Lake Elsinore & San Jacinto Watersheds Authority

City of Lake Elsinore • City of Canyon Lake • County of Riverside
Elsinore Valley Municipal Water District • Santa Ana Watershed Project Authority

November 20, 2024

Ms. Jayne Joy
Regional Water Quality Control Board
3737 Main Street, Suite 500
Riverside, CA 92501

RE: Final Annual Water Quality Monitoring Report July 2023 – June 2024, Lake Elsinore and Canyon Lake Nutrient TMDL Task Force

Dear Ms. Joy:

The Lake Elsinore and San Jacinto Watershed Authority (LESJWA) is pleased to submit the attached FINAL Lake Elsinore and Canyon Lake Nutrient Total Maximum Daily Load (TMDL) Annual Water Quality Monitoring Report July 2023 – June 2024 on behalf of the Lake Elsinore and Canyon Lake Nutrient TMDL Task Force (LECL Task Force). This Final Report addresses all comments to the Draft Report (submitted on August 15, 2024) to address the following permit/order/waiver requirements, as applicable.

In 2004, the Water Quality Control Plan for the Santa Ana Region was amended to include Nutrient TMDLs and Compliance Dates for Lake Elsinore and Canyon Lake for Total Phosphorus (TP) and Total Nitrogen (TN). The Nutrient TMDLs include the submittal of an annual report of data collected pursuant to an approved Lake Elsinore & Canyon Lake TMDL Monitoring Plan by August 15, 2024, of each year.

Since adoption of the 2004 Nutrient TMDLs, the Santa Ana Water Board (and the State Water Resources Control Board as appropriate) has incorporated TMDL requirements into permits, general orders, and conditional waivers for various watershed sources of TP and TN. The permits, general orders, and waivers have similar but not always identical requirements with respect to Nutrient TMDL implementation and reporting. However, the permits, general orders, and waivers all commonly allow permittees the option of meeting certain requirements through participation in the LECL Task Force, which in turn prepares and submits reports and information on behalf of the LECL Task Force members for permit/order/waiver compliance.

The submittal of the DRAFT Lake Elsinore and Canyon Lake Nutrient TMDL Annual Water Quality Monitoring Report July 2023 – June 2024 on August 15th met certain permit/order/waiver requirements. Specifically, the Comprehensive Nutrient Reduction Plan (CNRP) that is incorporated into the National Pollutant Discharge Elimination System (NPDES) permit for the Riverside County Flood Control and Water Conservation District, the County of Riverside, and the Incorporated Cities of Riverside County within the Santa Ana Region (Riverside MS4 Permit) includes as a CNRP Implementation Plan milestone submittal of a draft annual monitoring report by August 15th each year (Attachment A, Table A-1., page A-5). The MS4 agencies, subject to the Riverside MS4 Permit, will provide appropriate certification statements under a separate cover to the Santa Ana Water Board staff with the final report to ensure compliance with applicable standard provisions.

The LECL Task Force members currently include the following: Riverside County, City of Beaumont, City of Canyon Lake, City of Hemet, City of Lake Elsinore, City of Moreno Valley, City of Murrieta, City of Menifee, City of San Jacinto, City of Riverside, City of Perris, City of Wildomar, Caltrans, California Department of Fish and Wildlife, Elsinore Valley Municipal Water District, March Air Force Reserve Joint Powers Authority, U.S. Air Force March Air Force Base, Eastern Municipal Water District, San Jacinto Agricultural Operators and San Jacinto Dairy and CAFO Operators that are members of the Western Riverside County Agriculture Coalition (WRCAC). The United States Forest Service was a member previously but withdrew from the LECL Task Force in 2012. As consistent with past practices, WRCAC works directly with, and will continue to work with, appropriate Santa Ana Water Board staff to inform staff regarding dairy and agricultural operators that are in compliance with Nutrient TMDL provisions through LECL Task Force submittals that are done on their behalf.

Thank you for your consideration. If you have any questions or concerns regarding this report, please contact me at 951-354-4242.

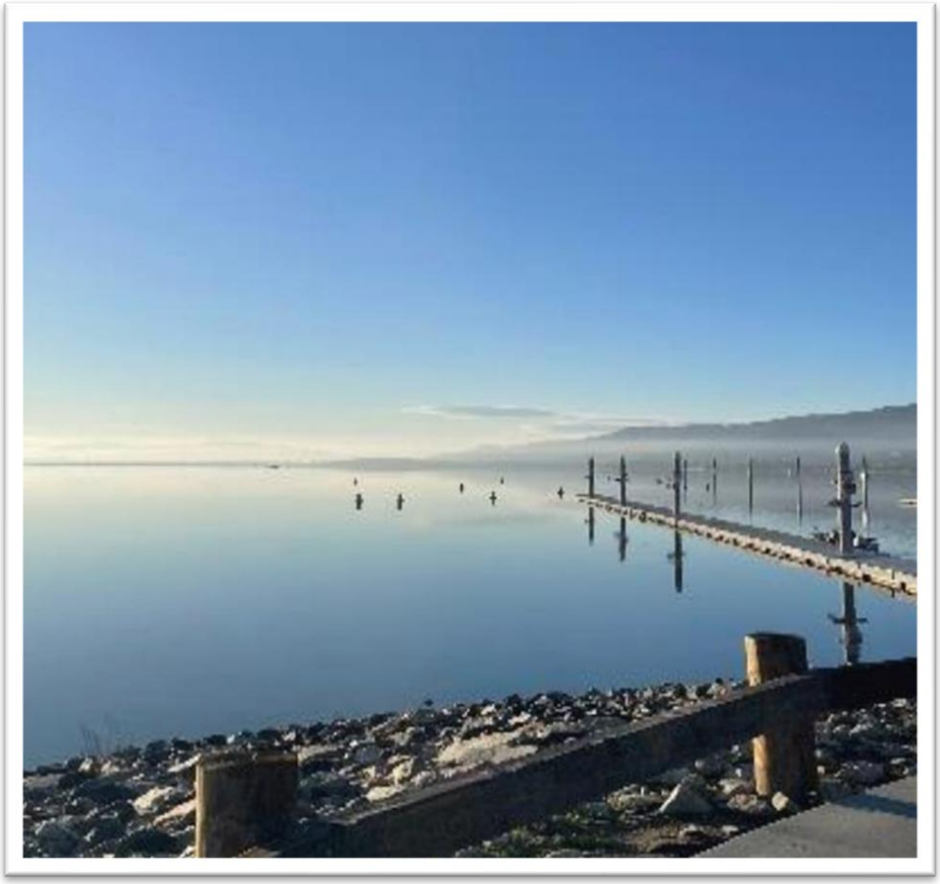
Respectfully submitted,

Rachel M. Gray
LECL TMDL Task Force Administrator

Enc: Final Annual Water Quality Monitoring Report July 2023 – June 2024, Lake Elsinore and Canyon Lake Nutrient TMDL

C: Jagroop Khela / Santa Ana Regional Water Quality Control Board
Terri Reeder / Santa Ana Regional Water Quality Control Board
Lauren Briggs / Santa Ana Regional Water Quality Control Board
Adam Fischer / Santa Ana Regional Water Quality Control Board

Lake Elsinore and Canyon Lake Watersheds Nutrient TMDL Monitoring 2023-2024 Annual Report - FINAL



Prepared for:
Lake Elsinore & San Jacinto Watersheds Project Authority
11615 Sterling Avenue
Riverside, California 92503

Prepared by:
WSP USA Environment & Infrastructure
9177 Sky Park Court
San Diego, CA 92123

November 20, 2024

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND ABBREVIATIONS

µg/L	micrograms per liter
µS/cm	microSiemens per centimeter
Basin Plan	Water Quality Control Plan for the Santa Ana River Basin
CCC	criterion continuous concentration
cf	cubic feet
cfs	cubic feet per second
CMC	criterion maximum concentration
DI	Depth-integrated
DO	dissolved oxygen
EMC	event mean concentration
Epi	epilimnion
EVMWD	Elsinore Valley Municipal Water District
Forest Service	San Bernardino Nation Forest Service
FY	fiscal year
Hypo	hypolimnion
J	concentration between MDL and RL
kg	kilogram
LA	load allocation
LESJWA	Lake Elsinore and San Jacinto Watersheds Authority
MDL	Method detection limit
Mgal	million gallons of water
mg/L	milligrams per liter
NA	not applicable
ND	non-detect
NM:LE	not measured lab error
NPDES	National Pollutant Discharge Elimination System
NS	not sampled
NWS	National Weather Service
QAPP	Quality Assurance Project Plan
RCFC&WCD	Riverside County Flood Control and Water Conservation District
RL	Reporting limit
RWQCB	Regional Water Quality Control Board, Santa Ana Region
SAWPA	Santa Ana Watershed Project Authority
SM	Standard Method
Surf	Surface sample (0-2 meter composite)
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
TMDL Task Force	Lake Elsinore and Canyon Lake TMDL Task Force
US EPA	U.S. Environmental Protection Agency
USGS	United States Geological Survey
WLA	waste load allocation

This page intentionally left blank.

1.0 Introduction

The following document summarizes results of compliance monitoring required in support of the Lake Elsinore and Canyon Lake Nutrient Total Maximum Daily Load (TMDL) for the 2023-2024 fiscal year (FY). The monitoring was performed according to the Lake Elsinore & Canyon Lake Nutrient TMDL Monitoring Quality Assurance Project Plan (QAPP) (Amec Foster Wheeler, September 2016), and the associated Compliance Monitoring Work Plan (Haley & Aldrich, Inc., July 2016).

1.1 Background

Lake Elsinore is the largest natural freshwater lake in southern California that provides a variety of habitats for terrestrial and aquatic species. While a natural lake, the lake does have a history of drying during extended drought periods, and then being refilled through large storm events over one or more years. To help maintain its water level during periods when the lake would potentially go dry, Elsinore Valey Municipal Water District (EVMWD) discharges approximately 6.0 million gallons per day (MDG) of treated, recycled water into Lake Elsinore. The beneficial uses of the lake include water contact recreation (REC1), non-water contact recreation (REC2), commercial and sportfishing (COMM), warm freshwater habitat (WARM), wildlife habitat (WILD), and rare, threatened or endangered species (RARE)[1]. While being a natural lake, it is not in its historically natural condition, as the lake has been modified in various ways to enhance its recreational use and aquatic habitat, including creation of a levee at the lake's south end to increase the water depth/reduce evaporation, and being supplemented with recycled water from EVMWD. Canyon Lake was constructed in 1928 as the Railroad Canyon Reservoir. It is located approximately two miles upstream of Lake Elsinore and water spilled from Canyon Lake is a main source of water for Lake Elsinore during wet years. The beneficial uses of Canyon Lake include municipal and domestic water supply (MUN), agricultural supply (AGR), groundwater recharge (GWR), body contact recreation (REC1), non-body contact recreation (REC2), commercial and sportfishing (COMM), warm freshwater aquatic habitat (WARM), and wildlife habitat (WILD). The beneficial uses of COMM and RARE in Lake Elsinore and COMM in Canyon Lake were approved by the California Regional Water Quality Control Board, Santa Ana Region (RWQCB) as an amendment to the Water Quality Control Plan for the Santa Ana River Basin (Basin Plan) under resolution R8-2017-0019 on June 16, 2017, and became effective on October 15, 2018 after being approved by US EPA.

Lake Elsinore and Canyon Lake were first listed by the RWQCB on its Clean Water Act Section 303(d) list of impaired waterbodies in 1994 and 1998, respectively. Both lakes remain on the latest approved 303(d) list, Res. No. 2022-0006. Current impairments identified for these waters included excessive levels of nutrients in both lakes, as well as organic enrichment/low dissolved oxygen (DO), sedimentation/siltation, unknown causes of toxicity, and PCBs/DDTs in Lake Elsinore. The Clean Water Act Section 303(d) requires the development and implementation of a TMDL for waters that do not or are not expected to meet water quality standards (beneficial uses, water quality objectives). In 2000, the RWQCB initiated the development of TMDLs for nutrients for Lake Elsinore and Canyon Lake.

---

[1] Based on federally listed Riverside fairy shrimp (*Streptocephalus woottoni*) in adjacent wetlands.

In December 2004, the RWQCB adopted amendments to the Basin Plan to incorporate TMDLs for nutrients in Canyon Lake and Lake Elsinore. The amendments were subsequently approved by US EPA on September 30, 2005. The Basin Plan Amendment specifies, among other things, monitoring recommendations to measure progress towards attainment of TMDL thresholds and associated waste load allocations (WLAs) and monitoring to measure compliance towards in-lake numeric water quality targets. Numeric in-lake targets and watershed load allocations have been established and incorporated in the TMDL for nutrients (total nitrogen, phosphorus, and ammonia), DO, and chlorophyll-a (Tables 1-1 and 1-2); however, the ultimate compliance goal for beneficial uses in both lakes is to reduce eutrophication, which can negatively affect biological communities, result in fish kills, and impact recreational use. The recommendations outlined in RWQCB Resolution No. R8-2004-0037 required stakeholders to develop management plans and conduct long-term monitoring and implementation programs aimed at reducing nutrient loads to Lake Elsinore and Canyon Lake. Task 4 of the adopted Lake Elsinore and Canyon Lake TMDL Amendment required stakeholders to prepare and implement a Nutrient Monitoring Program. The program was to include the following:

1. A watershed-wide monitoring program to determine compliance with interim and/or final nitrogen and phosphorus loading; compliance with the nitrogen and phosphorus TMDL, and load allocations (LAs), including WLAs.

2. A Lake Elsinore in-lake nutrient monitoring program to determine compliance with interim and final nitrogen, phosphorus, chlorophyll-a, and DO numeric targets.

3. A Canyon Lake in-lake nutrient monitoring program to determine compliance with interim and final nitrogen, phosphorus, chlorophyll-a, and DO numeric targets.

4. A draft annual report summarizing the data collected for the year and evaluating compliance with the TMDL, due August 15 of each year.

Table 1-1. Final In-Lake Numeric Compliance Targets for the 2004 TMDLs (adapted from Table 5-9n in the Basin Plan, Santa Ana Water Board 2016)

Indicator	Lake Elsinore	Canyon Lake
Total Phosphorus Concentration (Final)	Annual average no greater than 0.1 milligrams/liter (mg/L) to be attained no later than 2020	Annual average no greater than 0.1 mg/L to be attained no later than 2020
Total Nitrogen Concentration (Final)	Annual average no greater than 0.75 mg/L to be attained no later than 2020	Annual average no greater than 0.75 mg/L to be attained no later than 2020
Ammonia Nitrogen Concentration (Final)	Calculated concentrations to be attained no later than 2020 *Acute*: 1-hour average concentration of total ammonia nitrogen (mg/L) not to exceed, more than once every three years on the average, the Criterion Maximum Concentration (CMC) (acute criteria), where $CMC = 0.411/(1+10^{7.204-pH}) + 58.4/(1+10^{pH-7.204})$ *Chronic*: 30-day average concentration of total ammonia nitrogen (mg/L) not to exceed, more than once every three years on the average, the Criterion Continuous Concentration (CCC) (chronic criteria), where $CCC = (0.0577/(1+10^{7.688-pH}) + 2.487/(1+10^{pH-7.688})) * \min (2.85, 1.45*10^{0.028(25-T)}$	Calculated concentrations to be attained no later than 2020 *Acute*: 1-hour average concentration of total ammonia nitrogen (mg/L) not to exceed, more than once every three years on the average, the CMC (acute criteria), where $CMC = 0.411/(1+10^{7.204-pH}) + 58.4/(1+10^{pH-7.204})$ *Chronic*: 30-day average concentration of total ammonia nitrogen (mg/L) not to exceed, more than once every three years on the average, the CCC (chronic criteria), where $CCC = (0.0577/(1+10^{7.688-pH}) + 2.487/(1+10^{pH-7.688})) * \min (2.85, 1.45*10^{0.028(25-T)}$
Chlorophyll-*a* Concentration (Final)	Summer average no greater than 25 micrograms/liter (µg/L); to be attained no later than 2020	Annual average no greater than 25 µg/L; to be attained no later than 2020
Dissolved Oxygen Concentration (Final)	No less than 5 mg/L 1 meter (m) above lake bottom; to be attained no later than 2020	Daily average in hypolimnion no less than 5 mg/L; to be attained no later than 2020

Table 1-2. Final Watershed Loading Numeric Load Allocations from the 2004 TMDL (adapted from Table 5-9p in the Basin Plan, Santa Ana Water Board 2016)

TMDL	Final Total Phosphorus TMDL (kg/yr)[a, b]	Final Total Nitrogen TMDL (kg/yr)[a, b]
Canyon Lake	8,691	37,735
Lake Elsinore	28,584	230,025

a - Final compliance to be achieved as soon as possible, but no later than December 31, 2020.
b - TMDL specified as 10-year running average. Sum all wasteload and allocation sources.

