0.38
MBLK	Chloride			<0.25	mg/L				
MRL_CHK	Chloride		0.5	0.450	mg/L	90	(50-150)		
MS_201905200220	Chloride		13	ND	mg/L	**55**	(80-120)		
MS_201812290130	Chloride	210	130	349	mg/L	108	(80-120)		
MSD_201812290130	Chloride	210	130	346	mg/L	105	(80-120)	20	0.89
MSD_201905200220	Chloride		13	ND	mg/L	**60**	(80-120)	20	0.73
LCS1	Sulfate		50	52.3	mg/L	105	(90-110)		
LCS2	Sulfate		50	52.4	mg/L	105	(90-110)	20	0.19
MBLK	Sulfate			<0.125	mg/L				
MRL_CHK	Sulfate		1	0.994	mg/L	99	(50-150)		
MRLLW	Sulfate		0.25	0.269	mg/L	108	(50-150)		
MS_201905200220	Sulfate	730	250	977	mg/L	100	(80-120)		
MS_201812290130	Sulfate	370	250	635	mg/L	108	(80-120)		
MSD_201812290130	Sulfate	370	250	630	mg/L	105	(80-120)	20	0.81
MSD_201905200220	Sulfate	730	250	983	mg/L	102	(80-120)	20	0.65

Alkalinity in CaCO3 units by SM 2320B

Analytical Batch: 1173608 **Analysis Date: 05/23/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Alkalinity in CaCO3 units		100	98.8	mg/L	99	(90-110)		
LCS2	Alkalinity in CaCO3 units		100	98.6	mg/L	99	(90-110)	20	0.20
MBLK	Alkalinity in CaCO3 units			<1	mg/L				
MRLHI	Alkalinity in CaCO3 units		20	20.1	mg/L	101	(50-150)		

Spike recovery is already corrected for native results.
Spikes which exceed Limits and Method Blanks with positive results are highlighted by Underlining.
Criteria for MS and Dup are advisory only, batch control is based on LCS. Criteria for duplicates are advisory only, unless otherwise specified in the method.
RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
(S) - Indicates surrogate compound.
(I) - Indicates internal standard compound.

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Laboratory QC

Report: 806101
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Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MS_201905220100	Alkalinity in CaCO3 units	270	100	349	mg/L	81	(80-120)		
MS_201904101009	Alkalinity in CaCO3 units	270	100	356	mg/L	83	(80-120)		
MSD_201905220100	Alkalinity in CaCO3 units	270	100	347	mg/L	**79**	(80-120)	20	0.67
MSD_201904101009	Alkalinity in CaCO3 units	270	100	352	mg/L	80	(80-120)	20	1.0

PH (H3=past HT not compliant) by SM4500-HB

Analytical Batch: 1173609 **Analysis Date: 05/23/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
DUP_201905220100	PH (H3=past HT not compliant)	8.1		8.07	Units		(0-20)	20	0.12
DUP_201904101009	PH (H3=past HT not compliant)	7.6		7.64	Units		(0-20)	20	0.13
LCS1	PH (H3=past HT not compliant)		6	5.97	Units	100	(98-102)		
LCS2	PH (H3=past HT not compliant)		6	5.97	Units	100	(98-102)	20	0.0

Specific Conductance by SM2510B

Analytical Batch: 1173610 **Analysis Date: 05/23/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
DUP1_201904101009	Specific Conductance	1600		1580	umho/cm		(0-20)	20	0.68
DUP1_201905240347	Specific Conductance	660		665	umho/cm		(0-20)	20	0.26
LCS1	Specific Conductance		1000	990	umho/cm	99	(95-105)		
LCS2	Specific Conductance		1000	984	umho/cm	99	(95-105)	20	0.51
MBLK	Specific Conductance			<1	umho/cm				
MRL_CHK	Specific Conductance		1.8	2.00	umho/cm	112	(50-150)		
MRLHI	Specific Conductance		10	10.4	umho/cm	104	(50-150)		

Fluoride by SM 4500F-C

Analytical Batch: 1173613 **Analysis Date: 05/22/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Fluoride		1	0.994	mg/L	100	(90-110)		
LCS2	Fluoride		1	0.981	mg/L	98	(90-110)	20	1.4
MBLK	Fluoride			<0.025	mg/L				
MRL_CHK	Fluoride		0.05	0.0488	mg/L	98	(50-150)		
MS_201905210695	Fluoride	0.32	1	1.31	mg/L	99	(80-120)		
MSD_201905210695	Fluoride	0.32	1	1.31	mg/L	99	(80-120)	20	0.37

Odor at 60 C (TON) by SM 2150B

Analytical Batch: 1173647 **Analysis Date: 05/22/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
DUP1_201905220800	Odor at 60 C (TON)	ND		ND	TON		(0-20)		
MBLK	Odor at 60 C (TON)			<1	TON				

Nitrite Nitrogen by RFA by EPA 353.2

Analytical Batch: 1173653 **Analysis Date: 05/23/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Nitrite Nitrogen by RFA		0.1	0.0914	mg/L	91	(90-110)		
LCS2	Nitrite Nitrogen by RFA		0.1	0.0936	mg/L	94	(90-110)	20	2.4

Spike recovery is already corrected for native results.
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RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
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David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MBLK	Nitrite Nitrogen by RFA			<0.0049	mg/L				
MRL_CHK	Nitrite Nitrogen by RFA		0.01	0.00800	mg/L	80	(50-150)		
MS_201905200220	Nitrite Nitrogen by RFA	ND	0.1	0.0935	mg/L	94	(90-110)		
MSD_201905200220	Nitrite Nitrogen by RFA	ND	0.1	0.0931	mg/L	93	(90-110)	20	0.43

Turbidity by EPA 180.1

Analytical Batch: 1173754 **Analysis Date: 05/23/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
DUP1_201905220022	Turbidity	ND		0.0500	NTU		(0-20)	20	4.1
DUP2_201905200220	Turbidity	5.4		5.63	NTU		(0-20)	20	4.0
LCS1	Turbidity		20	20.1	NTU	101	(90-110)		
LCS2	Turbidity		20	20.7	NTU	103	(90-110)	20	2.9
MBLK	Turbidity			<0.10	NTU				
MRLHI	Turbidity		0.1	0.0730	NTU	73	(50-150)		

ICP Metals by EPA 200.7

Analytical Batch: 1173798 **Analysis Date: 05/23/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Boron Total ICAP		0.5	0.490	mg/L	98	(85-115)		
LCS2	Boron Total ICAP		0.5	0.488	mg/L	98	(85-115)	20	0.41
MBLK	Boron Total ICAP			<0.025	mg/L				
MRL_CHK	Boron Total ICAP		0.05	0.0494	mg/L	99	(50-150)		
MS_201905220423	Boron Total ICAP	0.08	0.5	0.561	mg/L	96	(70-130)		
MS2_201905220561	Boron Total ICAP	0.070	0.5	0.579	mg/L	102	(70-130)		
MSD_201905220423	Boron Total ICAP	0.08	0.5	0.575	mg/L	99	(70-130)	20	2.4
MSD2_201905220561	Boron Total ICAP	0.070	0.5	0.574	mg/L	101	(70-130)	20	0.95
LCS1	Calcium Total ICAP		50	49.8	mg/L	100	(85-115)		
LCS2	Calcium Total ICAP		50	49.8	mg/L	100	(85-115)	20	0.0
MBLK	Calcium Total ICAP			<0.5	mg/L				
MRL_CHK	Calcium Total ICAP		1	1.01	mg/L	101	(50-150)		
MS_201905220423	Calcium Total ICAP	47	50	94.9	mg/L	96	(70-130)		
MS2_201905220561	Calcium Total ICAP	56	50	101	mg/L	90	(70-130)		
MSD_201905220423	Calcium Total ICAP	47	50	95.5	mg/L	97	(70-130)	20	0.67
MSD2_201905220561	Calcium Total ICAP	56	50	100	mg/L	89	(70-130)	20	0.89
LCS1	Iron Total ICAP		5	5.00	mg/L	100	(85-115)		
LCS2	Iron Total ICAP		5	5.00	mg/L	100	(85-115)	20	0.0
MBLK	Iron Total ICAP			<0.01	mg/L				
MRL_CHK	Iron Total ICAP		0.02	0.0209	mg/L	104	(50-150)		
MS_201905220423	Iron Total ICAP	ND	5	4.95	mg/L	99	(70-130)		
MS2_201905220561	Iron Total ICAP	ND	5	5.22	mg/L	104	(70-130)		
MSD_201905220423	Iron Total ICAP	ND	5	5.09	mg/L	102	(70-130)	20	2.8

Spike recovery is already corrected for native results.
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RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
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QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MSD2_201905220561	Iron Total ICAP	ND	5	5.19	mg/L	104	(70-130)	20	0.53
LCS1	Magnesium Total ICAP		20	19.6	mg/L	98	(85-115)		
LCS2	Magnesium Total ICAP		20	19.6	mg/L	98	(85-115)	20	0.0
MBLK	Magnesium Total ICAP			<0.05	mg/L				
MRL_CHK	Magnesium Total ICAP		0.1	0.0984	mg/L	98	(50-150)		
MS_201905220423	Magnesium Total ICAP	9.8	20	29.0	mg/L	96	(70-130)		
MS2_201905220561	Magnesium Total ICAP	7.6	20	27.9	mg/L	102	(70-130)		
MSD_201905220423	Magnesium Total ICAP	9.8	20	29.4	mg/L	98	(70-130)	20	1.2
MSD2_201905220561	Magnesium Total ICAP	7.6	20	27.8	mg/L	101	(70-130)	20	0.30
LCS1	Potassium Total ICAP		20	19.8	mg/L	99	(85-115)		
LCS2	Potassium Total ICAP		20	19.8	mg/L	99	(85-115)	20	0.0
MBLK	Potassium Total ICAP			<0.5	mg/L				
MRL_CHK	Potassium Total ICAP		1	0.706	mg/L	71	(50-150)		
MS_201905220423	Potassium Total ICAP	1.8	20	22.5	mg/L	104	(70-130)		
MS2_201905220561	Potassium Total ICAP	2.4	20	23.8	mg/L	107	(70-130)		
MSD_201905220423	Potassium Total ICAP	1.8	20	23.0	mg/L	106	(70-130)	20	2.1
MSD2_201905220561	Potassium Total ICAP	2.4	20	23.9	mg/L	107	(70-130)	20	0.27
LCS1	Silica		21	20.2	mg/L	94	(85-115)		
LCS2	Silica		21	20.2	mg/L	95	(85-115)	20	0.0
MBLK	Silica			<0.25	mg/L				
MRL_CHK	Silica		0.43	0.420	mg/L	98	(50-150)		
MS_201905220423	Silica	24	21	44.2	mg/L	94	(70-130)		
MS2_201905220561	Silica	11	21	31.0	mg/L	94	(70-130)		
MSD_201905220423	Silica	24	21	44.2	mg/L	94	(70-130)	20	0.068
MSD2_201905220561	Silica	11	21	31.2	mg/L	95	(70-130)	20	0.61
LCS1	Sodium Total ICAP		50	49.3	mg/L	99	(85-115)		
LCS2	Sodium Total ICAP		50	48.9	mg/L	98	(85-115)	20	0.82
MBLK	Sodium Total ICAP			<0.5	mg/L				
MRL_CHK	Sodium Total ICAP		1	0.947	mg/L	95	(50-150)		
MS_201905220423	Sodium Total ICAP	47	50	93.5	mg/L	94	(70-130)		
MS2_201905220561	Sodium Total ICAP	30	50	79.6	mg/L	98	(70-130)		
MSD_201905220423	Sodium Total ICAP	47	50	94.1	mg/L	95	(70-130)	20	0.59
MSD2_201905220561	Sodium Total ICAP	30	50	79.7	mg/L	98	(70-130)	20	0.068

ICPMS Metals by EPA 200.8

Analytical Batch: 1173831 **Analysis Date: 05/24/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Aluminum Total ICAP/MS		100	103	ug/L	103	(85-115)		
LCS2	Aluminum Total ICAP/MS		100	102	ug/L	103	(85-115)	20	0.0
MBLK	Aluminum Total ICAP/MS			<10	ug/L				

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Laboratory QC

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Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MRL_CHK	Aluminum Total ICAP/MS		20	20.3	ug/L	102	(50-150)		
MS_201905220061	Aluminum Total ICAP/MS	ND	100	116	ug/L	105	(70-130)		
MS2_201905220275	Aluminum Total ICAP/MS	ND	100	114	ug/L	114	(70-130)		
MSD_201905220061	Aluminum Total ICAP/MS	ND	100	119	ug/L	108	(70-130)	20	2.5
LCS1	Antimony Total ICAP/MS		50	46.7	ug/L	93	(85-115)		
LCS2	Antimony Total ICAP/MS		50	46.0	ug/L	92	(85-115)	20	1.5
MBLK	Antimony Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Antimony Total ICAP/MS		1	0.982	ug/L	98	(50-150)		
MS_201905220061	Antimony Total ICAP/MS	1.3	50	50.0	ug/L	97	(70-130)		
MS2_201905220275	Antimony Total ICAP/MS	ND	50	51.2	ug/L	102	(70-130)		
MSD_201905220061	Antimony Total ICAP/MS	1.3	50	52.4	ug/L	102	(70-130)	20	4.7
LCS1	Arsenic Total ICAP/MS		50	52.1	ug/L	104	(85-115)		
LCS2	Arsenic Total ICAP/MS		50	51.9	ug/L	104	(85-115)	20	0.39
MBLK	Arsenic Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Arsenic Total ICAP/MS		1	1.13	ug/L	113	(50-150)		
MS_201905220061	Arsenic Total ICAP/MS	2.4	50	59.3	ug/L	114	(70-130)		
MS2_201905220275	Arsenic Total ICAP/MS	1.8	50	60.7	ug/L	118	(70-130)		
MSD_201905220061	Arsenic Total ICAP/MS	2.4	50	60.7	ug/L	117	(70-130)	20	2.3
LCS1	Barium Total ICAP/MS		50	49.5	ug/L	99	(85-115)		
LCS2	Barium Total ICAP/MS		50	49.7	ug/L	99	(85-115)	20	0.40
MBLK	Barium Total ICAP/MS			<1	ug/L				
MRL_CHK	Barium Total ICAP/MS		2	1.99	ug/L	100	(50-150)		
MS_201905220061	Barium Total ICAP/MS	9.3	50	61.0	ug/L	103	(70-130)		
MS2_201905220275	Barium Total ICAP/MS	49	50	103	ug/L	108	(70-130)		
MSD_201905220061	Barium Total ICAP/MS	9.3	50	63.0	ug/L	107	(70-130)	20	3.2
LCS1	Beryllium Total ICAP/MS		25	24.6	ug/L	99	(85-115)		
LCS2	Beryllium Total ICAP/MS		25	24.7	ug/L	99	(85-115)	20	0.41
MBLK	Beryllium Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Beryllium Total ICAP/MS		1	1.02	ug/L	102	(50-150)		
MS_201905220061	Beryllium Total ICAP/MS	ND	25	26.8	ug/L	107	(70-130)		
MS2_201905220275	Beryllium Total ICAP/MS	ND	25	27.1	ug/L	108	(70-130)		
MSD_201905220061	Beryllium Total ICAP/MS	ND	25	27.8	ug/L	111	(70-130)	20	4.1
MSD2_201905220275	Beryllium Total ICAP/MS	ND	25	26.0	ug/L	104	(70-130)	20	4.2
LCS1	Cadmium Total ICAP/MS		25	24.8	ug/L	99	(85-115)		
LCS2	Cadmium Total ICAP/MS		25	24.9	ug/L	99	(85-115)	20	0.40
MBLK	Cadmium Total ICAP/MS			<0.25	ug/L				
MRL_CHK	Cadmium Total ICAP/MS		0.5	0.533	ug/L	107	(50-150)		
MS_201905220061	Cadmium Total ICAP/MS	ND	25	25.6	ug/L	102	(70-130)		

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Laboratory QC

Report: 806101
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Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MS2_201905220275	Cadmium Total ICAP/MS	ND	25	25.9	ug/L	104	(70-130)		
MSD_201905220061	Cadmium Total ICAP/MS	ND	25	26.7	ug/L	107	(70-130)	20	4.4
LCS1	Chromium Total ICAP/MS		50	50.9	ug/L	102	(85-115)		
LCS2	Chromium Total ICAP/MS		50	50.8	ug/L	102	(85-115)	20	0.20
MBLK	Chromium Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Chromium Total ICAP/MS		1	1.04	ug/L	104	(50-150)		
MS_201905220061	Chromium Total ICAP/MS	ND	50	51.6	ug/L	103	(70-130)		
MS2_201905220275	Chromium Total ICAP/MS	ND	50	56.6	ug/L	113	(70-130)		
MSD_201905220061	Chromium Total ICAP/MS	ND	50	54.4	ug/L	109	(70-130)	20	5.2
LCS1	Copper Total ICAP/MS		50	50.5	ug/L	101	(85-115)		
LCS2	Copper Total ICAP/MS		50	50.2	ug/L	100	(85-115)	20	0.60
MBLK	Copper Total ICAP/MS			<1	ug/L				
MRL_CHK	Copper Total ICAP/MS		2	2.09	ug/L	104	(50-150)		
MS_201905220061	Copper Total ICAP/MS	200	50	258	ug/L	107	(70-130)		
MS2_201905220275	Copper Total ICAP/MS	2.9	50	53.3	ug/L	101	(70-130)		
MSD_201905220061	Copper Total ICAP/MS	200	50	258	ug/L	108	(70-130)	20	0.30
LCS1	Lead Total ICAP/MS		50	50.6	ug/L	101	(85-115)		
LCS2	Lead Total ICAP/MS		50	50.4	ug/L	101	(85-115)	20	0.40
MBLK	Lead Total ICAP/MS			<0.25	ug/L				
MRL_CHK	Lead Total ICAP/MS		0.5	0.527	ug/L	105	(50-150)		
MS_201905220061	Lead Total ICAP/MS	0.81	50	51.4	ug/L	101	(70-130)		
MS2_201905220275	Lead Total ICAP/MS	ND	50	51.8	ug/L	103	(70-130)		
MSD_201905220061	Lead Total ICAP/MS	0.81	50	52.8	ug/L	104	(70-130)	20	2.6
LCS1	Manganese Total ICAP/MS		100	102	ug/L	102	(85-115)		
LCS2	Manganese Total ICAP/MS		100	101	ug/L	101	(85-115)	20	0.99
MBLK	Manganese Total ICAP/MS			<1	ug/L				
MRL_CHK	Manganese Total ICAP/MS		2	2.04	ug/L	102	(50-150)		
MS_201905220061	Manganese Total ICAP/MS	ND	100	103	ug/L	102	(70-130)		
MS2_201905220275	Manganese Total ICAP/MS	ND	100	109	ug/L	109	(70-130)		
MSD_201905220061	Manganese Total ICAP/MS	ND	100	106	ug/L	105	(70-130)	20	2.9
LCS1	Nickel Total ICAP/MS		50	51.2	ug/L	102	(85-115)		
LCS2	Nickel Total ICAP/MS		50	50.6	ug/L	101	(85-115)	20	1.2
MBLK	Nickel Total ICAP/MS			<2.5	ug/L				
MRL_CHK	Nickel Total ICAP/MS		5	5.13	ug/L	103	(50-150)		
MS_201905220061	Nickel Total ICAP/MS	ND	50	51.2	ug/L	101	(70-130)		
MS2_201905220275	Nickel Total ICAP/MS	ND	50	51.9	ug/L	102	(70-130)		
MSD_201905220061	Nickel Total ICAP/MS	ND	50	52.3	ug/L	103	(70-130)	20	2.1
LCS1	Selenium Total ICAP/MS		50	50.8	ug/L	102	(85-115)		

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Report: 806101
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David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS2	Selenium Total ICAP/MS		50	50.7	ug/L	101	(85-115)	20	0.20
MBLK	Selenium Total ICAP/MS			<2.5	ug/L				
MRL_CHK	Selenium Total ICAP/MS		5	5.23	ug/L	105	(50-150)		
MS_201905220061	Selenium Total ICAP/MS	ND	50	57.9	ug/L	115	(70-130)		
MS2_201905220275	Selenium Total ICAP/MS	35	50	94.0	ug/L	117	(70-130)		
MSD_201905220061	Selenium Total ICAP/MS	ND	50	59.0	ug/L	118	(70-130)	20	2.0
LCS1	Silver Total ICAP/MS		25	24.5	ug/L	98	(85-115)		
LCS2	Silver Total ICAP/MS		25	24.2	ug/L	97	(85-115)	20	1.2
MBLK	Silver Total ICAP/MS			<0.25	ug/L				
MRL_CHK	Silver Total ICAP/MS		0.5	0.436	ug/L	87	(50-150)		
MS_201905220061	Silver Total ICAP/MS	ND	25	24.0	ug/L	95	(70-130)		
MS2_201905220275	Silver Total ICAP/MS	ND	25	24.8	ug/L	99	(70-130)		
MSD_201905220061	Silver Total ICAP/MS	ND	25	25.4	ug/L	100	(70-130)	20	5.8
LCS1	Thallium Total ICAP/MS		50	51.0	ug/L	102	(85-115)		
LCS2	Thallium Total ICAP/MS		50	50.8	ug/L	102	(85-115)	20	0.39
MBLK	Thallium Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Thallium Total ICAP/MS		1	1.03	ug/L	103	(50-150)		
MS_201905220061	Thallium Total ICAP/MS	ND	50	52.4	ug/L	105	(70-130)		
MS2_201905220275	Thallium Total ICAP/MS	ND	50	54.0	ug/L	108	(70-130)		
MSD_201905220061	Thallium Total ICAP/MS	ND	50	54.0	ug/L	108	(70-130)	20	2.9
LCS1	Uranium ICAP/MS		50	51.4	ug/L	103	(85-115)		
LCS2	Uranium ICAP/MS		50	52.2	ug/L	104	(85-115)	20	1.4
MBLK	Uranium ICAP/MS			<0.5	ug/L				
MRL_CHK	Uranium ICAP/MS		1	1.01	ug/L	101	(50-150)		
MS_201905220061	Uranium ICAP/MS	3.8	50	59.5	ug/L	111	(70-130)		
MS2_201905220275	Uranium ICAP/MS	3.9	50	64.3	ug/L	121	(70-130)		
MSD_201905220061	Uranium ICAP/MS	3.8	50	61.0	ug/L	114	(70-130)	20	2.5
MSD2_201905220275	Uranium ICAP/MS	3.9	50	60.8	ug/L	114	(70-130)	20	5.7
LCS1	Vanadium Total ICAP/MS		50	51.0	ug/L	102	(85-115)		
LCS2	Vanadium Total ICAP/MS		50	50.8	ug/L	102	(85-115)	20	0.39
MBLK	Vanadium Total ICAP/MS			<1.5	ug/L				
MRL_CHK	Vanadium Total ICAP/MS		3	3.01	ug/L	100	(50-150)		
MS_201905220061	Vanadium Total ICAP/MS	ND	50	54.7	ug/L	109	(70-130)		
MS2_201905220275	Vanadium Total ICAP/MS	ND	50	59.9	ug/L	119	(70-130)		
MSD_201905220061	Vanadium Total ICAP/MS	ND	50	56.7	ug/L	113	(70-130)	20	3.5
LCS1	Zinc Total ICAP/MS		50	51.3	ug/L	103	(85-115)		
LCS2	Zinc Total ICAP/MS		50	50.2	ug/L	100	(85-115)	20	2.2
MBLK	Zinc Total ICAP/MS			<10	ug/L				

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Laboratory QC

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QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MRL_CHK	Zinc Total ICAP/MS		20	20.3	ug/L	101	(50-150)		
MS_201905220061	Zinc Total ICAP/MS	ND	50	62.5	ug/L	106	(70-130)		
MS2_201905220275	Zinc Total ICAP/MS	ND	50	60.3	ug/L	103	(70-130)		
MSD_201905220061	Zinc Total ICAP/MS	ND	50	64.2	ug/L	110	(70-130)	20	2.6

Radon 222 by SM 7500RN

Analytical Batch: 1173888 **Analysis Date: 05/22/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
DUP_201905220264	Radon 222	ND		22.8	pCi/L		(0-10)	10	**78**
LCS1	Radon 222		200	228	pCi/L	114	(80-120)		
LCS2	Radon 222		208	231	pCi/L	111	(80-120)	10	1.3
MBLK	Radon 222			<50	pCi/L				

1,2,3-Trichloropropane (SIM) by CASRL 524M-TCP

Analytical Batch: 1173900 **Analysis Date: 05/23/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
DUP_201905220100	1,2,3-Trichloropropane	ND		ND	ug/L		(0-20)		
LCS1	1,2,3-Trichloropropane		0.01	0.00903	ug/L	90	(80-120)		
LCS2	1,2,3-Trichloropropane		0.01	0.00892	ug/L	89	(80-120)	20	1.2
MBLK	1,2,3-Trichloropropane			<0.005	ug/L				
MRL_CHK	1,2,3-Trichloropropane		0.005	0.00459	ug/L	92	(80-120)		
DUP_201905220100	Toluene-d8 (S)		2000	104	%	104	(70-130)		
LCS1	Toluene-d8 (S)		2000	92.6	%	93	(70-130)		
LCS2	Toluene-d8 (S)		2000	89.6	%	90	(70-130)		
MBLK	Toluene-d8 (S)			89.9	%	90	(70-130)		
MRL_CHK	Toluene-d8 (S)		2000	92.8	%	93	(70-130)		

Apparent Color by SM 2120B

Analytical Batch: 1173910 **Analysis Date: 05/23/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
DUP1_201905220587	Apparent Color	ND		ND	ACU		(0-20)		
DUP2_201905220753	Apparent Color	ND		ND	ACU		(0-20)		
MBLK	Apparent Color			<0.5	ACU				

Surfactants by SM 5540C/EPA 425.1

Analytical Batch: 1173939 **Analysis Date: 05/23/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Surfactants		0.2	0.214	mg/L	107	(90-110)		
LCS2	Surfactants		0.2	0.210	mg/L	105	(90-110)	20	1.9
MBLK	Surfactants			<0.05	mg/L				
MRL_CHK	Surfactants		0.1	0.101	mg/L	101	(75-125)		
MS_201905220426	Surfactants	ND	0.2	0.216	mg/L	102	(80-120)		
MSD_201905220426	Surfactants	ND	0.2	0.230	mg/L	109	(80-120)	20	6.3

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QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
Chloride, Sulfate by EPA 300.0 by EPA 300.0									
Analytical Batch: 1174171							**Analysis Date: 05/24/2019**		
LCS1	Chloride		25	26.0	mg/L	104	(90-110)		
LCS2	Chloride		25	25.9	mg/L	103	(90-110)	20	0.39
MBLK	Chloride			<0.25	mg/L				
MRL_CHK	Chloride		0.5	0.464	mg/L	93	(50-150)		
MS_201905240487	Chloride	23	26	50.8	mg/L	111	(80-120)		
MSD_201905240487	Chloride	23	26	50.7	mg/L	111	(80-120)	20	0.26
LCS1	Sulfate		50	51.8	mg/L	104	(90-110)		
LCS2	Sulfate		50	51.7	mg/L	103	(90-110)	20	0.19
MBLK	Sulfate			<0.125	mg/L				
MRL_CHK	Sulfate		1	0.990	mg/L	99	(50-150)		
MRLLW	Sulfate		0.25	0.253	mg/L	101	(50-150)		
MS_201905240487	Sulfate	78	50	132	mg/L	107	(80-120)		
MSD_201905240487	Sulfate	78	50	131	mg/L	107	(80-120)	20	0.43
Diquat and Paraquat by EPA 549.2									
Analytical Batch: 1174443							**Analysis Date: 05/29/2019**		
CCCH	Diquat		10	10.0	ug/L	100	(80-120)		
CCCL	Diquat		0.4	0.385	ug/L	96	(50-150)		
CCCM	Diquat		4	3.99	ug/L	100	(80-120)		
LCS1	Diquat		5	3.98	ug/L	80	(73-96)		
MBLK	Diquat			<0.4	ug/L				
MRLLW	Diquat		0.4	0.370	ug/L	93	(50-150)		
MS_201905220011	Diquat	ND	5	4.05	ug/L	81	(70-130)		
MS2_201905230013	Diquat	ND	5	3.97	ug/L	79	(70-130)		
MSD_201905220011	Diquat	ND	5	4.00	ug/L	80	(70-130)	20	1.3
CCCH	Paraquat		10	10.2	ug/L	102	(80-120)		
CCCL	Paraquat		2	2.20	ug/L	110	(50-150)		
CCCM	Paraquat		4	3.90	ug/L	98	(80-120)		
LCS1	Paraquat		5	3.95	ug/L	79	(71-104)		
MBLK	Paraquat			<2	ug/L				
MRL_CHK	Paraquat		2	1.63	ug/L	82	(50-150)		
MS_201905220011	Paraquat	ND	5	3.99	ug/L	80	(70-130)		
MS2_201905230013	Paraquat	ND	5	4.17	ug/L	83	(70-130)		
MSD_201905220011	Paraquat	ND	5	4.03	ug/L	81	(70-130)	20	1.1

Spike recovery is already corrected for native results.
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Criteria for MS and Dup are advisory only, batch control is based on LCS. Criteria for duplicates are advisory only, unless otherwise specified in the method.
RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
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Laboratory QC

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
Glyphosate by EPA 547									
Analytical Batch: 1174458							**Analysis Date: 05/28/2019**		
CCCH	Glyphosate		25	20.7	ug/L	83	(80-120)		
CCCM	Glyphosate		10	8.06	ug/L	81	(80-120)		
LCS1	Glyphosate		10	9.88	ug/L	99	(80-120)		
MBLK	Glyphosate			<3	ug/L				
MRL_CHK	Glyphosate		6	5.16	ug/L	86	(50-150)		
MS_201905210014	Glyphosate	ND	10	9.47	ug/L	95	(70-130)		
MS2_201905220010	Glyphosate	ND	10	9.79	ug/L	98	(70-130)		
MSD_201905210014	Glyphosate	ND	10	9.46	ug/L	95	(70-130)	20	0.15
Total Dissolved Solids (TDS) by E160.1/SM2540C									
Analytical Batch: 1174483							**Analysis Date: 05/28/2019**		
DUP_201905240038	Total Dissolved Solid (TDS)	520		516	mg/L		(0-20)	10	0.39
DUP_201905230100	Total Dissolved Solid (TDS)	220		230	mg/L		(0-20)	10	2.6
LCS1	Total Dissolved Solid (TDS)		175	178	mg/L	102	(80-114)		
LCS2	Total Dissolved Solid (TDS)		700	688	mg/L	98	(80-114)		
MBLK	Total Dissolved Solid (TDS)			<5	mg/L				
MRL_CHK	Total Dissolved Solid (TDS)		10	9.00	mg/L	90	(50-150)		
Perchlorate by LCMS by EPA 331.0									
Analytical Batch: 1174578							**Analysis Date: 05/28/2019**		
CCCH	Oxygen Enriched Perchlorate (S)			129	%	129	(70-130)		
CCCL	Oxygen Enriched Perchlorate (S)			101	%	101	(70-130)		
CCCM	Oxygen Enriched Perchlorate (S)			99.9	%	100	(70-130)		
ICCS	Oxygen Enriched Perchlorate (S)			98.8	%	99	(70-130)		
LCS1	Oxygen Enriched Perchlorate (S)			96.3	%	96	(70-130)		
LCS2	Oxygen Enriched Perchlorate (S)			94.3	%	94	(70-130)		
MBLK	Oxygen Enriched Perchlorate (S)			103	%	103	(70-130)		
MRL_CHK	Oxygen Enriched Perchlorate (S)			101	%	101	(70-130)		
MS_201905230128	Oxygen Enriched Perchlorate (S)			88.1	%	88	(70-130)		
MSD_201905230128	Oxygen Enriched Perchlorate (S)			113	%	113	(70-130)		
CCCH	Perchlorate		5000	5080	ng/l	102	(80-120)		
CCCL	Perchlorate		50	62.2	ng/l	124	(50-150)		
CCCM	Perchlorate		1000	990	ng/l	99	(80-120)		
ICCS	Perchlorate		1000	1000	ng/l	100	(80-120)		
LCS1	Perchlorate		1000	1070	ng/L	107	(80-120)		
LCS2	Perchlorate		1000	1110	ng/L	111	(80-120)	20	3.7

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RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
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Laboratory QC

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MBLK	Perchlorate			<16.67	ng/L				
MRL_CHK	Perchlorate		50	62.2	ng/L	124	(50-150)		
MS_201905230128	Perchlorate	ND	100	119	ng/L	119	(50-150)		
MSD_201905230128	Perchlorate	ND	100	85.8	ng/L	86	(50-150)	50	32

Volatile Organics by GCMS by EPA 524.2

Analytical Batch: 1174669 **Analysis Date: 05/28/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	1,1,1,2-Tetrachloroethane		5	4.62	ug/L	92	(70-130)		
LCS2	1,1,1,2-Tetrachloroethane		5	4.67	ug/L	93	(70-130)	20	1.1
MBLK	1,1,1,2-Tetrachloroethane			<0.5	ug/L				
MRL_CHK	1,1,1,2-Tetrachloroethane		0.5	0.430	ug/L	86	(50-150)		
LCS1	1,1,1-Trichloroethane		5	4.90	ug/L	98	(70-130)		
LCS2	1,1,1-Trichloroethane		5	4.82	ug/L	96	(70-130)	20	1.6
MBLK	1,1,1-Trichloroethane			<0.5	ug/L				
MRL_CHK	1,1,1-Trichloroethane		0.5	0.470	ug/L	94	(50-150)		
LCS1	1,1,2,2-Tetrachloroethane		5	4.91	ug/L	98	(70-130)		
LCS2	1,1,2,2-Tetrachloroethane		5	5.05	ug/L	101	(70-130)	20	2.8
MBLK	1,1,2,2-Tetrachloroethane			<0.5	ug/L				
MRL_CHK	1,1,2,2-Tetrachloroethane		0.5	0.510	ug/L	102	(50-150)		
LCS1	1,1,2-Trichloroethane		5	5.04	ug/L	101	(70-130)		
LCS2	1,1,2-Trichloroethane		5	4.84	ug/L	97	(70-130)	20	4.0
MBLK	1,1,2-Trichloroethane			<0.5	ug/L				
MRL_CHK	1,1,2-Trichloroethane		0.5	0.520	ug/L	104	(50-150)		
LCS1	1,1-Dichloroethane		5	4.75	ug/L	95	(70-130)		
LCS2	1,1-Dichloroethane		5	4.90	ug/L	98	(70-130)	20	3.1
MBLK	1,1-Dichloroethane			<0.5	ug/L				
MRL_CHK	1,1-Dichloroethane		0.5	0.500	ug/L	100	(50-150)		
LCS1	1,1-Dichloroethylene		5	4.73	ug/L	95	(70-130)		
LCS2	1,1-Dichloroethylene		5	4.59	ug/L	92	(70-130)	20	3.0
MBLK	1,1-Dichloroethylene			<0.5	ug/L				
MRL_CHK	1,1-Dichloroethylene		0.5	0.450	ug/L	90	(50-150)		
LCS1	1,1-Dichloropropene		5	4.89	ug/L	98	(70-130)		
LCS2	1,1-Dichloropropene		5	4.66	ug/L	93	(70-130)	20	4.8
MBLK	1,1-Dichloropropene			<0.5	ug/L				
MRL_CHK	1,1-Dichloropropene		0.5	0.500	ug/L	100	(50-150)		
LCS1	1,2,3-Trichlorobenzene		5	4.93	ug/L	99	(70-130)		
LCS2	1,2,3-Trichlorobenzene		5	4.78	ug/L	96	(70-130)	20	3.1
MBLK	1,2,3-Trichlorobenzene			<0.5	ug/L				
MRL_CHK	1,2,3-Trichlorobenzene		0.5	0.440	ug/L	88	(50-150)		

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RPD not calculated for LCS2 when different a concentration than LCS1 is used.
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Report: 806101
Project: SPECIAL
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David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	1,2,3-Trichloropropane		5	5.09	ug/L	102	(70-130)		
LCS2	1,2,3-Trichloropropane		5	5.05	ug/L	101	(70-130)	20	0.79
MBLK	1,2,3-Trichloropropane			<0.5	ug/L				
MRL_CHK	1,2,3-Trichloropropane		0.5	0.550	ug/L	110	(50-150)		
LCS1	1,2,4-Trichlorobenzene		5	4.96	ug/L	99	(70-130)		
LCS2	1,2,4-Trichlorobenzene		5	4.79	ug/L	96	(70-130)	20	3.5
MBLK	1,2,4-Trichlorobenzene			<0.5	ug/L				
MRL_CHK	1,2,4-Trichlorobenzene		0.5	0.460	ug/L	92	(50-150)		
LCS1	1,2,4-Trimethylbenzene		5	5.02	ug/L	100	(70-130)		
LCS2	1,2,4-Trimethylbenzene		5	5.06	ug/L	101	(70-130)	20	0.79
MBLK	1,2,4-Trimethylbenzene			<0.5	ug/L				
MRL_CHK	1,2,4-Trimethylbenzene		0.5	0.470	ug/L	94	(50-150)		
LCS1	1,2-Dichloroethane		5	4.82	ug/L	96	(70-130)		
LCS2	1,2-Dichloroethane		5	4.72	ug/L	94	(70-130)	20	2.1
MBLK	1,2-Dichloroethane			<0.5	ug/L				
MRL_CHK	1,2-Dichloroethane		0.5	0.490	ug/L	98	(50-150)		
LCS1	1,2-Dichloroethane-d4 (S)		5	102	%	102	(70-130)		
LCS2	1,2-Dichloroethane-d4 (S)		5	97.8	%	98	(70-130)		
MBLK	1,2-Dichloroethane-d4 (S)			98.6	%	99	(70-130)		
MRL_CHK	1,2-Dichloroethane-d4 (S)		5	102	%	102	(70-130)		
MRLLW	1,2-Dichloroethane-d4 (S)		5	99.6	%	100	(70-130)		
LCS1	1,2-Dichloropropane		5	4.64	ug/L	93	(70-130)		
LCS2	1,2-Dichloropropane		5	4.66	ug/L	93	(70-130)	20	0.43
MBLK	1,2-Dichloropropane			<0.5	ug/L				
MRL_CHK	1,2-Dichloropropane		0.5	0.490	ug/L	98	(50-150)		
LCS1	1,3,5-Trimethylbenzene		5	5.08	ug/L	102	(70-130)		
LCS2	1,3,5-Trimethylbenzene		5	5.10	ug/L	102	(70-130)	20	0.39
MBLK	1,3,5-Trimethylbenzene			<0.5	ug/L				
MRL_CHK	1,3,5-Trimethylbenzene		0.5	0.470	ug/L	94	(50-150)		
LCS1	1,3-Dichloropropane		5	5.09	ug/L	102	(70-130)		
LCS2	1,3-Dichloropropane		5	4.83	ug/L	97	(70-130)	20	5.2
MBLK	1,3-Dichloropropane			<0.5	ug/L				
MRL_CHK	1,3-Dichloropropane		0.5	0.530	ug/L	106	(50-150)		
LCS1	2,2-Dichloropropane		5	4.96	ug/L	99	(70-130)		
LCS2	2,2-Dichloropropane		5	4.92	ug/L	98	(70-130)	20	0.81
MBLK	2,2-Dichloropropane			<0.5	ug/L				
MRL_CHK	2,2-Dichloropropane		0.5	0.570	ug/L	114	(50-150)		
LCS1	2-Butanone (MEK)		50	49.8	ug/L	100	(70-130)		

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RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
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David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS2	2-Butanone (MEK)		50	48.8	ug/L	98	(70-130)	20	2.0
MBLK	2-Butanone (MEK)			<5.0	ug/L				
MRL_CHK	2-Butanone (MEK)		5	4.99	ug/L	100	(50-150)		
LCS1	4-Bromofluorobenzene (S)		5	103	%	103	(70-130)		
LCS2	4-Bromofluorobenzene (S)		5	103	%	103	(70-130)		
MBLK	4-Bromofluorobenzene (S)			95.6	%	96	(70-130)		
MRL_CHK	4-Bromofluorobenzene (S)		5	99.4	%	99	(70-130)		
MRLLW	4-Bromofluorobenzene (S)		5	97.8	%	98	(70-130)		
LCS1	4-Methyl-2-Pentanone (MIBK)		50	52.0	ug/L	104	(70-130)		
LCS2	4-Methyl-2-Pentanone (MIBK)		50	50.7	ug/L	101	(70-130)	20	2.5
MBLK	4-Methyl-2-Pentanone (MIBK)			<5.0	ug/L				
MRL_CHK	4-Methyl-2-Pentanone (MIBK)		5	4.97	ug/L	99	(50-150)		
LCS1	Benzene		5	5.01	ug/L	100	(70-130)		
LCS2	Benzene		5	4.87	ug/L	97	(70-130)	20	2.8
MBLK	Benzene			<0.5	ug/L				
MRL_CHK	Benzene		0.5	0.500	ug/L	100	(50-150)		
LCS1	Bromobenzene		5	5.10	ug/L	102	(70-130)		
LCS2	Bromobenzene		5	5.01	ug/L	100	(70-130)	20	1.8
MBLK	Bromobenzene			<0.5	ug/L				
MRL_CHK	Bromobenzene		0.5	0.430	ug/L	86	(50-150)		
LCS1	Bromochloromethane		5	5.30	ug/L	106	(70-130)		
LCS2	Bromochloromethane		5	5.21	ug/L	104	(70-130)	20	1.7
MBLK	Bromochloromethane			<0.5	ug/L				
MRL_CHK	Bromochloromethane		0.5	0.500	ug/L	100	(50-150)		
LCS1	Bromodichloromethane		5	4.91	ug/L	98	(70-130)		
LCS2	Bromodichloromethane		5	4.68	ug/L	94	(70-130)	20	4.8
MBLK	Bromodichloromethane			<0.5	ug/L				
MRL_CHK	Bromodichloromethane		0.5	0.430	ug/L	86	(50-150)		
LCS1	Bromoethane		5	4.75	ug/L	95	(70-130)		
LCS2	Bromoethane		5	4.78	ug/L	96	(70-130)	20	0.63
MBLK	Bromoethane			<0.5	ug/L				
MRL_CHK	Bromoethane		0.5	0.490	ug/L	98	(50-150)		
LCS1	Bromoform		5	4.80	ug/L	96	(70-130)		
LCS2	Bromoform		5	4.98	ug/L	100	(70-130)	20	3.7
MBLK	Bromoform			<0.5	ug/L				
MRL_CHK	Bromoform		0.5	0.670	ug/L	134	(50-150)		
LCS1	Bromomethane (Methyl Bromide)		5	5.55	ug/L	111	(70-130)		
LCS2	Bromomethane (Methyl Bromide)		5	5.23	ug/L	105	(70-130)	20	5.9

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QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MBLK	Bromomethane (Methyl Bromide)			<0.5	ug/L				
MRL_CHK	Bromomethane (Methyl Bromide)		0.5	0.740	ug/L	148	(50-150)		
LCS1	Carbon disulfide		5	4.77	ug/L	95	(70-130)		
LCS2	Carbon disulfide		5	4.79	ug/L	96	(70-130)	20	0.42
MBLK	Carbon disulfide			<0.5	ug/L				
MRL_CHK	Carbon disulfide		0.5	0.460	ug/L	92	(50-150)		
LCS1	Carbon Tetrachloride		5	4.65	ug/L	93	(70-130)		
LCS2	Carbon Tetrachloride		5	4.33	ug/L	87	(70-130)	20	7.1
MBLK	Carbon Tetrachloride			<0.5	ug/L				
MRL_CHK	Carbon Tetrachloride		0.5	0.390	ug/L	78	(50-150)		
LCS1	Chlorobenzene		5	5.02	ug/L	100	(70-130)		
LCS2	Chlorobenzene		5	4.99	ug/L	100	(70-130)	20	0.60
MBLK	Chlorobenzene			<0.5	ug/L				
MRL_CHK	Chlorobenzene		0.5	0.500	ug/L	100	(50-150)		
LCS1	Chlorodibromomethane		5	5.03	ug/L	101	(70-130)		
LCS2	Chlorodibromomethane		5	5.04	ug/L	101	(70-130)	20	0.20
MBLK	Chlorodibromomethane			<0.5	ug/L				
MRL_CHK	Chlorodibromomethane		0.5	0.600	ug/L	120	(50-150)		
LCS1	Chloroethane		5	5.06	ug/L	101	(70-130)		
LCS2	Chloroethane		5	4.50	ug/L	90	(70-130)	20	12
MBLK	Chloroethane			<0.5	ug/L				
MRL_CHK	Chloroethane		0.5	0.540	ug/L	108	(50-150)		
LCS1	Chloroform (Trichloromethane)		5	4.81	ug/L	96	(70-130)		
LCS2	Chloroform (Trichloromethane)		5	4.75	ug/L	95	(70-130)	20	1.3
MBLK	Chloroform (Trichloromethane)			<0.5	ug/L				
MRL_CHK	Chloroform (Trichloromethane)		0.5	0.510	ug/L	102	(50-150)		
LCS1	Chloromethane(Methyl Chloride)		5	4.45	ug/L	89	(70-130)		
LCS2	Chloromethane(Methyl Chloride)		5	4.82	ug/L	96	(70-130)	20	8.0
MBLK	Chloromethane(Methyl Chloride)			<0.5	ug/L				
MRL_CHK	Chloromethane(Methyl Chloride)		0.5	0.540	ug/L	108	(50-150)		
LCS1	cis-1,2-Dichloroethylene		5	4.64	ug/L	93	(70-130)		
LCS2	cis-1,2-Dichloroethylene		5	4.80	ug/L	96	(70-130)	20	3.4
MBLK	cis-1,2-Dichloroethylene			<0.5	ug/L				
MRL_CHK	cis-1,2-Dichloroethylene		0.5	0.480	ug/L	96	(50-150)		
LCS1	cis-1,3-Dichloropropene		5	4.93	ug/L	99	(70-130)		
LCS2	cis-1,3-Dichloropropene		5	4.83	ug/L	97	(70-130)	20	2.0
MBLK	cis-1,3-Dichloropropene			<0.5	ug/L				
MRL_CHK	cis-1,3-Dichloropropene		0.5	0.440	ug/L	88	(50-150)		

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Laboratory QC

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Dibromomethane		5	4.94	ug/L	99	(70-130)		
LCS2	Dibromomethane		5	4.79	ug/L	96	(70-130)	20	3.1
MBLK	Dibromomethane			<0.5	ug/L				
MRL_CHK	Dibromomethane		0.5	0.490	ug/L	98	(50-150)		
LCS1	Dichlorodifluoromethane		5	4.48	ug/L	90	(70-130)		
LCS2	Dichlorodifluoromethane		5	4.49	ug/L	90	(70-130)	20	0.22
MBLK	Dichlorodifluoromethane			<0.5	ug/L				
MRL_CHK	Dichlorodifluoromethane		0.5	0.440	ug/L	88	(50-150)		
LCS1	Dichloromethane		5	4.52	ug/L	90	(70-130)		
LCS2	Dichloromethane		5	4.54	ug/L	91	(70-130)	20	0.44
MBLK	Dichloromethane			<0.5	ug/L				
MRL_CHK	Dichloromethane		0.5	0.470	ug/L	94	(50-150)		
LCS1	Di-isopropyl ether		5	4.93	ug/L	99	(70-130)		
LCS2	Di-isopropyl ether		5	4.87	ug/L	97	(70-130)	20	1.2
MBLK	Di-isopropyl ether			<3.0	ug/L				
MRL_CHK	Di-isopropyl ether		0.5	0.500	ug/L	100	(50-150)		
LCS1	Ethyl benzene		5	5.19	ug/L	104	(70-130)		
LCS2	Ethyl benzene		5	4.95	ug/L	99	(70-130)	20	4.7
MBLK	Ethyl benzene			<0.5	ug/L				
MRL_CHK	Ethyl benzene		0.5	0.500	ug/L	100	(50-150)		
LCS1	Hexachlorobutadiene		5	5.04	ug/L	101	(70-130)		
LCS2	Hexachlorobutadiene		5	4.73	ug/L	95	(70-130)	20	6.3
MBLK	Hexachlorobutadiene			<0.5	ug/L				
MRL_CHK	Hexachlorobutadiene		0.5	0.480	ug/L	96	(50-150)		
LCS1	Isopropylbenzene		5	5.04	ug/L	101	(70-130)		
LCS2	Isopropylbenzene		5	4.97	ug/L	99	(70-130)	20	1.4
MBLK	Isopropylbenzene			<0.5	ug/L				
MRL_CHK	Isopropylbenzene		0.5	0.470	ug/L	94	(50-150)		
LCS1	m,p-Xylenes		10	10.5	ug/L	105	(70-130)		
LCS2	m,p-Xylenes		10	10.0	ug/L	100	(70-130)	20	4.9
MBLK	m,p-Xylenes			<0.5	ug/L				
MRL_CHK	m,p-Xylenes		1	1.03	ug/L	103	(50-150)		
MRLLW	m,p-Xylenes		0.5	0.520	ug/L	104	(50-150)		
LCS1	m-Dichlorobenzene (1,3-DCB)		5	4.98	ug/L	100	(70-130)		
LCS2	m-Dichlorobenzene (1,3-DCB)		5	5.07	ug/L	101	(70-130)	20	1.8
MBLK	m-Dichlorobenzene (1,3-DCB)			<0.5	ug/L				
MRL_CHK	m-Dichlorobenzene (1,3-DCB)		0.5	0.510	ug/L	102	(50-150)		
LCS1	Methyl Tert-butyl ether (MTBE)		5	4.73	ug/L	95	(70-130)		

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Laboratory QC

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS2	Methyl Tert-butyl ether (MTBE)		5	4.68	ug/L	94	(70-130)	20	1.1
MBLK	Methyl Tert-butyl ether (MTBE)			<0.5	ug/L				
MRL_CHK	Methyl Tert-butyl ether (MTBE)		0.5	0.470	ug/L	94	(50-150)		
LCS1	Naphthalene		5	5.16	ug/L	103	(70-130)		
LCS2	Naphthalene		5	4.85	ug/L	97	(70-130)	20	6.2
MBLK	Naphthalene			<0.5	ug/L				
MRL_CHK	Naphthalene		0.5	0.460	ug/L	92	(50-150)		
LCS1	n-Butylbenzene		5	5.20	ug/L	104	(70-130)		
LCS2	n-Butylbenzene		5	4.89	ug/L	98	(70-130)	20	6.1
MBLK	n-Butylbenzene			<0.5	ug/L				
MRL_CHK	n-Butylbenzene		0.5	0.480	ug/L	96	(50-150)		
LCS1	n-Propylbenzene		5	5.14	ug/L	103	(70-130)		
LCS2	n-Propylbenzene		5	5.13	ug/L	103	(70-130)	20	0.20
MBLK	n-Propylbenzene			<0.5	ug/L				
MRL_CHK	n-Propylbenzene		0.5	0.460	ug/L	92	(50-150)		
LCS1	o-Chlorotoluene		5	5.07	ug/L	101	(70-130)		
LCS2	o-Chlorotoluene		5	5.07	ug/L	101	(70-130)	20	0.0
MBLK	o-Chlorotoluene			<0.5	ug/L				
MRL_CHK	o-Chlorotoluene		0.5	0.510	ug/L	102	(50-150)		
LCS1	o-Dichlorobenzene (1,2-DCB)		5	5.22	ug/L	104	(70-130)		
LCS2	o-Dichlorobenzene (1,2-DCB)		5	4.89	ug/L	98	(70-130)	20	6.5
MBLK	o-Dichlorobenzene (1,2-DCB)			<0.5	ug/L				
MRL_CHK	o-Dichlorobenzene (1,2-DCB)		0.5	0.500	ug/L	100	(50-150)		
LCS1	o-Xylene		5	5.35	ug/L	107	(70-130)		
LCS2	o-Xylene		5	5.29	ug/L	106	(70-130)	20	1.1
MBLK	o-Xylene			<0.5	ug/L				
MRL_CHK	o-Xylene		0.5	0.480	ug/L	96	(50-150)		
LCS1	p-Chlorotoluene		5	5.09	ug/L	102	(70-130)		
LCS2	p-Chlorotoluene		5	5.14	ug/L	103	(70-130)	20	0.98
MBLK	p-Chlorotoluene			<0.5	ug/L				
MRL_CHK	p-Chlorotoluene		0.5	0.510	ug/L	102	(50-150)		
LCS1	p-Dichlorobenzene (1,4-DCB)		5	4.96	ug/L	99	(70-130)		
LCS2	p-Dichlorobenzene (1,4-DCB)		5	4.95	ug/L	99	(70-130)	20	0.20
MBLK	p-Dichlorobenzene (1,4-DCB)			<0.5	ug/L				
MRL_CHK	p-Dichlorobenzene (1,4-DCB)		0.5	0.510	ug/L	102	(50-150)		
LCS1	p-Isopropyltoluene		5	5.02	ug/L	100	(70-130)		
LCS2	p-Isopropyltoluene		5	5.14	ug/L	103	(70-130)	20	2.4
MBLK	p-Isopropyltoluene			<0.5	ug/L				

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Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MRL_CHK	p-Isopropyltoluene		0.5	0.480	ug/L	96	(50-150)		
LCS1	sec-Butylbenzene		5	5.03	ug/L	101	(70-130)		
LCS2	sec-Butylbenzene		5	5.05	ug/L	101	(70-130)	20	0.40
MBLK	sec-Butylbenzene			<0.5	ug/L				
MRL_CHK	sec-Butylbenzene		0.5	0.470	ug/L	94	(50-150)		
LCS1	Styrene		5	5.31	ug/L	106	(70-130)		
LCS2	Styrene		5	5.14	ug/L	103	(70-130)	20	3.3
MBLK	Styrene			<0.5	ug/L				
MRL_CHK	Styrene		0.5	0.490	ug/L	98	(50-150)		
LCS1	tert-amyl Methyl Ether		5	5.11	ug/L	102	(70-130)		
LCS2	tert-amyl Methyl Ether		5	5.02	ug/L	100	(70-130)	20	1.8
MBLK	tert-amyl Methyl Ether			<3.0	ug/L				
MRL_CHK	tert-amyl Methyl Ether		0.5	0.530	ug/L	106	(50-150)		
LCS1	tert-Butyl Ethyl Ether		5	5.02	ug/L	100	(70-130)		
LCS2	tert-Butyl Ethyl Ether		5	4.95	ug/L	99	(70-130)	20	1.4
MBLK	tert-Butyl Ethyl Ether			<3.0	ug/L				
MRL_CHK	tert-Butyl Ethyl Ether		0.5	0.470	ug/L	94	(50-150)		
LCS1	tert-Butylbenzene		5	5.04	ug/L	101	(70-130)		
LCS2	tert-Butylbenzene		5	4.97	ug/L	99	(70-130)	20	1.4
MBLK	tert-Butylbenzene			<0.5	ug/L				
MRL_CHK	tert-Butylbenzene		0.5	0.440	ug/L	88	(50-150)		
LCS1	Tetrachloroethylene (PCE)		5	5.00	ug/L	100	(70-130)		
LCS2	Tetrachloroethylene (PCE)		5	4.63	ug/L	93	(70-130)	20	7.7
MBLK	Tetrachloroethylene (PCE)			<0.5	ug/L				
MRL_CHK	Tetrachloroethylene (PCE)		0.5	0.460	ug/L	92	(50-150)		
LCS1	Toluene		5	5.09	ug/L	102	(70-130)		
LCS2	Toluene		5	4.97	ug/L	99	(70-130)	20	2.4
MBLK	Toluene			<0.5	ug/L				
MRL_CHK	Toluene		0.5	0.550	ug/L	110	(50-150)		
LCS1	Toluene-d8 (S)		5	103	%	103	(70-130)		
LCS2	Toluene-d8 (S)		5	99.8	%	100	(70-130)		
MBLK	Toluene-d8 (S)			100	%	100	(70-130)		
MRL_CHK	Toluene-d8 (S)		5	99.4	%	99	(70-130)		
MRLLW	Toluene-d8 (S)		5	101	%	101	(70-130)		
LCS1	trans-1,2-Dichloroethylene		5	4.75	ug/L	95	(70-130)		
LCS2	trans-1,2-Dichloroethylene		5	4.61	ug/L	92	(70-130)	20	3.0
MBLK	trans-1,2-Dichloroethylene			<0.5	ug/L				
MRL_CHK	trans-1,2-Dichloroethylene		0.5	0.440	ug/L	88	(50-150)		

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Report: 806101
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David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	trans-1,3-Dichloropropene		5	5.23	ug/L	105	(70-130)		
LCS2	trans-1,3-Dichloropropene		5	5.04	ug/L	101	(70-130)	20	3.7
MBLK	trans-1,3-Dichloropropene			<0.5	ug/L				
MRL_CHK	trans-1,3-Dichloropropene		0.5	0.660	ug/L	132	(50-150)		
LCS1	Trichloroethylene (TCE)		5	4.99	ug/L	100	(70-130)		
LCS2	Trichloroethylene (TCE)		5	4.79	ug/L	96	(70-130)	20	4.1
MBLK	Trichloroethylene (TCE)			<0.5	ug/L				
MRL_CHK	Trichloroethylene (TCE)		0.5	0.500	ug/L	100	(50-150)		
LCS1	Trichlorofluoromethane		5	4.78	ug/L	96	(70-130)		
LCS2	Trichlorofluoromethane		5	4.66	ug/L	93	(70-130)	20	2.5
MBLK	Trichlorofluoromethane			<0.5	ug/L				
MRL_CHK	Trichlorofluoromethane		0.5	0.480	ug/L	96	(50-150)		
LCS1	Trichlorotrifluoroethane(Freon		5	4.82	ug/L	96	(70-130)		
LCS2	Trichlorotrifluoroethane(Freon		5	4.64	ug/L	93	(70-130)	20	3.8
MBLK	Trichlorotrifluoroethane(Freon			<0.5	ug/L				
MRL_CHK	Trichlorotrifluoroethane(Freon		0.5	0.340	ug/L	68	(50-150)		
LCS1	Vinyl chloride (VC)		5	4.66	ug/L	93	(70-130)		
LCS2	Vinyl chloride (VC)		5	4.50	ug/L	90	(70-130)	20	3.5
MBLK	Vinyl chloride (VC)			<0.3	ug/L				
MRL_CHK	Vinyl chloride (VC)		0.5	0.480	ug/L	96	(50-150)		
MRLLW	Vinyl chloride (VC)		0.25	0.230	ug/L	92	(50-150)		

Hexavalent Chromium by 218.6 by EPA 218.6

Analytical Batch: 1174776 **Analysis Date: 05/29/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Hexavalent Chromium by 218.6		2	1.94	ug/L	97	(90-110)		
LCS2	Hexavalent Chromium by 218.6		2	1.93	ug/L	97	(90-110)	10	0.52
MBLK	Hexavalent Chromium by 218.6			<0.01	ug/L				
MRL_CHK	Hexavalent Chromium by 218.6		0.02	0.0203	ug/L	101	(50-150)		
MS_201905280765	Hexavalent Chromium by 218.6	15	2	17.4	ug/L	100	(90-110)		
MS_201905210146	Hexavalent Chromium by 218.6	2.0	2	4.00	ug/L	100	(90-110)		
MSD_201905210146	Hexavalent Chromium by 218.6	2.0	2	4.03	ug/L	102	(90-110)	15	0.68
MSD_201905280765	Hexavalent Chromium by 218.6	15	2	17.4	ug/L	99	(90-110)	15	0.18

Endothall by EPA 548.1

Prep Batch: 1174382 Analytical Batch: 1174900 **Analysis Date: 05/31/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Endothall		25	18.3	ug/L	73	(66-117)		
LCS2	Endothall		25	21.5	ug/L	86	(66-117)	30	16
MBLK	Endothall			<5	ug/L				
MRL_CHK	Endothall		5	6.09	ug/L	122	(50-150)		

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David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MS_201905220600	Endothall	ND	25	15.2	ug/L	<u>61</u>	(66-117)		
MS_2ND_201905220027	Endothall	ND	25	22.6	ug/L	90	(66-117)		
MSD_201905220600	Endothall	ND	25	16.2	ug/L	<u>65</u>	(66-117)	30	5.9

Organochlorine Pesticides/PCBs by EPA 505

Analytical Batch: 1175303 **Analysis Date: 05/29/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
CCCH	Alachlor (Alanex)		1	1.06	ug/L	106	(70-130)		
CCCH	Alachlor (Alanex)		1	1.05	ug/L	105	(70-130)		
CCCH	Alachlor (Alanex)		1	1.05	ug/L	105	(70-130)		
CCCH	Alachlor (Alanex)		1	1.02	ug/L	102	(70-130)		
MBLK	Alachlor (Alanex)			<0.1	ug/L				
MRL_CHK	Alachlor (Alanex)		0.1	0.104	ug/L	104	(50-150)		
MS1_201905220010	Alachlor (Alanex)	ND	0.2	0.231	ug/L	116	(65-135)		
MS2_201906070515	Alachlor (Alanex)	ND	1	1.06	ug/L	106	(65-135)		
CCCH	Aldrin		0.1	0.0960	ug/L	96	(70-130)		
CCCH	Aldrin		0.1	0.0930	ug/L	93	(70-130)		
CCCH	Aldrin		0.1	0.0977	ug/L	98	(70-130)		
CCCH	Aldrin		0.1	0.0954	ug/L	95	(70-130)		
MBLK	Aldrin			<0.01	ug/L				
MRL_CHK	Aldrin		0.01	0.0105	ug/L	105	(50-150)		
MS1_201905220010	Aldrin	ND	0.02	0.0208	ug/L	104	(65-135)		
MS2_201906070515	Aldrin	ND	0.1	0.103	ug/L	103	(65-135)		
MBLK	Chlordane			<0.1	ug/L				
CCCH	Dieldrin		0.1	0.0988	ug/L	99	(70-130)		
CCCH	Dieldrin		0.1	0.0983	ug/L	98	(70-130)		
CCCH	Dieldrin		0.1	0.0995	ug/L	100	(70-130)		
CCCH	Dieldrin		0.1	0.0953	ug/L	95	(70-130)		
MBLK	Dieldrin			<0.01	ug/L				
MRL_CHK	Dieldrin		0.01	0.0116	ug/L	116	(50-150)		
MS1_201905220010	Dieldrin	ND	0.02	0.0215	ug/L	108	(65-135)		
MS2_201906070515	Dieldrin	ND	0.1	0.102	ug/L	102	(65-135)		
CCCH	Endrin		0.1	0.0987	ug/L	99	(70-130)		
CCCH	Endrin		0.1	0.0944	ug/L	94	(70-130)		
CCCH	Endrin		0.1	0.0989	ug/L	99	(70-130)		
CCCH	Endrin		0.1	0.0974	ug/L	97	(70-130)		
MBLK	Endrin			<0.01	ug/L				
MRL_CHK	Endrin		0.01	0.0114	ug/L	114	(50-150)		
MS1_201905220010	Endrin	ND	0.02	0.0205	ug/L	102	(65-135)		
MS2_201906070515	Endrin	ND	0.1	0.101	ug/L	101	(65-135)		

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David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
CCCH	Heptachlor		0.1	0.0994	ug/L	99	(70-130)		
CCCH	Heptachlor		0.1	0.0950	ug/L	95	(70-130)		
CCCH	Heptachlor		0.1	0.0956	ug/L	96	(70-130)		
CCCH	Heptachlor		0.1	0.0970	ug/L	97	(70-130)		
MBLK	Heptachlor			<0.01	ug/L				
MRL_CHK	Heptachlor		0.01	0.0104	ug/L	104	(50-150)		
MS1_201905220010	Heptachlor	ND	0.02	0.0206	ug/L	103	(65-135)		
MS2_201906070515	Heptachlor	ND	0.1	0.100	ug/L	100	(65-135)		
CCCH	Heptachlor Epoxide		0.1	0.0977	ug/L	98	(70-130)		
CCCH	Heptachlor Epoxide		0.1	0.100	ug/L	100	(70-130)		
CCCH	Heptachlor Epoxide		0.1	0.0988	ug/L	99	(70-130)		
CCCH	Heptachlor Epoxide		0.1	0.0994	ug/L	99	(70-130)		
MBLK	Heptachlor Epoxide			<0.01	ug/L				
MRL_CHK	Heptachlor Epoxide		0.01	0.00960	ug/L	96	(50-150)		
MS1_201905220010	Heptachlor Epoxide	ND	0.02	0.0206	ug/L	103	(65-135)		
MS2_201906070515	Heptachlor Epoxide	ND	0.1	0.103	ug/L	103	(65-135)		
CCCH	Lindane (gamma-BHC)		0.1	0.0984	ug/L	98	(70-130)		
CCCH	Lindane (gamma-BHC)		0.1	0.103	ug/L	103	(70-130)		
CCCH	Lindane (gamma-BHC)		0.1	0.0980	ug/L	98	(70-130)		
CCCH	Lindane (gamma-BHC)		0.1	0.101	ug/L	101	(70-130)		
MBLK	Lindane (gamma-BHC)			<0.01	ug/L				
MRL_CHK	Lindane (gamma-BHC)		0.01	0.0125	ug/L	125	(50-150)		
MS1_201905220010	Lindane (gamma-BHC)	ND	0.02	0.0216	ug/L	108	(65-135)		
MS2_201906070515	Lindane (gamma-BHC)	ND	0.1	0.102	ug/L	102	(65-135)		
CCCH	Methoxychlor		0.5	0.399	ug/L	80	(70-130)		
CCCH	Methoxychlor		0.5	0.491	ug/L	98	(70-130)		
CCCH	Methoxychlor		0.5	0.445	ug/L	89	(70-130)		
CCCH	Methoxychlor		0.5	0.462	ug/L	93	(70-130)		
MBLK	Methoxychlor			<0.05	ug/L				
MRL_CHK	Methoxychlor		0.05	0.0518	ug/L	104	(50-150)		
MS1_201905220010	Methoxychlor	ND	0.1	0.113	ug/L	113	(65-135)		
MS2_201906070515	Methoxychlor	ND	0.5	0.466	ug/L	93	(65-135)		
MBLK	PCB 1016 Aroclor			<0.08	ug/L				
MBLK	PCB 1221 Aroclor			<0.1	ug/L				
MBLK	PCB 1232 Aroclor			<0.1	ug/L				
MBLK	PCB 1242 Aroclor			<0.1	ug/L				
MBLK	PCB 1248 Aroclor			<0.1	ug/L				
MBLK	PCB 1254 Aroclor			<0.1	ug/L				

Spike recovery is already corrected for native results.
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RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
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Laboratory QC

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MBLK	PCB 1260 Aroclor			<0.1	ug/L				
CCCH	Tetrachlorometaxylene (S)			89.5	%	89	(70-130)		
CCCH	Tetrachlorometaxylene (S)			102	%	102	(70-130)		
CCCH	Tetrachlorometaxylene (S)			103	%	103	(70-130)		
CCCH	Tetrachlorometaxylene (S)			91.1	%	91	(70-130)		
MBLK	Tetrachlorometaxylene (S)			103	%	103	(70-130)		
MRL_CHK	Tetrachlorometaxylene (S)			101	%	101	(70-130)		
MS1_201905220010	Tetrachlorometaxylene (S)			94.5	%	94	(70-130)		
MS2_201906070515	Tetrachlorometaxylene (S)			90.7	%	91	(70-130)		
CCCH	Toxaphene		2.5	2.50	ug/L	100	(70-130)		
CCCH	Toxaphene		2.5	2.35	ug/L	94	(70-130)		
MBLK	Toxaphene			<0.5	ug/L				
MRL_CHK	Toxaphene		0.5	0.562	ug/L	112	(50-150)		
MS1_201905220010	Toxaphene	ND	2.5	2.50	ug/L	100	(65-135)		
MS2_201906070515	Toxaphene	ND	2.5	2.50	ug/L	100	(65-135)		

Mercury Total by EPA 245.1

Analytical Batch: 1175326 **Analysis Date: 05/31/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Mercury		1.5	1.60	ug/L	107	(90-110)		
LCS2	Mercury		1.5	1.59	ug/L	106	(90-110)	20	0.63
MBLK	Mercury			<0.1	ug/L				
MRL_CHK	Mercury		0.2	0.189	ug/L	95	(50-150)		
MS_201905220010	Mercury	ND	1.5	1.64	ug/L	108	(70-130)		
MS2_201905220663	Mercury	ND	1.5	1.56	ug/L	104	(70-130)		
MSD_201905220010	Mercury	ND	1.5	1.86	ug/L	123	(70-130)	20	13
MSD2_201905220663	Mercury	ND	1.5	1.59	ug/L	106	(70-130)	20	1.6

Aldicarbs by EPA 531.2

Analytical Batch: 1175661 **Analysis Date: 06/03/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
CCCH	3-Hydroxycarbofuran		25	24.7	ug/L	99	(70-130)		
CCCM	3-Hydroxycarbofuran		10	9.99	ug/L	100	(70-130)		
LCS	3-Hydroxycarbofuran		5	5.48	ug/L	110	(70-130)		
MBLK	3-Hydroxycarbofuran			<0.167	ug/L				
MRL_CHK	3-Hydroxycarbofuran		0.5	0.535	ug/L	107	(50-150)		
MS1_201905300029	3-Hydroxycarbofuran	ND	5	5.76	ug/L	115	(70-130)		
MSD1_201905300029	3-Hydroxycarbofuran	ND	5	5.73	ug/L	115	(70-130)	20	0.50
CCCH	4-Bromo-3,5-dimethylphenyl-N-methylcarbamate (:			99.0	%	99	(70-130)		
CCCM	4-Bromo-3,5-dimethylphenyl-N-methylcarbamate (:			98.7	%	99	(70-130)		
LCS	4-Bromo-3,5-dimethylphenyl-N-methylcarbamate (:			109	%	109	(70-130)		

Spike recovery is already corrected for native results.
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RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
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Laboratory QC

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MBLK	4-Bromo-3,5-dimethylphenyl-N-methylcarbamate (:			107	%	107	(70-130)		
MRL_CHK	4-Bromo-3,5-dimethylphenyl-N-methylcarbamate (:		100	103	%	103	(70-130)		
MS1_201905300029	4-Bromo-3,5-dimethylphenyl-N-methylcarbamate (:			99.1	%	99	(70-130)		
MSD1_201905300029	4-Bromo-3,5-dimethylphenyl-N-methylcarbamate (:			96.9	%	97	(70-130)		
CCCH	Aldicarb (Temik)		25	22.2	ug/L	89	(70-130)		
CCCM	Aldicarb (Temik)		10	8.85	ug/L	89	(70-130)		
LCS	Aldicarb (Temik)		5	4.73	ug/L	95	(70-130)		
MBLK	Aldicarb (Temik)			<0.167	ug/L				
MRL_CHK	Aldicarb (Temik)		0.5	0.443	ug/L	89	(50-150)		
MS1_201905300029	Aldicarb (Temik)	ND	5	5.59	ug/L	112	(70-130)		
MSD1_201905300029	Aldicarb (Temik)	ND	5	5.43	ug/L	109	(70-130)	20	3.0
CCCH	Aldicarb sulfone		25	24.7	ug/L	99	(70-130)		
CCCM	Aldicarb sulfone		10	10.1	ug/L	101	(70-130)		
LCS	Aldicarb sulfone		5	5.39	ug/L	108	(70-130)		
MBLK	Aldicarb sulfone			<0.167	ug/L				
MRL_CHK	Aldicarb sulfone		0.5	0.524	ug/L	105	(50-150)		
MS1_201905300029	Aldicarb sulfone	ND	5	5.77	ug/L	115	(70-130)		
MSD1_201905300029	Aldicarb sulfone	ND	5	5.83	ug/L	117	(70-130)	20	1.0
CCCH	Aldicarb sulfoxide		25	23.8	ug/L	95	(70-130)		
CCCM	Aldicarb sulfoxide		10	9.58	ug/L	96	(70-130)		
LCS	Aldicarb sulfoxide		5	4.63	ug/L	93	(70-130)		
MBLK	Aldicarb sulfoxide			<0.167	ug/L				
MRL_CHK	Aldicarb sulfoxide		0.5	0.462	ug/L	92	(50-150)		
MS1_201905300029	Aldicarb sulfoxide	ND	5	5.74	ug/L	115	(70-130)		
MSD1_201905300029	Aldicarb sulfoxide	ND	5	5.85	ug/L	117	(70-130)	20	1.8
CCCH	Baygon		25	24.5	ug/L	98	(70-130)		
CCCM	Baygon		10	10.1	ug/L	101	(70-130)		
LCS	Baygon		5	4.90	ug/L	98	(70-130)		
MBLK	Baygon			<0.167	ug/L				
MRL_CHK	Baygon		0.5	0.451	ug/L	90	(50-150)		
MS1_201905300029	Baygon	ND	5	5.68	ug/L	114	(70-130)		
MSD1_201905300029	Baygon	ND	5	5.67	ug/L	113	(70-130)	20	0.23
CCCH	Carbaryl		25	24.8	ug/L	99	(70-130)		
CCCM	Carbaryl		10	9.83	ug/L	98	(70-130)		
LCS	Carbaryl		5	5.26	ug/L	105	(70-130)		
MBLK	Carbaryl			<0.167	ug/L				
MRL_CHK	Carbaryl		0.5	0.493	ug/L	99	(50-150)		
MS1_201905300029	Carbaryl	ND	5	5.48	ug/L	110	(70-130)		

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Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MSD1_201905300029	Carbaryl	ND	5	5.51	ug/L	110	(70-130)	20	0.61
CCCH	Carbofuran (Furadan)		25	24.7	ug/L	99	(70-130)		
CCCM	Carbofuran (Furadan)		10	10.3	ug/L	103	(70-130)		
LCS	Carbofuran (Furadan)		5	4.85	ug/L	97	(70-130)		
MBLK	Carbofuran (Furadan)			<0.167	ug/L				
MRL_CHK	Carbofuran (Furadan)		0.5	0.516	ug/L	103	(50-150)		
MS1_201905300029	Carbofuran (Furadan)	ND	5	5.63	ug/L	113	(70-130)		
MSD1_201905300029	Carbofuran (Furadan)	ND	5	5.59	ug/L	112	(70-130)	20	0.73
CCCH	Methiocarb		25	24.9	ug/L	100	(70-130)		
CCCM	Methiocarb		10	9.87	ug/L	99	(70-130)		
LCS	Methiocarb		5	5.37	ug/L	107	(70-130)		
MBLK	Methiocarb			<0.167	ug/L				
MRL_CHK	Methiocarb		0.5	0.618	ug/L	124	(50-150)		
MS1_201905300029	Methiocarb	ND	5	5.42	ug/L	108	(70-130)		
MSD1_201905300029	Methiocarb	ND	5	5.31	ug/L	106	(70-130)	20	2.0
CCCH	Methomyl		25	20.7	ug/L	83	(70-130)		
CCCM	Methomyl		10	8.61	ug/L	86	(70-130)		
LCS	Methomyl		5	4.56	ug/L	91	(70-130)		
MBLK	Methomyl			<0.167	ug/L				
MRL_CHK	Methomyl		0.5	0.356	ug/L	71	(50-150)		
MS1_201905300029	Methomyl	ND	5	5.68	ug/L	114	(70-130)		
MSD1_201905300029	Methomyl	ND	5	5.53	ug/L	111	(70-130)	20	2.7
CCCH	Oxamyl (Vydate)		25	22.9	ug/L	92	(70-130)		
CCCM	Oxamyl (Vydate)		10	9.46	ug/L	95	(70-130)		
LCS	Oxamyl (Vydate)		5	5.00	ug/L	100	(70-130)		
MBLK	Oxamyl (Vydate)			<0.167	ug/L				
MRL_CHK	Oxamyl (Vydate)		0.5	0.434	ug/L	87	(50-150)		
MS1_201905300029	Oxamyl (Vydate)	ND	5	5.87	ug/L	117	(70-130)		
MSD1_201905300029	Oxamyl (Vydate)	ND	5	5.84	ug/L	117	(70-130)	20	0.45