Since August 2001, the Lake Elsinore and San Jacinto Watersheds Authority (LESJWA) has been working with local stakeholders and the RWQCB to identify the source of nutrients impairing each lake and evaluate the impacts to water quality and beneficial uses incurred from nutrient sources.

At that time, LESJWA contracted with the State to serve as a neutral facilitator for the RWQCB to assist in formation of a TMDL workgroup and assist the workgroup in participating with the RWQCB in the development and definition of the TMDLs.

After adoption of the Lake Elsinore and Canyon Lake nutrient TMDLs on December 20, 2004, stakeholders named in the TMDLs began the process to create a formal cost sharing body, or Task Force, to implement several tasks included in the TMDLs.

In November 2006, stakeholders finalized an agreement to form the Lake Elsinore and Canyon Lake TMDL Task Force (hereafter “TMDL Task Force”). The TMDL Task Force consists of representatives from local cities, Riverside County, agriculture and dairy, and the regulatory community. At the request of the stakeholders and RWQCB, LESJWA (staffed by the Santa Ana Watershed Project Authority or “SAWPA”) serves as administrator of the TMDL Task Force and oversees the TMDL implementation for Lake Elsinore and Canyon Lake.

LESJWA, in support of the TMDL Task Force, provided funding to meet the requirement of the TMDL by developing a single comprehensive watershed-wide nutrient Monitoring Plan. The Lake Elsinore and Canyon Lake Nutrient TMDL Monitoring Plan was approved by the RWQCB in March 2006, and subsequently implemented by the TMDL Task Force starting in April 2006 through October 2012. During this time frame, in-lake monitoring for both lakes was conducted through the EVMWD National Pollutant Discharge Elimination System (NPDES) compliance program (Order No. R8-2005-0003, NPDES No. CA8000027, Regional Water Reclamation Plant, Lake Elsinore, Riverside County). On October 26, 2012, the RWQCB adopted a resolution (Resolution No. R8-2012-0052) granting the TMDL Task Force a temporary suspension of in-lake TMDL monitoring programs to achieve cost savings that were then applied to implementing lake improvement projects aimed at reducing nutrient impacts in Canyon Lake and Lake Elsinore. As a result, the Lake Elsinore and Canyon Lake Nutrient TMDL field compliance monitoring was not conducted during the 2013-2014 and 2014-2015 fiscal year (FY) cycles.

The in-lake and watershed-wide water quality monitoring for both lakes was resumed in July 2015 as Phase II of the Lake Elsinore and Canyon Lake Nutrient TMDL Monitoring Program moving forward. A revised Monitoring Work Plan (Haley & Aldrich 2016) and companion Quality Assurance Project Plan (Amec Foster Wheeler 2016) were prepared and approved by the RWQCB in October 2016.

1.2 Nutrient TMDL Compliance Monitoring Objectives

The primary objectives of the Nutrient TMDL Compliance Monitoring Program are to:

1. Determine in-lake concentrations of causal (total nitrogen and total phosphorus) and response (total ammonia, dissolved oxygen, and chlorophyll-a) targets outlined in the adopted 2004 Lake Elsinore and Canyon Lake Nutrient TMDL through regular monitoring of both lakes.

2. Evaluate trends in causal and response parameter concentrations toward achieving 2004 TMDL numeric targets.

3. Quantify the external pollutant loading originating from the watershed above the lakes through stormwater monitoring of the major upstream inputs to Canyon Lake.

4. Determine the total nutrient loads into Lake Elsinore and Canyon Lake from their tributaries (i.e., San Jacinto River and Salt Creek).

5. Provide water quality data from both in-lake and watershed monitoring to update loading model.

Additionally, the data generated by this monitoring program will help support the needs of other programs by tracking the trends in watershed loading and in-lake concentrations relative to BMPs or any other actions taken in the upstream watershed to reduce nutrient loads.

2.0 San Jacinto River Watershed-Wide Monitoring

Watershed monitoring and reporting was performed by NV5 of San Diego, California.

2.1 Summary of 2023-2024 Wet Weather Watershed Monitoring and Nutrient Loads

A summary of the measured concentrations and estimated annual nutrient loads derived from each of the three monitored locations for the period of July 1, 2023 through June 30, 2024, is presented in **Table 2-1**. A more detailed account, including storm hydrographs and event loads are presented in the following sections for each monitoring location.

Table 2-1. Summary of 2023-2024 Monitoring

Number and Location Description	Total Annual Flow [a] (Mgal)	Annual Event Mean Storm Concentration (mg/L)		Estimated Annual Load (kg)	
		Total Nitrogen	Total Phosphorus	Total Nitrogen	Total Phosphorus
Site 3 - Salt Creek at Murrieta Road (USGS 11070465)	1,663	2.10	0.42	13,312	2,668
Site 4 - San Jacinto River at Goetz Road (USGS 11070365)	5,137	1.37	0.38	26,684	7,371
Site 6 - San Jacinto River at Ramona Expressway [b]	3	Not Measured [b]	Not Measured [b]	Not Measured [b]	Not Measured [b]
Site 30 - Canyon Lake Spillway (USGS 11070500)	6,274	1.15	0.15	27,399	3,459
Site 1 - San Jacinto River at Cranston Guard Station	3,241	Not Measured [c]	Not Measured [c]	Not Measured [c]	Not Measured [c]

Note:
When a concentration was non-detect, the annual average value for compliance purposes was calculated by converting non-detect (ND) values to zero. If the result of the calculated mean was non-zero but below the corresponding MDL, the average value was reported as ND.

a - Flow data after 03/06/2024 are provisional and may be subject to change.

b - Mystic Lake did not overflow during the wet weather monitoring period from October 1, 2023, to May 31, 2024. Therefore, no samples were collected from the sampling station at San Jacinto River at Ramona Expressway (Station ID 741) during the 2023-2024 monitoring year.

c -The USGS stream gauge at Site 30 (USGS 11070500) is located downstream of Canyon Lake on the San Jacinto River close to the river entrance to Lake Elsinore. This downstream location is influenced by local urban runoff and groundwater seepage in addition to the flows from Canyon Lake. In addition, runoff from other local tributaries into Lake Elsinore are not included in this table.
Mgal = million gallons; 1 million gallons = 133,680 cubic feet = 3,785,412 L; mg/L = milligrams per liter; kg = kilograms; USGS = United States Geological Survey.

2.2 Historical Wet Weather Watershed Monitoring and Incoming Nutrient Loads

A summary of the historical total nitrogen and total phosphorus water quality monitoring data for the period of July 1, 2014 through June 30, 2024, is presented in **Tables 2-2** to **2-3**. **Table 2-4** presents the 10-year running average of incoming total nitrogen and total phosphorus loads for both lakes in comparison to their TMDL load allocations. In general, the monitoring locations only flow during storm events and the storm flows account for the estimated annual load of nutrients. Lake Elsinore meets the current 10-year running average TMDL load allocations for both total nitrogen and total phosphorus, Canyon Lake meets TMDL load allocation for total nitrogen and exceeds the TMDL allocation for total phosphorus (**Table 2-4**). The 10-year running average loading for Lake Elsinore was calculated from samples collected at the Canyon Lake Spillway station. These samples represent the catchment area upstream of the Canyon Lake Spillway and correspond to 93.6% of the total area contributing runoff to Lake Elsinore. The remaining 6.4% of the Lake Elsinore catchment is in the immediate area surrounding Lake Elsinore.

Table 2-2. Summary of Historical Annual Mean Storm Concentrations Based on Monitoring Year

Monitoring Year	Site 3 - Salt Creek at Murrieta Road		Site 4 - San Jacinto River at Goetz Road		Site 30 - Canyon Lake Spillway	
	TN (mg/L)	TP (mg/L)	TN (mg/L)	TP (mg/L)	TN (mg/L)	TP (mg/L)
2014-2015	2.2	0.5	1.8	0.4	NS	NS
2015-2016	2.5	0.5	2.4	1.4	NS	NS
2016-2017	2.1	0.6	2	1.2	1.9	0.4
2017-2018	2.7	0.4	2	0.4	NS	NS
2018-2019	2.4	0.4	1.7	0.6	1.4	0.2
2019-2020	2.4	0.6	1.8	0.7	1.1	0.16
2020-2021	1.9	0.4	1.9	0.5	1.7	0.05
2021-2022	2.7	0.5	2.4	0.6	1.5	ND(<0.003)[a]
2022-2023	2.7	0.5	2.4	0.6	1.5	ND(<0.003)[a]
2023-2024	2.1	0.4	1.4	0.4	1.2	0.15

ND = not detected (analyte not detected at the indicated method detection limit (MDL)).

NS – Not sampled when Canyon Lake does not overtop the Canyon Lake Spillway. The USGS stream gauge at Site 30 (USGS 11070500) is located downstream of Canyon Lake on the San Jacinto River close to the river entrance to Lake Elsinore. This downstream location is influenced by local urban runoff and groundwater seepage in addition to the flows from Canyon Lake. In addition, runoff from other local tributaries into Lake Elsinore are not included in this table.

a - When a concentration was non-detect, the annual average value for compliance purposes was calculated by converting non-detect (ND) values to zero. If the result of the calculated mean was non-zero but below the corresponding MDL, the average value was reported as ND.

Page left intentionally blank

Table 2-3. Summary of Historical Estimated Annual Loads Based on Monitoring Year

Monitoring Year	Site 3 - Salt Creek at Murrieta Road			Site 4 - San Jacinto River at Goetz Road			Site 30 - Canyon Lake Spillway		
	Flow (Mgal)	TN (kg)	TP (kg)	Flow (Mgal)	TN (kg)	TP (kg)	Flow (Mgal)	TN (kg)	TP (kg)
2014-2015[a]	908	8721	2610	831	5711	1634	316	NS	NS
2015-2016	515	5,647	1,447	872	7,926	4,624	476	NS	NS
2016-2017	1,596	12,366	4,026	2,802	21,651	14,403	4,850	33,759	6,637
2017-2018	271	2,586	482	393	3,055	810	117	NS	NS
2018-2019	1,394	12,213	2,266	3,208	20,457	7,409	5,893	32,832	5,416
2019-2020	1,645	14,792	3,705	3,290	23,337	8,660	4,497	18,762	2,635
2020-2021	255	1,902	396	519	3,794	992	878	5,626	175
2021-2022	351	3,698	625	537	4,976	1,282	640	3,632	0[b]
2022-2023	1,240	8,576	1,533	2,821	17,132	4,388	4,037	19,391	1,231
2023-2024	1,663	13,312	2,668	5,137	26,684	7,371	6,274	27,399	3,459

NS – Not sampled when Canyon Lake does not overtop the Canyon Lake Spillway. The USGS stream gauge at Site 30 (USGS 11070500) is located downstream of Canyon Lake on the San Jacinto River close to the river entrance to Lake Elsinore. This downstream location is influenced by local urban runoff and groundwater seepage in addition to the flows from Canyon Lake. In addition, runoff from other local tributaries into Lake Elsinore are not included in this table.

a - Sum of January 1, 2014 to June 30, 2015. All other monitoring year dates are July 1 to June 30.

b - When a concentration was non-detect, the annual load value for compliance purposes was calculated by converting non-detect (ND) values to zero.

Table 2-4. Historical Estimated Annual Loads as a 10-Year Running Average Relative to the 2004 TMDL Wasteload and Load Allocations

Lake	Analyte	10-yr Running Average (kg/yr) [a]	TMDL Load Allocation (kg/yr)	% of TMDL Load Allocation
Lake Elsinore[b]	Total Nitrogen	11,736	29,953	39.2%
	Total Phosphorus	1,651	6,922	23.9%
Canyon Lake[c]	Total Nitrogen	18,490	21,902	84.4%
	Total Phosphorus	6,292	3,797	196.6%
		-2,002 credit for alum application = 4,290		113.0%

a - Sum of average 10-year annual loads for the monitoring period January 2014 – December 2023

b – Load allocations taken from Resolution R8-2004-0037 (2004 TMDL) Table 5-9r categorized as Canyon Lake Overflows. Watershed loading estimates for Lake Elsinore were taken from data collected at the Canyon Lake Spillway when it overflows. Internal sediment and atmospheric deposition allocations (Table 5-9r) were subtracted from the total of all allocation sources for both TN and TP to provide a more valid comparison to incoming watershed loads.

c – Load allocations taken from Resolution R8-2004-0037 (2004 TMDL) Table 5-9q. Internal sediment, atmospheric deposition, and supplemental water allocations (Table 5-9q) were subtracted from the total of all allocation sources for both TN and TP to provide a more valid comparison to incoming watershed loads.

.

2.3 Monitoring Strategy

Phase II of the San Jacinto River Watershed Monitoring Program follows the guidelines detailed in the Lake Elsinore and Canyon Lake Nutrient TMDL Compliance Monitoring Plan. The Phase II San Jacinto River Watershed Monitoring Program sampling activities during the 2023-2024 monitoring period included collection of samples during up to three storm events at the designated monitoring stations throughout the San Jacinto River Watershed. Average nutrient concentrations during the monitored events were used to calculate mass loading during remaining wet weather events that were not monitored to derive total estimated annual mass loads throughout the monitoring year.

2.4 Monitoring Stations and Stream Gauge Locations

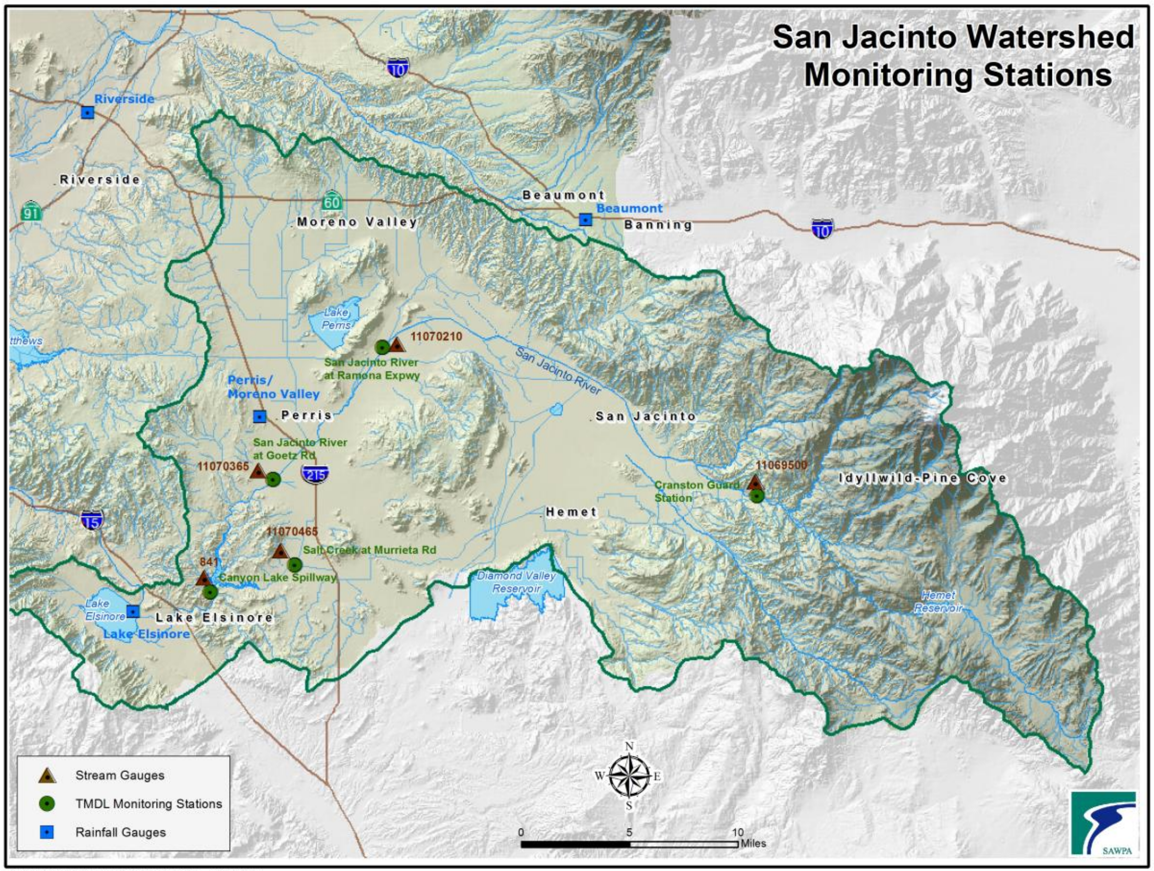
To monitor TMDL compliance, five sampling stations were carefully selected to reflect various types of land uses within the San Jacinto River Watershed. Sampling of these locations began in 2006. Sampling station locations were deliberately set up to be within the vicinity of United States Geological Survey (USGS) stream gauge stations. The sampling stations are listed in **Table 2-5** below and shown on **Figure 2-1**.

Three of the five sites (Station IDs 745, 759, and 741) were selected because they are indicative of inputs to Canyon Lake originating from the main stem of the San Jacinto River, Salt Creek, and the watershed above Mystic Lake. The sampling location along the San Jacinto River at Ramona Expressway (Station 741) is located downgradient of Mystic Lake and is only sampled if Mystic Lake is overflowing. Flow has not been observed at this location since a strong El Niño event in the mid-1990s. Because Mystic Lake is an area of active land subsidence, this monitoring station is not expected to flow except under extremely high rainfall conditions.

Table 2-5. San Jacinto River Watershed Monitoring Stations

Station ID	USGS Station ID	Agency	Site Number and Location Description
745	11070465	USGS	Site 3 - Salt Creek at Murrieta Road
759	11070365	USGS	Site 4 - San Jacinto River at Goetz Road
741	11070210	USGS	Site 6 - San Jacinto River at Ramona Expressway
841	11070500	USGS	Site 30 - Canyon Lake Spillway
792[a]	11069500	USGS	Site 1 - San Jacinto River at Cranston Guard Station

a - The Cranston Guard Station (Station 792) was monitored between 2007 and 2011 by the San Bernardino National Forest Service in accordance with their agreement for in-lieu obligations to the Task Force. In 2012, the Forest Service pulled out of the Task Force and no longer provides monitoring support.



P:\projects\Rick_Whetsel\sj_tmdl.mxd SW-1108

Figure 2-1. San Jacinto River Watershed Monitoring Stations

The fourth site, located below the Canyon Lake Dam (Station ID 841), is indicative of loads entering Lake Elsinore from Canyon Lake and the upstream watershed when the water level overtops the Railroad Canyon Dam Spillway. This site only represents a portion of the total load into Lake Elsinore from upstream of Canyon Lake Dam and does not include runoff from the local watershed. The Railroad Canyon Dam Spillway elevation at Canyon Lake is 1,381.76 feet. Samples are collected from this location during storm events that create lake levels that overtop the dam spillway elevation. The Canyon Lake level is publicly available at the following website:

https://www.evmwd.com/who-we-are/lake-levels

The fifth site at the Cranston Guard Station site on the San Jacinto River (Station 792) was only monitored between 2007 and 2011 by the San Bernardino National Forest Service who no longer provides monitoring support.

2.5 Stream Gauge Records

The USGS monitor stream flow from several gauging stations in the San Jacinto River Watershed. Stream gauging stations maintained and operated for Phase II of the San Jacinto River Watershed Monitoring Program are shown in **Figure 2-1** and identified in **Table 2-5**.

The data record captured per USGS stream gauge is publicly available at the USGS website, where data for the specific gauge numbers provided in **Table 2-6** can be found:

http://waterdata.usgs.gov/ca/nwis/current/?type=flow

A summary of the stream gauge data recorded at each of the stations with measured flow for the monitoring period of July 1, 2023 through June 30, 2024 is presented in **Table 2-6** and visually presented in **Figure 2-2** through **Figure 2-6**. The total monthly flows at each of the USGS stations are reported in **Table 2-6**. In general, the flows are only observed during wet weather storm events and dry weather flows are not observed from each of the USGS stations. The flow data are downloaded from the USGS website and are considered provisional for approximately six months; therefore, flow data presented after March 6, 2024, in this report are provisional. The provisional data provided by the USGS are subject to change and are not citable until reviewed and approved by the USGS.

Table 2-6. Summary of Stream Gauge Data (July 2023 through June 2024)

July 2023-June 2024 Total Monthly Flow (cf)	Site 3 - Salt Creek at Murrieta Road (11070465[b]) (cf)	Site 4 - San Jacinto River at Goetz Road (11070365 [b]) (cf)	Site 6 - San Jacinto River at Ramona Expressway [a] (11070210 [b]) (cf)	Site 30 - Canyon Lake Spillway (11070500 [b]) (cf)	Site 1 - San Jacinto River at Cranston Guard Station (11069500 [b]) (cf)
July	0	0	0	83,844	2,120,058
August	28,179,828	90,681,606	0	76,518,378	21,019,221
September	0	9,162	0	1,161,324	1,164,555
October	0	0	0	1,019,637	627,894
November	1,948,149	1,405,350	0	13,437,459	1,893,546
December	3,357,414	17,988,030	0	6,760,854	3,269,205
January	25,196,805	55,195,920	0	100,205,883	12,714,048
February	105,898,302	375,588,396	368,460	437,831,973	98,437,212
March	38,860,065	94,857,039	0	106,689,825	119,033,640
April	17,419,698	42,096,204	0	85,343,949	124,772,760
May	0	7,801,866	0	8,469,189	46,446,201
June	1,487,394	1,136,862	0	1,191,519	1,770,138
Mean Annual Flow Volume (cf)	**222,347,655**	**686,760,435**	**368,460**	**838,713,834**	**433,268,478**

Notes:
a - No flows originating from the upper watershed were observed at the TMDL monitoring location just downstream of Mystic Lake.
b - USGS gauge number
cf = cubic feet

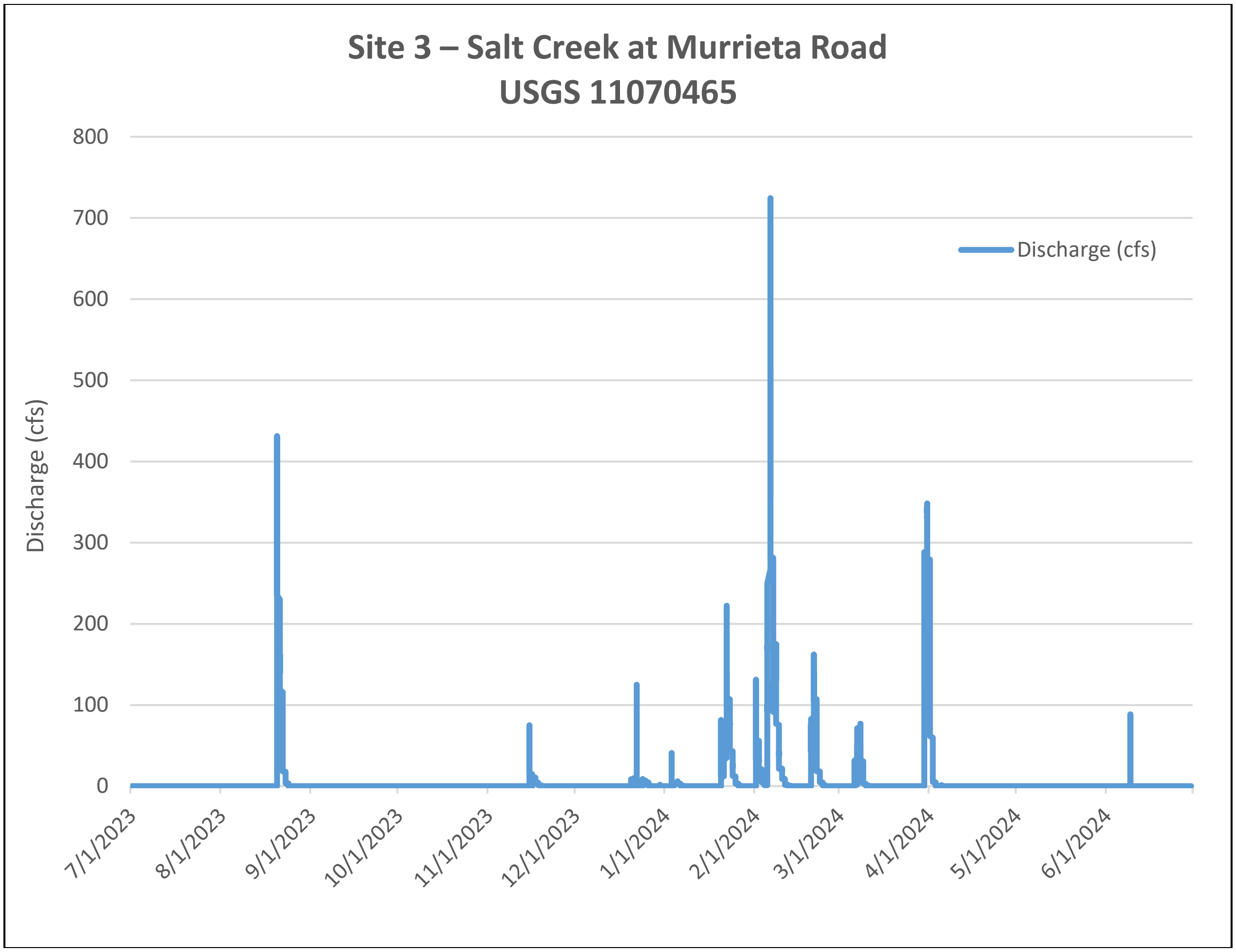


Figure 2-2. **Site 3 – Salt Creek at Murrieta Road – Daily Stream Gauge Records**

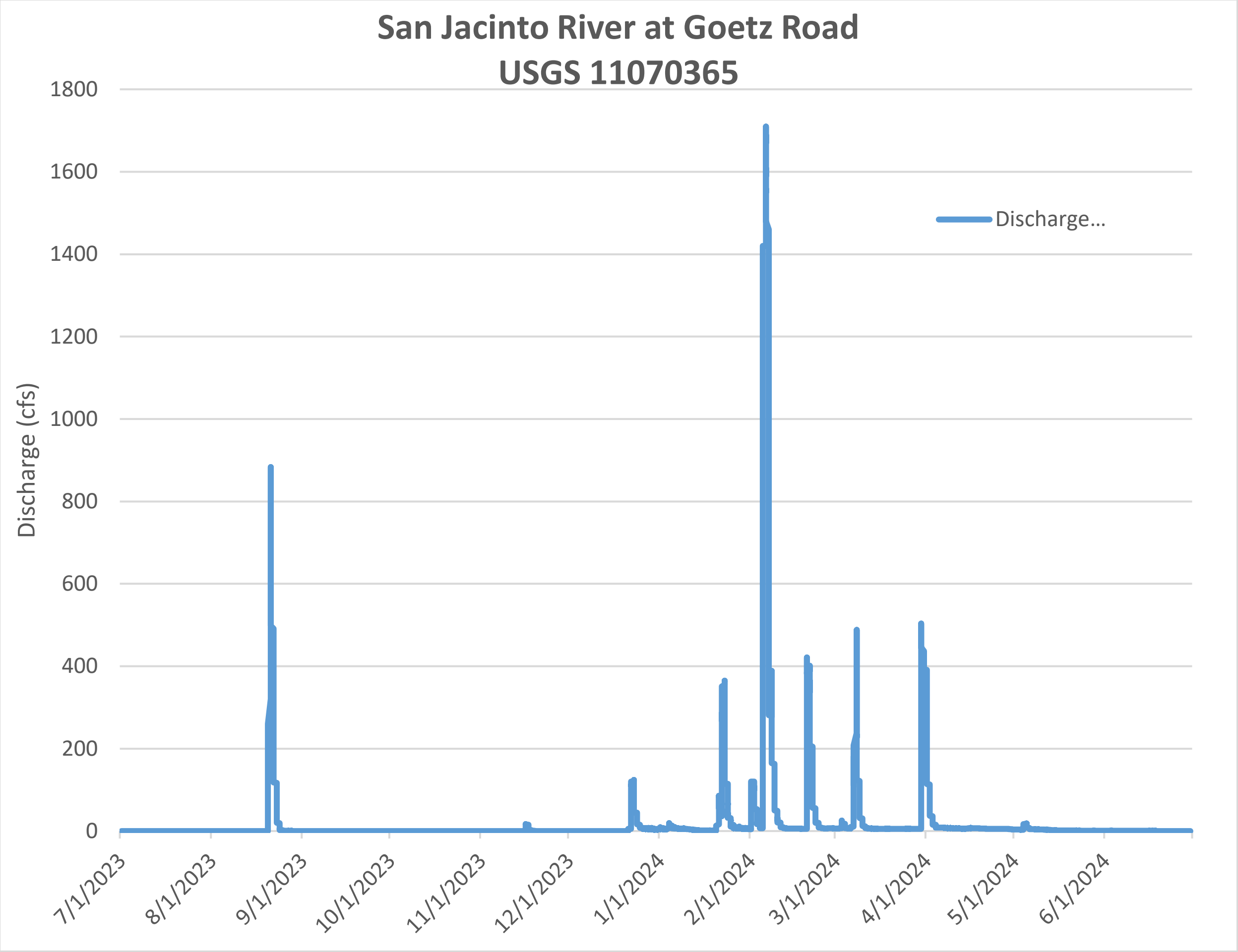


Figure 2-3. **Site 4 – San Jacinto River at Goetz Road – Daily Stream Gauge Records**