EPA Method 504.1 by EPA 504.1

Analytical Batch: 1175671 **Analysis Date: 06/03/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
CCCH	1,2-Dibromo-3-chloropropane		0.25	0.254	ug/L	102	(70-130)		
CCCM2	1,2-Dibromo-3-chloropropane		0.05	0.0507	ug/L	101	(70-130)		
DUP_201905240130	1,2-Dibromo-3-chloropropane	ND		ND	ug/L		(0-20)		
LCS2	1,2-Dibromo-3-chloropropane		0.2	0.216	ug/L	108	(70-130)		
MBLK	1,2-Dibromo-3-chloropropane			<0.01	ug/L				
MRL_CHK	1,2-Dibromo-3-chloropropane		0.01	0.00890	ug/L	89	(60-140)		
MRLLW	1,2-Dibromo-3-chloropropane		0.008	0.00840	ug/L	105	(60-140)		

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RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
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QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MS_201905240128	1,2-Dibromo-3-chloropropane	ND	0.25	0.279	ug/L	112	(65-135)		
CCCH	1,2-Dibromoethane		0.25	0.254	ug/L	102	(70-130)		
CCCM2	1,2-Dibromoethane		0.05	0.0548	ug/L	110	(70-130)		
DUP_201905240130	1,2-Dibromoethane	ND		ND	ug/L		(0-20)		
LCS2	1,2-Dibromoethane		0.2	0.210	ug/L	105	(70-130)		
MBLK	1,2-Dibromoethane			<0.01	ug/L				
MRL_CHK	1,2-Dibromoethane		0.01	0.0117	ug/L	117	(60-140)		
MS_201905240128	1,2-Dibromoethane	ND	0.25	0.272	ug/L	109	(65-135)		
CCCH	1,2-Dibromopropane (S)		100	110	%	110	(60-140)		
CCCM2	1,2-Dibromopropane (S)		100	102	%	102	(60-140)		
DUP_201905240130	1,2-Dibromopropane (S)		100	96.2	%	96	(60-140)		
LCS2	1,2-Dibromopropane (S)		100	106	%	106	(60-140)		
MBLK	1,2-Dibromopropane (S)			98.1	%	98	(60-140)		
MRL_CHK	1,2-Dibromopropane (S)		100	99.0	%	99	(60-140)		
MRLLW	1,2-Dibromopropane (S)		100	110	%	110	(60-140)		
MS_201905240128	1,2-Dibromopropane (S)		100	112	%	113	(60-140)		

ICPMS Metals by EPA 200.8

Analytical Batch: 1175821 **Analysis Date: 06/04/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Silver Total ICAP/MS		25	25.1	ug/L	100	(85-115)		
LCS2	Silver Total ICAP/MS		25	24.7	ug/L	99	(85-115)	20	1.6
MBLK	Silver Total ICAP/MS			<0.25	ug/L				
MRL_CHK	Silver Total ICAP/MS		0.5	0.542	ug/L	108	(50-150)		
MS_201905200099	Silver Total ICAP/MS	ND	25	25.2	ug/L	101	(70-130)		
MS2_201905220009	Silver Total ICAP/MS	ND	25	25.5	ug/L	102	(70-130)		
MSD_201905200099	Silver Total ICAP/MS	ND	25	25.6	ug/L	102	(70-130)	20	1.7
MSD2_201905220009	Silver Total ICAP/MS	ND	25	25.8	ug/L	103	(70-130)	20	1.3

EPA Method 504.1 by EPA 504.1

Analytical Batch: 1175953 **Analysis Date: 06/04/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
CCCH	1,2-Dibromo-3-chloropropane		0.25	0.248	ug/L	99	(70-130)		
CCCM2	1,2-Dibromo-3-chloropropane		0.05	0.0463	ug/L	93	(70-130)		
DUP_201905300522	1,2-Dibromo-3-chloropropane	ND		ND	ug/L		(0-20)		
LCS2	1,2-Dibromo-3-chloropropane		0.2	0.207	ug/L	104	(70-130)		
MBLK	1,2-Dibromo-3-chloropropane			<0.01	ug/L				
MRL_CHK	1,2-Dibromo-3-chloropropane		0.01	0.00980	ug/L	98	(60-140)		
MS_201905290135	1,2-Dibromo-3-chloropropane	ND	0.25	0.262	ug/L	105	(65-135)		
CCCH	1,2-Dibromoethane		0.25	0.249	ug/L	100	(70-130)		
CCCM2	1,2-Dibromoethane		0.05	0.0510	ug/L	102	(70-130)		

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QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
DUP_201905300522	1,2-Dibromoethane	ND		ND	ug/L		(0-20)		
LCS2	1,2-Dibromoethane		0.2	0.199	ug/L	100	(70-130)		
MBLK	1,2-Dibromoethane			<0.01	ug/L				
MRL_CHK	1,2-Dibromoethane		0.01	0.00760	ug/L	76	(60-140)		
MS_201905290135	1,2-Dibromoethane	ND	0.25	0.249	ug/L	99	(65-135)		
CCCH	1,2-Dibromopropane (S)		100	104	%	104	(60-140)		
CCCM2	1,2-Dibromopropane (S)		100	102	%	102	(60-140)		
DUP_201905300522	1,2-Dibromopropane (S)		100	96.7	%	97	(60-140)		
LCS2	1,2-Dibromopropane (S)		100	104	%	104	(60-140)		
MBLK	1,2-Dibromopropane (S)			99.5	%	99	(60-140)		
MRL_CHK	1,2-Dibromopropane (S)		100	110	%	110	(60-140)		
MRLLW	1,2-Dibromopropane (S)		100	102	%	102	(60-140)		
MS_201905290135	1,2-Dibromopropane (S)		100	106	%	106	(60-140)		

Cyanide by manual distillation by EPA 335.4

Analytical Batch: 1175985 **Analysis Date: 06/05/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Cyanide by manual distillation		0.1	0.100	mg/L	100	(90-110)		
LCS2	Cyanide by manual distillation		0.1	0.103	mg/L	103	(90-110)	20	3.0
MBLK	Cyanide by manual distillation			**0.00270**	mg/L				
MRL_CHK	Cyanide by manual distillation		0.005	0.00730	mg/L	146	(50-150)		
MS_201905090622	Cyanide by manual distillation	ND	0.1	0.108	mg/L	105	(90-110)		
MSD_201905090622	Cyanide by manual distillation	ND	0.1	0.105	mg/L	102	(90-110)	20	2.7

ICPMS Metals by EPA 200.8

Analytical Batch: 1176125 **Analysis Date: 06/04/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Aluminum Total ICAP/MS		100	100	ug/L	100	(85-115)		
LCS2	Aluminum Total ICAP/MS		100	102	ug/L	102	(85-115)	20	2.0
MBLK	Aluminum Total ICAP/MS			<10	ug/L				
MRL_CHK	Aluminum Total ICAP/MS		20	20.0	ug/L	100	(50-150)		
MS_201905230013	Aluminum Total ICAP/MS		100	111	ug/L	111	(70-130)		
MSD_201905230013	Aluminum Total ICAP/MS		100	108	ug/L	108	(70-130)	20	2.7
LCS1	Antimony Total ICAP/MS		50	49.3	ug/L	99	(85-115)		
LCS2	Antimony Total ICAP/MS		50	49.2	ug/L	98	(85-115)	20	0.20
MBLK	Antimony Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Antimony Total ICAP/MS		1	1.10	ug/L	110	(50-150)		
MS_201905230013	Antimony Total ICAP/MS		50	54.6	ug/L	109	(70-130)		
MSD_201905230013	Antimony Total ICAP/MS		50	55.3	ug/L	111	(70-130)	20	1.2
LCS1	Arsenic Total ICAP/MS		50	50.4	ug/L	101	(85-115)		
LCS2	Arsenic Total ICAP/MS		50	50.6	ug/L	101	(85-115)	20	0.40

Spike recovery is already corrected for native results.
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RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
(S) - Indicates surrogate compound.
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Laboratory QC

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MBLK	Arsenic Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Arsenic Total ICAP/MS		1	0.759	ug/L	76	(50-150)		
MS_201905230013	Arsenic Total ICAP/MS		50	58.5	ug/L	117	(70-130)		
MSD_201905230013	Arsenic Total ICAP/MS		50	58.7	ug/L	117	(70-130)	20	0.34
LCS1	Barium Total ICAP/MS		50	49.4	ug/L	99	(85-115)		
LCS2	Barium Total ICAP/MS		50	49.4	ug/L	99	(85-115)	20	0.0
MBLK	Barium Total ICAP/MS			<1	ug/L				
MRL_CHK	Barium Total ICAP/MS		2	1.92	ug/L	96	(50-150)		
LCS1	Beryllium Total ICAP/MS		25	24.7	ug/L	99	(85-115)		
LCS2	Beryllium Total ICAP/MS		25	24.8	ug/L	99	(85-115)	20	0.40
MBLK	Beryllium Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Beryllium Total ICAP/MS		1	0.991	ug/L	99	(50-150)		
MS_201905230013	Beryllium Total ICAP/MS		25	29.7	ug/L	119	(70-130)		
MSD_201905230013	Beryllium Total ICAP/MS		25	29.2	ug/L	117	(70-130)	20	1.6
LCS1	Cadmium Total ICAP/MS		25	24.6	ug/L	99	(85-115)		
LCS2	Cadmium Total ICAP/MS		25	24.4	ug/L	98	(85-115)	20	0.82
MBLK	Cadmium Total ICAP/MS			<0.25	ug/L				
MRL_CHK	Cadmium Total ICAP/MS		0.5	0.484	ug/L	97	(50-150)		
MS_201905230013	Cadmium Total ICAP/MS		25	27.6	ug/L	110	(70-130)		
MSD_201905230013	Cadmium Total ICAP/MS		25	27.3	ug/L	109	(70-130)	20	0.94
LCS1	Chromium Total ICAP/MS		50	49.0	ug/L	98	(85-115)		
LCS2	Chromium Total ICAP/MS		50	49.1	ug/L	98	(85-115)	20	0.20
MBLK	Chromium Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Chromium Total ICAP/MS		1	0.959	ug/L	96	(50-150)		
MS_201905230013	Chromium Total ICAP/MS		50	55.0	ug/L	110	(70-130)		
MSD_201905230013	Chromium Total ICAP/MS		50	53.9	ug/L	108	(70-130)	20	2.0
LCS1	Copper Total ICAP/MS		50	49.9	ug/L	100	(85-115)		
LCS2	Copper Total ICAP/MS		50	50.1	ug/L	100	(85-115)	20	0.40
MBLK	Copper Total ICAP/MS			<1	ug/L				
MRL_CHK	Copper Total ICAP/MS		2	1.86	ug/L	93	(50-150)		
MS_201905230013	Copper Total ICAP/MS		50	53.5	ug/L	107	(70-130)		
MSD_201905230013	Copper Total ICAP/MS		50	52.8	ug/L	106	(70-130)	20	1.3
LCS1	Lead Total ICAP/MS		50	48.2	ug/L	97	(85-115)		
LCS2	Lead Total ICAP/MS		50	48.6	ug/L	97	(85-115)	20	0.83
MBLK	Lead Total ICAP/MS			<0.25	ug/L				
MRL_CHK	Lead Total ICAP/MS		0.5	0.490	ug/L	98	(50-150)		
MS_201905230013	Lead Total ICAP/MS		50	51.7	ug/L	103	(70-130)		
MSD_201905230013	Lead Total ICAP/MS		50	51.3	ug/L	103	(70-130)	20	0.81

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Laboratory QC

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Manganese Total ICAP/MS		100	99.0	ug/L	99	(85-115)		
LCS2	Manganese Total ICAP/MS		100	99.6	ug/L	100	(85-115)	20	0.60
MBLK	Manganese Total ICAP/MS			<1	ug/L				
MRL_CHK	Manganese Total ICAP/MS		2	1.95	ug/L	97	(50-150)		
MS_201905230013	Manganese Total ICAP/MS		100	107	ug/L	107	(70-130)		
MSD_201905230013	Manganese Total ICAP/MS		100	106	ug/L	106	(70-130)	20	0.97
LCS1	Mercury Total ICAP/MS		0.75	0.748	ug/L	100	(85-115)		
LCS2	Mercury Total ICAP/MS		0.75	0.699	ug/L	93	(85-115)	20	6.8
MBLK	Mercury Total ICAP/MS			<0.1	ug/L				
MRL_CHK	Mercury Total ICAP/MS		0.2	0.188	ug/L	94	(50-150)		
MS_201905230013	Mercury Total ICAP/MS	ND	1.5	1.50	ug/L	99	(70-130)		
MSD_201905230013	Mercury Total ICAP/MS	ND	1.5	1.28	ug/L	85	(70-130)	20	16
LCS1	Nickel Total ICAP/MS		50	49.5	ug/L	99	(85-115)		
LCS2	Nickel Total ICAP/MS		50	49.6	ug/L	99	(85-115)	20	0.20
MBLK	Nickel Total ICAP/MS			<2.5	ug/L				
MRL_CHK	Nickel Total ICAP/MS		5	4.87	ug/L	97	(50-150)		
MS_201905230013	Nickel Total ICAP/MS		50	52.1	ug/L	104	(70-130)		
MSD_201905230013	Nickel Total ICAP/MS		50	51.4	ug/L	103	(70-130)	20	1.3
LCS1	Selenium Total ICAP/MS		50	48.6	ug/L	97	(85-115)		
LCS2	Selenium Total ICAP/MS		50	49.7	ug/L	100	(85-115)	20	2.2
MBLK	Selenium Total ICAP/MS			<2.5	ug/L				
MRL_CHK	Selenium Total ICAP/MS		5	4.95	ug/L	99	(50-150)		
MS_201905230013	Selenium Total ICAP/MS		50	58.0	ug/L	116	(70-130)		
MSD_201905230013	Selenium Total ICAP/MS		50	58.9	ug/L	118	(70-130)	20	1.6
LCS1	Silver Total ICAP/MS		25	25.7	ug/L	103	(85-115)		
LCS2	Silver Total ICAP/MS		25	25.7	ug/L	103	(85-115)	20	0.0
MBLK	Silver Total ICAP/MS			<0.25	ug/L				
MRL_CHK	Silver Total ICAP/MS		0.5	0.508	ug/L	102	(50-150)		
MS_201905230013	Silver Total ICAP/MS		25	27.8	ug/L	111	(70-130)		
MSD_201905230013	Silver Total ICAP/MS		25	27.8	ug/L	111	(70-130)	20	0.18
LCS1	Thallium Total ICAP/MS		50	47.6	ug/L	95	(85-115)		
LCS2	Thallium Total ICAP/MS		50	47.9	ug/L	96	(85-115)	20	0.63
MBLK	Thallium Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Thallium Total ICAP/MS		1	0.941	ug/L	94	(50-150)		
MS_201905230013	Thallium Total ICAP/MS		50	51.2	ug/L	102	(70-130)		
MSD_201905230013	Thallium Total ICAP/MS		50	50.8	ug/L	102	(70-130)	20	0.78
LCS1	Uranium ICAP/MS		50	47.8	ug/L	96	(85-115)		
LCS2	Uranium ICAP/MS		50	47.8	ug/L	96	(85-115)	20	0.0

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David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MBLK	Uranium ICAP/MS			<0.5	ug/L				
MRL_CHK	Uranium ICAP/MS		1	0.928	ug/L	93	(50-150)		
MS_201905230013	Uranium ICAP/MS		50	53.9	ug/L	108	(70-130)		
MSD_201905230013	Uranium ICAP/MS		50	53.4	ug/L	107	(70-130)	20	0.94
LCS1	Vanadium Total ICAP/MS		50	48.7	ug/L	97	(85-115)		
LCS2	Vanadium Total ICAP/MS		50	48.7	ug/L	97	(85-115)	20	0.0
MBLK	Vanadium Total ICAP/MS			<1.5	ug/L				
MRL_CHK	Vanadium Total ICAP/MS		3	3.00	ug/L	100	(50-150)		
MS_201905230013	Vanadium Total ICAP/MS	13	50	66.1	ug/L	107	(70-130)		
MSD_201905230013	Vanadium Total ICAP/MS	13	50	65.5	ug/L	106	(70-130)	20	0.94
LCS1	Zinc Total ICAP/MS		50	48.7	ug/L	97	(85-115)		
LCS2	Zinc Total ICAP/MS		50	49.2	ug/L	98	(85-115)	20	1.0
MBLK	Zinc Total ICAP/MS			<10	ug/L				
MRL_CHK	Zinc Total ICAP/MS		20	19.1	ug/L	95	(50-150)		
MS_201905230013	Zinc Total ICAP/MS		50	54.6	ug/L	109	(70-130)		
MSD_201905230013	Zinc Total ICAP/MS		50	54.0	ug/L	108	(70-130)	20	0.84

Chlorophenoxy Herbicides by EPA 515.4

Prep Batch: 1175936 Analytical Batch: 1176585 **Analysis Date: 06/07/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
CCC3	2,4,5-T		4	4.02	ug/L	100	(70-130)		
CCCH	2,4,5-T		4	3.96	ug/L	99	(70-130)		
CCCM	2,4,5-T		1	1.10	ug/L	110	(70-130)		
MBLK	2,4,5-T			<0.066	ug/L				
MRL_CHK	2,4,5-T		0.2	0.247	ug/L	123	(50-150)		
MS1_201905230303	2,4,5-T	ND	3	3.05	ug/L	102	(70-130)		
MSD1_201905230303	2,4,5-T	ND	3	3.07	ug/L	102	(70-130)	30	0.59
CCC3	2,4,5-TP (Silvex)		4	3.97	ug/L	99	(70-130)		
CCCH	2,4,5-TP (Silvex)		4	3.92	ug/L	98	(70-130)		
CCCM	2,4,5-TP (Silvex)		1	1.05	ug/L	105	(70-130)		
MBLK	2,4,5-TP (Silvex)			<0.066	ug/L				
MRL_CHK	2,4,5-TP (Silvex)		0.2	0.178	ug/L	89	(50-150)		
MS1_201905230303	2,4,5-TP (Silvex)	ND	3	3.08	ug/L	103	(70-130)		
MSD1_201905230303	2,4,5-TP (Silvex)	ND	3	2.96	ug/L	99	(70-130)	30	3.9
CCC3	2,4-D		2	1.96	ug/L	98	(70-130)		
CCCH	2,4-D		2	1.97	ug/L	99	(70-130)		
CCCM	2,4-D		0.5	0.541	ug/L	108	(70-130)		
MBLK	2,4-D			<0.033	ug/L				
MRL_CHK	2,4-D		0.1	0.123	ug/L	123	(50-150)		
MS1_201905230303	2,4-D	ND	1.5	1.73	ug/L	115	(70-130)		

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QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MSD1_201905230303	2,4-D	ND	1.5	1.71	ug/L	114	(70-130)	30	1.2
CCC3	2,4-DB		40	38.6	ug/L	97	(70-130)		
CCCH	2,4-DB		40	39.2	ug/L	98	(70-130)		
CCCM	2,4-DB		10	11.2	ug/L	112	(70-130)		
MBLK	2,4-DB			<0.666	ug/L				
MRL_CHK	2,4-DB		2	2.15	ug/L	108	(50-150)		
MRLLW	2,4-DB		1	0.971	ug/L	97	(50-150)		
MS1_201905230303	2,4-DB	ND	30	30.4	ug/L	101	(70-130)		
MSD1_201905230303	2,4-DB	ND	30	30.2	ug/L	101	(70-130)	30	0.73
CCC3	2,4-Dichlorophenyl acetic acid (S)		100	94.6	%	95	(70-130)		
CCCH	2,4-Dichlorophenyl acetic acid (S)		10	96.0	%	96	(70-130)		
CCCM	2,4-Dichlorophenyl acetic acid (S)		2.5	99.5	%	100	(70-130)		
MBLK	2,4-Dichlorophenyl acetic acid (S)			92.1	%	92	(70-130)		
MRL_CHK	2,4-Dichlorophenyl acetic acid (S)			100	%	100	(70-130)		
MRLLW	2,4-Dichlorophenyl acetic acid (S)		0.1	95.9	%	96	(70-130)		
MS1_201905230303	2,4-Dichlorophenyl acetic acid (S)			100	%	100	(70-130)		
MSD1_201905230303	2,4-Dichlorophenyl acetic acid (S)			97.1	%	97	(70-130)		
CCC3	3,5-Dichlorobenzoic acid		10	9.80	ug/L	98	(70-130)		
CCCH	3,5-Dichlorobenzoic acid		10	9.92	ug/L	99	(70-130)		
CCCM	3,5-Dichlorobenzoic acid		2.5	2.48	ug/L	99	(70-130)		
MBLK	3,5-Dichlorobenzoic acid			<0.166	ug/L				
MRL_CHK	3,5-Dichlorobenzoic acid		0.5	0.401	ug/L	80	(50-150)		
MS1_201905230303	3,5-Dichlorobenzoic acid	ND	7.5	7.85	ug/L	105	(70-130)		
MSD1_201905230303	3,5-Dichlorobenzoic acid	ND	7.5	7.72	ug/L	103	(70-130)	30	1.7
CCC3	4,4-Dibromooctafluorobiphenyl (I)		100	102	%	102	(50-150)		
CCCH	4,4-Dibromooctafluorobiphenyl (I)			102	%	102	(50-150)		
CCCM	4,4-Dibromooctafluorobiphenyl (I)			102	%	102	(50-150)		
MBLK	4,4-Dibromooctafluorobiphenyl (I)			109	%	109	(50-150)		
MRL_CHK	4,4-Dibromooctafluorobiphenyl (I)		100	102	%	102	(50-150)		
MRLLW	4,4-Dibromooctafluorobiphenyl (I)			105	%	105	(50-150)		
MS1_201905230303	4,4-Dibromooctafluorobiphenyl (I)		100	94.8	%	95	(50-150)		
MSD1_201905230303	4,4-Dibromooctafluorobiphenyl (I)			98.2	%	98	(50-150)		
CCC3	Acifluorfen		4	4.16	ug/L	104	(70-130)		
CCCH	Acifluorfen		4	3.86	ug/L	97	(70-130)		
CCCM	Acifluorfen		1	1.14	ug/L	114	(70-130)		
MBLK	Acifluorfen			<0.066	ug/L				
MRL_CHK	Acifluorfen		0.2	0.232	ug/L	116	(50-150)		
MS1_201905230303	Acifluorfen	ND	3	3.22	ug/L	107	(70-130)		

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RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
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Laboratory QC

Report: 806101
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Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MSD1_201905230303	Acifluorfen	ND	3	3.13	ug/L	104	(70-130)	30	2.9
CCC3	Bentazon		10	10.5	ug/L	105	(70-130)		
CCCH	Bentazon		10	10.7	ug/L	107	(70-130)		
CCCM	Bentazon		2.5	2.92	ug/L	117	(70-130)		
MBLK	Bentazon			<0.166	ug/L				
MRL_CHK	Bentazon		0.5	0.509	ug/L	102	(50-150)		
MS1_201905230303	Bentazon	ND	7.5	8.04	ug/L	107	(70-130)		
MSD1_201905230303	Bentazon	ND	7.5	8.27	ug/L	110	(70-130)	30	2.8
CCC3	Dalapon		20	23.6	ug/L	118	(70-130)		
CCCH	Dalapon		20	23.7	ug/L	119	(70-130)		
CCCM	Dalapon		5	5.85	ug/L	117	(70-130)		
MBLK	Dalapon			<0.333	ug/L				
MRL_CHK	Dalapon		1	1.03	ug/L	103	(50-150)		
MS1_201905230303	Dalapon	ND	15	15.7	ug/L	105	(70-130)		
MSD1_201905230303	Dalapon	ND	15	17.2	ug/L	115	(70-130)	30	8.9
CCC3	Dicamba		2	2.24	ug/L	112	(70-130)		
CCCH	Dicamba		2	2.13	ug/L	106	(70-130)		
CCCM	Dicamba		0.5	0.548	ug/L	110	(70-130)		
MBLK	Dicamba			<0.033	ug/L				
MRL_CHK	Dicamba		0.1	0.0615	ug/L	62	(50-150)		
MS1_201905230303	Dicamba	ND	1.5	1.53	ug/L	102	(70-130)		
MSD1_201905230303	Dicamba	ND	1.5	1.62	ug/L	108	(70-130)	30	5.5
CCC3	Dichlorprop		10	9.97	ug/L	100	(70-130)		
CCCH	Dichlorprop		10	9.96	ug/L	100	(70-130)		
CCCM	Dichlorprop		2.5	2.72	ug/L	109	(70-130)		
MBLK	Dichlorprop			<0.166	ug/L				
MRL_CHK	Dichlorprop		0.5	0.356	ug/L	71	(50-150)		
MS1_201905230303	Dichlorprop	ND	7.5	7.68	ug/L	102	(70-130)		
MSD1_201905230303	Dichlorprop	ND	7.5	7.62	ug/L	102	(70-130)	30	0.83
CCC3	Dinoseb		4	3.90	ug/L	98	(70-130)		
CCCH	Dinoseb		4	3.89	ug/L	97	(70-130)		
CCCM	Dinoseb		1	1.08	ug/L	108	(70-130)		
MBLK	Dinoseb			<0.066	ug/L				
MRL_CHK	Dinoseb		0.2	0.214	ug/L	107	(50-150)		
MS1_201905230303	Dinoseb	ND	3	3.01	ug/L	100	(70-130)		
MSD1_201905230303	Dinoseb	ND	3	2.89	ug/L	97	(70-130)	30	4.0
CCC3	Pentachlorophenol		0.8	0.887	ug/L	111	(70-130)		
CCCH	Pentachlorophenol		0.8	0.846	ug/L	106	(70-130)		

Spike recovery is already corrected for native results.
Spikes which exceed Limits and Method Blanks with positive results are highlighted by Underlining.
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RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
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Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
CCCM	Pentachlorophenol		0.2	0.240	ug/L	120	(70-130)		
MBLK	Pentachlorophenol			<0.013	ug/L				
MRL_CHK	Pentachlorophenol		0.04	0.0414	ug/L	103	(50-150)		
MS1_201905230303	Pentachlorophenol	ND	0.6	0.646	ug/L	108	(70-130)		
MSD1_201905230303	Pentachlorophenol	ND	0.6	0.712	ug/L	119	(70-130)	30	9.9
CCC3	Picloram		2	1.75	ug/L	88	(70-130)		
CCCH	Picloram		2	1.92	ug/L	96	(70-130)		
CCCM	Picloram		0.5	0.478	ug/L	96	(70-130)		
MBLK	Picloram			<0.033	ug/L				
MRL_CHK	Picloram		0.1	0.109	ug/L	109	(50-150)		
MS1_201905230303	Picloram	ND	1.5	1.68	ug/L	110	(70-130)		
MSD1_201905230303	Picloram	ND	1.5	1.85	ug/L	122	(70-130)	30	9.9
CCC3	Tot DCPA Mono&Diacid Degradate		2	2.17	ug/L	109	(70-130)		
CCCH	Tot DCPA Mono&Diacid Degradate		2	2.10	ug/L	105	(70-130)		
CCCM	Tot DCPA Mono&Diacid Degradate		0.5	0.509	ug/L	102	(70-130)		
MBLK	Tot DCPA Mono&Diacid Degradate			<0.033	ug/L				
MRL_CHK	Tot DCPA Mono&Diacid Degradate		0.1	0.146	ug/L	146	(50-150)		
MS1_201905230303	Tot DCPA Mono&Diacid Degradate	ND	1.5	1.55	ug/L	103	(70-130)		
MSD1_201905230303	Tot DCPA Mono&Diacid Degradate	ND	1.5	1.68	ug/L	112	(70-130)	30	8.2

Perfluorinated Alkyl Acids EPA 537 rev 1.1 by EPA 537

Prep Batch: 1175545 Analytical Batch: 1177011 **Analysis Date: 06/06/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
DUP_201905290302	13C-PFDA (S)			91.2	%	91	(70-130)		
MBLK	13C-PFDA (S)			107	%	107	(70-130)		
MRL_CHK	13C-PFDA (S)		100	107	%	107	(70-130)		
MS1_201906030075	13C-PFDA (S)		100	88.1	%	88	(70-130)		
DUP_201905290302	13C-PFHxA (S)			99.2	%	99	(70-130)		
MBLK	13C-PFHxA (S)			111	%	111	(70-130)		
MRL_CHK	13C-PFHxA (S)		100	104	%	104	(70-130)		
MS1_201906030075	13C-PFHxA (S)		100	97.9	%	98	(70-130)		
DUP_201905290302	13C-PFOA (I)			105	%	105	(50-150)		
MBLK	13C-PFOA (I)			96.8	%	97	(50-150)		
MRL_CHK	13C-PFOA (I)		100	94.8	%	95	(50-150)		
MS1_201906030075	13C-PFOA (I)		100	102	%	103	(50-150)		
DUP_201905290302	13C-PFOS (I)			95.2	%	95	(50-150)		
MBLK	13C-PFOS (I)			89.6	%	90	(50-150)		
MRL_CHK	13C-PFOS (I)		100	91.2	%	91	(50-150)		
MS1_201906030075	13C-PFOS (I)		100	93.3	%	93	(50-150)		
DUP_201905290302	d3-NMeFOSAA (I)			92.8	%	93	(50-150)		

Spike recovery is already corrected for native results.
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RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
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Laboratory QC

Report: 806101
Project: SPECIAL
Group: desal pilot

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QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MBLK	d3-NMeFOSAA (I)			96.0	%	96	(50-150)		
MRL_CHK	d3-NMeFOSAA (I)		100	91.8	%	92	(50-150)		
MS1_201906030075	d3-NMeFOSAA (I)		100	88.5	%	89	(50-150)		
DUP_201905290302	d5-NEtFOSAA (S)			104	%	105	(70-130)		
MBLK	d5-NEtFOSAA (S)			101	%	101	(70-130)		
MRL_CHK	d5-NEtFOSAA (S)		100	97.5	%	98	(70-130)		
MS1_201906030075	d5-NEtFOSAA (S)		100	101	%	101	(70-130)		
DUP_201905290302	N-ethyl Perfluorooctanesulfonamidoacetic acid			0.000106	ug/L		(0-30)		
MBLK	N-ethyl Perfluorooctanesulfonamidoacetic acid			<0.000667	ug/L				
MRL_CHK	N-ethyl Perfluorooctanesulfonamidoacetic acid		0.002	0.00194	ug/L	97	(50-150)		
MS1_201906030075	N-ethyl Perfluorooctanesulfonamidoacetic acid	ND	0.025	0.0249	ug/L	99	(70-130)		
DUP_201905290302	N-methyl Perfluorooctanesulfonamidoacetic acid			0.0000210	ug/L		(0-30)		
MBLK	N-methyl Perfluorooctanesulfonamidoacetic acid			<0.000667	ug/L				
MRL_CHK	N-methyl Perfluorooctanesulfonamidoacetic acid		0.002	0.00170	ug/L	85	(50-150)		
MS1_201906030075	N-methyl Perfluorooctanesulfonamidoacetic acid	ND	0.025	0.0237	ug/L	95	(70-130)		
DUP_201905290302	Perfluorobutanesulfonic acid	0.013		0.0136	ng/L		(0-30)	30	2.7
MBLK	Perfluorobutanesulfonic acid			<0.00059	ug/L				
MRL_CHK	Perfluorobutanesulfonic acid		0.0018	0.00192	ug/L	108	(50-150)		
MS1_201906030075	Perfluorobutanesulfonic acid	ND	0.022	0.0237	ug/L	107	(70-130)		
DUP_201905290302	Perfluorodecanoic acid			0.000309	ng/L		(0-30)		
MBLK	Perfluorodecanoic acid			<0.000667	ug/L				
MRL_CHK	Perfluorodecanoic acid		0.002	0.00246	ug/L	123	(50-150)		
MS1_201906030075	Perfluorodecanoic acid	ND	0.025	0.0230	ug/L	92	(70-130)		
DUP_201905290302	Perfluorododecanoic acid			0.000111	ug/L		(0-30)		
MBLK	Perfluorododecanoic acid			<0.000667	ug/L				
MRL_CHK	Perfluorododecanoic acid		0.002	0.00191	ug/L	95	(50-150)		
MS1_201906030075	Perfluorododecanoic acid	ND	0.025	0.0216	ug/L	87	(70-130)		
DUP_201905290302	Perfluoroheptanoic acid	0.011		0.0115	ug/L		(0-30)	30	0.79
MBLK	Perfluoroheptanoic acid			<0.000667	ug/L				
MRL_CHK	Perfluoroheptanoic acid		0.002	0.00150	ug/L	75	(50-150)		
MS1_201906030075	Perfluoroheptanoic acid	ND	0.025	0.0235	ug/L	93	(70-130)		
DUP_201905290302	Perfluorohexanesulfonic acid	0.066		0.0620	ug/L		(0-30)	30	5.8
MBLK	Perfluorohexanesulfonic acid			<0.000608	ug/L				
MRL_CHK	Perfluorohexanesulfonic acid		0.0018	0.00180	ug/L	99	(50-150)		
MS1_201906030075	Perfluorohexanesulfonic acid	ND	0.023	0.0248	ug/L	109	(70-130)		
DUP_201905290302	Perfluorohexanoic acid			0.0444	ug/L		(0-30)		
MBLK	Perfluorohexanoic acid			<0.000667	ug/L				
MRL_CHK	Perfluorohexanoic acid		0.002	0.00224	ug/L	112	(50-150)		

Spike recovery is already corrected for native results.
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Laboratory QC

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MS1_201906030075	Perfluorohexanoic acid	ND	0.025	0.0252	ug/L	101	(70-130)		
DUP_201905290302	Perfluorononanoic acid	0.0031		0.00280	ug/L		(0-30)	30	9.4
MBLK	Perfluorononanoic acid			<0.000667	ug/L				
MRL_CHK	Perfluorononanoic acid		0.002	0.00248	ug/L	124	(50-150)		
MS1_201906030075	Perfluorononanoic acid	ND	0.025	0.0268	ug/L	107	(70-130)		
DUP_201905290302	Perfluorooctanesulfonic acid	0.094		0.114	ug/L		(0-30)	30	3.8
MBLK	Perfluorooctanesulfonic acid			<0.000617	ug/L				
MRL_CHK	Perfluorooctanesulfonic acid		0.0019	0.00191	ug/L	103	(50-150)		
MS1_201906030075	Perfluorooctanesulfonic acid	ND	0.023	0.0251	ug/L	109	(70-130)		
DUP_201905290302	Perfluorooctanoic acid	0.013		0.0134	ug/L		(0-30)	30	1.0
MBLK	Perfluorooctanoic acid			<0.000667	ug/L				
MRL_CHK	Perfluorooctanoic acid		0.002	0.00289	ug/L	145	(50-150)		
MS1_201906030075	Perfluorooctanoic acid	ND	0.025	0.0256	ug/L	101	(70-130)		
DUP_201905290302	Perfluorotetradecanoic acid			0.000281	ug/L		(0-30)		
MBLK	Perfluorotetradecanoic acid			<0.000667	ug/L				
MRL_CHK	Perfluorotetradecanoic acid		0.002	0.00183	ug/L	92	(50-150)		
MS1_201906030075	Perfluorotetradecanoic acid	ND	0.025	0.0208	ug/L	83	(70-130)		
DUP_201905290302	Perfluorotridecanoic acid			0.000186	ug/L		(0-30)		
MBLK	Perfluorotridecanoic acid			<0.000667	ug/L				
MRL_CHK	Perfluorotridecanoic acid		0.002	0.00271	ug/L	136	(50-150)		
MS1_201906030075	Perfluorotridecanoic acid	ND	0.025	0.0210	ug/L	84	(70-130)		
DUP_201905290302	Perfluoroundecanoic acid			ND	ug/L		(0-30)		
MBLK	Perfluoroundecanoic acid			<0.000667	ug/L				
MRL_CHK	Perfluoroundecanoic acid		0.002	0.00239	ug/L	120	(50-150)		
MS1_201906030075	Perfluoroundecanoic acid	ND	0.025	0.0202	ug/L	81	(70-130)		

Perfluorinated Alkyl Acids EPA 537 rev 1.1 by EPA 537

Prep Batch: 1175545 Analytical Batch: 1177020 **Analysis Date: 06/07/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	13C-PFDA (S)		100	108	%	108	(70-130)		
LCS2	13C-PFDA (S)		100	105	%	105	(70-130)		
LCS1	13C-PFHxA (S)		100	108	%	108	(70-130)		
LCS2	13C-PFHxA (S)		100	103	%	103	(70-130)		
LCS1	13C-PFOA (I)		100	101	%	101	(50-150)		
LCS2	13C-PFOA (I)		100	104	%	104	(50-150)		
LCS1	13C-PFOS (I)		100	109	%	109	(50-150)		
LCS2	13C-PFOS (I)		100	102	%	102	(50-150)		
LCS1	d3-NMeFOSAA (I)		100	103	%	103	(50-150)		
LCS2	d3-NMeFOSAA (I)		100	103	%	103	(50-150)		
LCS1	d5-NEtFOSAA (S)		100	99.0	%	99	(70-130)		

Spike recovery is already corrected for native results.
Spikes which exceed Limits and Method Blanks with positive results are highlighted by Underlining.
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RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
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Report: 806101
Project: SPECIAL
Group: desal pilot

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QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS2	d5-NEtFOSAA (S)		100	96.7	%	97	(70-130)		
LCS1	N-ethyl Perfluorooctanesulfonamidoacetic acid		0.025	0.0256	ug/L	102	(70-130)		
LCS2	N-ethyl Perfluorooctanesulfonamidoacetic acid		0.025	0.0240	ug/L	96	(70-130)	30	6.0
LCS1	N-methyl Perfluorooctanesulfonamidoacetic acid		0.025	0.0256	ug/L	103	(70-130)		
LCS2	N-methyl Perfluorooctanesulfonamidoacetic acid		0.025	0.0251	ug/L	101	(70-130)	30	2.4
LCS1	Perfluorobutanesulfonic acid		0.022	0.0212	ug/L	96	(70-130)		
LCS2	Perfluorobutanesulfonic acid		0.022	0.0218	ug/L	99	(70-130)	30	2.8
LCS1	Perfluorodecanoic acid		0.025	0.0260	ug/L	104	(70-130)		
LCS2	Perfluorodecanoic acid		0.025	0.0258	ug/L	103	(70-130)	30	0.77
LCS1	Perfluorododecanoic acid		0.025	0.0272	ug/L	109	(70-130)		
LCS2	Perfluorododecanoic acid		0.025	0.0263	ug/L	105	(70-130)	30	3.4
LCS1	Perfluoroheptanoic acid		0.025	0.0190	ug/L	76	(70-130)		
LCS2	Perfluoroheptanoic acid		0.025	0.0179	ug/L	72	(70-130)	30	6.0
LCS1	Perfluorohexanesulfonic acid		0.023	0.0224	ug/L	98	(70-130)		
LCS2	Perfluorohexanesulfonic acid		0.023	0.0241	ug/L	106	(70-130)	30	7.3
LCS1	Perfluorohexanoic acid		0.025	0.0257	ug/L	103	(70-130)		
LCS2	Perfluorohexanoic acid		0.025	0.0257	ug/L	103	(70-130)	30	0.0
LCS1	Perfluorononanoic acid		0.025	0.0272	ug/L	109	(70-130)		
LCS2	Perfluorononanoic acid		0.025	0.0281	ug/L	112	(70-130)	30	2.9
LCS1	Perfluorooctanesulfonic acid		0.023	0.0216	ug/L	94	(70-130)		
LCS2	Perfluorooctanesulfonic acid		0.023	0.0236	ug/L	102	(70-130)	30	8.4
LCS1	Perfluorooctanoic acid		0.025	0.0258	ug/L	103	(70-130)		
LCS2	Perfluorooctanoic acid		0.025	0.0250	ug/L	100	(70-130)	30	3.1
LCS1	Perfluorotetradecanoic acid		0.025	0.0248	ug/L	99	(70-130)		
LCS2	Perfluorotetradecanoic acid		0.025	0.0251	ug/L	100	(70-130)	30	1.2
LCS1	Perfluorotridecanoic acid		0.025	0.0252	ug/L	101	(70-130)		
LCS2	Perfluorotridecanoic acid		0.025	0.0240	ug/L	96	(70-130)	30	4.9
LCS1	Perfluoroundecanoic acid		0.025	0.0280	ug/L	112	(70-130)		
LCS2	Perfluoroundecanoic acid		0.025	0.0241	ug/L	96	(70-130)	30	15

Perfluorinated Alkyl Acids EPA 537 rev 1.1 by EPA 537

Prep Batch: 1175640 Analytical Batch: 1177054 **Analysis Date: 06/07/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS2	13C-PFDA (S)		100	111	%	111	(70-130)		
MBLK	13C-PFDA (S)			108	%	108	(70-130)		
MRL_CHK	13C-PFDA (S)		100	108	%	109	(70-130)		
MS_201905310387	13C-PFDA (S)		100	112	%	112	(70-130)		
MSD_201905310387	13C-PFDA (S)		100	106	%	106	(70-130)		
LCS2	13C-PFHxA (S)		100	108	%	108	(70-130)		

Spike recovery is already corrected for native results.
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QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MBLK	13C-PFHxA (S)			111	%	111	(70-130)		
MRL_CHK	13C-PFHxA (S)		100	108	%	108	(70-130)		
MS_201905310387	13C-PFHxA (S)		100	108	%	108	(70-130)		
MSD_201905310387	13C-PFHxA (S)		100	109	%	109	(70-130)		
LCS2	13C-PFOA (I)		100	110	%	110	(50-150)		
MBLK	13C-PFOA (I)			114	%	114	(50-150)		
MRL_CHK	13C-PFOA (I)		100	111	%	111	(50-150)		
MS_201905310387	13C-PFOA (I)		100	113	%	113	(50-150)		
MSD_201905310387	13C-PFOA (I)		100	110	%	110	(50-150)		
LCS2	13C-PFOS (I)		100	106	%	106	(50-150)		
MBLK	13C-PFOS (I)			100	%	100	(50-150)		
MRL_CHK	13C-PFOS (I)		100	99.7	%	100	(50-150)		
MS_201905310387	13C-PFOS (I)		100	101	%	101	(50-150)		
MSD_201905310387	13C-PFOS (I)		100	107	%	107	(50-150)		
LCS2	d3-NMeFOSAA (I)		100	97.4	%	97	(50-150)		
MBLK	d3-NMeFOSAA (I)			99.5	%	100	(50-150)		
MRL_CHK	d3-NMeFOSAA (I)		100	94.6	%	95	(50-150)		
MS_201905310387	d3-NMeFOSAA (I)		100	97.8	%	98	(50-150)		
MSD_201905310387	d3-NMeFOSAA (I)		100	99.6	%	100	(50-150)		
LCS2	d5-NEtFOSAA (S)		100	114	%	114	(70-130)		
MBLK	d5-NEtFOSAA (S)			123	%	123	(70-130)		
MRL_CHK	d5-NEtFOSAA (S)		100	122	%	122	(70-130)		
MS_201905310387	d5-NEtFOSAA (S)		100	121	%	121	(70-130)		
MSD_201905310387	d5-NEtFOSAA (S)		100	106	%	106	(70-130)		
LCS2	N-ethyl Perfluorooctanesulfonamidoacetic acid		0.025	0.0287	ug/L	115	(70-130)	30	5.4
MBLK	N-ethyl Perfluorooctanesulfonamidoacetic acid			<0.000667	ug/L				
MRL_CHK	N-ethyl Perfluorooctanesulfonamidoacetic acid		0.002	0.00248	ug/L	124	(50-150)		
MS_201905310387	N-ethyl Perfluorooctanesulfonamidoacetic acid	ND	0.002	0.00205	ug/L	101	(50-150)		
MSD_201905310387	N-ethyl Perfluorooctanesulfonamidoacetic acid	ND	0.002	0.00191	ug/L	95	(50-150)	50	7.0
LCS2	N-methyl Perfluorooctanesulfonamidoacetic acid		0.025	0.0259	ug/L	104	(70-130)	30	1.1
MBLK	N-methyl Perfluorooctanesulfonamidoacetic acid			<0.000667	ug/L				
MRL_CHK	N-methyl Perfluorooctanesulfonamidoacetic acid		0.002	0.00226	ug/L	113	(50-150)		
MS_201905310387	N-methyl Perfluorooctanesulfonamidoacetic acid	ND	0.002	0.00209	ug/L	102	(50-150)		
MSD_201905310387	N-methyl Perfluorooctanesulfonamidoacetic acid	ND	0.002	0.00222	ug/L	108	(50-150)	50	6.0
LCS2	Perfluorobutanesulfonic acid		0.022	0.0233	ug/L	105	(70-130)	30	4.2
MBLK	Perfluorobutanesulfonic acid			<0.00059	ug/L				
MRL_CHK	Perfluorobutanesulfonic acid		0.0018	0.00201	ug/L	114	(50-150)		
MS_201905310387	Perfluorobutanesulfonic acid	ND	0.0018	0.00202	ug/L	114	(50-150)		

Spike recovery is already corrected for native results.
Spikes which exceed Limits and Method Blanks with positive results are highlighted by Underlining.
Criteria for MS and Dup are advisory only, batch control is based on LCS. Criteria for duplicates are advisory only, unless otherwise specified in the method.
RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
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Laboratory QC

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MSD_201905310387	Perfluorobutanesulfonic acid	ND	0.0018	0.00190	ug/L	107	(50-150)	50	6.3
LCS2	Perfluorodecanoic acid		0.025	0.0245	ug/L	98	(70-130)	30	6.3
MBLK	Perfluorodecanoic acid			<0.000667	ug/L				
MRL_CHK	Perfluorodecanoic acid		0.002	0.00236	ug/L	118	(50-150)		
MS_201905310387	Perfluorodecanoic acid	ND	0.002	0.00204	ug/L	100	(50-150)		
MSD_201905310387	Perfluorodecanoic acid	ND	0.002	0.00213	ug/L	105	(50-150)	50	4.4
LCS2	Perfluorododecanoic acid		0.025	0.0254	ug/L	102	(70-130)	30	4.6
MBLK	Perfluorododecanoic acid			<0.000667	ug/L				
MRL_CHK	Perfluorododecanoic acid		0.002	0.00223	ug/L	112	(50-150)		
MS_201905310387	Perfluorododecanoic acid	ND	0.002	0.00204	ug/L	102	(50-150)		
MSD_201905310387	Perfluorododecanoic acid	ND	0.002	0.00219	ug/L	109	(50-150)	50	7.3
LCS2	Perfluoroheptanoic acid		0.025	0.0178	ug/L	71	(70-130)	30	3.4
MBLK	Perfluoroheptanoic acid			<0.000667	ug/L				
MRL_CHK	Perfluoroheptanoic acid		0.002	0.00154	ug/L	77	(50-150)		
MS_201905310387	Perfluoroheptanoic acid	ND	0.002	0.00153	ug/L	75	(50-150)		
MSD_201905310387	Perfluoroheptanoic acid	ND	0.002	0.00164	ug/L	80	(50-150)	50	6.7
LCS2	Perfluorohexanesulfonic acid		0.023	0.0254	ug/L	112	(70-130)	30	0.39
MBLK	Perfluorohexanesulfonic acid			<0.000608	ug/L				
MRL_CHK	Perfluorohexanesulfonic acid		0.0018	0.00205	ug/L	112	(50-150)		
MS_201905310387	Perfluorohexanesulfonic acid	ND	0.0018	0.00182	ug/L	100	(50-150)		
MSD_201905310387	Perfluorohexanesulfonic acid	ND	0.0018	0.00199	ug/L	109	(50-150)	50	9.1
LCS2	Perfluorohexanoic acid		0.025	0.0252	ug/L	101	(70-130)	30	3.5
MBLK	Perfluorohexanoic acid			<0.000667	ug/L				
MRL_CHK	Perfluorohexanoic acid		0.002	0.00210	ug/L	105	(50-150)		
MS_201905310387	Perfluorohexanoic acid	ND	0.002	0.00194	ug/L	94	(50-150)		
MSD_201905310387	Perfluorohexanoic acid	ND	0.002	0.00206	ug/L	100	(50-150)	50	6.2
LCS2	Perfluorononanoic acid		0.025	0.0262	ug/L	105	(70-130)	30	8.8
MBLK	Perfluorononanoic acid			<0.000667	ug/L				
MRL_CHK	Perfluorononanoic acid		0.002	0.00253	ug/L	127	(50-150)		
MS_201905310387	Perfluorononanoic acid	ND	0.002	0.00259	ug/L	129	(50-150)		
MSD_201905310387	Perfluorononanoic acid	ND	0.002	0.00227	ug/L	113	(50-150)	50	13
LCS2	Perfluorooctanesulfonic acid		0.023	0.0246	ug/L	106	(70-130)	30	0.41
MBLK	Perfluorooctanesulfonic acid			<0.000617	ug/L				
MRL_CHK	Perfluorooctanesulfonic acid		0.0019	0.00182	ug/L	99	(50-150)		
MS_201905310387	Perfluorooctanesulfonic acid	ND	0.0019	0.00192	ug/L	104	(50-150)		
MSD_201905310387	Perfluorooctanesulfonic acid	ND	0.0019	0.00158	ug/L	85	(50-150)	50	20
LCS2	Perfluorooctanoic acid		0.025	0.0256	ug/L	103	(70-130)	30	0.39
MBLK	Perfluorooctanoic acid			<0.000667	ug/L				

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Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MRL_CHK	Perfluorooctanoic acid		0.002	0.00220	ug/L	110	(50-150)		
MS_201905310387	Perfluorooctanoic acid	ND	0.002	0.00228	ug/L	109	(50-150)		
MSD_201905310387	Perfluorooctanoic acid	ND	0.002	0.00214	ug/L	102	(50-150)	50	6.1
LCS2	Perfluorotetradecanoic acid		0.025	0.0238	ug/L	95	(70-130)	30	0.84
MBLK	Perfluorotetradecanoic acid			<0.000667	ug/L				
MRL_CHK	Perfluorotetradecanoic acid		0.002	0.00219	ug/L	109	(50-150)		
MS_201905310387	Perfluorotetradecanoic acid	ND	0.002	0.00202	ug/L	96	(50-150)		
MSD_201905310387	Perfluorotetradecanoic acid	ND	0.002	0.00216	ug/L	104	(50-150)	50	7.2
LCS2	Perfluorotridecanoic acid		0.025	0.0248	ug/L	99	(70-130)	30	4.5
MBLK	Perfluorotridecanoic acid			<0.000667	ug/L				
MRL_CHK	Perfluorotridecanoic acid		0.002	0.00268	ug/L	134	(50-150)		
MS_201905310387	Perfluorotridecanoic acid	ND	0.002	0.00241	ug/L	118	(50-150)		
MSD_201905310387	Perfluorotridecanoic acid	ND	0.002	0.00253	ug/L	124	(50-150)	50	4.9
LCS2	Perfluoroundecanoic acid		0.025	0.0228	ug/L	91	(70-130)	30	9.6
MBLK	Perfluoroundecanoic acid			<0.000667	ug/L				
MRL_CHK	Perfluoroundecanoic acid		0.002	0.00248	ug/L	124	(50-150)		
MS_201905310387	Perfluoroundecanoic acid	ND	0.002	0.00255	ug/L	122	(50-150)		
MSD_201905310387	Perfluoroundecanoic acid	ND	0.002	0.00143	ug/L	66	(50-150)	50	<u>**56**</u>

Perfluorinated Alkyl Acids EPA 537 rev 1.1 by EPA 537

Prep Batch: 1175640 Analytical Batch: 1177087 **Analysis Date: 06/08/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	13C-PFDA (S)		100	108	%	108	(70-130)		
LCS1	13C-PFHxA (S)		100	112	%	112	(70-130)		
LCS1	13C-PFOA (I)		100	105	%	105	(50-150)		
LCS1	13C-PFOS (I)		100	106	%	106	(50-150)		
LCS1	d3-NMeFOSAA (I)		100	104	%	104	(50-150)		
LCS1	d5-NEtFOSAA (S)		100	104	%	104	(70-130)		
LCS1	N-ethyl Perfluorooctanesulfonamidoacetic acid		0.025	0.0258	ug/L	103	(70-130)		
LCS1	N-methyl Perfluorooctanesulfonamidoacetic acid		0.025	0.0250	ug/L	100	(70-130)		
LCS1	Perfluorobutanesulfonic acid		0.022	0.0232	ug/L	105	(70-130)		
LCS1	Perfluorodecanoic acid		0.025	0.0274	ug/L	109	(70-130)		
LCS1	Perfluorododecanoic acid		0.025	0.0260	ug/L	104	(70-130)		
LCS1	Perfluoroheptanoic acid		0.025	0.0190	ug/L	76	(70-130)		
LCS1	Perfluorohexanesulfonic acid		0.023	0.0242	ug/L	106	(70-130)		
LCS1	Perfluorohexanoic acid		0.025	0.0284	ug/L	113	(70-130)		
LCS1	Perfluorononanoic acid		0.025	0.0277	ug/L	111	(70-130)		
LCS1	Perfluorooctanesulfonic acid		0.023	0.0243	ug/L	105	(70-130)		
LCS1	Perfluorooctanoic acid		0.025	0.0290	ug/L	116	(70-130)		
LCS1	Perfluorotetradecanoic acid		0.025	0.0277	ug/L	111	(70-130)		

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RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
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Laboratory QC

Report: 806101
Project: SPECIAL
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David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	Perfluorotridecanoic acid		0.025	0.0261	ug/L	104	(70-130)		
LCS1	Perfluoroundecanoic acid		0.025	0.0258	ug/L	103	(70-130)		

Semivolatiles by GCMS by EPA 525.2

Prep Batch: 1176017 Analytical Batch: 1177380 **Analysis Date: 06/12/2019**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS1	1,3-Dimethyl-2-nitrobenzene (S)		5	96.4	%	96	(70-130)		
LCS2	1,3-Dimethyl-2-nitrobenzene (S)		5	96.1	%	96	(70-130)		
MBLK	1,3-Dimethyl-2-nitrobenzene (S)			94.0	%	94	(70-130)		
MRL_CHK	1,3-Dimethyl-2-nitrobenzene (S)		5	95.6	%	96	(70-130)		
MS_201905240012	1,3-Dimethyl-2-nitrobenzene (S)		5	93.7	%	94	(70-130)		
MSD_201905240012	1,3-Dimethyl-2-nitrobenzene (S)		5	89.5	%	90	(70-130)		
LCS1	2,4-DDD		2	2.11	ug/L	106	(70-130)		
LCS2	2,4-DDD		2	2.11	ug/L	106	(70-130)	20	0.0
MBLK	2,4-DDD			<0.1	ug/L				
MRL_CHK	2,4-DDD		0.1	0.125	ug/L	125	(50-150)		
MS_201905240012	2,4-DDD		2	2.09	ug/L	105	(70-130)		
MSD_201905240012	2,4-DDD		2	2.24	ug/L	112	(70-130)	20	6.7
LCS1	2,4-DDE		2	2.00	ug/L	100	(70-130)		
LCS2	2,4-DDE		2	2.00	ug/L	100	(70-130)	20	0.0
MBLK	2,4-DDE			<0.1	ug/L				
MRL_CHK	2,4-DDE		0.1	0.106	ug/L	106	(50-150)		
MS_201905240012	2,4-DDE		2	1.97	ug/L	98	(70-130)		
MSD_201905240012	2,4-DDE		2	2.13	ug/L	107	(70-130)	20	8.0
LCS1	2,4-DDT		2	2.10	ug/L	105	(70-130)		
LCS2	2,4-DDT		2	2.14	ug/L	107	(70-130)	20	1.9
MBLK	2,4-DDT			<0.1	ug/L				
MRL_CHK	2,4-DDT		0.1	0.101	ug/L	101	(50-150)		
MS_201905240012	2,4-DDT		2	2.10	ug/L	105	(70-130)		
MSD_201905240012	2,4-DDT		2	2.29	ug/L	115	(70-130)	20	8.7
LCS1	2,4-Dinitrotoluene		2	2.41	ug/L	121	(70-130)		
LCS2	2,4-Dinitrotoluene		2	2.26	ug/L	113	(70-130)	20	6.4
MBLK	2,4-Dinitrotoluene			<0.1	ug/L				
MRL_CHK	2,4-Dinitrotoluene		0.1	0.100	ug/L	100	(50-150)		
MS_201905240012	2,4-Dinitrotoluene	ND	2	2.41	ug/L	120	(70-130)		
MSD_201905240012	2,4-Dinitrotoluene	ND	2	2.28	ug/L	114	(70-130)	20	5.4
LCS1	2,6-Dinitrotoluene		2	2.13	ug/L	106	(70-130)		
LCS2	2,6-Dinitrotoluene		2	1.99	ug/L	100	(70-130)	20	6.8
MBLK	2,6-Dinitrotoluene			<0.1	ug/L				

Spike recovery is already corrected for native results.
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RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
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Laboratory QC

Report: 806101
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David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MRL_CHK	2,6-Dinitrotoluene		0.1	0.116	ug/L	116	(50-150)		
MS_201905240012	2,6-Dinitrotoluene	ND	2	2.01	ug/L	100	(70-130)		
MSD_201905240012	2,6-Dinitrotoluene	ND	2	2.07	ug/L	104	(70-130)	20	3.0
LCS1	4,4-DDD		2	2.10	ug/L	105	(70-130)		
LCS2	4,4-DDD		2	2.11	ug/L	106	(70-130)	20	0.0
MBLK	4,4-DDD			<0.1	ug/L				
MRL_CHK	4,4-DDD		0.1	0.0910	ug/L	91	(50-150)		
MS_201905240012	4,4-DDD	ND	2	2.12	ug/L	106	(70-130)		
MSD_201905240012	4,4-DDD	ND	2	2.25	ug/L	112	(70-130)	20	6.2
LCS1	4,4-DDE		2	1.94	ug/L	97	(70-130)		
LCS2	4,4-DDE		2	2.00	ug/L	100	(70-130)	20	3.0
MBLK	4,4-DDE			<0.1	ug/L				
MRL_CHK	4,4-DDE		0.1	0.0990	ug/L	99	(50-150)		
MS_201905240012	4,4-DDE	ND	2	1.96	ug/L	98	(70-130)		
MSD_201905240012	4,4-DDE	ND	2	2.18	ug/L	109	(70-130)	20	11
LCS1	4,4-DDT		2	2.11	ug/L	106	(70-130)		
LCS2	4,4-DDT		2	2.10	ug/L	105	(70-130)	20	0.48
MBLK	4,4-DDT			<0.1	ug/L				
MRL_CHK	4,4-DDT		0.1	0.0960	ug/L	96	(50-150)		
MS_201905240012	4,4-DDT	ND	2	2.10	ug/L	105	(70-130)		
MSD_201905240012	4,4-DDT	ND	2	2.30	ug/L	115	(70-130)	20	9.0
LCS1	Acenaphthene		2	1.97	ug/L	99	(70-130)		
LCS2	Acenaphthene		2	2.00	ug/L	100	(70-130)	20	1.5
MBLK	Acenaphthene			<0.1	ug/L				
MRL_CHK	Acenaphthene		0.1	0.0860	ug/L	86	(50-150)		
MS_201905240012	Acenaphthene	ND	2	1.97	ug/L	99	(70-130)		
MSD_201905240012	Acenaphthene	ND	2	1.97	ug/L	99	(70-130)	20	0.051
LCS1	Acenaphthene-d10 (I)		5	97.5	%	98	(50-150)		
LCS2	Acenaphthene-d10 (I)		5	84.3	%	84	(50-150)		
MBLK	Acenaphthene-d10 (I)			87.5	%	88	(50-150)		
MRL_CHK	Acenaphthene-d10 (I)		5	84.5	%	85	(50-150)		
MS_201905240012	Acenaphthene-d10 (I)		5	78.6	%	79	(50-150)		
MSD_201905240012	Acenaphthene-d10 (I)		5	81.6	%	82	(50-150)		
LCS1	Acenaphthylene		2	1.74	ug/L	87	(70-130)		
LCS2	Acenaphthylene		2	1.74	ug/L	87	(70-130)	20	0.0
MBLK	Acenaphthylene			<0.1	ug/L				
MRL_CHK	Acenaphthylene		0.1	0.0700	ug/L	70	(50-150)		
MS_201905240012	Acenaphthylene	ND	2	1.81	ug/L	91	(70-130)		

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RPD not calculated for LCS2 when different a concentration than LCS1 is used.
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David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MSD_201905240012	Acenaphthylene	ND	2	1.66	ug/L	83	(70-130)	20	8.6
LCS1	Acetochlor		2	2.06	ug/L	103	(70-130)		
LCS2	Acetochlor		2	2.12	ug/L	106	(70-130)	20	2.9
MBLK	Acetochlor			<0.1	ug/L				
MRL_CHK	Acetochlor		0.05	0.0500	ug/L	100	(50-150)		
MS_201905240012	Acetochlor	ND	2	2.10	ug/L	105	(70-130)		
MSD_201905240012	Acetochlor	ND	2	2.24	ug/L	112	(70-130)	20	6.6
LCS1	Alachlor		2	2.02	ug/L	101	(70-130)		
LCS2	Alachlor		2	2.08	ug/L	104	(70-130)	20	2.9
MBLK	Alachlor			<0.05	ug/L				
MRL_CHK	Alachlor		0.05	0.0500	ug/L	100	(50-150)		
MS_201905240012	Alachlor	ND	2	2.02	ug/L	101	(70-130)		
MSD_201905240012	Alachlor	ND	2	2.16	ug/L	108	(70-130)	20	6.8
LCS1	Aldrin		2	1.46	ug/L	73	(70-130)		
LCS2	Aldrin		2	1.51	ug/L	76	(70-130)	20	3.4
MBLK	Aldrin			<0.05	ug/L				
MRL_CHK	Aldrin		0.05	0.0450	ug/L	90	(50-150)		
MS_201905240012	Aldrin	ND	2	1.49	ug/L	75	(70-130)		
MSD_201905240012	Aldrin	ND	2	1.60	ug/L	80	(70-130)	20	7.0
LCS1	Alpha-BHC		2	2.07	ug/L	103	(70-130)		
LCS2	Alpha-BHC		2	2.05	ug/L	102	(70-130)	20	0.97
MBLK	Alpha-BHC			<0.1	ug/L				
MRL_CHK	Alpha-BHC		0.1	0.101	ug/L	101	(50-150)		
MS_201905240012	Alpha-BHC	ND	2	2.04	ug/L	102	(70-130)		
MSD_201905240012	Alpha-BHC	ND	2	2.09	ug/L	104	(70-130)	20	2.4
LCS1	alpha-Chlordane		2	1.98	ug/L	99	(70-130)		
LCS2	alpha-Chlordane		2	2.07	ug/L	103	(70-130)	20	4.4
MBLK	alpha-Chlordane			<0.05	ug/L				
MRL_CHK	alpha-Chlordane		0.05	0.0540	ug/L	108	(50-150)		
MS_201905240012	alpha-Chlordane	ND	2	1.99	ug/L	100	(70-130)		
MSD_201905240012	alpha-Chlordane	ND	2	2.16	ug/L	108	(70-130)	20	8.0
LCS1	Anthracene		2	1.94	ug/L	97	(70-130)		
LCS2	Anthracene		2	1.93	ug/L	96	(70-130)	20	0.52
MBLK	Anthracene			<0.02	ug/L				
MRL_CHK	Anthracene		0.02	0.0220	ug/L	110	(50-150)		
MS_201905240012	Anthracene	ND	2	1.90	ug/L	95	(70-130)		
MSD_201905240012	Anthracene	ND	2	1.91	ug/L	96	(70-130)	20	0.58
LCS1	Atrazine		2	2.32	ug/L	116	(70-130)		

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Laboratory QC

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS2	Atrazine		2	2.30	ug/L	115	(70-130)	20	0.87
MBLK	Atrazine			<0.05	ug/L				
MRL_CHK	Atrazine		0.05	0.0510	ug/L	102	(50-150)		
MS_201905240012	Atrazine	ND	2	2.26	ug/L	113	(70-130)		
MSD_201905240012	Atrazine	ND	2	2.38	ug/L	119	(70-130)	20	5.3
LCS1	Benz(a)Anthracene		2	2.03	ug/L	102	(70-130)		
LCS2	Benz(a)Anthracene		2	1.97	ug/L	99	(70-130)	20	3.0
MBLK	Benz(a)Anthracene			<0.05	ug/L				
MRL_CHK	Benz(a)Anthracene		0.05	0.0540	ug/L	108	(50-150)		
MS_201905240012	Benz(a)Anthracene	ND	2	2.03	ug/L	102	(70-130)		
MSD_201905240012	Benz(a)Anthracene	ND	2	2.04	ug/L	102	(70-130)	20	0.39
LCS1	Benzo(a)pyrene		2	1.94	ug/L	97	(70-130)		
LCS2	Benzo(a)pyrene		2	1.86	ug/L	93	(70-130)	20	4.2
MBLK	Benzo(a)pyrene			<0.02	ug/L				
MRL_CHK	Benzo(a)pyrene		0.02	0.0180	ug/L	90	(50-150)		
MS_201905240012	Benzo(a)pyrene	ND	2	1.94	ug/L	97	(70-130)		
MSD_201905240012	Benzo(a)pyrene	ND	2	1.84	ug/L	92	(70-130)	20	5.1
LCS1	Benzo(b)Fluoranthene		2	2.08	ug/L	104	(70-130)		
LCS2	Benzo(b)Fluoranthene		2	1.98	ug/L	99	(70-130)	20	4.9
MBLK	Benzo(b)Fluoranthene			<0.02	ug/L				
MRL_CHK	Benzo(b)Fluoranthene		0.02	0.0220	ug/L	110	(50-150)		
MS_201905240012	Benzo(b)Fluoranthene	ND	2	2.02	ug/L	101	(70-130)		
MSD_201905240012	Benzo(b)Fluoranthene	ND	2	2.02	ug/L	101	(70-130)	20	0.099
LCS1	Benzo(g,h,i)Perylene		2	2.17	ug/L	109	(70-130)		
LCS2	Benzo(g,h,i)Perylene		2	2.09	ug/L	105	(70-130)	20	3.8
MBLK	Benzo(g,h,i)Perylene			<0.05	ug/L				
MRL_CHK	Benzo(g,h,i)Perylene		0.05	0.0400	ug/L	80	(50-150)		
MS_201905240012	Benzo(g,h,i)Perylene	ND	2	2.09	ug/L	105	(70-130)		
MSD_201905240012	Benzo(g,h,i)Perylene	ND	2	2.09	ug/L	105	(70-130)	20	0.0
LCS1	Benzo(k)Fluoranthene		2	2.11	ug/L	105	(70-130)		
LCS2	Benzo(k)Fluoranthene		2	2.10	ug/L	105	(70-130)	20	0.48
MBLK	Benzo(k)Fluoranthene			<0.02	ug/L				
MRL_CHK	Benzo(k)Fluoranthene		0.02	0.0190	ug/L	95	(50-150)		
MS_201905240012	Benzo(k)Fluoranthene	ND	2	2.12	ug/L	106	(70-130)		
MSD_201905240012	Benzo(k)Fluoranthene	ND	2	2.06	ug/L	103	(70-130)	20	2.6
LCS1	Beta-BHC		2	2.27	ug/L	114	(70-130)		
LCS2	Beta-BHC		2	2.21	ug/L	111	(70-130)	20	2.7
MBLK	Beta-BHC			<0.1	ug/L				

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David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MRL_CHK	Beta-BHC		0.1	0.114	ug/L	114	(50-150)		
MS_201905240012	Beta-BHC	ND	2	2.34	ug/L	117	(70-130)		
MSD_201905240012	Beta-BHC	ND	2	2.34	ug/L	117	(70-130)	20	0.60
LCS1	Bromacil		2	2.31	ug/L	116	(70-130)		
LCS2	Bromacil		2	2.29	ug/L	115	(70-130)	20	0.87
MBLK	Bromacil			<0.2	ug/L				
MRL_CHK	Bromacil		0.1	0.117	ug/L	117	(50-150)		
MS_201905240012	Bromacil	ND	2	2.42	ug/L	121	(70-130)		
MSD_201905240012	Bromacil	ND	2	2.33	ug/L	117	(70-130)	20	3.7
LCS1	Butachlor		2	2.24	ug/L	112	(70-130)		
LCS2	Butachlor		2	2.22	ug/L	111	(70-130)	20	0.90
MBLK	Butachlor			<0.05	ug/L				
MRL_CHK	Butachlor		0.05	0.0550	ug/L	110	(50-150)		
MS_201905240012	Butachlor	ND	2	2.24	ug/L	112	(70-130)		
MSD_201905240012	Butachlor	ND	2	2.41	ug/L	120	(70-130)	20	7.4
LCS1	Butylbenzylphthalate		2	2.24	ug/L	112	(70-130)		
LCS2	Butylbenzylphthalate		2	2.16	ug/L	108	(70-130)	20	3.6
MBLK	Butylbenzylphthalate			<0.5	ug/L				
MRL_CHK	Butylbenzylphthalate		0.15	0.157	ug/L	105	(50-150)		
MS_201905240012	Butylbenzylphthalate	ND	2	2.22	ug/L	111	(70-130)		
MSD_201905240012	Butylbenzylphthalate	ND	2	2.31	ug/L	115	(70-130)	20	3.8
LCS1	Caffeine by method 525mod		2	1.76	ug/L	88	(45-137)		
LCS2	Caffeine by method 525mod		2	1.79	ug/L	90	(45-137)	20	1.7
MBLK	Caffeine by method 525mod			<0.05	ug/L				
MRL_CHK	Caffeine by method 525mod		0.05	0.0490	ug/L	98	(50-150)		
MS_201905240012	Caffeine by method 525mod		2	1.84	ug/L	92	(46-144)		
MSD_201905240012	Caffeine by method 525mod		2	1.80	ug/L	90	(46-144)	20	2.3
LCS1	Chlorobenzilate		2	2.35	ug/L	117	(70-130)		
LCS2	Chlorobenzilate		2	2.31	ug/L	116	(70-130)	20	1.7
MBLK	Chlorobenzilate			<0.1	ug/L				
MRL_CHK	Chlorobenzilate		0.1	0.106	ug/L	106	(50-150)		
MS_201905240012	Chlorobenzilate	ND	2	2.30	ug/L	115	(70-130)		
MSD_201905240012	Chlorobenzilate	ND	2	2.44	ug/L	122	(70-130)	20	6.1
LCS1	Chloroneb		2	2.12	ug/L	106	(70-130)		
LCS2	Chloroneb		2	2.13	ug/L	107	(70-130)	20	0.47
MBLK	Chloroneb			<0.1	ug/L				
MRL_CHK	Chloroneb		0.1	0.107	ug/L	107	(50-150)		
MS_201905240012	Chloroneb	ND	2	2.07	ug/L	104	(70-130)		

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Laboratory QC

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Group: desal pilot

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QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MSD_201905240012	Chloroneb	ND	2	2.13	ug/L	107	(70-130)	20	2.7
LCS1	Chlorothalonil(Draconil,Bravo)		2	2.14	ug/L	107	(70-130)		
LCS2	Chlorothalonil(Draconil,Bravo)		2	2.14	ug/L	107	(70-130)	20	0.0
MBLK	Chlorothalonil(Draconil,Bravo)			<0.1	ug/L				
MRL_CHK	Chlorothalonil(Draconil,Bravo)		0.05	0.0500	ug/L	100	(50-150)		
MS_201905240012	Chlorothalonil(Draconil,Bravo)	ND	2	2.16	ug/L	108	(70-130)		
MSD_201905240012	Chlorothalonil(Draconil,Bravo)	ND	2	2.24	ug/L	112	(70-130)	20	4.2
LCS1	Chlorpyrifos (Dursban)		2	2.04	ug/L	102	(70-130)		
LCS2	Chlorpyrifos (Dursban)		2	1.98	ug/L	99	(70-130)	20	3.0
MBLK	Chlorpyrifos (Dursban)			<0.05	ug/L				
MRL_CHK	Chlorpyrifos (Dursban)		0.05	0.0580	ug/L	116	(50-150)		
MS_201905240012	Chlorpyrifos (Dursban)	ND	2	2.06	ug/L	103	(70-130)		
MSD_201905240012	Chlorpyrifos (Dursban)	ND	2	2.12	ug/L	106	(70-130)	20	3.1
LCS1	Chrysene		2	1.98	ug/L	99	(70-130)		
LCS2	Chrysene		2	1.94	ug/L	97	(70-130)	20	2.0
MBLK	Chrysene			<0.02	ug/L				
MRL_CHK	Chrysene		0.02	0.0190	ug/L	95	(50-150)		
MS_201905240012	Chrysene	ND	2	1.99	ug/L	100	(70-130)		
MSD_201905240012	Chrysene	ND	2	1.95	ug/L	98	(70-130)	20	2.1
LCS1	Chrysene-d12 (I)		5	110	%	110	(50-150)		
LCS2	Chrysene-d12 (I)		5	95.1	%	95	(50-150)		
MBLK	Chrysene-d12 (I)			98.3	%	98	(50-150)		
MRL_CHK	Chrysene-d12 (I)		5	94.4	%	94	(50-150)		
MS_201905240012	Chrysene-d12 (I)		5	90.7	%	91	(50-150)		
MSD_201905240012	Chrysene-d12 (I)		5	95.1	%	95	(50-150)		
LCS1	Delta-BHC		2	2.04	ug/L	102	(70-130)		
LCS2	Delta-BHC		2	2.06	ug/L	103	(70-130)	20	0.98
MBLK	Delta-BHC			<0.1	ug/L				
MRL_CHK	Delta-BHC		0.1	0.106	ug/L	106	(50-150)		
MS_201905240012	Delta-BHC	ND	2	2.04	ug/L	102	(70-130)		
MSD_201905240012	Delta-BHC	ND	2	2.12	ug/L	106	(70-130)	20	4.1
LCS1	Di-(2-Ethylhexyl)adipate		2	2.30	ug/L	115	(70-130)		
LCS2	Di-(2-Ethylhexyl)adipate		2	2.31	ug/L	116	(70-130)	20	0.43
MBLK	Di-(2-Ethylhexyl)adipate			<0.6	ug/L				
MRL_CHK	Di-(2-Ethylhexyl)adipate		0.3	0.325	ug/L	108	(50-150)		
MS_201905240012	Di-(2-Ethylhexyl)adipate	ND	2	2.30	ug/L	115	(70-130)		
MSD_201905240012	Di-(2-Ethylhexyl)adipate	ND	2	2.45	ug/L	122	(70-130)	20	6.5
LCS1	Di(2-Ethylhexyl)phthalate		2	1.84	ug/L	92	(70-130)		