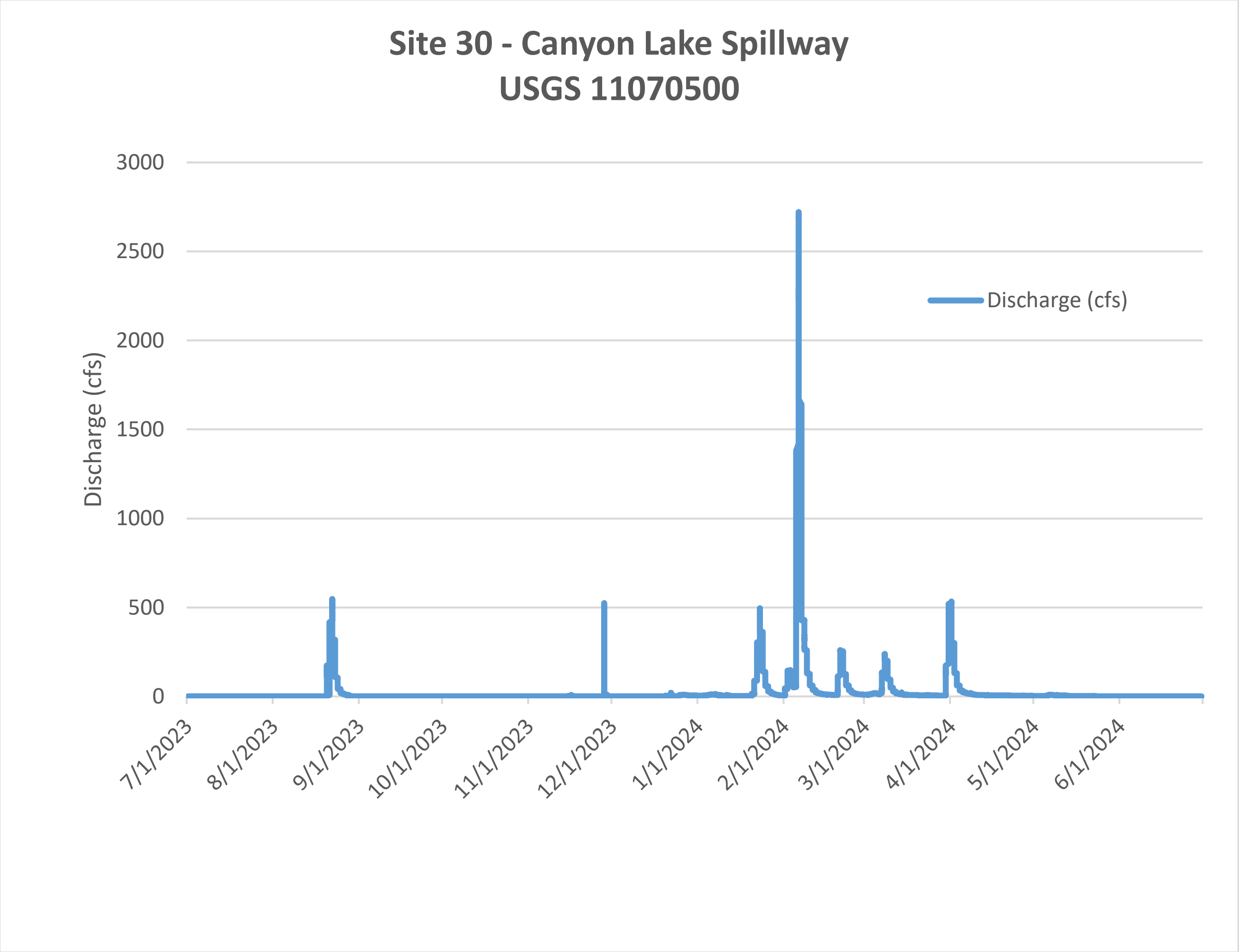


Figure 2-4. **Site 30 – Canyon Lake Spillway – Daily Stream Gauge Records**

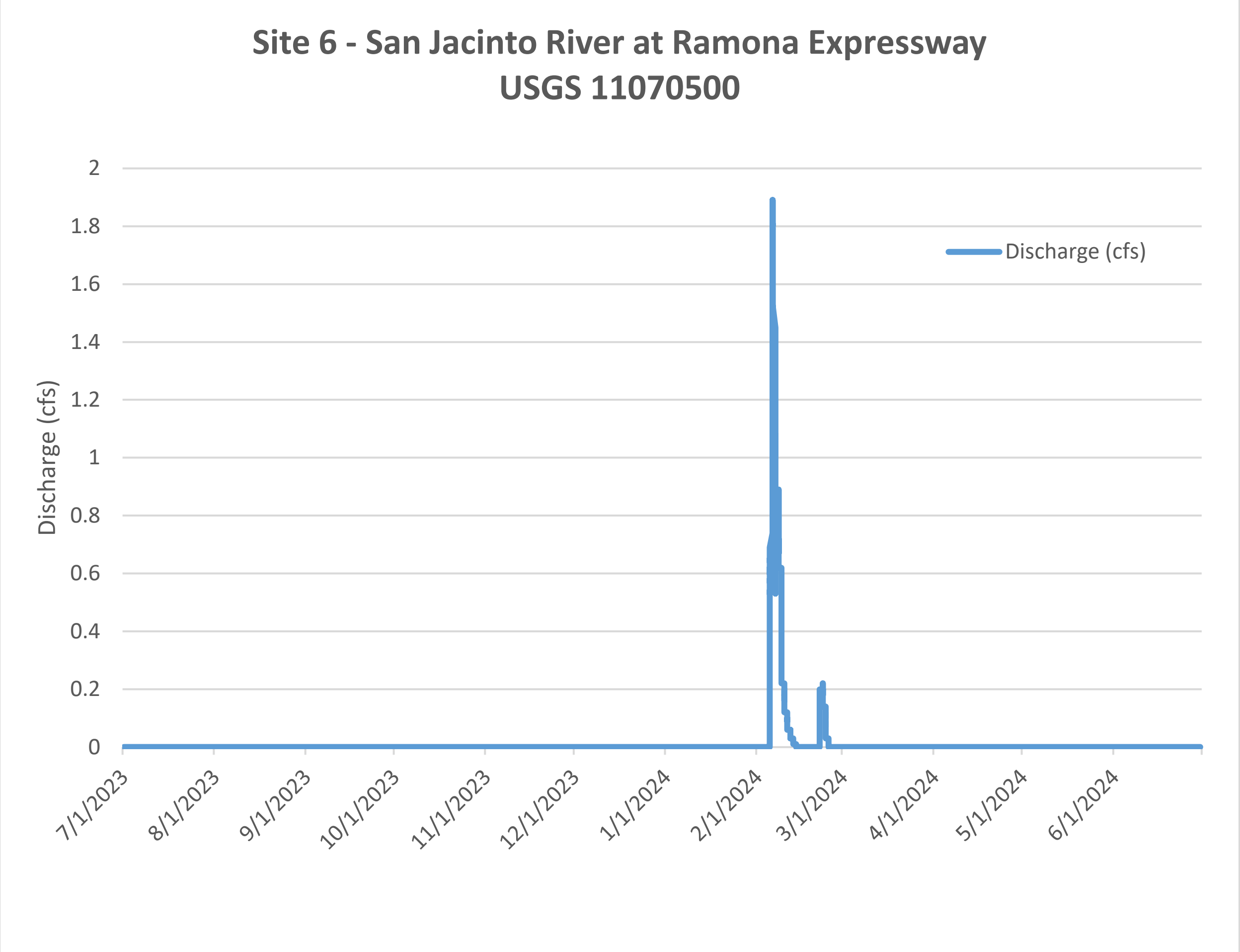


Figure 2-5. **Site 6 – San Jacinto River at Ramona Expressway – Daily Stream Gauge Records**

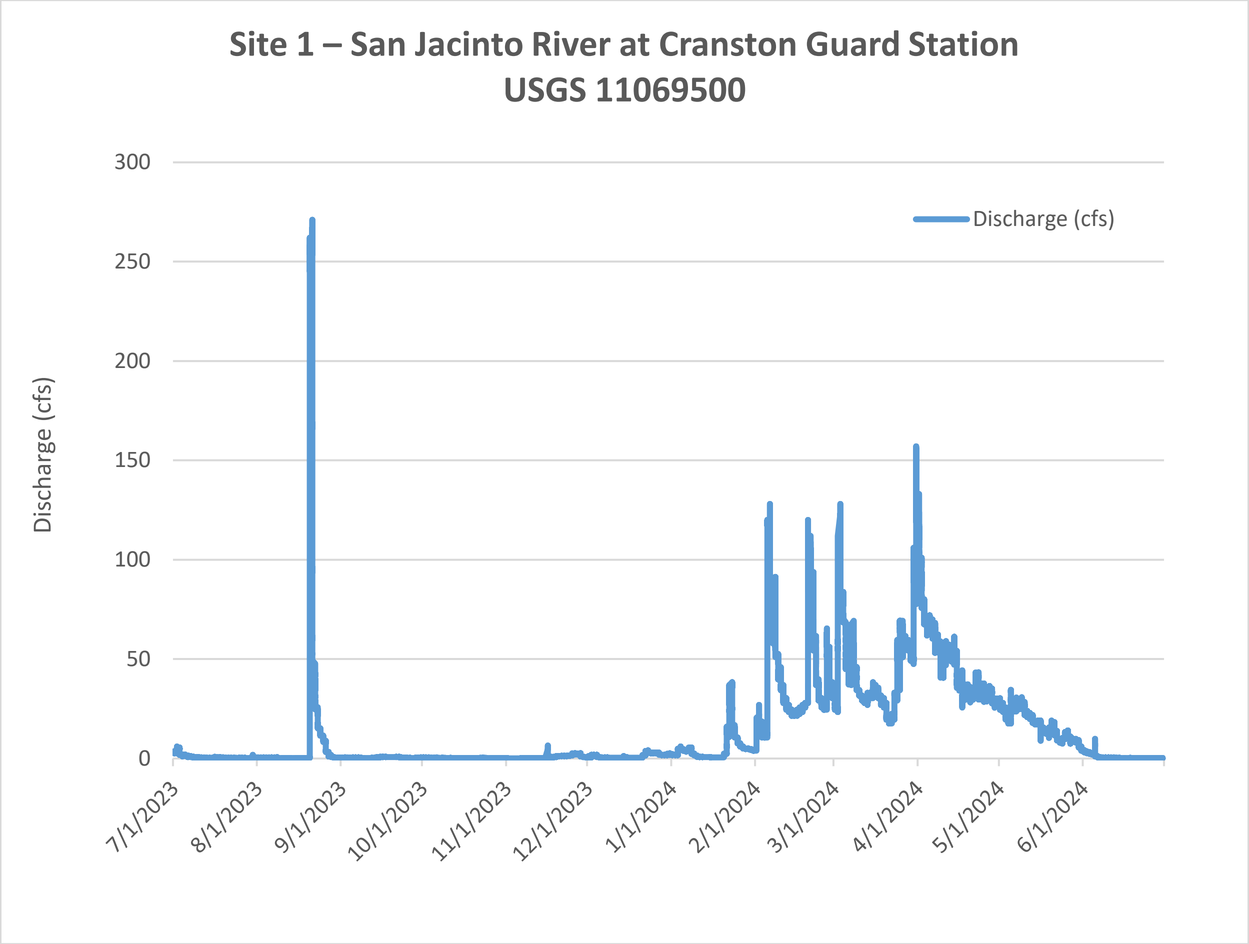


Figure 2-6. Site 1 – San Jacinto River at Cranston Guard Station – Daily Stream Gauge Records

2.6 Sampling Strategy

Phase II of the San Jacinto River Watershed Monitoring Program includes collecting water quality samples during up to three storm events at the designated monitoring stations throughout the San Jacinto River Watershed. Throughout the wet weather monitoring period from October 1, 2023, to May 31, 2024, the National Weather Service (NWS) forecasts were monitored to determine when storm events met the mobilization criteria. The mobilization criteria for sampling requires an NWS quantitative precipitation forecast greater than a 1.0-inch forecast within 24 hours from October 1 through December 31, and greater than an 0.5-inch forecast within 24 hours from January 1 through May 31.

Flow-weighted composite samples were collected during the storm events at the designated monitoring stations. Discrete time-weighted sample aliquots were collected over the rising limb (increasing flow) and the falling limb (decreasing flow) of the hydrograph using automatic sampling equipment (e.g., ISCO autosamplers). The first sample aliquot was taken at or shortly after the time that storm water runoff began, and each subsequent aliquot of equal volume was collected at intervals of approximately 2 hours across the hydrograph, depending on the forecasted size of the storm event. Flow rates and volumes were based on data from USGS stream gauges located near the sampling stations. Upon completion of sampling, field teams downloaded the USGS flow data and subsampled each time-weighted discrete sample to create a single flow-weighted composite sample for laboratory analysis.

The following protocols were applied:

- Sampling commenced once flow was established in the channel.
- Field measurements (temperature, pH, conductivity, dissolved oxygen, and turbidity) were recorded in the field during the rising limb of the hydrograph using portable calibrated YSI multi-parameter meters, or equivalent.
- Biochemical Oxygen Demand and Chemical Oxygen Demand were analyzed for the first discrete grab sample only.

Sampling and analysis followed the guidelines detailed in the Lake Elsinore and Canyon Lake Nutrient TMDL Compliance Monitoring Plan (Haley & Aldrich, Inc., July 2016). More detail regarding the sampling approach (e.g., compositing, sample naming conventions) are described in the Lake Elsinore and Canyon Lake Nutrient TMDL Compliance QAPP (Amec Foster Wheeler, September 2016). These documents are available at the following website under the monitoring tab:

https://sawpa.gov/task-force/lake-elsinore-and-canyon-lake-tmdl-task-force/

Samples for all analytical chemistry measurements were submitted Weck Laboratories Inc. located in Industry, California.

2.7 San Jacinto River Watershed Monitoring Events

Water quality samples were collected during the three storm events that met the mobilization criteria during the wet weather monitoring period from October 1, 2023, to May 31, 2024.

The first monitoring event occurred on January 20-26, 2024. Water quality samples were collected at Salt Creek at Murrieta Road (Station ID 745), San Jacinto River at Goetz Road (Station ID 759), and Canyon Lake Spillway (Station ID 841). A peak flow of 222 cfs was recorded at Salt Creek at Murrieta Road (Station ID 745), a peak flow of 364 cfs was recorded at San Jacinto River at Goetz Road (Station ID 759), and a peak flow of 495 cfs was recorded at Canyon Lake Spillway (Station ID 841). No flows were recorded at the San Jacinto River at Ramona Expressway (Station ID 741). A total of 1.26 to 1.98 inches of rainfall was recorded in the region during this storm (RCFCWCD 2024).

The second monitoring event occurred on February 1-4, 2024. Water quality samples were collected at Salt Creek at Murrieta Road (Station ID 745), San Jacinto River at Goetz Road (Station ID 759), and Canyon Lake Spillway (Station ID 841). A peak flow of 131 cfs was recorded at Salt Creek at Murrieta Road (Station ID 745), a peak flow of 120 cfs was recorded at San Jacinto River at Goetz Road (Station ID 759), and a peak flow of 147 cfs was recorded at Canyon Lake Spillway (Station ID 841). No flows were recorded at the San Jacinto River at Ramona Expressway (Station ID 741). A total of 0.79 to 1.03 inches of rainfall was recorded in the region during this storm (RCFCWCD 2024).

The third monitoring event occurred on February 20-24, 2024. Water quality samples were collected at Salt Creek at Murrieta Road (Station ID 745), San Jacinto River at Goetz Road (Station ID 759), and Canyon Lake Spillway (Station ID 841). A peak flow of 162 cfs was recorded at Salt Creek at Murrieta Road (Station ID 745), a peak flow of 421 cfs was recorded at San Jacinto River at Goetz Road (Station ID 759), and a peak flow of 260 cfs was recorded at Canyon Lake Spillway (Station ID 841). No flows were recorded at the San Jacinto River at Ramona Expressway (Station ID 741). A total of 0.69 to 2.32 inches of rainfall was recorded in the region during this storm (RCFCWCD 2024).

Mass loads for each chemical constituent at each location were calculated as the product of the event mean concentrations and the storm volumes for each storm event. The annual loads were calculated as the sum of the monitored event loads and the storm events where no sampling occurred, which are the product of the storm volumes for the storm events not monitored and the annual mean concentrations.

2.8 San Jacinto River Watershed Annual Water Quality Summary

A summary of watershed water quality monitoring data for each of the four monitoring locations for the monitoring period of July 1, 2023, through June 30, 2024, is presented below. The complete set of analytical laboratory report results is included in **Appendix A**. Included with each summary of the monitoring data are the concentrations for each analyte. Also included are the estimated storm event loads and annual loads for each analyte.

2.8.1 Summary of Monitoring Data – Salt Creek at Murrieta Road

Water quality samples were collected during three storm events at Salt Creek at Murrieta Road (Station ID 745) during the wet weather monitoring period from October 1, 2023, to May 31, 2024.

During the storm event on January 20-26, 2024, a total of 57 discrete time-weighted samples were collected across the hydrograph at two-hour intervals and a single flow-weighted composite sample was submitted for analysis. Based on data provided by the nearby USGS stream gauge (Station ID 11070465), flow for the storm event was estimated at 547 acre-feet or 178 million gallons (Mgal), which represents approximately 10.7% of the total annual flow.

During the storm event on February 1-4, 2024, a total of 21 discrete time-weighted samples were collected across the hydrograph at four-hour intervals and a single flow-weighted composite sample was submitted for analysis. Based on data provided by the nearby USGS stream gauge (Station ID 11070465), flow for the storm event was estimated at 181 acre-feet or 59 Mgal, which represents approximately 3.5% of the total annual flow.