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QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS2	Di(2-Ethylhexyl)phthalate		2	1.89	ug/L	95	(70-130)	20	2.7
MBLK	Di(2-Ethylhexyl)phthalate			<0.6	ug/L				
MRL_CHK	Di(2-Ethylhexyl)phthalate		0.6	0.604	ug/L	101	(50-150)		
MS_201905240012	Di(2-Ethylhexyl)phthalate	ND	2	1.90	ug/L	95	(70-130)		
MSD_201905240012	Di(2-Ethylhexyl)phthalate	ND	2	1.96	ug/L	98	(70-130)	20	2.9
LCS1	Diazinon (Qualitative)		2	1.84	ug/L	92	(15-132)		
LCS2	Diazinon (Qualitative)		2	1.85	ug/L	92	(15-132)	20	0.0
MBLK	Diazinon (Qualitative)			<0.10	ug/L				
MRL_CHK	Diazinon (Qualitative)		0.1	0.0990	ug/L	99	(15-132)		
MS_201905240012	Diazinon (Qualitative)	ND	2	2.03	ug/L	101	(15-132)		
MSD_201905240012	Diazinon (Qualitative)	ND	2	2.08	ug/L	104	(15-132)	20	2.5
LCS1	Dibenz(a,h)Anthracene		2	2.24	ug/L	112	(70-130)		
LCS2	Dibenz(a,h)Anthracene		2	2.20	ug/L	110	(70-130)	20	1.8
MBLK	Dibenz(a,h)Anthracene			<0.05	ug/L				
MRL_CHK	Dibenz(a,h)Anthracene		0.05	0.0440	ug/L	88	(50-150)		
MS_201905240012	Dibenz(a,h)Anthracene	ND	2	2.27	ug/L	114	(70-130)		
MSD_201905240012	Dibenz(a,h)Anthracene	ND	2	2.27	ug/L	113	(70-130)	20	0.044
LCS1	Dichlorvos (DDVP)		2	2.07	ug/L	104	(70-130)		
LCS2	Dichlorvos (DDVP)		2	1.99	ug/L	100	(70-130)	20	3.9
MBLK	Dichlorvos (DDVP)			<0.05	ug/L				
MRL_CHK	Dichlorvos (DDVP)		0.05	0.0500	ug/L	100	(50-150)		
MS_201905240012	Dichlorvos (DDVP)	ND	2	2.03	ug/L	101	(70-130)		
MSD_201905240012	Dichlorvos (DDVP)	ND	2	2.02	ug/L	101	(70-130)	20	0.40
LCS1	Dieldrin		2	1.92	ug/L	96	(70-130)		
LCS2	Dieldrin		2	1.91	ug/L	96	(70-130)	20	0.52
MBLK	Dieldrin			<0.2	ug/L				
MRL_CHK	Dieldrin		0.1	0.111	ug/L	111	(50-150)		
MS_201905240012	Dieldrin	ND	2	2.00	ug/L	100	(70-130)		
MSD_201905240012	Dieldrin	ND	2	2.08	ug/L	104	(70-130)	20	3.9
LCS1	Diethylphthalate		2	2.22	ug/L	111	(70-130)		
LCS2	Diethylphthalate		2	2.21	ug/L	111	(70-130)	20	0.45
MBLK	Diethylphthalate			<0.5	ug/L				
MRL_CHK	Diethylphthalate		0.15	0.171	ug/L	114	(50-150)		
MS_201905240012	Diethylphthalate	ND	2	2.17	ug/L	108	(70-130)		
MSD_201905240012	Diethylphthalate	ND	2	2.21	ug/L	111	(70-130)	20	1.9
LCS1	Dimethoate		2	1.72	ug/L	86	(35-100)		
LCS2	Dimethoate		2	1.77	ug/L	89	(35-100)	20	2.3
MBLK	Dimethoate			<0.1	ug/L				

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QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MRL_CHK	Dimethoate		0.1	0.0900	ug/L	90	(35-100)		
MS_201905240012	Dimethoate	ND	2	1.84	ug/L	92	(34-111)		
MSD_201905240012	Dimethoate	ND	2	1.80	ug/L	90	(34-111)	20	1.6
LCS1	Dimethylphthalate		2	2.16	ug/L	108	(70-130)		
LCS2	Dimethylphthalate		2	2.14	ug/L	107	(70-130)	20	0.93
MBLK	Dimethylphthalate			<0.5	ug/L				
MRL_CHK	Dimethylphthalate		0.3	0.293	ug/L	98	(50-150)		
MS_201905240012	Dimethylphthalate	ND	2	2.18	ug/L	109	(70-130)		
MSD_201905240012	Dimethylphthalate	ND	2	2.12	ug/L	106	(70-130)	20	3.0
LCS1	Di-n-Butylphthalate		4	4.32	ug/L	108	(70-130)		
LCS2	Di-n-Butylphthalate		4	4.35	ug/L	109	(70-130)	20	0.69
MBLK	Di-n-Butylphthalate			<1	ug/L				
MRL_CHK	Di-n-Butylphthalate		0.3	0.323	ug/L	108	(50-150)		
MS_201905240012	Di-n-Butylphthalate	ND	4	4.33	ug/L	108	(70-130)		
MSD_201905240012	Di-n-Butylphthalate	ND	4	4.59	ug/L	115	(70-130)	20	5.8
LCS1	Di-N-octylphthalate		2	2.08	ug/L	104	(70-130)		
LCS2	Di-N-octylphthalate		2	2.07	ug/L	103	(70-130)	20	0.48
MBLK	Di-N-octylphthalate			<0.1	ug/L				
MRL_CHK	Di-N-octylphthalate		0.1	0.0900	ug/L	90	(50-150)		
MS_201905240012	Di-N-octylphthalate	ND	2	2.25	ug/L	112	(70-130)		
MSD_201905240012	Di-N-octylphthalate	ND	2	2.28	ug/L	114	(70-130)	20	1.5
LCS1	Endosulfan I (Alpha)		2	1.99	ug/L	100	(70-130)		
LCS2	Endosulfan I (Alpha)		2	2.18	ug/L	109	(70-130)	20	9.6
MBLK	Endosulfan I (Alpha)			<0.1	ug/L				
MRL_CHK	Endosulfan I (Alpha)		0.1	0.0870	ug/L	87	(50-150)		
MS_201905240012	Endosulfan I (Alpha)	ND	2	2.03	ug/L	102	(70-130)		
MSD_201905240012	Endosulfan I (Alpha)	ND	2	2.20	ug/L	110	(70-130)	20	7.9
LCS1	Endosulfan II (Beta)		2	1.97	ug/L	99	(70-130)		
LCS2	Endosulfan II (Beta)		2	2.06	ug/L	103	(70-130)	20	4.5
MBLK	Endosulfan II (Beta)			<0.1	ug/L				
MRL_CHK	Endosulfan II (Beta)		0.1	0.113	ug/L	113	(50-150)		
MS_201905240012	Endosulfan II (Beta)	ND	2	2.08	ug/L	104	(70-130)		
MSD_201905240012	Endosulfan II (Beta)	ND	2	2.07	ug/L	103	(70-130)	20	0.43
LCS1	Endosulfan Sulfate		2	2.20	ug/L	110	(70-130)		
LCS2	Endosulfan Sulfate		2	2.17	ug/L	109	(70-130)	20	1.4
MBLK	Endosulfan Sulfate			<0.1	ug/L				
MRL_CHK	Endosulfan Sulfate		0.1	0.110	ug/L	110	(50-150)		
MS_201905240012	Endosulfan Sulfate	ND	2	2.30	ug/L	115	(70-130)		

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Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MSD_201905240012	Endosulfan Sulfate	ND	2	2.25	ug/L	112	(70-130)	20	2.4
LCS1	Endrin		2	1.97	ug/L	99	(70-130)		
LCS2	Endrin		2	2.03	ug/L	101	(70-130)	20	3.0
MBLK	Endrin			<0.1	ug/L				
MRL_CHK	Endrin		0.1	0.138	ug/L	138	(50-150)		
MS_201905240012	Endrin	ND	2	2.00	ug/L	100	(70-130)		
MSD_201905240012	Endrin	ND	2	2.12	ug/L	106	(70-130)	20	5.8
LCS1	Endrin Aldehyde		2	1.88	ug/L	94	(70-130)		
LCS2	Endrin Aldehyde		2	1.88	ug/L	94	(70-130)	20	0.0
MBLK	Endrin Aldehyde			<0.1	ug/L				
MRL_CHK	Endrin Aldehyde		0.1	0.0730	ug/L	73	(50-150)		
MS_201905240012	Endrin Aldehyde	ND	2	1.82	ug/L	91	(70-130)		
MSD_201905240012	Endrin Aldehyde	ND	2	1.96	ug/L	98	(70-130)	20	8.2
LCS1	EPTC		2	1.82	ug/L	91	(70-130)		
LCS2	EPTC		2	1.79	ug/L	90	(70-130)	20	1.7
MBLK	EPTC			<0.1	ug/L				
MRL_CHK	EPTC		0.1	0.0860	ug/L	86	(50-150)		
MS_201905240012	EPTC	ND	2	1.79	ug/L	90	(70-130)		
MSD_201905240012	EPTC	ND	2	1.71	ug/L	86	(70-130)	20	4.5
LCS1	Fluoranthene		2	2.09	ug/L	105	(70-130)		
LCS2	Fluoranthene		2	2.08	ug/L	104	(70-130)	20	0.48
MBLK	Fluoranthene			<0.1	ug/L				
MRL_CHK	Fluoranthene		0.05	0.0510	ug/L	102	(50-150)		
MS_201905240012	Fluoranthene	ND	2	2.09	ug/L	105	(70-130)		
MSD_201905240012	Fluoranthene	ND	2	2.16	ug/L	108	(70-130)	20	3.3
LCS1	Fluorene		2	2.15	ug/L	108	(70-130)		
LCS2	Fluorene		2	2.12	ug/L	106	(70-130)	20	0.94
MBLK	Fluorene			<0.05	ug/L				
MRL_CHK	Fluorene		0.05	0.0510	ug/L	102	(50-150)		
MS_201905240012	Fluorene	ND	2	2.16	ug/L	108	(70-130)		
MSD_201905240012	Fluorene	ND	2	2.14	ug/L	107	(70-130)	20	0.70
LCS1	gamma-Chlordane		2	1.95	ug/L	98	(70-130)		
LCS2	gamma-Chlordane		2	1.96	ug/L	98	(70-130)	20	0.51
MBLK	gamma-Chlordane			<0.05	ug/L				
MRL_CHK	gamma-Chlordane		0.05	0.0490	ug/L	98	(50-150)		
MS_201905240012	gamma-Chlordane	ND	2	1.98	ug/L	99	(70-130)		
MSD_201905240012	gamma-Chlordane	ND	2	2.08	ug/L	104	(70-130)	20	5.1
LCS1	Heptachlor		2	1.97	ug/L	99	(70-130)		

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QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS2	Heptachlor		2	2.03	ug/L	102	(70-130)	20	3.0
MBLK	Heptachlor			<0.04	ug/L				
MRL_CHK	Heptachlor		0.04	0.0370	ug/L	93	(50-150)		
MS_201905240012	Heptachlor	ND	2	1.93	ug/L	96	(70-130)		
MSD_201905240012	Heptachlor	ND	2	2.10	ug/L	105	(70-130)	20	8.6
LCS1	Heptachlor Epoxide (isomer B)		2	2.03	ug/L	101	(70-130)		
LCS2	Heptachlor Epoxide (isomer B)		2	2.04	ug/L	102	(70-130)	20	0.49
MBLK	Heptachlor Epoxide (isomer B)			<0.05	ug/L				
MRL_CHK	Heptachlor Epoxide (isomer B)		0.05	0.0490	ug/L	98	(50-150)		
MS_201905240012	Heptachlor Epoxide (isomer B)	ND	2	2.06	ug/L	103	(70-130)		
MSD_201905240012	Heptachlor Epoxide (isomer B)	ND	2	2.10	ug/L	105	(70-130)	20	2.1
LCS1	Hexachlorobenzene		2	2.04	ug/L	102	(70-130)		
LCS2	Hexachlorobenzene		2	2.05	ug/L	102	(70-130)	20	0.49
MBLK	Hexachlorobenzene			<0.05	ug/L				
MRL_CHK	Hexachlorobenzene		0.05	0.0520	ug/L	104	(50-150)		
MS_201905240012	Hexachlorobenzene	ND	2	2.01	ug/L	101	(70-130)		
MSD_201905240012	Hexachlorobenzene	ND	2	2.08	ug/L	104	(70-130)	20	3.4
LCS1	Hexachlorocyclopentadiene		2	2.02	ug/L	101	(70-130)		
LCS2	Hexachlorocyclopentadiene		2	2.00	ug/L	100	(70-130)	20	1
MBLK	Hexachlorocyclopentadiene			<0.05	ug/L				
MRL_CHK	Hexachlorocyclopentadiene		0.05	0.0440	ug/L	88	(50-150)		
MS_201905240012	Hexachlorocyclopentadiene	ND	2	1.97	ug/L	99	(70-130)		
MSD_201905240012	Hexachlorocyclopentadiene	ND	2	1.86	ug/L	93	(70-130)	20	5.7
LCS1	Indeno(1,2,3,c,d)Pyrene		2	2.17	ug/L	109	(70-130)		
LCS2	Indeno(1,2,3,c,d)Pyrene		2	2.16	ug/L	108	(70-130)	20	0.46
MBLK	Indeno(1,2,3,c,d)Pyrene			<0.05	ug/L				
MRL_CHK	Indeno(1,2,3,c,d)Pyrene		0.05	0.0430	ug/L	86	(50-150)		
MS_201905240012	Indeno(1,2,3,c,d)Pyrene	ND	2	2.27	ug/L	114	(70-130)		
MSD_201905240012	Indeno(1,2,3,c,d)Pyrene	ND	2	2.16	ug/L	108	(70-130)	20	5.0
LCS1	Isophorone		2	1.92	ug/L	96	(70-130)		
LCS2	Isophorone		2	1.84	ug/L	92	(70-130)	20	4.3
MBLK	Isophorone			<0.5	ug/L				
MRL_CHK	Isophorone		0.1	0.0820	ug/L	82	(50-150)		
MS_201905240012	Isophorone	ND	2	1.89	ug/L	94	(70-130)		
MSD_201905240012	Isophorone	ND	2	1.81	ug/L	90	(70-130)	20	4.2
LCS1	Lindane		2	2.17	ug/L	108	(70-130)		
LCS2	Lindane		2	2.18	ug/L	109	(70-130)	20	0.46
MBLK	Lindane			<0.04	ug/L				

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David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MRL_CHK	Lindane		0.04	0.0530	ug/L	133	(50-150)		
MS_201905240012	Lindane	ND	2	2.10	ug/L	105	(70-130)		
MSD_201905240012	Lindane	ND	2	2.22	ug/L	111	(70-130)	20	5.4
LCS1	Malathion		2	2.31	ug/L	115	(70-130)		
LCS2	Malathion		2	2.29	ug/L	114	(70-130)	20	0.87
MBLK	Malathion			<0.1	ug/L				
MRL_CHK	Malathion		0.1	0.119	ug/L	119	(50-150)		
MS_201905240012	Malathion	ND	2	2.33	ug/L	116	(70-130)		
MSD_201905240012	Malathion	ND	2	2.44	ug/L	122	(70-130)	20	4.8
LCS1	Methoxychlor		2	2.36	ug/L	118	(70-130)		
LCS2	Methoxychlor		2	2.31	ug/L	116	(70-130)	20	2.1
MBLK	Methoxychlor			<0.1	ug/L				
MRL_CHK	Methoxychlor		0.1	0.0980	ug/L	98	(50-150)		
MS_201905240012	Methoxychlor	ND	2	2.28	ug/L	114	(70-130)		
MSD_201905240012	Methoxychlor	ND	2	2.37	ug/L	118	(70-130)	20	4.1
LCS1	Metolachlor		2	2.14	ug/L	107	(70-130)		
LCS2	Metolachlor		2	2.17	ug/L	109	(70-130)	20	1.4
MBLK	Metolachlor			<0.05	ug/L				
MRL_CHK	Metolachlor		0.05	0.0480	ug/L	96	(50-150)		
MS_201905240012	Metolachlor	ND	2	2.14	ug/L	107	(70-130)		
MSD_201905240012	Metolachlor	ND	2	2.28	ug/L	114	(70-130)	20	6.2
LCS1	Metribuzin		2	2.01	ug/L	100	(70-130)		
LCS2	Metribuzin		2	1.94	ug/L	97	(70-130)	20	3.5
MBLK	Metribuzin			<0.05	ug/L				
MRL_CHK	Metribuzin		0.05	0.0450	ug/L	90	(50-150)		
MS_201905240012	Metribuzin	ND	2	1.95	ug/L	98	(70-130)		
MSD_201905240012	Metribuzin	ND	2	1.92	ug/L	96	(70-130)	20	1.5
LCS1	Molinate		2	1.96	ug/L	98	(70-130)		
LCS2	Molinate		2	1.84	ug/L	92	(70-130)	20	6.3
MBLK	Molinate			<0.1	ug/L				
MRL_CHK	Molinate		0.1	0.0910	ug/L	91	(50-150)		
MS_201905240012	Molinate	ND	2	1.98	ug/L	99	(70-130)		
MSD_201905240012	Molinate	ND	2	1.83	ug/L	92	(70-130)	20	8.1
LCS1	Naphthalene		2	1.94	ug/L	97	(70-130)		
LCS2	Naphthalene		2	1.90	ug/L	95	(70-130)	20	2.1
MBLK	Naphthalene			<0.3	ug/L				
MRL_CHK	Naphthalene		0.1	0.0980	ug/L	98	(50-150)		
MS_201905240012	Naphthalene	ND	2	1.90	ug/L	95	(70-130)		

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QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MSD_201905240012	Naphthalene	ND	2	1.79	ug/L	90	(70-130)	20	6.1
LCS1	Parathion		2	2.52	ug/L	126	(70-130)		
LCS2	Parathion		2	2.39	ug/L	119	(70-130)	20	5.3
MBLK	Parathion			<0.1	ug/L				
MRL_CHK	Parathion		0.1	0.0940	ug/L	94	(50-150)		
MS_201905240012	Parathion	ND	2	2.39	ug/L	119	(70-130)		
MSD_201905240012	Parathion	ND	2	2.48	ug/L	124	(70-130)	20	3.8
LCS1	Pendimethalin		2	2.48	ug/L	124	(70-130)		
LCS2	Pendimethalin		2	2.51	ug/L	126	(70-130)	20	1.2
MBLK	Pendimethalin			<0.1	ug/L				
MRL_CHK	Pendimethalin		0.1	0.0940	ug/L	94	(50-150)		
MS_201905240012	Pendimethalin	ND	2	2.40	ug/L	120	(70-130)		
MSD_201905240012	Pendimethalin	ND	2	2.56	ug/L	128	(70-130)	20	6.2
LCS1	Permethrin (mixed isomers)		4	4.38	ug/L	110	(70-130)		
LCS2	Permethrin (mixed isomers)		4	4.27	ug/L	107	(70-130)	20	2.5
MBLK	Permethrin (mixed isomers)			<0.2	ug/L				
MRL_CHK	Permethrin (mixed isomers)		0.2	0.184	ug/L	92	(50-150)		
MS_201905240012	Permethrin (mixed isomers)	ND	4	4.37	ug/L	109	(70-130)		
MSD_201905240012	Permethrin (mixed isomers)	ND	4	4.51	ug/L	113	(70-130)	20	3.1
LCS1	Perylene-d12 (S)		5	98.2	%	98	(70-130)		
LCS2	Perylene-d12 (S)		5	97.5	%	97	(70-130)		
MBLK	Perylene-d12 (S)			82.0	%	82	(70-130)		
MRL_CHK	Perylene-d12 (S)		5	82.6	%	83	(70-130)		
MS_201905240012	Perylene-d12 (S)		5	100	%	100	(70-130)		
MSD_201905240012	Perylene-d12 (S)		5	96.4	%	96	(70-130)		
LCS1	Phenanthrene		2	1.99	ug/L	100	(70-130)		
LCS2	Phenanthrene		2	1.99	ug/L	100	(70-130)	20	0.0
MBLK	Phenanthrene			<0.04	ug/L				
MRL_CHK	Phenanthrene		0.02	0.0220	ug/L	110	(50-150)		
MS_201905240012	Phenanthrene	ND	2	2.00	ug/L	100	(70-130)		
MSD_201905240012	Phenanthrene	ND	2	2.01	ug/L	101	(70-130)	20	0.65
LCS1	Phenanthrene-d10 (I)		5	107	%	107	(50-150)		
LCS2	Phenanthrene-d10 (I)		5	92.4	%	92	(50-150)		
MBLK	Phenanthrene-d10 (I)			94.7	%	95	(50-150)		
MRL_CHK	Phenanthrene-d10 (I)		5	92.7	%	93	(50-150)		
MS_201905240012	Phenanthrene-d10 (I)		5	86.1	%	86	(50-150)		
MSD_201905240012	Phenanthrene-d10 (I)		5	89.1	%	89	(50-150)		
LCS1	Propachlor		2	2.12	ug/L	106	(70-130)		

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QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS2	Propachlor		2	2.08	ug/L	104	(70-130)	20	1.9
MBLK	Propachlor			<0.05	ug/L				
MRL_CHK	Propachlor		0.05	0.0660	ug/L	132	(50-150)		
MS_201905240012	Propachlor	ND	2	2.06	ug/L	103	(70-130)		
MSD_201905240012	Propachlor	ND	2	2.22	ug/L	111	(70-130)	20	8.1
LCS1	Pyrene		2	2.12	ug/L	106	(70-130)		
LCS2	Pyrene		2	2.11	ug/L	105	(70-130)	20	0.47
MBLK	Pyrene			<0.05	ug/L				
MRL_CHK	Pyrene		0.05	0.0480	ug/L	96	(50-150)		
MS_201905240012	Pyrene	ND	2	2.10	ug/L	105	(70-130)		
MSD_201905240012	Pyrene	ND	2	2.22	ug/L	111	(70-130)	20	5.3
LCS1	Simazine		2	2.25	ug/L	113	(70-130)		
LCS2	Simazine		2	2.20	ug/L	110	(70-130)	20	2.3
MBLK	Simazine			<0.05	ug/L				
MRL_CHK	Simazine		0.05	0.0620	ug/L	124	(50-150)		
MS_201905240012	Simazine	ND	2	2.19	ug/L	110	(70-130)		
MSD_201905240012	Simazine	ND	2	2.18	ug/L	109	(70-130)	20	0.60
LCS1	Terbacil		2	2.33	ug/L	116	(70-130)		
LCS2	Terbacil		2	2.24	ug/L	112	(70-130)	20	3.9
MBLK	Terbacil			<0.1	ug/L				
MRL_CHK	Terbacil		0.1	0.143	ug/L	143	(50-150)		
MS_201905240012	Terbacil	ND	2	2.27	ug/L	114	(70-130)		
MSD_201905240012	Terbacil	ND	2	2.26	ug/L	113	(70-130)	20	0.57
LCS1	Terbuthylazine		2	2.39	ug/L	119	(70-130)		
LCS2	Terbuthylazine		2	2.38	ug/L	119	(70-130)	20	0.42
MBLK	Terbuthylazine			<0.1	ug/L				
MRL_CHK	Terbuthylazine		0.1	0.100	ug/L	100	(50-150)		
MS_201905240012	Terbuthylazine	ND	2	2.30	ug/L	115	(70-130)		
MSD_201905240012	Terbuthylazine	ND	2	2.45	ug/L	122	(70-130)	20	6.1
LCS1	Thiobencarb		2	2.15	ug/L	107	(70-130)		
LCS2	Thiobencarb		2	2.14	ug/L	107	(70-130)	20	0.0
MBLK	Thiobencarb			<0.2	ug/L				
MRL_CHK	Thiobencarb		0.1	0.100	ug/L	100	(50-150)		
MS_201905240012	Thiobencarb	ND	2	2.09	ug/L	104	(70-130)		
MSD_201905240012	Thiobencarb	ND	2	2.17	ug/L	109	(70-130)	20	3.8
LCS1	trans-Nonachlor		2	1.99	ug/L	100	(70-130)		
LCS2	trans-Nonachlor		2	1.99	ug/L	100	(70-130)	20	0.0
MBLK	trans-Nonachlor			<0.05	ug/L				

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QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MRL_CHK	trans-Nonachlor		0.05	0.0540	ug/L	108	(50-150)		
MS_201905240012	trans-Nonachlor	ND	2	2.05	ug/L	102	(70-130)		
MSD_201905240012	trans-Nonachlor	ND	2	2.25	ug/L	113	(70-130)	20	9.3
LCS1	Trifluralin		2	2.29	ug/L	114	(70-130)		
LCS2	Trifluralin		2	2.29	ug/L	114	(70-130)	20	0.0
MBLK	Trifluralin			<0.1	ug/L				
MRL_CHK	Trifluralin		0.1	0.104	ug/L	104	(50-150)		
MS_201905240012	Trifluralin	ND	2	2.28	ug/L	114	(70-130)		
MSD_201905240012	Trifluralin	ND	2	2.37	ug/L	118	(70-130)	20	4.0
LCS1	Triphenylphosphate (S)		5	112	%	112	(70-130)		
LCS2	Triphenylphosphate (S)		5	111	%	111	(70-130)		
MBLK	Triphenylphosphate (S)			112	%	112	(70-130)		
MRL_CHK	Triphenylphosphate (S)		5	109	%	109	(70-130)		
MS_201905240012	Triphenylphosphate (S)		5	115	%	115	(70-130)		
MSD_201905240012	Triphenylphosphate (S)		5	115	%	115	(70-130)		
Gross Alpha/Beta Radiation by EPA 900.0									
Analytical Batch: 1177411							**Analysis Date: 06/07/2019**		
DUP1_201905230668	Beta, Gross	4.1		4.35	pCi/L		(0-20)		
DUP2_201905230680	Beta, Gross	5.2		ND	pCi/L		(0-20)		
LCS1	Beta, Gross		31	28.6	pCi/L	91	(80-120)		
LCS2	Beta, Gross		31	30.3	pCi/L	97	(80-120)	20	5.8
MBLK	Beta, Gross			<3	pCi/L				
MS_201905230665	Beta, Gross	3.4	31	33.6	pCi/L	96	(70-130)		
Gross Alpha by Co-precipitation by SM 7110C									
Analytical Batch: 1180088							**Analysis Date: 06/19/2019**		
LCS1	Gross Alpha by Coprecipitation		31	27.4	pCi/L	88	(80-120)		
LCS2	Gross Alpha by Coprecipitation		31	28.4	pCi/L	91	(80-120)	20	3.6
MBLK	Gross Alpha by Coprecipitation			<3	pCi/L				
MS_201905280036	Gross Alpha by Coprecipitation	25	31	82.6	pCi/L	92	(70-130)		
ICPMS Metals by EPA 200.8									
Analytical Batch: 1180365							**Analysis Date: 06/27/2019**		
LCS1	Aluminum Total ICAP/MS		100	106	ug/L	106	(85-115)		
LCS2	Aluminum Total ICAP/MS		100	108	ug/L	108	(85-115)	20	1.9
MBLK	Aluminum Total ICAP/MS			<10	ug/L				
MRL_CHK	Aluminum Total ICAP/MS		20	20.6	ug/L	103	(50-150)		
MS_201906260226	Aluminum Total ICAP/MS	38	100	150	ug/L	111	(70-130)		

Spike recovery is already corrected for native results.
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RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
(S) - Indicates surrogate compound.
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Laboratory QC

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MS2_201905230507	Aluminum Total ICAP/MS	ND	100	125	ug/L	118	(70-130)		
MSD_201906260226	Aluminum Total ICAP/MS	38	100	151	ug/L	112	(70-130)	20	0.97
MSD2_201905230507	Aluminum Total ICAP/MS	ND	100	120	ug/L	114	(70-130)	20	3.8
LCS1	Antimony Total ICAP/MS		50	47.7	ug/L	96	(85-115)		
LCS2	Antimony Total ICAP/MS		50	47.7	ug/L	95	(85-115)	20	0.0
MBLK	Antimony Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Antimony Total ICAP/MS		1	0.985	ug/L	99	(50-150)		
MS_201906260226	Antimony Total ICAP/MS	ND	50	53.2	ug/L	106	(70-130)		
MS2_201905230507	Antimony Total ICAP/MS	ND	50	52.9	ug/L	106	(70-130)		
MSD_201906260226	Antimony Total ICAP/MS	ND	50	53.6	ug/L	107	(70-130)	20	0.73
MSD2_201905230507	Antimony Total ICAP/MS	ND	50	52.3	ug/L	105	(70-130)	20	1.1
LCS1	Arsenic Total ICAP/MS		50	52.8	ug/L	106	(85-115)		
LCS2	Arsenic Total ICAP/MS		50	52.7	ug/L	105	(85-115)	20	0.19
MBLK	Arsenic Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Arsenic Total ICAP/MS		1	1.10	ug/L	110	(50-150)		
MS_201906260226	Arsenic Total ICAP/MS	ND	50	62.8	ug/L	124	(70-130)		
MS2_201905230507	Arsenic Total ICAP/MS	ND	50	59.5	ug/L	119	(70-130)		
MSD_201906260226	Arsenic Total ICAP/MS	ND	50	62.9	ug/L	125	(70-130)	20	0.22
MSD2_201905230507	Arsenic Total ICAP/MS	ND	50	59.3	ug/L	119	(70-130)	20	0.34
LCS1	Barium Total ICAP/MS		50	50.3	ug/L	101	(85-115)		
LCS2	Barium Total ICAP/MS		50	51.5	ug/L	103	(85-115)	20	2.4
MBLK	Barium Total ICAP/MS			<1	ug/L				
MRL_CHK	Barium Total ICAP/MS		2	1.94	ug/L	97	(50-150)		
MS_201906260226	Barium Total ICAP/MS	61	50	116	ug/L	109	(70-130)		
MS2_201905230507	Barium Total ICAP/MS	ND	50	57.0	ug/L	112	(70-130)		
MSD_201906260226	Barium Total ICAP/MS	61	50	118	ug/L	114	(70-130)	20	2.0
MSD2_201905230507	Barium Total ICAP/MS	ND	50	55.4	ug/L	109	(70-130)	20	2.9
LCS1	Beryllium Total ICAP/MS		25	25.6	ug/L	102	(85-115)		
LCS2	Beryllium Total ICAP/MS		25	25.2	ug/L	101	(85-115)	20	1.6
MBLK	Beryllium Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Beryllium Total ICAP/MS		1	0.964	ug/L	96	(50-150)		
MS_201906260226	Beryllium Total ICAP/MS	ND	25	28.3	ug/L	113	(70-130)		
MS2_201905230507	Beryllium Total ICAP/MS	ND	25	29.0	ug/L	116	(70-130)		
MSD_201906260226	Beryllium Total ICAP/MS	ND	25	28.6	ug/L	114	(70-130)	20	0.91
MSD2_201905230507	Beryllium Total ICAP/MS	ND	25	28.1	ug/L	112	(70-130)	20	3.1
LCS1	Cadmium Total ICAP/MS		25	25.7	ug/L	103	(85-115)		
LCS2	Cadmium Total ICAP/MS		25	25.5	ug/L	102	(85-115)	20	0.78
MBLK	Cadmium Total ICAP/MS			<0.25	ug/L				

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RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
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Laboratory QC

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
MRL_CHK	Cadmium Total ICAP/MS		0.5	0.464	ug/L	93	(50-150)		
MS_201906260226	Cadmium Total ICAP/MS	ND	25	27.0	ug/L	108	(70-130)		
MS2_201905230507	Cadmium Total ICAP/MS	ND	25	28.7	ug/L	115	(70-130)		
MSD_201906260226	Cadmium Total ICAP/MS	ND	25	27.3	ug/L	109	(70-130)	20	1.0
MSD2_201905230507	Cadmium Total ICAP/MS	ND	25	28.5	ug/L	114	(70-130)	20	0.86
LCS1	Chromium Total ICAP/MS		50	52.4	ug/L	105	(85-115)		
LCS2	Chromium Total ICAP/MS		50	52.7	ug/L	105	(85-115)	20	0.57
MBLK	Chromium Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Chromium Total ICAP/MS		1	1.00	ug/L	100	(50-150)		
MS_201906260226	Chromium Total ICAP/MS	ND	50	55.4	ug/L	111	(70-130)		
MS2_201905230507	Chromium Total ICAP/MS	ND	50	56.6	ug/L	113	(70-130)		
MSD_201906260226	Chromium Total ICAP/MS	ND	50	55.6	ug/L	111	(70-130)	20	0.30
MSD2_201905230507	Chromium Total ICAP/MS	ND	50	55.7	ug/L	111	(70-130)	20	1.6
LCS1	Copper Total ICAP/MS		50	51.9	ug/L	104	(85-115)		
LCS2	Copper Total ICAP/MS		50	52.4	ug/L	105	(85-115)	20	0.96
MBLK	Copper Total ICAP/MS			<1	ug/L				
MRL_CHK	Copper Total ICAP/MS		2	2.05	ug/L	103	(50-150)		
MS_201906260226	Copper Total ICAP/MS	ND	50	54.2	ug/L	107	(70-130)		
MS2_201905230507	Copper Total ICAP/MS	ND	50	56.2	ug/L	112	(70-130)		
MSD_201906260226	Copper Total ICAP/MS	ND	50	54.2	ug/L	107	(70-130)	20	0.026
MSD2_201905230507	Copper Total ICAP/MS	ND	50	55.8	ug/L	111	(70-130)	20	0.77
LCS1	Lead Total ICAP/MS		50	52.4	ug/L	105	(85-115)		
LCS2	Lead Total ICAP/MS		50	52.1	ug/L	104	(85-115)	20	0.57
MBLK	Lead Total ICAP/MS			<0.25	ug/L				
MRL_CHK	Lead Total ICAP/MS		0.5	0.519	ug/L	104	(50-150)		
MS_201906260226	Lead Total ICAP/MS	ND	50	55.1	ug/L	110	(70-130)		
MS2_201905230507	Lead Total ICAP/MS	ND	50	57.1	ug/L	114	(70-130)		
MSD_201906260226	Lead Total ICAP/MS	ND	50	55.2	ug/L	110	(70-130)	20	0.15
MSD2_201905230507	Lead Total ICAP/MS	ND	50	56.4	ug/L	113	(70-130)	20	1.3
LCS1	Manganese Total ICAP/MS		100	108	ug/L	108	(85-115)		
LCS2	Manganese Total ICAP/MS		100	108	ug/L	108	(85-115)	20	0.0
MBLK	Manganese Total ICAP/MS			<1	ug/L				
MRL_CHK	Manganese Total ICAP/MS		2	2.14	ug/L	107	(50-150)		
MS_201906260226	Manganese Total ICAP/MS	ND	100	113	ug/L	113	(70-130)		
MS2_201905230507	Manganese Total ICAP/MS	ND	100	116	ug/L	116	(70-130)		
MSD_201906260226	Manganese Total ICAP/MS	ND	100	115	ug/L	115	(70-130)	20	1.6
MSD2_201905230507	Manganese Total ICAP/MS	ND	100	113	ug/L	113	(70-130)	20	2.5
LCS1	Nickel Total ICAP/MS		50	52.0	ug/L	104	(85-115)		

Spike recovery is already corrected for native results.
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RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
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Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS2	Nickel Total ICAP/MS		50	52.9	ug/L	106	(85-115)	20	1.7
MBLK	Nickel Total ICAP/MS			<2.5	ug/L				
MRL_CHK	Nickel Total ICAP/MS		5	5.12	ug/L	102	(50-150)		
MS_201906260226	Nickel Total ICAP/MS	ND	50	54.8	ug/L	107	(70-130)		
MS2_201905230507	Nickel Total ICAP/MS	ND	50	56.0	ug/L	111	(70-130)		
MSD_201906260226	Nickel Total ICAP/MS	ND	50	54.7	ug/L	106	(70-130)	20	0.21
MSD2_201905230507	Nickel Total ICAP/MS	ND	50	54.9	ug/L	109	(70-130)	20	1.9
LCS1	Selenium Total ICAP/MS		50	52.7	ug/L	105	(85-115)		
LCS2	Selenium Total ICAP/MS		50	52.4	ug/L	105	(85-115)	20	0.57
MBLK	Selenium Total ICAP/MS			<2.5	ug/L				
MRL_CHK	Selenium Total ICAP/MS		5	5.25	ug/L	105	(50-150)		
MS2_201905230507	Selenium Total ICAP/MS	ND	50	64.8	ug/L	130	(70-130)		
MSD2_201905230507	Selenium Total ICAP/MS	ND	50	65.3	ug/L	**131**	(70-130)	20	0.77
LCS1	Silver Total ICAP/MS		25	24.0	ug/L	96	(85-115)		
LCS2	Silver Total ICAP/MS		25	24.1	ug/L	96	(85-115)	20	0.0
MBLK	Silver Total ICAP/MS			<0.25	ug/L				
MRL_CHK	Silver Total ICAP/MS		0.5	0.471	ug/L	94	(50-150)		
MS_201906260226	Silver Total ICAP/MS	ND	25	24.9	ug/L	99	(70-130)		
MS2_201905230507	Silver Total ICAP/MS	ND	25	25.6	ug/L	102	(70-130)		
MSD_201906260226	Silver Total ICAP/MS	ND	25	25.0	ug/L	100	(70-130)	20	0.40
MSD2_201905230507	Silver Total ICAP/MS	ND	25	25.5	ug/L	102	(70-130)	20	0.57
LCS1	Thallium Total ICAP/MS		50	52.4	ug/L	105	(85-115)		
LCS2	Thallium Total ICAP/MS		50	52.5	ug/L	105	(85-115)	20	0.19
MBLK	Thallium Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Thallium Total ICAP/MS		1	1.04	ug/L	105	(50-150)		
MS_201906260226	Thallium Total ICAP/MS	ND	50	55.8	ug/L	112	(70-130)		
MS2_201905230507	Thallium Total ICAP/MS	ND	50	56.8	ug/L	114	(70-130)		
MSD_201906260226	Thallium Total ICAP/MS	ND	50	56.0	ug/L	112	(70-130)	20	0.28
MSD2_201905230507	Thallium Total ICAP/MS	ND	50	56.4	ug/L	113	(70-130)	20	0.63
LCS1	Uranium ICAP/MS		50	51.9	ug/L	104	(85-115)		
LCS2	Uranium ICAP/MS		50	53.6	ug/L	107	(85-115)	20	3.2
MBLK	Uranium ICAP/MS			<0.5	ug/L				
MRL_CHK	Uranium ICAP/MS		1	1.01	ug/L	101	(50-150)		
MS_201906260226	Uranium ICAP/MS	1.9	50	62.3	ug/L	121	(70-130)		
MS2_201905230507	Uranium ICAP/MS	ND	50	59.3	ug/L	119	(70-130)		
MSD_201906260226	Uranium ICAP/MS	1.9	50	62.6	ug/L	122	(70-130)	20	0.54
MSD2_201905230507	Uranium ICAP/MS	ND	50	59.3	ug/L	119	(70-130)	20	0.029
LCS1	Vanadium Total ICAP/MS		50	52.3	ug/L	105	(85-115)		

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RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
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Laboratory QC

Report: 806101
Project: SPECIAL
Group: desal pilot

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
LCS2	Vanadium Total ICAP/MS		50	52.6	ug/L	105	(85-115)	20	0.57
MBLK	Vanadium Total ICAP/MS			<1.5	ug/L				
MRL_CHK	Vanadium Total ICAP/MS		3	3.09	ug/L	103	(50-150)		
MS_201906260226	Vanadium Total ICAP/MS	ND	50	60.7	ug/L	117	(70-130)		
MS2_201905230507	Vanadium Total ICAP/MS	ND	50	58.9	ug/L	117	(70-130)		
MSD_201906260226	Vanadium Total ICAP/MS	ND	50	60.4	ug/L	116	(70-130)	20	0.53
MSD2_201905230507	Vanadium Total ICAP/MS	ND	50	57.8	ug/L	115	(70-130)	20	2.0
LCS1	Zinc Total ICAP/MS		50	52.9	ug/L	106	(85-115)		
LCS2	Zinc Total ICAP/MS		50	52.6	ug/L	105	(85-115)	20	0.57
MBLK	Zinc Total ICAP/MS			<10	ug/L				
MRL_CHK	Zinc Total ICAP/MS		20	20.4	ug/L	102	(50-150)		
MS_201906260226	Zinc Total ICAP/MS	ND	50	55.5	ug/L	109	(70-130)		
MS2_201905230507	Zinc Total ICAP/MS	ND	50	59.2	ug/L	117	(70-130)		
MSD_201906260226	Zinc Total ICAP/MS	ND	50	55.2	ug/L	109	(70-130)	20	0.31
MSD2_201905230507	Zinc Total ICAP/MS	ND	50	58.9	ug/L	116	(70-130)	20	0.56

Spike recovery is already corrected for native results.
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July 3, 2019

Eurofins Eaton Analytical- MON
750 Royal Oaks Dr. STE 100
Monrovia, CA 91016

CLIENT PROJECT: Folder # 806101, Job # 1000014, Sub COC # 99-66761
LAB CODE: R190139

Dear Customer:

Enclosed are asbestos analysis results for TEM drinking water samples received at our laboratory on May 29, 2019. The samples were analyzed for asbestos using transmission electron microscopy (TEM) per the US EPA 100.2 Method.

The current EPA regulatoty limit for asbestos in drinking water is 7 million fibers per liter (> 10 um in length). The analytical sensitivity for the EPA 100.2 method is 0.2 MFL.

Thank you for your business and we look forward to continuing good relations.

Kind Regards,

Tianbao Bai, Ph.D., CIH
Laboratory Director

AMENDED

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ASBESTOS ANALYTICAL REPORT
By: Transmission Electron Microscopy

Prepared for

Eurofins Eaton Analytical- MON

CLIENT PROJECT: Folder # 806101, Job # 1000014, Sub COC # 99-66761

LAB CODE: R190139

TEST METHOD: EPA 100.2

REPORT DATE: 06/11/19

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AMENDED

ASBESTOS IN DRINKING WATER ANALYSIS

By: TRANSMISSION ELECTRON MICROSCOPY

Client: Eurofins Eaton Analytical- MON
750 Royal Oaks Dr. STE 100
Monrovia, CA 91016

		Lab Code:	R190139
Time Collected:	5:15 AM	**Date Collected:**	05-22-19
Time Received:	9:40 AM	**Date Received:**	05-29-19
Time Filtered:	2:30 PM	**Date Filtered:**	05-29-19
Time Analyzed:		**Date Analyzed:**	06-04-19
Avg Grid Opening Size:	0.01 mm^2	**Date Reported:**	06-11-19

Project: Folder # 806101, Job # 1000014, Sub COC # 99-66761

TEM DRINKING WATER (EPA 100.2)

Client ID Lab ID	Sample Volume Filtered	Dilution Factor	Effective Filter Area (mm^2)	# Of Grid Openings Analyzed	Total Area of Filter Examined	Analytical Sensitivity (MFL)	Asbestos Type	>10 µm	Concentration (MFL)	Confidence Limit Lower	Confidence Limit Upper
20190520 0220 R00542	100	10	1064.1	54	0.54	0.197	None Detected	0	**<.2**	0.0	<0.73

LEGEND: MFL = million fibers per liter , > 10 um in length | CHRY = chrysotile | CROC = crocidolite
NSD = no asbestos structures detected | um = micrometer | mm = millimeter
ml = milliliter

METHOD: EPA 100.2

ANALYTICAL SENSITIVITY: 0.2 MFL

MAXIMUM CONTAMINANT LEVEL: 7 MFL

This report relates only to the samples tested or analyzed and may not be reproduced, except in full, without written approval by Eurofins CEI. Eurofins CEI makes no warranty representation regarding the accuracy of customer submitted information in preparing and presenting analytical results. Interpretation of the analytical results is the sole responsibility of the customer. Samples were received in acceptable condition unless otherwise noted.

Information provided by customer includes customer sample ID, location, volume and area as well as date and time of sampling.

For the current states of certification please refer to the website: www.EurofinsUS.com/CEI

ANALYST: Jennifer Turner

APPROVED BY: Tianbao Bai, Ph.D., CIH
Laboratory Director

AMENDED due to Client Wishes to Change Specifications for Analysis - Report down to 0.2 MFL

To: Jaclyn Contreras
Subject: 806101 - needs a <0.2 RL
Importance: High

Jackie – this sample requires an RL of <0.2MFL, please ask the sub-lab to issue a revised report.

Thank you,

Yolanda Martin
Analytical Services Manager

In observance of the Independence Day Holiday, we will be closed on Thursday, July 4, 2019. The last day to ship samples will be Tuesday, July 2nd.

Eurofins Eaton Analytical, LLC
750 Royal Oaks Drive, Suite 100
Monrovia, CA 91016
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Mobil: +1 626-483-7376

Email: YolandaMartin@EurofinsUS.com
Website: www.EurofinsUS.com/Eaton

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Submittal Form

R190139 R00542

Date: 5/28/2019

Ship To:
`Eurofins CEI, Inc.
730 SE Maynard Road

Cary, NC 27511

Phone: 919-481-1413 Fax:

Folder #: 806101 **Report Due:** 06/12/2019 **Sub COC#:** 99-66761

*REPORTING REQUIREMENTS: *Do Not Combine Reports with any other samples submitted under different Folder Numbers!*
Report & Invoice must have the Folder # 806101 Job # 1000014

Report all quality control data according to Method. Include dates analyzed. Date extracted (if extracted) and Method reference on the report.
Results must have Complete data & QC with Approval Signature.

Reports: Jackie Contreras Sub-Contracting Administrator
EMAIL TO: us20_subcontract@eurofinsus.com
Eurofins Eaton Analytical, LLC 750 Royal Oaks Drive, Suite 100, Monrovia, CA 91016
Phone (626) 386-1165 Fax (626) 386-1122
Invoices to: Eurofins Eaton Analytical, LLC

Provide in each Report the Specified State Certification # & Exp Date for requested tests + matrix.
Samples from: **CALIFORNIA**

JLS	Use Lab Order # for ID	*Client Sample ID for reference only*	Analysis Requested	Sample Date & Time	Matrix	PWS Systemcode	PWSID
	201905200220	Test Well		05/22/19 0515	DW		
EPA 100.2	Asbestos (Subbed)_CA cert		Asbestos				

Sample type: **Sample Event:** **Facility ID:** **Sample Point ID:** {CL_SAMPLEPOINTID} **Static ID:**

2.5°C AR 5/29

Relinquished by: [signature] Sample Control Date 5-28-19 Time 1139
Received by: NR Date 5-29-19 Time 9:40
Relinquished by: Sample Control Date ______ Time ______
Received by: ______ Date ______ Time ______

NOTIFICATION REQUIRED IF RECEIVED OUTSIDE OF 0-6 CELSIUS

An Acknowledgement of Receipt is requested to attn: Jackie Contreras

750 Royal Oaks Drive, Suite 100, Monrovia, CA 91016 Tel (626) 386-1100 Fax (866) 988-3757 www.EurofinsUS.com/Eaton

ANALYSIS REPORT

Prepared by:	Prepared for:
Eurofins Lancaster Laboratories Environmental 2425 New Holland Pike Lancaster, PA 17601	Eurofins Eaton Analytical, Inc Suite 100 750 Royal Oaks Drive Monrovia CA 91016

Report Date: June 10, 2019 15:07

Project: 806101

Account #: 14482
Group Number: 2046310
PO Number: NA
State of Sample Origin: CA

Electronic Copy To Eurofins Eaton Analytical, Inc Attn: EEAI Reports

Respectfully Submitted,

Hannah L. Cottman
Project Manager

(717) 556-7383

To view our laboratory's current scopes of accreditation please go to https://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/certifications-and-accreditations-eurofins-lancaster-laboratories-environmental/ . Historical copies may be requested through your project manager.

SAMPLE INFORMATION

Client Sample Description	Sample Collection Date/Time	ELLE#
201905200220 Potable Water	05/22/2019 05:15	1068713

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

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Project Name: 806101
ELLE Group #: 2046310

General Comments:

See the Laboratory Sample Analysis Record section of the Analysis Report for the method references.

All QC met criteria unless otherwise noted in an Analysis Specific Comment below.
Refer to the QC Summary for specific values and acceptance criteria.

Project specific QC samples are not included in this data set.

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Surrogate recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in an Analysis Specific Comment below.

The samples were received at the appropriate temperature and in accordance with the chain of custody unless otherwise noted.

Analysis Specific Comments:

No additional comments are necessary.

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Lancaster Laboratories Environmental

Analysis Report

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Sample Description:	**201905200220 Potable Water Folder# 806101 Sub PO# 99-66754 Job# 1000014**	**Eurofins Eaton Analytical, Inc ELLE Sample #: PW 1068713 ELLE Group #: 2046310**
Project Name:	**806101**	**Matrix: Potable Water**
Submittal Date/Time:	05/30/2019 10:20	
Collection Date/Time:	05/22/2019 05:15	

CAT No.	Analysis Name	CAS Number	Result	EDL*	MRL	Dilution Factor
Dioxins/Furans		**EPA 1613B October 1994**	**pg/l**	**pg/l**	**pg/l**	
12935	2378-TCDD	1746-01-6	N.D.	0.125	3.92	1

Labeled Compounds	**%Rec**	**Windows**
13C12-2378-TCDD	121	25 - 164

Dioxins/Furans Data Qualifiers:

B	*Detected in Method Blank*
U	*Undetected*
J	*Estimated concentration between Estimated Detection Limit and Minimum Reporting Level*
E	*Exceeds calibration range*
C	*Confirmed quantitation on secondary GC column*
Q	*EMPC - Estimated Maximum Possible Concentration*
F	*Interference is present*
S	*Saturation of detection signal*

Sample Comments

CA ELAP Lab Certification No. 2792

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12935	2378-TCDD in Potable Water	EPA 1613B October 1994	1	19157005	06/07/2019 08:36	Joel A Denlinger	1
10914	Dioxins/Furans in Water - SepF	EPA 1613B October 1994	1	19157005	06/06/2019 08:47	Alex L Barton	1

EDL = Estimated Detection Limit
*=This limit was used in the evaluation of the final result

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Quality Control Summary

Client Name: Eurofins Eaton Analytical, Inc Group Number: 2046310
Reported: 06/10/2019 15:07

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Method Blank

Analysis Name	Result pg/l	EDL** pg/l	MRL pg/l
Batch number: 19157005	Sample number(s): 1068713		
2378-TCDD	0.123 J	0.108	4.00

OPR/OPRD

Analysis Name	OPR Spike Added pg/l	OPR Conc pg/l	OPRD Spike Added pg/l	OPRD Conc pg/l	OPR %REC	OPRD %REC	OPR/OPRD Limits	RPD	RPD Max
Batch number: 19157005	Sample number(s): 1068713								
2378-TCDD	2.00	2.30			115		67-158		

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: 2378-TCDD in Potable Water
Batch number: 19157005

	13C12-2378-TCDD
1068713	121
Blank	131
Limits:	25-164

	13C12-2378-TCDD
OPR	130
Limits:	20-175

*- Outside of specification
**-This limit was used in the evaluation of the final result for the blank
(1) The result for one or both determinations was less than five times the MRL.
(2) The unspiked result was more than four times the spike added.

14482 2046310 1068713

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Submittal Form

Date: 5/28/2019

Ship To:
`Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike

Lancaster, PA 17601

Phone: 717-656-2300 Fax:

REPORTING REQUIRMENTS:** ***Do Not Combine Reports with any other samples submitted under different Folder Numbers!
Report & Invoice must have the Folder # **806101** Job # **1000014**

Report all quality control data according to Method. Include dates analyzed. Date extracted (if extracted) and Method reference on the report.
Results must have Complete data & QC with Approval Signature.

Reports: Jackie Contreras Sub-Contracting Administrator
EMAIL TO: us20_subcontract@eurofinsus.com
Eurofins Eaton Analytical, LLC 750 Royal Oaks Drive, Suite 100, Monrovia, CA 91016
Phone (626) 386-1165 Fax (626) 386-1122
Invoices to: Eurofins Eaton Analytical, LLC

Provide in each Report the Specified State Certification # & Exp Date for requested tests + matrix.

Samples from: **CALIFORNIA**

J flag

Folder #:	Report Due:	Sub COC#:
806101	06/20/2019	99-66754

JLS	Use Lab Order # for ID	*Client Sample ID for reference only*	Analysis Requested	Sample Date & Time	Matrix	PWS Systemcode	PWSID
	201905200220	Test Well		05/22/19 0515	DW		
	Sample type:	**Sample Event:**	**Facility ID:**	**Sample Point ID:** {CL_SAMPLEPOINTID}	**Static ID:**		
EPA 1613B	2,3,7,8-TCDD		2,3,7,8-TCDD				

Relinquished by:	Sample Control	Date 5-28-19	Time 1107	NOTIFICATION REQUIRED IF RECEIVED OUTSIDE OF 0-6 CELSIUS
Received by:		Date	Time	An Acknowledgement of Receipt is requested to attn: Jackie Contreras
Relinquished by:	Sample Control	Date	Time	
Received by:		Date 5/30/19	Time 1020	

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Sample Administration Receipt Documentation Log

Doc Log ID: 250228

Group Number(s): 2046310

Client: Eaton Analytical

Delivery and Receipt Information

Delivery Method:	Fed Ex	Arrival Timestamp:	05/30/2019 10:20
Number of Packages:	1	Number of Projects:	2
State/Province of Origin:	CA		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	No	Sample Date/Times match COC:	Yes
Samples Chilled:	Yes	VOA Vial Headspace ≥ 6mm:	N/A
Paperwork Enclosed:	Yes	Total Trip Blank Qty:	0
Samples Intact:	Yes	Air Quality Samples Present:	No
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Simon Nies (25112) at 13:21 on 05/30/2019

Samples Chilled Details

Thermometer Types: *DT = Digital (Temp. Bottle)* *IR = Infrared (Surface Temp)* *All Temperatures in °C.*

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	32170023	2.3	IR	Wet	Y	Bagged	N

2425 New Holland Pike
Lancaster, PA 17605-2425

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F 717-656-2681
www.LancasterLabs.com

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

BMQL	Below Minimum Quantitation Level	**mL**	milliliter(s)
C	degrees Celsius	**MPN**	Most Probable Number
cfu	colony forming units	**N.D.**	non-detect
CP Units	cobalt-chloroplatinate units	**ng**	nanogram(s)
F	degrees Fahrenheit	**NTU**	nephelometric turbidity units
g	gram(s)	**pg/L**	picogram/liter
IU	International Units	**RL**	Reporting Limit
kg	kilogram(s)	**TNTC**	Too Numerous To Count
L	liter(s)	**µg**	microgram(s)
lb.	pound(s)	**µL**	microliter(s)
m3	cubic meter(s)	**umhos/cm**	micromhos/cm
meq	milliequivalents	**MCL**	Maximum Contamination Limit
mg	milligram(s)		

<	less than
>	greater than
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg) or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff.

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Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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Data Qualifiers

Qualifier	Definition
C	Result confirmed by reanalysis
D1	Indicates for dual column analyses that the result is reported from column 1
D2	Indicates for dual column analyses that the result is reported from column 2
E	Concentration exceeds the calibration range
K1	Initial Calibration Blank is above the QC limit and the sample result is ND
K2	Continuing Calibration Blank is above the QC limit and the sample result is ND
K3	Initial Calibration Verification is above the QC limit and the sample result is ND
K4	Continuing Calibration Verification is above the QC limit and the sample result is ND
J (or G, I, X)	Estimated value >= the Method Detection Limit (MDL or DL) and < the Limit of Quantitation (LOQ or RL)
P	Concentration difference between the primary and confirmation column >40%. The lower result is reported.
P^	Concentration difference between the primary and confirmation column > 40%. The higher result is reported.
U	Analyte was not detected at the value indicated
V	Concentration difference between the primary and confirmation column >100%. The reporting limit is raised due to this disparity and evident interference.
W	The dissolved oxygen uptake for the unseeded blank is greater than 0.20 mg/L.
Z	Laboratory Defined - see analysis report

Additional Organic and Inorganic CLP qualifiers may be used with Form 1 reports as defined by the CLP methods.

Qualifiers specific to Dioxin/Furans and PCB Congeners are detailed on the individual Analysis Report.

EnviroMatrix Analytical, Inc.

11 June 2020

Geoscience Support Services, Inc.
Attn: Nathan Reynolds
PO Box 220
Claremont, CA 91711

EMA Log #: 20D0672

Project: GMGP Water Quality 2020

Enclosed are the results of analyses for samples received by the laboratory on 04/21/20 15:55. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that this data is in compliance both technically and for completeness.

Leland S. Pitt
Laboratory Director

CA ELAP Certification #: 2564

Client Name:	Geoscience Support Services, Inc.	**EMA Log #: 20D0672**
Project Name:	GMGP Water Quality 2020	

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
P2	20D0672-01	Grnd-Water	04/21/20 09:36	04/21/20 15:55
P11 B	20D0672-02	Grnd-Water	04/21/20 10:55	04/21/20 15:55
P11 D	20D0672-03	Grnd-Water	04/21/20 11:30	04/21/20 15:55
Gun R	20D0672-04	Grnd-Water	04/21/20 12:45	04/21/20 15:55
TEST	20D0672-05	Grnd-Water	04/21/20 14:30	04/21/20 15:55

Total Metals by EPA 200 Series Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
P11 B (20D0672-02) Grnd-Water Sampled: 04/21/20 10:55 Received: 04/21/20 15:55										
Boron	**0.54**	0.25	0.50	mg/l	1	ICP	0052751	05/27/20 11:47 05/28/20 14:51	EPA 200.7	
Barium	**0.185**	0.0002	0.010	"	"	MG	0051171	05/11/20 15:50 05/12/20 12:45	EPA 200.8	
Calcium	**68.0**	0.10	0.50	"	"	ICP	0052751	05/27/20 11:47 05/28/20 14:51	EPA 200.7	
Chromium	**0.0009**	0.0002	0.005	"	"	MG	0051171	05/11/20 15:50 05/12/20 12:45	EPA 200.8	J
Copper	**0.002**	0.0002	0.010	"	"	MG	"	05/11/20 15:50 05/12/20 12:45	"	J
Iron	**0.490**	0.002	0.050	"	"	MG	"	05/11/20 15:50 05/12/20 12:45	"	
Potassium	**41.1**	1.00	1.00	"	"	ICP	0052751	05/27/20 11:47 05/28/20 14:51	EPA 200.7	
Magnesium	**57.3**	0.100	0.500	"	"	ICP	"	05/27/20 11:47 05/28/20 14:51	"	
Manganese	**0.095**	0.0001	0.005	"	"	MG	0051171	05/11/20 15:50 05/12/20 12:45	EPA 200.8	
Sodium	**321**	0.20	2.50	"	5	ICP	0052751	05/27/20 11:47 06/02/20 13:36	EPA 200.7	
Zinc	**0.010**	0.0003	0.020	"	1	MG	0051171	05/11/20 15:50 05/12/20 12:45	EPA 200.8	J
P11 D (20D0672-03) Grnd-Water Sampled: 04/21/20 11:30 Received: 04/21/20 15:55										
Boron	**0.47**	0.25	0.50	mg/l	1	ICP	0052751	05/27/20 11:47 05/28/20 14:56	EPA 200.7	J
Barium	**0.348**	0.0002	0.010	"	"	MG	0051171	05/11/20 15:50 05/12/20 12:47	EPA 200.8	
Calcium	**145**	0.10	0.50	"	"	ICP	0052751	05/27/20 11:47 05/28/20 14:55	EPA 200.7	
Chromium	**0.0006**	0.0002	0.005	"	"	MG	0051171	05/11/20 15:50 05/12/20 12:47	EPA 200.8	J
Copper	**0.003**	0.0002	0.010	"	"	MG	"	05/11/20 15:50 05/12/20 12:47	"	J
Iron	**0.820**	0.002	0.050	"	"	MG	"	05/11/20 15:50 05/12/20 12:47	"	
Potassium	**27.4**	1.00	1.00	"	"	ICP	0052751	05/27/20 11:47 05/28/20 14:55	EPA 200.7	
Magnesium	**106**	0.100	0.500	"	"	ICP	"	05/27/20 11:47 05/28/20 14:55	"	

Client Name:	Geoscience Support Services, Inc.	**EMA Log #: 20D0672**
Project Name:	GMGP Water Quality 2020	

Total Metals by EPA 200 Series Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
P11 D (20D0672-03) Grnd-Water Sampled: 04/21/20 11:30 Received: 04/21/20 15:55										
Manganese	**0.464**	0.0001	0.005	mg/l	1	MG	0051171	05/11/20 15:50 05/12/20 12:47	EPA 200.8	
Sodium	**504**	0.20	2.50	"	5	ICP	0052751	05/27/20 11:47 06/02/20 13:41	EPA 200.7	
Zinc	**0.004**	0.0003	0.020	"	1	MG	0051171	05/11/20 15:50 05/12/20 12:47	EPA 200.8	J
Gun R (20D0672-04) Grnd-Water Sampled: 04/21/20 12:45 Received: 04/21/20 15:55										
Boron	**0.36**	0.25	0.50	mg/l	1	ICP	0052751	05/27/20 11:47 05/28/20 15:01	EPA 200.7	J
Barium	**0.099**	0.0002	0.010	"	"	MG	0051171	05/11/20 15:50 05/12/20 12:49	EPA 200.8	
Calcium	**403**	0.50	2.50	"	5	ICP	0052751	05/27/20 11:47 05/28/20 15:01	EPA 200.7	
Chromium	**0.0004**	0.0002	0.005	"	1	MG	0051171	05/11/20 15:50 05/12/20 12:49	EPA 200.8	J
Copper	**0.010**	0.0002	0.010	"	"	MG	"	05/11/20 15:50 05/12/20 12:49	"	
Iron	**0.262**	0.002	0.050	"	"	MG	"	05/11/20 15:50 05/12/20 12:49	"	
Potassium	**11.5**	1.00	1.00	"	"	ICP	0052751	05/27/20 11:47 05/28/20 15:01	EPA 200.7	
Magnesium	**197**	0.500	2.50	"	5	ICP	"	05/27/20 11:47 05/28/20 15:01	"	
Manganese	**2.29**	0.001	0.050	"	10	MG	0051171	05/11/20 15:50 05/12/20 13:36	EPA 200.8	
Sodium	**688**	0.20	2.50	"	5	ICP	0052751	05/27/20 11:47 06/02/20 13:55	EPA 200.7	
Zinc	**0.009**	0.0003	0.020	"	1	MG	0051171	05/11/20 15:50 05/12/20 12:49	EPA 200.8	J
TEST (20D0672-05) Grnd-Water Sampled: 04/21/20 14:30 Received: 04/21/20 15:55										
Boron	**0.95**	0.25	0.50	mg/l	1	ICP	0052751	05/27/20 11:47 05/28/20 15:06	EPA 200.7	
Barium	**0.132**	0.0002	0.010	"	"	MG	0051171	05/11/20 15:50 05/12/20 12:51	EPA 200.8	
Calcium	**452**	0.50	2.50	"	5	ICP	0052751	05/27/20 11:47 05/28/20 15:06	EPA 200.7	
Chromium	**0.0003**	0.0002	0.005	"	1	MG	0051171	05/11/20 15:50 05/12/20 12:51	EPA 200.8	J

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20D0672
Project Name:	GMGP Water Quality 2020	

Total Metals by EPA 200 Series Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
TEST (20D0672-05) Grnd-Water Sampled: 04/21/20 14:30 Received: 04/21/20 15:55										
Copper	**0.002**	0.0002	0.010	mg/l	1	MG	0051171	05/11/20 15:50 05/12/20 12:51	EPA 200.8	J
Iron	**0.858**	0.002	0.050	"	"	MG	"	05/11/20 15:50 05/12/20 12:51	"	
Potassium	**31.5**	1.00	1.00	"	"	ICP	0052751	05/27/20 11:47 05/28/20 15:06	EPA 200.7	
Magnesium	**107**	0.100	0.500	"	"	ICP	"	05/27/20 11:47 05/28/20 15:06	"	
Manganese	**1.07**	0.0001	0.005	"	"	MG	0051171	05/11/20 15:50 05/12/20 12:51	EPA 200.8	
Sodium	**820**	0.20	2.50	"	5	ICP	0052751	05/27/20 11:47 06/02/20 14:00	EPA 200.7	
Zinc	**0.039**	0.0003	0.020	"	1	MG	0051171	05/11/20 15:50 05/12/20 12:51	EPA 200.8	

Client Name:	Geoscience Support Services, Inc.	**EMA Log #: 20D0672**
Project Name:	GMGP Water Quality 2020	

Metals (Dissolved) by EPA 200 Series Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
P2 (20D0672-01) Grnd-Water Sampled: 04/21/20 09:36 Received: 04/21/20 15:55										
Boron	**0.46**	0.25	0.50	mg/l	1	ICP	0060145	06/01/20 08:05 06/02/20 12:43	EPA 200.7	J
Barium	**0.064**	0.0002	0.010	"	"	MG	0051181	05/11/20 16:20 05/12/20 11:47	EPA 200.8	
Calcium	**546**	0.50	2.50	"	5	ICP	0060145	06/01/20 08:05 06/02/20 12:42	EPA 200.7	
Chromium	**0.0003**	0.0002	0.005	"	1	MG	0051181	05/11/20 16:20 05/12/20 11:47	EPA 200.8	J
Copper	**0.002**	0.001	0.010	"	"	MG	"	05/11/20 16:20 05/12/20 11:47	"	J
Iron	**0.035**	0.002	0.050	"	"	MG	"	05/11/20 16:20 05/12/20 11:47	"	J
Potassium	**17.0**	1.00	1.00	"	"	ICP	0060145	06/01/20 08:05 06/02/20 12:42	EPA 200.7	
Magnesium	**355**	2.50	5.00	"	5	ICP	"	06/01/20 08:05 06/02/20 12:42	"	
Manganese	**4.86**	0.001	0.050	"	10	MG	0051181	05/11/20 16:20 05/12/20 13:09	EPA 200.8	
Sodium	**954**	1.00	12.5	"	25	ICP	0060145	06/01/20 08:05 06/02/20 12:42	EPA 200.7	
Zinc	**0.003**	0.0003	0.020	"	1	MG	0051181	05/11/20 16:20 05/12/20 11:47	EPA 200.8	J

Conventional Chemistry Parameters by Standard/EPA Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
P2 (20D0672-01) Grnd-Water Sampled: 04/21/20 09:36 Received: 04/21/20 15:55										
Bicarbonate Alkalinity	**404**	5	5	mg CaCO3/L	1	LBH	0042356	04/23/20 09:22 04/23/20 09:22	SM2320B	
Carbonate Alkalinity	ND	5	5	"	"	LBH	"	04/23/20 09:22 04/23/20 09:22	"	
Hydroxide Alkalinity	ND	5	5	"	"	LBH	"	04/23/20 09:22 04/23/20 09:22	"	
Total Alkalinity	**404**	5	5	"	"	LBH	"	04/23/20 09:22 04/23/20 09:22	"	
Ammonia as N	**0.35**	0.02	0.10	mg/l	"	UM	0050447	05/05/20 12:10 05/05/20 14:26	EPA 350.1	
Chloride	**2200**	0.05	0.05	"	"	NLF	0042414	04/24/20 15:15 04/24/20 15:15	SM4500 Cl B	
Specific Conductance (EC)	**8330**	1.00	1.00	umhos/cm	"	LBH	0042237	04/22/20 12:50 04/22/20 12:50	SM2510 B	
Fluoride	**0.277**	0.031	0.100	mg/l	"	LBH	0042937	04/29/20 13:53 04/29/20 13:53	SM4500 F C	
Hardness (Dissolved)	**2830**	10	10	mg CaCO3/L	"	ICP	0060145	06/01/20 08:05 06/02/20 12:42	EPA 200.7	
Nitrate as N	**1.41**	0.09	0.50	mg/l	10	UM	0050738	05/07/20 16:00 05/07/20 19:55	EPA 353.2	W-02
Nitrite as N	**0.13**	0.007	0.05	"	1	UM	0042415	04/22/20 12:50 04/22/20 12:50	SM4500 NO2 B	
pH at 25 deg C	**7.03**	0.01	0.10	pH Units	"	NLF	0042234	04/21/20 16:54 04/21/20 16:54	SM4500-H+ B	HT-15
Orthophosphate as P	**3.72**	0.04	0.25	mg/l	5	LBH	0042330	04/22/20 08:30 04/22/20 08:30	SM4500 P E	
Phosphorus, Total	**2.08**	0.20	0.50	"	10	UM	0042230	04/22/20 12:00 04/23/20 14:25	EPA 365.1	
Total Dissolved Solids	**5460**	1.0	20.0	"	1	NLF	0042758	04/27/20 09:00 04/29/20 09:00	SM2540 C	
Sulfate as SO4	**1240**	50.0	250	"	50	LBH	0051246	05/12/20 11:45 05/12/20 11:45	SM4500 SO4 E	
Turbidity	**50.0**	0.05	0.05	NTU	1	NLF	0042231	04/22/20 10:00 04/22/20 10:00	SM2130 B	
P11 B (20D0672-02) Grnd-Water Sampled: 04/21/20 10:55 Received: 04/21/20 15:55										
Bicarbonate Alkalinity	**260**	5	5	mg CaCO3/L	1	LBH	0042356	04/23/20 09:22 04/23/20 09:22	SM2320B	

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20D0672
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
P11 B (20D0672-02) Grnd-Water Sampled: 04/21/20 10:55 Received: 04/21/20 15:55										
Carbonate Alkalinity	ND	5	5	mg CaCO3/L	1	LBH	0042356	04/23/20 09:22 04/23/20 09:22	SM2320B	
Hydroxide Alkalinity	ND	5	5	"	"	LBH	"	04/23/20 09:22 04/23/20 09:22	"	
Total Alkalinity	**260**	5	5	"	"	LBH	"	04/23/20 09:22 04/23/20 09:22	"	
Ammonia as N	**4.52**	0.11	0.50	mg/l	5	UM	0050447	05/05/20 12:10 05/05/20 14:26	EPA 350.1	
Chloride	**380**	0.05	0.05	"	1	NLF	0042414	04/24/20 15:15 04/24/20 15:15	SM4500 Cl B	
Specific Conductance (EC)	**1950**	1.00	1.00	umhos/cm	"	LBH	0042237	04/22/20 12:50 04/22/20 12:50	SM2510 B	
Fluoride	**0.405**	0.031	0.100	mg/l	"	LBH	0042937	04/29/20 13:53 04/29/20 13:53	SM4500 F C	
Hardness (Total)	**406**	10	10	mg CaCO3/L	"	ICP	0052751	05/27/20 11:47 05/28/20 14:51	EPA 200.7	
Nitrate as N	**0.03**	0.009	0.05	mg/l	"	UM	0050738	05/07/20 16:00 05/07/20 19:55	EPA 353.2	W-02, J
Nitrite as N	ND	0.007	0.05	"	"	UM	0042415	04/22/20 12:50 04/22/20 12:50	SM4500 NO2 B	
pH at 25 deg C	**7.54**	0.01	0.10	pH Units	"	NLF	0042234	04/21/20 16:56 04/21/20 16:56	SM4500-H+ B	HT-15
Orthophosphate as P	**1.88**	0.04	0.25	mg/l	5	LBH	0042330	04/22/20 08:30 04/22/20 08:30	SM4500 P E	
Phosphorus, Total	**1.76**	0.20	0.50	"	10	UM	0042230	04/22/20 12:00 04/23/20 14:25	EPA 365.1	
Total Dissolved Solids	**1080**	1.0	20.0	"	1	NLF	0042758	04/27/20 09:00 04/29/20 09:00	SM2540 C	
Sulfate as SO4	**183**	5.0	25.0	"	5	LBH	0051246	05/12/20 11:45 05/12/20 11:45	SM4500 SO4 E	
Turbidity	**1.30**	0.05	0.05	NTU	1	NLF	0042231	04/22/20 10:00 04/22/20 10:00	SM2130 B	
P11 D (20D0672-03) Grnd-Water Sampled: 04/21/20 11:30 Received: 04/21/20 15:55										
Bicarbonate Alkalinity	**380**	5	5	mg CaCO3/L	1	LBH	0042356	04/23/20 09:22 04/23/20 09:22	SM2320B	
Carbonate Alkalinity	ND	5	5	"	"	LBH	"	04/23/20 09:22 04/23/20 09:22	"	

Client Name:	Geoscience Support Services, Inc.	EMA Log #: **20D0672**
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
P11 D (20D0672-03) Grnd-Water Sampled: 04/21/20 11:30 Received: 04/21/20 15:55										
Hydroxide Alkalinity	ND	5	5	mg CaCO3/L	1	LBH	0042356	04/23/20 09:22 04/23/20 09:22	SM2320B	
Total Alkalinity	**380**	5	5	"	"	LBH	"	04/23/20 09:22 04/23/20 09:22	"	
Ammonia as N	**2.05**	0.04	0.20	mg/l	2	UM	0050447	05/05/20 12:10 05/05/20 14:26	EPA 350.1	
Chloride	**630**	0.05	0.05	"	1	NLF	0042414	04/24/20 15:15 04/24/20 15:15	SM4500 Cl B	
Specific Conductance (EC)	**3150**	1.00	1.00	umhos/cm	"	LBH	0042237	04/22/20 12:50 04/22/20 12:50	SM2510 B	
Fluoride	**0.298**	0.031	0.100	mg/l	"	LBH	0042937	04/29/20 13:53 04/29/20 13:53	SM4500 F C	
Hardness (Total)	**800**	10	10	mg CaCO3/L	"	ICP	0052751	05/27/20 11:47 05/28/20 14:55	EPA 200.7	
Nitrate as N	**0.04**	0.009	0.05	mg/l	"	UM	0050738	05/07/20 16:00 05/07/20 19:55	EPA 353.2	W-02, J
Nitrite as N	ND	0.007	0.05	"	"	UM	0042415	04/22/20 12:50 04/22/20 12:50	SM4500 NO2 B	
pH at 25 deg C	**7.37**	0.01	0.10	pH Units	"	NLF	0042234	04/21/20 16:58 04/21/20 16:58	SM4500-H+ B	HT-15
Orthophosphate as P	**0.68**	0.007	0.05	mg/l	"	LBH	0042330	04/22/20 08:30 04/22/20 08:30	SM4500 P E	
Phosphorus, Total	**0.66**	0.02	0.05	"	"	UM	0042230	04/22/20 12:00 04/23/20 14:25	EPA 365.1	
Total Dissolved Solids	**1890**	1.0	20.0	"	"	NLF	0042758	04/27/20 09:00 04/29/20 09:00	SM2540 C	
Sulfate as SO4	**346**	25.0	125	"	25	LBH	0051246	05/12/20 11:45 05/12/20 11:45	SM4500 SO4 E	
Turbidity	**4.10**	0.05	0.05	NTU	1	NLF	0042231	04/22/20 10:00 04/22/20 10:00	SM2130 B	
Gun R (20D0672-04) Grnd-Water Sampled: 04/21/20 12:45 Received: 04/21/20 15:55										
Bicarbonate Alkalinity	**346**	5	5	mg CaCO3/L	1	LBH	0042356	04/23/20 09:22 04/23/20 09:22	SM2320B	
Carbonate Alkalinity	ND	5	5	"	"	LBH	"	04/23/20 09:22 04/23/20 09:22	"	
Hydroxide Alkalinity	ND	5	5	"	"	LBH	"	04/23/20 09:22 04/23/20 09:22	"	

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20D0672
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared / Sample Analyzed	Method	Notes
Gun R (20D0672-04) Grnd-Water Sampled: 04/21/20 12:45 Received: 04/21/20 15:55										
Total Alkalinity	**346**	5	5	mg CaCO3/L	1	LBH	0042356	04/23/20 09:22 04/23/20 09:22	SM2320B	
Ammonia as N	**0.08**	0.02	0.10	mg/l	"	UM	0050447	05/05/20 12:10 05/05/20 14:26	EPA 350.1	J
Chloride	**1110**	0.05	0.05	"	"	NLF	0042414	04/24/20 15:15 04/24/20 15:15	SM4500 Cl B	
Specific Conductance (EC)	**5190**	1.00	1.00	umhos/cm	"	LBH	0042237	04/22/20 12:50 04/22/20 12:50	SM2510 B	
Fluoride	**0.271**	0.031	0.100	mg/l	"	LBH	0042937	04/29/20 13:53 04/29/20 13:53	SM4500 F C	
Hardness (Total)	**1820**	10	10	mg CaCO3/L	"	ICP	0052751	05/27/20 11:47 05/28/20 15:01	EPA 200.7	
Nitrate as N	**0.70**	0.02	0.10	mg/l	2	UM	0050738	05/07/20 16:00 05/07/20 19:55	EPA 353.2	W-02
Nitrite as N	**0.009**	0.007	0.05	"	1	UM	0042415	04/22/20 12:50 04/22/20 12:50	SM4500 NO2 B	J
pH at 25 deg C	**7.19**	0.01	0.10	pH Units	"	NLF	0042234	04/21/20 17:00 04/21/20 17:00	SM4500-H+ B	HT-15
Orthophosphate as P	**0.11**	0.007	0.05	mg/l	"	LBH	0042330	04/22/20 08:30 04/22/20 08:30	SM4500 P E	
Phosphorus, Total	**0.10**	0.02	0.05	"	"	UM	0042230	04/22/20 12:00 04/23/20 14:25	EPA 365.1	
Total Dissolved Solids	**3320**	1.0	20.0	"	"	NLF	0042758	04/27/20 09:00 04/29/20 09:00	SM2540 C	
Sulfate as SO4	**853**	25.0	125	"	25	LBH	0051246	05/12/20 11:45 05/12/20 11:45	SM4500 SO4 E	
Turbidity	**1.60**	0.05	0.05	NTU	1	NLF	0042231	04/22/20 10:00 04/22/20 10:00	SM2130 B	
TEST (20D0672-05) Grnd-Water Sampled: 04/21/20 14:30 Received: 04/21/20 15:55										
Bicarbonate Alkalinity	**384**	5	5	mg CaCO3/L	1	LBH	0042356	04/23/20 09:22 04/23/20 09:22	SM2320B	
Carbonate Alkalinity	ND	5	5	"	"	LBH	"	04/23/20 09:22 04/23/20 09:22	"	
Hydroxide Alkalinity	ND	5	5	"	"	LBH	"	04/23/20 16:51 04/23/20 16:51	"	
Total Alkalinity	**384**	5	5	"	"	LBH	"	04/23/20 16:51 04/23/20 16:51	"	

Client Name:	Geoscience Support Services, Inc.		**EMA Log #: 20D0672**
Project Name:	GMGP Water Quality 2020		

Conventional Chemistry Parameters by Standard/EPA Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
TEST (20D0672-05) Grnd-Water	**Sampled: 04/21/20 14:30**	**Received: 04/21/20 15:55**								
Ammonia as N	**0.99**	0.02	0.10	mg/l	1	UM	0050447	05/05/20 12:10 05/05/20 14:26	EPA 350.1	
Chloride	**1290**	0.05	0.05	"	"	NLF	0042414	04/24/20 15:15 04/24/20 15:15	SM4500 Cl B	
Specific Conductance (EC)	**5440**	1.00	1.00	umhos/cm	"	LBH	0042237	04/22/20 12:50 04/22/20 12:50	SM2510 B	
Fluoride	**0.275**	0.031	0.100	mg/l	"	LBH	0042937	04/29/20 13:53 04/29/20 13:53	SM4500 F C	
Hardness (Total)	**1570**	10	10	mg CaCO3/L	"	ICP	0052751	05/27/20 11:47 05/28/20 15:06	EPA 200.7	
Nitrate as N	**0.05**	0.009	0.05	mg/l	"	UM	0050738	05/07/20 16:00 05/07/20 19:55	EPA 353.2	W-02
Nitrite as N	ND	0.007	0.05	"	"	UM	0042415	04/22/20 12:50 04/22/20 12:50	SM4500 NO2 B	
pH at 25 deg C	**7.04**	0.01	0.10	pH Units	"	NLF	0042234	04/21/20 17:05 04/21/20 17:05	SM4500-H+ B	HT-15
Orthophosphate as P	**0.33**	0.007	0.05	mg/l	"	LBH	0042330	04/22/20 08:30 04/22/20 08:30	SM4500 P E	
Phosphorus, Total	**0.32**	0.02	0.05	"	"	UM	0042230	04/22/20 12:00 04/23/20 14:25	EPA 365.1	
Total Dissolved Solids	**3500**	1.0	20.0	"	"	NLF	0042758	04/27/20 09:00 04/29/20 09:00	SM2540 C	
Sulfate as SO4	**802**	25.0	125	"	25	LBH	0051246	05/12/20 11:45 05/12/20 11:45	SM4500 SO4 E	
Turbidity	**6.50**	0.05	0.05	NTU	1	NLF	0042231	04/22/20 10:00 04/22/20 10:00	SM2130 B	

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20D0672
Project Name:	GMGP Water Quality 2020	

Miscellaneous Physical/Conventional Chemistry Parameters

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared / Sample Analyzed	Method	Notes
P2 (20D0672-01) Grnd-Water Sampled: 04/21/20 09:36 Received: 04/21/20 15:55										
Aggressive Index	**12.8**	1.00	1.00	N/A	1	MAR	0060459	06/04/20 15:15 06/05/20 07:54	Calculation	
adj-Sodium Adsorption Ratio	**9.78**	0.100	0.100	Ratio	"	MAR	0051855	05/18/20 08:33 05/18/20 08:43	Suarez-1981	
Langelier Index at 20 deg C	**0.77**	-3.00	-3.00	N/A	"	MAR	0061171	06/11/20 17:54 06/11/20 17:54	Calculation	
P11 B (20D0672-02) Grnd-Water Sampled: 04/21/20 10:55 Received: 04/21/20 15:55										
Aggressive Index	**12.2**	1.00	1.00	N/A	1	MAR	0060459	06/04/20 15:15 06/05/20 07:54	Calculation	
adj-Sodium Adsorption Ratio	**7.67**	0.100	0.100	Ratio	"	MAR	0051855	05/18/20 08:33 05/18/20 08:43	Suarez-1981	
Langelier Index at 20 deg C	**0.18**	-3.00	-3.00	N/A	"	MAR	0061171	06/11/20 17:54 06/11/20 17:54	Calculation	
P11 D (20D0672-03) Grnd-Water Sampled: 04/21/20 11:30 Received: 04/21/20 15:55										
Aggressive Index	**12.5**	1.00	1.00	N/A	1	MAR	0060459	06/04/20 15:15 06/05/20 07:54	Calculation	
adj-Sodium Adsorption Ratio	**9.12**	0.100	0.100	Ratio	"	MAR	0051855	05/18/20 08:33 05/18/20 08:43	Suarez-1981	
Langelier Index at 20 deg C	**0.51**	-3.00	-3.00	N/A	"	MAR	0061171	06/11/20 17:54 06/11/20 17:54	Calculation	
Gun R (20D0672-04) Grnd-Water Sampled: 04/21/20 12:45 Received: 04/21/20 15:55										
Aggressive Index	**12.7**	1.00	1.00	N/A	1	MAR	0060459	06/04/20 15:15 06/05/20 07:54	Calculation	
adj-Sodium Adsorption Ratio	**9.03**	0.100	0.100	Ratio	"	MAR	0051855	05/18/20 08:33 05/18/20 08:43	Suarez-1981	
Langelier Index at 20 deg C	**0.73**	-3.00	-3.00	N/A	"	MAR	0061171	06/11/20 17:54 06/11/20 17:54	Calculation	
TEST (20D0672-05) Grnd-Water Sampled: 04/21/20 14:30 Received: 04/21/20 15:55										
Aggressive Index	**12.7**	1.00	1.00	N/A	1	MAR	0060459	06/04/20 15:15 06/05/20 07:54	Calculation	
adj-Sodium Adsorption Ratio	**13.2**	0.100	0.100	Ratio	"	MAR	0051855	05/18/20 08:33 05/18/20 08:43	Suarez-1981	
Langelier Index at 20 deg C	**0.68**	-3.00	-3.00	N/A	"	MAR	0061171	06/11/20 17:54 06/11/20 17:54	Calculation	

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20D0672
Project Name:	GMGP Water Quality 2020	

Total Metals by EPA 200 Series Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0051171												
Blank (0051171-BLK1)					Prepared: 05/11/20 Analyzed: 05/12/20							
Barium	ND	0.0002	0.010	mg/l	MG							
Chromium	ND	0.0002	0.005	"	MG							
Copper	ND	0.0002	0.010	"	MG							
Iron	ND	0.002	0.050	"	MG							
Manganese	ND	0.0001	0.005	"	MG							
Zinc	ND	0.0003	0.020	"	MG							
LCS (0051171-BS1)					Prepared: 05/11/20 Analyzed: 05/12/20							
Barium	0.104	0.0002	0.010	mg/l	MG	0.100		104	85-115			
Chromium	0.100	0.0002	0.005	"	MG	0.100		100	85-115			
Copper	0.102	0.0002	0.010	"	MG	0.100		102	85-115			
Manganese	0.107	0.0001	0.005	"	MG	0.100		107	85-115			
Zinc	0.105	0.0003	0.020	"	MG	0.100		105	85-115			
Iron	0.102	0.002	0.050	"	MG	0.100		102	85-115			
LCS Dup (0051171-BSD1)					Prepared: 05/11/20 Analyzed: 05/12/20							
Barium	0.103	0.0002	0.010	mg/l	MG	0.100		103	85-115	0.5	20	
Iron	0.105	0.002	0.050	"	MG	0.100		105	85-115	3	20	
Manganese	0.107	0.0001	0.005	"	MG	0.100		107	85-115	0.3	20	
Copper	0.103	0.0002	0.010	"	MG	0.100		103	85-115	0.8	20	
Chromium	0.101	0.0002	0.005	"	MG	0.100		101	85-115	0.8	20	
Zinc	0.106	0.0003	0.020	"	MG	0.100		106	85-115	0.8	20	
Duplicate (0051171-DUP1)		**Source: 20D0527-06**			Prepared: 05/11/20 Analyzed: 05/12/20							
Barium	0.146	0.0002	0.010	mg/l	MG		0.151			3	20	
Zinc	0.077	0.0003	0.020	"	MG		0.033			81	20	QR-06
Chromium	0.0008	0.0002	0.005	"	MG		0.0007			23	20	QR-04, J
Copper	0.002	0.0002	0.010	"	MG		0.002			21	20	QR-04, J
Manganese	0.146	0.0001	0.005	"	MG		0.119			20	20	
Iron	1.82	0.017	0.500	"	MG		1.88			3	20	

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20D0672
Project Name:	GMGP Water Quality 2020	

Total Metals by EPA 200 Series Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0051171												
Matrix Spike (0051171-MS1)		**Source: 20D0527-06**			Prepared: 05/11/20 Analyzed: 05/12/20							
Barium	0.246	0.0002	0.010	mg/l	MG	0.100	0.151	94	70-130			
Chromium	0.104	0.0002	0.005	"	MG	0.100	0.0007	103	70-130			
Copper	0.106	0.0002	0.010	"	MG	0.100	0.002	104	70-130			
Manganese	0.233	0.0001	0.005	"	MG	0.100	0.119	114	70-130			
Zinc	0.146	0.0003	0.020	"	MG	0.100	0.033	113	70-130			
Iron	2.00	0.017	0.500	"	MG	0.100	1.88	116	70-130			
Matrix Spike (0051171-MS2)		**Source: 20D0226-02**			Prepared: 05/11/20 Analyzed: 05/12/20							
Barium	0.116	0.0002	0.010	mg/l	MG	0.100	0.009	107	70-130			
Manganese	0.118	0.0001	0.005	"	MG	0.100	0.006	112	70-130			
Chromium	0.106	0.0002	0.005	"	MG	0.100	0.0008	105	70-130			
Iron	0.312	0.002	0.050	"	MG	0.100	0.187	125	70-130			
Copper	0.141	0.0002	0.010	"	MG	0.100	0.029	112	70-130			
Zinc	0.248	0.0003	0.020	"	MG	0.100	0.134	114	70-130			
Matrix Spike Dup (0051171-MSD1)		**Source: 20D0527-06**			Prepared: 05/11/20 Analyzed: 05/12/20							
Barium	0.254	0.0002	0.010	mg/l	MG	0.100	0.151	103	70-130	4	20	
Chromium	0.102	0.0002	0.005	"	MG	0.100	0.0007	102	70-130	1	20	
Iron	1.88	0.017	0.500	"	MG	0.100	1.88	NR	70-130	6	20	QM-4X
Copper	0.106	0.0002	0.010	"	MG	0.100	0.002	104	70-130	0.1	20	
Manganese	0.215	0.0001	0.005	"	MG	0.100	0.119	96	70-130	8	20	
Zinc	0.125	0.0003	0.020	"	MG	0.100	0.033	92	70-130	15	20	
Batch 0052751												
Blank (0052751-BLK1)					Prepared: 05/27/20 Analyzed: 05/28/20							
Boron	ND	0.25	0.50	mg/l	ICP							
Magnesium	ND	0.100	0.500	"	ICP							
Sodium	ND	0.04	0.50	"	ICP							
Potassium	ND	1.00	1.00	"	ICP							
Calcium	ND	0.10	0.50	"	ICP							

Client Name: Geoscience Support Services, Inc. **EMA Log #: 20D0672**

Project Name: GMGP Water Quality 2020

Total Metals by EPA 200 Series Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0052751												
LCS (0052751-BS1)					Prepared: 05/27/20 Analyzed: 05/28/20							
Magnesium	1.08	0.100	0.500	mg/l	ICP	1.00		108	85-115			
Boron	1.09	0.25	0.50	"	ICP	1.00		109	85-115			
Calcium	1.13	0.10	0.50	"	ICP	1.00		113	85-115			
Sodium	ND	0.04	0.50	"	MEG	1.00			85-115			
Potassium	10.9	1.00	1.00	"	ICP	10.0		109	85-115			
LCS (0052751-BS2)					Prepared: 05/27/20 Analyzed: 05/28/20							
Potassium	5.36	1.00	1.00	mg/l	ICP	5.00		107	85-115			
Boron	ND	0.25	0.50	"	ICP				85-115			
Sodium	5.34	0.04	0.50	"	ICP	5.00		107	85-115			
Magnesium	5.68	0.100	0.500	"	ICP	5.00		114	85-115			
Calcium	5.11	0.10	0.50	"	ICP	5.00		102	85-115			
LCS Dup (0052751-BSD1)					Prepared: 05/27/20 Analyzed: 05/28/20							
Potassium	10.8	1.00	1.00	mg/l	ICP	10.0		108	85-115	0.5	20	
Magnesium	1.07	0.100	0.500	"	ICP	1.00		107	85-115	0.2	20	
Calcium	1.13	0.10	0.50	"	ICP	1.00		113	85-115	0.09	20	
Boron	1.12	0.25	0.50	"	ICP	1.00		112	85-115	3	20	
Sodium	ND	0.04	0.50	"	MEG	1.00			85-115		20	
LCS Dup (0052751-BSD2)					Prepared: 05/27/20 Analyzed: 05/28/20							
Potassium	5.14	1.00	1.00	mg/l	ICP	5.00		103	85-115	4	20	
Calcium	5.08	0.10	0.50	"	ICP	5.00		102	85-115	0.6	20	
Magnesium	5.77	0.100	0.500	"	ICP	5.00		115	85-115	2	20	
Boron	ND	0.25	0.50	"	ICP				85-115		20	
Sodium	5.39	0.04	0.50	"	ICP	5.00		108	85-115	1	20	
Duplicate (0052751-DUP1)		**Source: 20D0880-02**			Prepared: 05/27/20 Analyzed: 05/28/20							
Boron	ND	0.25	0.50	mg/l	ICP		ND				20	
Magnesium	99.4	0.100	0.500	"	ICP		110			10	20	
Potassium	ND	1.00	1.00	"	ICP		ND				20	
Sodium	99.6	0.04	0.50	"	ICP		104			5	20	
Calcium	206	0.50	2.50	"	ICP		212			3	20	

Client Name:	Geoscience Support Services, Inc.
Project Name:	GMGP Water Quality 2020

EMA Log #: 20D0672

Total Metals by EPA 200 Series Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0052751												
Matrix Spike (0052751-MS1)		**Source: 20D0880-02**			Prepared: 05/27/20 Analyzed: 05/28/20							
Potassium	11.0	1.00	1.00	mg/l	ICP	10.0	ND	110	75-125			
Boron	1.16	0.25	0.50	"	ICP	1.00	ND	116	75-125			
Magnesium	99.0	0.100	0.500	"	ICP	1.00	110	NR	75-125			QM-4X
Calcium	211	0.50	2.50	"	ICP	1.00	212	NR	75-125			QM-4X
Sodium	103	0.04	0.50	"	ICP	1.00	104	NR	75-125			QM-4X
Matrix Spike (0052751-MS2)		**Source: 20D0856-01**			Prepared: 05/27/20 Analyzed: 05/28/20							
Boron	1.54	0.25	0.50	mg/l	ICP	1.00	0.51	103	75-125			
Potassium	26.0	1.00	1.00	"	ICP	10.0	15.5	105	75-125			
Magnesium	38.4	0.100	0.500	"	ICP	1.00	33.9	451	75-125			QM-4X
Sodium	160	0.04	0.50	"	ICP	1.00	154	600	75-125			QM-4X
Calcium	74.6	0.10	0.50	"	ICP	1.00	76.4	NR	75-125			QM-4X
Matrix Spike Dup (0052751-MSD1)		**Source: 20D0880-02**			Prepared: 05/27/20 Analyzed: 05/28/20							
Boron	1.15	0.25	0.50	mg/l	ICP	1.00	ND	115	75-125	1	20	
Potassium	11.3	1.00	1.00	"	ICP	10.0	ND	113	75-125	2	20	
Calcium	215	0.50	2.50	"	ICP	1.00	212	340	75-125	2	20	QM-4X
Magnesium	103	0.100	0.500	"	ICP	1.00	110	NR	75-125	4	20	QM-4X
Sodium	99.1	0.04	0.50	"	ICP	1.00	104	NR	75-125	4	20	QM-4X

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20D0672
Project Name:	GMGP Water Quality 2020	

Metals (Dissolved) by EPA 200 Series Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0051181												
Blank (0051181-BLK1)					Prepared: 05/11/20 Analyzed: 05/12/20							
Barium	ND	0.0002	0.010	mg/l	MG							
Chromium	ND	0.0002	0.005	"	MG							
Manganese	ND	0.0001	0.005	"	MG							
Copper	ND	0.001	0.010	"	MG							
Iron	ND	0.002	0.050	"	MG							
Zinc	ND	0.0003	0.020	"	MG							
LCS (0051181-BS1)					Prepared: 05/11/20 Analyzed: 05/12/20							
Chromium	0.099	0.0002	0.005	mg/l	MG	0.100		99	75-125			
Barium	0.101	0.0002	0.010	"	MG	0.100		101	85-115			
Manganese	0.105	0.0001	0.005	"	MG	0.100		105	85-115			
Iron	0.102	0.002	0.050	"	MG	0.100		102	85-115			
Zinc	0.101	0.0003	0.020	"	MG	0.100		101	85-115			
Copper	0.100	0.001	0.010	"	MG	0.100		100	85-115			
LCS Dup (0051181-BSD1)					Prepared: 05/11/20 Analyzed: 05/12/20							
Manganese	0.103	0.0001	0.005	mg/l	MG	0.100		103	85-115	2	20	
Chromium	0.097	0.0002	0.005	"	MG	0.100		97	75-125	1	20	
Barium	0.095	0.0002	0.010	"	MG	0.100		95	85-115	7	20	
Iron	0.101	0.002	0.050	"	MG	0.100		101	85-115	1	20	
Zinc	0.100	0.0003	0.020	"	MG	0.100		100	85-115	1	20	
Copper	0.099	0.001	0.010	"	MG	0.100		99	85-115	1	20	
Duplicate (0051181-DUP1)		**Source: 20D0226-02**			Prepared: 05/11/20 Analyzed: 05/12/20							
Manganese	0.002	0.0001	0.005	mg/l	MG		0.002			1	20	J
Chromium	0.0004	0.0002	0.005	"	MG		0.0004			7	20	J
Barium	0.006	0.0002	0.010	"	MG		0.005			11	20	J
Zinc	0.109	0.0003	0.020	"	MG		0.108			0.8	20	
Iron	0.008	0.002	0.050	"	MG		0.008			0.5	20	J
Copper	0.022	0.001	0.010	"	MG		0.021			1	20	

Metals (Dissolved) by EPA 200 Series Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0051181												
Matrix Spike (0051181-MS1)		**Source: 20D0226-02**			Prepared: 05/11/20 Analyzed: 05/12/20							
Manganese	0.105	0.0001	0.005	mg/l	MG	0.100	0.002	103	70-130			
Chromium	0.097	0.0002	0.005	"	MG	0.100	0.0004	96	75-125			
Barium	0.100	0.0002	0.010	"	MG	0.100	0.005	95	70-130			
Copper	0.120	0.001	0.010	"	MG	0.100	0.021	98	70-130			
Iron	0.109	0.002	0.050	"	MG	0.100	0.008	101	70-130			
Zinc	0.206	0.0003	0.020	"	MG	0.100	0.108	98	70-130			
Matrix Spike Dup (0051181-MSD1)		**Source: 20D0226-02**			Prepared: 05/11/20 Analyzed: 05/12/20							
Barium	0.102	0.0002	0.010	mg/l	MG	0.100	0.005	97	70-130	2	20	
Manganese	0.105	0.0001	0.005	"	MG	0.100	0.002	102	70-130	0.6	20	
Chromium	0.096	0.0002	0.005	"	MG	0.100	0.0004	95	75-125	0.9	20	
Iron	0.107	0.002	0.050	"	MG	0.100	0.008	99	70-130	2	20	
Zinc	0.205	0.0003	0.020	"	MG	0.100	0.108	98	70-130	0.2	20	
Copper	0.118	0.001	0.010	"	MG	0.100	0.021	97	70-130	1	20	
Batch 0060145												
Blank (0060145-BLK1)					Prepared: 06/01/20 Analyzed: 06/02/20							
Magnesium	ND	0.50	1.00	mg/l	ICP							
Boron	ND	0.25	0.50	"	ICP							
Potassium	ND	1.00	1.00	"	ICP							
Calcium	ND	0.10	0.50	"	ICP							
Sodium	ND	0.04	0.50	"	ICP							
LCS (0060145-BS1)					Prepared: 06/01/20 Analyzed: 06/11/20							
Calcium	2.75	0.10	0.50	mg/l	ICP	1.00		275	85-115			
Sodium	4.00	0.04	0.50	"	ICP	1.00		400	85-115			
Magnesium	1.10	0.50	1.00	"	ICP	1.00		110	85-115			
Potassium	11.0	1.00	1.00	"	ICP	10.0		110	85-115			
Boron	1.13	0.25	0.50	"	ICP	1.00		113	85-115			

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20D0672
Project Name:	GMGP Water Quality 2020	

Metals (Dissolved) by EPA 200 Series Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0060145												
LCS (0060145-BS2)					Prepared: 06/01/20 Analyzed: 06/11/20							
Boron	ND	0.25	0.50	mg/l	ICP				85-115			
Sodium	5.41	0.04	0.50	"	ICP	5.00		108	85-115			
Calcium	5.38	0.10	0.50	"	ICP	5.00		108	85-115			
Magnesium	6.32	0.50	1.00	"	ICP	5.00		126	85-115			
Potassium	5.50	1.00	1.00	"	ICP	5.00		110	85-115			
LCS Dup (0060145-BSD1)					Prepared: 06/01/20 Analyzed: 06/11/20							
Calcium	2.77	0.10	0.50	mg/l	ICP	1.00		277	85-115	0.9	20	
Sodium	3.98	0.04	0.50	"	ICP	1.00		398	85-115	0.4	20	
Magnesium	1.14	0.50	1.00	"	ICP	1.00		114	85-115	3	20	
Boron	1.12	0.25	0.50	"	ICP	1.00		112	85-115	0.2	20	
Potassium	11.0	1.00	1.00	"	ICP	10.0		110	85-115	0.09	20	
LCS Dup (0060145-BSD2)					Prepared: 06/01/20 Analyzed: 06/11/20							
Calcium	5.34	0.10	0.50	mg/l	ICP	5.00		107	85-115	0.8	20	
Potassium	5.40	1.00	1.00	"	ICP	5.00		108	85-115	2	20	
Boron	ND	0.25	0.50	"	ICP				85-115		20	
Magnesium	6.26	0.50	1.00	"	ICP	5.00		125	85-115	0.8	20	
Sodium	5.29	0.04	0.50	"	ICP	5.00		106	85-115	2	20	
Duplicate (0060145-DUP1)	**Source: 20D0672-01**				Prepared: 06/01/20 Analyzed: 06/02/20							
Sodium	944	1.00	12.5	mg/l	ICP		954			1	20	
Potassium	16.5	1.00	1.00	"	ICP		17.0			3	20	
Boron	0.47	0.25	0.50	"	ICP		0.46			0.7	20	J
Magnesium	352	2.50	5.00	"	ICP		355			0.8	20	
Calcium	538	0.50	2.50	"	ICP		546			2	20	
Matrix Spike (0060145-MS1)	**Source: 20D0672-01**				Prepared: 06/01/20 Analyzed: 06/02/20							
Magnesium	317	2.50	5.00	mg/l	ICP	1.00	355	NR	75-125			QM-4X
Calcium	516	0.50	2.50	"	ICP	1.00	546	NR	75-125			QM-4X
Boron	1.41	0.25	0.50	"	ICP	1.00	0.46	95	75-125			
Sodium	867	0.20	2.50	"	ICP	1.00	954	NR	75-125			QM-4X
Potassium	26.4	1.00	1.00	"	ICP	10.0	17.0	94	75-125			

Client Name:	Geoscience Support Services, Inc.	EMA Log #:	**20D0672**
Project Name:	GMGP Water Quality 2020		

Metals (Dissolved) by EPA 200 Series Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0060145												
Matrix Spike Dup (0060145-MSD1)		**Source: 20D0672-01**			Prepared: 06/01/20 Analyzed: 06/02/20							
Boron	1.37	0.25	0.50	mg/l	ICP	1.00	0.46	90	75-125	3	20	
Calcium	496	0.50	2.50	"	ICP	1.00	546	NR	75-125	4	20	QM-4X
Magnesium	306	2.50	5.00	"	ICP	1.00	355	NR	75-125	4	20	QM-4X
Potassium	26.8	1.00	1.00	"	ICP	10.0	17.0	98	75-125	2	20	
Sodium	828	0.20	2.50	"	ICP	1.00	954	NR	75-125	5	20	QM-4X

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20D0672
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0042230												
Blank (0042230-BLK1)					Prepared: 04/22/20 Analyzed: 04/23/20							
Phosphorus, Total	ND	0.02	0.05	mg/l	UM							
LCS (0042230-BS1)					Prepared: 04/22/20 Analyzed: 04/23/20							
Phosphorus, Total	0.49	0.02	0.05	mg/l	UM	0.500		98	90-110			
LCS Dup (0042230-BSD1)					Prepared: 04/22/20 Analyzed: 04/23/20							
Phosphorus, Total	0.49	0.02	0.05	mg/l	UM	0.500		99	90-110	0.6	20	
Duplicate (0042230-DUP1)	**Source: 20D0225-01**				Prepared: 04/22/20 Analyzed: 04/23/20							
Phosphorus, Total	0.08	0.02	0.05	mg/l	UM		0.07			11	20	
Matrix Spike (0042230-MS1)	**Source: 20D0225-01**				Prepared: 04/22/20 Analyzed: 04/23/20							
Phosphorus, Total	1.05	0.04	0.10	mg/l	UM	1.00	0.07	98	90-110			
Matrix Spike Dup (0042230-MSD1)	**Source: 20D0225-01**				Prepared: 04/22/20 Analyzed: 04/23/20							
Phosphorus, Total	1.07	0.04	0.10	mg/l	UM	1.00	0.07	100	90-110	2	20	
Batch 0042231												
Duplicate (0042231-DUP1)	**Source: 20D0614-01**				Prepared & Analyzed: 04/21/20							
Turbidity	0.10	0.05	0.05	NTU	NLF		0.10			0	20	
Reference (0042231-SRM1)					Prepared & Analyzed: 04/21/20							
Turbidity	4.20	0.05	0.05	NTU	NLF	4.50		93	84.7-131			
Batch 0042234												
Duplicate (0042234-DUP1)	**Source: 20D0672-01**				Prepared & Analyzed: 04/21/20							
pH at 25 deg C	7.04	0.01	0.10	pH Units	NLF		7.03			0.3	20	

Client Name:	Geoscience Support Services, Inc.	**EMA Log #: 20D0672**
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0042234												
Reference (0042234-SRM1)					Prepared & Analyzed: 04/21/20							
pH at 25 deg C	6.50	0.01	0.10	pH Units	NLF	6.39		102	96.87-103.12			
Batch 0042237												
Duplicate (0042237-DUP1)		**Source: 20D0607-01**			Prepared & Analyzed: 04/22/20							
Specific Conductance (EC)	5740	1.00	1.00	umhos/cm	LBH		5770			0.5	20	
Reference (0042237-SRM1)					Prepared & Analyzed: 04/22/20							
Specific Conductance (EC)	445	1.00	1.00	umhos/cm	LBH	444		100	90.09-110.13			
Batch 0042330												
Blank (0042330-BLK1)					Prepared & Analyzed: 04/22/20							
Orthophosphate as P	ND	0.007	0.05	mg/l	LBH							
LCS (0042330-BS1)					Prepared & Analyzed: 04/22/20							
Orthophosphate as P	0.49	0.007	0.05	mg/l	LBH	0.500		99	80-120			
LCS Dup (0042330-BSD1)					Prepared & Analyzed: 04/22/20							
Orthophosphate as P	0.49	0.007	0.05	mg/l	LBH	0.500		98	80-120	0.6	20	
Duplicate (0042330-DUP1)		**Source: 20D0615-05**			Prepared & Analyzed: 04/22/20							
Orthophosphate as P	0.31	0.007	0.05	mg/l	LBH		0.32			1	20	
Matrix Spike (0042330-MS1)		**Source: 20D0615-05**			Prepared & Analyzed: 04/22/20							
Orthophosphate as P	0.81	0.007	0.05	mg/l	LBH	0.500	0.32	98	80-120			

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0042330												
Matrix Spike Dup (0042330-MSD1)	**Source: 20D0615-05**				Prepared & Analyzed: 04/22/20							
Orthophosphate as P	0.80	0.007	0.05	mg/l	LBH	0.500	0.32	97	80-120	0.5	20	
Batch 0042356												
Duplicate (0042356-DUP1)	**Source: 20D0683-03**				Prepared & Analyzed: 04/23/20							
Hydroxide Alkalinity	ND	5	5	mg CaCO3/L	LBH		ND				20	
Carbonate Alkalinity	ND	5	5	"	LBH		ND				20	
Bicarbonate Alkalinity	ND	5	5	"	LBH		ND				20	
Total Alkalinity	300	5	5	"	LBH		280			7	20	
Reference (0042356-SRM1)					Prepared & Analyzed: 04/23/20							
Hydroxide Alkalinity	ND	5	5	mg CaCO3/L	LBH	0.00			0-0			
Carbonate Alkalinity	ND	5	5	"	LBH	0.00			0-0			
Bicarbonate Alkalinity	32	5	5	"	LBH	138		23	55.03-145.69			
Total Alkalinity	32	5	5	"	LBH	138		23	55.03-145.69			
Batch 0042414												
Blank (0042414-BLK1)					Prepared & Analyzed: 04/24/20							
Chloride	ND	0.05	0.05	mg/l	NLF							
LCS (0042414-BS1)					Prepared & Analyzed: 04/24/20							
Chloride	180	0.05	0.05	mg/l	NLF	200		90	80-120			
LCS Dup (0042414-BSD1)					Prepared & Analyzed: 04/24/20							
Chloride	190	0.05	0.05	mg/l	NLF	200		95	80-120	5	20	

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20D0672
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Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0042414												
Duplicate (0042414-DUP1)		**Source: 20D0702-01**			Prepared & Analyzed: 04/24/20							
Chloride	1820	0.05	0.05	mg/l	NLF		1820			0	20	
Matrix Spike (0042414-MS1)		**Source: 20D0702-01**			Prepared & Analyzed: 04/24/20							
Chloride	2050	0.06	0.06	mg/l	NLF	200	1820	115	80-120			
Matrix Spike Dup (0042414-MSD1)		**Source: 20D0702-01**			Prepared & Analyzed: 04/24/20							
Chloride	2040	0.06	0.06	mg/l	NLF	200	1820	109	80-120	0.6	20	
Reference (0042414-SRM1)					Prepared & Analyzed: 04/24/20							
Chloride	48.0	0.05	0.05	mg/l	NLF	47.7		101	86.58-113.83			
Reference (0042414-SRM2)					Prepared & Analyzed: 04/24/20							
Chloride	49.0	0.05	0.05	mg/l	NLF	47.7		103	86.58-113.83			
Batch 0042415												
Blank (0042415-BLK1)					Prepared & Analyzed: 04/22/20							
Nitrite as N	ND	0.007	0.05	mg/l	UM							
LCS (0042415-BS1)					Prepared & Analyzed: 04/22/20							
Nitrite as N	0.10	0.007	0.05	mg/l	UM	0.100		102	80-120			
LCS Dup (0042415-BSD1)					Prepared & Analyzed: 04/22/20							
Nitrite as N	0.10	0.007	0.05	mg/l	UM	0.100		102	80-120	0	20	
Duplicate (0042415-DUP1)		**Source: 20D0635-01**			Prepared & Analyzed: 04/22/20							
Nitrite as N	ND	0.007	0.05	mg/l	UM		ND				20	

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20D0672
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0042415												
Matrix Spike (0042415-MS1)	**Source: 20D0635-01**				Prepared & Analyzed: 04/22/20							
Nitrite as N	0.10	0.007	0.05	mg/l	UM	0.100	ND	98	80-120			
Matrix Spike Dup (0042415-MSD1)	**Source: 20D0635-01**				Prepared & Analyzed: 04/22/20							
Nitrite as N	0.10	0.007	0.05	mg/l	UM	0.100	ND	99	80-120	1	20	
Batch 0042758												
Blank (0042758-BLK1)					Prepared: 04/27/20 Analyzed: 04/29/20							
Total Dissolved Solids	ND	1.0	20.0	mg/l	NLF							
Duplicate (0042758-DUP1)	**Source: 20D0673-02**				Prepared: 04/27/20 Analyzed: 04/29/20							
Total Dissolved Solids	598	1.0	20.0	mg/l	NLF		603			0.8	20	
Reference (0042758-SRM1)					Prepared: 04/27/20 Analyzed: 04/29/20							
Total Dissolved Solids	342	1.0	20.0	mg/l	NLF	328		104	86.28-113.72			
Batch 0042937												
Blank (0042937-BLK1)					Prepared & Analyzed: 04/29/20							
Fluoride	ND	0.031	0.100	mg/l	LBH							
LCS (0042937-BS1)					Prepared & Analyzed: 04/29/20							
Fluoride	0.980	0.031	0.100	mg/l	LBH	1.00		98	80-120			
LCS Dup (0042937-BSD1)					Prepared & Analyzed: 04/29/20							
Fluoride	0.980	0.031	0.100	mg/l	LBH	1.00		98	80-120	0	20	

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20D0672
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0042937												
Duplicate (0042937-DUP1)		**Source: 20D0856-01**			Prepared & Analyzed: 04/29/20							
Fluoride	0.606	0.031	0.100	mg/l	LBH		0.610			0.7	20	
Matrix Spike (0042937-MS1)		**Source: 20D0856-01**			Prepared & Analyzed: 04/29/20							
Fluoride	1.60	0.062	0.200	mg/l	LBH	1.00	0.610	99	80-120			
Matrix Spike Dup (0042937-MSD1)		**Source: 20D0856-01**			Prepared & Analyzed: 04/29/20							
Fluoride	1.60	0.062	0.200	mg/l	LBH	1.00	0.610	99	80-120	0	20	
Batch 0050447												
Blank (0050447-BLK1)					Prepared & Analyzed: 05/05/20							
Ammonia as N	ND	0.02	0.10	mg/l	UM							
LCS (0050447-BS1)					Prepared & Analyzed: 05/05/20							
Ammonia as N	0.96	0.02	0.10	mg/l	UM	1.00		96	90-110			
LCS Dup (0050447-BSD1)					Prepared & Analyzed: 05/05/20							
Ammonia as N	0.97	0.02	0.10	mg/l	UM	1.00		97	90-110	1	20	
Duplicate (0050447-DUP1)		**Source: 20D0865-03**			Prepared & Analyzed: 05/05/20							
Ammonia as N	0.06	0.02	0.10	mg/l	UM		0.06			2	20	J
Matrix Spike (0050447-MS1)		**Source: 20D0865-03**			Prepared & Analyzed: 05/05/20							
Ammonia as N	2.01	0.04	0.20	mg/l	UM	2.00	0.06	98	90-110			
Matrix Spike Dup (0050447-MSD1)		**Source: 20D0865-03**			Prepared & Analyzed: 05/05/20							
Ammonia as N	2.00	0.04	0.20	mg/l	UM	2.00	0.06	97	90-110	0.6	20	

Client Name:	Geoscience Support Services, Inc.	EMA Log #:	20D0672
Project Name:	GMGP Water Quality 2020		

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0050738												
Blank (0050738-BLK1)					Prepared & Analyzed: 05/07/20							
Nitrate as N	ND	0.009	0.05	mg/l	UM							
LCS (0050738-BS1)					Prepared & Analyzed: 05/07/20							
Nitrate as N	0.49	0.009	0.05	mg/l	UM	0.500		99	90-110			
LCS Dup (0050738-BSD1)					Prepared & Analyzed: 05/07/20							
Nitrate as N	0.50	0.009	0.05	mg/l	UM	0.500		99	90-110	0.4	20	
Duplicate (0050738-DUP1)		**Source: 20D0730-01**			Prepared & Analyzed: 05/07/20							
Nitrate as N	0.02	0.009	0.05	mg/l	UM		0.02			5	20	J
Matrix Spike (0050738-MS1)		**Source: 20D0730-01**			Prepared & Analyzed: 05/07/20							
Nitrate as N	1.00	0.02	0.10	mg/l	UM	1.00	0.02	98	90-110			
Matrix Spike Dup (0050738-MSD1)		**Source: 20D0730-01**			Prepared & Analyzed: 05/07/20							
Nitrate as N	1.02	0.02	0.10	mg/l	UM	1.00	0.02	100	90-110	1	20	
Batch 0051246												
Blank (0051246-BLK1)					Prepared & Analyzed: 05/12/20							
Sulfate as SO4	2.0	1.0	5.0	mg/l	LBH							J
LCS (0051246-BS1)					Prepared & Analyzed: 05/12/20							
Sulfate as SO4	9.4	1.0	5.0	mg/l	LBH	10.0		94	80-120			
LCS Dup (0051246-BSD1)					Prepared & Analyzed: 05/12/20							
Sulfate as SO4	9.3	1.0	5.0	mg/l	LBH	10.0		93	80-120	0.3	20	

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20D0672
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0051246												
Duplicate (0051246-DUP1)	**Source: 20D0672-03**				Prepared & Analyzed: 05/12/20							
Sulfate as SO4	351	25.0	125	mg/l	LBH		346			1	20	
Matrix Spike (0051246-MS1)	**Source: 20D0672-03**				Prepared & Analyzed: 05/12/20							
Sulfate as SO4	607	25.0	125	mg/l	LBH	250	346	104	80-120			
Matrix Spike Dup (0051246-MSD1)	**Source: 20D0672-03**				Prepared & Analyzed: 05/12/20							
Sulfate as SO4	612	25.0	125	mg/l	LBH	250	346	106	80-120	0.7	20	
Batch 0052751												
Blank (0052751-BLK1)					Prepared: 05/27/20 Analyzed: 05/28/20							
Hardness (Total)	ND	10	10	mg CaCO3/L	ICP							
Duplicate (0052751-DUP1)	**Source: 20D0880-02**				Prepared: 05/27/20 Analyzed: 05/28/20							
Hardness (Total)	925	10	10	mg CaCO3/L	ICP		983			6	20	
Batch 0060145												
Blank (0060145-BLK1)					Prepared: 06/01/20 Analyzed: 06/02/20							
Hardness (Dissolved)	ND	10	10	mg CaCO3/L	ICP							
Duplicate (0060145-DUP1)	**Source: 20D0672-01**				Prepared: 06/01/20 Analyzed: 06/02/20							
Hardness (Dissolved)	2790	10	10	mg CaCO3/L	ICP		2830			1	20	

Notes and Definitions

W-02	The sample for nitrate analysis was preserved with H2SO4 after the nitrite portion of the analysis was completed to extend the holding time for the sample. Nitrate results are corrected for the nitrite contribution per the method.
QR-06	The RPD value was exceeded due to the sample concentration being less than 10 times the reporting limit. The QC batch was accepted based on the LCS or QCS results.
QR-04	The RPD between the sample and sample duplicate is not valid since both results are below the reporting limit for this analyte.
QM-4X	The spike recovery was outside of the QC acceptance limits for the MS and/or MSD due to analyte concentration at 4 times or greater the spike concentration. The QC batch was accepted based on LCS and/or LCSD recoveries within the acceptance limits.
J	Detected but below the Reporting Limit; therefore, result is an estimated concentration (CLP J-Flag).
HT-15	This sample was received outside of the EPA's recommended 15 minute holding time for this analysis. However, the sample was analyzed immediately upon receipt.
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis (if indicated in units column)
RPD	Relative Percent Difference
MDL	Method detection limit (indicated per client's request)

CHAIN-OF-CUSTODY RECORD 2010572 - EnviroMatrix (EMA) Analytical, Inc.

4340 Viewridge Ave., Ste. A - San Diego, CA 92123 - Phone (858) 560-7717 - Fax (858) 560-7763

EMA LOG #:
Client: GEOSCIENCE
Attn: NATHAN REYNOLDS
Samplers(s): IKG Environmental Inc
Address:
Phone: 909-576-8922 Fax:
Email: nreynolds@geosciencewater.com
Billing Address:
Project ID:
Project #: OMWD PUMPTEST PO #:

Requested Analysis

ID #	Client Sample ID	Sample Date	Sample Time	Sample Matrix	Container # / Type	Oil & Grease □ 413.1 □ 413.2 □ 1664	8015 (TPH) □ Gas □ Diesel □ Ext	624/8260 (VOC) Full BTXE MTBE Oxy Nap	625 / 8270 (SVOC) □ PAH only	608 / 8081 (Organochlorine Pesticides)	608 / 8082 (Polychlorinated Biphenyls)	8141 (Organophosphorus Pesticides)	TBT (Organotin Compounds)	□ pH □ EC □ TSS □TDS	□ Nitrate □ Nitrite □ N-N □ TKN □NH3	CAC Title 22/CAM17 Metals □ TTLC □ STLC	TCLP (RCRA) □ Metals □ Organics	Cd Cr Cu Pb Ni Ag Zn □ Dissolved	Coliform, □ Total (MTF) □ Fecal (MTF)	Colilert, T+E.Coli □ P/A □ Enumeration	Enterococcus, □ MTF □ Enterolert	Heterotrophic Plate Count (HPC)	□ BOD □ COD □ Cyanide	LAB FILTER		SEE ATTACHED
1	P2	4-21	936	GW	5																			X		X
2	P11 B	↓	1055	↓	5																					X
3	P11 D		1130		5																					X
4	GUN R		1245		5																					X
5	TEST		1430		5																					X
6																										
7																										
8																										
9																										
10																										

Matrix Codes: A = Air, DW = Drinking Water, GW = Groundwater, SW = Storm Water
WW = Wastewater, S = Soil, SED = Sediment, SD = Solid, T = Tissue, O = Oil, L = Liquid
Shipped By: □ Courier □ UPS □ FedEx □ USPS □ Client Drop Off □ Other
[1]Turn-Around-Time: □ Same Day □ 1 day □ 2 day □ 3 day □ 4 day □ 5 day □ STD (7-business days)
[1]Reporting Requirements: □ Fax □ PDF □ Excel □ Geotracker/EDF □ Hard Copy □ EDT □ CEDEN □ SDWIS
[1]Sample Disposal: □ By Laboratory □ [2]Return to Client: P/U or Delivery □ Archive

Sample Integrity

Correct Containers: Yes No N/A	Containers Properly Preseved: Yes No N/A
Custody Seals Intact: Yes No N/A	Temp @ Receipt: 6° Lento
COC/Labels Agree: Yes No N/A	Sampled By: Client EMA Autosampler

RELINQUISHED BY	DATE/TIME	RECEIVED BY
Signature: [signature] Print: IAN GOLTZ Company: IKG	4/21/20 1555	Signature: [signature] Print: [illegible] Company: [illegible]
Signature: Print: Company:		Signature: Print: Company:
Signature: Print: Company:		Signature: Print: Company:

Project/Sample Location/Address:

Project/Sample Comments: Nathan Reynold is P.M @ nreynolds@geosciencewater.com

[1]Additional costs may apply. Please note there is a $35 minimum charge for all clients.
[2]EMA reserves the right to return any samples that do not match our waste profile.
NOTE: By relinquishing samples to EMA, Inc., client agrees to pay for the services requested on this COC form and any additional analyses performed on this project. Payment for services is due within 30 days from date of invoice. Samples will be disposed of 7 days after report has been finalized unless otherwise noted. All work is subject to EMA's terms and conditions.

EnviroMatrix Analytical, Inc.

(x5) x2 16 oz Jar Ø
x1 125 H2SO4 Jar
x2 125 HNO3 Jar
x1 125 Jar Ø

Analytical Services Quotation

x-2-5

GMGP Water Quality 2020
Geoscience Support Services, Inc.
Nathan Reynolds

Bid Date: 04/17/2020
Bid Expires: 04/17/2021
Prices Expire: 04/17/2021

Matrix	Parameters	Method	#	TAT (days)	Unit Price	Extended Price
Water	Aggressive Index (calc)(LAB)	-	5	7	$5.00	$25.00
Water	Alkalinity (All Forms)	varies	5	7	$25.00	$125.00
Water	Hexavalent Chromium	EPA 218.6	5	7	$105.00	$525.00
Water	Langelier Index (Calc)	-	5	7	$5.00	$25.00
Water	Barium (Total)	EPA 200.8	5	7	$10.00	$50.00
Water	Boron (Total)	EPA 200.7	5	7	$10.00	$50.00
Water	Calcium (Total)	EPA 200.7	5	7	$10.00	$50.00
Water	Chromium (Total)	EPA 200.8	5	7	$10.00	$50.00
Water	Copper (Total)	EPA 200.8	5	7	$10.00	$50.00
Water	Iron (Total)	EPA 200.8	5	7	$10.00	$50.00
Water	Magnesium (Total)	EPA 200.7	5	7	$10.00	$50.00
Water	Manganese (Total)	EPA 200.8	5	7	$10.00	$50.00
Water	Potassium (Total)	EPA 200.7	5	7	$10.00	$50.00
Water	Silicon (Total)	EPA 200.7	5	7	$35.00	$175.00
Water	Sodium (Total)	EPA 200.7	5	7	$10.00	$50.00
Water	Strontium (Total)	EPA 200.7	5	7	$45.00	$225.00
Water	Zinc (Total)	EPA 200.8	5	7	$10.00	$50.00
Water	Ammonia as N	EPA 350.1	5	7	$25.00	$125.00
Water	Chloride	SM4500 Cl C	5	7	$15.00	$75.00
Water	Fluoride	SM4500 F C	5	7	$20.00	$100.00
Water	Hardness	EPA 200.7	5	7	$15.00	$75.00
Water	Nitrate as N	EPA 365.1	5	7	$25.00	$125.00
Water	Nitrite as N	SM4500 NO2 B	5	7	$25.00	$125.00
Water	Orthophosphate as P	SM4500 P E	5	7	$15.00	$75.00
Water	pH in water	SM4500-H+ B	5	7	$10.00	$50.00
Water	Specific Conductance (EC)	SM2510 B	5	7	$15.00	$75.00
Water	Sulfate	SM4500 SO4 E	5	7	$15.00	$75.00
Water	Total Dissolved Solids	SM2540 C	5	7	$15.00	$75.00
Water	Total phosphate as P	EPA 365.1	5	7	$20.00	$100.00

Made JK 4/20/20

Mark Allen Rein
Project Manager
EnviroMatrix Analytical, Inc.

4340 Viewridge Avenue, Suite A • San Diego, California 92123 • (858) 560-7717 • Fax (858) 560-7763
Analytical Chemistry Laboratory

EnviroMatrix Analytical, Inc.

23 October 2020

Geoscience Support Services, Inc.
Attn: Nathan Reynolds
PO Box 220
Claremont, CA 91711

EMA Log #: 20I0485

Project: GMGP Water Quality 2020

Enclosed are the results of analyses for samples received by the laboratory on 09/16/20 14:35. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that this data is in compliance both technically and for completeness.

Leland S. Pitt
Laboratory Director

CA ELAP Certification #: 2564

4340 Viewridge Avenue, Suite A - San Diego, California 92123 - (858) 560-7717 - Fax (858) 560-7763
Analytical Chemistry Laboratory

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
P2	20I0485-01	Grnd-Water	09/16/20 09:40	09/16/20 14:35
P11B	20I0485-02	Grnd-Water	09/16/20 10:45	09/16/20 14:35
P11D	20I0485-03	Grnd-Water	09/16/20 11:15	09/16/20 14:35
GUNR	20I0485-04	Grnd-Water	09/16/20 12:20	09/16/20 14:35
DS	20I0485-05	Grnd-Water	09/16/20 13:55	09/16/20 14:35

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20I0485
Project Name:	GMGP Water Quality 2020	

Total Metals by EPA 200 Series Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
P2 (20I0485-01) Grnd-Water Sampled: 09/16/20 09:40 Received: 09/16/20 14:35										
Boron	**0.76**	0.25	0.50	mg/l	1	ICP	0092440	09/24/20 15:36 09/28/20 16:08	EPA 200.7	
Barium	**0.070**	0.0002	0.010	"	"	MG	0092945	09/29/20 15:09 09/30/20 16:14	EPA 200.8	
Calcium	ND	1.00	5.00	"	10	ICP	0092440	09/24/20 15:36 09/30/20 13:24	EPA 200.7	
Chromium	**0.0002**	0.0002	0.005	"	1	MG	0092945	09/29/20 15:09 09/30/20 16:14	EPA 200.8	J
Copper	**0.004**	0.0002	0.010	"	"	MG	"	09/29/20 15:09 09/30/20 16:14	"	J
Iron	**0.453**	0.002	0.050	"	"	MG	"	09/29/20 15:09 09/30/20 16:14	"	
Potassium	**5.22**	1.00	1.00	"	"	ICP	0092440	09/24/20 15:36 09/28/20 16:08	EPA 200.7	
Magnesium	ND	1.00	5.00	"	10	ICP	"	09/24/20 15:36 09/30/20 13:24	"	
Manganese	**3.36**	0.001	0.050	"	"	MG	0092945	09/29/20 15:09 09/30/20 17:06	EPA 200.8	
Sodium	**2.78**	0.40	5.00	"	"	ICP	0092440	09/24/20 15:36 09/30/20 13:24	EPA 200.7	J
Zinc	**0.004**	0.0003	0.020	"	1	MG	0092945	09/29/20 15:09 09/30/20 16:14	EPA 200.8	J
P11B (20I0485-02) Grnd-Water Sampled: 09/16/20 10:45 Received: 09/16/20 14:35										
Boron	**0.73**	0.25	0.50	mg/l	1	ICP	0092440	09/24/20 15:36 09/28/20 16:32	EPA 200.7	
Barium	**0.348**	0.0002	0.010	"	"	MG	0092945	09/29/20 15:09 09/30/20 16:25	EPA 200.8	
Calcium	**107**	1.00	5.00	"	10	ICP	0092440	09/24/20 15:36 09/30/20 13:27	EPA 200.7	
Chromium	**0.0002**	0.0002	0.005	"	1	MG	0092945	09/29/20 15:09 09/30/20 16:25	EPA 200.8	J
Copper	**0.0008**	0.0002	0.010	"	"	MG	"	09/29/20 15:09 09/30/20 16:25	"	J
Iron	**0.305**	0.002	0.050	"	"	MG	"	09/29/20 15:09 09/30/20 16:25	"	
Potassium	**70.0**	1.00	1.00	"	"	ICP	0092440	09/24/20 15:36 09/28/20 16:31	EPA 200.7	
Magnesium	**143**	1.00	5.00	"	10	ICP	"	09/24/20 15:36 09/30/20 13:27	"	

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20I0485
Project Name:	GMGP Water Quality 2020	

Total Metals by EPA 200 Series Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
P11B (20I0485-02) Grnd-Water Sampled: 09/16/20 10:45 Received: 09/16/20 14:35										
Manganese	**0.127**	0.0001	0.005	mg/l	1	MG	0092945	09/29/20 15:09 09/30/20 16:25	EPA 200.8	
Sodium	**576**	0.40	5.00	"	10	ICP	0092440	09/24/20 15:36 09/30/20 13:27	EPA 200.7	
Zinc	**0.002**	0.0003	0.020	"	1	MG	0092945	09/29/20 15:09 09/30/20 16:25	EPA 200.8	J
P11D (20I0485-03) Grnd-Water Sampled: 09/16/20 11:15 Received: 09/16/20 14:35										
Boron	**0.53**	0.25	0.50	mg/l	1	ICP	0092440	09/24/20 15:36 09/28/20 16:38	EPA 200.7	
Barium	**0.357**	0.0002	0.010	"	"	MG	0092945	09/29/20 15:09 09/30/20 16:27	EPA 200.8	
Calcium	**142**	1.00	5.00	"	10	ICP	0092440	09/24/20 15:36 09/30/20 13:29	EPA 200.7	
Chromium	ND	0.0002	0.005	"	1	MG	0092945	09/29/20 15:09 09/30/20 16:27	EPA 200.8	
Copper	**0.0008**	0.0002	0.010	"	"	MG	"	09/29/20 15:09 09/30/20 16:27	"	J
Iron	**1.15**	0.002	0.050	"	"	MG	"	09/29/20 15:09 09/30/20 16:27	"	
Potassium	**30.5**	1.00	1.00	"	"	ICP	0092440	09/24/20 15:36 09/28/20 16:37	EPA 200.7	
Magnesium	**123**	1.00	5.00	"	10	ICP	"	09/24/20 15:36 09/30/20 13:30	"	
Manganese	**0.476**	0.0001	0.005	"	1	MG	0092945	09/29/20 15:09 09/30/20 16:27	EPA 200.8	
Sodium	**514**	0.40	5.00	"	10	ICP	0092440	09/24/20 15:36 09/30/20 13:29	EPA 200.7	
Zinc	**0.001**	0.0003	0.020	"	1	MG	0092945	09/29/20 15:09 09/30/20 16:27	EPA 200.8	J
GUNR (20I0485-04) Grnd-Water Sampled: 09/16/20 12:20 Received: 09/16/20 14:35										
Boron	**0.38**	0.25	0.50	mg/l	1	ICP	0092440	09/24/20 15:36 09/28/20 16:43	EPA 200.7	J
Barium	**0.093**	0.0002	0.010	"	"	MG	0092945	09/29/20 15:09 09/30/20 16:28	EPA 200.8	
Calcium	**369**	1.00	5.00	"	10	ICP	0092440	09/24/20 15:36 09/30/20 13:32	EPA 200.7	
Chromium	ND	0.0002	0.005	"	1	MG	0092945	09/29/20 15:09 09/30/20 16:28	EPA 200.8	

Client Name:	Geoscience Support Services, Inc.
Project Name:	GMGP Water Quality 2020

EMA Log #: 20I0485

Total Metals by EPA 200 Series Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
GUNR (20I0485-04) Grnd-Water Sampled: 09/16/20 12:20 Received: 09/16/20 14:35										
Copper	**0.002**	0.0002	0.010	mg/l	1	MG	0092945	09/29/20 15:09 09/30/20 16:28	EPA 200.8	J
Iron	**0.195**	0.002	0.050	"	"	MG	"	09/29/20 15:09 09/30/20 16:28	"	
Potassium	**13.0**	1.00	1.00	"	"	ICP	0092440	09/24/20 15:36 09/28/20 16:42	EPA 200.7	
Magnesium	**224**	1.00	5.00	"	10	ICP	"	09/24/20 15:36 09/30/20 13:32	"	
Manganese	**1.99**	0.001	0.050	"	"	MG	0092945	09/29/20 15:09 09/30/20 17:08	EPA 200.8	
Sodium	**682**	0.40	5.00	"	"	ICP	0092440	09/24/20 15:36 09/30/20 13:32	EPA 200.7	
Zinc	**0.003**	0.0003	0.020	"	1	MG	0092945	09/29/20 15:09 09/30/20 16:28	EPA 200.8	J
DS (20I0485-05) Grnd-Water Sampled: 09/16/20 13:55 Received: 09/16/20 14:35										
Boron	**0.96**	0.25	0.50	mg/l	1	ICP	0092440	09/24/20 15:36 09/28/20 16:47	EPA 200.7	
Barium	**0.132**	0.0002	0.010	"	"	MG	0092945	09/29/20 15:09 09/30/20 16:30	EPA 200.8	
Calcium	**457**	1.00	5.00	"	10	ICP	0092440	09/24/20 15:36 09/30/20 14:12	EPA 200.7	
Chromium	ND	0.0002	0.005	"	1	MG	0092945	09/29/20 15:09 09/30/20 16:30	EPA 200.8	
Copper	**0.001**	0.0002	0.010	"	"	MG	"	09/29/20 15:09 09/30/20 16:30	"	J
Iron	**0.700**	0.002	0.050	"	"	MG	"	09/29/20 15:09 09/30/20 16:30	"	
Potassium	**34.0**	1.00	1.00	"	"	ICP	0092440	09/24/20 15:36 09/28/20 16:47	EPA 200.7	
Magnesium	**139**	1.00	5.00	"	10	ICP	"	09/24/20 15:36 09/30/20 14:12	"	
Manganese	**1.00**	0.0001	0.005	"	1	MG	0092945	09/29/20 15:09 09/30/20 16:30	EPA 200.8	
Sodium	**900**	0.40	5.00	"	10	ICP	0092440	09/24/20 15:36 09/30/20 14:12	EPA 200.7	
Zinc	**0.006**	0.0003	0.020	"	1	MG	0092945	09/29/20 15:09 09/30/20 16:30	EPA 200.8	J

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20I0485
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared / Sample Analyzed	Method	Notes
P2 (20I0485-01) Grnd-Water Sampled: 09/16/20 09:40 Received: 09/16/20 14:35										
Bicarbonate Alkalinity	**556**	5	5	mg CaCO3/L	1	JB	0092234	09/21/20 13:00 09/21/20 13:00	SM2320B	
Carbonate Alkalinity	ND	5	5	"	"	JB	"	09/21/20 13:00 09/21/20 13:00	"	
Hydroxide Alkalinity	ND	5	5	"	"	JB	"	09/21/20 13:00 09/21/20 13:00	"	
Total Alkalinity	**556**	5	5	"	"	JB	"	09/21/20 13:00 09/21/20 13:00	"	
Ammonia as N	**0.08**	0.02	0.10	mg/l	"	UM	0091123	10/05/20 11:30 10/05/20 17:23	EPA 350.1	J
Chloride	**2480**	0.05	0.05	"	"	SF	0091821	09/17/20 10:00 09/17/20 10:00	SM4500 Cl B	
Specific Conductance (EC)	**8060**	1.00	1.00	umhos/cm	"	SF	0092236	09/22/20 09:00 09/22/20 09:00	SM2510 B	
Fluoride	**0.408**	0.031	0.100	mg/l	"	SF	0092349	09/22/20 12:00 09/23/20 11:03	SM4500 F C	
Hardness (Total)	ND	10	10	mg CaCO3/L	"	NLF	0092440	09/24/20 15:36 09/30/20 17:01	EPA 200.7	
Nitrate as N	**4.25**	0.18	1.00	mg/l	20	UM	0092422	09/29/20 17:00 09/29/20 17:10	EPA 353.2	W-02
Nitrite as N	**0.45**	0.01	0.10	"	2	SF	0092167	09/18/20 09:00 09/18/20 09:00	SM4500 NO2 B	
pH at 25 deg C	**7.07**	0.01	0.10	pH Units	1	JB	0091742	09/16/20 15:35 09/16/20 15:35	SM4500-H+ B	HT-15
Orthophosphate as P	**0.62**	0.007	0.05	mg/l	"	UM	0092027	09/16/20 17:45 09/16/20 17:45	SM4500 P E	
Phosphorus, Total	**0.58**	0.04	0.10	"	2	UM	0092257	09/22/20 11:00 09/23/20 20:49	EPA 365.1	
Total Dissolved Solids	**5990**	1.0	20.0	"	1	NP	0092179	09/21/20 19:18 09/23/20 20:21	SM2540 C	
Sulfate as SO4	**1400**	100	500	"	100	JB	0091814	09/17/20 10:00 09/17/20 10:00	SM4500 SO4 E	
Turbidity	**5.00**	0.05	0.05	NTU	1	JB	0091834	09/18/20 09:00 09/18/20 09:00	SM2130 B	
P11B (20I0485-02) Grnd-Water Sampled: 09/16/20 10:45 Received: 09/16/20 14:35										
Bicarbonate Alkalinity	**452**	5	5	mg CaCO3/L	1	JB	0092234	09/21/20 13:00 09/21/20 13:00	SM2320B	

Client Name:	Geoscience Support Services, Inc.	EMA Log #: **20I0485**
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
P11B (20I0485-02) Grnd-Water Sampled: 09/16/20 10:45 Received: 09/16/20 14:35										
Carbonate Alkalinity	ND	5	5	mg CaCO3/L	1	JB	0092234	09/21/20 13:00 09/21/20 13:00	SM2320B	
Hydroxide Alkalinity	ND	5	5	"	"	JB	"	09/21/20 13:00 09/21/20 13:00	"	
Total Alkalinity	**452**	5	5	"	"	JB	"	09/21/20 13:00 09/21/20 13:00	"	
Ammonia as N	**6.26**	0.11	0.50	mg/l	5	UM	0091123	10/05/20 11:30 10/05/20 17:23	EPA 350.1	
Chloride	**690**	0.05	0.05	"	1	SF	0091821	09/17/20 10:00 09/17/20 10:00	SM4500 Cl B	
Specific Conductance (EC)	**2920**	1.00	1.00	umhos/cm	"	SF	0092236	09/22/20 09:00 09/22/20 09:00	SM2510 B	
Fluoride	**0.616**	0.031	0.100	mg/l	"	SF	0092349	09/22/20 12:00 09/23/20 11:03	SM4500 F C	
Hardness (Total)	**858**	10	10	mg CaCO3/L	"	NLF	0092440	09/24/20 15:36 09/30/20 17:01	EPA 200.7	
Nitrate as N	**0.02**	0.009	0.05	mg/l	"	UM	0092422	09/29/20 17:00 09/29/20 17:10	EPA 353.2	W-02, J
Nitrite as N	ND	0.007	0.05	"	"	SF	0092167	09/18/20 09:00 09/18/20 09:00	SM4500 NO2 B	
pH at 25 deg C	**7.49**	0.01	0.10	pH Units	"	JB	0091742	09/16/20 15:37 09/16/20 15:37	SM4500-H+ B	HT-15
Orthophosphate as P	**0.74**	0.007	0.05	mg/l	"	UM	0092027	09/16/20 17:45 09/16/20 17:45	SM4500 P E	
Phosphorus, Total	**0.69**	0.04	0.10	"	2	UM	0092257	09/22/20 11:00 09/23/20 20:49	EPA 365.1	
Total Dissolved Solids	**1780**	1.0	20.0	"	1	NP	0092179	09/21/20 19:18 09/23/20 20:21	SM2540 C	
Sulfate as SO4	**337**	20.0	100	"	20	JB	0091814	09/18/20 09:00 09/18/20 09:00	SM4500 SO4 E	
Turbidity	**1.30**	0.05	0.05	NTU	1	JB	0091834	09/18/20 09:00 09/18/20 09:00	SM2130 B	
P11D (20I0485-03) Grnd-Water Sampled: 09/16/20 11:15 Received: 09/16/20 14:35										
Bicarbonate Alkalinity	**408**	5	5	mg CaCO3/L	1	JB	0092234	09/21/20 13:00 09/21/20 13:00	SM2320B	
Carbonate Alkalinity	ND	5	5	"	"	JB	"	09/21/20 13:00 09/21/20 13:00	"	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20I0485
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
P11D (20I0485-03) Grnd-Water Sampled: 09/16/20 11:15 Received: 09/16/20 14:35										
Hydroxide Alkalinity	ND	5	5	mg CaCO3/L	1	JB	0092234	09/21/20 13:00 09/21/20 13:00	SM2320B	
Total Alkalinity	**408**	5	5	"	"	JB	"	09/21/20 13:00 09/21/20 13:00	"	
Ammonia as N	**2.16**	0.04	0.20	mg/l	2	UM	0091123	10/05/20 11:30 10/05/20 17:23	EPA 350.1	
Chloride	**600**	0.05	0.05	"	1	SF	0091821	09/17/20 10:00 09/17/20 10:00	SM4500 Cl B	
Specific Conductance (EC)	**2850**	1.00	1.00	umhos/cm	"	SF	0092236	09/22/20 09:00 09/22/20 09:00	SM2510 B	
Fluoride	**0.303**	0.031	0.100	mg/l	"	SF	0092349	09/22/20 12:00 09/23/20 11:03	SM4500 F C	
Hardness (Total)	**860**	10	10	mg CaCO3/L	"	NLF	0092440	09/24/20 15:36 09/30/20 17:01	EPA 200.7	
Nitrate as N	**0.02**	0.009	0.05	mg/l	"	UM	0092422	09/29/20 17:00 09/29/20 17:10	EPA 353.2	W-02, J
Nitrite as N	ND	0.007	0.05	"	"	SF	0092167	09/18/20 09:00 09/18/20 09:00	SM4500 NO2 B	
pH at 25 deg C	**7.30**	0.01	0.10	pH Units	"	JB	0091742	09/16/20 15:39 09/16/20 15:39	SM4500-H+ B	HT-15
Orthophosphate as P	**0.44**	0.007	0.05	mg/l	"	UM	0092027	09/16/20 17:45 09/16/20 17:45	SM4500 P E	
Phosphorus, Total	**0.46**	0.04	0.10	"	2	UM	0092257	09/22/20 11:00 09/23/20 20:49	EPA 365.1	
Total Dissolved Solids	**1870**	1.0	20.0	"	1	NP	0092179	09/21/20 19:18 09/23/20 20:21	SM2540 C	
Sulfate as SO4	**359**	25.0	125	"	25	JB	0091814	09/18/20 09:00 09/18/20 09:00	SM4500 SO4 E	
Turbidity	**10.0**	0.05	0.05	NTU	1	JB	0091834	09/18/20 09:00 09/18/20 09:00	SM2130 B	
GUNR (20I0485-04) Grnd-Water Sampled: 09/16/20 12:20 Received: 09/16/20 14:35										
Bicarbonate Alkalinity	**340**	5	5	mg CaCO3/L	1	JB	0092234	09/21/20 13:00 09/21/20 13:00	SM2320B	
Carbonate Alkalinity	ND	5	5	"	"	JB	"	09/21/20 13:00 09/21/20 13:00	"	
Hydroxide Alkalinity	ND	5	5	"	"	JB	"	09/21/20 13:00 09/21/20 13:00	"	

Client Name: Geoscience Support Services, Inc.	**EMA Log #: 20I0485**
Project Name: GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
GUNR (20I0485-04) Grnd-Water Sampled: 09/16/20 12:20 Received: 09/16/20 14:35										
Total Alkalinity	**340**	5	5	mg CaCO3/L	1	JB	0092234	09/21/20 13:00 09/21/20 13:00	SM2320B	
Ammonia as N	**0.23**	0.02	0.10	mg/l	"	UM	0091123	10/05/20 11:30 10/05/20 17:23	EPA 350.1	
Chloride	**1230**	0.05	0.05	"	"	SF	0091821	09/17/20 10:00 09/17/20 10:00	SM4500 Cl B	
Specific Conductance (EC)	**4150**	1.00	1.00	umhos/cm	"	SF	0092236	09/22/20 09:00 09/22/20 09:00	SM2510 B	
Fluoride	**0.292**	0.031	0.100	mg/l	"	SF	0092349	09/22/20 12:00 09/23/20 11:03	SM4500 F C	
Hardness (Total)	**1840**	10	10	mg CaCO3/L	"	NLF	0092440	09/24/20 15:36 09/30/20 17:01	EPA 200.7	
Nitrate as N	**1.84**	0.04	0.25	mg/l	5	UM	0092422	09/29/20 17:00 09/29/20 17:10	EPA 353.2	W-02
Nitrite as N	**0.02**	0.007	0.05	"	1	SF	0092167	09/18/20 09:00 09/18/20 09:00	SM4500 NO2 B	J
pH at 25 deg C	**6.83**	0.01	0.10	pH Units	"	JB	0091742	09/16/20 15:41 09/16/20 15:41	SM4500-H+ B	HT-15
Orthophosphate as P	**0.11**	0.007	0.05	mg/l	"	UM	0092027	09/16/20 17:45 09/16/20 17:45	SM4500 P E	
Phosphorus, Total	**0.11**	0.02	0.05	"	"	UM	0092257	09/22/20 11:00 09/23/20 20:49	EPA 365.1	
Total Dissolved Solids	**3210**	1.0	20.0	"	"	NP	0092179	09/21/20 19:18 09/23/20 20:21	SM2540 C	
Sulfate as SO4	**657**	50.0	250	"	50	JB	0091814	09/18/20 09:00 09/18/20 09:00	SM4500 SO4 E	
Turbidity	**1.40**	0.05	0.05	NTU	1	JB	0091834	09/18/20 09:00 09/18/20 09:00	SM2130 B	
DS (20I0485-05) Grnd-Water Sampled: 09/16/20 13:55 Received: 09/16/20 14:35										
Bicarbonate Alkalinity	**408**	5	5	mg CaCO3/L	1	JB	0092234	09/21/20 13:00 09/21/20 13:00	SM2320B	
Carbonate Alkalinity	ND	5	5	"	"	JB	"	09/21/20 13:00 09/21/20 13:00	"	
Hydroxide Alkalinity	ND	5	5	"	"	JB	"	09/21/20 13:00 09/21/20 13:00	"	
Total Alkalinity	**408**	5	5	"	"	JB	"	09/21/20 13:00 09/21/20 13:00	"	

Client Name:	Geoscience Support Services, Inc.
Project Name:	GMGP Water Quality 2020

EMA Log #: 20I0485

Conventional Chemistry Parameters by Standard/EPA Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
DS (20I0485-05) Grnd-Water Sampled: 09/16/20 13:55 Received: 09/16/20 14:35										
Ammonia as N	**0.95**	0.02	0.10	mg/l	1	UM	0091123	10/05/20 11:30 10/05/20 17:23	EPA 350.1	
Chloride	**1330**	0.05	0.05	"	"	SF	0091821	09/17/20 10:00 09/17/20 10:00	SM4500 Cl B	
Specific Conductance (EC)	**4930**	1.00	1.00	umhos/cm	"	SF	0092236	09/22/20 09:00 09/22/20 09:00	SM2510 B	
Fluoride	**0.253**	0.031	0.100	mg/l	"	SF	0092349	09/22/20 12:00 09/23/20 11:03	SM4500 F C	
Hardness (Total)	**1710**	10	10	mg CaCO3/L	"	NLF	0092440	09/24/20 15:36 09/30/20 17:01	EPA 200.7	
Nitrate as N	**0.02**	0.009	0.05	mg/l	"	UM	0092422	09/29/20 17:00 09/29/20 17:10	EPA 353.2	W-02, J
Nitrite as N	ND	0.007	0.05	"	"	SF	0092167	09/18/20 09:00 09/18/20 09:00	SM4500 NO2 B	
pH at 25 deg C	**6.96**	0.01	0.10	pH Units	"	JB	0091742	09/16/20 15:43 09/16/20 15:43	SM4500-H+ B	HT-15
Orthophosphate as P	**0.31**	0.007	0.05	mg/l	"	UM	0092027	09/16/20 17:45 09/16/20 17:45	SM4500 P E	
Phosphorus, Total	**0.33**	0.02	0.05	"	"	UM	0092257	09/22/20 11:00 09/23/20 20:49	EPA 365.1	
Total Dissolved Solids	**3590**	1.0	20.0	"	"	NP	0092179	09/21/20 19:18 09/23/20 20:21	SM2540 C	
Sulfate as SO4	**748**	50.0	250	"	50	JB	0091814	09/18/20 09:00 09/18/20 09:00	SM4500 SO4 E	
Turbidity	**6.40**	0.05	0.05	NTU	1	JB	0091834	09/18/20 09:00 09/18/20 09:00	SM2130 B	

Client Name: Geoscience Support Services, Inc.	EMA Log #: 20I0485
Project Name: GMGP Water Quality 2020	

Miscellaneous Physical/Conventional Chemistry Parameters

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
P2 (20I0485-01) Grnd-Water Sampled: 09/16/20 09:40 Received: 09/16/20 14:35										
Aggressive Index	**10.1**	1.00	1.00	N/A	1	MAR	0102329	10/23/20 11:54 10/23/20 12:02	Calculation	
adj-Sodium Adsorption Ratio	**0.310**	0.100	0.100	Ratio	"	MAR	0102331	10/23/20 12:16 10/23/20 12:16	Suarez-1981	
Langelier Index at 20 deg C	**-2.03**	-3.00	-3.00	N/A	"	MAR	0102332	10/23/20 12:56 10/23/20 13:11	Calculation	
P11B (20I0485-02) Grnd-Water Sampled: 09/16/20 10:45 Received: 09/16/20 14:35										
Aggressive Index	**12.6**	1.00	1.00	N/A	1	MAR	0102329	10/23/20 11:54 10/23/20 12:02	Calculation	
adj-Sodium Adsorption Ratio	**9.62**	0.100	0.100	Ratio	"	MAR	0102331	10/23/20 12:16 10/23/20 12:16	Suarez-1981	
Langelier Index at 20 deg C	**0.57**	-3.00	-3.00	N/A	"	MAR	0102332	10/23/20 12:56 10/23/20 13:11	Calculation	
P11D (20I0485-03) Grnd-Water Sampled: 09/16/20 11:15 Received: 09/16/20 14:35										
Aggressive Index	**12.5**	1.00	1.00	N/A	1	MAR	0102329	10/23/20 11:54 10/23/20 12:02	Calculation	
adj-Sodium Adsorption Ratio	**8.95**	0.100	0.100	Ratio	"	MAR	0102331	10/23/20 12:16 10/23/20 12:16	Suarez-1981	
Langelier Index at 20 deg C	**0.46**	-3.00	-3.00	N/A	"	MAR	0102332	10/23/20 12:56 10/23/20 13:11	Calculation	
GUNR (20I0485-04) Grnd-Water Sampled: 09/16/20 12:20 Received: 09/16/20 14:35										
Aggressive Index	**12.3**	1.00	1.00	N/A	1	MAR	0102329	10/23/20 11:54 10/23/20 12:02	Calculation	
adj-Sodium Adsorption Ratio	**8.59**	0.100	0.100	Ratio	"	MAR	0102331	10/23/20 12:16 10/23/20 12:16	Suarez-1981	
Langelier Index at 20 deg C	**0.33**	-3.00	-3.00	N/A	"	MAR	0102332	10/23/20 12:56 10/23/20 13:11	Calculation	
DS (20I0485-05) Grnd-Water Sampled: 09/16/20 13:55 Received: 09/16/20 14:35										
Aggressive Index	**12.6**	1.00	1.00	N/A	1	MAR	0102329	10/23/20 11:54 10/23/20 12:02	Calculation	
adj-Sodium Adsorption Ratio	**13.4**	0.100	0.100	Ratio	"	MAR	0102331	10/23/20 12:16 10/23/20 12:16	Suarez-1981	
Langelier Index at 20 deg C	**0.63**	-3.00	-3.00	N/A	"	MAR	0102332	10/23/20 12:56 10/23/20 13:11	Calculation	

Client Name: Geoscience Support Services, Inc.	**EMA Log #: 20I0485**
Project Name: GMGP Water Quality 2020	

Total Metals by EPA 200 Series Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0092440												
Blank (0092440-BLK1)					Prepared: 09/24/20 Analyzed: 09/30/20							
Calcium	ND	0.10	0.50	mg/l	ICP							
Sodium	ND	0.04	0.50	"	ICP							
Boron	ND	0.25	0.50	"	ICP							
Magnesium	ND	0.100	0.500	"	ICP							
Potassium	ND	1.00	1.00	"	ICP							
LCS (0092440-BS1)					Prepared: 09/24/20 Analyzed: 10/06/20							
Sodium	10.2	0.04	0.50	mg/l	ICP	1.00		NR	85-115			
Boron	1.07	0.25	0.50	"	ICP	1.00		107	85-115			
Magnesium	10.2	0.100	0.500	"	ICP	1.00		NR	85-115			
Calcium	10.2	0.10	0.50	"	ICP	1.00		NR	85-115			
LCS (0092440-BS2)					Prepared: 09/24/20 Analyzed: 09/28/20							
Potassium	5.20	1.00	1.00	mg/l	ICP	5.00		104	85-115			
Magnesium	5.23	0.100	0.500	"	ICP	5.00		105	85-115			
Calcium	4.65	0.10	0.50	"	ICP	5.00		93	85-115			
Sodium	4.41	0.04	0.50	"	ICP	5.00		88	85-115			
LCS Dup (0092440-BSD1)					Prepared: 09/24/20 Analyzed: 10/06/20							
Sodium	9.18	0.04	0.50	mg/l	ICP	1.00		918	85-115	10	20	
Boron	1.11	0.25	0.50	"	ICP	1.00		111	85-115	4	20	
Magnesium	9.30	0.100	0.500	"	ICP	1.00		930	85-115	9	20	
Calcium	9.24	0.10	0.50	"	ICP	1.00		924	85-115	10	20	
LCS Dup (0092440-BSD2)					Prepared: 09/24/20 Analyzed: 09/28/20							
Potassium	5.05	1.00	1.00	mg/l	ICP	5.00		101	85-115	3	20	
Magnesium	5.23	0.100	0.500	"	ICP	5.00		105	85-115	0	20	
Calcium	4.55	0.10	0.50	"	ICP	5.00		91	85-115	2	20	
Sodium	4.39	0.04	0.50	"	ICP	5.00		88	85-115	0.3	20	