During the storm event on February 20-24, 2024, a total of 36 discrete time-weighted samples were collected across the hydrograph at two-hour intervals and a single flow-weighted composite sample was submitted for analysis. Based on data provided by the nearby USGS stream gauge (Station ID 11070465), flow for the storm event was estimated at 453 acre-feet or 147 Mgal, which represents approximately 8.9% of the total annual flow.

Photos taken during the storm events are provided in **Figure 2-7** through **Figure 2-9.**

Figure 2-7. Storm Event at Salt Creek at Murrieta Road (January 20-26, 2024)

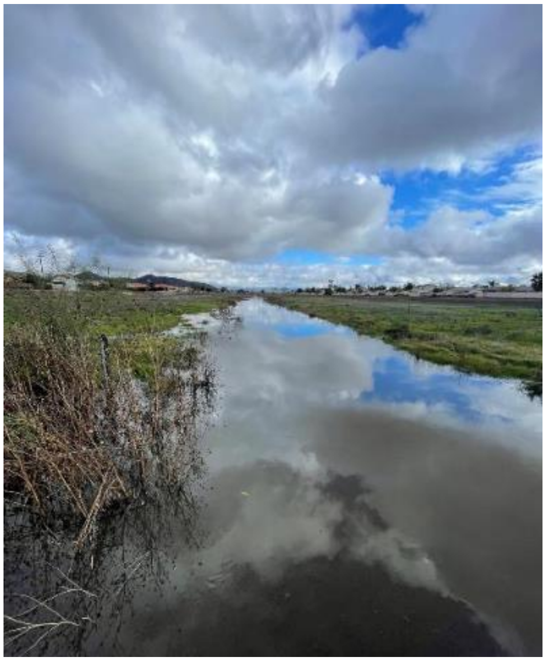


Figure 2-8. Storm Event at Salt Creek at Murrieta Road (February 1-4, 2024)[2]

Figure 2-9. Storm Event at Salt Creek at Murrieta Road (February 20-24, 2024)

---

[2] Photo from February 2024 was not available, image is a representative photo from 2022.

Event and annual mean concentrations for each analyte are presented in **Table 2-7**. Event and annual loads for each analyte are presented in **Table 2-8**. Concentrations for nutrients for the three storm events ranged from 1.9 to 2.3 milligrams per liter (mg/L) for total nitrogen, and 0.41 to 0.44 mg/L for total phosphorus (**Table 2-7**). Based on flow data provided by the nearby USGS stream gauge (Station ID 11070465), the total annual flow was estimated at 222,347,655 cubic feet (cf) or 1,663 Mgal for the period of July 1, 2023, through June 30, 2024. The estimated annual nutrient load was calculated to be 13,312 kg for total nitrogen and 2,668 kg for total phosphorus (**Table 2-8**) for the period of July 1, 2023 through June 30, 2024.

Table 2-7. Water Quality Concentrations at Salt Creek at Murrieta Road

Analyte	Units	Event 1	Event 2	Event 3	Annual Mean	Annual Geomean
Ammonia-Nitrogen	mg/L	0.071(J)	0.17	0.15	0.13	0.12
Chemical Oxygen Demand	mg/L	29	21	24	24.7	24.5
Kjeldahl Nitrogen	mg/L	1.8	1.3	1.2	1.43	1.41
Nitrate as N	mg/L	0.49	0.57	0.83	0.63	0.61
Nitrite as N	mg/L	ND(<0.042)[a]	48(J)	50(J)	49.0[b]	49.0[b]
Organic Nitrogen	mg/L	1.7	1.1	1.1	1.30	1.27
Total Nitrogen	mg/L	2.3	1.9	2.1	2.10	2.09
Total Phosphorus	mg/L	0.44	0.42	0.41	0.42	0.42
Ortho Phosphate Phosphorus	mg/L	0.26	0.3	0.3	0.29	0.29
Total Dissolved Solids	mg/L	430	310	410	383	379
Total Hardness	mg/L	156	140	173	156	156
Total Suspended Solids	mg/L	70	59	39	56.0	54.4

ND = not detected (analyte not detected at the indicated method detection limit (MDL)).
J- Reported value was detected above the MDL, but below the RL.
a – When the result was ND the detection limit is shown in parenthesis.
b –The annual average value for compliance purposes was calculated by converting non-detect (ND) values to zero. If the result of the calculated mean was non-zero but below the corresponding MDL, the average value was reported as ND.

Table 2-8. Water Quality Event and Annual Loads at Salt Creek at Murrieta Road

Analyte	Units	Load Event 1	Load Event 2	Load Event 3	Annual Load
Ammonia-Nitrogen	kg	48	38	84	800
Chemical Oxygen Demand	kg	19,577	4,682	13,430	157,041
Kjeldahl Nitrogen	kg	1,215	290	671	9,112
Nitrate as N	kg	331	127	464	3,971
Nitrite as N	kg	0[a]	10,701	27,979	275,772
Organic Nitrogen	kg	1,148	245	616	8,299
Total Nitrogen	kg	1,553	424	1,175	13,312
Total Phosphorus	kg	297	94	229	2,668
Ortho Phosphate Phosphorus	kg	176	67	168	1,797
Total Dissolved Solids	kg	290,275	69,109	229,428	2,443,614
Total Hardness	kg	105,309	31,210	96,807	989,764
Total Suspended Solids	kg	47,254	13,153	21,824	353,193

a - When a concentration was non-detect, the load value for compliance purposes was calculated by converting non-detect (ND) values to zero.

Hydrographs with the discrete time-weighted sample aliquot times are provided in **Figure 2-10** through **Figure 2-12.** The figures were developed based on flow data provided by the nearby USGS stream gauge (Station ID 11070465).

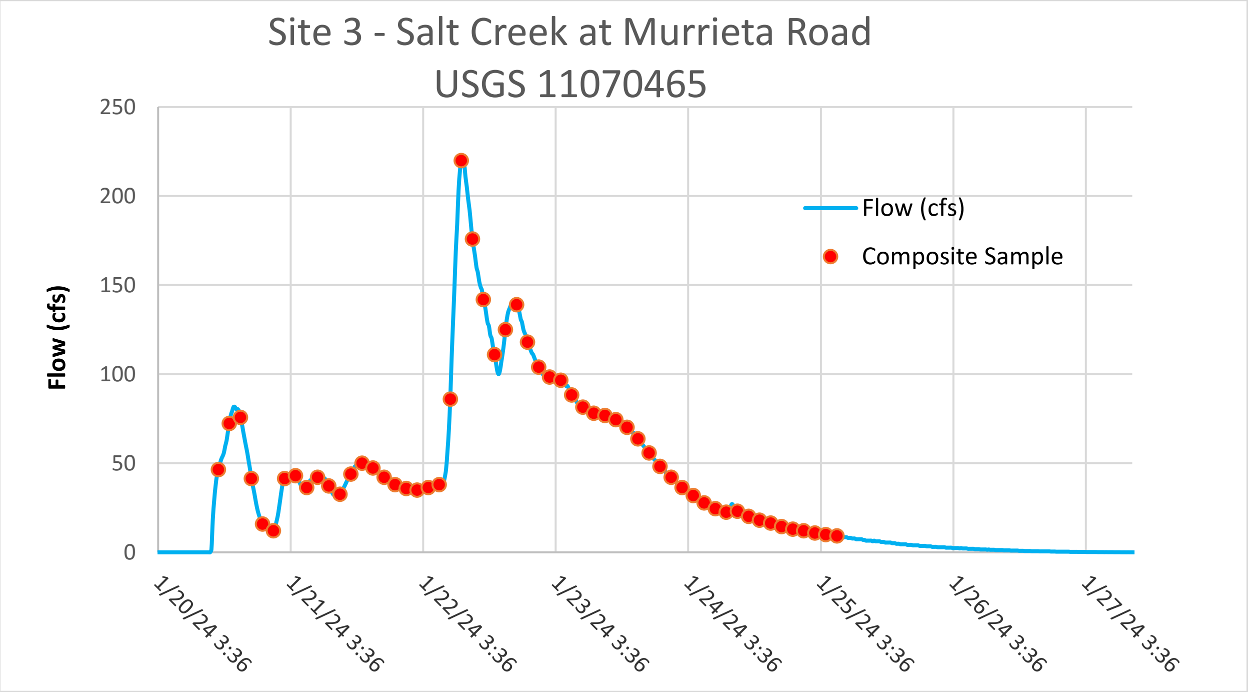


Figure 2-10. Hydrograph of First Storm Event at Salt Creek at Murrieta Road (January 20-26, 2024)

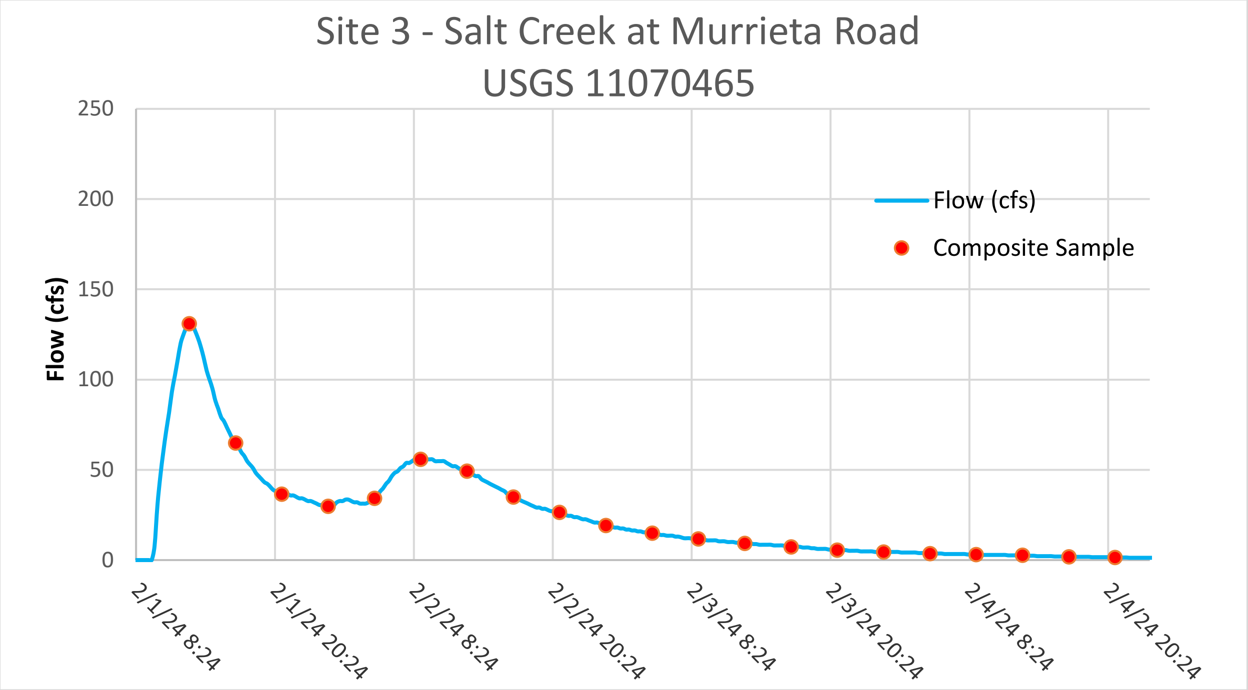


Figure 2-11. Hydrograph of Second Storm Event at Salt Creek at Murrieta Road (February 1-4, 2024)

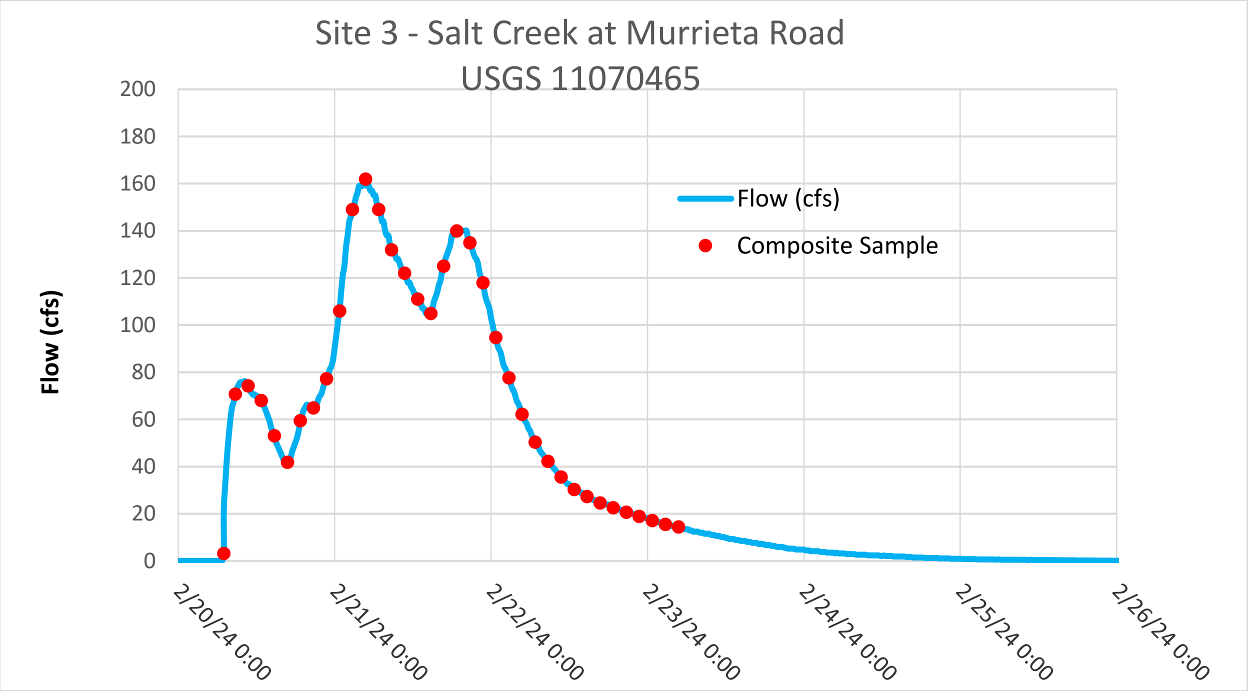


Figure 2-12. Hydrograph of Third Storm Event at Salt Creek at Murrieta Road (February 20-24, 2024)

2.8.2 Summary of Monitoring Data – San Jacinto River at Goetz Road

Water quality samples were collected during three storm events at San Jacinto River at Goetz Road (Station ID 759) during the wet weather monitoring period from October 1, 2023, to May 31, 2024.

During the storm event on January 20-26, 2024 a total of 57 discrete time-weighted samples were collected across the hydrograph at two-hour intervals and a single flow-weighted composite sample was submitted for analysis. Based on data provided by the nearby USGS stream gauge (Station ID 11070365), flow for the storm event was estimated at 1,034 acre-feet or 337 Mgal, which represents approximately 6.5% of the total annual flow.

During the storm event on February 1-4, 2024, a total of 24 discrete time-weighted samples were collected across the hydrograph at four-hour intervals and a single flow-weighted composite sample was submitted for analysis. Based on data provided by the nearby USGS stream gauge (Station ID 11070365), flow for the storm event was estimated at 299 acre-feet or 98 Mgal, which represents approximately 1.9% of the total annual flow.

During the storm event on February 20-24, 2024, a total of 41 discrete time-weighted samples were collected across the hydrograph at two-hour intervals and a single flow-weighted composite sample was submitted for analysis. Based on data provided by the nearby USGS stream gauge (Station ID 11070365), flow for the storm event was estimated at 1,315 acre-feet or 429 Mgal, which represents approximately 8.3% of the total annual flow.

Photos taken during the storm events are provided in **Figure 2-13** through **Figure 2-15**.