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20I0485
Project Name:	GMGP Water Quality 2020	

Total Metals by EPA 200 Series Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0092440												
Duplicate (0092440-DUP1)		**Source: 20H0575-01**			Prepared: 09/24/20 Analyzed: 09/30/20							
Sodium	3090	1.00	12.5	mg/l	ICP		3020			2	20	
Magnesium	13.1	0.100	0.500	"	ICP		11.8			11	20	
Potassium	176	1.00	1.00	"	ICP		168			5	20	
Calcium	203	0.50	2.50	"	ICP		169			18	20	
Boron	0.26	0.25	0.50	"	ICP		ND				20	J
Duplicate (0092440-DUP2)		**Source: 20H0575-02**			Prepared: 09/24/20 Analyzed: 09/30/20							
Magnesium	3.86	0.100	0.500	mg/l	ICP		3.71			4	20	
Calcium	38.2	0.10	0.50	"	ICP		36.6			4	20	
Sodium	1960	1.00	12.5	"	ICP		1920			2	20	
Boron	ND	0.25	0.50	"	ICP		ND				20	
Potassium	76.0	1.00	1.00	"	ICP		71.4			6	20	
Matrix Spike (0092440-MS1)		**Source: 20H0575-01**			Prepared: 09/24/20 Analyzed: 09/30/20							
Magnesium	14.0	0.100	0.500	mg/l	ICP	1.00	11.8	220	75-125			QM-4X
Potassium	223	5.00	5.00	"	ICP	10.0	168	556	75-125			QM-4X
Calcium	207	0.50	2.50	"	ICP	1.00	169	NR	75-125			QM-4X
Sodium	3080	1.00	12.5	"	ICP	1.00	3020	NR	75-125			QM-4X
Boron	1.31	0.25	0.50	"	ICP	1.00	ND	131	75-125			QM-05
Matrix Spike (0092440-MS2)		**Source: 20H0575-02**			Prepared: 09/24/20 Analyzed: 09/30/20							
Calcium	41.6	0.10	0.50	mg/l	ICP	1.00	36.6	500	75-125			QM-4X
Magnesium	5.28	0.100	0.500	"	ICP	1.00	3.71	157	75-125			QM-4X
Boron	1.30	0.25	0.50	"	ICP	1.00	ND	130	75-125			QM-05
Sodium	1980	1.00	12.5	"	ICP	1.00	1920	NR	75-125			QM-4X
Potassium	82.2	1.00	1.00	"	ICP	10.0	71.4	108	75-125			
Matrix Spike Dup (0092440-MSD1)		**Source: 20H0575-01**			Prepared: 09/24/20 Analyzed: 09/30/20							
Sodium	3140	1.00	12.5	mg/l	ICP	1.00	3020	NR	75-125	2	20	QM-4X
Calcium	207	0.50	2.50	"	ICP	1.00	169	NR	75-125	0	20	QM-4X
Potassium	258	5.00	5.00	"	ICP	10.0	168	897	75-125	14	20	QM-4X
Boron	1.32	0.25	0.50	"	ICP	1.00	ND	132	75-125	0.6	20	QM-05
Magnesium	14.0	0.100	0.500	"	ICP	1.00	11.8	223	75-125	0.2	20	QM-4X

Client Name:	Geoscience Support Services, Inc.	**EMA Log #: 20I0485**
Project Name:	GMGP Water Quality 2020	

Total Metals by EPA 200 Series Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0092440												
Matrix Spike Dup (0092440-MSD2)	**Source: 20H0575-02**				Prepared: 09/24/20 Analyzed: 09/28/20							
Potassium	84.7	1.00	1.00	mg/l	ICP	10.0	71.4	133	75-125	3	20	QM-4X
Boron	1.33	0.25	0.50	"	ICP	1.00	ND	133	75-125	2	20	QM-05
Calcium	43.9	0.10	0.50	"	ICP	1.00	36.6	738	75-125	6	20	QM-4X
Sodium	2110	1.00	12.5	"	ICP	1.00	1920	NR	75-125	6	20	QM-4X
Magnesium	5.60	0.100	0.500	"	ICP	1.00	3.71	189	75-125	6	20	QM-4X
Batch 0092945												
Blank (0092945-BLK1)					Prepared: 09/29/20 Analyzed: 09/30/20							
Barium	ND	0.0002	0.010	mg/l	MG							
Chromium	ND	0.0002	0.005	"	MG							
Manganese	ND	0.0001	0.005	"	MG							
Iron	ND	0.002	0.050	"	MG							
Copper	ND	0.0002	0.010	"	MG							
Zinc	ND	0.0003	0.020	"	MG							
LCS (0092945-BS1)					Prepared: 09/29/20 Analyzed: 09/30/20							
Barium	0.100	0.0002	0.010	mg/l	MG	0.100		100	85-115			
Iron	0.108	0.002	0.050	"	MG	0.100		108	85-115			
Copper	0.107	0.0002	0.010	"	MG	0.100		107	85-115			
Manganese	0.105	0.0001	0.005	"	MG	0.100		105	85-115			
Zinc	0.109	0.0003	0.020	"	MG	0.100		109	85-115			
Chromium	0.103	0.0002	0.005	"	MG	0.100		103	85-115			
LCS Dup (0092945-BSD1)					Prepared: 09/29/20 Analyzed: 09/30/20							
Barium	0.097	0.0002	0.010	mg/l	MG	0.100		97	85-115	3	20	
Chromium	0.102	0.0002	0.005	"	MG	0.100		102	85-115	1	20	
Iron	0.108	0.002	0.050	"	MG	0.100		108	85-115	0.3	20	
Zinc	0.107	0.0003	0.020	"	MG	0.100		107	85-115	2	20	
Copper	0.106	0.0002	0.010	"	MG	0.100		106	85-115	1	20	
Manganese	0.105	0.0001	0.005	"	MG	0.100		105	85-115	0.1	20	

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20I0485
Project Name:	GMGP Water Quality 2020	

Total Metals by EPA 200 Series Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0092945												
Duplicate (0092945-DUP1)		**Source: 20I0383-01RE1**		Prepared: 09/29/20 Analyzed: 09/30/20								
Barium	0.077	0.0002	0.010	mg/l	MG		0.075			2	20	
Copper	0.862	0.0002	0.010	"	MG		0.846			2	20	
Chromium	ND	0.0002	0.005	"	MG		0.0002				20	
Zinc	0.492	0.0003	0.020	"	MG		0.481			2	20	
Iron	0.021	0.002	0.050	"	MG		0.016			28	20	QR-04, J
Manganese	0.007	0.0001	0.005	"	MG		0.007			6	20	
Matrix Spike (0092945-MS1)		**Source: 20I0383-01RE1**		Prepared: 09/29/20 Analyzed: 09/30/20								
Barium	0.185	0.0002	0.010	mg/l	MG	0.100	0.075	109	70-130			
Zinc	0.603	0.0003	0.020	"	MG	0.100	0.481	122	70-130			
Chromium	0.103	0.0002	0.005	"	MG	0.100	0.0002	103	70-130			
Copper	0.979	0.0002	0.010	"	MG	0.100	0.846	134	70-130			QM-4X
Iron	0.115	0.002	0.050	"	MG	0.100	0.016	100	70-130			
Manganese	0.112	0.0001	0.005	"	MG	0.100	0.007	105	70-130			
Matrix Spike (0092945-MS2)		**Source: 20I0384-01RE1**		Prepared: 09/29/20 Analyzed: 09/30/20								
Barium	0.108	0.0002	0.010	mg/l	MG	0.100	0.002	106	70-130			
Copper	0.117	0.0002	0.010	"	MG	0.100	0.014	103	70-130			
Manganese	0.107	0.0001	0.005	"	MG	0.100	0.001	105	70-130			
Chromium	0.103	0.0002	0.005	"	MG	0.100	ND	103	70-130			
Iron	0.117	0.002	0.050	"	MG	0.100	0.015	103	70-130			
Zinc	0.385	0.0003	0.020	"	MG	0.100	0.280	104	70-130			
Matrix Spike Dup (0092945-MSD1)		**Source: 20I0383-01RE1**		Prepared: 09/29/20 Analyzed: 09/30/20								
Barium	0.178	0.0002	0.010	mg/l	MG	0.100	0.075	103	70-130	4	20	
Zinc	0.592	0.0003	0.020	"	MG	0.100	0.481	112	70-130	2	20	
Copper	0.975	0.0002	0.010	"	MG	0.100	0.846	130	70-130	0.4	20	
Iron	0.113	0.002	0.050	"	MG	0.100	0.016	97	70-130	2	20	
Manganese	0.110	0.0001	0.005	"	MG	0.100	0.007	103	70-130	2	20	
Chromium	0.101	0.0002	0.005	"	MG	0.100	0.0002	101	70-130	2	20	

Client Name:	Geoscience Support Services, Inc.
Project Name:	GMGP Water Quality 2020

EMA Log #: 20I0485

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0091123												
Blank (0091123-BLK1)					Prepared & Analyzed: 10/05/20							
Ammonia as N	ND	0.02	0.10	mg/l	UM							
LCS (0091123-BS1)					Prepared & Analyzed: 10/05/20							
Ammonia as N	0.94	0.02	0.10	mg/l	UM	1.00		94	90-110			
LCS Dup (0091123-BSD1)					Prepared & Analyzed: 10/05/20							
Ammonia as N	0.96	0.02	0.10	mg/l	UM	1.00		96	90-110	1	20	
Duplicate (0091123-DUP1)		**Source: 20I0262-07**			Prepared & Analyzed: 10/05/20							
Ammonia as N	ND	0.02	0.10	mg/l	UM		ND				20	
Matrix Spike (0091123-MS1)		**Source: 20I0262-07**			Prepared & Analyzed: 10/05/20							
Ammonia as N	1.89	0.04	0.20	mg/l	UM	2.00	ND	94	90-110			
Matrix Spike Dup (0091123-MSD1)		**Source: 20I0262-07**			Prepared & Analyzed: 10/05/20							
Ammonia as N	1.92	0.04	0.20	mg/l	UM	2.00	ND	96	90-110	2	20	
Batch 0091742												
Duplicate (0091742-DUP1)		**Source: 20I0454-01**			Prepared & Analyzed: 09/16/20							
pH at 25 deg C	7.52	0.01	0.10	pH Units	JB		7.51			0.2	20	
Reference (0091742-SRM1)					Prepared & Analyzed: 09/16/20							
pH at 25 deg C	6.39	0.01	0.10	pH Units	JB	6.39		100	96.87-103.12			
Batch 0091814												
Blank (0091814-BLK1)					Prepared & Analyzed: 09/17/20							
Sulfate as SO4	ND	1.0	5.0	mg/l	JB							

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Client Name:	Geoscience Support Services, Inc.
Project Name:	GMGP Water Quality 2020

EMA Log #: 20I0485

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0091814												
LCS (0091814-BS1)					Prepared & Analyzed: 09/17/20							
Sulfate as SO4	9.0	1.0	5.0	mg/l	JB	10.0		90	80-120			
LCS Dup (0091814-BSD1)					Prepared & Analyzed: 09/17/20							
Sulfate as SO4	8.7	1.0	5.0	mg/l	JB	10.0		87	80-120	3	20	
Duplicate (0091814-DUP1)		**Source: 20I0485-01**			Prepared & Analyzed: 09/17/20							
Sulfate as SO4	1400	100	500	mg/l	JB		1400			0.4	20	
Matrix Spike (0091814-MS1)		**Source: 20I0485-01**			Prepared & Analyzed: 09/17/20							
Sulfate as SO4	3410	200	1000	mg/l	JB	2000	1400	101	80-120			
Matrix Spike Dup (0091814-MSD1)		**Source: 20I0485-01**			Prepared & Analyzed: 09/17/20							
Sulfate as SO4	3410	200	1000	mg/l	JB	2000	1400	101	80-120	0.1	20	
Reference (0091814-SRM1)					Prepared & Analyzed: 09/17/20							
Sulfate as SO4	9.0	1.0	5.0	mg/l	JB	9.71		93	75.55-118.52			
Reference (0091814-SRM2)					Prepared & Analyzed: 09/17/20							
Sulfate as SO4	8.9	1.0	5.0	mg/l	JB	9.71		92	75.55-118.52			
Batch 0091821												
Blank (0091821-BLK1)					Prepared & Analyzed: 09/17/20							
Chloride	ND	0.05	0.05	mg/l	SF							
LCS (0091821-BS1)					Prepared & Analyzed: 09/17/20							
Chloride	180	0.05	0.05	mg/l	SF	200		90	80-120			

Client Name:	Geoscience Support Services, Inc.	EMA Log #:	**20I0485**
Project Name:	GMGP Water Quality 2020		

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0091821												
LCS Dup (0091821-BSD1)					Prepared & Analyzed: 09/17/20							
Chloride	190	0.05	0.05	mg/l	SF	200		95	80-120	5	20	
Duplicate (0091821-DUP1)	**Source: 20H0884-03**				Prepared & Analyzed: 09/17/20							
Chloride	138	0.05	0.05	mg/l	SF		138			0	20	
Matrix Spike (0091821-MS1)	**Source: 20H0884-03**				Prepared & Analyzed: 09/17/20							
Chloride	320	0.05	0.05	mg/l	SF	200	138	91	80-120			
Matrix Spike Dup (0091821-MSD1)	**Source: 20H0884-03**				Prepared & Analyzed: 09/17/20							
Chloride	320	0.05	0.05	mg/l	SF	200	138	91	80-120	0	20	
Batch 0091834												
Duplicate (0091834-DUP1)	**Source: 20I0520-01**				Prepared & Analyzed: 09/18/20							
Turbidity	0.12	0.05	0.05	NTU	JB		0.12			0	20	
Reference (0091834-SRM1)					Prepared & Analyzed: 09/18/20							
Turbidity	3.00	0.05	0.05	NTU	JB	3.22		93	83.8-115			
Batch 0092027												
Blank (0092027-BLK1)					Prepared & Analyzed: 09/16/20							
Orthophosphate as P	ND	0.007	0.05	mg/l	UM							
LCS (0092027-BS1)					Prepared & Analyzed: 09/16/20							
Orthophosphate as P	0.51	0.007	0.05	mg/l	UM	0.500		102	80-120			

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20I0485
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0092027												
LCS Dup (0092027-BSD1)					Prepared & Analyzed: 09/16/20							
Orthophosphate as P	0.49	0.007	0.05	mg/l	UM	0.500		99	80-120	3	20	
Duplicate (0092027-DUP1)		**Source: 20I0437-01**			Prepared & Analyzed: 09/16/20							
Orthophosphate as P	0.49	0.007	0.05	mg/l	UM		0.48			1	20	
Matrix Spike (0092027-MS1)		**Source: 20I0437-01**			Prepared & Analyzed: 09/16/20							
Orthophosphate as P	0.96	0.007	0.05	mg/l	UM	0.500	0.48	95	80-120			
Matrix Spike Dup (0092027-MSD1)		**Source: 20I0437-01**			Prepared & Analyzed: 09/16/20							
Orthophosphate as P	0.97	0.007	0.05	mg/l	UM	0.500	0.48	97	80-120	1	20	
Batch 0092167												
Blank (0092167-BLK1)					Prepared & Analyzed: 09/18/20							
Nitrite as N	ND	0.007	0.05	mg/l	SF							
LCS (0092167-BS1)					Prepared & Analyzed: 09/18/20							
Nitrite as N	0.10	0.007	0.05	mg/l	SF	0.100		98	80-120			
LCS Dup (0092167-BSD1)					Prepared & Analyzed: 09/18/20							
Nitrite as N	0.10	0.007	0.05	mg/l	SF	0.100		100	80-120	2	20	
Duplicate (0092167-DUP1)		**Source: 20I0536-01**			Prepared & Analyzed: 09/18/20							
Nitrite as N	0.02	0.007	0.05	mg/l	SF		0.02			6	20	J
Matrix Spike (0092167-MS1)		**Source: 20I0536-01**			Prepared & Analyzed: 09/18/20							
Nitrite as N	0.12	0.007	0.05	mg/l	SF	0.100	0.02	99	80-120			

Client Name:	Geoscience Support Services, Inc.	**EMA Log #: 20I0485**
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0092167												
Matrix Spike Dup (0092167-MSD1)		**Source: 20I0536-01**			Prepared & Analyzed: 09/18/20							
Nitrite as N	0.11	0.007	0.05	mg/l	SF	0.100	0.02	95	80-120	4	20	
Batch 0092179												
Blank (0092179-BLK1)					Prepared: 09/21/20 Analyzed: 09/23/20							
Total Dissolved Solids	ND	1.0	20.0	mg/l	NP							
Duplicate (0092179-DUP1)		**Source: 20I0485-01**			Prepared: 09/21/20 Analyzed: 09/23/20							
Total Dissolved Solids	6220	1.0	20.0	mg/l	NP		5990			4	20	
Reference (0092179-SRM1)					Prepared: 09/21/20 Analyzed: 09/23/20							
Total Dissolved Solids	310	1.0	20.0	mg/l	NP	305		102	90.16-110.46			
Batch 0092234												
Duplicate (0092234-DUP1)		**Source: 20I0485-01**			Prepared & Analyzed: 09/22/20							
Hydroxide Alkalinity	ND	5	5	mg CaCO3/L	JB		ND				20	
Bicarbonate Alkalinity	556	5	5	"	JB		556			0	20	
Carbonate Alkalinity	ND	5	5	"	JB		ND				20	
Total Alkalinity	556	5	5	"	JB		556			0	20	
Reference (0092234-SRM1)					Prepared & Analyzed: 09/21/20							
Hydroxide Alkalinity	ND	5	5	mg CaCO3/L	JB	0.00			0-0			
Carbonate Alkalinity	ND	5	5	"	JB	0.00			0-0			
Bicarbonate Alkalinity	130	5	5	"	JB	138		94	89.8-110.1			
Total Alkalinity	130	5	5	"	JB	138		94	89.8-110.1			

Client Name:	Geoscience Support Services, Inc.		**EMA Log #: 20I0485**
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Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0092236												
Duplicate (0092236-DUP1)		**Source: 20I0596-01**			Prepared & Analyzed: 09/22/20							
Specific Conductance (EC)	4950	1.00	1.00	umhos/cm	SF		5050			2	20	
Reference (0092236-SRM1)					Prepared & Analyzed: 09/22/20							
Specific Conductance (EC)	344	1.00	1.00	umhos/cm	SF	348		99	89.94-110.06			
Batch 0092257												
Blank (0092257-BLK1)					Prepared: 09/22/20 Analyzed: 09/23/20							
Phosphorus, Total	ND	0.02	0.05	mg/l	UM							
LCS (0092257-BS1)					Prepared: 09/22/20 Analyzed: 09/23/20							
Phosphorus, Total	0.48	0.02	0.05	mg/l	UM	0.500		96	90-110			
LCS Dup (0092257-BSD1)					Prepared: 09/22/20 Analyzed: 09/23/20							
Phosphorus, Total	0.48	0.02	0.05	mg/l	UM	0.500		95	90-110	1	20	
Duplicate (0092257-DUP1)		**Source: 20I0451-01**			Prepared: 09/22/20 Analyzed: 09/23/20							
Phosphorus, Total	ND	0.02	0.05	mg/l	UM		ND				20	
Matrix Spike (0092257-MS1)		**Source: 20I0451-01**			Prepared: 09/22/20 Analyzed: 09/23/20							
Phosphorus, Total	0.94	0.04	0.10	mg/l	UM	1.00	ND	94	90-110			
Matrix Spike Dup (0092257-MSD1)		**Source: 20I0451-01**			Prepared: 09/22/20 Analyzed: 09/23/20							
Phosphorus, Total	0.92	0.04	0.10	mg/l	UM	1.00	ND	92	90-110	3	20	
Batch 0092349												
Blank (0092349-BLK1)					Prepared: 09/22/20 Analyzed: 09/23/20							
Fluoride	ND	0.031	0.100	mg/l	SF							

Client Name:	Geoscience Support Services, Inc.	**EMA Log #: 20I0485**
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0092349												
LCS (0092349-BS1)					Prepared: 09/22/20 Analyzed: 09/23/20							
Fluoride	0.968	0.031	0.100	mg/l	SF	1.00		97	80-120			
LCS Dup (0092349-BSD1)					Prepared: 09/22/20 Analyzed: 09/23/20							
Fluoride	0.982	0.031	0.100	mg/l	SF	1.00		98	80-120	1	20	
Duplicate (0092349-DUP1)	**Source: 20I0367-01**				Prepared: 09/22/20 Analyzed: 09/23/20							
Fluoride	1.12	0.031	0.100	mg/l	SF		1.13			0.4	20	
Matrix Spike (0092349-MS1)	**Source: 20I0367-01**				Prepared: 09/22/20 Analyzed: 09/23/20							
Fluoride	2.17	0.062	0.200	mg/l	SF	1.00	1.13	104	80-120			
Matrix Spike Dup (0092349-MSD1)	**Source: 20I0367-01**				Prepared: 09/22/20 Analyzed: 09/23/20							
Fluoride	2.13	0.062	0.200	mg/l	SF	1.00	1.13	100	80-120	2	20	
Batch 0092422												
Blank (0092422-BLK1)					Prepared & Analyzed: 09/29/20							
Nitrate as N	ND	0.009	0.05	mg/l	UM							
LCS (0092422-BS1)					Prepared & Analyzed: 09/29/20							
Nitrate as N	0.48	0.009	0.05	mg/l	UM	0.500		96	90-110			
LCS Dup (0092422-BSD1)					Prepared & Analyzed: 09/29/20							
Nitrate as N	0.50	0.009	0.05	mg/l	UM	0.500		100	90-110	3	20	
Duplicate (0092422-DUP1)	**Source: 20I0647-01**				Prepared & Analyzed: 09/29/20							
Nitrate as N	1.58	0.04	0.25	mg/l	UM		1.58			0	20	

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20I0485
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0092422												
Matrix Spike (0092422-MS1)		**Source: 20I0647-01**			Prepared & Analyzed: 09/29/20							
Nitrate as N	4.02	0.04	0.25	mg/l	UM	2.50	1.58	98	90-110			
Matrix Spike Dup (0092422-MSD1)		**Source: 20I0647-01**			Prepared & Analyzed: 09/29/20							
Nitrate as N	4.02	0.04	0.25	mg/l	UM	2.50	1.58	97	90-110	0.2	20	
Batch 0092440												
Blank (0092440-BLK1)					Prepared: 09/24/20 Analyzed: 09/30/20							
Hardness (Total)	ND	10	10	mg CaCO3/L	NLF							
Duplicate (0092440-DUP1)		**Source: 20H0575-01**			Prepared: 09/24/20 Analyzed: 09/30/20							
Hardness (Total)	561	10	10	mg CaCO3/L	NLF		471			18	20	
Duplicate (0092440-DUP2)		**Source: 20H0575-02**			Prepared: 09/24/20 Analyzed: 09/30/20							
Hardness (Total)	111	10	10	mg CaCO3/L	NLF		107			4	20	

Client Name: Geoscience Support Services, Inc.		**EMA Log #: 20I0485**
Project Name: GMGP Water Quality 2020		

Notes and Definitions

W-02	The sample for nitrate analysis was preserved with H_2SO_4 after the nitrite portion of the analysis was completed to extend the holding time for the sample. Nitrate results are corrected for the nitrite contribution per the method.
QR-04	The RPD between the sample and sample duplicate is not valid since both results are below the reporting limit for this analyte.
QM-4X	The spike recovery was outside of the QC acceptance limits for the MS and/or MSD due to analyte concentration at 4 times or greater the spike concentration. The QC batch was accepted based on LCS and/or LCSD recoveries within the acceptance limits.
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
J	Detected but below the Reporting Limit; therefore, result is an estimated concentration (CLP J-Flag).
HT-15	This sample was received outside of the EPA's recommended 15 minute holding time for this analysis. However, the sample was analyzed immediately upon receipt.
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis (if indicated in units column)
RPD	Relative Percent Difference
MDL	Method detection limit (indicated per client's request)

2010485

CHAIN-OF-CUSTODY RECORD

– EnviroMatrix (EMA) Analytical, Inc.

4340 Viewridge Ave., Ste. A - San Diego, CA 92123 - Phone (858) 560-7717 - Fax (858) 560-7763

EMA LOG #:

Client: GeoScience
Attn: Nathan Reynolds
Samplers(s): IKG
Address:
Phone: 909-576-8922 Fax:
Email: Nreynolds@geosciencewater.com
Billing Address:
Project ID:
Project #: OMWD Pump Test PO #:

Requested Analysis

ID #	Client Sample ID	Sample Date	Sample Time	Sample Matrix	Container # / Type	Oil & Grease □ 413.1 □ 413.2 □ 1664	8015 (TPH) □ Gas □ Diesel □ Ext	624/8260 (VOC) Full BTXE MTBE Oxy Nap	625 / 8270 (SVOC) □ PAH only	608 / 8081 (Organochlorine Pesticides)	608 / 8082 (Polychlorinated Biphenyls)	8141 (Organophosphorus Pesticides)	TBT (Organotin Compounds)	□ pH □ EC □ TSS □ TDS	□ Nitrate □ Nitrite □ N-N □ TKN □ NH3	CAC Title 22/CAM17 Metals □ TTLC □ STLC	TCLP (RCRA) □ Metals □ Organics	Cd Cr Cu Pb Ni Ag Zn □ Dissolved	Coliform, □ Total (MTF) □ Fecal (MTF)	Colilert, T+E.Coli □ P/A □ Enumeration	Enterococcus, □ MTF □ Enterolert	Heterotrophic Plate Count (HPC)	□ BOD □ COD □ Cyanide		see attached			
1	P2	9.16	9:40	GW	3																				X			
2	P11B	9.16	1045		3																				X			
3	P11D	9.16	1115		3																				X			
4	GUNR	9.16	1220		3																				X			
5	DS	9.16	1335		3																				X			
6																												
7																												
8																												
9																												
10																												

Matrix Codes: A = Air, DW = Drinking Water, GW = Groundwater, SW = Storm Water
WW = Wastewater, S = Soil, SED = Sediment, SD = Solid, T = Tissue, O = Oil, L = Liquid

Shipped By: □ Courier □ UPS □ FedEx □ USPS □ Client Drop Off □ Other

[1]Turn-Around-Time: □ Same Day □ 1 day □ 2 day □ 3 day □ 4 day □ 5 day ☒ STD (7-business days)

[1]Reporting Requirements: □ Fax □ PDF □ Excel □ Geotracker/EDF □ Hard Copy □ EDT □ CEDEN □ SDWIS

[1]Sample Disposal: □ By Laboratory □ [2]Return to Client: P/U or Delivery □ Archive

Sample Integrity

Correct Containers: Yes No N/A	Containers Properly Preseved: Yes No N/A
Custody Seals Intact: Yes No N/A	Temp @ Receipt: 4°C
COC/Labels Agree: Yes No N/A	Sampled By: Client EMA Autosampler

RELINQUISHED BY	DATE/TIME	RECEIVED BY
Signature: [signature]	9.16.20	Signature: [signature]
Print: IAN GOLTZ	14:35	Print: Bridget Mendiola
Company: IKG		Company: EMA
Signature:		Signature:
Print:		Print:
Company:		Company:
Signature:		Signature:
Print:		Print:
Company:		Company:

Project/Sample Location/Address:

Project/Sample Comments: See Nathan Reynolds for Requested Analysis / P2 filtered in field (45m) for metals only.

[1]Additional costs may apply. Please note there is a $35 minimum charge for all clients.

[2]EMA reserves the right to return any samples that do not match our waste profile.

NOTE: By relinquishing samples to EMA, Inc., client agrees to pay for the services requested on this COC form and any additional analyses performed on this project. Payment for services is due within 30 days from date of invoice. Samples will be disposed of 7 days after report has been finalized unless otherwise noted. All work is subject to EMA's terms and conditions.

2020485

EnviroMatrix Analytical, Inc.

(x5) x1 125 H_2SO_4 Jar

Analytical Services Quotation

GMGP Water Quality 2020
Geoscience Support Services, Inc.
Nathan Reynolds

Bid Date: 04/17/2020
Bid Expires: 04/17/2021
Prices Expire: 04/17/2021

Matrix	Parameters	Method	#	TAT (days)	Unit Price	Extended Price
Water	Aggressive Index (calc)(LAB)	-	5	7	$5.00	$25.00
Water	Alkalinity (All Forms)	varies	5	7	$25.00	$125.00
Water	Hexavalent Chromium	EPA 218.6	5	7	$105.00	$525.00
Water	Langelier Index (Calc)	-	5	7	$5.00	$25.00
Water	Barium (Total)	EPA 200.8	5	7	$10.00	$50.00
Water	Boron (Total)	EPA 200.7	5	7	$10.00	$50.00
Water	Calcium (Total)	EPA 200.7	5	7	$10.00	$50.00
Water	Chromium (Total)	EPA 200.8	5	7	$10.00	$50.00
Water	Copper (Total)	EPA 200.8	5	7	$10.00	$50.00
Water	Iron (Total)	EPA 200.8	5	7	$10.00	$50.00
Water	Magnesium (Total)	EPA 200.7	5	7	$10.00	$50.00
Water	Manganese (Total)	EPA 200.8	5	7	$10.00	$50.00
Water	Potassium (Total)	EPA 200.7	5	7	$10.00	$50.00
Water	Silicon (Total)	EPA 200.7	5	7	$35.00	$175.00
Water	Sodium (Total)	EPA 200.7	5	7	$10.00	$50.00
Water	Strontium (Total)	EPA 200.7	5	7	$45.00	$225.00
Water	Zinc (Total)	EPA 200.8	5	7	$10.00	$50.00
Water	Ammonia as N	EPA 350.1	5	7	$25.00	$125.00
Water	Chloride	SM4500 Cl C	5	7	$15.00	$75.00
Water	Fluoride	SM4500 F C	5	7	$20.00	$100.00
Water	Hardness	EPA 200.7	5	7	$15.00	$75.00
Water	Nitrate as N	EPA 365.1	5	7	$25.00	$125.00
Water	Nitrite as N	SM4500 NO2 B	5	7	$25.00	$125.00
Water	Orthophosphate as P	SM4500 P E	5	7	$15.00	$75.00
Water	pH in water	SM4500-H+ B	5	7	$10.00	$50.00
Water	Specific Conductance (EC)	SM2510 B	5	7	$15.00	$75.00
Water	Sulfate	SM4500 SO4 E	5	7	$15.00	$75.00
Water	Total Dissolved Solids	SM2540 C	5	7	$15.00	$75.00
Water	Total phosphate as P	EPA 365.1	5	7	$20.00	$100.00

Made JK 4/20/20

Mark Allen Rein
Project Manager
EnviroMatrix Analytical, Inc.
4340 Viewridge Avenue, Suite A • San Diego, California 92123 • (858) 560-7717 • Fax (858) 560-7763
Analytical Chemistry Laboratory

EnviroMatrix Analytical, Inc.

27 January 2021

Geoscience Support Services, Inc. **EMA Log #: 20L0030**

Attn: Nathan Reynolds

PO Box 220

Claremont, CA 91711

Project: GMGP Water Quality 2020

Enclosed are the results of analyses for samples received by the laboratory on 12/01/20 12:50. Samples were analyzed pursuant to client request utilizing EPA or other ELAP approved methodologies. I certify that this data is in compliance both technically and for completeness.

Leland S. Pitt

Laboratory Director

CA ELAP Certification #: 2564

PLEASE NOTE OUR NEW LOCATION:

9590 Chesapeake Dr. - San Diego, California 92123 - (858) 560-7717 - Fax (858) 560-7763

Analytical Chemistry Laboratory

Client Name:	Geoscience Support Services, Inc.
Project Name:	GMGP Water Quality 2020

EMA Log #: 20L0030

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
P2	20L0030-01	Grnd-Water	12/01/20 09:30	12/01/20 12:50
P11B	20L0030-02	Grnd-Water	12/01/20 10:20	12/01/20 12:50
P11D	20L0030-03	Grnd-Water	12/01/20 10:45	12/01/20 12:50
GUNR	20L0030-04	Grnd-Water	12/01/20 08:40	12/01/20 12:50
Test	20L0030-05	Grnd-Water	12/01/20 12:15	12/01/20 12:50

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20L0030
Project Name:	GMGP Water Quality 2020	

Total Metals by EPA 200 Series Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
P2 (20L0030-01) Grnd-Water Sampled: 12/01/20 09:30 Received: 12/01/20 12:50										
Boron	**0.65**	0.25	0.50	mg/l	1	ICP	0120337	12/03/20 11:37 12/04/20 13:28	EPA 200.7	
Barium	**0.063**	0.0004	0.020	"	2	icpms	0120857	12/08/20 15:39 12/09/20 18:25	EPA 200.8	
Calcium	**624**	1.00	5.00	"	10	ICP	0120337	12/03/20 11:37 12/09/20 12:25	EPA 200.7	
Chromium	ND	0.0004	0.010	"	2	icpms	0120857	12/08/20 15:39 12/09/20 18:25	EPA 200.8	
Copper	**0.004**	0.0004	0.020	"	"	icpms	"	12/08/20 15:39 12/09/20 18:25	"	J
Iron	**0.283**	0.003	0.100	"	"	icpms	"	12/08/20 15:39 12/09/20 18:25	"	
Potassium	**4.70**	1.00	1.00	"	1	ICP	0120337	12/03/20 11:37 12/04/20 13:27	EPA 200.7	
Magnesium	**400**	1.00	5.00	"	10	ICP	"	12/03/20 11:37 12/07/20 15:15	"	
Manganese	**3.03**	0.0002	0.010	"	2	icpms	0120857	12/08/20 15:39 12/09/20 18:25	EPA 200.8	
Sodium	**1250**	0.40	5.00	"	10	ICP	0120337	12/03/20 11:37 12/07/20 15:15	EPA 200.7	
Zinc	**0.006**	0.0006	0.040	"	2	icpms	0120857	12/08/20 15:39 12/09/20 18:25	EPA 200.8	J
P11B (20L0030-02) Grnd-Water Sampled: 12/01/20 10:20 Received: 12/01/20 12:50										
Boron	**0.51**	0.25	0.50	mg/l	1	ICP	0120337	12/03/20 11:37 12/04/20 12:17	EPA 200.7	
Barium	**0.308**	0.0004	0.020	"	2	icpms	0120857	12/08/20 15:39 12/09/20 18:27	EPA 200.8	
Calcium	**468**	0.50	2.50	"	5	ICP	0120337	12/03/20 11:37 12/04/20 12:15	EPA 200.7	
Chromium	**0.0005**	0.0004	0.010	"	2	icpms	0120857	12/08/20 15:39 12/09/20 18:27	EPA 200.8	J
Copper	**0.005**	0.0004	0.020	"	"	icpms	"	12/08/20 15:39 12/09/20 18:27	"	J
Iron	**2.04**	0.003	0.100	"	"	icpms	"	12/08/20 15:39 12/09/20 18:27	"	
Potassium	**15.6**	1.00	1.00	"	1	ICP	0120337	12/03/20 11:37 12/04/20 12:15	EPA 200.7	
Magnesium	**383**	1.00	5.00	"	10	ICP	"	12/03/20 11:37 12/07/20 14:27	"	

Client Name:	Geoscience Support Services, Inc.		**EMA Log #: 20L0030**
Project Name:	GMGP Water Quality 2020		

Total Metals by EPA 200 Series Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
P11B (20L0030-02) Grnd-Water Sampled: 12/01/20 10:20 Received: 12/01/20 12:50										
Manganese	**1.91**	0.0002	0.010	mg/l	2	icpms	0120857	12/08/20 15:39 12/09/20 18:27	EPA 200.8	
Sodium	**976**	1.00	12.5	"	25	ICP	0120337	12/03/20 11:37 12/04/20 12:15	EPA 200.7	
Zinc	**0.012**	0.0006	0.040	"	2	icpms	0120857	12/08/20 15:39 12/09/20 18:27	EPA 200.8	J
P11D (20L0030-03) Grnd-Water Sampled: 12/01/20 10:45 Received: 12/01/20 12:50										
Boron	ND	0.25	0.50	mg/l	1	ICP	0120337	12/03/20 11:37 12/04/20 13:38	EPA 200.7	
Barium	**0.362**	0.0002	0.010	"	"	icpms	0120857	12/08/20 15:39 12/09/20 18:07	EPA 200.8	
Calcium	**142**	1.00	5.00	"	10	ICP	0120337	12/03/20 11:37 12/09/20 12:28	EPA 200.7	
Chromium	**0.0002**	0.0002	0.005	"	1	icpms	0120857	12/08/20 15:39 12/09/20 18:07	EPA 200.8	J
Copper	**0.003**	0.0002	0.010	"	"	icpms	"	12/08/20 15:39 12/09/20 18:07	"	J
Iron	**1.12**	0.002	0.050	"	"	icpms	"	12/08/20 15:39 12/09/20 18:07	"	
Potassium	**3.03**	1.00	1.00	"	"	ICP	0120337	12/03/20 11:37 12/04/20 13:37	EPA 200.7	
Magnesium	**119**	1.00	5.00	"	10	ICP	"	12/03/20 11:37 12/07/20 15:19	"	
Manganese	**0.450**	0.0001	0.005	"	1	icpms	0120857	12/08/20 15:39 12/09/20 18:07	EPA 200.8	
Sodium	**474**	0.40	5.00	"	10	ICP	0120337	12/03/20 11:37 12/07/20 15:18	EPA 200.7	
Zinc	**0.009**	0.0003	0.020	"	1	icpms	0120857	12/08/20 15:39 12/09/20 18:07	EPA 200.8	J
GUNR (20L0030-04) Grnd-Water Sampled: 12/01/20 08:40 Received: 12/01/20 12:50										
Boron	ND	2.50	5.00	mg/l	10	ICP	0120337	12/03/20 11:37 12/04/20 13:41	EPA 200.7	
Barium	**0.094**	0.0004	0.020	"	2	icpms	0120857	12/08/20 15:39 12/09/20 18:29	EPA 200.8	
Calcium	**382**	1.00	5.00	"	10	ICP	0120337	12/03/20 11:37 12/09/20 12:31	EPA 200.7	
Chromium	ND	0.0004	0.010	"	2	icpms	0120857	12/08/20 15:39 12/09/20 18:29	EPA 200.8	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Client Name:	Geoscience Support Services, Inc.	**EMA Log #: 20L0030**
Project Name:	GMGP Water Quality 2020	

Total Metals by EPA 200 Series Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
GUNR (20L0030-04) Grnd-Water Sampled: 12/01/20 08:40 Received: 12/01/20 12:50										
Copper	**0.005**	0.0004	0.020	mg/l	2	icpms	0120857	12/08/20 15:39 12/09/20 18:29	EPA 200.8	J
Iron	**0.185**	0.003	0.100	"	"	icpms	"	12/08/20 15:39 12/09/20 18:29	"	
Potassium	**16.6**	10.0	10.0	"	10	ICP	0120337	12/03/20 11:37 12/04/20 13:39	EPA 200.7	
Magnesium	**226**	1.00	5.00	"	"	ICP	"	12/03/20 11:37 12/07/20 15:21	"	
Manganese	**1.81**	0.0002	0.010	"	2	icpms	0120857	12/08/20 15:39 12/09/20 18:29	EPA 200.8	
Sodium	**652**	0.40	5.00	"	10	ICP	0120337	12/03/20 11:37 12/07/20 15:21	EPA 200.7	
Zinc	**0.011**	0.0006	0.040	"	2	icpms	0120857	12/08/20 15:39 12/09/20 18:29	EPA 200.8	J
Test (20L0030-05) Grnd-Water Sampled: 12/01/20 12:15 Received: 12/01/20 12:50										
Boron	ND	2.50	5.00	mg/l	10	ICP	0120337	12/03/20 11:37 12/04/20 13:43	EPA 200.7	
Barium	**0.126**	0.0002	0.010	"	1	icpms	0120857	12/08/20 15:39 12/09/20 18:10	EPA 200.8	
Calcium	**462**	1.00	5.00	"	10	ICP	0120337	12/03/20 11:37 12/09/20 12:34	EPA 200.7	
Chromium	**0.0002**	0.0002	0.005	"	1	icpms	0120857	12/08/20 15:39 12/09/20 18:10	EPA 200.8	J
Copper	**0.002**	0.0002	0.010	"	"	icpms	"	12/08/20 15:39 12/09/20 18:10	"	J
Iron	**0.881**	0.002	0.050	"	"	icpms	"	12/08/20 15:39 12/09/20 18:10	"	
Potassium	**40.0**	10.0	10.0	"	10	ICP	0120337	12/03/20 11:37 12/04/20 13:42	EPA 200.7	
Magnesium	**144**	1.00	5.00	"	"	ICP	"	12/03/20 11:37 12/07/20 15:24	"	
Manganese	**0.918**	0.0001	0.005	"	1	icpms	0120857	12/08/20 15:39 12/09/20 18:10	EPA 200.8	
Sodium	**822**	0.40	5.00	"	10	ICP	0120337	12/03/20 11:37 12/07/20 15:24	EPA 200.7	
Zinc	**0.015**	0.0003	0.020	"	1	icpms	0120857	12/08/20 15:39 12/09/20 18:10	EPA 200.8	J

Client Name:	Geoscience Support Services, Inc.
Project Name:	GMGP Water Quality 2020

EMA Log #: 20L0030

Conventional Chemistry Parameters by Standard/EPA Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
P2 (20L0030-01) Grnd-Water Sampled: 12/01/20 09:30 Received: 12/01/20 12:50										
Bicarbonate Alkalinity	**496**	5	5	mg CaCO3/L	1	SF	0120416	12/03/20 11:00 12/03/20 11:00	SM2320B	
Carbonate Alkalinity	ND	5	5	"	"	SF	"	12/03/20 11:00 12/03/20 11:00	"	
Hydroxide Alkalinity	ND	5	5	"	"	SF	"	12/03/20 11:00 12/03/20 11:00	"	
Total Alkalinity	**496**	5	5	"	"	SF	"	12/03/20 11:00 12/03/20 11:00	"	
Ammonia as N	**0.14**	0.02	0.10	mg/l	"	UM	0120745	12/18/20 10:30 12/18/20 13:56	EPA 350.1	
Chloride	**2320**	0.05	0.05	"	"	SF	0120408	12/02/20 14:00 12/02/20 14:00	SM4500 Cl B	
Specific Conductance (EC)	**7800**	1.00	1.00	umhos/cm	"	SF	0120837	12/07/20 16:30 12/07/20 16:30	SM2510 B	
Fluoride	**0.424**	0.031	0.100	mg/l	"	SF	0121451	12/11/20 14:15 12/11/20 14:15	SM4500 F C	
Hardness (Total)	**3210**	10	10	mg CaCO3/L	"	ICP	0120337	12/03/20 11:37 12/07/20 15:15	EPA 200.7	
Nitrate as N	**2.05**	0.04	0.25	mg/l	5	UM	0121042	12/10/20 15:00 12/10/20 17:05	EPA 353.2	W-02
Nitrite as N	**0.30**	0.007	0.05	"	1	SF	0120759	12/02/20 11:00 12/02/20 11:00	SM4500 NO2 B	
pH at 25 deg C	**7.08**	0.01	0.10	pH Units	"	SF	0120328	12/01/20 17:31 12/01/20 17:31	SM4500-H+ B	HT-15
Orthophosphate as P	**0.47**	0.007	0.05	mg/l	"	UM	0120244	12/02/20 17:30 12/02/20 17:30	SM4500 P E	
Phosphorus, Total	**0.50**	0.04	0.10	"	2	UM	0120340	12/04/20 10:00 12/04/20 15:44	EPA 365.1	
Total Dissolved Solids	**5840**	1.0	20.0	"	1	NP	0120246	12/02/20 15:06 12/04/20 15:05	SM2540 C	
Sulfate as SO4	**1430**	50.0	250	"	50	SF	0120409	12/04/20 10:00 12/04/20 10:00	SM4500 SO4 E	
Turbidity	**1.10**	0.05	0.05	NTU	1	SF	0120331	12/02/20 09:00 12/02/20 09:00	SM2130 B	
P11B (20L0030-02) Grnd-Water Sampled: 12/01/20 10:20 Received: 12/01/20 12:50										
Bicarbonate Alkalinity	**520**	5	5	mg CaCO3/L	1	SF	0120416	12/03/20 11:00 12/03/20 11:00	SM2320B	

Client Name: Geoscience Support Services, Inc. **EMA Log #: 20L0030**
Project Name: GMGP Water Quality 2020

Conventional Chemistry Parameters by Standard/EPA Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
P11B (20L0030-02) Grnd-Water Sampled: 12/01/20 10:20 Received: 12/01/20 12:50										
Carbonate Alkalinity	ND	5	5	mg CaCO3/L	1	SF	0120416	12/03/20 11:00 12/03/20 11:00	SM2320B	
Hydroxide Alkalinity	ND	5	5	"	"	SF	"	12/03/20 11:00 12/03/20 11:00	"	
Total Alkalinity	**520**	5	5	"	"	SF	"	12/03/20 11:00 12/03/20 11:00	"	
Ammonia as N	**1.44**	0.02	0.10	mg/l	"	UM	0120745	12/18/20 10:30 12/18/20 13:56	EPA 350.1	
Chloride	**1790**	0.05	0.05	"	"	SF	0120408	12/02/20 14:00 12/02/20 14:00	SM4500 Cl B	
Specific Conductance (EC)	**6030**	1.00	1.00	umhos/cm	"	SF	0120837	12/07/20 16:30 12/07/20 16:30	SM2510 B	
Fluoride	**0.469**	0.031	0.100	mg/l	"	SF	0121451	12/11/20 14:15 12/11/20 14:15	SM4500 F C	
Hardness (Total)	**2750**	10	10	mg CaCO3/L	"	ICP	0120337	12/03/20 11:37 12/08/20 14:40	EPA 200.7	
Nitrate as N	**0.03**	0.009	0.05	mg/l	"	UM	0121042	12/10/20 15:00 12/10/20 17:05	EPA 353.2	W-02, J
Nitrite as N	ND	0.007	0.05	"	"	SF	0120759	12/02/20 11:00 12/02/20 11:00	SM4500 NO2 B	
pH at 25 deg C	**7.17**	0.01	0.10	pH Units	"	SF	0120328	12/01/20 17:34 12/01/20 17:34	SM4500-H+ B	HT-15
Orthophosphate as P	**0.51**	0.007	0.05	mg/l	"	UM	0120244	12/02/20 17:30 12/02/20 17:30	SM4500 P E	
Phosphorus, Total	**0.62**	0.04	0.10	"	2	UM	0120340	12/04/20 10:00 12/04/20 15:44	EPA 365.1	
Total Dissolved Solids	**4690**	1.0	20.0	"	1	NP	0120246	12/02/20 15:06 12/04/20 15:05	SM2540 C	
Sulfate as SO4	**1080**	25.0	125	"	25	SF	0120409	12/04/20 10:00 12/04/20 10:00	SM4500 SO4 E	
Turbidity	**18.0**	0.05	0.05	NTU	1	SF	0120331	12/02/20 09:00 12/02/20 09:00	SM2130 B	
P11D (20L0030-03) Grnd-Water Sampled: 12/01/20 10:45 Received: 12/01/20 12:50										
Bicarbonate Alkalinity	**390**	5	5	mg CaCO3/L	1	SF	0120416	12/03/20 11:00 12/03/20 11:00	SM2320B	
Carbonate Alkalinity	ND	5	5	"	"	SF	"	12/03/20 11:00 12/03/20 11:00	"	

Client Name:	Geoscience Support Services, Inc.	**EMA Log #: 20L0030**
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared / Sample Analyzed	Method	Notes
P11D (20L0030-03) Grnd-Water Sampled: 12/01/20 10:45 Received: 12/01/20 12:50										
Hydroxide Alkalinity	ND	5	5	mg CaCO3/L	1	SF	0120416	12/03/20 11:00 12/03/20 11:00	SM2320B	
Total Alkalinity	**390**	5	5	"	"	SF	"	12/03/20 11:00 12/03/20 11:00	"	
Ammonia as N	**2.17**	0.04	0.20	mg/l	2	UM	0120745	12/18/20 10:30 12/18/20 13:56	EPA 350.1	
Chloride	**590**	0.05	0.05	"	1	SF	0120408	12/02/20 14:00 12/02/20 14:00	SM4500 Cl B	
Specific Conductance (EC)	**2810**	1.00	1.00	umhos/cm	"	SF	0120837	12/07/20 16:30 12/07/20 16:30	SM2510 B	
Fluoride	**0.294**	0.031	0.100	mg/l	"	SF	0121451	12/11/20 14:15 12/11/20 14:15	SM4500 F C	
Hardness (Total)	**844**	10	10	mg CaCO3/L	"	ICP	0120337	12/03/20 11:37 12/07/20 15:18	EPA 200.7	
Nitrate as N	**0.02**	0.009	0.05	mg/l	"	UM	0121042	12/10/20 15:00 12/10/20 17:05	EPA 353.2	W-02, J
Nitrite as N	ND	0.007	0.05	"	"	SF	0120759	12/02/20 11:00 12/02/20 11:00	SM4500 NO2 B	
pH at 25 deg C	**7.34**	0.01	0.10	pH Units	"	SF	0120328	12/01/20 17:35 12/01/20 17:35	SM4500-H+ B	HT-15
Orthophosphate as P	**0.37**	0.007	0.05	mg/l	"	UM	0120244	12/02/20 17:30 12/02/20 17:30	SM4500 P E	
Phosphorus, Total	**0.42**	0.04	0.10	"	2	UM	0120340	12/04/20 10:00 12/04/20 15:44	EPA 365.1	
Total Dissolved Solids	**1850**	1.0	20.0	"	1	NP	0120246	12/02/20 15:06 12/04/20 15:05	SM2540 C	
Sulfate as SO4	**376**	10.0	50.0	"	10	SF	0120409	12/04/20 10:00 12/04/20 10:00	SM4500 SO4 E	
Turbidity	**8.40**	0.05	0.05	NTU	1	SF	0120331	12/02/20 09:00 12/02/20 09:00	SM2130 B	
GUNR (20L0030-04) Grnd-Water Sampled: 12/01/20 08:40 Received: 12/01/20 12:50										
Bicarbonate Alkalinity	**330**	5	5	mg CaCO3/L	1	SF	0120416	12/03/20 11:00 12/03/20 11:00	SM2320B	
Carbonate Alkalinity	ND	5	5	"	"	SF	"	12/03/20 11:00 12/03/20 11:00	"	
Hydroxide Alkalinity	ND	5	5	"	"	SF	"	12/03/20 11:00 12/03/20 11:00	"	

Client Name:	Geoscience Support Services, Inc.	EMA Log #: **20L0030**
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
GUNR (20L0030-04) Grnd-Water Sampled: 12/01/20 08:40 Received: 12/01/20 12:50										
Total Alkalinity	**330**	5	5	mg CaCO3/L	1	SF	0120416	12/03/20 11:00 12/03/20 11:00	SM2320B	
Ammonia as N	**0.22**	0.02	0.10	mg/l	"	UM	0120745	12/18/20 10:30 12/18/20 13:56	EPA 350.1	
Chloride	**1270**	0.05	0.05	"	"	SF	0120408	12/02/20 14:00 12/02/20 14:00	SM4500 Cl B	
Specific Conductance (EC)	**4750**	1.00	1.00	umhos/cm	"	SF	0120837	12/07/20 16:30 12/07/20 16:30	SM2510 B	
Fluoride	**0.277**	0.031	0.100	mg/l	"	SF	0121451	12/11/20 14:15 12/11/20 14:15	SM4500 F C	
Hardness (Total)	**1880**	10	10	mg CaCO3/L	"	ICP	0120337	12/03/20 11:37 12/07/20 15:21	EPA 200.7	
Nitrate as N	**1.73**	0.02	0.10	mg/l	2	UM	0121042	12/10/20 15:00 12/10/20 17:05	EPA 353.2	W-02
Nitrite as N	**0.01**	0.007	0.05	"	1	SF	0120759	12/02/20 11:00 12/02/20 11:00	SM4500 NO2 B	J
pH at 25 deg C	**6.77**	0.01	0.10	pH Units	"	SF	0120328	12/01/20 17:39 12/01/20 17:39	SM4500-H+ B	HT-15
Orthophosphate as P	**0.08**	0.007	0.05	mg/l	"	UM	0120244	12/02/20 17:30 12/02/20 17:30	SM4500 P E	
Phosphorus, Total	**0.08**	0.02	0.05	"	"	UM	0120340	12/04/20 10:00 12/04/20 15:44	EPA 365.1	
Total Dissolved Solids	**3330**	1.0	20.0	"	"	NP	0120246	12/02/20 15:06 12/04/20 15:05	SM2540 C	
Sulfate as SO4	**743**	25.0	125	"	25	SF	0120409	12/04/20 10:00 12/04/20 10:00	SM4500 SO4 E	
Turbidity	**1.20**	0.05	0.05	NTU	1	SF	0120331	12/02/20 09:00 12/02/20 09:00	SM2130 B	
Test (20L0030-05) Grnd-Water Sampled: 12/01/20 12:15 Received: 12/01/20 12:50										
Bicarbonate Alkalinity	**386**	5	5	mg CaCO3/L	1	SF	0120416	12/03/20 11:00 12/03/20 11:00	SM2320B	
Carbonate Alkalinity	ND	5	5	"	"	SF	"	12/03/20 11:00 12/03/20 11:00	"	
Hydroxide Alkalinity	ND	5	5	"	"	SF	"	12/03/20 11:00 12/03/20 11:00	"	
Total Alkalinity	**386**	5	5	"	"	SF	"	12/03/20 11:00 12/03/20 11:00	"	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Client Name:	Geoscience Support Services, Inc.	EMA Log #:	**20L0030**
Project Name:	GMGP Water Quality 2020		

Conventional Chemistry Parameters by Standard/EPA Methods

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
Test (20L0030-05) Grnd-Water Sampled: 12/01/20 12:15 Received: 12/01/20 12:50										
Ammonia as N	**1.06**	0.02	0.10	mg/l	1	UM	0120745	12/18/20 10:30 12/18/20 13:56	EPA 350.1	
Chloride	**1340**	0.05	0.05	"	"	SF	0120408	12/02/20 14:00 12/02/20 14:00	SM4500 Cl B	
Specific Conductance (EC)	**5110**	1.00	1.00	umhos/cm	"	SF	0120837	12/07/20 16:30 12/07/20 16:30	SM2510 B	
Fluoride	**0.243**	0.031	0.100	mg/l	"	SF	0121451	12/11/20 14:15 12/11/20 14:15	SM4500 F C	
Hardness (Total)	**1750**	10	10	mg CaCO3/L	"	ICP	0120337	12/03/20 11:37 12/07/20 15:24	EPA 200.7	
Nitrate as N	**0.01**	0.009	0.05	mg/l	"	UM	0121042	12/10/20 15:00 12/10/20 17:05	EPA 353.2	W-02, J
Nitrite as N	ND	0.007	0.05	"	"	SF	0120759	12/02/20 11:00 12/02/20 11:00	SM4500 NO2 B	
pH at 25 deg C	**6.99**	0.01	0.10	pH Units	"	SF	0120328	12/01/20 17:42 12/01/20 17:42	SM4500-H+ B	HT-15
Orthophosphate as P	**0.27**	0.007	0.05	mg/l	"	UM	0120244	12/02/20 17:30 12/02/20 17:30	SM4500 P E	
Phosphorus, Total	**0.34**	0.02	0.05	"	"	UM	0120340	12/04/20 10:00 12/04/20 15:44	EPA 365.1	
Total Dissolved Solids	**3580**	1.0	20.0	"	"	NP	0120246	12/02/20 15:06 12/04/20 15:05	SM2540 C	
Sulfate as SO4	**746**	25.0	125	"	25	SF	0120409	12/04/20 10:00 12/04/20 10:00	SM4500 SO4 E	
Turbidity	**6.90**	0.05	0.05	NTU	1	SF	0120331	12/02/20 09:00 12/02/20 09:00	SM2130 B	

Client Name:	Geoscience Support Services, Inc.
Project Name:	GMGP Water Quality 2020

EMA Log #: 20L0030

Miscellaneous Physical/Conventional Chemistry Parameters

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Analyst	Batch	Sample Prepared Sample Analyzed	Method	Notes
P2 (20L0030-01) Grnd-Water Sampled: 12/01/20 09:30 Received: 12/01/20 12:50										
Aggressive Index	**13.0**	1.00	1.00	N/A	1	MAR	1011366	01/13/21 13:37 01/13/21 13:38	Calculation	
adj-Sodium Adsorption Ratio	**12.2**	0.100	0.100	Ratio	"	MAR	0120242	12/02/20 10:11 12/02/20 10:12	Suarez-1981	
Langelier Index at 20 deg C	**0.97**	-3.00	-3.00	N/A	"	MAR	1011369	01/13/21 14:16 01/13/21 14:16	Calculation	
P11B (20L0030-02) Grnd-Water Sampled: 12/01/20 10:20 Received: 12/01/20 12:50										
Aggressive Index	**13.0**	1.00	1.00	N/A	1	MAR	1011366	01/13/21 13:37 01/13/21 13:38	Calculation	
adj-Sodium Adsorption Ratio	**9.91**	0.100	0.100	Ratio	"	MAR	0120242	12/02/20 10:11 12/02/20 10:12	Suarez-1981	
Langelier Index at 20 deg C	**0.95**	-3.00	-3.00	N/A	"	MAR	1011369	01/13/21 14:16 01/13/21 14:16	Calculation	
P11D (20L0030-03) Grnd-Water Sampled: 12/01/20 10:45 Received: 12/01/20 12:50										
Aggressive Index	**12.5**	1.00	1.00	N/A	1	MAR	1011366	01/13/21 13:37 01/13/21 13:38	Calculation	
adj-Sodium Adsorption Ratio	**8.37**	0.100	0.100	Ratio	"	MAR	0120242	12/02/20 10:11 12/02/20 10:12	Suarez-1981	
Langelier Index at 20 deg C	**0.48**	-3.00	-3.00	N/A	"	MAR	1011369	01/13/21 14:16 01/13/21 14:16	Calculation	
GUNR (20L0030-04) Grnd-Water Sampled: 12/01/20 08:40 Received: 12/01/20 12:50										
Aggressive Index	**12.3**	1.00	1.00	N/A	1	MAR	1011366	01/13/21 13:37 01/13/21 13:38	Calculation	
adj-Sodium Adsorption Ratio	**8.06**	0.100	0.100	Ratio	"	MAR	0120242	12/02/20 10:11 12/02/20 10:12	Suarez-1981	
Langelier Index at 20 deg C	**-0.16**	-3.00	-3.00	N/A	"	MAR	1011369	01/13/21 14:16 01/13/21 14:16	Calculation	
Test (20L0030-05) Grnd-Water Sampled: 12/01/20 12:15 Received: 12/01/20 12:50										
Aggressive Index	**12.6**	1.00	1.00	N/A	1	MAR	1011366	01/13/21 13:37 01/13/21 13:38	Calculation	
adj-Sodium Adsorption Ratio	**11.8**	0.100	0.100	Ratio	"	MAR	0120242	12/02/20 10:11 12/02/20 10:12	Suarez-1981	
Langelier Index at 20 deg C	**0.64**	-3.00	-3.00	N/A	"	MAR	1011369	01/13/21 14:16 01/13/21 14:16	Calculation	

Client Name:	Geoscience Support Services, Inc.	**EMA Log #: 20L0030**
Project Name:	GMGP Water Quality 2020	

Total Metals by EPA 200 Series Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0120337												
Blank (0120337-BLK1)					Prepared: 12/03/20 Analyzed: 12/04/20							
Boron	ND	0.25	0.50	mg/l	ICP							
Magnesium	ND	0.100	0.500	"	ICP							
Potassium	ND	1.00	1.00	"	ICP							
Sodium	ND	0.04	0.50	"	ICP							
Calcium	ND	0.10	0.50	"	ICP							
LCS (0120337-BS1)					Prepared: 12/03/20 Analyzed: 12/04/20							
Potassium	9.91	1.00	1.00	mg/l	ICP	10.0		99	85-115			
Boron	1.11	0.25	0.50	"	ICP	1.00		111	85-115			
LCS (0120337-BS2)					Prepared: 12/03/20 Analyzed: 12/08/20							
Magnesium	4.65	0.100	0.500	mg/l	ICP	5.00		93	85-115			
Sodium	5.36	0.04	0.50	"	ICP	5.00		107	85-115			
Calcium	5.15	0.10	0.50	"	ICP	5.00		103	85-115			
LCS Dup (0120337-BSD1)					Prepared: 12/03/20 Analyzed: 12/04/20							
Boron	1.14	0.25	0.50	mg/l	ICP	1.00		114	85-115	3	20	
Potassium	10.0	1.00	1.00	"	ICP	10.0		100	85-115	1	20	
LCS Dup (0120337-BSD2)					Prepared: 12/03/20 Analyzed: 12/04/20							
Calcium	5.10	0.10	0.50	mg/l	ICP	5.00		102	85-115	1	20	
Magnesium	4.67	0.100	0.500	"	ICP	5.00		93	85-115	0.6	20	
Sodium	5.73	0.04	0.50	"	ICP	5.00		115	85-115	7	20	
Duplicate (0120337-DUP1)		**Source: 20L0059-02**			Prepared: 12/03/20 Analyzed: 12/04/20							
Calcium	233	0.50	2.50	mg/l	ICP		263			12	20	
Boron	4.88	0.25	0.50	"	ICP		6.65			31	20	QR-03
Potassium	40.5	1.00	1.00	"	ICP		45.9			12	20	
Magnesium	203	2.50	12.5	"	ICP		202			0.6	20	
Sodium	3600	1.00	12.5	"	ICP		4090			13	20	

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20L0030
Project Name:	GMGP Water Quality 2020	

Total Metals by EPA 200 Series Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0120337												
Matrix Spike (0120337-MS1)		**Source: 20L0059-02**			Prepared: 12/03/20 Analyzed: 12/04/20							
Sodium	3400	1.00	12.5	mg/l	ICP	1.00	4090	NR	75-125			QM-4X
Calcium	228	2.50	12.5	"	ICP	1.00	263	NR	75-125			QM-4X
Boron	6.75	6.25	12.5	"	ICP	1.00	6.65	10	75-125			QM-05, J
Magnesium	202	2.50	12.5	"	ICP	1.00	202	NR	75-125			QM-4X
Potassium	49.8	25.0	25.0	"	ICP	10.0	45.9	39	75-125			QM-06
Matrix Spike (0120337-MS2)		**Source: 20L0030-02**			Prepared: 12/03/20 Analyzed: 12/07/20							
Magnesium	390	1.00	5.00	mg/l	ICP	1.00	383	680	75-125			QM-4X
Sodium	914	0.40	5.00	"	ICP	1.00	976	NR	75-125			QM-4X
Calcium	462	1.00	5.00	"	ICP	1.00	468	NR	75-125			QM-4X
Boron	ND	6.25	12.5	"	ICP	1.00	ND		75-125			QM-05
Potassium	29.1	25.0	25.0	"	ICP	10.0	ND	291	75-125			QM-05
Matrix Spike Dup (0120337-MSD1)		**Source: 20L0059-02**			Prepared: 12/03/20 Analyzed: 12/07/20							
Sodium	3390	1.00	12.5	mg/l	ICP	1.00	4090	NR	75-125	0.1	20	QM-4X
Boron	6.92	6.25	12.5	"	ICP	1.00	6.65	27	75-125	2	20	QM-05, J
Potassium	58.3	25.0	25.0	"	ICP	10.0	45.9	124	75-125	16	20	
Calcium	233	2.50	12.5	"	ICP	1.00	263	NR	75-125	2	20	QM-4X
Magnesium	204	2.50	12.5	"	ICP	1.00	202	148	75-125	1	20	QM-4X
Batch 0120857												
Blank (0120857-BLK1)					Prepared: 12/08/20 Analyzed: 12/09/20							
Barium	ND	0.0002	0.010	mg/l	icpms							
Copper	ND	0.0002	0.010	"	icpms							
Zinc	ND	0.0003	0.020	"	icpms							
Iron	ND	0.002	0.050	"	icpms							
Manganese	ND	0.0001	0.005	"	icpms							
Chromium	ND	0.0002	0.005	"	icpms							

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20L0030
Project Name:	GMGP Water Quality 2020	

Total Metals by EPA 200 Series Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0120857												
LCS (0120857-BS1)					Prepared: 12/08/20 Analyzed: 12/09/20							
Barium	0.099	0.0002	0.010	mg/l	icpms	0.100		99	85-115			
Chromium	0.101	0.0002	0.005	"	icpms	0.100		101	85-115			
Copper	0.102	0.0002	0.010	"	icpms	0.100		102	85-115			
Manganese	0.102	0.0001	0.005	"	icpms	0.100		102	85-115			
Zinc	0.103	0.0003	0.020	"	icpms	0.100		103	85-115			
Iron	0.105	0.002	0.050	"	icpms	0.100		105	85-115			
LCS Dup (0120857-BSD1)					Prepared: 12/08/20 Analyzed: 12/09/20							
Barium	0.097	0.0002	0.010	mg/l	icpms	0.100		97	85-115	2	20	
Copper	0.102	0.0002	0.010	"	icpms	0.100		102	85-115	0.2	20	
Manganese	0.102	0.0001	0.005	"	icpms	0.100		102	85-115	0.05	20	
Iron	0.107	0.002	0.050	"	icpms	0.100		107	85-115	1	20	
Chromium	0.100	0.0002	0.005	"	icpms	0.100		100	85-115	0.6	20	
Zinc	0.103	0.0003	0.020	"	icpms	0.100		103	85-115	0.08	20	
Duplicate (0120857-DUP1)		**Source: 20L0251-01**			Prepared: 12/08/20 Analyzed: 12/09/20							
Barium	0.135	0.0002	0.010	mg/l	icpms		0.135			0.6	20	
Zinc	0.130	0.0003	0.020	"	icpms		0.134			3	20	
Manganese	0.003	0.0001	0.005	"	icpms		0.003			7	20	J
Iron	0.143	0.002	0.050	"	icpms		0.142			0.3	20	
Chromium	0.002	0.0002	0.005	"	icpms		0.002			0.5	20	J
Copper	0.079	0.0002	0.010	"	icpms		0.083			4	20	
Matrix Spike (0120857-MS1)		**Source: 20L0251-01**			Prepared: 12/08/20 Analyzed: 12/09/20							
Barium	0.244	0.0002	0.010	mg/l	icpms	0.100	0.135	109	70-130			
Chromium	0.102	0.0002	0.005	"	icpms	0.100	0.002	100	70-130			
Copper	0.177	0.0002	0.010	"	icpms	0.100	0.083	95	70-130			
Zinc	0.226	0.0003	0.020	"	icpms	0.100	0.134	92	70-130			
Manganese	0.104	0.0001	0.005	"	icpms	0.100	0.003	101	70-130			
Iron	0.229	0.002	0.050	"	icpms	0.100	0.142	87	70-130			

Client Name:	Geoscience Support Services, Inc.
Project Name:	GMGP Water Quality 2020

EMA Log #: 20L0030

Total Metals by EPA 200 Series Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0120857												
Matrix Spike Dup (0120857-MSD1)		**Source: 20L0251-01**			Prepared: 12/08/20 Analyzed: 12/09/20							
Barium	0.238	0.0002	0.010	mg/l	icpms	0.100	0.135	103	70-130	3	20	
Zinc	0.223	0.0003	0.020	"	icpms	0.100	0.134	88	70-130	2	20	
Copper	0.175	0.0002	0.010	"	icpms	0.100	0.083	92	70-130	2	20	
Iron	0.238	0.002	0.050	"	icpms	0.100	0.142	96	70-130	4	20	
Chromium	0.100	0.0002	0.005	"	icpms	0.100	0.002	98	70-130	2	20	
Manganese	0.101	0.0001	0.005	"	icpms	0.100	0.003	98	70-130	3	20	

Client Name:	Geoscience Support Services, Inc.	**EMA Log #: 20L0030**
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0120244												
Blank (0120244-BLK1)					Prepared & Analyzed: 12/02/20							
Orthophosphate as P	ND	0.007	0.05	mg/l	UM							
LCS (0120244-BS1)					Prepared & Analyzed: 12/02/20							
Orthophosphate as P	0.51	0.007	0.05	mg/l	UM	0.500		101	80-120			
LCS Dup (0120244-BSD1)					Prepared & Analyzed: 12/02/20							
Orthophosphate as P	0.51	0.007	0.05	mg/l	UM	0.500		102	80-120	0.2	20	
Duplicate (0120244-DUP1)		**Source: 20L0030-04**			Prepared & Analyzed: 12/02/20							
Orthophosphate as P	0.08	0.007	0.05	mg/l	UM		0.08			4	20	
Matrix Spike (0120244-MS1)		**Source: 20L0030-04**			Prepared & Analyzed: 12/02/20							
Orthophosphate as P	0.59	0.007	0.05	mg/l	UM	0.500	0.08	101	80-120			
Matrix Spike Dup (0120244-MSD1)		**Source: 20L0030-04**			Prepared & Analyzed: 12/02/20							
Orthophosphate as P	0.59	0.007	0.05	mg/l	UM	0.500	0.08	101	80-120	0.2	20	
Batch 0120246												
Blank (0120246-BLK1)					Prepared: 12/02/20 Analyzed: 12/04/20							
Total Dissolved Solids	ND	1.0	20.0	mg/l	NP							
Duplicate (0120246-DUP1)		**Source: 20L0019-05**			Prepared: 12/02/20 Analyzed: 12/04/20							
Total Dissolved Solids	1930	1.0	20.0	mg/l	NP		1920			0.6	20	
Reference (0120246-SRM1)					Prepared: 12/02/20 Analyzed: 12/04/20							
Total Dissolved Solids	400	1.0	20.0	mg/l	NP	425		94	89.41-110.58			

Client Name:	Geoscience Support Services, Inc.	**EMA Log #: 20L0030**
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0120328												
Duplicate (0120328-DUP1)		**Source: 20L0030-05**			Prepared & Analyzed: 12/01/20							
pH at 25 deg C	7.02	0.01	0.10	pH Units	SF		6.99			0.4	20	
Reference (0120328-SRM1)					Prepared & Analyzed: 12/01/20							
pH at 25 deg C	6.46	0.01	0.10	pH Units	SF	6.39		101	96.87-103.12			
Batch 0120331												
Duplicate (0120331-DUP1)		**Source: 20L0041-02**			Prepared & Analyzed: 12/02/20							
Turbidity	0.15	0.05	0.05	NTU	SF		0.15			0	20	
Reference (0120331-SRM1)					Prepared & Analyzed: 12/02/20							
Turbidity	1.70	0.05	0.05	NTU	SF	1.75		97	82.3-120			
Batch 0120337												
Blank (0120337-BLK1)					Prepared: 12/03/20 Analyzed: 12/07/20							
Hardness (Total)	ND	10	10	mg CaCO3/L	ICP							
Duplicate (0120337-DUP1)		**Source: 20L0059-02**			Prepared: 12/03/20 Analyzed: 12/08/20							
Hardness (Total)	1420	10	10	mg CaCO3/L	ICP		1490			5	20	
Batch 0120340												
Blank (0120340-BLK1)					Prepared & Analyzed: 12/04/20							
Phosphorus, Total	ND	0.02	0.05	mg/l	UM							

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20L0030
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0120340												
LCS (0120340-BS1)					Prepared & Analyzed: 12/04/20							
Phosphorus, Total	0.50	0.02	0.05	mg/l	UM	0.500		100	90-110			
LCS Dup (0120340-BSD1)					Prepared & Analyzed: 12/04/20							
Phosphorus, Total	0.51	0.02	0.05	mg/l	UM	0.500		102	90-110	1	20	
Duplicate (0120340-DUP1)		**Source: 20L0030-05**			Prepared & Analyzed: 12/04/20							
Phosphorus, Total	0.34	0.02	0.05	mg/l	UM		0.34			0.9	20	
Matrix Spike (0120340-MS1)		**Source: 20L0030-05**			Prepared & Analyzed: 12/04/20							
Phosphorus, Total	1.33	0.04	0.10	mg/l	UM	1.00	0.34	99	90-110			
Matrix Spike Dup (0120340-MSD1)		**Source: 20L0030-05**			Prepared & Analyzed: 12/04/20							
Phosphorus, Total	1.37	0.04	0.10	mg/l	UM	1.00	0.34	103	90-110	3	20	
Batch 0120408												
Blank (0120408-BLK1)					Prepared & Analyzed: 12/02/20							
Chloride	ND	0.05	0.05	mg/l	SF							
Blank (0120408-BLK2)					Prepared & Analyzed: 12/02/20							
Chloride	ND	0.05	0.05	mg/l	SF							
LCS (0120408-BS1)					Prepared & Analyzed: 12/02/20							
Chloride	190	0.05	0.05	mg/l	SF	200		95	80-120			
LCS Dup (0120408-BSD1)					Prepared & Analyzed: 12/02/20							
Chloride	200	0.05	0.05	mg/l	SF	200		100	80-120	5	20	

Client Name: Geoscience Support Services, Inc.	**EMA Log #: 20L0030**
Project Name: GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0120408												
Duplicate (0120408-DUP1)		**Source: 20K0737-02**			Prepared & Analyzed: 12/02/20							
Chloride	110	0.05	0.05	mg/l	SF		120			9	20	
Matrix Spike (0120408-MS1)		**Source: 20K0737-02**			Prepared & Analyzed: 12/02/20							
Chloride	290	0.05	0.05	mg/l	SF	200	120	85	80-120			
Matrix Spike Dup (0120408-MSD1)		**Source: 20K0737-02**			Prepared & Analyzed: 12/02/20							
Chloride	290	0.05	0.05	mg/l	SF	200	120	85	80-120	0	20	
Batch 0120409												
Blank (0120409-BLK1)					Prepared & Analyzed: 12/04/20							
Sulfate as SO4	ND	1.0	5.0	mg/l	SF							
LCS (0120409-BS1)					Prepared & Analyzed: 12/04/20							
Sulfate as SO4	9.0	1.0	5.0	mg/l	SF	10.0		90	80-120			
LCS Dup (0120409-BSD1)					Prepared & Analyzed: 12/04/20							
Sulfate as SO4	10.2	1.0	5.0	mg/l	SF	10.0		102	80-120	13	20	
Duplicate (0120409-DUP1)		**Source: 20L0136-03**			Prepared & Analyzed: 12/04/20							
Sulfate as SO4	ND	1.0	5.0	mg/l	SF		ND				20	
Matrix Spike (0120409-MS1)		**Source: 20L0136-03**			Prepared & Analyzed: 12/04/20							
Sulfate as SO4	9.4	1.0	5.0	mg/l	SF	10.0	ND	94	80-120			
Matrix Spike Dup (0120409-MSD1)		**Source: 20L0136-03**			Prepared & Analyzed: 12/04/20							
Sulfate as SO4	9.6	1.0	5.0	mg/l	SF	10.0	ND	96	80-120	2	20	

Client Name:	Geoscience Support Services, Inc.	EMA Log #: **20L0030**
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0120416												
Duplicate (0120416-DUP1)		**Source: 20L0058-01**			Prepared & Analyzed: 12/03/20							
Carbonate Alkalinity	ND	5	5	mg CaCO3/L	SF		ND				20	
Bicarbonate Alkalinity	110	5	5	"	SF		110			0	20	
Hydroxide Alkalinity	ND	5	5	"	SF		ND				20	
Total Alkalinity	110	5	5	"	SF		110			0	20	
Reference (0120416-SRM1)					Prepared & Analyzed: 12/03/20							
Carbonate Alkalinity	ND	5	5	mg CaCO3/L	SF	0.00			0-0			
Hydroxide Alkalinity	ND	5	5	"	SF	0.00			0-0			
Bicarbonate Alkalinity	42	5	5	"	SF	46.0		91	90-110			
Total Alkalinity	42	5	5	"	SF	46.0		91	90-110			
Batch 0120745												
Blank (0120745-BLK1)					Prepared & Analyzed: 12/18/20							
Ammonia as N	ND	0.02	0.10	mg/l	UM							
LCS (0120745-BS1)					Prepared & Analyzed: 12/18/20							
Ammonia as N	0.97	0.02	0.10	mg/l	UM	1.00		97	90-110			
LCS Dup (0120745-BSD1)					Prepared & Analyzed: 12/18/20							
Ammonia as N	0.99	0.02	0.10	mg/l	UM	1.00		99	90-110	2	20	
Duplicate (0120745-DUP1)		**Source: 20L0030-01**			Prepared & Analyzed: 12/18/20							
Ammonia as N	0.14	0.02	0.10	mg/l	UM		0.14			5	20	
Matrix Spike (0120745-MS1)		**Source: 20L0030-01**			Prepared & Analyzed: 12/18/20							
Ammonia as N	2.24	0.04	0.20	mg/l	UM	2.00	0.14	105	90-110			

Client Name:	Geoscience Support Services, Inc.	EMA Log #: 20L0030
Project Name:	GMGP Water Quality 2020	

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0120745												
Matrix Spike Dup (0120745-MSD1)		**Source: 20L0030-01**			Prepared & Analyzed: 12/18/20							
Ammonia as N	2.24	0.04	0.20	mg/l	UM	2.00	0.14	105	90-110	0.09	20	
Batch 0120759												
Blank (0120759-BLK1)					Prepared & Analyzed: 12/01/20							
Nitrite as N	ND	0.007	0.05	mg/l	SF							
LCS (0120759-BS1)					Prepared & Analyzed: 12/01/20							
Nitrite as N	0.10	0.007	0.05	mg/l	SF	0.100		99	80-120			
LCS Dup (0120759-BSD1)					Prepared & Analyzed: 12/01/20							
Nitrite as N	0.10	0.007	0.05	mg/l	SF	0.100		99	80-120	0	20	
Duplicate (0120759-DUP1)		**Source: 20L0019-05**			Prepared & Analyzed: 12/01/20							
Nitrite as N	0.02	0.007	0.05	mg/l	SF		0.02			6	20	J
Matrix Spike (0120759-MS1)		**Source: 20L0019-05**			Prepared & Analyzed: 12/01/20							
Nitrite as N	0.11	0.007	0.05	mg/l	SF	0.100	0.02	94	80-120			
Matrix Spike Dup (0120759-MSD1)		**Source: 20L0019-05**			Prepared & Analyzed: 12/01/20							
Nitrite as N	0.11	0.007	0.05	mg/l	SF	0.100	0.02	95	80-120	0.9	20	
Batch 0120837												
Duplicate (0120837-DUP1)		**Source: 20K0824-01**			Prepared & Analyzed: 12/07/20							
Specific Conductance (EC)	5250	1.00	1.00	umhos/cm	SF		5220			0.6	20	

Client Name:	Geoscience Support Services, Inc.
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Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0120837												
Duplicate (0120837-DUP2)		**Source: 20L0207-01**			Prepared & Analyzed: 12/07/20							
Specific Conductance (EC)	2150	1.00	1.00	umhos/cm	SF		2110			2	20	
Reference (0120837-SRM1)					Prepared & Analyzed: 12/07/20							
Specific Conductance (EC)	435	1.00	1.00	umhos/cm	SF	466		93	89.91-110.08			
Batch 0121042												
Blank (0121042-BLK1)					Prepared & Analyzed: 12/10/20							
Nitrate as N	ND	0.009	0.05	mg/l	UM							
LCS (0121042-BS1)					Prepared & Analyzed: 12/10/20							
Nitrate as N	0.49	0.009	0.05	mg/l	UM	0.500		98	90-110			
LCS Dup (0121042-BSD1)					Prepared & Analyzed: 12/10/20							
Nitrate as N	0.49	0.009	0.05	mg/l	UM	0.500		97	90-110	0.4	20	
Duplicate (0121042-DUP1)		**Source: 20K0362-01**			Prepared & Analyzed: 12/10/20							
Nitrate as N	0.02	0.009	0.05	mg/l	UM		0.02			6	20	J
Matrix Spike (0121042-MS1)		**Source: 20K0362-01**			Prepared & Analyzed: 12/10/20							
Nitrate as N	0.98	0.02	0.10	mg/l	UM	1.00	0.02	96	90-110			
Matrix Spike Dup (0121042-MSD1)		**Source: 20K0362-01**			Prepared & Analyzed: 12/10/20							
Nitrate as N	0.99	0.02	0.10	mg/l	UM	1.00	0.02	97	90-110	1	20	
Batch 0121451												
Blank (0121451-BLK1)					Prepared & Analyzed: 12/11/20							
Fluoride	ND	0.031	0.100	mg/l	SF							

Conventional Chemistry Parameters by Standard/EPA Methods - Quality Control

Analyte	Result	MDL	Reporting Limit	Units	Analyst	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0121451												
LCS (0121451-BS1)					Prepared & Analyzed: 12/11/20							
Fluoride	0.965	0.031	0.100	mg/l	SF	1.00		96	80-120			
LCS Dup (0121451-BSD1)					Prepared & Analyzed: 12/11/20							
Fluoride	0.974	0.031	0.100	mg/l	SF	1.00		97	80-120	0.9	20	
Duplicate (0121451-DUP1)		**Source: 20L0019-05**			Prepared & Analyzed: 12/11/20							
Fluoride	0.384	0.031	0.100	mg/l	SF		0.391			2	20	
Matrix Spike (0121451-MS1)		**Source: 20L0019-05**			Prepared & Analyzed: 12/11/20							
Fluoride	1.34	0.062	0.200	mg/l	SF	1.00	0.391	95	80-120			
Matrix Spike Dup (0121451-MSD1)		**Source: 20L0019-05**			Prepared & Analyzed: 12/11/20							
Fluoride	1.36	0.062	0.200	mg/l	SF	1.00	0.391	96	80-120	0.9	20	

Notes and Definitions

W-02	The sample for nitrate analysis was preserved with H_2SO_4 after the nitrite portion of the analysis was completed to extend the holding time for the sample. Nitrate results are corrected for the nitrite contribution per the method.
QR-03	The RPD value for the sample duplicate or MS/MSD was outside of QC acceptance limits due to matrix interference.
QM-4X	The spike recovery was outside of the QC acceptance limits for the MS and/or MSD due to analyte concentration at 4 times or greater the spike concentration. The QC batch was accepted based on LCS and/or LCSD recoveries within the acceptance limits.
QM-06	Due to noted non-homogeneity of the QC sample matrix, the MS/MSD did not provide reliable results for accuracy and precision. Sample results for the QC batch were accepted based on LCS/LCSD percent recoveries and RPD values.
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to matrix interference. The LCS and/or LCSD were within acceptance limits showing that the laboratory is in control and the data is acceptable.
J	Detected but below the Reporting Limit; therefore, result is an estimated concentration (CLP J-Flag).
HT-15	This sample was received outside of the EPA's recommended 15 minute holding time for this analysis. However, the sample was analyzed immediately upon receipt.
ND	Analyte NOT DETECTED at or above the reporting limit (or method detection limit when specified)
NR	Not Reported
dry	Sample results reported on a dry weight basis (if indicated in units column)
RPD	Relative Percent Difference
MDL	Method detection limit (indicated per client's request)

2OL0030

CHAIN-OF-CUSTODY RECORD

EnviroMatrix Analytical, Inc.

4340 Viewridge Ave., Ste. A - San Diego, CA 92123 - Phone (858) 560-7717 - Fax (858) 560-7763

EMA LOG #:

Client: Geoscience
Attn: Nathan Reynolds
Samplers(s): IKC
Address:
Phone: 909-576-0922 Fax:
Email: NReynolds@geosciencewater.com
Billing Address:
Project ID:
Project #: OMWD PO #:

Requested Analysis

ID #	Client Sample ID	Sample Date	Sample Time	Sample Matrix	Container # / Type	Oil & Grease ☐ 413.1 ☐ 413.2 ☐ 1664	8015 (TPH) ☐ Gas ☐ Diesel ☐ Ext	624/8260 (VOC) Full BTXE MTBE Oxy Nap	625 / 8270 (SVOC) ☐ PAH only	608 / 8081 (Organochlorine Pesticides)	608 / 8082 (Polychlorinated Biphenyls)	8141 (Organophosphorus Pesticides)	TBT (Organotin Compounds)	☐ pH ☐ EC ☐ TSS ☐ TDS	☐ Nitrate ☐ Nitrite ☐ N-N ☐ TKN ☐ NH3	CAC Title 22/CAM17 Metals ☐ TTLC ☐ STLC	TCLP (RCRA) ☐ Metals ☐ Organics	Cd Cr Cu Pb Ni Ag Zn ☐ Dissolved	Coliform, ☐ Total (MTF) ☐ Fecal (MTF)	Colilert, T+E.Coli ☐ P/A ☐ Enumeration	Enterococcus, ☐ MTF ☐ Enterolert	Heterotrophic Plate Count (HPC)	☐ BOD ☐ COD ☐ Cyanide	See Attached
1	P7	12-1	930	W	6																			X
2	P11B	12-1	1020	W	6																			X
3	P11D	12-1	1045	W	6																			X
4	GUNR	12-1	840	W	6																			X
5	Test	12-1	1215	W	6																			X
6																								
7																								
8																								
9																								
10																								

Matrix Codes: A = Air, DW = Drinking Water, GW = Groundwater, SW = Storm Water
WW = Wastewater, S = Soil, SED = Sediment, SD = Solid, T = Tissue, O = Oil, L = Liquid

Shipped By: ☐ Courier ☐ UPS ☐ FedEx ☐ USPS ☐ Client Drop Off ☐ Other

[1]**Turn-Around-Time:** ☐ Same Day ☐ 1 day ☐ 2 day ☐ 3 day ☐ 4 day ☐ 5 day ☐ STD (7-business days)

[1]**Reporting Requirements:** ☐ Fax ☐ PDF ☐ Excel ☐ Geotracker/EDF ☐ Hard Copy ☐ EDT ☐ CEDEN ☐ SDWIS

[1]**Sample Disposal:** ☐ By Laboratory ☐ [2]Return to Client: P/U or Delivery ☐ Archive

Sample Integrity

Correct Containers: Yes No N/A	Containers Properly Preseved: Yes No N/A
Custody Seals Intact: Yes No N/A	Temp @ Receipt: 4.7
COC/Labels Agree: Yes No N/A	Sampled By: Client EMA Autosampler

RELINQUISHED BY	DATE/TIME	RECEIVED BY
Signature: [signature] Print: Ian Goltz Company: IKC	12-01-20 12:50	Signature: [signature] Print: Brian [illegible] Company: EMA
Signature: Print: Company:		Signature: Print: Company:
Signature: Print: Company:		Signature: Print: Company:

Project/Sample Location/Address:

Project/Sample Comments: See Nathan Reynolds for Requested Analysis.

[1]Additional costs may apply. Please note there is a $35 minimum charge for all clients.
[2]EMA reserves the right to return any samples that do not match our waste profile.
NOTE: By relinquishing samples to EMA, Inc., client agrees to pay for the services requested on this COC form and any additional analyses performed on this project. Payment for services is due within 30 days from date of invoice. Samples will be disposed of 7 days after report has been finalized unless otherwise noted. All work is subject to EMA's terms and conditions.

2020485

EnviroMatrix Analytical, Inc.

x5
x2 16 oz Jar Ø
x1 125 H_2SO_4 Jar
x1 125 HNO_3 Jar
x1 125 Jar Ø

Analytical Services Quotation

GMGP Water Quality 2020
Geoscience Support Services, Inc.
Nathan Reynolds

Bid Date: 04/17/2020
Bid Expires: 04/17/2021
Prices Expire: 04/17/2021

Matrix	Parameters	Method	#	TAT (days)	Unit Price	Extended Price
Water	**Aggressive Index (calc)(LAB)**	-	**5**	**7**	**$5.00**	**$25.00**
Water	**Alkalinity (All Forms)**	varies	**5**	**7**	**$25.00**	**$125.00**
Water	Hexavalent Chromium	EPA 218.6	5	7	$105.00	$525.00
Water	Langelier Index (Calc)	-	5	7	$5.00	$25.00
Water	Barium (Total)	EPA 200.8	5	7	$10.00	$50.00
Water	**Boron (Total)**	**EPA 200.7**	**5**	**7**	**$10.00**	**$50.00**
Water	Calcium (Total)	EPA 200.7	5	7	$10.00	$50.00
Water	Chromium (Total)	EPA 200.8	5	7	$10.00	$50.00
Water	Copper (Total)	EPA 200.8	5	7	$10.00	$50.00
Water	Iron (Total)	EPA 200.8	5	7	$10.00	$50.00
Water	**Magnesium (Total)**	**EPA 200.7**	**5**	**7**	**$10.00**	**$50.00**
Water	Manganese (Total)	EPA 200.8	5	7	$10.00	$50.00
Water	Potassium (Total)	EPA 200.7	5	7	$10.00	$50.00
Water	Silicon (Total)	EPA 200.7	5	7	$35.00	$175.00
Water	Sodium (Total)	EPA 200.7	5	7	$10.00	$50.00
Water	**Strontium (Total)**	**EPA 200.7**	**5**	**7**	**$45.00**	**$225.00**
Water	Zinc (Total)	EPA 200.8	5	7	$10.00	$50.00
Water	Ammonia as N	EPA 350.1	5	7	$25.00	$125.00
Water	Chloride	SM4500 Cl C	5	7	$15.00	$75.00
Water	Fluoride	SM4500 F C	5	7	$20.00	$100.00
Water	**Hardness**	**EPA 200.7**	**5**	**7**	**$15.00**	**$75.00**
Water	Nitrate as N	EPA 365.1	5	7	$25.00	$125.00
Water	Nitrite as N	SM4500 NO2 B	5	7	$25.00	$125.00
Water	Orthophosphate as P	SM4500 P E	5	7	$15.00	$75.00
Water	pH in water	SM4500-H+ B	5	7	$10.00	$50.00
Water	**Specific Conductance (EC)**	**SM2510 B**	**5**	**7**	**$15.00**	**$75.00**
Water	Sulfate	SM4500 SO4 E	5	7	$15.00	$75.00
Water	Total Dissolved Solids	SM2540 C	5	7	$15.00	$75.00
Water	Total phosphate as P	EPA 365.1	5	7	$20.00	$100.00

20L0030

Mdc JK 4/20/20

Mark Allen Rein
Project Manager
EnviroMatrix Analytical, Inc.

4340 Viewridge Avenue, Suite A • San Diego, California 92123 • (858) 560-7717 • Fax (858) 560-7763
Analytical Chemistry Laboratory

APPENDIX J

Conversion of Transducer Pressure Measurements to Groundwater Elevations

GEOSCIENCE

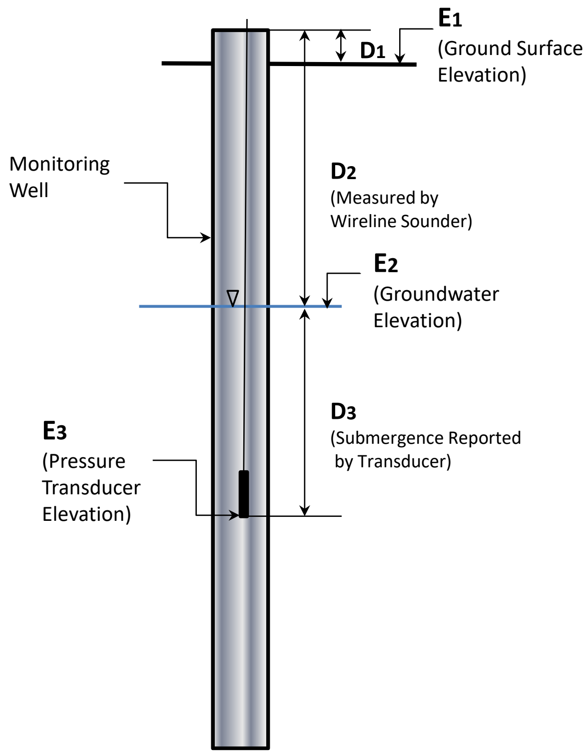
CONVERSION OF TRANSDUCER PRESSURE MEASUREMENTS TO GROUNDWATER ELEVATIONS

Pressure transducer readings were converted to groundwater elevation values (expressed as ft NAVD88[1]) using the setting depth of the pressure transducer and the ground surface elevation at the monitoring well site (see inset). After initially setting a pressure transducer in the well, and after each time a transducer is removed from a well, the depth to water is determined using an electrical wire line sounder. The transducer elevation is then determined as follows:

$$\text{Transducer Elevation (E3)} = \text{E1} + \text{D1} - \text{D2} - \text{D3}$$

Once the transducer elevation has been established, groundwater elevations in ft NAVD88 are calculated from transducer submergence readings (D3) (psi converted to ft) and depth to water measurements (D2) as follows:

$$\text{Groundwater Elevation (E2)} = \text{E3} + \text{D3}$$



Measurements of depth to water were made with an electric wireline water level indicator during each transducer download event. The Desalter Test Well, Surf Cup #1, Surf Cup #1 (abandoned), Surf Cup #2, Morgan Run #3 Green North, Morgan Run GunR, Valley 7 Well, Morgan Run Test Well, and Morgan Run P-11A reference point elevations (RP) were surveyed on February 18, 2020. Morgan Run P-1, P-2, P-4D, P-7, P-11A, and P-11D RP elevations were surveyed on August 25, 2020. All elevations are in ft NAVD88 and summarized in Table 1.

The Baro-Diver® and In-Situ BaroTroll were used to manually compensate groundwater elevation data. The following formula was used to manually compensate transducer submergence: (Transducer Submergence *ft* – (Barometric Pressure *psi* * 2.28 *ft/psi*)).

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[1] Elevations reported in North American Vertical Datum of 1988 (NAVD88)

APPENDIX K

Estimating Total Dissolved Solids from Electrical Conductivity (EC) Measurements

GEOSCIENCE

ESTIMATING TOTAL DISSOLVED SOLIDS FROM ELECTRICAL CONDUCTIVITY (EC) MEASUREMENTS

Estimation of TDS from EC utilizes a conversion factor that is specific to a given water chemistry. Based on the normalized EC value (corrected to 25° C), an EC conversion factor may be used to estimate TDS from the product of the temperature-corrected EC value and the TDS:EC correction factor. The factor is calculated by dividing the laboratory measured EC by the laboratory measured TDS using the gravimetric calculated TDS.

Accuracy of the TDS:EC conversion factor is improved through collection of on-going direct measurements of TDS in groundwater samples using laboratory gravimetric methods. The equation of which may be used as a general estimate of TDS from measured EC.

APPENDIX L

Desalter Test Well

Pump Design Technical Specifications

THIS TECHNICAL SPECIFICATION HAS BEEN PREPARED FOR THE OLIVENHAIN MUNICIPAL WATER DISTRICT BY OR UNDER THE DIRECTION OF THE FOLLOWING DESIGN PROFESSIONALS LICENSED BY THE STATE OF CALIFORNIA. THEY ARE BASED ON THE MOST RECENT AVAILABLE INFORMATION REGARDING SITE CONDITIONS, DRILLING METHODS AND MATERIALS TO BE USED. HOWEVER, SHOULD THE CONTRACTOR TAKE EXCEPTION TO ANY PART OF THESE SPECIFICATIONS OR PUMP DESIGN, AND IS NOT PREPARED TO FOLLOW THE SPECIFICATIONS AS INCLUDED HEREIN, THE CONTRACTOR WILL NOTIFY THE OWNER OR THE OWNER'S REPRESENTATIVE IN WRITING BEFORE MOBILIZING TO THE SITE.

Mark D. Williams, Ph.D., P.E.
Principal Engineer
RCE No. 68138

Olivenhain Municipal Water District

EQUIPPING THE SAN DIEGUITO VALLEY DESALINATION TEST WELL WITH A DEEPWELL, VERTICAL LINESHAFT TURBINE PUMP

TABLE OF CONTENTS

SECTION 11217

SUBMERSIBLE VERTICAL TURBINE-TYPE WELL PUMP

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Furnish complete, tested and operating, the equipment as shown on the Figure 1, and as specified herein.

B. Work Included in This Section:
   1. Submersible vertical turbine type pump assembly for installation in an existing well casing complete with electric submersible motor, power cable, intake screen, pump bowls, column and pump appurtenances as specified herein.

1.02 SUBMITTALS

A. Shop Drawings: Submit Shop Drawings in the Product Review category for favorable review of the Pump. Include sufficient data to show that equipment conforms to Specification requirements, including prototype pump performance curves and motor data. Submit all items of equipment in complete initial package.

B. Performance Testing: Certified non-witnessed factory performance tests in accordance with Hydraulics Institute Standards are required for each pump. Obtain favorable review from the Engineer prior to shipment of the pumps.

C. Manuals: Furnish manufacturer's installation, lubrication, operation and maintenance manuals, bulletins, and parts lists.

D. Affidavits: Furnish affidavits from the manufacturer stating that the equipment has been properly installed, adjusted and tested and is ready for full time operation.

1.03 QUALITY ASSURANCE

A. All equipment furnished under this Section shall: (1) be of a single manufacturer who has been regularly engaged in the design and manufacture of the equipment for at least five years; and (2) be demonstrated to the satisfaction of the Owner that the quality is equal to equipment made by those manufacturers specifically named herein.

B. All parts of the submersible well pump furnished under this Specification Section shall be of a single pump manufacturer.

1.04 SEISMIC CERTIFICATION

A. Seismic anchorage certifications and descriptions shall not be required.

PART 2 - PRODUCTS

2.01 SUBMERSIBLE TURBINE TYPE PUMPS

A. General: Provide submersible vertical turbine type well pump for this project.

B. Pump Schedule: The required pump characteristics shall be as follows:

Design Operating Point	200 gpm @ 200 ft TDH
Speed	3,500 rpm
Maximum Motor Horsepower	20 HP
Minimum Pump Efficiency	
@ Design Operating Point	70 Percent
Shut Off Head, 0 GPM @	310 ft ± 5 ft
Motor Data (speed/phase/volts)	3,500 rpm, 3-phase, 460 volts

C. Pump Types:
1. The pump shall be water lubricated submersible vertical turbine type pumps including bowl assembly, column, pump suction barrel, well seal, discharge head and submersible electric motor.
2. Manufacturers:
    a. 1st Manufacturer – Grundfos SP 230S
    b. 2nd Manufacturer – Or Equal

D. Pump Construction:
1. Bowl Assembly:
    a. Provide pump bowls of stainless steel or bronze.
    b. The impeller shaft shall be stainless steel (not less than 12% chrome content) and shall be supported by bronze and/or neoprene bearings located on both sides of each impeller.
    c. The impellers shall be of the enclosed type and shall be of stainless steel, of heavy construction, accurately fitted, statically and dynamically balanced. The impellers shall be preadjusted at the factory.
2. Discharge Column Assembly:
    a. Contractor shall supply approximately 100 feet pump column pipe. The column pipe shall be Schedule 40 stainless steel, not less than 3 inches inside diameter. The pipe shall be furnished in interchangeable sections and shall be connected with threaded sleeve type couplings.
3. Discharge Head: Weld flange to top of the well casing and install pre-fabricated stainless steel well seal with one 3-inch diameter hole for water column pipe, and

molded rubber for watertight closure. Provide 4 bolts, nuts and washers and secure casing seal.

E. Motors and Cable:
1. Duty conditions
a. Submersible duty
b. Suitable for inverter duty
2. Nominal horsepower rating: 20 HP
3. Supply Voltage: 460 volts, 3-phase, 60-Hz
4. Manufacturer’s cable shall be continuous and without splices

2.02 PUMP CONTROLS

A. Contractor shall connect the pump to the existing Variable Frequency Motor Controller.

B. It is essential that the pump provided are capable of complete and stable operation over the entire range of the pump curve, from maximum flow rate operating point all the way to shut off.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install equipment in strict conformance with manufacturer's installation instructions. Check pump and motor alignment according to the Standards of the Hydraulics Institute after pump and motor have been installed.

3.02 FIELD SERVICE

A. Contractor shall thoroughly check and inspect the pump after installation, place the pump in operation and make necessary adjustments.

3.03 FIELD TESTING

A. Perform field testing, observed by the Engineer, to demonstrate that the installed pump equipment provides the hydraulic performance determined by factory tests and that the equipment runs smoothly and is free from excessive noise and vibrations. Hydraulic Institute vibration limits shall govern.

B. Measure the following parameters in 15-minute increments:
1. Input voltage (phase to phase to VFD)
2. Phase current to VFD

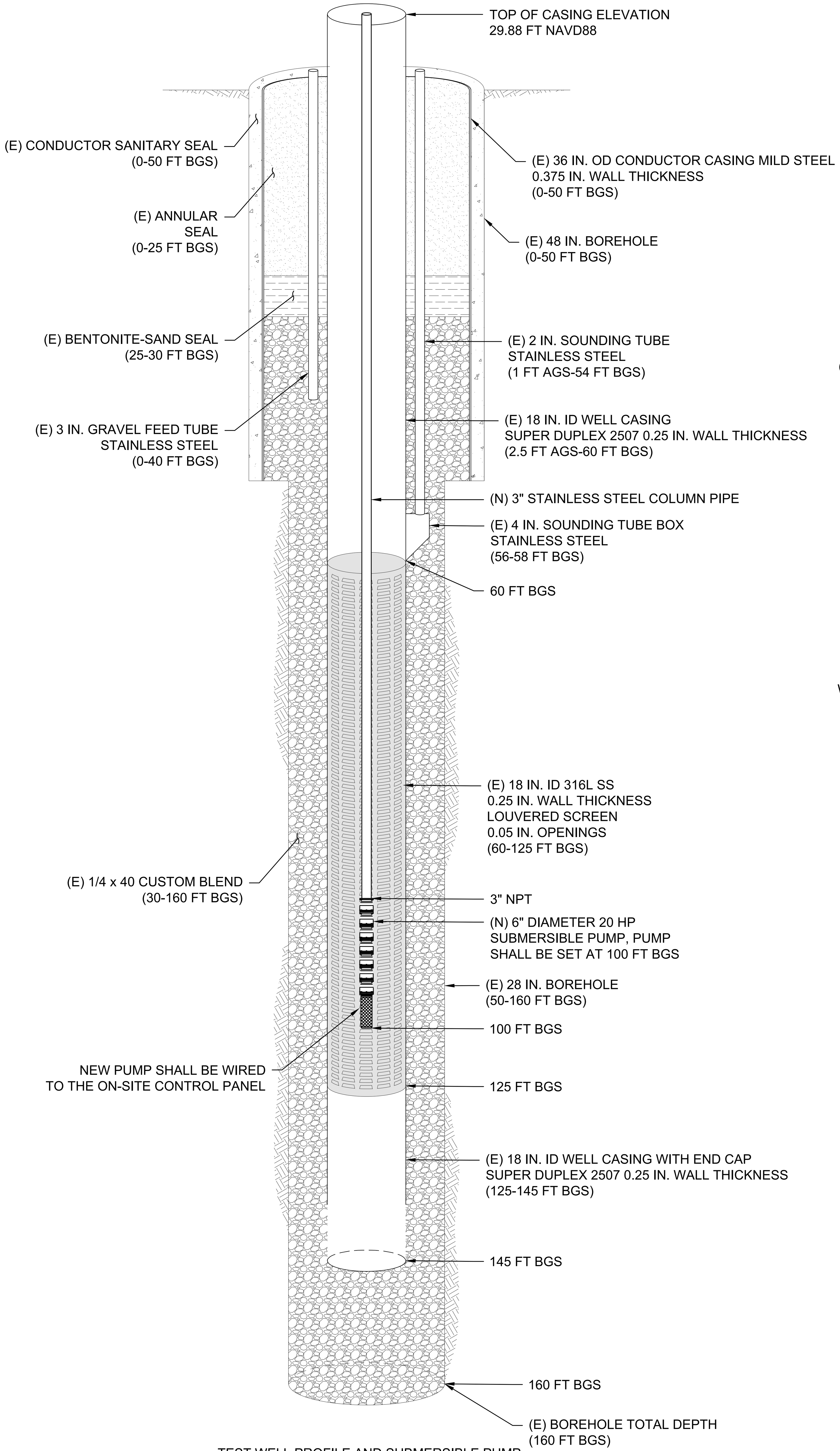
3. Power Factor incoming to VFD
4. Suction Hydraulic Grade Line
5. Discharge Hydraulic Grade Line

C. Test Duration: Over a maximum 8-hour period, until the suction Hydraulic Grade Line stabilizes within a 10 feet allowance.

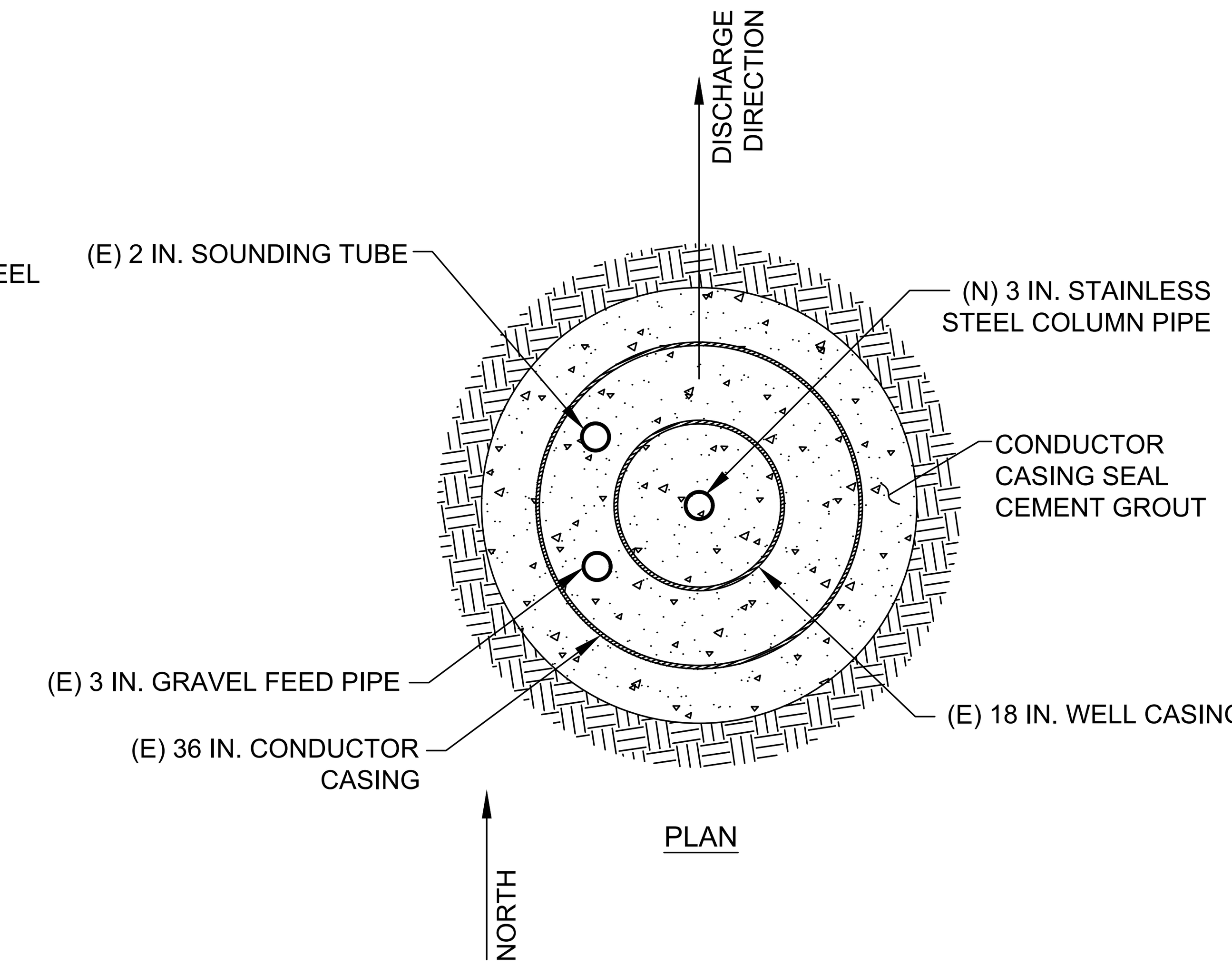
END OF SECTION

FIGURES

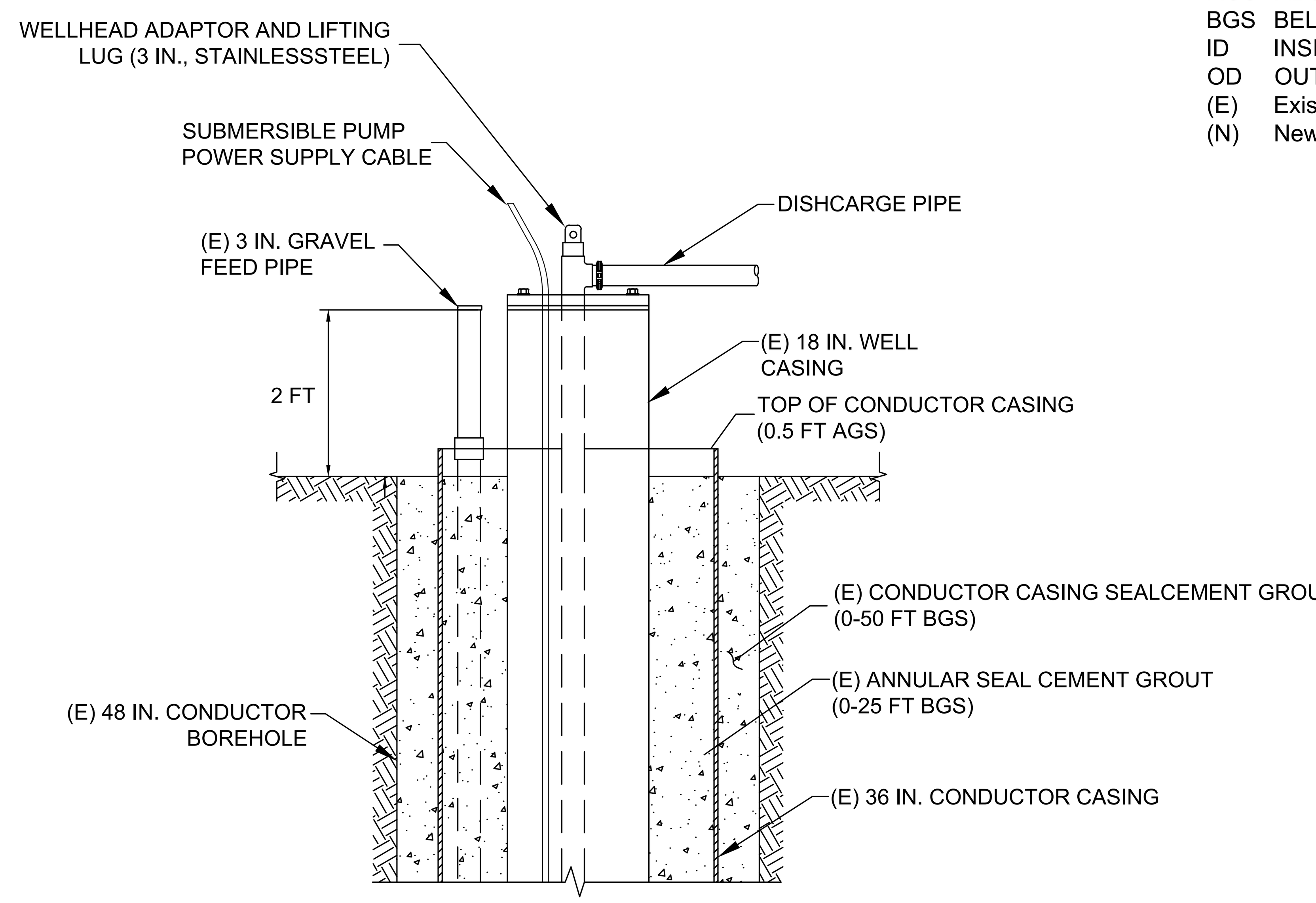
GEOSCIENCE



TEST WELL PROFILE AND SUBMERSIBLE PUMP
NOT TO SCALE



WELL CASING AND CONDUCTOR CASING DETAIL
NOT TO SCALE



PROFILE

WELLHEAD COMPLETION DETAIL
NOT TO SCALE

GENERAL NOTES:

1. CONTRACTOR SHALL REMOVE THE EXISTING PUMP, PIPE COLUMN AND WELL CAP, AND INSTALL NEW PUMP, PIPE COLUMN SHOWN ON FIGURE 01.
2. CONTRACTOR SHALL LEAVE THE TOP OF WELL CASING AS HIGH AS POSSIBLE.
3. ALL FIELD AND SHOP WELDING SHALL BE DONE BY THE ELECTRIC ARC PROCESS UNLESS OTHERWISE SPECIFIED. ALL FIELD WELDING SHALL BE DONE IN PASSES NOT THICKER THAN ¼-INCH. GIVE PARTICULAR ATTENTION TO THE ALIGNMENT OF EDGES TO BE JOINED, SO THAT COMPLETE FUSION AND PENETRATION WILL BE EFFECTED THROUGHOUT THE BOTTOM OF THE WELD. WELDS SHALL CONTAIN NO VALLEYS OR UNDERCUTS IN THE CENTER OR EDGES OF THE WELD. THOROUGHLY CLEAN EACH PASS, EXCEPT THE FINAL ONE, OF DIRT,

   ALL WELDING SHALL BE DONE BY EXPERIENCED, SKILLED OPERATORS FAMILIAR WITH THE METHODS AND MATERIALS TO BE USED. HAND WELDING WILL BE DONE ONLY BY WELDERS QUALIFIED UNDER THE STANDARD QUALIFICATION PROCEDURE OF SECTION IX OF THE ASME BOILER AND PRESSURE VESSEL CODE.
4. CONTRACTOR SHALL WIRE THE NEW SUBMERSIBLE PUMP TO THE EXISTING CONTROL PANEL ON-SITE. RIGID STEEL CONDUIT SHALL BE USED IN ALL CONDUIT SYSTEMS, EXCEPT WHERE FLEXIBLE CONDUIT IS REQUIRED, OR ALLOW THE USE OF POLYVINYL CHLORIDE (PVC) CONDUIT. THE MINIMUM SIZE RACEWAY SHALL BE 3/4-INCH.

   GALVANIZED RIGID STEEL CONDUIT (GRS) SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION, CONFORMING TO ANSI C80.1 AND UL 6. COUPLINGS SHALL BE THREADED TYPE.

   FLEXIBLE METAL CONDUIT SHALL BE LIQUID-TIGHT, SHALL HAVE A MOISTURE- AND OIL-PROOF PVC JACKET EXTRUDED OVER A GALVANIZED, FLEXIBLE STEEL CONDUIT, AND SHALL CONFORM TO UL 360.

   RIGID NONMETALLIC CONDUIT SHALL BE PVC SCHEDULE 40 (PVC-40) CONDUIT APPROVED FOR UNDERGROUND USE AND FOR USE WITH 90°C WIRES, AND SHALL CONFORM TO UL 651.
5. CONTRACTOR SHALL WELD FLANGE TO TOP OF THE WELL CASING AND INSTALL PRE-FABRICATED STAINLESS STEEL WELL SEAL WITH ONE 3-INCH DIAMETER HOLE FOR WATER COLUMN PIPE , AND MOLDED RUBBER FOR WATERTIGHT CLOSURE. PROVIDE 4 BOLTS, NUTS AND WASHERS AND SECURE CASING SEAL.

ABBREVIATIONS LIST:

AGS ABOVE GROUND SURFACE
BGS BELOW GROUND SURFACE
ID INSIDE DIAMETER
OD OUTSIDE DIAMETER
(E) Existing
(N) New

SUBMERSIBLE PUMP DESIGN	
TOTAL DYNAMIC HEAD (FT.)	200
MOTOR VOLTS (V)	460
MOTOR HORSE POWER (HP)	20
PUMP MATERIAL	304 STAINLESS STEEL
COLUMN PIPE DIAMETER (IN.)	3
COLUMN PIPE MATERIAL	316L STAINLESS STEEL

GEOSCIENCE
The First Name in Groundwater

811 CALL 811 AT LEAST TWO DAYS BEFORE YOU DIG
Know what's below. Call before you dig.
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

REV.	DATE	BY	DESCRIPTION
1			
2			
3			
4			

LINE IS 2 INCHES AT FULL SCALE (IF NOT 2" - SCALE ACCORDINGLY)
DESIGNED: TC
DRAWN: JF
CHECKED: MW
DATE:

REGISTERED PROFESSIONAL ENGINEER MARK D. WILLIAMS No. 68138 Exp. 06-30-21 CIVIL STATE OF CALIFORNIA

DISTRICT ENGINEER:
____________, P.E. DATE
R.C.E. NO. ________ EXP. DATE: ________
PREPARED UNDER THE SUPERVISION OF:
MARK WILLIAMS DATE
PE NO. 68138 EXP. DATE: 6/30/21

OLIVENHAIN Municipal Water District

OLIVENHAIN MUNICIPAL WATER DISTRICT
SAN DIEGUITO VALLEY DESALINATION PROJECT
TEST WELL AT SURF CUP SPORTS FIELDS

WELL PROFILE AND SUBMERSIBLE PUMP

DRAWING NO.
01

SHEET NO.
01 OF 01

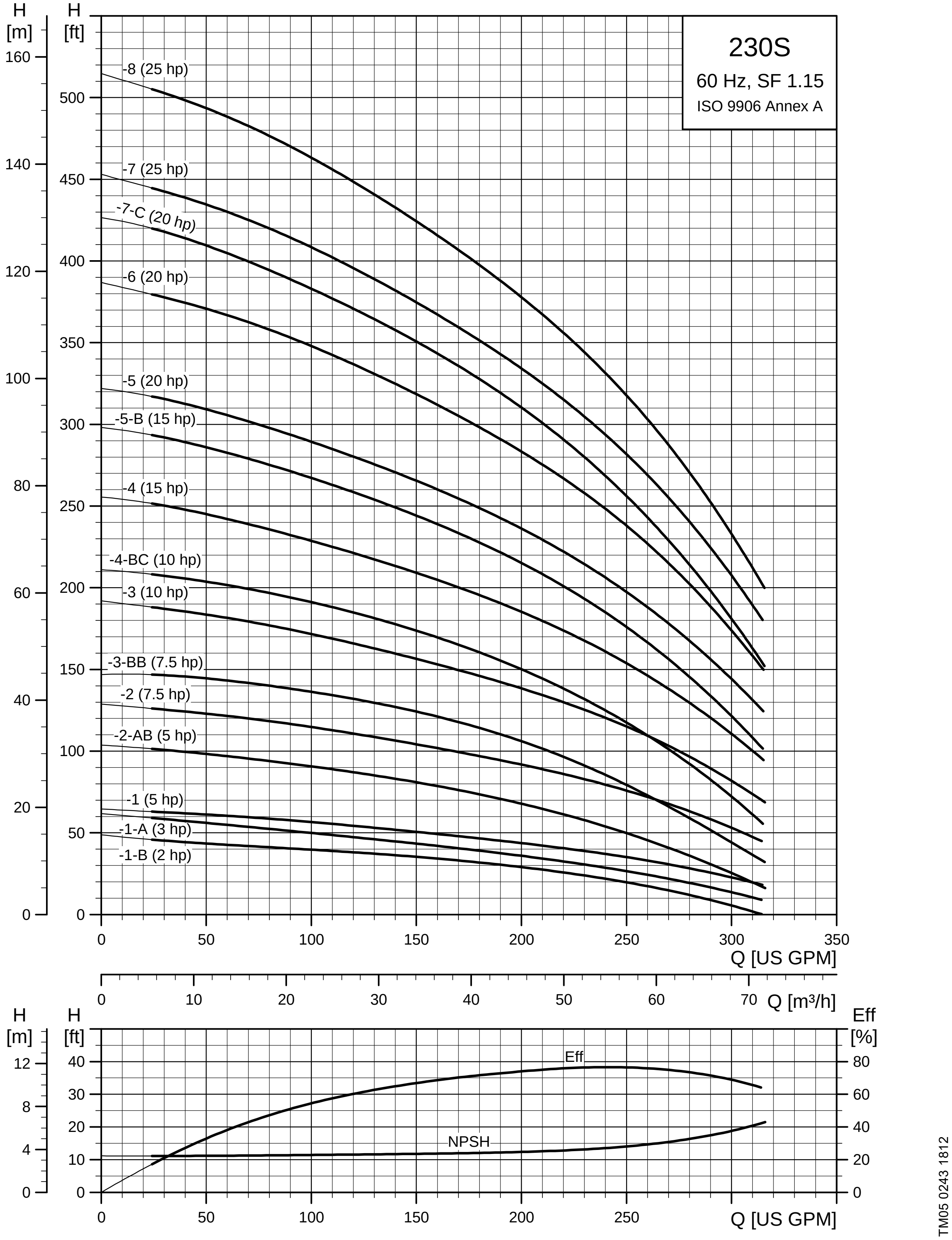
X:\Projects\CAD\Pump Design\OMWD\Test Well Pump\OMWD - Test Well - 01_Well Profile_recover.dwg, 1/26/2021

APPENDIX A
PUMP CURVE

GEOSCIENCE

6" and larger wells - continued

SP 230S (230 gpm)

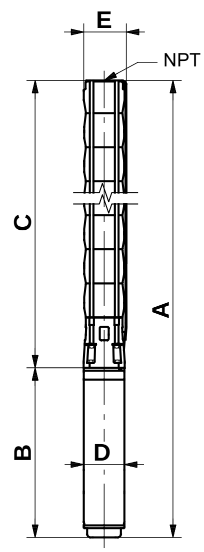


6" and larger wells - continued

SP 230S (230 gpm) pump with 4", 6" motor

Pump model	Nom. head [ft]	Motor					Dimensions [in (mm)]					Net weight (complete) [lb]
		Ph	Volts [V]	[Hp]		[rpm]	A	B	C	D	E	
230S - Motor diameter 4-inch, 3-wire motor, 60 Hz, rated flow rate 230 gpm (3" NPT)												
230S20-1B	32	1	230	2	●	3434	34.45 (875)	19.57 (497)	14.89 (378)	3.75 (95)	5.75 (146)	49.5
	32	3	230	2	■	3432	30.12 (765)	15.24 (387)	14.89 (378)	3.75 (95)	5.75 (146)	49.5
	32	3	460	2	■	3432	30.12 (765)	15.24 (387)	14.89 (378)	3.75 (95)	5.75 (146)	49.5
230S30-1A	38	1	230	3	●	3459	37.60 (955)	22.72 (577)	14.89 (378)	3.75 (95)	5.75 (146)	49.5
	38	3	230	3	●	3460	32.84 (834)	17.96 (456)	14.89 (378)	3.75 (95)	5.75 (146)	49.5
	39	3	460	3	●	3489	32.84 (834)	17.96 (456)	14.89 (378)	3.75 (95)	5.75 (146)	49.5
230S50-1	46	1	230	5	●	3516	41.54 (1055)	26.66 (677)	14.89 (378)	3.75 (95)	5.75 (146)	49.5
	46	3	230	5	●	3528	37.56 (954)	22.68 (576)	14.89 (378)	3.75 (95)	5.75 (146)	49.5
	46	3	460	5	●	3527	37.56 (954)	22.68 (576)	14.89 (378)	3.75 (95)	5.75 (146)	49.5
230S50-2AB	71	1	230	5	●	3459	45.99 (1168)	26.66 (677)	19.34 (491)	3.75 (95)	5.75 (146)	49.5
	71	3	230	5	●	3487	42.01 (1067)	22.68 (576)	19.34 (491)	3.75 (95)	5.75 (146)	79.2
	71	3	460	5	●	3484	42.01 (1067)	22.68 (576)	19.34 (491)	3.75 (95)	5.75 (146)	79.2
230S75-2	86	3	230	7.5	●	3488	45.95 (1167)	26.62 (676)	19.34 (491)	3.75 (95)	5.75 (146)	79.2
	86	3	460	7.5	●	3488	45.95 (1167)	26.62 (676)	19.34 (491)	3.75 (95)	5.75 (146)	79.2
230S75-3BB	110	3	230	7.5	●	3468	50.40 (1280)	26.62 (676)	23.78 (604)	3.75 (95)	5.75 (146)	126.0
	110	3	460	7.5	●	3468	50.40 (1280)	26.62 (676)	23.78 (604)	3.75 (95)	5.75 (146)	126.0
230S100-3	129	3	460	10	●	3472	54.34 (1380)	30.56 (776)	23.78 (604)	3.75 (95)	5.75 (146)	126.0
230S100-4BC	141	3	460	10	●	3456	58.78 (1493)	30.56 (776)	28.23 (717)	3.75 (95)	5.75 (146)	144.9
230S - Motor diameter 6 inch, 60 Hz, rated flow rate 230 gpm (3" NPT)												
-	-	3	208	5	▲	3480	-	23.51 (597)	-	5.50 (139.5)	-	80.0
			230	5	▲	3510	-	23.51 (597)	-	5.50 (139.5)	-	80.0
			460	5	▲	3500	-	23.51 (597)	-	5.50 (139.5)	-	80.0
230S75-2	87	3	230	7.5	▲	3496	43.47 (1104)	23.51 (597)	19.97 (507)	5.52 (140)	5.79 (147)	111.6
	87	3	460	7.5	▲	3505	43.47 (1104)	23.51 (597)	19.97 (507)	5.52 (140)	5.79 (147)	111.6
230S75-3BB	111	3	230	7.5	▲	3477	47.92 (1217)	23.51 (597)	24.41 (620)	5.52 (140)	5.79 (147)	131.4
	111	3	460	7.5	▲	3488	47.92 (1217)	23.51 (597)	24.41 (620)	5.52 (140)	5.79 (147)	131.4
230S100-3	129	3	230	10	▲	3474	49.10 (1247)	24.69 (627)	24.41 (620)	5.52 (140)	5.79 (147)	126.0
	130	3	460	10	▲	3486	49.10 (1247)	24.69 (627)	24.41 (620)	5.52 (140)	5.79 (147)	126.0
230S100-4BC	141	3	230	10	▲	3457	53.55 (1360)	24.69 (627)	28.86 (733)	5.52 (140)	5.79 (147)	144.9
	143	3	460	10	▲	3472	53.55 (1360)	24.69 (627)	28.86 (733)	5.52 (140)	5.79 (147)	144.9
230S150-4	176	3	230	15	▲	3491	55.91 (1420)	27.05 (687)	28.86 (733)	5.52 (140)	5.79 (147)	144.9
	176	3	460	15	▲	3495	55.91 (1420)	27.05 (687)	28.86 (733)	5.52 (140)	5.79 (147)	144.9
230S150-5B	202	3	230	15	▲	3470	60.36 (1533)	27.05 (687)	33.31 (846)	5.52 (140)	5.79 (147)	161.1
	202	3	460	15	▲	3476	60.36 (1533)	27.05 (687)	33.31 (846)	5.52 (140)	5.79 (147)	161.1
230S200-5	222	3	230	20	▲	3499	62.92 (1598)	29.61 (752)	33.31 (846)	5.52 (140)	5.79 (147)	161.1
	224	3	460	20	▲	3508	62.92 (1598)	29.61 (752)	33.31 (846)	5.52 (140)	5.79 (147)	161.1
230S200-6	248	3	230	20	▲	3476	67.37 (1711)	29.61 (752)	37.76 (959)	5.52 (140)	5.79 (147)	167.4
	252	3	460	20	▲	3488	67.37 (1711)	29.61 (752)	37.76 (959)	5.52 (140)	5.79 (147)	167.4
230S200-7C	288	3	230	20	▲	3462	71.82 (1824)	29.61 (752)	42.21 (1072)	5.52 (140)	5.79 (147)	181.8
	291	3	460	20	▲	3475	71.82 (1824)	29.61 (752)	42.21 (1072)	5.52 (140)	5.79 (147)	181.8

230S



TM00 0961 1196

E = Maximum diameter of pump including cable guard and motor.

Notes:
Control box is required for 3-wire, single-phase applications. Data does not include control box.
Performance conforms to ISO 9906. 1999 (E) Annex A. Minimum submergence is 8 ft (2.4 m).

- ■ MS 402 motor.
- ● MS 4000 motor.
- ▲ MS 6000C motor.

APPENDIX B
RESPONSES TO QUESTIONS AND COMMENTS ON 90% DESIGN

GEOSCIENCE

Technical Memorandum

To:	Mr. Jason Hubbard, P.E. Engineering Manager Olivenhain Municipal Water District 1966 Olivenhain Rd Encinitas, CA 92024	
From:	Mark Williams, Ph.D., PE Principal Engineer GEOSCIENCE Support Services, Inc.	Tim Chen Project Manager GEOSCIENCE Support Services, Inc.
Date:	January 19, 2021	
Subject:	**Responses to Comments and Questions on 90% Design for OMWD-Owned Pump in Test Well**	

QUESTION NO. 1: TOTAL DYNAMIC HEAD CALCULATIONS – PROVIDE THE TDH CALCULATIONS INCLUDING THE STATIC LIFT, MINOR LOSSES THROUGH FITTINGS, PIPELINE LOSSES, AND OTHER LOSSES. THE MOST LIKELY OPERATING CONDITION IS PUMPING THROUGH APPROXIMATELY 1,200 FEET OF 4-INCH PVC PIPE TO THE SURF CUP SPORTS POND. UNDER THIS CONDITION, WHAT IS THE PUMP EFFICIENCY?

Table 1 below shows the hydraulic calculations. The static lift, friction loss, and minor loss are approximately 90 feet, 40 feet and 1 foot, respectively. The total dynamic head will be 191 feet. Assuming a pump efficiency of 60%, 20 horsepower will be required for the submersible pump.

Table 1 Hydraulic Calculations (Using Hazen-Williams)

	[1]	[2]		[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
Pipeline Description	Length	Maximum Flow		Pipe Size	I.D.	Velocity	Static Lift	Friction Head Loss	Minor Head Loss	Total Head Loss	Contingency for Additional Head Loss in Pump Column	Required TDH
	ft	gpm	cfs	in	in	fps	ft	ft	ft	ft	ft	ft
Well to Surf Cup Pond	1,270	200	0.45	**4.00**	4.00	5.11	90	40	1.0	41	60	191

Notes:

[1] Measured from Google Earth.

[2] Assumed well capacity is 250 gpm.

[3] Selected from standard pipe sizes.

[4] Based on JM Eagle Pressure-Rated PVC C900 Pipelines, pressure class 100 psi (DR 41).

[5] Calculated from [2] and [4].

[6] From groundwater level to the surface elevation at Surf Cup Pond.

[7] Calculated from [1], [2] and [4] using Hazen-Williams Equation.

[8] Calculated using the equivalent length method, and assuming additional 20% as the safety factor.

[9] = [7] + [8]

[10] Based on potential head loss in the pump column caused by iron and manganese deposits.

[11] = [6] + [9] + [10]

COMMENT NO. 1: GSSI WILL CONTACT THE PUMP MANUFACTURER TO MAKE SURE THE PUMP IS SUITABLE FOR THE LOCAL GROUNDWATER QUALITY, AND IN PARTICULAR POTENTIAL IRON AND MANGANESE DEPOSITS, AND IMPLEMENT MANUFACTURER RECOMMENDATIONS.

The presence of high levels of dissolved iron and manganese in groundwater is driving the accumulation of "Iron and Manganese" deposits through biologically-catalized oxidation. This is occurring as air is introduced most likely in the well casing during well pumping, and this then drives the formation of the deposits seen in the discharge piping. Therefore, the material requirements of this pump need to 1) Minimize corrosion of pump impellers/bowels during operating cycles, which expose the pump to oxidative/scaling conditions and off cycles where the pump is then exposed to reducing conditions; and 2) withstand mild acidification if the pump required de-scaling during service to remove iron an manganese scaling. For these requirements we recommend minimum 304 stainless steel pump bowls, impellers and other wetted internals. We have confirmed with one pump manufacture (Grundfos) that stainless pump components would be the best selection given the aforementioned requirements.

APPENDIX M

Woodard & Curran

Refined Manganese Treatment Design Criteria Report

GEOSCIENCE

COMMITMENT & INTEGRITY DRIVE RESULTS

9655 Chesapeake Drive | Suite 320
San Diego, California 92123
www.woodardcurran.com

T 800.426.4262
T 858.875.7400

TECHNICAL MEMORANDUM

TO:	Joseph Randall, Olivenhain Municipal Water District
CC:	Brian Villalobos, Geoscience Support Services, Inc.
PREPARED BY:	Leslie Dumas and Martha de Maria y Campos, Woodard & Curran
REVIEWED BY:	Kraig Erickson, Woodard & Curran
DATE:	August 26, 2020
RE:	San Dieguito Valley Brackish Groundwater Desalination Design Pilot – Refined Manganese Treatment Design Criteria Report

The goal of this technical memorandum is to refine pre-treatment and reverse osmosis design criteria to support Olivenhain Municipal Water District's San Dieguito Valley Brackish Groundwater Desalination Design Pilot. This memorandum is based on site specific data generated from the operation of the pilot test well and field testing of the manganese pre-treatment system in June 2020.

1. PROJECT BACKGROUND

Olivenhain Municipal Water District (OMWD) relies on purchased water for its potable water needs with limited local water supply options available. Faced with rising costs, decreasing availability, and uncertain future reliability of this purchased water supply, OMWD is focusing on developing a reliable local potable water supply through implementation of the San Dieguito Valley Brackish Groundwater Desalination Project (Project).

The full-scale project will increase OMWD's potable water supply by 1,120 AFY. As both of San Diego County's major sources of potable water—the State Water Project and the Colorado River—are facing significant challenges, local, drought-proof supplies, such as desalinated groundwater, are imperative to maintaining a $222 billion regional economy that is dependent upon a reliable source of water. The development of a new water supply will improve local water supply reliability and resiliency to drought or other emergencies and benefit OMWD's 84,000 customers with improved water supply reliability and water rate stability. The full-scale project will also decrease the San Diego region's reliance on imported water.

The *San Dieguito Valley Brackish Groundwater Desalination Study* that was conducted in 2017 evaluated if 1.0 million gallons per day (mgd) of potable water could be produced from brackish groundwater in the San Dieguito Valley Groundwater Basin. The study evaluated numerous project considerations including production wells, conveyance pipelines, desalination treatment facilities, brine management, as well as project alternatives and costs, environmental and regulatory considerations, and implementation plans.

As an outcome of the feasibility study, OMWD secured additional funding from the State of California's Depart of Water Resources (DWR) Water Desalination Grant program to pilot a new potable water supply from the San Dieguito Valley Groundwater Basin. The objectives of the design pilot are to:

1) Verify test well locations with pilot borings,
2) Verify water balance of San Dieguito Valley Groundwater Basin test wells,
3) Verify water quality from test wells for required desalination treatment, and
4) Verify manganese treatment by piloting pre-treatment technologies.

The San Dieguito Valley Brackish Groundwater Desalination Design Pilot constructed a test well in April 2019. In June 2020, field testing of treatment technologies was completed to refine treatment design criteria prior to construction of a full-scale project. Results will confirm the most beneficial and cost-effective approach to increase potable water supplies. The design pilot will increase OMWD's knowledge base regarding brackish desalination and sustainability of the local groundwater basin. Long-term monitoring and pumping of test well(s) will examine and confirm water quality and water balance in the project area, which will contribute to water quality improvements and water supply enhancements in the full-scale project. Data from long-term testing will be used to refine and recalibrate the groundwater model and field test greensand filtration equipment to develop site specific design criteria for manganese pre-treatment, offering research benefits in groundwater modeling, coastal basin response, and innovative water quality treatment technology. Continued outreach and involvement efforts will benefit public understanding and support of brackish desalination.

2. PILOT TREATMENT STUDY

Documented in the 2017 feasibility study, feed water for the proposed RO system will have first undergone pre-treatment for manganese removal via greensand filtration. Design source water quality exceeds the California Secondary Maximum Contaminant Levels (SMCLs) for manganese (Mn) as well as total dissolved solids (TDS) of 0.05 mg/L and 500 mg/L, respectively. Secondary standards affect the aesthetic quality of the water (color, odor, and taste). More importantly, high Mn levels will adversely impact the reverse osmosis membranes of the desalination system by increasing cleaning requirements (i.e., greater system downtime), potentially shortening membrane life, and limiting the recovery of product water. The design Mn concentration in the feed water to the desalination process is 1.75 mg/L, which is based on the 2016 Morgan Run well site water quality data and is slightly above the average for the recent water quality data for the region. This value is 35 times higher than 0.05 mg/L, which is both the California SMCL for Mn and the upper limit recommended by manufacturers for waters to be treated by reverse osmosis membranes. Thus, it is important to reduce Mn upstream of the reverse osmosis membranes with a pretreatment process. The recommended pretreatment process is greensand filtration.

A filtration system pilot study was conducted in June of 2020 to evaluate the removal of iron (Fe) and manganese (Mn) from groundwater extracted from an existing well to be used as source water for the San Dieguito Valley Brackish Groundwater Desalination Project. The resulting filtration system would be a pretreatment step to remove these constituents prior to the reverse osmosis (RO) desalination process.

Groundwater from the existing supply well used as the water source for the pilot test has significant iron and manganese content that exceed the California Secondary Maximum Contaminant Levels (SMCLs) levels, and therefore can detrimentally affect anticipated membrane treatment processes. Iron levels in the subject raw well water averaged 0.97 mg/L and manganese concentration averaged 0.94 mg/L in laboratory samples. The project specifications require that the finished water from the proposed iron and manganese treatment system satisfy U.S. Environmental Protection Agency (EPA) and California State secondary drinking water regulations and standards. The California SMCL limits the concentration of iron to 0.30 mg/L and manganese to 0.05 mg/L. The pilot test contaminant removal goals were therefore treated water concentrations of less than SMCL values.

2.1 Pilot Study

A pilot treatment study was conducted to identify the most appropriate treatment methodology for the removal of iron, manganese and arsenic, the three most common naturally-occurring constituents in groundwater in California. Assessing the removal these three constituents together is required as many treatment processes will concurrently remove these constituents and it is possible for one constituent, even at concentrations below the MCL, to affect the removal of another. Objectives of the pilot study were to test and evaluate the performance of filtration media, to determine reagent chemicals required and chemical consumption rates, and to project the length of filter run times in service and backwash waste volume as a percentage of production. With input from WRT/Loprest Division, two water treatment media systems were selected for testing that have demonstrated effective removal of iron and manganese from groundwater sources to manage these contaminants below SMCL concentrations. The medias tested were Inversand's GreensandPlus® with an anthracite media cap, and Mang-Ox® manganese dioxide media. GreensandPlus® is a manganese dioxide coated media with a silica sand core. It requires oxidant addition ion prior to media contact. Chlorine is the most common oxidant; however other oxidants are effective. The manganese dioxide coating acts as a catalyst in the oxidation process of both iron and manganese. Mang-Ox® is an 80% pure manganese dioxide ore, mined and screened for potable water use. In waters with a positive oxidation/reduction potential (ORP), it can work without the use of an oxidant; however, for this pilot study, all feed water to the two columns were conducted using the recommended hypochlorite feed rates for the raw water for full oxidation and removal of iron and manganese.

The pilot study was conducted near the test well site in Del Mar, California, and used raw groundwater extracted from OMWD test well constructed in April 2019. The pilot study ran 10 to 12 hours per day for two days with the each of the media type in separate columns operated simultaneously in parallel testing with individual backwash settings for each column. **Figure 1** is a photograph of the pilot study setup; the Filtration System Pilot Study Description is included in **Appendix A**, and the study report is included in **Appendix B**.

Figure 1: Filter Test Column Setup

The first media system tested, designated column F1 in the pilot study, included the mixed media of Inversand's GreensandPlus® with an anthracite media cap to assist in solids filtration capacity and solids backwash removal. This media system was operated using a hypochlorite reagent feed for available free chlorine as an oxidant as pretreatment. The second media system type, designated column F2, was a mono bed (single treatment media type) of Mang-Ox® manganese oxide granular media operated in a similar filtration manner using available free chlorine as an oxidant for pretreatment. Free chlorine oxidant addition rates were adjusted to maintain a level between 1.0 and 1.2 mg/L residual in the finished water.

Two runs for each media type were conducted to demonstrate iron and manganese removal capability. The filter columns were operated continuously for an extended service cycle exceeding the typical backwash frequency to assess actual pressure loss and contaminant removal performance to media contaminant leakage or elevated pressure loss of 8 psid. The filter runs were separated using a backwash cycle between runs. The backwash cycle was completed in two steps:

1. Backwash and surface wash combined for 4 minutes at a flow rate of 2 gpm/ft^2 for surface wash for each media type. A backwash flow rate of 12 gpm/ft^2 kwas used for the Manganese GreensandPlus® media column (F1) and a backwash flow rate of 20 gpm/ft^2 was used for the Mang-Ox® media column (F2).

2. A backwash-only step for 4 minutes and a final rinse to waste at the service flow rate.

The surface wash was conducted with the backwash water to improve media surface cleaning efficiency. Effluent water was accumulated for use as backwash supply water.

During each filter run, the following parameters were measured and recorded at the indicated intervals for each run:

1. Filter flow rate (gpm)
2. Filter inlet and effluent free chlorine (mg/L)
3. Iron in filter influent (mg/L)
4. Iron in filter effluent (mg/L)
5. Manganese in filter influent (mg/L)
6. Manganese in filter effluent (mg/L)
7. Chemical feed pump speed (strokes/minute)

Water quality analyses was performed at a State-certified analytical laboratory for the following constituent:

- Total iron via EPA Method 200.7
- Total Manganese via EPA Method 200.7
- Arsenic (As) via EPA Method 200.8

Free chlorine, manganese, iron and pH were tested onsite.

2.2 Pilot Study Results

Groundwater from the test well was run through the pilot study columns to simulate treatment, with water quality samples collected and analyzed in the field to assess contaminant removal. Water quality samples were also collected and sent to a State-certified analytical laboratory as a quality control check against the field measurements. The resultant water quality data were then used to assess media performance. One key parameter used in this analysis is the contaminant leakage threshold or break-through point, defined as the point where the media's capability for treatment has been exceeded and, in an operational scenario, would need to be replaced.

Water quality produced from the column containing GreensandPlus® (F1) removed iron and manganese to less than target SMCL values in laboratory samples and regularly tested less than 0.20 mg/L iron and less than 0.05 mg/L manganese in field samples of the treated water for 6 hours of service run time at standard flow rate. At reduced flow rate in the service run no. 2, similar removal results were obtained through 10 hours of service. The column containing Mang-Ox® (F2) produced acceptable contaminant removal with iron and manganese effluent levels below 0.20 mg/L and 0.050 mg/L through 10 hours of service run length at standard flow rate. At the reduced flow rate in service run no. 2, these effluent results were extended to 12 hours of service operation. **Table 1** provides a summary of analytical results from the two runs.

Table 1: Pilot Study Analytical Test Results

Sample	Fe (mg/L) Field	Fe (mg/L) Laboratory	Mn (mg/L) Field	Mn (mg/L) Laboratory	As (µg/L) Laboratory
MCL	0.3		0.05		10
RUN #1 @ 8 GPM / FT^2					
Raw (average)	0.92		0.94		5.8
F1 09:30	0.01	<0.02	0.04	0.0033	2.7
F2 09:30	0.05	0.02	0.024	0.012	2.2
F1 15:30	0.29	0.28	0.102	0.088	3.4
F2 15:30	0.15	0.16	0.062	0.022	2.6
F1 17:30	0.45	0.4	0.134	0.24	3.8
F2 17:30	0.18	0.2	0.041	0.029	2.8
RUN #2 @ 6 GPM / FT^2					
Raw (average)	0.9		0.95		5
F1 06:45	0.03	<0.02	0.077	0.15	3
F2 06:45	0.03	<0.02	0.032	0.0089	2
F1 14:00	0.02	<0.02	0.027	0.34	<1.0
F2 14:00	<0.02	<0.02	0.047	0.0032	<1.0
F1 18:00	0.19	0.4	0.086	0.49	3.8
F2 18:00	0.06	0.16	0.062	0.022	3.5
F1 backwash - bucket (Total)	--	20	--	3.1	56
F1 backwash - bucket (Dissolved)	--	0.11	--	0.83	3.8
F2 backwash - bucket (Total)	--	27	--	6.1	73
F2 backwash - bucket (Dissolved)	--	0.12	--	0.39	4

Notes:

- SHADING indicates exceedance of the MCL
- F1 – GreensandPlus®
- F2 – Mang-Ox®

A general contaminant leakage threshold was observed at 8-hour service in column F1 (GreensandPlus®) and at 10 hours service in column F2 (Mang-Ox®) during run no. 1 with service conditions of 8 gpm/ft^2. In run no. 2, at a service flow rate of 6 gpm/ft^2, a contaminant leakage appears at approximately 10 hours of service in both columns. The pressure loss increases over for each media through the service test runs averaged 2.0 and 2.5 psid in columns F1 and F2 respectively. Starting clean pressure loss averaged 1.8 psid for column F1 and was 1.4 psid for column F2. Pressure loss results through each filter column and media type never exceeded recommended backwash initiation points through the extended service test periods in either test run.

3. DESIGN CRITERIA

3.1 Design Source Water Quality

As previously documented in the *San Dieguito Valley Brackish Groundwater Desalination Study* (February 2017), the design of the desalination process was based on source water quality representative of the recommended project area. **Table 2** compares the original design source water quality from the feasibility study to the updated design source water quality from the new OMWD test well sampled on May 22, 2019.

Table 2: Updated Design Source Water Quality

Parameter	Unit	Original Value (2017 Study)	Test Well (May 2019)
Alkalinity, Total	mg/L as CaCO3	340	380
Ammonia as N	mg/L	ND-0.13	No data
Barium	mg/l	0.08	0.13
Calcium	mg/L	305	400
Chloride	mg/L	1160	1300
Fluoride	mg/L	0.341	0.27
Hardness	mg/L as CaCO3	1475	1400
Iron	mg/L	ND	0.63
Magnesium	mg/L	167	100
Manganese	mg/L	1.75	1.1
Nitrate as N	mg/L	1.485	No data
pH (lab)	-----	7.2	7.8
Phosphorus, Total	mg/L	0.1	No data
Potassium	mg/L	ND-9.56	39
Silica (as SiO2)	mg/L	31	31
Sodium	mg/L	622	620
Strontium	mg/l	ND	No data
Sulfate as SO4	mg/L	822	730
TDS	mg/L	3105	3200
Turbidity	NTU	0.31	5.4

3.2 Manganese Pretreatment

The design source water quality exceeds the California SMCL for manganese (Mn) and total dissolved solids (TDS) of 0.05 mg/L and 500 mg/L, respectively. Secondary standards affect the aesthetic quality of the water (color, odor, and taste). More importantly, high manganese levels will adversely impact the reverse osmosis membranes of the desalination system by increasing cleaning requirements (i.e., greater system downtime), potentially shortening membrane life, and limiting the recovery of product water. The design Mn concentration in the feed water to the desalination process is 1.1 mg/L, which is based on the recent test well site water quality data. This value is 22 times higher than 0.05 mg/L, which is both the California SMCL for manganese and the upper limit recommended by manufacturers for waters to be treated by reverse osmosis membranes. Thus, it is important to reduce manganese concentrations upstream of the reverse osmosis membranes with a pretreatment process.

The recommended pretreatment process is the use of Mang-Ox®, a manganese dioxide media for filtration. The manganese dioxide acts as a catalyst in the oxidation of both iron and manganese, converting the soluble forms of the mineral (Fe^{+2} or ferrous ion and Mn^{+2} or manganous ion) to insoluble forms (Fe^{+3}, ferric ion and Mn^{+4}, tetravalent manganese ion) for removal by filtration. Chlorine, formed from the addition of sodium hypochlorite, acts an oxidant in the process. After the ionic conversion, the Mn^{4+} reacts with the dissolved oxygen in the water to form MnO_2, precipitate out of solution as a solid, and become trapped in the media bed. The MnO_2 that accumulate in the filter bed are removed through periodic backwashing of the media.

Feed water for the reverse osmosis system will have first undergone pretreatment for manganese removal via oxidation and filtration, the anticipated iron and manganese design criteria for the RO system is shown in **Table 3**.

Table 3: Revised Iron and Manganese Design Water Quality

Parameter	Unit	Test Well (May 2019)	Mang-Ox© (June 2020)
Iron	mg/L	0.63	0.135
Manganese	mg/L	1.1	0.016

For the purposes of this design, it is assumed that hypochlorite is fed into the raw groundwater prior to the Mang-Ox® pretreatment to act as an oxidant for removal of iron and manganese; however, this assumption should be reconsidered as part of the final to design to determine if chemical oxidant addition is necessary for treatment of raw water using Mang-Ox®.

3.3 Reverse Osmosis

To produce 1.0 mgd of desalinated water, the *San Dieguito Valley Brackish Groundwater Desalination Study* recommended a reverse osmosis (RO) skid. RO skids come completely equipped with cartridge filters (needed as a protective measure to prevent solids, such as sand or silt, from fouling the RO membranes), feed pumps, piping, pressure vessels, RO membranes, instrumentation and controls, and a clean-in-place system. A clean-in-place system is needed to chemically clean and remove foulants (e.g. particles, mineral scale and biological components) from the RO membranes. Foulants result in additional head loss and increased energy requirements to maintain production flow rates. Additionally, foulants may result in a deterioration in permeate water quality.

The updated design water quality parameters shown in **Table 2** were used in manufacturer-provided modeling software to project the RO system recovery. The first iteration of the model results reduced the recovery rate to 73 percent from the original 81 percent documented in the *San Dieguito Valley Brackish Groundwater Desalination Study.* A second iteration of the model was run to determine the sensitivity to pH. The results indicate that a recovery of 81 percent is possible with pH adjustment to 7.4 or lower. The modeling software recommended antiscalant addition to reduce the corrosivity of the permeate and prolong the life of the membranes. The results of both model runs can be found in **Appendix C.**

High pressure membrane processes such as RO provide a barrier for rejecting constituents such as TDS and hardness. The RO process uses a semi-permeable thin film composite (TFC) membrane to separate water from ions and large molecular weight molecules dissolved in the water, thus reducing the TDS concentration. Brine is a byproduct of the RO process that must be disposed of. Operationally, raw water is introduced to the feed side of the RO membrane under pressure. When the applied pressure exceeds the osmotic pressure of the membrane, water on the feed side begins to pass through as permeate, or product water, which has a very low TDS concentration. The bulk of the TDS present in the raw water cannot pass through and is left to concentrate in the water remaining on the feed side of the membrane until it exits the treatment process as a brine waste stream.

3.4 Groundwater Desalter Process Design

The groundwater desalter process includes several elements: a pretreatment process, the RO system with a bypass, and a product water blending tank, as depicted in **Figure 2**. The bypass and product water blending tank are important to produce water that closely matches the quality of the potable water in OMWD's existing distribution system. The bypass and blending tank allow the pretreated source water to mix with the water treated by reverse osmosis.