Figure 2-13. Storm Event at San Jacinto River at Goetz Road (January 20-26. 2024)

Figure 2-14. Storm Event at San Jacinto River at Goetz Road (February 1-4, 2024)

Figure 2-15. Storm Event at San Jacinto River at Goetz Road (February 20-24, 2024)

Event and annual mean concentrations for each analyte are presented in **Table 2-9**. Event and annual loads for each analyte are presented in **Table 2-10**. Concentrations for nutrients for the three storm events ranged from 1.3 to 1.5 mg/L for total nitrogen, and 0.34 to 0.44 mg/L for total phosphorus (**Table 2-9)**. Based on flow data provided by the nearby USGS stream gauge (Station

ID 11070365), the total annual flow was estimated at 686,760,435 cf or 5,137 Mgal for the period of July 1, 2023, through June 30, 2024. The estimated annual nutrient load was calculated to be 26,684 kg for total nitrogen and 7,371 kg for total phosphorus (**Error! Reference source not found. 2-10**) for the period of July 1, 2023 through June 30, 2024.

Table 2-9. Water Quality Concentrations at San Jacinto River at Goetz Road

Analyte	Units	Event 1	Event 2	Event 3	Annual Mean	Annual Geomean
Ammonia-Nitrogen	mg/L	0.031(J)	0.08(J)	0.12	0.08	0.07
Chemical Oxygen Demand	mg/L	30	65	18	37.7	32.7
Kjeldahl Nitrogen	mg/L	0.75	0.75	0.68	0.73	0.73
Nitrate as N	mg/L	0.57	0.53	0.74	0.61	0.61
Nitrite as N	mg/L	ND<(0.042)[a]	ND<(0.042)[a]	63(J)	63.0[b]	63.0[b]
Organic Nitrogen	mg/L	0.72	0.67	0.56	0.65	0.65
Total Nitrogen	mg/L	1.3	1.3	1.5	1.37	1.36
Total Phosphorus	mg/L	0.34	0.35	0.44	0.38	0.37
Ortho Phosphate Phosphorus	mg/L	0.2	0.22	0.31	0.24	0.24
Total Dissolved Solids	mg/L	150	160	120	143	142
Total Hardness	mg/L	63.3	73.6	61.5	66.1	65.9
Total Suspended Solids	mg/L	53	45	39	45.7	45.3

ND = not detected (analyte not detected at the indicated method detection limit (MDL)).
J- Reported value was detected above the MDL, but below the RL.
a – When the result was ND the detection limit is shown in parenthesis.
b –The annual average value for compliance purposes was calculated by converting non-detect (ND) values to zero. If the result of the calculated mean was non-zero but below the corresponding MDL, the average value was reported as ND.

Table 2-10. Water Quality Event and Annual Loads at San Jacinto River at Goetz Road

Analyte	Units	Load Event 1	Load Event 2	Load Event 3	Annual Load
Ammonia-Nitrogen	kg	40	30	195	1,510
Chemical Oxygen Demand	kg	38,293	23,992	29,207	700,891
Kjeldahl Nitrogen	kg	957	277	1,103	14,094
Nitrate as N	kg	728	196	1,201	12,047
Nitrite as N	kg	0[a]	0[a]	102,225	1,121,485
Organic Nitrogen	kg	919	247	909	12,591
Total Nitrogen	kg	1,659	480	2,434	26,684
Total Phosphorus	kg	434	129	714	7,371
Ortho Phosphate Phosphorus	kg	255	81	503	4,776
Total Dissolved Solids	kg	191,466	59,057	194,715	2,764,188
Total Hardness	kg	80,798	27,166	99,791	1,277,709
Total Suspended Solids	kg	67,651	16,610	63,282	886,372

a - When a concentration was non-detect, the load value for compliance purposes was calculated by converting non-detect (ND) values to zero.

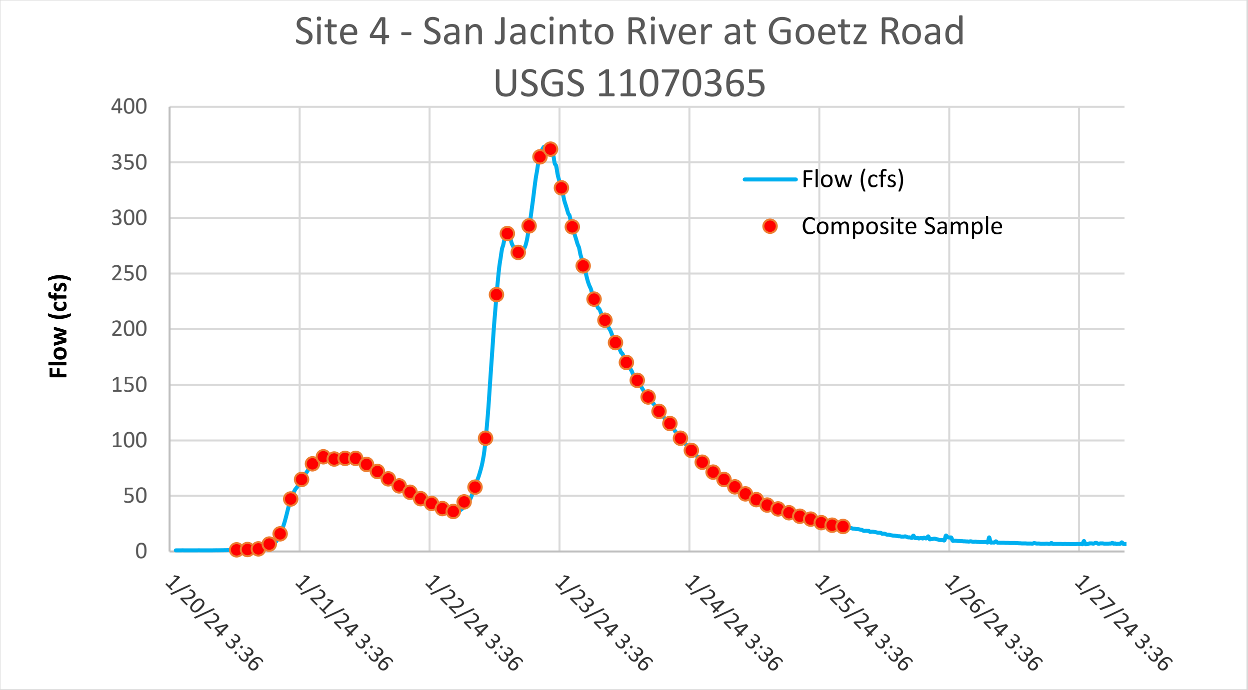


Figure 2-16. Hydrograph of First Storm Event at San Jacinto River at Goetz Road (January 20-26, 2024)

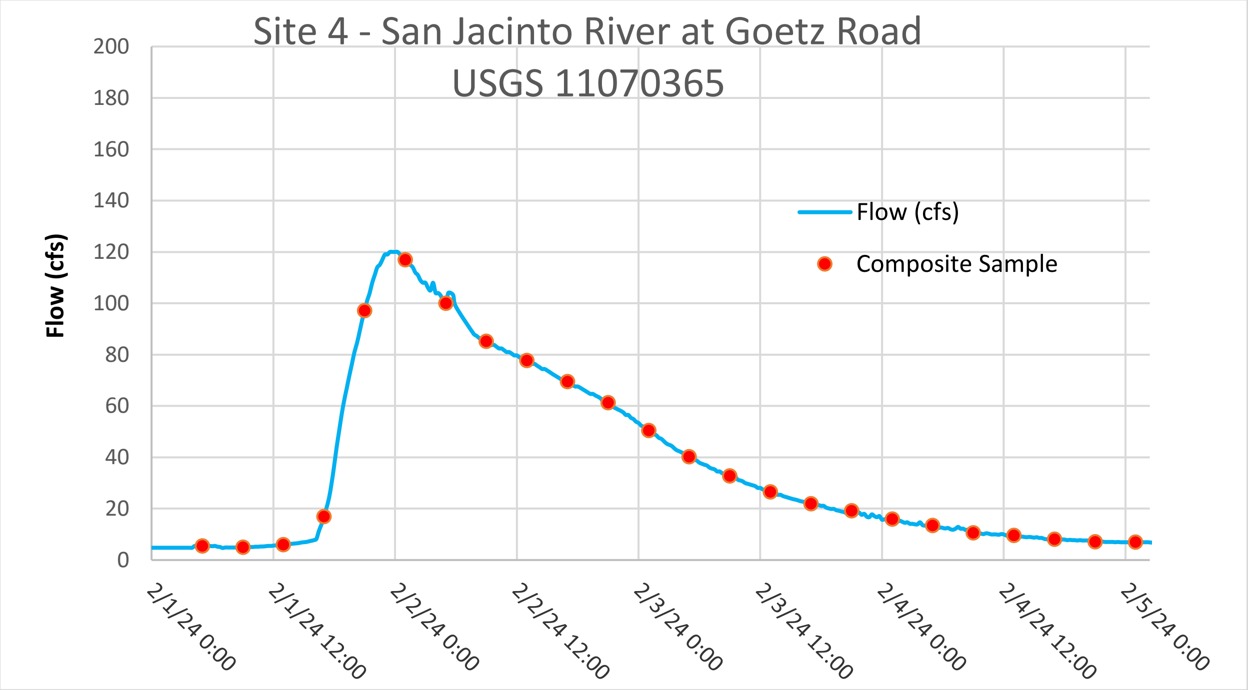


Figure 2-17. Hydrograph of Second Storm Event at San Jacinto River at Goetz Road (February 1-4, 2024)

Hydrographs with the discrete time-weighted sample aliquot times are provided in **Figure 2-16** through **Figure 2-18**. The figure was developed based on flow data provided by the nearby USGS stream gauge (Station ID 11070365).

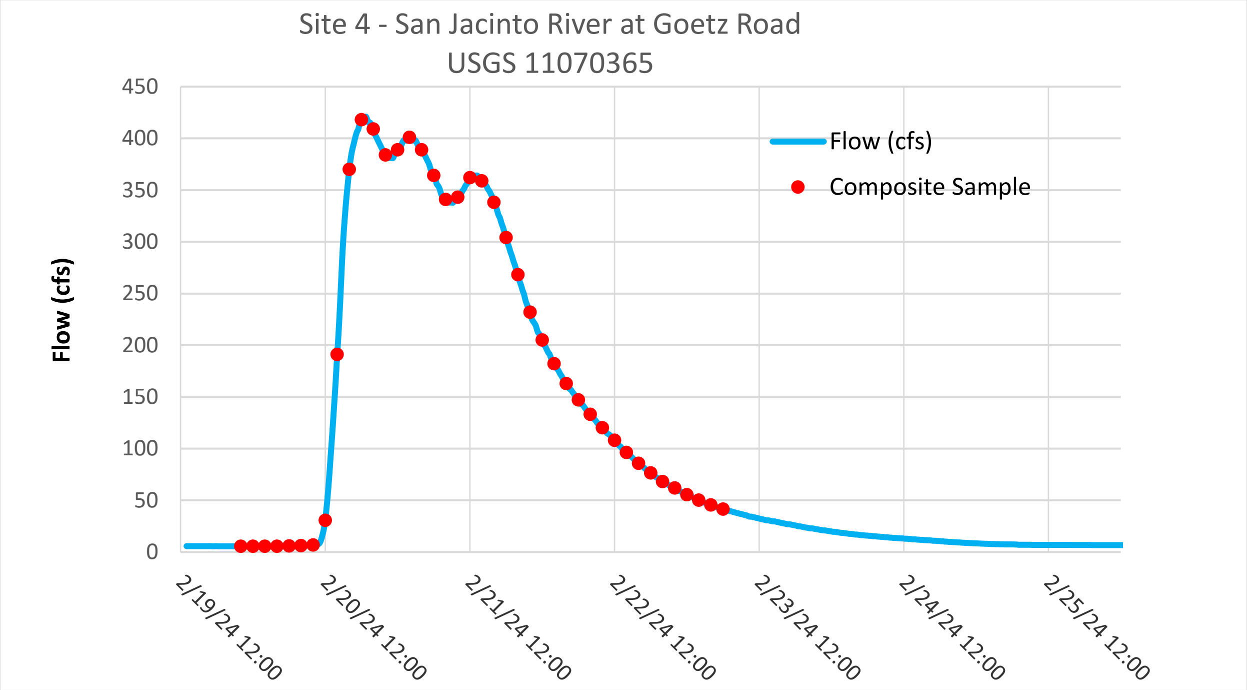


Figure 2-18. Hydrograph of Third Storm Event at San Jacinto River at Goetz Road (February 20-24, 2024)

2.8.3 Summary of Monitoring Data – San Jacinto River at Ramona Expressway

Mystic Lake did not overflow during the wet weather monitoring period from October 1, 2023, to May 31, 2024. Therefore, no samples were collected from the sampling station at San Jacinto River at Ramona Expressway (Station ID 741) during the 2023-2024 monitoring year. Flows from the local area and from overflow of the upstream levee structure were observed at the San Jacinto River at Ramona Expressway (Station ID 741) from February 5, 2024, through February 14, 2024, and from February 22, 2024, through February 25, 2024. However, these flows did not originate from Mystic Lake.

2.8.4 Summary of Monitoring Data – Canyon Lake Spillway

Water quality samples were collected during three storm events at Canyon Lake Spillway (Station ID 841) during the wet weather monitoring period from October 1, 2023, to May 31, 2024.

During the storm event on January 20-26, 2024, a total of 51 discrete time-weighted samples were collected across the hydrograph at two-hour intervals for the period that flows exited Canyon Lake during the monitoring event (i.e., the water level in Canyon Lake was actively cresting the spillway) and a single flow-weighted composite sample was submitted for analysis. Based on data provided by the nearby USGS stream gauge (Station ID 11070500), flow for the storm event was estimated at 1,995 acre-feet or 650 Mgal, which represents approximately 10.3% of the total annual inflow to Lake Elsinore from Canyon Lake.

During the storm event on February 1-4, 2024, a total of 21 discrete time-weighted samples were collected across the hydrograph at four-hour intervals for the period that flows exited Canyon Lake during the monitoring event (i.e., the water level in Canyon Lake was actively cresting the spillway) and a single flow-weighted composite sample was submitted for analysis. Based on data provided by the nearby USGS stream gauge (Station ID 11070500), flow for the storm event was estimated at 645 acre-feet or 210 Mgal, which represents approximately 3.4% of the total annual inflow to Lake Elsinore from Canyon Lake.

During the storm event on February 20-24, 2024, a total of 33 discrete time-weighted samples were collected across the hydrograph at two-hour intervals for the period that flows exited Canyon Lake during the monitoring event (i.e., the water level in Canyon Lake was actively cresting the spillway) and a single flow-weighted composite sample was submitted for analysis. Based on data provided by the nearby USGS stream gauge (Station ID 11070500), flow for the storm event was estimated at 1,197 acre-feet or 390 Mgal, which represents approximately 6.2% of the total annual inflow to Lake Elsinore from Canyon Lake.

Note that this USGS stream gauge is located below the Canyon Lake Dam at a location that does occasionally capture other flows from the surrounding local watershed. The flows from Canyon Lake do not include runoff from the local surrounding watershed into Lake Elsinore. Photos taken during the storm events are provided in **Figure 2-19** through **Figure 2-21**.