The pretreatment filters require sodium hypochlorite (chlorine) addition as an oxidant for manganese removal; then ammonia is required to remove chlorine prior to the RO membranes. The planning-level equipment quantities and design criteria presented in the *San Dieguito Valley Brackish Groundwater Desalination Study* remained the same if pH adjustment is implemented before the RO system. The design criteria are summarized in **Table 4**. Based on the schematic layout plan (Figure 2) and design criteria for the facility, planning-level footprint requirements are summarized in **Table 5.** For property acquisition planning purposes, these layouts provide a suitable basis for determining the required parcel size for the treatment site, approximately 0.5 acres

Table 4: Groundwater Desalter Revised Design Criteria

Facility Description	Design Criteria
Influent Pump Station	1.2 mgd 2 pumps (1 duty, 1 standby)
Pretreatment Filters	1.19 mgd effluent 3 units (3 duty)
Pretreatment Effluent Tank	50,000 gallons 16-foot diameter
RO Skid System *(81% recovery with pH adjustment to 7.4 or lower)* With feed pump, cartridge filters, Clean-in-place system	0.81 mgd effluent 1 unit
Brine Production	0.19 mgd
Chemical storage and feed facilities Sodium Hypochlorite tank Ammonium Hydroxide storage Calcium Chloride tank Sodium Hydroxide tank Sodium Fluoride storage RO Antiscalant storage	 400 gallon, 3.75-foot diameter Two (2) 50 gallon barrels 2,000 gallons; 7.5-foot diameter 1,500 gallons, 7.2-foot diameter Four (4) 50-pound bags Two (2) 50 gallon barrels
Product Water Tank	42,000 gallons 15-foot diameter
Product Water Pumps	1.0 mgd 2 pumps (1 duty, 1 standby)

Table 5: Groundwater Desalter Footprint Requirements

Facility Description	Footprint
Influent Pump Station	15' x 7'
Pretreatment Filter	42' x 22'
Pretreatment Effluent Tank	16' dia. tank
Process Building RO membrane system Electrical Staff Facilities	54' x 48' 48' x 29' 15' x 25' 15' x 20'
RO clean-in-place system	16' x 15'
Product Water Tank	15' dia.
Product Water Pumps	15' x 7'
Chemical storage and feed facilities Sodium Hypochlorite Ammonium Hydroxide Calcium Chloride Sodium Hydroxide Sodium Fluoride RO Antiscalant	 14' x 10' containment area 15' x 10' containment area 16' x 15' containment area 16' x 15' containment area 14' x 10' containment area 15' x 10' containment area

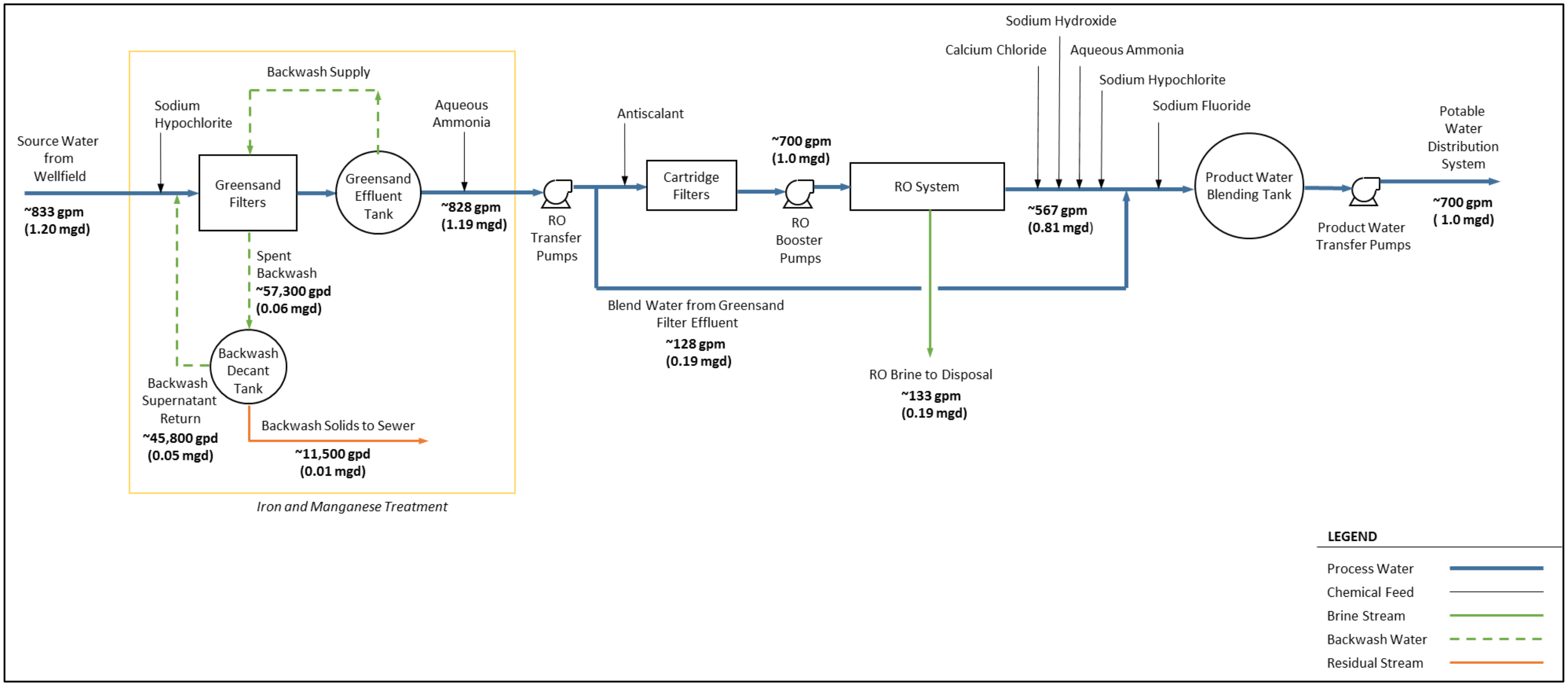


Figure 2: Groundwater Desalter Process Flow Diagram

APPENDIX A – FILTRATION SYSTEM PILOT STUDY DESCRIPTION

Filtration System Pilot Study Description

for

Olivenhain Municipal Water District
Olivenhain, CA
San Dieguito Valley Brackish Groundwater Desalination Project
PWS ID# CA-3710029

Pilot Study Objective
Pilot Study Description
Introduction and Process Overview
Equipment Description
Installation Instructions
Safety Procedures
Description of Pilot Operation
Pilot Operating Procedures
Equipment Maintenance
Sampling and Testing Protocol
Pilot Study Conclusion
Operation Log (Appendix A)

Job No. L33653
March 20, 2020

Pilot Study Objectives

1. Test and evaluate the performance of filtration media for the removal of iron, manganese and arsenic. The medias to be tested are: Inversand's Greensand Plus with anthracite media cap and Mang-Ox manganese dioxide media.
2. Determine reagent chemicals required and chemical consumption rates.
3. Project the length of filter run times in service, and backwash waste volume as a percentage of production.

Pilot Study Description

Job Name: Olivenhain Municipal WD, CA Job Number: _L33653__

Job Location: San Dieguito Valley Desal. Proj. Start Date: April 2020

System Configuration	Trailer mounted Pilot unit
System Serial #	None
Number of Columns	3 (Two columns used for this testing)
Column Height	40 inches
Column Diameter	6-inch
Media Bed Depth per Column	30 inches GS+/anthracite, 30 inches MnO_2
Design Flow Rate	8 to 10 GPM/sq.ft. Nominal: 1.5 GPM (8.0 GPM/sq ft)
Pump Size and Model	Not required.
Reagent Injection Pump	Electronic solenoid operated w/ stroke adjustment and flow-paced frequency adjustment.
Filtration Column Operation	Push-button initiated automatic backwash and rinse to solids settling tank (if required for waste disposal).

Pilot Site Description

The pilot unit will be located at San Dieguito Valley Desalination Project Site in Delmar, California. Source water for the pilot will be raw well water, taken prior to chemical treatment at the well supply facility to the desalination process. Raw water sample is a representative blend of the well pumping rates. The pilot system is automated to operate while raw water supply is available. Well water pumps will be operated for 10 to 12 hours per day to provide test water for the pilot test. The pilot test arrangement includes multiple columns for simultaneous parallel testing of each media type with individual backwash settings for each column. Sample valves are provided for effluent sampling for each test column.

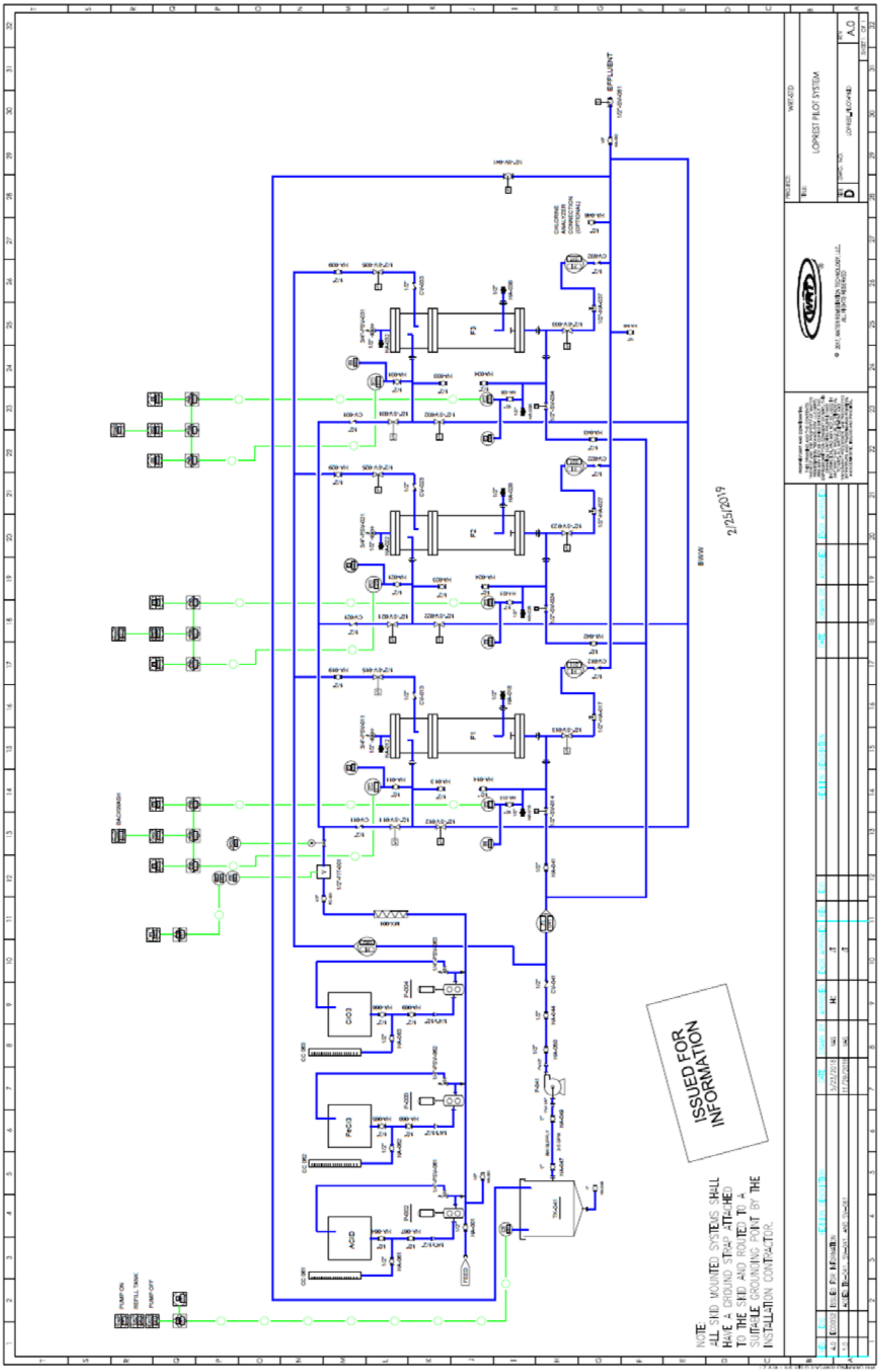
Discharge water from the pilot unit will be released to a wastewater treatment collection line for disposal.

Introduction and Process Overview

Introduction to WRT/Loprest's Filtration System

This filtration system removes iron, manganese, and arsenic contaminants from drinking water in a downflow filtration media process using chemical oxidation and media filtration. The process has been designed for simplicity of operation, minimal maintenance, and reliable operation. Oxidized metal contaminants are collected within the packed media bed and safely removed during a backwash operation. The backwash wastewater from the filter is directed to an on-site collection tank.

The filtration system is designed to meet the water production requirements of a specific treatment facility. The process flow diagram for the pilot filtration system is shown on the following page.


EFFLUENT
BWW
2/25/2019
ISSUED FOR INFORMATION
NOTE:
ALL SKID MOUNTED SYSTEMS SHALL HAVE A GROUND STRAP ATTACHED TO THE SKID AND ROUTED TO A SUITABLE GROUNDING POINT BY THE INSTALLATION CONTRACTOR.
LOPREST PILOT SYSTEM
BACKWASH
PUMP ON
REFILL TANK
PUMP OFF
ACID
FeCl3
F1
F2
F3

Equipment Description

WRT/Loprest division's filter pilot test equipment is installed in a 16 ft. x 8 ft. trailer. The pilot test components are installed and pre-plumbed in the trailer for single-point supply and discharge connection at the test site. The following equipment is installed in the trailer unit:

- Three (3) Pulsafeeder metering pumps, with a maximum injection flow rate of 3.0 GPD, each with a dedicated solution tank and a 100 mL calibration cylinder. One pump will be used to inject sodium hypochlorite oxidizing reagent, and the second pump will be used to inject ferric chloride. A third chemical injection pumping system is provided for pH control acid addition should this be required. Two chemical reagent metering pumps are required for this pilot test.
- Three (3) vertical pressure filter vessels constructed of Sch 40 PVC pipe, nominal 6-inch outside diameter (6.03 inches inside diameter) by 65-1/2 inches straight side height, cross sectional area of 0.1963 sq. ft. including flow distribution internal piping, manual and automatically controlled valves, instrumentation and controls, and filtration media bed as follows:
    - Slotted stainless steel strainer underdrain laterals
    - Upper surface wash header/distributor
    - 30 to 36 inches of 20 x 60 mesh prewashed filtration media
    - 6 inches of 1/8-inch x 1/4-inch washed gravel subfill
    - Automatic and separate manually operated valves to control filtration, rinse to waste, surface wash and backwash flow sequences
    - Pressure indicators on inlet and outlet flow piping
    - Vessel-mounted air release valve
    - Inlet and outlet valve sample ports
    - Rate of flow indicators for the service inlet, backwash, and surface wash flow streams
- A surface wash system is included.
- A 200-gallon polyethylene storage tank and backwash pump. The storage tank is used to store filtered water for filter backwash operations.
- PLC-based control panel, which automatically controls the filter control valves, subsurface wash and backwash pump during filter cleaning sequences. Filter cleaning sequence initiation can be controlled using elapsed service time, filter differential pressure, or manually. It is anticipated that pressure filter differential pressure will be used as the primary filter cleaning sequence initiation followed by elapsed service time initiation during this pilot testing.
- Additional portable test equipment as follows:
    - Hach DR 900 Portable Colorimeter and accompanying reagent packs for free chlorine measurement, as well as iron and manganese measurements.
    - Industrial Test Systems, Inc., Quick Arsenic II arsenic test kit for arsenic III and arsenic V analytical measurements.
    - LaMott DC1500 free chlorine test kit for free chlorine analysis.

- Portable handheld probe and analyzer for pH

Installation Instructions

Installation of Filtration Equipment

Installation of the Filtration Equipment requires a minimum of effort as the system arrives at the site, with all equipment fully assembled and tested prior to arrival. The filtration system is installed by trained WRT technicians.

The filtration system is self-contained and requires a minimum amount of plumbing and electrical connections. Setup of the filtration equipment consists of the following steps:

1. Locating and placing the pilot trailer unit at the site.
2. Connecting the raw water source tank supply pump to the pilot inlet connection.
3. Connecting the discharge line (effluent) on the filtration pilot unit to the appropriate discharge point.
4. Connect electrical power to standard unswitched convenience outlet.

The pilot trailer unit should be located as close to the source well as possible to minimize inlet piping run length.

Installation Responsibility

WRT personnel or trained representatives will complete all necessary work to put the system into operation.

The Utility will need to provide a single 120VAC, 20 amp, GFI power source for the pilot system, an access point for source water and a discharge point for treated water.

Securing the filtration unit

The self-contained filtration pilot unit should be strategically placed and leveled to ensure maximum operating efficiency and ease of access. The trailer unit should be properly secured to avoid outside tampering.

Plumbing Connections

Feed
The pilot unit comes equipped with fittings for connecting to the water supply. Care should be exercised in making fitting connections to prevent water leaks. All connections should maintain proper alignment to avoid improper loading on any connection.

Discharge
The pilot unit also comes equipped with discharge fittings. A discharge line needs to be installed to route the treated water to a discharge location. The pilot system discharge rate is less than 2 gpm continuous flow and 3 gpm intermittent backwash flow rate.

Pump
If the utilities water system does not have approximately 15 PSI available, a supply pump requiring a source of 120VAC electrical power will be used. The pump (if required) will be provided with the pilot unit. The supply pump power is interlocked with the raw water source tank level control to automatically shut down upon low water level.

Flow Control
A flow control mechanism is provided to regulate the influent flow to the filtration system.

Chlorine reagent supply system
A pre-mixed reagent supply tank is provided containing a pre-determined concentration of reagent for approximately the mid-range stroke setting of the reagent injection pump at the pilot system service flow rate. The reagent pump unit operation is automated, and the injection rate is flow-paced using internal PLC generated PID control system. When the service flow is interrupted, the reagent supply system remains energized but the injection process shuts off. Reagent addition is automatically restarted once the service flow is restored.

Initial stock solution concentration is 0.5 gallons 10% NaOCl per 10 gallons water. Adjustments to stock solution concentration may be modified to best approximate mid-range injection pump settings.

Electrical Connections
The filtration system may require a 120VAC, 20 amp, GFI electrical power source for operation of a pump, if required. Typical precautions should be taken when installing electrical power around a source of water. It is recommended that electrical connections be made only after equipment is fully installed. Electrical connections should be performed by a certified electrician.

Filtration Treatment Media

The media will be installed into the treatment columns prior to arrival at the test site. The media will remain in the columns during the course of the test. Upon completion of the pilot study, the media will be removed from the site and properly disposed of by WRT.

Additional media testing will commence upon a new media column fill and full backwash.

All Filtration Removal Media is NSF, Standard 61 certified for use in drinking water applications.

Safety Procedures

Safety Procedures

The filtration system is simple to use and requires a minimum of day-to-day operator interface. Pilot system setup chemical reagent replenishment and replacement of media, if required, will be performed by trained WRT representatives so that a minimum of system interface is required by utility personnel. However, when working with the filtration equipment the following precautions should be adhered to:

- To reduce risk of electrical shock, this equipment must be properly grounded.
- Inspect equipment thoroughly before connecting electrical power.
- Qualified personnel or a certified electrician should perform power connections.
- Always disconnect power before servicing equipment.
- This equipment should be used only for the purpose and function for which it was designed.
- Safety equipment should be used when performing any checks or service maintenance on or near the top of the process columns.

Description of Pilot Operations

Water will be provided from the well for testing. The pilot system will be operated at least 7 to 10 hours per day during weekdays. A pressure reducing valve to limit the pressure delivered to the trailer to 30 psi will be installed on the inlet. Chlorine will be injected into the raw water upstream of the pilot filter with an inline static mixer.

Following a rapid reaction and oxidation process, the chemically treated raw water will pass through the pilot filter and the filtered water will be directed via piping to a 200-gallon storage tank, which is used for backwash supply to the filter. The rate of flow during filtration will be approximately 1.0 gpm based on an 5.0 gpm/ft^2 loading rate. Filtered water will be directed into the top of the 200-gallon storage tank. When backwash supply tank is full, filtered water will instead be routed to the effluent drain collection.

When backwashing the filter is required, water will be pumped from the 200-gallon storage tank. Backwash water will be discharged to onsite drainage. Samples will be collected for characterization of the backwash water and sludge prior to discharge.

Pilot Unit Start-Up Procedure

- Check to make sure all sample valves are open, and any pilot unit discharge valves are open.
    - As the column fills with water, close the sample valve and proceed to the next column.
- After all of the columns are filled with water, slowly ramp up the flow to the predetermined flow rate.
    - Tap the sides of the column with a rubber mallet to remove any large air bubbles.
- Monitor column flow, pressures, and pressure differentials on the touch screen interface control consol. All operations parameters are displayed and accessible from this panel. A large overall pressure or a large pressure differential between columns is indicative of a plugged discharge screen or an air lock somewhere in the system.
    - Depending on the size and height of the columns, the pressure drop per column ranges from two to three psi per column.
- If pressures are not normal, shut down the flow and bleed the pressure off through one of the sample ports.
    - Usually, restarting the flow will eliminate the plugging problem.

Pilot Unit Operating Procedures

This section describes the steps and procedures that will be followed during the study for each media that is being tested.

1. *Preparation of Chemical Solutions*

Sodium hypochlorite (10%) concentrate is used to prepare the chlorine solution. The dilution factors for the chlorine solution is 2,000 mls into 10 gallons of water.

2. *Target Chemical Dosing*

Oxidant chlorine target dosages is between 2 and 4 ppm to maintain final effluent chlorine concentration of 0.5 to 1.0 ppm free chlorine. Addition of chlorine will initially be set at 1 ppm and adjusted accordingly. To confirm the desired chlorine dosage, the chlorine residual will be measured on the filter influent and effluent multiple times during each test run. The chlorine residual on the filter effluent will be maintained at or above 0.5 ppm at all times during all runs.

3. *Operating Procedure*

The pilot filter column was backwashed at WRT's facility. The source of water for the first backwash was potable water from the local potable water distribution system at WRT's facility. After the first backwash, the filtered water from the pilot unit is used for backwashing.

Two runs for will be conducted to demonstrate iron and manganese removal capability and media capacity (estimated at 20 hrs). Chemical feed rates will be noted in the attached data log.

Two separate backwash cycles are used for each of the media ypes being tested. The backwash cycle for manganese oxide media is conducted in three steps: 1) backwash and surface wash combined for 4 minutes at a flow rate of 20 gpm/ft^2 for backwash and 2 gpm/ft^2 for surface wash then 2) backwash only for 4 minutes at a flow rate of 20 gpm/ft^2 then 3) rinse to waste for 4 minutes at the service flow rate.

The backwash cycle for Greensand/anthracite media is conducted in three steps: 1) backwash and surface wash combined for 4 minutes at a flow rate of 12 gpm/ ft^2 and 2 gpm/ft^2 for surface wash then 2) backwash only for 4 minutes at a flow rate of 12 gpm/ft^2 then 3) rinse to waste for 4 minutes at the service flow rate. Effluent water is accumulated for use as backwash supply water.

During each filter run, the following parameters are measured and recorded at the indicated intervals for each run:

1. filter rate of flow, gpm
2. filter inlet and effluent free chlorine, mg/L
3. pH at filter influent,
4. pH, color and alkalinity in filter effluent, mg/L
5. iron and manganese in column inlet, (mg/l), once at the start of each run
6. iron and manganese in filter effluents, mg/l
7. Sodium hypochlorite chemical feed pump speed, strokes per minute.

The above data will be recorded on pilot test log sheets, which are included in the Appendix A.

Measured on-site effluent water quality tests are conducted every 2 hours of continuous service run.

Effluent water will be accumulated for use as backwash supply water. The volume of water used for backwashing and filter to waste will be recorded for use in calculating the backwash volume to filtration volume ratio. The volume of water produced during filtration will be calculated based on the length of the filter run and the filter rate of flow. During backwash operation, the raw water source pump is de-energized.

Equipment Maintenance

The filtration system requires minimal maintenance to perform properly. Upon installation, it is recommended that the system be monitored closely to ensure that any pumps, flow meters, and valves are operating properly. The flow meter located in the source water line should be checked at least once per day to ensure that the system is achieving the designed flow rate. *Please refer to pump, control system, and motor manufacturer's operation and maintenance instructions for proper maintenance on peripheral equipment.*

Daily Maintenance

1. CHECK FEED WATER FLOW RATE
   The feed water volume through the flow meter should maintain the designed flow rate as noted in the pilot study log book.

2. CHECK RAW WATER CHEMICAL REAGENT CONTROL SYSTEM FOR PROPER OPERATION
   The chemical reagent injection system requires routine dosing checks.
   - Refer to manual to clean, purge and prime the injection metering pump.
   - Check chemical reagent day tank carboy level and if necessary replace the carboy with a full reagent supply as required. If necessary, refer to manual for reagent refill procedure.

3. CHECK FOR AIR ENTRAINMENT
   The media columns can collect gas entrained from the raw water when the pressure is reduced. Automatic air vent valves are included on each media column but may inadequately purge air from the system. Air bubble formation in the media filter bed interferes with filtration of solid particulate material from the water.
   - If air bubbles are formed in the media columns, there may be insufficient back pressure on the treated discharge water line to prevent formation.
   - Slowly close the discharge metering valve to increase the operating pressure of the media filter vessel. 7 to15 psig is generally required to mitigate air formation in the media columns.

4. CHECK FOR LEAKS
   - Ensure that all lines and fittings are free of any leaks. Tighten any connections that are leaking. Teflon tape or paste may be required.
   - Check the pump fittings regularly to ensure that there are no leaks.

5. REFILL CHEMICAL FEED TANKS (if required)

Weekly Maintenance when required for long-term pilot testing

1. CHECK POWER
   Verify that AC voltage is correct.

2. CHECK FILTERS
   Check filters located on the bulkhead (top) of each process column. Check filters to ensure that there is not a buildup of media particulates that would reduce flow.

Sampling and Testing Protocol

The pilot test consisted of two separate test runs.

The pilot study is typically completed in one week onsite. The operation of the pilot study is conducted by Loprest Division of WRT personnel.

Spot water samples are drawn during the prescribed sampling time and provided to the Owner for offsite laboratory testing.

Sample Tests

Chlorine, arsenic, manganese, iron and pH is tested onsite using the instruments and procedures described in the following section. Each filter influent and effluent sample is taken in sufficient volume to provide the required sample volume for each parameter to be tested. Sample volumes drawn are per testing laboratory recommendation to provide a sample for offsite testing. The Owner's representative will collect samples for the Owner's independent lab analysis.

Onsite Test Equipment, Procedures, and Methods

Field testing for chlorine, iron, and manganese are performed with a Hach DR 900. With this instrument, packets of reagents specific for each constituent are added to a pair of sample cylinders, which are then inserted into the test instrument in two steps. One sample is called the blank, which is inserted into the DR 900 first, and the instrument is zeroed. The DR 900 measures the amount of light passing through the blank sample and stores the result. Next, the second prepared sample is inserted, and the value is read by the DR 900. The instrument compares the stored value for the blank to the value for the prepared sample and displays the results for the constituent being tested.

For manganese, the blank is prepared with deionized water. The iron and chlorine test blanks are prepared with water from the filter effluent. The test results are displayed on the digital readout. For iron, the Total Iron, FerroVer test Method 8008 was used. For chlorine, the Free Chlorine DPD method was used. For manganese, Method 8149 was used.

pH is measured using an Oakton pH6 Acorn Series meter with a range of 0.0 – 14.0 pH. The probe was calibrated daily using a 7.0 pH buffer solution.

During each filter run, the following parameters will be measured and recorded at two-hour intervals for 5-6 hours each day during operation using the equipment listed in Equipment Description:

1. Filter inlet and outlet pressure
2. Differential pressure across the filter
3. Filter influent and effluent chlorine (offline measurement)
4. Iron in filter influent and effluent (ppm) (offline measurement)
5. Manganese in filter effluent (ppm) (offline measurement)
6. Arsenic in filter effluent (ppb) (offline measurement)
7. Filter influent and effluent pH (offline measurement)

At the start of each run, the chemical feed rates in ppm will be recorded, along with the influent concentrations of iron and manganese post chemical injection.

Samples will be collected from the influent and effluent for verification twice per filter run for each media (once at the middle of the run and once toward the end of the run). Analytical testing will be performed by a qualified, independent lab, approved and agreed upon by the Utility and Loprest prior to beginning the pilot study.

Each process column is equipped with a valve for sampling the effluent water for analytical metal content level tests. When a sample is required, the sampling valve should be opened and water should be allowed to slowly flow for approximately thirty (30) seconds before filling the sample container. Avoid abrupt changes in flow conditions to obtain the most representative sample. Typical test sample volume is about 250 mL for metals analysis. Fill the sample container slowly avoiding aeration and sample splashing. Both containers must be preserved with 1:1 Nitric acid. Close the valve when an adequate amount of sample water has been taken. Specific sampling procedures for metal speciation will be provided by the testing laboratory. All sampling will be performed by the Utility personnel.

Analytical testing will be performed by a qualified, independent lab, approved and agreed upon by the Utility and HDR prior to beginning the pilot study.

Methods of analysis to be used are:

Manganese	EPA Method M200.7 ICP-MS
Iron (total)	EPA Method M200.8 ICP-MS
Arsenic (total)	EPA Method M200.8 ICP-MS

The proposed test protocol is shown below in Table 1.

An Operation Log will be completed during the course of the pilot study. This will include all field observations, adjustments, flow and totalizer data, onsite analytical field test results, date, operator identification and other relevant information. A copy of the Operation Log sheet is attached for reference as Appendix A.

The proposed length of this pilot study is up to 4 days. Based on the test protocol, this will provide a total of up to 2 sets comparative metal removal data for each filter service run period comparing feed and treated water for each media type tested.

Table 1. TEST PROTOCOL – Water Samples

Iron, Manganese and Arsenic Pilot Test
Day Sampled

Sample Point	Day 1	Day 2						
Feed	**X**	**X**						
Media Filter discharge	**X**	**X**						

Sampling of inorganic water quality parameters in both the combined feed and discharge water from each test column will be conducted once per filter run. These will include: METALS - iron, manganese and arsenic.

On-site colorimetric and spectrophotometric testing of iron and manganese and ppb level testing for arsenic is conducted periodically through the pilot testing period to monitor the filter's performance. The results are recorded in the operational log record.

Sample frequency will be adjusted, if necessary, as the piloting proceeds, based upon results from previous tests.

WRT Metals and Radionuclide Removal Experience

WRT has completed over 80 radionuclide and metals removal pilot studies in 17 states, with additional pilot studies underway. WRT has more than 150 licensed and permitted full scale metal contaminant removal and radionuclide removal installations in operation in 19 states with additional systems under construction.

Pilot Study Conclusion

Upon completion of the pilot study, a Pilot Study Report will be written by WRT. This report will include the analytical data, operation log and other information collected during the pilot study including post pilot test results of all waste material solids characterization testing. This data will be analyzed and presented in tabulated form where applicable, and observations and conclusions will be presented. This completed Pilot Study Report will be delivered to the Utility.

Appendix A

Operation Log sheet

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APPENDIX B – FILTRATION SYSTEM PILOT STUDY REPORT

Pilot Study Report

on

WRT/Loprest Div. Filtration System
for Iron/Manganese Removal

conducted by

Loprest, a division of WRT
Westminster, Colorado

for the

Olivenhain Municipal Water District
San Dieguito Valley Brackish Groundwater Desalination Project
Job # L33653
Olivenhain, CA
June 26, 2020

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1.0 EXECUTIVE SUMMARY/CONCLUSIONS

The Olivenhain Municipal Water District is planning to add iron and manganese removal treatment to an existing well water source as part of the San Dieguito Valley Brackish Groundwater Desalination Project as RO pretreatment. The Water District asked WRT/Loprest Division to complete a pilot study for a water treatment system for iron and manganese contaminant removal. The pilot study is conducted to evaluate two different types of oxidation and filtration media systems.

The subject well water source has significant iron and manganese content that can detrimentally affect anticipated membrane treatment processes testing much higher than secondary MCL levels. The Water District with input from WRT/Loprest Division selected two water treatment media systems for testing that have demonstrated effective removal of iron and manganese from groundwater sources to manage these contaminants below Secondary MCL concentrations. The iron levels in the subject raw well water averaged 0.97 mg/L during testing. The measured manganese concentration averaged 0.94 mg/L in laboratory samples. The project specifications require that the finished water from the proposed treatment system shall satisfy the EPA and California State secondary drinking water regulations and standards. The California State Water Resources Board maximum containment level (MCL) limits the concentration of iron at 0.30 mg/L and manganese at 0.05 mg/L. The pilot test contaminant removal goals are treated water concentrations of less than secondary MCL values.

To fully test the effectiveness of these media system types on water source at this well site, the pilot study was conducted in two filter service runs for each media type. The first filter run is conducted using recommended hypochlorite feed rates to the raw water for full oxidation and removal of iron and manganese metal contaminants for a service period of nominally 8 hours continuous run at a standard hydraulic flow rate of 8 gpm/ft^2. The second service runs are conducted at a lower hydraulic flow rate of 6 gpm/ft^2 to assess the performance differences for the media types. Iron and manganese levels are the above the MCL limits and removal of these metal contaminants is the primary objective of the testing. Free chlorine oxidant addition rates were adjusted to maintain a level between 1.0 and 1.2 mg/L residual in the finished water.

The first media system tested, designated column F1, includes a mixed media of Inversand's GreensandPlus®.and an anthracite media cap to assist in solids filtration capacity and solids backwash removal. This media system is operated using a hypochlorite reagent feed for available free chlorine as an oxidant as pretreatment. Water quality produced from this column removed iron and manganese to less than target MCL values in laboratory samples and regularly tested less than 0.20 mg/L iron and less than 0.05 mg/L manganese in field samples of the treated water for 6 hours of service run time at standard flow rate. At reduced flow rate in the service run no. 2 similar removal results were obtained through 10 hours of service. Media system type, designated column F2, is a mono bed of Mang-Ox® manganese oxide granular media operated in a similar filtration manner using available free chlorine as an oxidant for pretreatment. This media system produced acceptable contaminant removal with iron and manganese effluent levels below 0.20 mg/L and 0.050 mg/L through 10 hours of service run length at standard flow rate. At reduced flow rate these effluent results were extended to 12 hours of service operation. The pressure loss increases over for each media through the service test runs averaged 2.0 and 2.5 psid in columns F1 and F2 respectively. Starting clean pressure loss for column F1 averaged 1.8 psid and for column F2, 1.4 psid. Pressure loss results through each filter column and media type never exceeded recommended backwash initiation points through the extended service test periods in either test run.

The Olivenhain Municipal Water District well water can be effectively treated for iron and manganese removal using either of these media types and will produce acceptable water within USEPA and California state secondary MCL values for both iron and manganese. A greater iron and manganese removal capacity during this test is seen in the column F2 media type which resulted in extended service runs to the contaminant leakage endpoint over that of the F1 media type. The difference may be explained by the limitations of the GreensandPlus® media when treating higher TDS water types. It can also be noted that some of column F1 treatment media is displaced to accommodate the anthracite cap filtration media. Either of these differences may account for the reduced performance of the column F1 media type over the column F2 media. The pressure loss rise over the course of the extended filter runs were consistent and did not rise substantially before iron and contaminant leakage signaled the end of the service period. Therefore, service run times will be best terminated based upon filter throughput volume or service time. The test results and service run times are significantly less than the calculated theoretical capacities of the column F1 media type as tested and are much less than 1,000 gr./sq. ft. of filter area.

2.0 THE WRT/LOPREST FILTRATION SYSTEM AND STUDY OVERVIEW

The WRT/Loprest filtration system removes iron and manganese contaminants from drinking water in a downflow filtration media process using chemical oxidation and co-precipitation. Solid phase metal oxide contaminants are physically separated from the water stream, collected within a packed media bed and safely removed during a backwash operation. The backwash wastewater from the filter is directed to an on-site collection and retention basin. The process has been designed for simplicity of operation, minimal maintenance, and reliable operation. The filtration system is designed to meet the water production requirements of a specific treatment facility.

Several media types have demonstrated effective catalytic oxidation properties and can be used to facilitate the oxidation process. Depending upon the specific water conditions and corresponding water quality, oxidative media types will perform differently on varying water types. This pilot study is conducted using two selected media types for side-by-side comparative assessment of the iron and manganese removal performance following media contact for treating this raw ground water source. A manganese dioxide media trade named

Mang-Ox® and a proprietary product from Inversand Co. trademarked GreensandPlus® are tested in two 40-inch tall parallel filter columns.

2.1 Iron and Manganese Removal

The most common method of removing iron and manganese from water involves the oxidation of soluble iron (Fe^{+2}, or ferrous ion) and manganese (Mn^{+2}, or manganous ion) to insoluble forms (Fe^{+3}, ferric ion, and Mn^{+4}, tetravalent manganese ion), and subsequent removal of the precipitates formed by filtration.

GreensandPlus® is a manganese dioxide coated media with a silica sand core. It requires oxidant addition ion prior to media contact. Chlorine is the most common oxidant; however other oxidants are effective. The manganese dioxide coating acts as a catalyst in the oxidation process of both iron and manganese.
Mang-Ox® is an 80% pure manganese dioxide ore, mined and screened for potable water use. In waters with a positive oxidation/reduction potential (ORP), it can work without the use of an oxidant. Other manganese dioxide ore materials mixed with a variety of sand materials are available under various trade names.
These medias are evaluated in this testing. F1 filter column contained GreensandPlus® media and F2 filter column contained Mang-Ox® media.

3.0 TEST EQUIPMENT DESCRIPTION

WRT/Loprest division's filter pilot test equipment is installed in a 16 ft. x 8 ft. trailer. The pilot test components are installed and pre-plumbed in the trailer for single-point supply and discharge connection at the test site. The filtration equipment includes two test media filtration columns, chlorination and chemical feed addition, and all automated filtration backwash piping valves and instrumentation and process control equipment. Refer to Figure 1 for the pilot equipment general process flow diagram. The following equipment is installed in the trailer unit:

- Three (3) Pulsafeeder metering pumps, with a maximum injection flow rate of 3.0 GPD, each with a dedicated solution tank and a 100 mL calibration cylinder. One pump will be used to inject sodium hypochlorite oxidizing reagent, and the second pump will be used to inject ferric chloride (if required). A third chemical injection pumping system is provided for pH control acid addition should this be required for the finished water quality. One chemical reagent metering pump is required for this pilot test.
- Three (3) vertical pressure filter vessels constructed of Sch 40 PVC pipe, nominal 6-inch outside diameter (6.03 inches inside diameter) by 65-1/2 inches straight side height, cross sectional area of 0.1963 sq. ft. including flow distribution internal piping, manual and automatically controlled valves, instrumentation and controls, and filtration media bed as follows:
    - Slotted stainless steel strainer underdrain laterals

- Upper surface wash header/distributor
- 30 to 36 inches of 20 x 60 mesh prewashed filtration media
- 6 inches of 1/8-inch x 1/4-inch washed gravel sub fill
- Automatic and separate manually operated valves to control filtration, rinse to waste, surface wash and backwash flow sequences
- Pressure indicators on inlet and outlet flow piping
- Vessel-mounted air release valve
- Inlet and outlet valve sample ports
- Rate of flow indicators for the service inlet, backwash, and surface wash flow streams

- An air-scour wash system is included for media cleaning backwash.
- A 200-gallon polyethylene storage tank and backwash pump. The storage tank is used to store filtered water for filter backwash operations.
- PLC-based control panel, which automatically controls the filter control valves, subsurface wash and backwash pump during filter cleaning sequences. Filter cleaning sequence initiation can be controlled using elapsed service time, filter differential pressure, or manually. It is anticipated that pressure filter differential pressure will be used as the primary filter cleaning sequence initiation followed by elapsed service time initiation during this pilot testing.
- Additional portable test equipment as follows:
    - Hach DR 900 Portable Colorimeter and accompanying reagent packs for free chlorine measurement, ammonia as well as iron and manganese measurements.
    - LaMott DC1500 free chlorine test kit for free chlorine analysis.
    - Portable handheld probe and analyzer for pH

The source water enters the pilot test unit from a connection to the raw water pressurized supply line through a hose connection to the WRT/Loprest filtration system trailer. Raw water sampling occurs at this location referred to as SP1 on the process flow diagram. The water is first directed to the filter column service inlet piping where oxidant (sodium hypochlorite) reagent is added to the raw water. The pretreated water then enters the top of each media treatment column. The treated water exits the bottom of each treatment column where it is directed to the main discharge piping and out through the outlet connection on the trailer. Each treatment column is equipped with a valved effluent sample connection labeled SP2, SP3 and SP4.

The media filter columns are backwashed automatically using one of several backwash trigger points set at the PLC controller. Set points for filter backwash can be initiated manually, by operating time interval, by filter differential pressure loss or by filtered water discharge conditions. Based upon the filter run requirements and the testing protocol for the test(s) a filter backwash frequency is selected. Backwashing of the filter units is accomplished by directing treated and finished water from the integrated treated water collection tank. Backwash water supply is directed automatically to each filter column sequentially up flow through the media column to expand the media bed and release the collected solids to exit the out of the top of the filter media column. The backwashed liquid and solids are sent to the wastewater discharge connection on the trailer and directed to an onsite wastewater retention basin.

3.1 Pilot Study Equipment and Process Flow Diagram

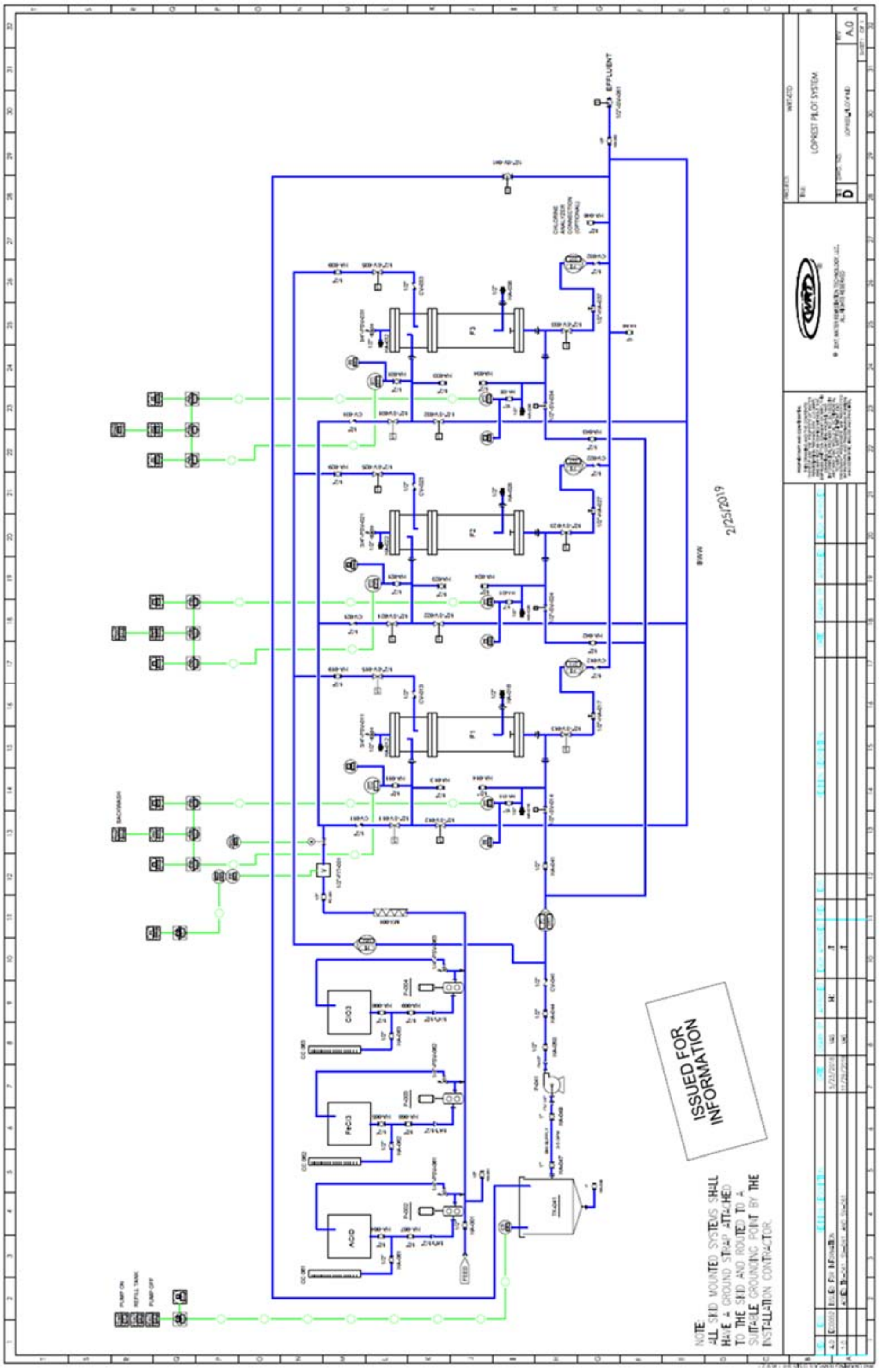

Figure 1. Pilot Study Equipment Process flow diagram

3.2 WRT/Loprest Pilot Study Equipment Photos

Photo 1. Filter test column units

Photo 2. Filter backwash water collection tank.

Photo 3. Reagent chemical pumping system

4.0 RAW WATER ANALYTICAL DATA

A comparison of the raw water constituent levels presented in the project specifications vs. those measured onsite are summarized below. All analytical results can be found in Appendix A of this report.

TABLE 1
RAW FEED WATER CHARACTERISTICS

Constituent	Raw Well Water	Owner Provided Data
Iron, total, mg/L	0.97 (avg.)	0.63
Manganese, mg/L	0.95 (avg.)	1.10

4.1 Statement of Purpose

The iron and manganese levels in water collected from the Desalination Project well water exceed the USEPA and California Water Resources Board Drinking Water Div. secondary drinking water MCL values for iron (0.30 mg/L) and manganese (0.050 mg/L). Previously reported and pilot test raw water iron and manganese levels were well above the secondary MCL values.

The purposes of this study are to evaluate the removal performance of iron and manganese from the raw water supply for each media type for purposes of full-scale treatment implementation.

5.0 PILOT TEST PROTOCOL

The pilot test consisted of two separate full service runs for each media type. The flow rate was 1.5 gpm for an 8 gpm/sq. ft. treatment rate for the first filter run. A reduced flow rate of 1.1 gpm for a 6gpm/sq. ft. treatment rate is used during the second filter run.

5.1 Operating Procedures and Performance Testing

This section describes the steps and procedures that were followed during the onsite pilot study. One of the first steps was the preparation of chemical feed stock solutions.

5.1.1 Preparation of Chemical Solutions

Sodium hypochlorite (10%) was used to prepare the chlorine solution. The dilution factors for the chlorine solution was 2.0 liters of 10.0 percent sodium hypochlorite into 10 gals of water.

5.1.2 Operating Procedure

The pilot filter columns were initially contacted with chlorine oxidant and backwashed at the WRT/Loprest facility. The source of water for the first backwash was potable water from the local potable water distribution system at WRT's facility. After the first backwash, the filtered water from the pilot unit was used for backwashing.

Two runs for each media type were conducted to demonstrate iron and manganese removal capability. The filter columns were operated continuously for an extended service cycle exceeding the typical backwash frequency to assess actual pressure loss and contaminant removal performance to media contaminant leakage or elevated pressure loss of 8 psid. The filter runs are separated using a backwash cycle. Chemical feed rates were noted in the attached data log.

	Media Type	Raw Water Source
Filter Run No. 1	Manganese Greensand +®	Project Well Water
	Mang-Ox®	Project Well Water
Filter Run No. 2	Manganese Greensand +®	Project Well Water
	Mang-Ox®	Project Well Water

The backwash cycle was completed in two steps: 1) backwash and surface wash combined for 4 minutes at a flow rate of 2 gpm/ft^2 for surface wash for each media type. 12 gpm/ft^2 backwash is used for the Manganese Greensand+® media column and 20 gpm/ft^2 is used for the Mang-O®x media column. 2) A backwash only step for 4 minutes and a final rinse to waste at the service flow rate. The surface wash with the backwash water is used to improve media surface cleaning efficiency. Effluent water was accumulated for use as backwash supply water.

During each filter run, the following parameters were measured and recorded at the indicated intervals for each run:

1. filter rate of flow, gpm
2. filter inlet and effluent free chlorine, mg/L
3. iron in filter influent, mg/L
4. iron in filter effluent, mg/L
5. manganese in raw water, (µg/L), once at the start of each run
6. manganese in filter effluents, µg/L
7. chemical feed pump speed strokes per minute

The above data was recorded on pilot test log sheets, which are included in the Appendix B of this report.

5.1.3 Sampling Protocol

All inorganic water analyses were performed an external laboratory certified by the National Environmental Laboratory Accreditation Program. All samples are drawn into clean sample containers and preserved for metal analysis. Chain of custody documentation is completed, and samples transported to the laboratory for immediate analysis. Test samples are submitted to Eurofins Eaton Analytical in Monrovia, California for analysis using USEPA and California state recognized testing methods for drinking water.
Methods for analysis are:

Total Iron	EPA 200.7
Total Manganese	EPA 200.7
Arsenic	EPA 200.8

5.1.4 Sample Tests

Free chlorine, manganese, iron and pH were tested onsite using the instruments and procedures described in the following section. Each filter influent and effluent sample was taken in enough volume to provide the required sample volume for each parameter to be tested. Sample volumes were sufficient to provide a sample for offsite testing. The Owner's representative collected samples for the off-site independent lab analysis.

5.1.5 Onsite Test Equipment, Procedures, and Methods

Field testing for iron, and manganese and ammonia nitrogen are performed with a Hach DR 900. With this instrument, packets of reagents specific for each constituent are added to a pair of sample cylinders, which are then inserted into the test instrument in two steps. One sample is called the blank, which is inserted into the DR 900 first, and the instrument is zeroed. The DR 900 measures the amount of light passing through the blank sample and electronically stores the result. Next, the second prepared sample is inserted, and the value is read by the DR 900. The instrument compares the stored value for the blank to the value for the prepared sample and displays the results for the constituent being tested.

For manganese, the blank is prepared with deionized water. The iron test blanks are prepared with water from the filter effluent. The test results are displayed on the digital readout. For iron, the Total Iron, FerroVer test Method 8008 is used. For manganese, Method 8149 is used.

Chlorine analysis is performed on a Lamotte DC1500 using the DPD Method. This test is equivalent to Standard Method 4500-C1 G.

pH is measured using an Oakton pH Acorn Series Pocket pH Tester with a range of 0.0 – 10.0 pH. The probe was calibrated daily using a 7.0 pH buffer solution.

6.0 TREATMENT PERFORMANCE EVALUATION

This section provides a performance summary of the equipment and media types evaluated during the pilot test. Refer to Section 3.0 for a complete description and specification of the pilot test equipment and field analysis test equipment.

6.1 Breakpoint Chlorination Testing

A breakpoint chlorination test on the raw water performed at the start of testing provides some indication of chlorine demand from the water constituents that consume the oxidant. A simple test using calculated hypochlorite addition rates versus measured raw water free chlorine content is performed. The test revealed the following results:

Metering Pump Setting, percent of full stroke rate	Addition rate, mL/min	Addition rate, mg NaOCl/L	Free Chlorine remaining, mg Cl_2/L
10	2.0	1.02	0.0
15	3.0	2.30	0.0
17	3.5	2.69	0.19
20	4.0	3.07	0.56
25	6.5	4.99	0.72
30	7.0	5.37	0.96
35	9.0	6.91	1.16
40	10.0	7.68	1.41
45	11.0	8.44	1.62
50	12.0	9.21	1.89
55	13.5	10.4	2.20
60	15.0	11.5	2.31
65	17.0	13.1	2.42
70	18.0	13.8	2.88
75	19.0	14.6	3.03

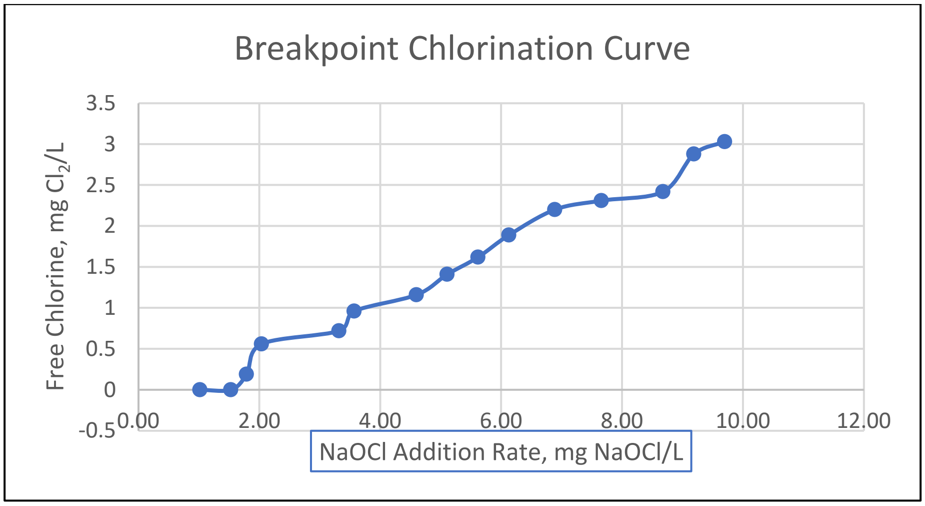

Figure 2. Graphical depiction of chlorination breakpoint for free chlorine residual.

The data obtained shows a general hypochlorite addition rate of 3.0 mg/L NaOCl attains breakpoint of free chlorine demand for the raw water. Addition rates of hypochlorite above this value will yield proportional increases in free chlorine content in the finished water.

6.2 Filter Headloss

The pressure differential across the filter during the various runs increased uniformly in a predictable manner throughout each filter run for each media type. No sharp increases in pressure loss was observed in each of the two filter runs. A clean pressure loss for filter column F1 measured 2.0 and 1.6 psid at the start of each successive filter run. Pressure loss increased an average 2.0 psid over the 10-hour service run period in each filter run. Filter column F2 provided a lower overall clean pressure loss of 1.7 and 1.3 for each filter run with a higher average increase in pressure loss of 2.5 psid over a 10-hour service period. Both filter columns returned to previous clean pressure loss values following the prescribed surface wash scour and backwash cleaning cycle. During all testing for all filter runs, the filter differential pressure loss did not exceed 4.8 psid and gained approximately 0.2 and 0.28 psid per hour of service time for filter columns F1 and F2 respectively. Precise measurements of filter pressure loss given the pilot test instrumentation and variations in flow conditions is not possible, however the general increase in pressure loss over the course of each filter run is expected. A general contaminant leakage threshold is observed at 8-hour service in column F1 and at 10 hours service in column F2 at the Run no. 1 service conditions of 8 gpm/ft^2. At Run no. 2 flow rate of 6 gpm/ft^2 a contaminant leakage appears at approximately 10 hours of service in both columns. Based upon this data, service run length or service volume throughput may be best used to terminate the length of a filter service run rather than differential pressure. Due to the relatively high contaminant iron and manganese inlet concentrations, the theoretical capacity of the media will be reached within an average 8 hour service cycle and as was observed, a head loss of 8 to 10 psid normally used as a terminal service end point will most likely not be obtained before the treated water exceeds acceptable iron and manganese levels.

6.3 Iron and Manganese Treatment

A summary of the influent and filtered water values for iron and manganese is presented in Tables 2 through 5. The test results noted "field" are test results from the Hach DR 900 and field test kits, and those noted Lab are from Eurofins Test Laboratories off-site analysis.

TABLE 2
IRON AND MANGANESE TEST RESULTS
Desal Project Well Water, MEDIA #F1 RUN #1
June 2, 2020

ANALYTE	**Hours of Service**						
	0	1	2	4	6	8	10
Fe in, mg/L, field (raw)		0.96	0.96	0.97	0.97	0.96	0.93
Fe in, mg/L, Lab (raw)			0.92				
Fe out, mg/L, field		0.03	0.01	0.08	0.17	0.29	0.45
Fe out, mg/L, Lab			<0.020			0.28	0.40
Mn in, mg/L, field		0.313	0.295	0.327	0.309	0.320	0.391
Mn in, mg/L, Lab			0.94				
Mn out, mg/L, field		0.040	0.040	0.074	0.082	0.102	0.134
Mn out, mg/L, Lab			0.0033			0.088	0.240
As in, µg/L, Lab			5.8				
As out, µg/L, Lab			2.7			3.4	3.8
, psid	2.0	2.2	2.9	3.2	3.5	3.9	4.4

NOTES: Media = F1 Manganese Greensand+® Flow = 1.5 GPM

TABLE 3
IRON AND MANGANESE TEST RESULTS
Desal Project Well Water, MEDIA #F2 RUN #1
June 2, 2020

ANALYTE	**Hours of Service**						
	0	1	2	4	6	8	10
Fe in, mg/L, field		0.96	0.96	0.97	0.97	0.96	0.93
Fe in, mg/L, Lab (raw)			0.92				
Fe out, mg/L, field		0.00	0.05	0.02	0.09	0.15	0.18
Fe out, mg/L, Lab			0.020			0.16	0.20
Mn in, mg/L, field		0.313	0.295	0.327	0.309	0.320	0.391
Mn in, mg/L, Lab			0.94				
Mn out, mg/L, field		0.020	0.024	0.053	0.046	0.062	0.041
Mn out, mg/L, Lab		<0.0020	0.012			0.022	0.029
As in, µg/L, Lab			5.8	0.28			
As out, µg/L, Lab			2.2			2.6	2.8
DP, psid	1.7	1.8	2.7	3.3	3.8	4.2	4.7

NOTES: Media = F2 Mang-Ox® Flow = 1.5 GPM

TABLE 4
IRON AND MANGANESE TEST RESULTS
Desal Project Well Water, MEDIA #F1 RUN #2
June 3, 2020

ANALYTE	Hours of Service							
	0	1	2	4	6	8	10	12
Fe in, mg/L, field		0.98	1.04	1.03	0.99	0.94	1.00	0.94
Fe in, mg/L, Lab (raw)		0.90						
Fe out, mg/L, field		0.03	<0.010	0.02	<0.010	0.02	0.12	0.19
Fe out, mg/L, Lab		<0.020				<0.020		0.40
Mn in, mg/L, field		0.321	0.303	0.285	0.316	0.309	0.306	0.309
Mn in, mg/L, Lab		0.95	0.097			0.26		
Mn out, mg/L, field		0.077	0.049	0.042	0.035	0.027	0.068	0.086
Mn out, mg/L, Lab		0.15				<0.0020		0.49
As in, µg/L, Lab		5.0						
As out, µg/L, Lab		3.0				<1.0		3.8
DP, psid	1.6	1.6	1.8	1.9	2.0	2.3	2.6	2.7

NOTES: Media = F1 Manganese Greensand+® Flow = 1.1 GPM

TABLE 5
IRON AND MANGANESE TEST RESULTS
Desal Project Well Water, MEDIA #F2 RUN #2
June 3, 2020

ANALYTE	Hours of Service							
	0	1	2	4	6	8	10	12
Fe in, mg/L, field		0.98	1.04	1.03	0.99	0.94	1.00	0.94
Fe in, mg/L, Lab (raw)		0.90						
Fe out, mg/L, field		0.03	<0.010	0.08	0.02	<0.010	0.07	0.06
Fe out, mg/L, Lab		<0.020				<0.020		0.16
Mn in, mg/L, field		0.321	0.303	0.285	0.316	0.309	0.306	0.309
Mn in, mg/L, Lab		0.95	0.097			0.26		
Mn out, mg/L, field		0.032	0.013	0.025	0.027	0.047	0.047	0.062
Mn out, mg/L, Lab		0.0089				0.0032		0.022
As in, µg/L, Lab		5.0						
As out, µg/L, Lab		2.0				<1.0		3.5
DP, psid	1.3	1.5	1.7	2.1	2.3	2.8	3.1	3.4

NOTES: Media = F1 MangOx® Flow = 1.1 GPM

7.0 PERFORMANCE EVALUATION NOTES

Run 1 was conducted at 8 gpm/ft^2 with a nominal 1.2 to 1.4 mg/L free chlorine in the inlet flow to each filter column. Sodium hypochlorite was fed at a rate of 7.5 mg/l (calculated) to maintain a chlorine residual in the treated effluent water above 1.0 mg/l as free chlorine. Effluent free chlorine levels were measured with field instruments. Ammonia nitrogen when present in the raw water can reduce finished water free chlorine residual. Also, higher levels of iron and hydrogen sulfide will also contribute to higher chlorine oxidant demand. Measured ammonia nitrogen in the effluent treated water may indicate less available free chlorine in the downstream water distribution system than what is measured at the treatment column outlet. Therefore, ammonia nitrogen measurements were taken to assess the filter medias' capability to provide oxidative benefit to the raw water ammonia present. Measured raw water ammonia values were 0.63 mg/L ammonia nitrogen in field tests. At the start of the first filter run, the medias provided a nominal 40 to 50 percent reduction in ammonia through each column. In addition, the pilot test technician noted a strong hydrogen sulfide odor from the raw untreated well water. Although actual hydrogen sulfide concentrations were not measured, its presence in the raw water will increase the oxidant demand and affect the residual measured free chlorine in the filter effluent water. This may explain the unusually high oxidant dosing rate to provide the required free chlorine residual in the treated water.

To effectively provide full oxidation of the target contaminant metals iron and manganese, free chlorine levels were always maintained in the treated effluent water at a 1.0 to 1.2 mg/L setpoint. The field tests confirm that iron and manganese can be removed to below secondary MCL values using either media type. At the standard service flow rate of 8 gpm/ft^2 the F1 media type appears to reach effluent breakthrough for iron and manganese secondary MCL levels at 6 hours of service. Column F2 media demonstrated iron removal capability for the full 10 hours of service and provided manganese removal through 8 hours of service operation in standard flow rate. Manganese effluent levels quickly increased after 8 hours service operation. These water test conditions illustrate a better iron and manganese removal performance with the column F2 media. Although variations in field tests and laboratory analysis are illustrated in the data set, the general trend in breakthrough performance for iron and manganese results are consistent.

Run No. 2 was performed at a reduced service flow rate corresponding to 6 gpm/ft^2 using the same proportional sodium hypochlorite feed rates as is used in Run No. 1 to maintain approximately 1 mg/L free chlorine in the treated water. The results for iron and manganese removal is very predictable and essentially trend identically to the run no, 1 test. A 25 percent reduction in flow rate through the media should extend the service term by approximately this equivalent time. The data obtained reflect this result. Both media types reach terminal iron and manganese capacity about 2 to 3 hours beyond that obtained in the standard service flow rate test. Column F2 media performed iron and manganese removal below secondary MCL levels through the full length of test of 12 hours. The column F1 media provided better iron and manganese effluent results below the secondary MCL values at the reduced flow rate than in the previous standard flow rate test to 10 hours of service. Pressure loss data for both media types suggest very little discernable difference in performance through the service periods.

APPENDIX A

Analytical Test Results
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ACCREDITED
CERTIFICATE #'s 5890.01 & 5890.02

Laboratory Report

for

David C. McCollum Water Treatment Plant
1966 Olivenhain Rd.
Encinitas, CA 92024
Attention: Tom Arellano
Fax: 760-740-1702

NELAP ACCREDITED TNI LABORATORY
Utah ELCP CA00006

Date of Issue
06/17/2020
EUROFINS EATON ANALYTICAL, LLC

Report: 874995
Project: WOODARD
Group: OMWD Desal Pilot Test

YOM: Yolanda O Martin

Project Manager

* Accredited in accordance with TNI 2016 and ISO/IEC 17025:2017.
* Laboratory certifies that the test results meet all **TNI 2016 and ISO/IEC 17025:2017** requirements unless noted under the individual analysis.
* Following the cover page are State Certification List, ISO 17025 Accredited Method List, Acknowledgement of Samples Received, Comments, Hits Report, Data Report, QC Summary, QC Report and Regulatory Forms, as applicable.
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Refer to Certificate and scope of accreditation (5890) found at: https://www.eurofinsus.com/Eaton

SPECIFIC TESTS	METHOD OR TECHNIQUE USED	Environ-mental (Drinking Water)	Environ-mental (Waste Water)	Water as a Component of Food and Bev/Bev/ Bottled Water
1,2,3-TCP (5 PPT & 0.5 PPT)	CA SRL 524M-TCP	x		x
1,4-Dioxane	EPA 522	x		x
2,3,7,8-TCDD	Modified EPA 1613B	x		x
Acrylamide	In House Method (2440)	x		x
Algal Toxins/Microcystin	In House Method (3570)			
Alkalinity	SM 2320B	x	x	x
Ammonia	EPA 350.1		x	x
Ammonia	SM 4500-NH3 H		x	x
Anions and DBPs by IC	EPA 300.0	x	x	x
Anions and DBPs by IC	EPA 300.1	x		x
Asbestos	EPA 100.2	x	x	
BOD / CBOD	SM 5210B		x	x
Bromate	In House Method (2447)	x		x
Carbamates	EPA 531.2	x		x
Carbonate as CO3	SM 2330B	x	x	x
Carbonyls	EPA 556	x		x
COD	EPA 410.4 / SM 5220D		x	
Chloramines	SM 4500-CL G	x	x	x
Chlorinated Acids	EPA 515.4	x		x
Chlorinated Acids	EPA 555	x		x
Chlorine Dioxide	SM 4500-CLO2 D Palin Test	x		x
Chlorine -Total/Free/ Combined Residual	SM 4500-Cl G	x	x	x
Conductivity	EPA 120.1		x	
Conductivity	SM 2510B	x	x	x
Corrosivity (Langelier Index)	SM 2330B	x		x
Cyanide, Amenable	SM 4500-CN G	x	x	
Cyanide, Free	SM 4500CN F	x	x	x
Cyanide, Total	EPA 335.4	x	x	x
Cyanogen Chloride (screen)	In House Method (2470)	x		x
Diquat and Paraquat	EPA 549.2	x		x
DBP/HAA	SM 6251B	x		x
Dissolved Oxygen	SM 4500-O G		x	x
DOC	SM 5310C	x		x
E. Coli	(MTF/EC+MUG)	x		x
E. Coli	CFR 141.21(f)(6)(i)	x		x
E. Coli	SM 9223		x	
E. Coli (Enumeration)	SM 9221B.1/ SM 9221F	x		x
E. Coli (Enumeration)	SM 9223B	x		x
EDB/DCBP	EPA 504.1	x		
EDB/DBCP and DBP	EPA 551.1	x		x
EDTA and NTA	In House Method (2454)	x		x
Endothall	EPA 548.1	x		x
Endothall	In-house Method (2445)	x		x
Enterococci	SM 9230B	x	x	
Fecal Coliform	SM 9221 E (MTF/EC)	x		
Fecal Coliform	SM 9221C, E (MTF/EC)		x	
Fecal Coliform (Enumeration)	SM 9221E (MTF/EC)	x		x
Fecal Coliform with Chlorine Present	SM 9221E		x	
Fecal Streptococci	SM 9230B	x	x	
Fluoride	SM 4500-F C	x	x	x
Glyphosate	EPA 547	x		x
Glyphosate + AMPA	In House Method (3618)	x		x
Gross Alpha/Beta	EPA 900.0	x	x	x
Gross Alpha Coprecipitation	SM 7110 C	x	x	x
Hardness	SM 2340B	x	x	x
Heterotrophic Bacteria	In House Method (2439)	x		x
Heterotrophic Bacteria	SM 9215 B	x		x
Hexavalent Chromium	EPA 218.6	x	x	x

SPECIFIC TESTS	METHOD OR TECHNIQUE USED	Environ-mental (Drinking Water)	Environ-mental (Waste Water)	Water as a Component of Food and Bev/Bev/ Bottled Water
Hexavalent Chromium	EPA 218.7	x		x
Hexavalent Chromium	SM 3500-Cr B		x	
Hormones	EPA 539	x		x
Hydroxide as OH Calc.	SM 2330B	x		x
Kjeldahl Nitrogen	EPA 351.2		x	
Legionella	Legiolert	x		x
Mercury	EPA 200.8	x		x
Metals	EPA 200.7 / 200.8	x	x	x
Microcystin LR	ELISA (2360)	x		x
Microcystin, Total	EPA 546	x		x
NDMA	EEA/Agilent 521.1 In house method (2425)	x		x
Nitrate/Nitrite Nitrogen	EPA 353.2	x	x	x
OCL, Pesticides/PCB	EPA 505	x		x
Ortho Phosphate	EPA 365.1	x	x	x
Ortho Phosphorous	SM 4500P E	x		x
Oxyhalides Disinfection Byproducts	EPA 317.0	x		x
Perchlorate	EPA 331.0	x		x
Perchlorate (low and high)	EPA 314.0	x		x
Perfluorinated Alkyl Acids	EPA 537	x		x
Perfluorinated Polutant	In house Method (2434)	x		x
pH	EPA 150.1	x		
pH	SM 4500-H+B	x	x	x
Phenylurea Pesticides/ Herbicides	In House Method, based on EPA 532 (2448)	x		x
Pseudomonas	IDEXX Pseudalert (2461)	x		x
Radium-226	GA Institute of Tech	x		x
Radium-228	GA Institute of Tech	x		x
Radon-222	SM 7500RN	x		x
Residue, Filterable	SM 2540C	x	x	x
Residue, Non-filterable	SM 2540D		x	
Residue, Total	SM 2540B		x	x
Residue, Volatile	EPA 160.4		x	
Semi-VOC	EPA 525.2	x		x
Silica	SM 4500-Si D	x	x	
Silica	SM 4500-SiO2 C	x	x	
Sulfide	SM 4500-$S^{=}$ D		x	
Sulfite	SM 4500-SO^{3}B	x	x	x
Surfactants	SM 5540C	x	x	x
Taste and Odor Analytes	SM 6040E	x		x
Total Coliform (P/A)	SM 9221 A, B	x		x
Total Coliform (Enumeration)	SM 9221 A, B, C	x		x
Total Coliform / E. coli	Colisure SM 9223	x		x
Total Coliform	SM 9221B		x	
Total Coliform with Chlorine Present	SM 9221B		x	
Total Coliform / E.coli (P/A and Enumeration)	SM 9223	x		x
TOC	SM 5310C	x	x	x
TOX	SM 5320B		x	
Total Phenols	EPA 420.1		x	
Total Phenols	EPA 420.4	x	x	x
Total Phosphorous	SM 4500 P E		x	
Triazine Pesticides & Degradates	In House (3617)	x		x
Turbidity	EPA 180.1	x	x	x
Turbidity	SM 2130B	x	x	
Uranium by ICP/MS	EPA 200.8	x		x
UV 254	SM 5910B	x		
VOC	EPA 524.2	x		x
VOC	In House Method (2411)	x		x
Yeast and Mold	SM 9610	x		x
Field Sampling	N/A			

Acknowledgement of Samples Received

Addr: **David C. McCollum Water Treatment Plant**
1966 Olivenhain Rd.
Encinitas, CA 92024

Attn: Tom Arellano
Phone: 760-740-1385 x183

Client ID: OLIVENHAIN
Folder #: 874995
Project: WOODARD
Sample Group: OMWD Desal Pilot Test

Project Manager: Yolanda O Martin
Phone: (626)-386-1104

The following samples were received from you on **June 05, 2020** at **1616**. They have been scheduled for the tests listed below each sample. If this information is incorrect, please contact your service representative. Thank you for using Eurofins Eaton Analytical, LLC.

Sample #	Sample ID			Sample Date
202006050429	RAW			06/02/2020 0930
	Arsenic Total ICAP/MS	Iron Total ICAP	Manganese Total ICAP	
	Metals digestion performed.	RUSH Sample Kit		
202006050430	F1			06/02/2020 0930
	Arsenic Total ICAP/MS	Iron Total ICAP	Manganese Total ICAP	
	Metals digestion performed.			
202006050431	F2			06/02/2020 0930
	Arsenic Total ICAP/MS	Iron Total ICAP	Manganese Total ICAP	
	Metals digestion performed.			
202006050432	F1			06/02/2020 1530
	Arsenic Total ICAP/MS	Iron Total ICAP	Manganese Total ICAP	
	Metals digestion performed.			
202006050433	F2			06/02/2020 1530
	Arsenic Total ICAP/MS	Iron Total ICAP	Manganese Total ICAP	
	Metals digestion performed.			
202006050434	F1			06/02/2020 1730
	Arsenic Total ICAP/MS	Iron Total ICAP	Manganese Total ICAP	
	Metals digestion performed.			
202006050435	F2			06/02/2020 1730
	Arsenic Total ICAP/MS	Iron Total ICAP	Manganese Total ICAP	
	Metals digestion performed.			
202006050436	RAW			06/03/2020 0645
	Arsenic Total ICAP/MS	Iron Total ICAP	Manganese Total ICAP	
	Metals digestion performed.			
202006050437	F1			06/03/2020 0645
	Arsenic Total ICAP/MS	Iron Total ICAP	Manganese Total ICAP	
	Metals digestion performed.			
202006050438	F2			06/03/2020 0645
	Arsenic Total ICAP/MS	Iron Total ICAP	Manganese Total ICAP	
	Metals digestion performed.			

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Acknowledgement of Samples Received

Addr: **David C. McCollum Water Treatment Plant**
1966 Olivenhain Rd.
Encinitas, CA 92024

Client ID: OLIVENHAIN
Folder #: 874995
Project: WOODARD
Sample Group: OMWD Desal Pilot Test

Attn: Tom Arellano
Phone: 760-740-1385 x183

Project Manager: Yolanda O Martin
Phone: (626)-386-1104

The following samples were received from you on **June 05, 2020** at **1616**. They have been scheduled for the tests listed below each sample. If this information is incorrect, please contact your service representative. Thank you for using Eurofins Eaton Analytical, LLC.

Sample #	Sample ID			Sample Date
202006050439	F1			06/03/2020 1400
	Arsenic Total ICAP/MS	Iron Total ICAP	Manganese Total ICAP	
	Metals digestion performed.			
202006050440	F2			06/03/2020 1400
	Arsenic Total ICAP/MS	Iron Total ICAP	Manganese Total ICAP	
	Metals digestion performed.			
202006050441	F1			06/03/2020 1800
	Arsenic Total ICAP/MS	Iron Total ICAP	Manganese Total ICAP	
	Metals digestion performed.			
202006050442	F2			06/03/2020 1800
	Arsenic Total ICAP/MS	Iron Total ICAP	Manganese Total ICAP	
	Metals digestion performed.			
202006080150	F1 backwash - bucket (Total)			06/02/2020 1730
	Arsenic Total ICAP/MS	Iron Total ICAP	Manganese Total ICAP	
	Metals digestion performed.			
202006080151	F1 backwash - bucket (Dissolved)			06/02/2020 1730
	Arsenic dissolved ICAP/MS	Iron Dissolved ICAP	Manganese Dissolved ICAP	
	Metals digestion performed.			
202006080152	F2 backwash - bucket (Total)			06/02/2020 1730
	Arsenic Total ICAP/MS	Iron Total ICAP	Manganese Total ICAP	
	Metals digestion performed.			
202006080153	F2 backwash - bucket (Dissolved)			06/02/2020 1730
	Arsenic dissolved ICAP/MS	Iron Dissolved ICAP	Manganese Dissolved ICAP	
	Metals digestion performed.			
202006050443	COURIER CHARGE			06/05/2020 0000
	Courier Charge			

Test Description

750 Royal Oaks Drive, Suite 100, Monrovia, CA 91016 Tel (626) 386-1100 Fax (866) 988-3757 www.EurofinsUS.com/Eaton

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CHAIN OF CUSTODY RECORD

874495

750 Royal Oaks Drive, Suite 100
Monrovia, CA 91016-3629

Phone: 626 386 1100
Fax: 626 386 1101

800 566 LABS (800 566 5227)

Website: www.EatonAnalytical.com

EUROFINS EATON ANALYTICAL USE ONLY:

LOGIN COMMENTS: Recd with 2 5 gallon buckets of water

SAMPLES CHECKED AGAINST COC BY:

SAMPLES LOGGED IN BY:

SAMPLE TEMP RECEIVED AT:

SAMPLES REC'D DAY OF COLLECTION? ☐ (check for yes)

☐ ______ (Other) IR Gun ID = ______ (Observation= ______ °C) (Corr.Factor ______ °C) (Final = ______ °C)

☑ Monrovia IR Gun ID = 618 (Observation= 23.0 °C) (Corr.Factor -0.2 °C) (Final = 22.8 °C)

Compliance Acceptance Criteria: (Chemistry: 4 ± 2 °C) (Microbiology: ≤10°C)

TYPE OF ICE: Real ____ Synthetic ____ No Ice ✓ **CONDITION OF ICE:** Frozen ____ Partially Frozen ____ Thawed ____ N/A ✓

METHOD OF SHIPMENT: Pick-Up / Walk-In / FedEx / UPS / DHL / Area Fast / Top Line / Other: ______

TO BE COMPLETED BY SAMPLER:

COMPANY/AGENCY NAME: WOODARD + CURRAN / OMWD

PROJECT CODE: WOODARD

EEA CLIENT CODE:

COC ID:

SAMPLE GROUP: OMWD DESAL PILOT TEST

TAT requested: rush by adv notice only STD X 1 wk ___ 3 day ___ 2 day ___ 1 day ___

COMPLIANCE SAMPLES ☐ (check for yes)
- Requires state forms ☐

NON-COMPLIANCE SAMPLES ☒ (check for yes)

REGULATION INVOLVED: ______ (eg. SDWA, NPDES, etc.)