Figure 2-19. Storm Event Sampling Below the Canyon Lake Spillway (January 20-26, 2024)

Figure 2-20. Storm Event Sampling Below the Canyon Lake Spillway (February 1-4, 2024)

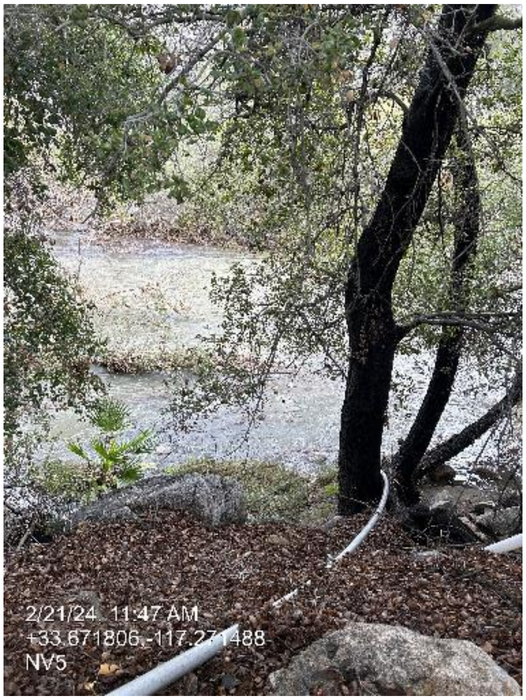


Figure 2-21. Storm Event Sampling Below the Canyon Lake Spillway (February 20-24, 2024)

Event and annual mean concentrations of each analyte are presented in **Table 2-11**. Event and annual loads for each analyte are presented in **Table 2-12**. Concentrations of nutrients for the three storm events ranged from 0.95 to 1.4 mg/L for total nitrogen and 0.061 to 0.3 mg/L for total phosphorus (**Table 2-11**). Based on flow data provided by the nearby USGS stream gauge (Station ID 11070500), the total annual flow was estimated at 838,713,834 cf or 6,274 Mgal for the period of July 1, 2023, through June 30, 2024. The USGS stream gauge (Station ID 11070500) located downstream of the Canyon Lake Spillway (Station ID 841) sampling location has minimal dry weather flow and storm flows account for the vast majority of the estimated annual load of nutrients exiting Canyon Lake. The estimated annual nutrient load was calculated to be 27, 399 kg for total nitrogen and 3,459 kg for total phosphorus **(Table 2-12**) for the period of July 1, 2023, through June 30, 2024.

Hydrographs with the discrete time-weighted sample aliquot times are provided in **Figure 2-22** through **Figure 2-24**. The figure was developed based on flow data provided by the nearby USGS stream gauge (Station ID 11070365). A hydrograph of the Canyon Lake Level at Railroad Canyon Dam Spillway compared to the spillway elevation is provided in **Figure 2-25**.

Table 2-11. Water Quality Concentrations at Canyon Lake Spillway

Analyte	Units	Event 1	Event 2	Event 3	Annual Mean	Annual Geomean
Ammonia-Nitrogen	mg/L	0.021(J)	0.066(J)	.087(J)	0.06	0.049
Chemical Oxygen Demand	mg/L	32	23	18	24.3	23.7
Kjeldahl Nitrogen	mg/L	0.76	0.74	0.74	0.75	0.747
Nitrate as N	mg/L	0.29	0.21	0.63	0.38	0.337
Nitrite as N	mg/L	ND(<0.042)[a]	ND(<0.042)[a]	ND(<0.042)[a]	ND(<0.042)[b]	ND(<0.042)[b]
Organic Nitrogen	mg/L	0.74	0.68	0.66	0.69	0.69
Total Nitrogen	mg/L	1.1	0.95	1.4	1.15	1.14
Total Phosphorus	mg/L	0.061	0.081	0.3	0.15	0.11
Ortho Phosphate Phosphorus	mg/L	ND(<0.0071)[a]	0.011	0.22	0.12[b]	0.049[b]
Total Dissolved Solids	mg/L	500	440	250	397	380
Total Hardness	mg/L	239	- [c]	131	185	180
Total Suspended Solids	mg/L	10	9	15	11.3	11.1

ND = not detected (analyte not detected at the indicated method detection limit (MDL)).
J- Reported value was detected above the MDL, but below the RL.
a – When the result was ND the detection limit is shown in parenthesis.
b –The annual average value for compliance purposes was calculated by converting non-detect (ND) values to zero. If the result of the calculated mean was non-zero but below the corresponding MDL, the average value was reported as ND.
c – Due to laboratory error, total hardness was not analyzed and reported.

Table 2-12. Water Quality Event and Annual Loads at Canyon Lake Spillway

Analyte	Units	Load Event 1	Load Event 2	Load Event 3	Annual Load
Ammonia-Nitrogen	kg	52	53	128	1,336
Chemical Oxygen Demand	kg	78,759	18,311	26,581	586,366
Kjeldahl Nitrogen	kg	1,871	589	1,093	17,751
Nitrate as N	kg	714	167	930	8,974
Nitrite as N	kg	0[a]	0[a]	0[a]	0[a]
Organic Nitrogen	kg	1,821	541	975	16,521
Total Nitrogen	kg	2,707	756	2,067	27,399
Total Phosphorus	kg	150	64	443	3,459
Ortho Phosphate Phosphorus	kg	0[a]	9	325	2,530
Total Dissolved Solids	kg	1,230,616	350,304	369,174	9,492,971
Total Hardness	kg	588,234	147,287[b]	193,447	4,446,865
Total Suspended Solids	kg	24,612	7,165	22,150	269,439

a - When a concentration was non-detect, the load value for compliance purposes was calculated by converting non-detect (ND) values to zero.
b - Total hardness annual mean concentration was used to estimate value for event load, due to missing data from laboratory error.

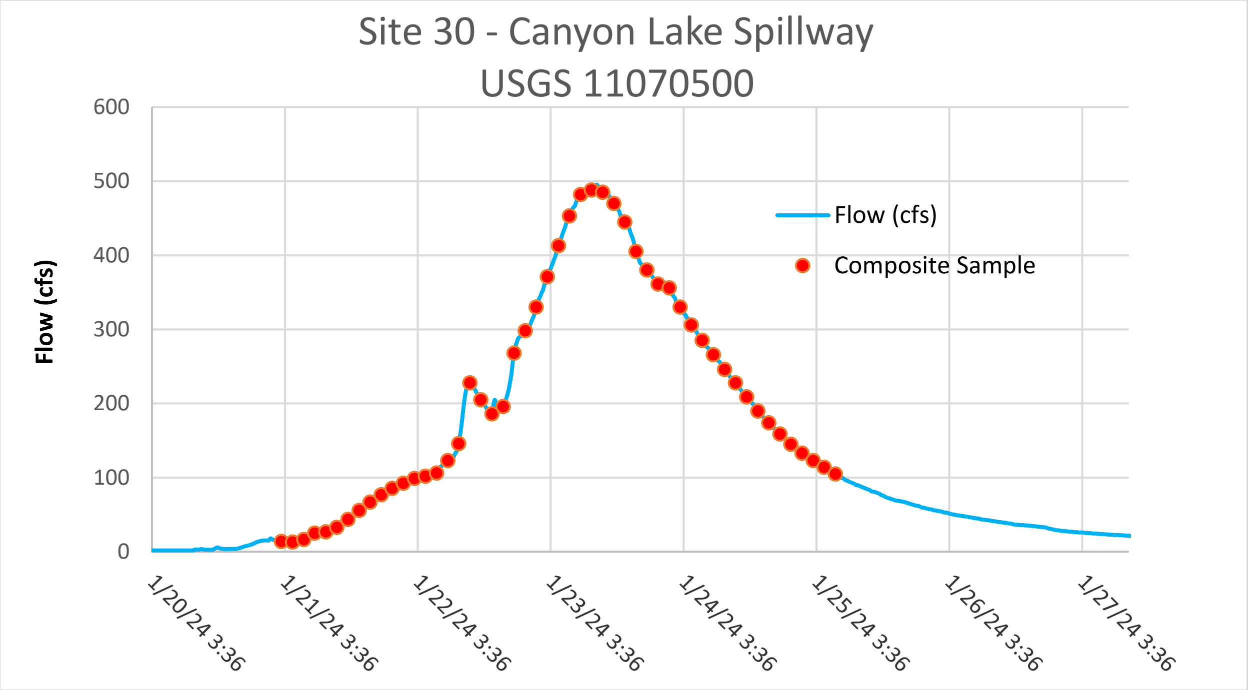


Figure 2-22. Hydrograph of First Storm Event at Canyon Lake Spillway (January 20-26, 2024)

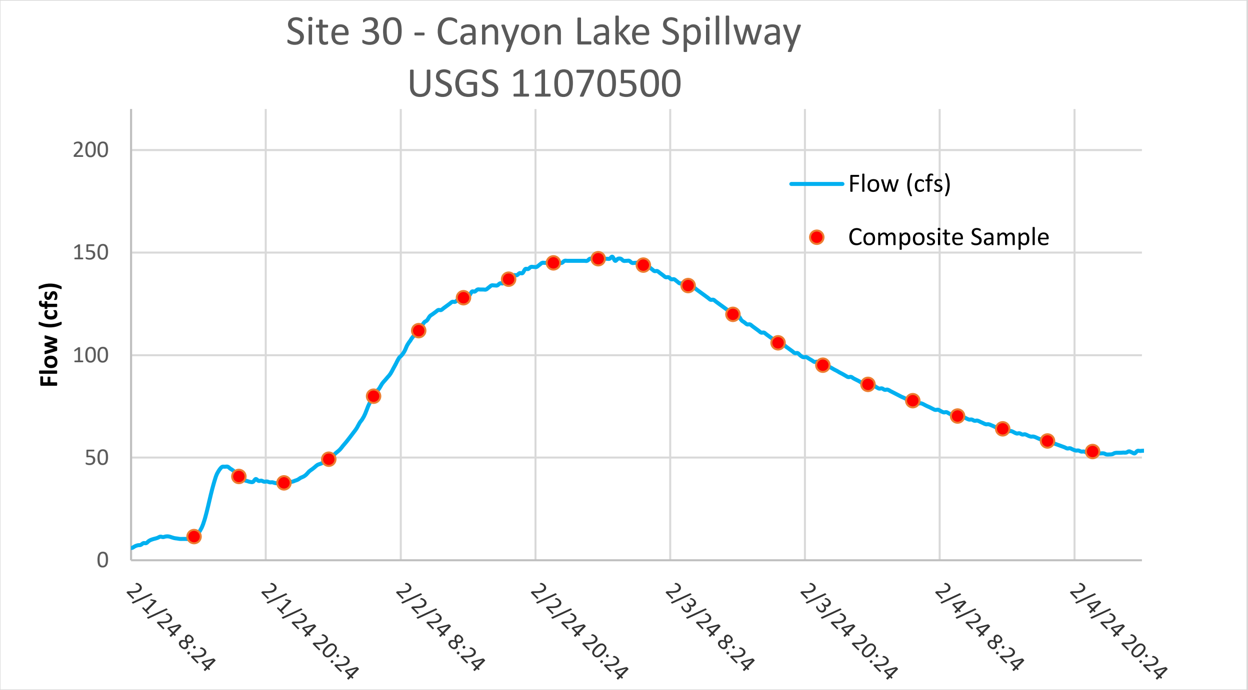


Figure 2-23. Hydrograph of Second Storm Event at Canyon Lake Spillway (February 1-4. 2024)

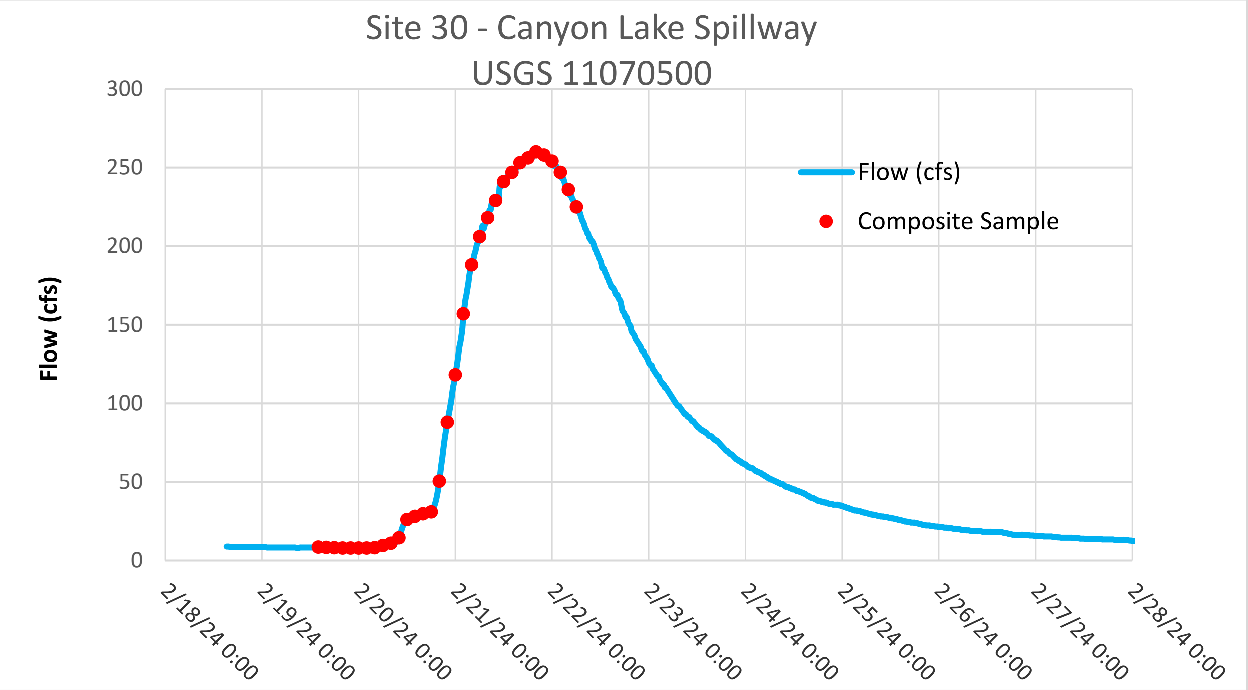


Figure 2-24. Hydrograph of Third Storm Event at Canyon Lake Spillway (February 20-24, 2024)

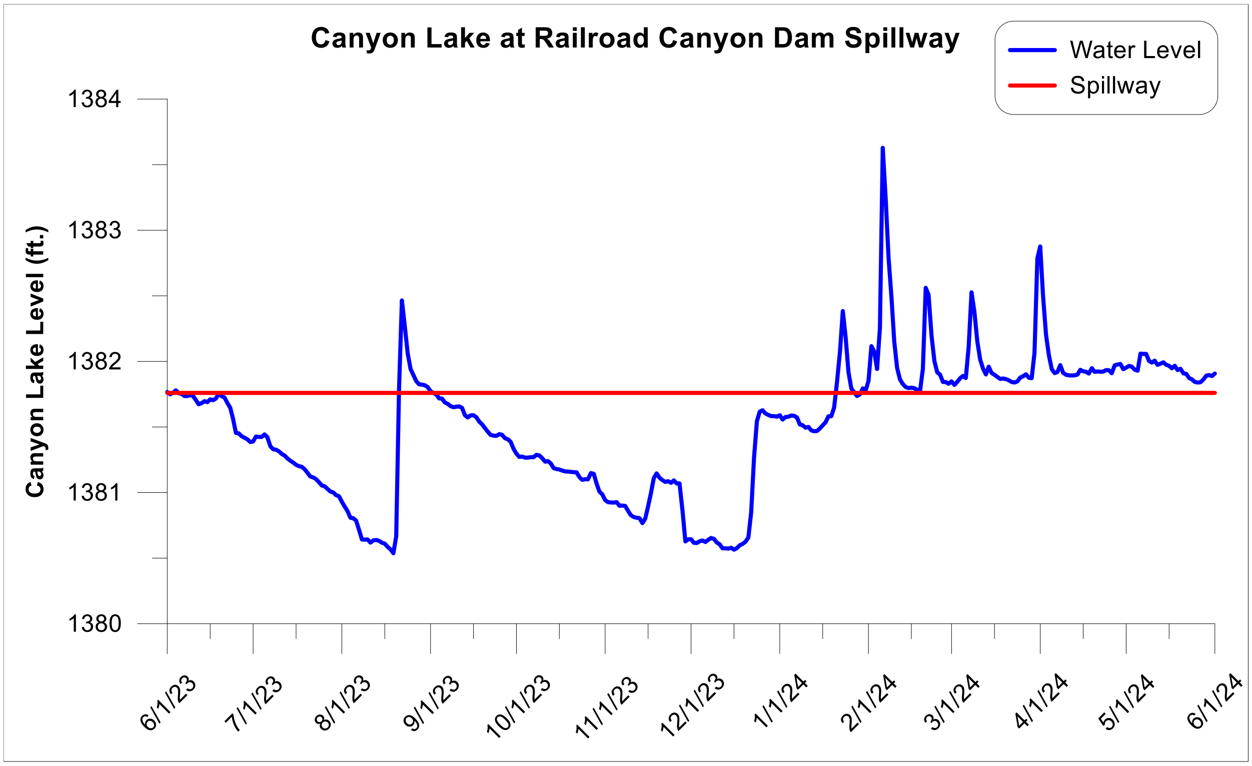


Figure 2-25. Canyon Lake Level at Railroad Canyon Dam Spillway

2.9 San Jacinto River Watershed Rainfall Records

The RCFC&WCD maintains rainfall records for rain gauges located within or near the San Jacinto River Watershed as shown in **Table 2-13**.