Type of samples (circle one): ROUTINE SPECIAL CONFIRMATION

SEE ATTACHED KIT ORDER FOR ANALYSES ☒ (check for yes), ***OR***

List **ALL ANALYSES REQUIRED** (enter number of bottles sent for each test for each sample)

SAMPLE DATE	SAMPLE TIME	SAMPLE ID	CLIENT LAB ID	MATRIX *	FIELD DATA	FIELD DATA	ARSENIC	IRON	MANGANESE	SAMPLER COMMENTS
6/2	0930	RAW		RGW						
		F1		FW						
		F2		FW						
	1530	F1		FW						
	1530	F2		FW						
	1730	F1 + COMPOSITE		FW						+ COMPOSITE FILTERED
	1730	F2 + COMPOSITE		FW						+ COMP. FILTERED
6/3	0645	RAW + F1 + F2		RGW						
	1400	F1 + F2		FW						
	1800	F1 + F2		FW						

*** MATRIX TYPES: RSW** = Raw Surface Water **CFW** = Chlor(am)inated Finished Water **SEAW** = Sea Water **BW** = Bottled Water **SO** = Soil **O** = Other - Please Identify
RGW = Raw Ground Water **FW** = Other Finished Water **WW** = Waste Water **SW** = Storm Water **SL** = Sludge

	SIGNATURE	PRINT NAME	COMPANY/TITLE	DATE	TIME
SAMPLED BY:	DAVID JONES / [signature]	DAVID JONES / KRAIG ERICKSON	WOODARD + CURRAN	6/2 - 6/3	0930
RELINQUISHED BY:	[signature]	KRAIG ERICKSON	"	6/5	11:30
RECEIVED BY:	[signature]	RICK ZIMMER	EUROFINS	6-5-20	100
RELINQUISHED BY:	[signature]	RICK ZIMMER	EUROFINS	6-5-20	100
RECEIVED BY:	[signature]	X BALLUGOT	EEA	6/5/20	1300

QA FO 0029.2 (Version 2) (08/28/2014)

REL: [signature] 6/5/20 1545 [signature] 6/5/20 1616

PAGE ____ OF ____

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Kit Order for Olivenhain Municipal Water District

Yolanda O Martin is your Eurofins Eaton Analytical, LLC Service Manager

750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
(626) 386-1100 FAX (866) 988-3757

Created Date & Time: 5/28/2020 2:01:32PM

Note: Sampler Please return this paper with your samples

Kit #: 264883

Created By: Yolanda O Martin - [YOM]
Deliver By: 05/29/2020
STG: Bottle Orders
Ice Type: W

Client ID: OLIVENHAIN
Project Code: WOODARD Bottle Orders
Group Name: OMWD Desal Pilot Test
PO#/JOB#:
Description: No Schedule
Shipping Method: Courier

Ship Sample Kits to	Send Report to	Billing Address
DMW Water Treatment Plant 1966 Olivenhain Road Encinitas, CA 92024 Attn: Joey Randall Phone: 760-753-6466	~~David C. McCollum Water Treatment Plant 1966 Olivenhain Rd Encinitas, CA 92024 Attn: Tom Arellano Phone: 760-740-1385 x183 Fax: 760-740-1702~~ WOODARD + CURRAN	~~David C. McCollum Water Treatment Plant 1966 Olivenhain Rd Encinitas, CA 92024 Attn: Tom Arellano Phone: 760-740-1385 x183 Fax: 760-740-1702~~ WOODARD + CURRAN

# of Sample	Tests	Bottle Qty - Type [preservative information]	Total	UN DOT #
5	Arsenic Total ICAP/MS, Iron Total ICAP, Manganese Total ICAP, Metals digestion performed.	2 - 500ml acid poly [2ml HNO3 (18%)]	~~10~~	UN2031

Sum Tests: 5

2ND COMPOSITE SAMPLE THRU 45-MICRON FILTER + ANALYZE FOR DISSOLVED

Sum Bottles: ~~10~~
14 + 2~5 GALLON BUCKETS

Comments

Label Cooler: WOODARD
No ice packs

Give to Xzer in the morning. (5/29/20)

6/2/20 Run 1 0930 RAW
F1
F2
1530 F1
1530 F2
1730 F1
1730 F2

6/3/20 Run 2 0645 RAW
F1
F2
1400 F1
1400 F2
1800 F1
1800 F2

6/2/20 COMPOSITE GRAB
5 GALLON BUCKETS
– 1730 F1 BACKWASH
– 1730 F2 BACKWASH

Code	Status	Date Shipped	Via	Tracking #	# of Coolers	Prepared By

Tel: (626) 386-1100
Fax: (866) 988-3757
1 800 566 LABS (1 800 566 5227)

Laboratory Comments

Report: 874995
Project: WOODARD
Group: OMWD Desal Pilot Test

David C. McCollum Water Treatment Plant
Tom Arellano
1966 Olivenhain Rd.
Encinitas, CA 92024

Flags Legend:

D1 - Sample required dilution due to matrix.

The Comments Report may be blank if there are no comments for this report.

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Tel: (626) 386-1100
Fax: (866) 988-3757
1 800 566 LABS (1 800 566 5227)

Laboratory Hits

Report: 874995
Project: WOODARD
Group: OMWD Desal Pilot Test

David C. McCollum Water Treatment Plant
Tom Arellano
1966 Olivenhain Rd.
Encinitas, CA 92024

Samples Received on:
06/05/2020 1616

Analyzed	Analyte	Sample ID	Result	Federal MCL	Units	MRL
	202006050429	**RAW**				
06/11/2020 23:15	Arsenic Total ICAP/MS		5.8	10	ug/L	1.0
06/08/2020 15:02	Iron Total ICAP		0.92	0.3	mg/L	0.020
06/08/2020 15:02	Manganese Total ICAP		0.94	0.05	mg/L	0.0020
06/08/2020 09:39	Metals digestion performed.		NO		Yes/No	
	202006050430	**F1**				
06/11/2020 23:18	Arsenic Total ICAP/MS		2.7	10	ug/L	1.0
06/09/2020 12:16	Manganese Total ICAP		0.0033	0.05	mg/L	0.0020
06/08/2020 09:39	Metals digestion performed.		NO		Yes/No	
	202006050431	**F2**				
06/11/2020 23:21	Arsenic Total ICAP/MS		2.2	10	ug/L	1.0
06/09/2020 12:17	Iron Total ICAP		0.020	0.3	mg/L	0.020
06/09/2020 12:17	Manganese Total ICAP		0.012	0.05	mg/L	0.0020
06/08/2020 09:39	Metals digestion performed.		NO		Yes/No	
	202006050432	**F1**				
06/10/2020 03:42	Arsenic Total ICAP/MS		3.4	10	ug/L	1.0
06/08/2020 14:28	Iron Total ICAP		0.28	0.3	mg/L	0.020
06/08/2020 14:28	Manganese Total ICAP		0.088	0.05	mg/L	0.0020
06/08/2020 09:39	Metals digestion performed.		NO		Yes/No	
	202006050433	**F2**				
06/10/2020 03:45	Arsenic Total ICAP/MS		2.6	10	ug/L	1.0
06/08/2020 14:27	Iron Total ICAP		0.16	0.3	mg/L	0.020
06/08/2020 14:27	Manganese Total ICAP		0.022	0.05	mg/L	0.0020
06/08/2020 09:39	Metals digestion performed.		NO		Yes/No	
	202006050434	**F1**				
06/10/2020 03:48	Arsenic Total ICAP/MS		3.8	10	ug/L	1.0
06/08/2020 14:58	Iron Total ICAP		0.40	0.3	mg/L	0.020
06/08/2020 14:58	Manganese Total ICAP		0.24	0.05	mg/L	0.0020
06/08/2020 09:39	Metals digestion performed.		NO		Yes/No	
	202006050435	**F2**				
06/10/2020 03:51	Arsenic Total ICAP/MS		2.8	10	ug/L	1.0
06/08/2020 14:59	Iron Total ICAP		0.20	0.3	mg/L	0.020
06/08/2020 14:59	Manganese Total ICAP		0.029	0.05	mg/L	0.0020
06/08/2020 09:39	Metals digestion performed.		NO		Yes/No	

SUMMARY OF POSITIVE DATA ONLY

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Tel: (626) 386-1100
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Laboratory Hits

Report: 874995
Project: WOODARD
Group: OMWD Desal Pilot Test

David C. McCollum Water Treatment Plant
Tom Arellano
1966 Olivenhain Rd.
Encinitas, CA 92024

Samples Received on:
06/05/2020 1616

Analyzed	Analyte	Sample ID	Result	Federal MCL	Units	MRL
	202006050436	**RAW**				
06/10/2020 03:54	Arsenic Total ICAP/MS		5.0	10	ug/L	1.0
06/08/2020 14:49	Iron Total ICAP		0.90	0.3	mg/L	0.020
06/08/2020 14:49	Manganese Total ICAP		0.95	0.05	mg/L	0.0020
06/08/2020 09:39	Metals digestion performed.		NO		Yes/No	
	202006050437	**F1**				
06/10/2020 03:57	Arsenic Total ICAP/MS		3.0	10	ug/L	1.0
06/08/2020 14:29	Manganese Total ICAP		0.15	0.05	mg/L	0.0020
06/08/2020 09:39	Metals digestion performed.		NO		Yes/No	
	202006050438	**F2**				
06/11/2020 23:09	Arsenic Total ICAP/MS		2.0	10	ug/L	1.0
06/08/2020 14:36	Manganese Total ICAP		0.0089	0.05	mg/L	0.0020
06/08/2020 09:39	Metals digestion performed.		NO		Yes/No	
	202006050439	**F1**				
06/08/2020 15:01	Manganese Total ICAP		0.34	0.05	mg/L	0.0020
06/08/2020 09:39	Metals digestion performed.		NO		Yes/No	
	202006050440	**F2**				
06/08/2020 15:00	Manganese Total ICAP		0.0032	0.05	mg/L	0.0020
06/08/2020 09:39	Metals digestion performed.		NO		Yes/No	
	202006050441	**F1**				
06/11/2020 23:30	Arsenic Total ICAP/MS		3.8	10	ug/L	1.0
06/09/2020 12:18	Iron Total ICAP		0.40	0.3	mg/L	0.020
06/09/2020 12:18	Manganese Total ICAP		0.49	0.05	mg/L	0.0020
06/08/2020 09:39	Metals digestion performed.		NO		Yes/No	
	202006050442	**F2**				
06/11/2020 23:51	Arsenic Total ICAP/MS		3.5	10	ug/L	1.0
06/09/2020 12:19	Iron Total ICAP		0.16	0.3	mg/L	0.020
06/09/2020 12:19	Manganese Total ICAP		0.022	0.05	mg/L	0.0020
06/08/2020 09:39	Metals digestion performed.		NO		Yes/No	
	202006080150	**F1 backwash - bucket (Total)**				
06/12/2020 15:57	Arsenic Total ICAP/MS		56	10	ug/L	1.0
06/15/2020 14:10	Iron Total ICAP		20	0.3	mg/L	0.20
06/15/2020 13:52	Manganese Total ICAP		3.1	0.05	mg/L	0.0020
06/11/2020 09:58	Metals digestion performed.		YES		Yes/No	

SUMMARY OF POSITIVE DATA ONLY

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Laboratory Hits

Tel: (626) 386-1100
Fax: (866) 988-3757
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Report: 874995
Project: WOODARD
Group: OMWD Desal Pilot Test

David C. McCollum Water Treatment Plant
Tom Arellano
1966 Olivenhain Rd.
Encinitas, CA 92024

Samples Received on:
06/05/2020 1616

Analyzed	Analyte	Sample ID	Result	Federal MCL	Units	MRL
	202006080151	**F1 backwash - bucket (Dissolved)**				
06/15/2020 18:06	Arsenic dissolved ICAP/MS		3.8		ug/L	1.0
06/13/2020 12:49	Iron Dissolved ICAP		0.11		mg/L	0.020
06/13/2020 12:49	Manganese Dissolved ICAP		0.83		mg/L	0.0020
06/10/2020 09:22	Metals digestion performed.		NO		Yes/No	
	202006080152	**F2 backwash - bucket (Total)**				
06/12/2020 15:59	Arsenic Total ICAP/MS		73	10	ug/L	1.0
06/15/2020 14:11	Iron Total ICAP		27	0.3	mg/L	0.20
06/15/2020 13:53	Manganese Total ICAP		6.1	0.05	mg/L	0.0020
06/11/2020 09:58	Metals digestion performed.		YES		Yes/No	
	202006080153	**F2 backwash - bucket (Dissolved)**				
06/15/2020 18:08	Arsenic dissolved ICAP/MS		4.0		ug/L	1.0
06/13/2020 12:52	Iron Dissolved ICAP		0.12		mg/L	0.020
06/13/2020 12:52	Manganese Dissolved ICAP		0.39		mg/L	0.0020
06/10/2020 09:22	Metals digestion performed.		NO		Yes/No	

SUMMARY OF POSITIVE DATA ONLY

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Tel: (626) 386-1100
Fax: (866) 988-3757
1 800 566 LABS (1 800 566 5227)

Laboratory Data

Report: 874995
Project: WOODARD
Group: OMWD Desal Pilot Test

David C. McCollum Water Treatment Plant
Tom Arellano
1966 Olivenhain Rd.
Encinitas, CA 92024

Samples Received on:
06/05/2020 1616

Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
RAW (202006050429)						**Sampled on 06/02/2020 0930**			
		EPA 200.8 - ICPMS Metals							
06/08/20	06/11/20 23:15	1253632	1254476	(EPA 200.8)	Arsenic Total ICAP/MS	5.8	ug/L	1.0	1
		EPA 200 Prep - Metals digestion performed.							
	06/08/20 09:39		1253642	(EPA 200 Prep)	Metals digestion performed.	NO	Yes/No		1
		EPA 200.7 - ICP Metals							
06/08/20	06/08/20 15:02	1253632	1253707	(EPA 200.7)	Iron Total ICAP	0.92	mg/L	0.020	1
06/08/20	06/08/20 15:02	1253632	1253707	(EPA 200.7)	Manganese Total ICAP	0.94	mg/L	0.0020	1
F1 (202006050430)						**Sampled on 06/02/2020 0930**			
		EPA 200.8 - ICPMS Metals							
06/08/20	06/11/20 23:18	1253632	1254476	(EPA 200.8)	Arsenic Total ICAP/MS	2.7	ug/L	1.0	1
		EPA 200 Prep - Metals digestion performed.							
	06/08/20 09:39		1253642	(EPA 200 Prep)	Metals digestion performed.	NO	Yes/No		1
		EPA 200.7 - ICP Metals							
06/08/20	06/09/20 12:16	1253632	1253893	(EPA 200.7)	Iron Total ICAP	ND	mg/L	0.020	1
06/08/20	06/09/20 12:16	1253632	1253893	(EPA 200.7)	Manganese Total ICAP	0.0033	mg/L	0.0020	1
F2 (202006050431)						**Sampled on 06/02/2020 0930**			
		EPA 200.8 - ICPMS Metals							
06/08/20	06/11/20 23:21	1253632	1254476	(EPA 200.8)	Arsenic Total ICAP/MS	2.2	ug/L	1.0	1
		EPA 200 Prep - Metals digestion performed.							
	06/08/20 09:39		1253642	(EPA 200 Prep)	Metals digestion performed.	NO	Yes/No		1
		EPA 200.7 - ICP Metals							
06/08/20	06/09/20 12:17	1253632	1253893	(EPA 200.7)	Iron Total ICAP	0.020	mg/L	0.020	1
06/08/20	06/09/20 12:17	1253632	1253893	(EPA 200.7)	Manganese Total ICAP	0.012	mg/L	0.0020	1
F1 (202006050432)						**Sampled on 06/02/2020 1530**			
		EPA 200.8 - ICPMS Metals							
06/08/20	06/10/20 03:42	1253632	1254057	(EPA 200.8)	Arsenic Total ICAP/MS	3.4	ug/L	1.0	1
		EPA 200 Prep - Metals digestion performed.							
	06/08/20 09:39		1253642	(EPA 200 Prep)	Metals digestion performed.	NO	Yes/No		1
		EPA 200.7 - ICP Metals							
06/08/20	06/08/20 14:28	1253632	1253649	(EPA 200.7)	Iron Total ICAP	0.28	mg/L	0.020	1
06/08/20	06/08/20 14:28	1253632	1253649	(EPA 200.7)	Manganese Total ICAP	0.088	mg/L	0.0020	1
F2 (202006050433)						**Sampled on 06/02/2020 1530**			
		EPA 200.8 - ICPMS Metals							

Rounding on totals after summation.
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Laboratory Data

Report: 874995
Project: WOODARD
Group: OMWD Desal Pilot Test

David C. McCollum Water Treatment Plant
Tom Arellano
1966 Olivenhain Rd.
Encinitas, CA 92024

Samples Received on:
06/05/2020 1616

Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
06/08/20	06/10/20 03:45	1253632	1254057	(EPA 200.8)	Arsenic Total ICAP/MS	2.6	ug/L	1.0	1
		EPA 200 Prep - Metals digestion performed.							
	06/08/20 09:39		1253642	(EPA 200 Prep)	Metals digestion performed.	NO	Yes/No		1
		EPA 200.7 - ICP Metals							
06/08/20	06/08/20 14:27	1253632	1253649	(EPA 200.7)	Iron Total ICAP	0.16	mg/L	0.020	1
06/08/20	06/08/20 14:27	1253632	1253649	(EPA 200.7)	Manganese Total ICAP	0.022	mg/L	0.0020	1
F1 (202006050434)						**Sampled on 06/02/2020 1730**			
		EPA 200.8 - ICPMS Metals							
06/08/20	06/10/20 03:48	1253860	1254057	(EPA 200.8)	Arsenic Total ICAP/MS	3.8	ug/L	1.0	1
		EPA 200 Prep - Metals digestion performed.							
	06/08/20 09:39		1253642	(EPA 200 Prep)	Metals digestion performed.	NO	Yes/No		1
		EPA 200.7 - ICP Metals							
06/08/20	06/08/20 14:58	1253860	1253707	(EPA 200.7)	Iron Total ICAP	0.40	mg/L	0.020	1
06/08/20	06/08/20 14:58	1253860	1253707	(EPA 200.7)	Manganese Total ICAP	0.24	mg/L	0.0020	1
F2 (202006050435)						**Sampled on 06/02/2020 1730**			
		EPA 200.8 - ICPMS Metals							
06/08/20	06/10/20 03:51	1253860	1254057	(EPA 200.8)	Arsenic Total ICAP/MS	2.8	ug/L	1.0	1
		EPA 200 Prep - Metals digestion performed.							
	06/08/20 09:39		1253642	(EPA 200 Prep)	Metals digestion performed.	NO	Yes/No		1
		EPA 200.7 - ICP Metals							
06/08/20	06/08/20 14:59	1253860	1253707	(EPA 200.7)	Iron Total ICAP	0.20	mg/L	0.020	1
06/08/20	06/08/20 14:59	1253860	1253707	(EPA 200.7)	Manganese Total ICAP	0.029	mg/L	0.0020	1
RAW (202006050436)						**Sampled on 06/03/2020 0645**			
		EPA 200.8 - ICPMS Metals							
06/08/20	06/10/20 03:54	1253632	1254057	(EPA 200.8)	Arsenic Total ICAP/MS	5.0	ug/L	1.0	1
		EPA 200 Prep - Metals digestion performed.							
	06/08/20 09:39		1253642	(EPA 200 Prep)	Metals digestion performed.	NO	Yes/No		1
		EPA 200.7 - ICP Metals							
06/08/20	06/08/20 14:49	1253632	1253707	(EPA 200.7)	Iron Total ICAP	0.90	mg/L	0.020	1
06/08/20	06/08/20 14:49	1253632	1253707	(EPA 200.7)	Manganese Total ICAP	0.95	mg/L	0.0020	1
F1 (202006050437)						**Sampled on 06/03/2020 0645**			
		EPA 200.8 - ICPMS Metals							
06/08/20	06/10/20 03:57	1253632	1254057	(EPA 200.8)	Arsenic Total ICAP/MS	3.0	ug/L	1.0	1
		EPA 200 Prep - Metals digestion performed.							
	06/08/20 09:39		1253642	(EPA 200 Prep)	Metals digestion performed.	NO	Yes/No		1

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Laboratory Data

Report: 874995
Project: WOODARD
Group: OMWD Desal Pilot Test

David C. McCollum Water Treatment Plant
Tom Arellano
1966 Olivenhain Rd.
Encinitas, CA 92024

Samples Received on:
06/05/2020 1616

Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
		EPA 200.7 - ICP Metals							
06/08/20	06/08/20 14:29	1253632	1253649	(EPA 200.7)	Iron Total ICAP	ND	mg/L	0.020	1
06/08/20	06/08/20 14:29	1253632	1253649	(EPA 200.7)	Manganese Total ICAP	0.15	mg/L	0.0020	1
F2 (202006050438)						**Sampled on 06/03/2020 0645**			
		EPA 200.8 - ICPMS Metals							
06/08/20	06/11/20 23:09	1253632	1254476	(EPA 200.8)	Arsenic Total ICAP/MS	2.0	ug/L	1.0	1
		EPA 200 Prep - Metals digestion performed.							
	06/08/20 09:39		1253642	(EPA 200 Prep)	Metals digestion performed.	NO	Yes/No		1
		EPA 200.7 - ICP Metals							
06/08/20	06/08/20 14:36	1253632	1253707	(EPA 200.7)	Iron Total ICAP	ND	mg/L	0.020	1
06/08/20	06/08/20 14:36	1253632	1253707	(EPA 200.7)	Manganese Total ICAP	0.0089	mg/L	0.0020	1
F1 (202006050439)						**Sampled on 06/03/2020 1400**			
		EPA 200.8 - ICPMS Metals							
06/08/20	06/11/20 23:24	1253632	1254476	(EPA 200.8)	Arsenic Total ICAP/MS	ND (D1)	ug/L	5.0	5
		EPA 200 Prep - Metals digestion performed.							
	06/08/20 09:39		1253642	(EPA 200 Prep)	Metals digestion performed.	NO	Yes/No		1
		EPA 200.7 - ICP Metals							
06/08/20	06/08/20 15:01	1253632	1253707	(EPA 200.7)	Iron Total ICAP	ND	mg/L	0.020	1
06/08/20	06/08/20 15:01	1253632	1253707	(EPA 200.7)	Manganese Total ICAP	0.34	mg/L	0.0020	1
F2 (202006050440)						**Sampled on 06/03/2020 1400**			
		EPA 200.8 - ICPMS Metals							
	06/11/20 23:27	1253632	1254476	(EPA 200.8)	Arsenic Total ICAP/MS	ND (D1)	ug/L	5.0	5
		EPA 200 Prep - Metals digestion performed.							
	06/08/20 09:39		1253642	(EPA 200 Prep)	Metals digestion performed.	NO	Yes/No		1
		EPA 200.7 - ICP Metals							
	06/08/20 15:00	1253632	1253707	(EPA 200.7)	Iron Total ICAP	ND	mg/L	0.020	1
	06/08/20 15:00	1253632	1253707	(EPA 200.7)	Manganese Total ICAP	0.0032	mg/L	0.0020	1
F1 (202006050441)						**Sampled on 06/03/2020 1800**			
		EPA 200.8 - ICPMS Metals							
06/08/20	06/11/20 23:30	1253632	1254476	(EPA 200.8)	Arsenic Total ICAP/MS	3.8	ug/L	1.0	1
		EPA 200 Prep - Metals digestion performed.							
	06/08/20 09:39		1253642	(EPA 200 Prep)	Metals digestion performed.	NO	Yes/No		1
		EPA 200.7 - ICP Metals							
06/08/20	06/09/20 12:18	1253632	1253893	(EPA 200.7)	Iron Total ICAP	0.40	mg/L	0.020	1

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Laboratory Data

Report: 874995
Project: WOODARD
Group: OMWD Desal Pilot Test

David C. McCollum Water Treatment Plant
Tom Arellano
1966 Olivenhain Rd.
Encinitas, CA 92024

Samples Received on:
06/05/2020 1616

Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
06/08/20	06/09/20 12:18	1253632	1253893	(EPA 200.7)	Manganese Total ICAP	0.49	mg/L	0.0020	1
F2 (202006050442)						**Sampled on 06/03/2020 1800**			
		EPA 200.8 - ICPMS Metals							
06/08/20	06/11/20 23:51	1253632	1254477	(EPA 200.8)	Arsenic Total ICAP/MS	3.5	ug/L	1.0	1
		EPA 200 Prep - Metals digestion performed.							
	06/08/20 09:39		1253642	(EPA 200 Prep)	Metals digestion performed.	NO	Yes/No		1
		EPA 200.7 - ICP Metals							
06/08/20	06/09/20 12:19	1253632	1253893	(EPA 200.7)	Iron Total ICAP	0.16	mg/L	0.020	1
06/08/20	06/09/20 12:19	1253632	1253893	(EPA 200.7)	Manganese Total ICAP	0.022	mg/L	0.0020	1
F1 backwash - bucket (Total) (202006080150)						**Sampled on 06/02/2020 1730**			
		EPA 200.8 - ICPMS Metals							
06/10/20	06/12/20 15:57	1254360	1254545	(EPA 200.8)	Arsenic Total ICAP/MS	56	ug/L	1.0	1
		EPA 200 Prep - Metals digestion performed.							
	06/11/20 09:58		1254548	(EPA 200 Prep)	Metals digestion performed.	YES	Yes/No		1
		EPA 200.7 - ICP Metals							
06/10/20	06/15/20 14:10	1254360	1255267	(EPA 200.7)	Iron Total ICAP	20	mg/L	0.20	10
06/10/20	06/15/20 13:52	1254360	1255267	(EPA 200.7)	Manganese Total ICAP	3.1	mg/L	0.0020	1
F1 backwash - bucket (Dissolved) (202006080151)						**Sampled on 06/02/2020 1730**			
		EPA 200.8 - ICPMS Metals							
06/10/20	06/15/20 18:06	1254202	1255354	(EPA 200.8)	Arsenic dissolved ICAP/MS	3.8	ug/L	1.0	1
		EPA 200 Prep - Metals digestion performed.							
	06/10/20 09:22		1254840	(EPA 200 Prep)	Metals digestion performed.	NO	Yes/No		1
		EPA 200.7 - ICP Metals							
06/10/20	06/13/20 12:49	1254202	1255060	(EPA 200.7)	Iron Dissolved ICAP	0.11	mg/L	0.020	1
06/10/20	06/13/20 12:49	1254202	1255060	(EPA 200.7)	Manganese Dissolved ICAP	0.83	mg/L	0.0020	1
F2 backwash - bucket (Total) (202006080152)						**Sampled on 06/02/2020 1730**			
		EPA 200.8 - ICPMS Metals							
06/10/20	06/12/20 15:59	1254360	1254545	(EPA 200.8)	Arsenic Total ICAP/MS	73	ug/L	1.0	1
		EPA 200 Prep - Metals digestion performed.							
	06/11/20 09:58		1254548	(EPA 200 Prep)	Metals digestion performed.	YES	Yes/No		1
		EPA 200.7 - ICP Metals							
06/10/20	06/15/20 14:11	1254360	1255267	(EPA 200.7)	Iron Total ICAP	27	mg/L	0.20	10
06/10/20	06/15/20 13:53	1254360	1255267	(EPA 200.7)	Manganese Total ICAP	6.1	mg/L	0.0020	1
F2 backwash - bucket (Dissolved) (202006080153)						**Sampled on 06/02/2020 1730**			

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Laboratory Data

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Report: 874995
Project: WOODARD
Group: OMWD Desal Pilot Test

David C. McCollum Water Treatment Plant
Tom Arellano
1966 Olivenhain Rd.
Encinitas, CA 92024

Samples Received on:
06/05/2020 1616

Prepped	Analyzed	Prep Batch	Analytical Batch	Method	Analyte	Result	Units	MRL	Dilution
		EPA 200.8 - ICPMS Metals							
06/10/20	06/15/20 18:08	1254202	1255354	(EPA 200.8)	Arsenic dissolved ICAP/MS	4.0	ug/L	1.0	1
		EPA 200 Prep - Metals digestion performed.							
	06/10/20 09:22		1254840	(EPA 200 Prep)	Metals digestion performed.	NO	Yes/No		1
		EPA 200.7 - ICP Metals							
06/10/20	06/13/20 12:52	1254202	1255060	(EPA 200.7)	Iron Dissolved ICAP	0.12	mg/L	0.020	1
06/10/20	06/13/20 12:52	1254202	1255060	(EPA 200.7)	Manganese Dissolved ICAP	0.39	mg/L	0.0020	1

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Laboratory QC Summary

Report: 874995
Project: WOODARD
Group: OMWD Desal Pilot Test

David C. McCollum Water Treatment Plant

Metals digestion performed.

Analytical Batch: 1253642 — **Analysis Date: 06/08/2020**

202006050429	RAW	Analyzed by: YP3Q
202006050430	F1	Analyzed by: YP3Q
202006050431	F2	Analyzed by: YP3Q
202006050432	F1	Analyzed by: YP3Q
202006050433	F2	Analyzed by: YP3Q
202006050434	F1	Analyzed by: YP3Q
202006050435	F2	Analyzed by: YP3Q
202006050436	RAW	Analyzed by: YP3Q
202006050437	F1	Analyzed by: YP3Q
202006050438	F2	Analyzed by: YP3Q
202006050439	F1	Analyzed by: YP3Q
202006050440	F2	Analyzed by: YP3Q
202006050441	F1	Analyzed by: YP3Q
202006050442	F2	Analyzed by: YP3Q

ICP Metals

Prep Batch: 1253632 Analytical Batch: 1253649 — **Analysis Date: 06/08/2020**

202006050432	F1	Analyzed by: NINA
202006050433	F2	Analyzed by: NINA
202006050437	F1	Analyzed by: NINA

ICP Metals

Prep Batch: 1253632 Analytical Batch: 1253707 — **Analysis Date: 06/08/2020**

202006050429	RAW	Analyzed by: NINA
202006050434	F1	Analyzed by: NINA
202006050435	F2	Analyzed by: NINA
202006050436	RAW	Analyzed by: NINA
202006050438	F2	Analyzed by: NINA
202006050439	F1	Analyzed by: NINA
202006050440	F2	Analyzed by: NINA

ICP Metals

Prep Batch: 1253632 Analytical Batch: 1253893 — **Analysis Date: 06/09/2020**

202006050430	F1	Analyzed by: NINA
202006050431	F2	Analyzed by: NINA
202006050441	F1	Analyzed by: NINA
202006050442	F2	Analyzed by: NINA

ICPMS Metals

Prep Batch: 1253632 Analytical Batch: 1254057 — **Analysis Date: 06/10/2020**

202006050432	F1	Analyzed by: AZS
202006050433	F2	Analyzed by: AZS
202006050434	F1	Analyzed by: AZS
202006050435	F2	Analyzed by: AZS
202006050436	RAW	Analyzed by: AZS
202006050437	F1	Analyzed by: AZS

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Laboratory QC Summary

Report: 874995
Project: WOODARD
Group: OMWD Desal Pilot Test

David C. McCollum Water Treatment Plant

ICPMS Metals

Prep Batch: 1253632 Analytical Batch: 1254476 — **Analysis Date: 06/11/2020**

202006050429	RAW	Analyzed by: AZS
202006050430	F1	Analyzed by: AZS
202006050431	F2	Analyzed by: AZS
202006050438	F2	Analyzed by: AZS
202006050439	F1	Analyzed by: AZS
202006050440	F2	Analyzed by: AZS
202006050441	F1	Analyzed by: AZS

ICPMS Metals

Prep Batch: 1253632 Analytical Batch: 1254477 — **Analysis Date: 06/11/2020**

202006050442	F2	Analyzed by: AZS

ICPMS Metals

Prep Batch: 1254360 Analytical Batch: 1254545 — **Analysis Date: 06/12/2020**

202006080150	F1 backwash - bucket (Total)	Analyzed by: DHX7
202006080152	F2 backwash - bucket (Total)	Analyzed by: DHX7

Metals digestion performed.

Analytical Batch: 1254548 — **Analysis Date: 06/11/2020**

202006080150	F1 backwash - bucket (Total)	Analyzed by: YP3Q
202006080152	F2 backwash - bucket (Total)	Analyzed by: YP3Q

Metals digestion performed.

Analytical Batch: 1254840 — **Analysis Date: 06/10/2020**

202006080151	F1 backwash - bucket (Dissolved)	Analyzed by: YP3Q
202006080153	F2 backwash - bucket (Dissolved)	Analyzed by: YP3Q

ICP Metals

Prep Batch: 1254202 Analytical Batch: 1255060 — **Analysis Date: 06/13/2020**

202006080151	F1 backwash - bucket (Dissolved)	Analyzed by: NINA
202006080153	F2 backwash - bucket (Dissolved)	Analyzed by: NINA

ICP Metals

Prep Batch: 1254360 Analytical Batch: 1255267 — **Analysis Date: 06/15/2020**

202006080150	F1 backwash - bucket (Total)	Analyzed by: NINA
202006080152	F2 backwash - bucket (Total)	Analyzed by: NINA

ICPMS Metals

Prep Batch: 1254202 Analytical Batch: 1255354 — **Analysis Date: 06/15/2020**

202006080151	F1 backwash - bucket (Dissolved)	Analyzed by: DHX7
202006080153	F2 backwash - bucket (Dissolved)	Analyzed by: DHX7

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Laboratory QC

Report: 874995
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David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield(%)	Limits (%)	RPD Limit(%)	RPD%
ICP Metals by EPA 200.7									
Analytical Batch: 1253649						**Analysis Date: 06/08/2020**			
LCS1	Iron Total ICAP		5	5.12	mg/L	102	(85-115)		
LCS2	Iron Total ICAP		5	5.06	mg/L	101	(85-115)	20	1.2
MBLK	Iron Total ICAP			<0.01	mg/L				
MRL_CHK	Iron Total ICAP		0.02	0.0199	mg/L	99	(50-150)		
MS_202006040244	Iron Total ICAP	0.026	5	4.96	mg/L	99	(70-130)		
MS2_202006040248	Iron Total ICAP	0.055	5	5.12	mg/L	101	(70-130)		
MSD_202006040244	Iron Total ICAP	0.026	5	5.01	mg/L	100	(70-130)	20	0.89
MSD2_202006040248	Iron Total ICAP	0.055	5	5.02	mg/L	99	(70-130)	20	1.9
LCS1	Manganese Total ICAP		2	2.03	mg/L	101	(85-115)		
LCS2	Manganese Total ICAP		2	2.01	mg/L	101	(85-115)	20	0.99
MBLK	Manganese Total ICAP			<0.001	mg/L				
MRL_CHK	Manganese Total ICAP		0.002	0.00146	mg/L	73	(50-150)		
MS_202006040244	Manganese Total ICAP	0.045	2	2.02	mg/L	99	(70-130)		
MS2_202006040248	Manganese Total ICAP	0.039	2	2.06	mg/L	101	(70-130)		
MSD_202006040244	Manganese Total ICAP	0.045	2	2.04	mg/L	100	(70-130)	20	0.75
MSD2_202006040248	Manganese Total ICAP	0.039	2	2.01	mg/L	98	(70-130)	20	2.4
ICP Metals by EPA 200.7									
Analytical Batch: 1253707						**Analysis Date: 06/08/2020**			
LCS1	Iron Dissolved ICAP		5	5.07	mg/L	101	(85-115)		
LCS2	Iron Dissolved ICAP		5	5.03	mg/L	101	(85-115)	20	0.79
MBLK	Iron Dissolved ICAP			<0.01	mg/L				
MRL_CHK	Iron Dissolved ICAP		0.02	0.0200	mg/L	100	(50-150)		
MS_202006050438	Iron Dissolved ICAP	ND	5	5.02	mg/L	100	(70-130)		
MS2_202006050436	Iron Dissolved ICAP	0.9	5	5.78	mg/L	98	(70-130)		
MSD_202006050438	Iron Dissolved ICAP	ND	5	4.87	mg/L	97	(70-130)	20	3.1
MSD2_202006050436	Iron Dissolved ICAP	0.9	5	5.74	mg/L	97	(70-130)	20	0.79
LCS1	Iron Total ICAP		5	5.07	mg/L	101	(85-115)		
LCS2	Iron Total ICAP		5	5.03	mg/L	101	(85-115)	20	0.79
MBLK	Iron Total ICAP			<0.01	mg/L				
MRL_CHK	Iron Total ICAP		0.02	0.0200	mg/L	100	(50-150)		
MS_202006050438	Iron Total ICAP	ND	5	5.02	mg/L	100	(70-130)		
MS2_202006050436	Iron Total ICAP	0.90	5	5.78	mg/L	98	(70-130)		
MSD_202006050438	Iron Total ICAP	ND	5	4.87	mg/L	97	(70-130)	20	3.1
MSD2_202006050436	Iron Total ICAP	0.90	5	5.74	mg/L	97	(70-130)	20	0.79

Spike recovery is already corrected for native results.
Spikes which exceed Limits and Method Blanks with positive results are highlighted by Underlining.
Criteria for MS and Dup are advisory only, batch control is based on LCS. Criteria for duplicates are advisory only, unless otherwise specified in the method.
RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
(S) - Indicates surrogate compound.
(I) - Indicates internal standard compound.

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Laboratory QC

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Report: 874995
Project: WOODARD
Group: OMWD Desal Pilot Test

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield(%)	Limits (%)	RPD Limit(%)	RPD%
LCS1	Manganese Dissolved ICAP		2	2.02	mg/L	101	(85-115)		
LCS2	Manganese Dissolved ICAP		2	2.00	mg/L	100	(85-115)	20	1
MBLK	Manganese Dissolved ICAP			<0.001	mg/L				
MRL_CHK	Manganese Dissolved ICAP		0.002	0.00200	mg/L	100	(50-150)		
MS_202006050438	Manganese Dissolved ICAP	0.0089	2	1.98	mg/L	99	(70-130)		
MS2_202006050436	Manganese Dissolved ICAP	0.95	2	2.86	mg/L	96	(70-130)		
MSD_202006050438	Manganese Dissolved ICAP	0.0089	2	1.94	mg/L	96	(70-130)	20	2.3
MSD2_202006050436	Manganese Dissolved ICAP	0.95	2	2.86	mg/L	95	(70-130)	20	0.032
LCS1	Manganese Total ICAP		2	2.02	mg/L	101	(85-115)		
LCS2	Manganese Total ICAP		2	2.00	mg/L	100	(85-115)	20	1
MBLK	Manganese Total ICAP			<0.001	mg/L				
MRL_CHK	Manganese Total ICAP		0.002	0.00200	mg/L	100	(50-150)		
MS_202006050438	Manganese Total ICAP	0.0089	2	1.98	mg/L	99	(70-130)		
MS2_202006050436	Manganese Total ICAP	0.95	2	2.86	mg/L	96	(70-130)		
MSD_202006050438	Manganese Total ICAP	0.0089	2	1.94	mg/L	96	(70-130)	20	2.3
MSD2_202006050436	Manganese Total ICAP	0.95	2	2.86	mg/L	95	(70-130)	20	0.032

ICP Metals by EPA 200.7

Analytical Batch: 1253893 **Analysis Date: 06/09/2020**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield(%)	Limits (%)	RPD Limit(%)	RPD%
LCS1	Iron Total ICAP		5	5.15	mg/L	103	(85-115)		
LCS2	Iron Total ICAP		5	5.09	mg/L	102	(85-115)	20	1.2
MBLK	Iron Total ICAP			<0.01	mg/L				
MRL_CHK	Iron Total ICAP		0.02	0.0207	mg/L	104	(50-150)		
MS_202006010625	Iron Total ICAP	ND	5	5.18	mg/L	103	(70-130)		
MS2_202006050116	Iron Total ICAP	1.1	5	6.34	mg/L	104	(70-130)		
MSD_202006010625	Iron Total ICAP	ND	5	5.20	mg/L	104	(70-130)	20	0.47
MSD2_202006050116	Iron Total ICAP	1.1	5	6.25	mg/L	103	(70-130)	20	1.4
LCS1	Manganese Total ICAP		2	2.04	mg/L	102	(85-115)		
LCS2	Manganese Total ICAP		2	2.02	mg/L	101	(85-115)	20	0.99
MBLK	Manganese Total ICAP			<0.001	mg/L				
MRL_CHK	Manganese Total ICAP		0.002	0.00143	mg/L	72	(50-150)		
MS_202006010625	Manganese Total ICAP	0.0026	2	2.02	mg/L	101	(70-130)		
MS2_202006050116	Manganese Total ICAP	0.12	2	2.19	mg/L	104	(70-130)		
MSD_202006010625	Manganese Total ICAP	0.0026	2	2.04	mg/L	102	(70-130)	20	0.74
MSD2_202006050116	Manganese Total ICAP	0.12	2	2.13	mg/L	100	(70-130)	20	3.0

ICPMS Metals by EPA 200.8

Analytical Batch: 1254057 **Analysis Date: 06/10/2020**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield(%)	Limits (%)	RPD Limit(%)	RPD%
LCS1	Arsenic Total ICAP/MS		50	46.9	ug/L	94	(85-115)		

Spike recovery is already corrected for native results.
Spikes which exceed Limits and Method Blanks with positive results are highlighted by Underlining.
Criteria for MS and Dup are advisory only, batch control is based on LCS. Criteria for duplicates are advisory only, unless otherwise specified in the method.
RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
(S) - Indicates surrogate compound.
(I) - Indicates internal standard compound.

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Laboratory QC

Report: 874995
Project: WOODARD
Group: OMWD Desal Pilot Test

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield(%)	Limits (%)	RPD Limit(%)	RPD%
LCS2	Arsenic Total ICAP/MS		50	47.9	ug/L	96	(85-115)	20	2.1
MBLK	Arsenic Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Arsenic Total ICAP/MS		1	0.806	ug/L	81	(50-150)		
MS_202006050167	Arsenic Total ICAP/MS	ND	50	50.8	ug/L	101	(70-130)		
MS2_202006050437	Arsenic Total ICAP/MS	3.0	50	46.7	ug/L	87	(70-130)		
MSD_202006050167	Arsenic Total ICAP/MS	ND	50	49.2	ug/L	98	(70-130)	20	3.2
MSD2_202006050437	Arsenic Total ICAP/MS	3.0	50	48.5	ug/L	91	(70-130)	20	3.9

ICPMS Metals by EPA 200.8

Analytical Batch: 1254476 **Analysis Date: 06/11/2020**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield(%)	Limits (%)	RPD Limit(%)	RPD%
LCS1	Arsenic Total ICAP/MS		50	49.0	ug/L	98	(85-115)		
LCS2	Arsenic Total ICAP/MS		50	49.5	ug/L	99	(85-115)	20	1.0
MBLK	Arsenic Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Arsenic Total ICAP/MS		1	1.00	ug/L	100	(50-150)		
MS_202006090433	Arsenic Total ICAP/MS	2.1	50	55.0	ug/L	106	(70-130)		
MS2_202006050170	Arsenic Total ICAP/MS	ND	50	53.2	ug/L	105	(70-130)		
MSD_202006090433	Arsenic Total ICAP/MS	2.1	50	54.6	ug/L	105	(70-130)	20	0.54
MSD2_202006050170	Arsenic Total ICAP/MS	ND	50	54.3	ug/L	108	(70-130)	20	2.0

ICPMS Metals by EPA 200.8

Analytical Batch: 1254477 **Analysis Date: 06/11/2020**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield(%)	Limits (%)	RPD Limit(%)	RPD%
LCS1	Arsenic Total ICAP/MS		50	49.4	ug/L	99	(85-115)		
LCS2	Arsenic Total ICAP/MS		50	50.3	ug/L	101	(85-115)	20	1.8
MBLK	Arsenic Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Arsenic Total ICAP/MS		1	0.990	ug/L	99	(50-150)		
MS_202006050442	Arsenic Total ICAP/MS	3.5	50	52.2	ug/L	97	(70-130)		
MS2_202006080658	Arsenic Total ICAP/MS	1.3	50	50.9	ug/L	99	(70-130)		
MSD_202006050442	Arsenic Total ICAP/MS	3.5	50	56.6	ug/L	106	(70-130)	20	8.2
MSD2_202006080658	Arsenic Total ICAP/MS	1.3	50	54.0	ug/L	105	(70-130)	20	6.0

ICPMS Metals by EPA 200.8

Analytical Batch: 1254545 **Analysis Date: 06/12/2020**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield(%)	Limits (%)	RPD Limit(%)	RPD%
LCS1	Arsenic Total ICAP/MS		50	54.0	ug/L	108	(85-115)		
LCS2	Arsenic Total ICAP/MS		50	52.5	ug/L	105	(85-115)	20	2.8
MBLK	Arsenic Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Arsenic Total ICAP/MS		1	1.09	ug/L	109	(50-150)		
MS_202006090439	Arsenic Total ICAP/MS	ND	50	55.0	ug/L	110	(70-130)		
MS2_202006100400	Arsenic Total ICAP/MS	ND	50	55.0	ug/L	110	(70-130)		
MSD_202006090439	Arsenic Total ICAP/MS	ND	50	54.3	ug/L	109	(70-130)	20	1.2

Spike recovery is already corrected for native results.
Spikes which exceed Limits and Method Blanks with positive results are highlighted by Underlining.
Criteria for MS and Dup are advisory only, batch control is based on LCS. Criteria for duplicates are advisory only, unless otherwise specified in the method.
RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
(S) - Indicates surrogate compound.
(I) - Indicates internal standard compound.

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Laboratory QC

Report: 874995
Project: WOODARD
Group: OMWD Desal Pilot Test

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield(%)	Limits (%)	RPD Limit(%)	RPD%
MSD2_202006100400	Arsenic Total ICAP/MS	ND	50	54.2	ug/L	108	(70-130)	20	1.6

ICP Metals by EPA 200.7

Analytical Batch: 1255060 **Analysis Date: 06/13/2020**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield(%)	Limits (%)	RPD Limit(%)	RPD%
LCS1	Iron Dissolved ICAP		5	5.05	mg/L	101	(85-115)		
LCS2	Iron Dissolved ICAP		5	5.06	mg/L	101	(85-115)	20	0.20
MBLK	Iron Dissolved ICAP			<0.01	mg/L				
MRL_CHK	Iron Dissolved ICAP		0.02	0.0210	mg/L	105	(50-150)		
MS_202006080151	Iron Dissolved ICAP	0.11	5	5.15	mg/L	101	(70-130)		
MSD_202006080151	Iron Dissolved ICAP	0.11	5	5.16	mg/L	101	(70-130)	20	0.27
LCS1	Manganese Dissolved ICAP		2	2.01	mg/L	100	(85-115)		
LCS2	Manganese Dissolved ICAP		2	2.01	mg/L	100	(85-115)	20	0.0
MBLK	Manganese Dissolved ICAP			<0.001	mg/L				
MRL_CHK	Manganese Dissolved ICAP		0.002	0.00200	mg/L	100	(50-150)		
MS_202006080151	Manganese Dissolved ICAP	0.83	2	2.82	mg/L	100	(70-130)		
MSD_202006080151	Manganese Dissolved ICAP	0.83	2	2.82	mg/L	99	(70-130)	20	0.11

ICP Metals by EPA 200.7

Analytical Batch: 1255267 **Analysis Date: 06/15/2020**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield(%)	Limits (%)	RPD Limit(%)	RPD%
LCS1	Iron Total ICAP		5	5.07	mg/L	101	(85-115)		
LCS2	Iron Total ICAP		5	5.13	mg/L	103	(85-115)	20	1.2
MBLK	Iron Total ICAP			<0.01	mg/L				
MRL_CHK	Iron Total ICAP		0.02	0.0211	mg/L	106	(50-150)		
MS_202006080247	Iron Total ICAP	0.10	5	5.14	mg/L	101	(70-130)		
MS2_202006090134	Iron Total ICAP	0.20	5	5.20	mg/L	100	(70-130)		
MSD_202006080247	Iron Total ICAP	0.10	5	5.33	mg/L	105	(70-130)	20	3.6
MSD2_202006090134	Iron Total ICAP	0.20	5	5.37	mg/L	103	(70-130)	20	3.1
LCS1	Manganese Total ICAP		2	2.02	mg/L	101	(85-115)		
LCS2	Manganese Total ICAP		2	2.05	mg/L	102	(85-115)	20	0.98
MBLK	Manganese Total ICAP			<0.001	mg/L				
MRL_CHK	Manganese Total ICAP		0.002	0.00117	mg/L	59	(50-150)		
MS_202006080247	Manganese Total ICAP	0.051	2	2.06	mg/L	100	(70-130)		
MS2_202006090134	Manganese Total ICAP	0.0084	2	2.00	mg/L	100	(70-130)		
MSD_202006080247	Manganese Total ICAP	0.051	2	2.14	mg/L	104	(70-130)	20	4.0
MSD2_202006090134	Manganese Total ICAP	0.0084	2	2.08	mg/L	103	(70-130)	20	3.9

ICPMS Metals by EPA 200.8

Analytical Batch: 1255354 **Analysis Date: 06/15/2020**

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield(%)	Limits (%)	RPD Limit(%)	RPD%
LCS1	Arsenic dissolved ICAP/MS		50	51.2	ug/L	102	(85-115)		

Spike recovery is already corrected for native results.
Spikes which exceed Limits and Method Blanks with positive results are highlighted by Underlining.
Criteria for MS and Dup are advisory only, batch control is based on LCS. Criteria for duplicates are advisory only, unless otherwise specified in the method.
RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
(S) - Indicates surrogate compound.
(I) - Indicates internal standard compound.

Laboratory QC

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Report: 874995
Project: WOODARD
Group: OMWD Desal Pilot Test

David C. McCollum Water Treatment Plant

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield(%)	Limits (%)	RPD Limit(%)	RPD%
LCS2	Arsenic dissolved ICAP/MS		50	51.0	ug/L	102	(85-115)	20	0.39
MBLK	Arsenic dissolved ICAP/MS			<0.5	ug/L				
MBLK	Arsenic dissolved ICAP/MS			<0.5	ug/L				
MRL_CHK	Arsenic dissolved ICAP/MS		1	1.04	ug/L	103	(50-150)		
MS_202004300036	Arsenic dissolved ICAP/MS	1.7	50	53.6	ug/L	104	(70-130)		
MS2_202006120099	Arsenic dissolved ICAP/MS	ND	50	53.6	ug/L	107	(70-130)		
MSD_202004300036	Arsenic dissolved ICAP/MS	1.7	50	55.3	ug/L	107	(70-130)	20	3.1
MSD2_202006120099	Arsenic dissolved ICAP/MS	ND	50	52.0	ug/L	104	(70-130)	20	3.1
LCS1	Arsenic Total ICAP/MS		50	51.2	ug/L	102	(85-115)		
LCS2	Arsenic Total ICAP/MS		50	51.0	ug/L	102	(85-115)	20	0.39
MBLK	Arsenic Total ICAP/MS			<0.5	ug/L				
MRL_CHK	Arsenic Total ICAP/MS		1	1.04	ug/L	103	(50-150)		
MS_202004300036	Arsenic Total ICAP/MS	1.7	50	53.6	ug/L	104	(70-130)		
MS2_202006120099	Arsenic Total ICAP/MS	ND	50	53.6	ug/L	107	(70-130)		
MSD_202004300036	Arsenic Total ICAP/MS	1.7	50	55.3	ug/L	107	(70-130)	20	3.1
MSD2_202006120099	Arsenic Total ICAP/MS	ND	50	52.0	ug/L	104	(70-130)	20	3.1

Spike recovery is already corrected for native results.
Spikes which exceed Limits and Method Blanks with positive results are highlighted by Underlining.
Criteria for MS and Dup are advisory only, batch control is based on LCS. Criteria for duplicates are advisory only, unless otherwise specified in the method.
RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
(S) - Indicates surrogate compound.
(I) - Indicates internal standard compound.

APPENDIX B

Pilot Test Daily Operations Log
Page 43 - 45

#1 4min 2.4 + 0.39 = 2.8
4min 2.4

#2 4min 3.9 + 0.39 = 4.3
4min 3.9

Loprest Pilot
Loprest Trailer
Pilot Test Data Log

Job Name: Olivenhain CA
Job Number: 33653
Well # Run #1
Sheet # 1

Media Type F1: Green / Anthracite
Media Type F2: Mang - OX
Media Type F3:

Hydraulic Loading Rate: 8 gpm/sf (1.5 gpm per filter)
Backwash Rate: 12 gpm/sf (2.4 gpm)
Backwash Rate: 20 gpm/sf (3.9 gpm)

Line #	Date (2020)	Time 24:00	Initials	Flow Rate digital gpm	Flow Filter 1 rota gpm	Flow Filter 2 rota gpm	Flow Filter 3 rota gpm	Cl Rate cal colm mL/min	Cl Free In mg/l	Cl Free Out Filter 1 mg/l	Cl Free Out Filter 2 mg/l	Cl Free Out Filter 3 mg/l	Fe Rate cal colm mL/min	Fe (total) In mg/l	Fe (total) Out Filter 1 mg/l	Fe (total) Out Filter 2 mg/l	Fe (total) Out Filter 3 mg/l	Mn (total) In mg/l	Mn (total) Out Filter 1 mg/l	Mn (total) Out Filter 2 mg/l	Mn (total) Out Filter 3 mg/l	Pressure In Flt 1 gauge psi	Pressure Out Flt 1 gauge psi	Dif Pres DP 1 psid	Pressure In Flt 2 gauge psi	Pressure Out Flt 2 gauge psi	Dif Pres DP 2 psid	Pressure In Flt 3 gauge psi	Pressure Out Flt 3 gauge psi	Dif Pres DP 3 psid	pH In/Out	Turbidity In/Out NTU	Current RunTime hours	Total Treated Gallons gal	Pull Lab Samples? (1/day) yes/no	Notes
	6/2/20	0715	DF	3.1	1.5	1.5	–	9.5														24	22	2	24.3	22.6	1.7						0	0		START
		0800 0830		3.1	1.5	1.5		 10.0	1.09 1.13	0.97 1.00	0.70 0.82			0.96	0.03	0.00		0.313	0.04	0.02		24.6	22.4	2.2	24.8	23.0	1.8							146		NH_3-N R F1 F2 0.63 0.42 0.35
		0930		3.1	1.5	1.5		10.0	1.55	1.12	0.87			0.96	0.01	0.05		0.295	0.040	0.024		24.9	22.0	2.9	25.0	22.1	2.7							496	Y	Sample
		1130		3.1	1.5	1.5		9.5	1.35	1.10	0.87			0.97	0.08	0.02		0.327	0.074	0.053		25.2	21.9	3.2	25.1	21.8	3.3				7.17/7.21	1.87/0.16		772		
		1330		3.0	1.5	1.5		10.0	1.37	1.08	0.89			0.97	0.17	0.09		0.309	0.082	0.046		25.3	21.7	3.5	25.3	21.5	3.8					1.81/0.50		1147		
		1530		3.1	1.5	1.5		10.0	1.30	1.13	0.96			0.96	0.29	0.15		0.320	0.102	0.062		25.4	21.6	3.9	25.5	21.2	4.2					1.83/0.74		1442	Y	Sample
		1730		3.0	1.5	1.5		10.0	1.41	1.07	0.93			0.93	0.45	0.18		0.291	0.134	0.041		25.6	21.4	4.3	25.7	21.0	4.7							1810	Y	Sample Stop Run #1
																																				Backwash

Notes:

- Record action taken during pilot in Notes or in space below
- Send picture of Log Sheets at end of every day
- Calibration Column Level is "upside down". 200 mL is empty. 0 mL is near full

<u>Lopress Pilot</u>
Lopress Trailer
Pilot Test Data Log

Job Name: Olivenhain CA
Job Number: 33653
Well # Run #2
Sheet # 1

Media Type F1: Green/Anthracite
Media Type F2: WAN 81 - OX
Media Type F3:

6 gpm/ft²

Hydraulic Loading Rate: 8 gpm/sf (1.5 gpm per filter)
Backwash Rate: 12 gpm/sf (2.4 gpm)
Backwash Rate: 20 gpm/sf (3.9 gpm)

Line #	Date (2020)	Time 24:00	Initials	Flow Rate digital gpm	Flow Filter 1 rota gpm	Flow Filter 2 rota gpm	Flow Filter 3 rota gpm	Cl Rate cal colm mL/min	Cl Free In mg/l	Cl Free Out Filter 1 mg/l	Cl Free Out Filter 2 mg/l	Cl Free Out Filter 3 mg/l	Fe Rate cal colm mL/min	Fe (total) In mg/l	Fe (total) Out Filter 1 mg/l	Fe (total) Out Filter 2 mg/l	Fe (total) Out Filter 3 mg/l	Mn (total) In mg/l	Mn (total) Out Filter 1 mg/l	Mn (total) Out Filter 2 mg/l	Mn (total) Out Filter 3 mg/l	Pressure In Flt 1 gauge psi	Pressure Out Flt 1 gauge psi	Dif Pres DP 1 psid	Pressure In Flt 2 gauge psi	Pressure Out Flt 2 gauge psi	Dif Pres DP 2 psid	Pressure In Flt 3 gauge psi	Pressure Out Flt 3 gauge psi	Dif Pres DP 3 psid	pH In/Out	Turbidity In/Out NTU	Current RunTime hours	Total Treated Gallons gal	Pull Lab Samples? (1/day) yes/no	Notes
	6/3/20	0605	DS	2.3	1.2	1.2		7.0														28.8	27.1	1.6	28.7	27.4	1.3							⊖		START
		0645		2.2	1.1	1.1		7.5	1.12	0.87	0.73			0.98	0.03	0.03		0.321	0.077	0.032		29.2	27.5	1.6	29.2	27.7	1.5							83	Y	Sample
		0815		2.1	1.1	1.1		7.5	1.27	0.99	0.96			1.04	0.00	0.00		0.308	0.049	0.013		29.2	27.5	1.8	29.3	27.5	1.7					1.71/1.19		289		
		1000		2.2	1.1	1.1		7.0	1.25	1.09	0.97			1.03	0.02	0.09		0.285	0.042	0.025		29.3	27.4	1.9	29.4	27.3	2.1					0.90/0.35		502		
		1200		2.2	1.1	1.1		7.5	1.37	1.06	0.91			0.99	0.00	0.02		0.316	0.035	0.027		29.4	27.4	2.0	29.5	27.2	2.3					1.32/0.64		753		
		1400		2.2	1.1	1.1		7.0	1.43	1.03	0.92			0.94	0.02	0.00		0.309	0.027	0.047		29.5	27.2	2.3	29.6	26.8	2.8					0.65/0.04		1010	Y	Sample
		1600		2.2	1.1	1.1		7.0	1.14	1.08	0.94			1.00	0.12	0.07		0.306	0.069	0.047		29.6	27.0	2.6	29.6	26.5	3.1					1.64/0.32		1264		
		1800		2.2	1.1	1.1		7.5	1.40	1.15	0.92			0.94	0.19	0.06		0.309	0.036	0.062		29.6	26.9	2.7	29.7	26.3	3.4				7.22/7.24	1.42/.41		1502	Y	Sample

Notes:

- Record action taken during pilot in Notes or in space below
- Send picture of Log Sheets at end of every day
- Calibration Column Level is "upside down". 200 mL is empty. 0 mL is near full

APPENDIX C – REVERSE OSMOSIS MODEL RESULTS

Permeate Blending

Project name	OMWD_Pilot Results		Page : 1/7
Calculated by	Martha	Permeate flow/train	0.810 mgd
HP Pump flow	694.44 gpm	Raw water flow/train	1.190 mgd
Feed pressure	186.4 psi	Permeate recovery	81.00 %
Feed temperature	20.0 °C(68.0°F)	Blended flow	1.000 mgd
Feed water pH	7.40	Element age	0.0 years
Chem dose, mg/l, 100 %	17.2 H2SO4	Flux decline %, per year	5.0
Specific energy	2.46 kwh/kgal	Fouling factor	1.00
Pass NDP	115.5 psi	SP increase, per year	7.0 %
Average flux rate	13.7 gfd	Inter-stage pipe loss	0.000 psi
		Feed type	Brackish Well Non-Fouling

Pass - Stage	Perm. Flow gpm	Flow / Vessel Feed gpm	Flow / Vessel Conc gpm	Flux gfd	DP psi	Flux Max gfd	Beta	Stagewise Pressure Perm. psi	Stagewise Pressure Boost psi	Stagewise Pressure Conc psi	Perm. TDS mg/l	Element Type	Element Quantity	PV# x Elem #
1-1	499.1	49.6	14	18.3	12.8	24	1.2	0	0	173.6	49.5	ESPA2-LD	98	14 x 7M
1-2	63	27.9	18.9	4.6	7.4	8.7	1.09	0	0	166.2	580	ESPA2-LD	49	7 x 7M

Ion (mg/l)	Raw Water	Feed Water	Permeate Water	Concentrate 1	Concentrate 2	Blended Product
Hardness, as CaCO3	1409.84	1409.84	1.559	5009.0	7388.8	269.13
Ca	400.00	400.00	0.442	1421.2	2096.4	76.36
Mg	100.00	100.00	0.111	355.3	524.1	19.09
Na	620.00	620.00	35.330	2162.5	3102.1	146.42
K	39.00	39.00	2.516	135.7	193.9	9.45
NH4	0.00	0.00	0.000	0.0	0.0	0.00
Ba	0.130	0.130	0.001	0.5	0.7	0.03
Sr	0.000	0.000	0.000	0.0	0.0	0.00
H	0.00	0.00	0.001	0.0	0.0	0.00
CO3	3.06	1.17	0.002	20.1	45.6	0.58
HCO3	463.60	445.64	24.065	1547.2	2198.7	108.11
SO4	730.00	746.82	5.719	2647.7	3893.2	143.33
Cl	1300.00	1300.00	39.420	4574.8	6651.8	278.93
F	0.27	0.27	0.016	0.9	1.3	0.06
NO3	1.48	1.48	0.309	4.9	6.5	0.53
PO4	0.10	0.10	0.001	0.4	0.5	0.02
OH	0.01	0.00	0.000	0.0	0.0	0.00
SiO2	31.00	31.00	0.951	109.1	158.6	6.66
B	0.00	0.00	0.000	0.0	0.0	0.00
CO2	10.14	24.48	24.48	24.48	24.48	21.76
NH3	0.00	0.00	0.00	0.00	0.00	0.00
TDS	**3688.64**	**3685.61**	**108.88**	**12980.12**	**18873.29**	**789.57**
pH	**7.80**	**7.40**	**6.21**	**7.89**	**8.03**	**6.88**

Saturations	**Raw Water**	**Feed Water**	**Concentrate**	**Limits**
CaSO4 / ksp * 100, %	29	30	237	400
SrSO4 / ksp * 100, %	0	0	0	1200
BaSO4 / ksp * 100, %	906	925	6106	10000
SiO2 saturation, %	25	27	121	140
CaF2 / ksp * 100, %	2	2	159	50000
Ca3(PO4)2 saturation index	0.3	-0.2	1.4	2.4
CCPP, mg/l	169.45	148.42	1448.01	850
Langelier saturation index	1.24	0.82	2.79	2.8
Ionic strength	0.08	0.08	0.41	
Osmotic pressure, psi	31.0	30.9	157.4	

Permeate Blending

Project name	OMWD_Pilot Results			Page : 2/7
Calculated by	Martha		Permeate flow/train	0.810 mgd
HP Pump flow		694.44 gpm	Raw water flow/train	1.190 mgd
Feed pressure		186.4 psi	Permeate recovery	81.00 %
Feed temperature		20.0 °C(68.0°F)	Blended flow	1.000 mgd
Feed water pH		7.40	Element age	0.0 years
Chem dose, mg/l, 100 %		17.2 H_2SO_4	Flux decline %, per year	5.0
Specific energy		2.46 kwh/kgal	Fouling factor	1.00
Pass NDP		115.5 psi	SP increase, per year	7.0 %
Average flux rate		13.7 gfd	Inter-stage pipe loss	0.000 psi
			Feed type	Brackish Well Non-Fouling

Pass - Stage	Perm. Flow gpm	Flow / Vessel Feed gpm	Flow / Vessel Conc gpm	Flux gfd	DP psi	Flux Max gfd	Beta	Stagewise Pressure Perm. psi	Stagewise Pressure Boost psi	Stagewise Pressure Conc psi	Perm. TDS mg/l	Element Type	Element Quantity	PV# x Elem #
1-1	499.1	49.6	14	18.3	12.8	24	1.2	0	0	173.6	49.5	ESPA2-LD	98	14 x 7M
1-2	63	27.9	18.9	4.6	7.4	8.7	1.09	0	0	166.2	580	ESPA2-LD	49	7 x 7M

Pass - Stage	Element no.	Feed Pressure psi	Pressure Drop psi	Conc Osmo. psi	NDP psi	Permeate Water Flow gpm	Permeate Water Flux gfd	Beta	Permeate (Stagewise cumulative) TDS	Ca	Mg	Na	Cl
1-1	1	186.4	3.36	35.7	152.9	6.7	24	1.13	16.3	0.065	0.016	5.304	5.857
1-1	2	183	2.72	41.7	143.2	6.2	22.4	1.15	19.1	0.076	0.019	6.225	6.878
1-1	3	180.3	2.16	49.4	134	5.8	20.8	1.16	22.8	0.091	0.023	7.425	8.208
1-1	4	178.1	1.68	59.5	123.3	5.3	19	1.18	27.2	0.109	0.027	8.876	9.819
1-1	5	176.5	1.27	72.5	110.3	4.7	16.8	1.19	32.7	0.131	0.033	10.658	11.801
1-1	6	175.2	0.93	89.1	94.4	3.9	14.2	1.2	39.9	0.16	0.04	12.985	14.391
1-1	7	174.3	0.67	108.6	75.5	3.1	11.2	1.2	49.5	0.199	0.05	16.108	17.873
1-2	1	173.6	1.44	118.6	60	2.4	8.7	1.09	236.9	0.96	0.24	76.918	85.701
1-2	2	172.2	1.25	128.1	48.9	1.9	7	1.08	277.5	1.126	0.281	90.082	100.438
1-2	3	170.9	1.11	136.6	38.8	1.5	5.5	1.07	325	1.32	0.33	105.451	117.663
1-2	4	169.8	1	143.9	29.9	1.2	4.2	1.05	379.4	1.543	0.386	123.04	137.405
1-2	5	168.8	0.92	149.7	22.5	0.9	3.1	1.04	440.3	1.793	0.448	142.751	159.562
1-2	6	167.9	0.86	154.2	16.5	0.6	2.3	1.03	507.4	2.07	0.517	164.43	183.972
1-2	7	167	0.82	157.4	11.9	0.5	1.6	1.02	580	2.37	0.592	187.841	210.38

Permeate Blending

Project name	OMWD_Pilot Results			Page : 3/7	
Calculated by	Martha		Permeate flow/train	0.810	mgd
HP Pump flow	694.44	gpm	Raw water flow/train	1.190	mgd
Feed pressure	186.4	psi	Permeate recovery	81.00	%
Feed temperature	20.0	°C(68.0°F)	Blended flow	1.000	mgd
Feed water pH	7.40		Element age	0.0	years
Chem dose, mg/l, 100 %	17.2	H2SO4	Flux decline %, per year	5.0	
Specific energy	2.46	kwh/kgal	Fouling factor	1.00	
Pass NDP	115.5	psi	SP increase, per year	7.0	%
Average flux rate	13.7	gfd	Inter-stage pipe loss	0.000	psi
			Feed type	Brackish Well Non-Fouling	

THE FOLLOWING PARAMETERS EXCEED RECOMMENDED DESIGN LIMITS

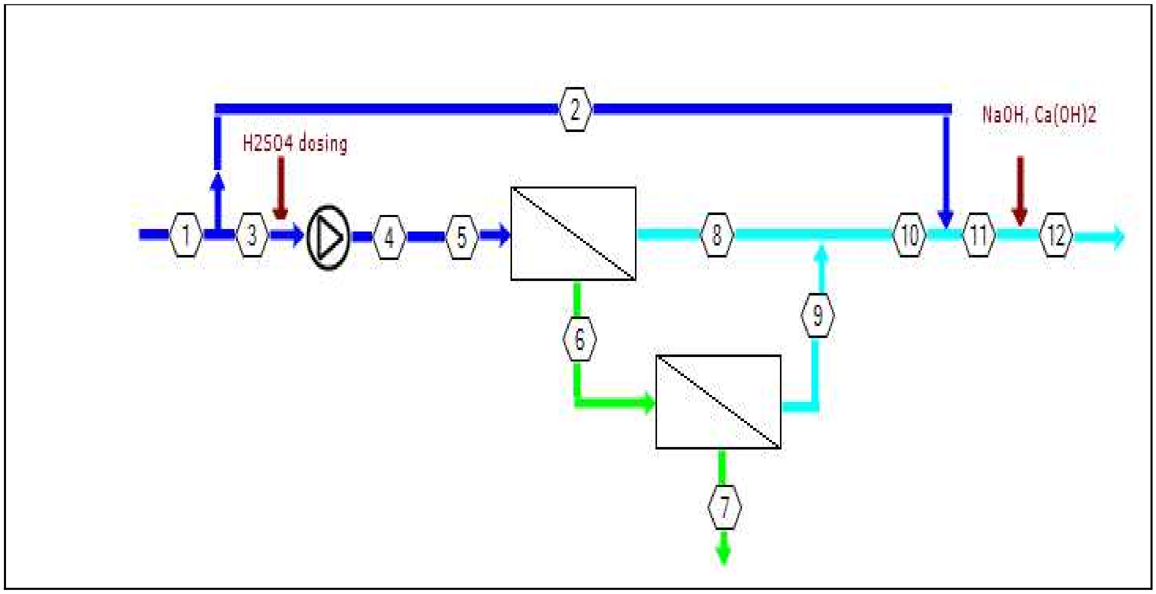
Concentrate CCPP (1448.0) is higher than limit (850).

The above saturations limits only apply when using effective scale inhibitor or dispersant. Without scale inhibitor or dispersant, the saturation and precipitation limit of the contaminant should not exceed its solubility in solution.

Permeate Blending

Project name OMWD_Pilot Results

Temperature : 68.0 °F Element age, P1 : 0.0 years



Stream No.	Flow (gpm)	Pressure (psi)	TDS (mg/l)	pH	Econd (µs/cm)
1	826	0	3689	7.80	6197
2	132	0	3689	7.80	6197
3	694	0	3689	7.80	6197
4	694	186	3686	7.40	6205
5	694	186	3686	7.40	6205
6	195	174	12980	7.89	19813
7	132	166	18873	8.03	28157
8	499	0	49.5	5.88	89.5
9	63.0	0	580	6.92	1096
10	563	0	109	6.21	196
11	694	0	790	6.88	1554
12	694	0	837	9.49	1649

Permeate Blending

Project name OMWD_Pilot Results

Calculated by	Martha		Permeate flow/train	0.810 mgd
HP Pump flow		694.44 gpm	Raw water flow/train	1.190 mgd
Feed pressure		186.4 psi	Permeate recovery	81.00 %
Feed temperature		20.0 °C(68.0°F)	Blended flow	1.000 mgd
Feed water pH		7.40	Element age	0.0 years
Chem dose, mg/l, 100 %		17.2 H2SO4	Flux decline %, per year	5.0
Specific energy		2.46 kwh/kgal	Fouling factor	1.00
Pass NDP		115.5 psi	SP increase, per year	7.0 %
Average flux rate		13.7 gfd	Inter-stage pipe loss	0.000 psi
			Feed type	Brackish Well Non-Fouling

Pass - Stage	Perm. Flow gpm	Flow / Vessel Feed gpm	Flow / Vessel Conc gpm	Flux gfd	DP psi	Flux Max gfd	Beta	Stagewise Pressure Perm. psi	Stagewise Pressure Boost psi	Stagewise Pressure Conc psi	Perm. TDS mg/l	Element Type	Element Quantity	PV# x Elem #
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1-2	63	27.9	18.9	4.6	7.4	8.7	1.09	0	0	166.2	580	ESPA2-LD	49	7 x 7M

CALCULATION OF POWER REQUIREMENT

	Pass 1	Total system power
Pump/Boost pressure, psi	186.4	
Product flow, mgd	0.8	0.9999999
Pump flow, mgd	1.0	
Pump efficiency, %	75.0	
Motor efficiency, %	93.0	
VFD efficiency, %	97.0	
Pumping power, BHP	111.4	
Pumping power, kw	83.1	83.1
Pumping energy, kwh/kgal		2.46

Permeate Blending

Project name OMWD_Pilot Results

Calculated by	Martha	Permeate flow/train	0.810 mgd
HP Pump flow	694.44 gpm	Raw water flow/train	1.190 mgd
Feed pressure	186.4 psi	Permeate recovery	81.00 %
Feed temperature	20.0 °C(68.0°F)	Blended flow	1.000 mgd
Feed water pH	7.40	Element age	0.0 years
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1-2	63	27.9	18.9	4.6	7.4	8.7	1.09	0	0	166.2	580	ESPA2-LD	49	7 x 7M

CALCULATION OF INVESTMENT AND WATER COST

Plant capacity as permeate	0.810 mgd
Specific investment	3,493,550.00 USD/mgd
Investment	2,829,775.00 USD
Plant life	15.0 years
Membrane life	5.0 years
Interest rate	4.5 %
Membrane cost	500.00 USD/element
Plant factor	90.0 %
Number of elements	147.0
Power cost	0.200 USD/kwhr
Inhibitor cost	2.20
Power consumption	2.46 kwhr/kgal
Inhibitor dosing	3.0 mg/l
Maintenance(as % of investment)	3.0 %
Acid cost	1.50
Acid dosing	17.17 mg/l

CALCULATION RESULTS

Capital cost	0.66 USD/kgal
Power cost	0.49 USD/kgal
Chemicals cost	0.15 USD/kgal
Membrane replacement costs	0.06 USD/kgal
Maintenance	0.32 USD/kgal
Total water cost	1.68 USD/kgal

Permeate Blending

Project name OMWD_Pilot Results

Calculated by	Martha	Permeate flow/train	0.810 mgd
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Average flux rate	13.7 gfd	Inter-stage pipe loss	0.000 psi
		Feed type	Brackish Well Non-Fouling

Pass - Stage	Perm. Flow	Flow / Vessel Feed	Conc	Flux	DP	Flux Max	Beta	Stagewise Pressure Perm.	Boost	Conc	Perm. TDS	Element Type	Element Quantity	PV# x Elem #
1-1	499.1	49.6	14	18.3	12.8	24	1.2	0	0	173.6	49.5	ESPA2-LD	98	14 x 7M
1-2	63	27.9	18.9	4.6	7.4	8.7	1.09	0	0	166.2	580	ESPA2-LD	49	7 x 7M

***********CALCULATION OF CHEMICAL COST***********

	Solution Conc., %	Specific Gravity	Solution Cost, USD/l	Dose, 100% basis	Consumption, kg/h
SMBS	**10.0**	**1.10**	**0**	**0**	**0**
Anti scalant	**40.0**	**1.00**	**0**	**0**	**0**
NaOCl	**10.0**	**1.30**	**0**	**0**	**0**
H2SO4 - Pass 1	**100**	**1.08**	**0**	**17.2**	**2.71**

***********SUMMARY FOR CHEMICAL COST***********

	Pass 1 Permeate	Total Product
USD/m3	**0.00**	**0.00**
USD/kgal	**0.00**	**0.00**
USD/mega litres	**0.00**	**0.00**
USD/mega usgal	**0.00**	**0.00**
USD/mega m3	**0.00**	**0.00**
USD/Acre.ft	**0.00**	**0.00**

GEOSCIENCE

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