Table 2-13. San Jacinto River Watershed Rainfall Gauges

Station ID	Station Description	Latitude	Longitude	Elevation (ft.)
67	Lake Elsinore	33.668712	-117.332380	1281
152	Perris	33.786980	-117.231831	1494
155	Perris / Moreno Valley – Pigeon Pass	33.987703	-117.270221	1902
186	Hemet / San Jacinto	33.787067	-116.959024	1554
248	Winchester	33.702903	-117.090382	1466

Rainfall data recorded at these five stations for the period July 1, 2023, through June 30, 2024, are summarized in **Table 2-14**.

Table 2-14. Summary Rainfall Data (July 2023 to June 2024)

Monthly Rainfall (inches)	Lake Elsinore	Perris CDF	Pigeon Pass	Hemet / San Jacinto	Winchester
Jul	0.02	0	0	0	0
Aug	2.09	2.18	3.02	1.54	1.87
Sep	0.02	0.02	0.11	0	0.05
Oct	0.02	0.02	0.28	0.02	0.16
Nov	0.26	0.49	0.54	1.16	0.64
Dec	0.73	1.08	1.26	0.81	0.75
Jan	1.51	1.99	2.04	2.33	2.30
Feb	5.06	7.71	9.67	5.20	5.95
Mar	2.52	2.89	2.55	1.83	1.90
Apr	1.05	0.92	0.67	0.67	1.06
May	0.06	0	0.22	0.13	0.05
Jun	0	0	0	0	0
Annual Rainfall (inches)	**13.34**	**17.30**	**20.36**	**13.69**	**14.73**

3.0 In-Lake Monitoring

3.1 Background

Routine in-lake monitoring was initiated in 2006 by local stakeholders in cooperation with the RWQCB at three open water locations in Lake Elsinore and four locations in Canyon Lake. Initially, monitoring consisted of monthly sampling October to May, and biweekly sampling June to September, with grab samples collected at the surface, within the water column, and/or as depth-integrated samples (depending on the lake and the analyte). Based on modifications adopted to the sampling program (RWQCB Resolution No. R8-2011-0023), in 2011-2012 sampling locations in Lake Elsinore and Canyon Lake were reduced to one and four stations, respectively, for analytical chemistry. This decision was based on a review of available data that indicated consistent similar nutrient concentrations and physical water quality parameters among the three sampling sites in Lake Elsinore and two sites in the East Basin of Canyon Lake. This cost savings allowed for shifting resources toward several implementation strategies aimed at reducing nutrient impacts in both lakes as described in RWQCB Resolution No. R8-2011-0023. All in-lake monitoring was then suspended temporarily during the 2013-2014 and 2014-2015 FYs to further redirect resources toward implementing in-lake best management practices. Starting in FY 2015-2016, ongoing in-lake sampling was resumed and is required to estimate progress toward attaining nutrient TMDL targets and calculating annual and 10-year running averages. The following sections describe monitoring methods and results in both lakes for the FY 2023-2024.

3.2 Historical In-Lake Monitoring Concentrations

A summary of TMDL water quality monitoring data parameters of interest during the period of January 1, 2011, through June 30, 2024 is presented in **Tables 3-1 and 3-2**. These tables present historical calendar-year annual means since 2011 for each of the numeric targets outlined in the 2004 TMDL. The tables also present the 10-year running averages for each parameter and the number of annual means (total nitrogen, total phosphorus, dissolved oxygen, and chlorophyll-a) and individual samples (total ammonia) within each 10-year period that did not achieve the TMDL target.

Table 3-1. Summary of Historical TMDL Data for Lake Elsinore Based on Calendar Year [1]

Parameter	2020 TMDL Target	Calendar Year	Number of Samples Collected	Annual Average	Units	2011-2020 Ten Year Average (Percent of Annual Means/Samples Not Meeting TMDL Target)	2012-2021 Ten Year Average (Percent of Annual Means/Samples Not Meeting TMDL Target)	2013-2022 Ten Year Average (Percent of Annual Means/Samples Not Meeting TMDL Target)	2014-2023 Ten Year Average[a] (Percent of Annual Means/Samples Not Meeting TMDL Target)	2015-2024 Ten Year Average[a] (Percent of Annual Means/Samples Not Meeting TMDL Target)
Total Phosphorus[b]	<0.1 mg/L (Annual Average)	2011	14	**0.294**	mg/L	0.246 (100%)	0.238 (100%)	0.236 (100%)	0.234 (100%)	0.232 (100%)
		2012	9	**0.162**						
		2013	NA	NA						
		2014	NA	NA						
		2015	3	**0.383**						
		2016	8	**0.416**						
		2017	8	**0.181**						
		2018	8	**0.162**						
		2019	8	**0.154**						
		2020	8	**0.219**						
		2021	8	**0.227**						
		2022	8	**0.146**						
		2023	8	**0.221**						
		2024	3	**0.207**						
Total Nitrogen[b]	<0.75 mg/L (Annual Average)	2011	14	**3.88**	mg/L	4.91 (100%)	4.97 (100%)	5.18 (100%)	5.05 (100%)	4.80 (100%)
		2012	9	**3.32**						
		2013	NA	NA						
		2014	NA	NA						
		2015	3	**6.10**						
		2016	8	**7.28**						
		2017	8	**4.68**						
		2018	8	**5.56**						
		2019	8	**4.50**						
		2020	8	**3.99**						
		2021	8	**4.30**						
		2022	8	**5.00**						
		2023	8	**4.05**						
		2024	3	**2.58**						
Total Ammonia[c]	Exceedance Thresholds Calculated from Site Specific Water Quality Conditions During each Event	2011	15	0.049	mg/L	0.180 (2004- CMC: 0%; CCC: 10%)	0.199 (2004- CMC: 0%; CCC: 13%)	0.218 (2004- CMC: 0%; CCC: 15%)	0.232 (2004- CMC: 0%; CCC: 16%)	0.266 (2004- CMC: 0%; CCC: 16%)
		2012	9	0.096						
		2013	NA	NA						
		2014	NA	NA						
		2015	3	0.357						
		2016	8	0.176						
		2017	8	0.124						
		2018	8	0.097						
		2019	8	0.229						
		2020	8	0.312						
		2021	8	0.199						
		2022	8	0.253						
		2023	8	0.339						
		2024	3	0.580						

Table 3-1 (cont.). Summary of Historical TMDL Data for Lake Elsinore Based on Calendar Year [1]

Parameter	2020 TMDL Target	Calendar Year	Number of Samples Collected	Annual Average	Units	2011-2020 Ten Year Average (Percent of Annual Means Not Meeting TMDL Target)	2012-2021 Ten Year Average (Percent of Annual Means Not Meeting TMDL Target)	2013-2022 Ten Year Average (Percent of Annual Means Not Meeting TMDL Target)	2014-2023 Ten Year Average[a] (Percent of Annual Means Not Meeting TMDL Target)	2015-2024 Ten Year Average[a] (Percent of Annual Means/Samples Not Meeting TMDL Target)
Depth-Integrated Chlorophyll-a (Summer)[b]	≤ 25 mg/L (Summer Average)	2011	8	**169**	µg/L	186 (100%)	183 (100%)	174 (100%)	169 (100%)	154 (100%)
		2012	2	**200**						
		2013	NA	NA						
		2014	NA	NA						
		2015	1	**326**						
		2016	4	**258**						
		2017	4	**148**						
		2018	4	**87**						
		2019	4	**89**						
		2020	2	**212**						
		2021	3	**147**						
		2022	4	**122**						
		2023	4	**129**						
		2024	1	**27.6**						
Dissolved Oxygen (1-m from lake bottom)[b]	>5 mg/L 1-m from lake bottom	2011	15	**3.4**	mg/L	3.7 (100%)	3.6 (100%)	3.4 (100%)	3.6 (100%)	3.5 (100%)
		2012	8	**4.8**						
		2013	NA	NA						
		2014	NA	NA						
		2015	3	**2.9**						
		2016	8	**4.2**						
		2017	8	**4.9**						
		2018	8	**3.2**						
		2019	8	**3.3**						
		2020	8	**2.8**						
		2021	8	**2.7**						
		2022	8	**3.6**						
		2023	8	**4.7**						
		2024	3	**3.0**						

Notes:
mg-milligram; ug- microgram; L-liter; m-meter,
CCC- Criterion Continuous Concentration; CMC- Criterion Maximum Concentration
Values in Bold indicate an exceedance of one or more TMDL criteria
The CCC and CMC were calculated using the 2004 TMDL formulas.
1- Reported values and compliance summary based on sampling at the central sampling location in Lake Elsinore (LE02).
a- includes data January 2014 - June 2024.
b- exceedance frequency based annual means
c- exceedance frequency based on individual samples exceeding corresponding sample-specific CMC or CCC
NA - not applicable, data not collected in 2013-2014

Table 3-2. Summary of Historical TMDL Data for Canyon Lake Based on Calendar Year [1]

Parameter	2020 TMDL Target	Calendar Year	Number of Sampling Events	Annual Average	Units	2011-2020 Ten Year Average (Percent of Annual Means/Samples Not Meeting TMDL Target)	2012-2021 Ten Year Average (Percent of Annual Means/Samples Not Meeting TMDL Target)	2013-2022 Ten Year Average (Percent of Annual Means/Samples Not Meeting TMDL Target)	2014-2023 Ten Year Average (Percent of Annual Means/Samples Not Meeting TMDL Target)	2015-2024 Ten Year Average (Percent of Annual Means/Samples Not Meeting TMDL Target)
Total Phosphorus[b]	<0.1 mg/L (Annual Average)	2011	15	**0.850**	mg/L	0.244 (70%)	0.167 (60%)	0.138 (50%)	0.125 (50%)	0.130 (50%)
		2012	8	**0.327**						
		2013	2	**0.266**						
		2014	15	**0.246**						
		2015	7	0.084						
		2016	7	0.099						
		2017	6	**0.249**						
		2018	6	0.038						
		2019	6	**0.146**						
		2020	6	**0.133**						
		2021	6	0.084						
		2022	6	0.036						
		2023	6	**0.138**						
		2024	3	**0.291**						
Total Nitrogen[b]	<0.75 mg/L (Annual Average)	2011	15	**1.57**	mg/L	1.59 (100%)	1.65 (100%)	1.53 (100%)	1.51 (100%)	1.53 (100%)
		2012	8	**2.41**						
		2013	NA	NA						
		2014	NA	NA						
		2015	3	**1.50**						
		2016	7	**1.47**						
		2017	6	**1.30**						
		2018	6	**1.37**						
		2019	6	**1.50**						
		2020	6	**1.62**						
		2021	6	**2.06**						
		2022	6	**1.43**						
		2023	6	**1.31**						
		2024	3	**1.71**						
Total Ammonia[c]	Exceedance Thresholds Calculated from Site Specific Water Quality Conditions During each Event	2011	14	0.765	mg/L	0.444 (CMC: 0%; CCC: 6%)	0.437 (CMC: 0%; CCC: 4%)	0.444 (CMC: 0%; CCC: 5%)	0.446 (CMC: 0%; CCC: 5%)	0.460 (CMC: 0%; CCC: 5%)
		2012	8	0.251						
		2013	NA	NA						
		2014	NA	NA						
		2015	3	0.577						
		2016	7	0.270						
		2017	6	0.301						
		2018	6	0.326						
		2019	6	0.471						
		2020	6	0.593						
		2021	6	0.707						
		2022	6	0.305						
		2023	6	0.467						
		2024	3	0.580						

Table 3-2 (cont.). Summary of Historical TMDL Data for Canyon Lake Based on Calendar Year [1]

Parameter	2020 TMDL Target	Calendar Year	Number of Sampling Events	Annual Average	Units	2011-2020 Ten Year Average (Percent of Annual Means Not Meeting TMDL Target)	2012-2021 Ten Year Average (Percent of Annual Means Not Meeting TMDL Target)	2013-2022 Ten Year Average (Percent of Annual Means Not Meeting TMDL Target)	2014-2023 Ten Year Average[a] (Percent of Annual Means Not Meeting TMDL Target)	2015-2024 Ten Year Average[a] (Percent of Annual Means/Samples Not Meeting TMDL Target)
Depth-Integrated Chlorophyll-a[b]	< 25 µg/L (Annual Average)	2011	15	**52.7**	µg/L	43.0 (80%)	39.9 (70%)	35.5 (70%)	31.6 (60%)	28.1 (50%)
		2012	8	**69.3**						
		2013	2	**59.5**						
		2014	15	**56.8**						
		2015	3	**60.2**						
		2016	7	**29.7**						
		2017	6	**29.4**						
		2018	6	**27.9**						
		2019	6	21.6						
		2020	6	22.7						
		2021	6	21.8						
		2022	6	**25.4**						
		2023	8	20.5						
		2024	3	22.1						
Dissolved Oxygen (Hypolimnion)[b,d]	>5 mg/L Hypolimnion (Daily Average)	2011	11	**0.3**	mg/L	0.9 (100%)	0.9 (100%)	0.8 (100%)	0.7 (100%)	0.8 (100%)
		2012	6	**0.8**						
		2013	NA	NA						
		2014	NA	NA						
		2015	3	**4.0**						
		2016	7	**1.3**						
		2017	5	**0.3**						
		2018	5	**0.4**						
		2019	4	**0.2**						
		2020	3	**0.03**						
		2021	4	**0.2**						
		2022	4	**0.3**						
		2023	3	**0.0**						
		2024	1	**1.5**						

Notes:
mg-milligram; ug- microgram; L-liter; m-meter,
CCC- Criterion Continuous Concentration; CMC- Criterion Maximum Concentration
Values in Bold indicate an exceedance of one or more TMDL criteria
The CCC and CMC were calculated using 2004 TMDL formulas.
1- Reported values and compliance summary based on a lake-wide average for each sampling date (Sites CL07, CL08, CL09, and CL10)
a- includes data January 2014 - June 2024.
b- exceedance frequency based annual means
c- exceedance frequency based on individual samples exceeding corresponding sample-specific CMC or CCC
NA - not applicable, data not collected in 2013-2014

3.3 Lake Elsinore Monitoring

3.3.1 Sampling Station Locations and Frequency

To maintain consistency and facilitate the assessment of trends toward meeting compliance goals, the in-lake monitoring design was resumed in July 2015 using the three former stations outlined in the approved Lake Elsinore and Canyon Lake Nutrient TMDL Monitoring Plan (LESJWA, 2006; **Figure 3-1**, **Table 3-3**). Analytical chemistry samples and in-situ water column profile readings were collected at Site LE02, while only in-situ water column profile readings were performed at the remaining two stations (LE01 and LE03). Profile readings for all three stations were taken in both the morning and afternoon. Water chemistry samples collected at Site LE02 were analyzed for those constituents outlined in **Table 3-4**. Sampling in Lake Elsinore was conducted monthly during summer months (June-September) and bi-monthly (i.e., every other month) for the remainder of the monitoring year, for a total of eight sampling events per year. In-lake TMDL sampling events were coordinated to correspond with satellite overpass dates to facilitate the comparison of in-lake and satellite derived chlorophyll-a data (see Section 3.4).

Table 3-3. Lake Elsinore TMDL Monitoring Locations

Site	Latitude	Longitude
LE01	33.668978°	-117.364185°
LE02	33.663344°	-117.354213°
LE03	33.654939°	-117.341653°

Table 3-4. In-lake Analytical Constituents and Methods for Lake Elsinore

Parameter	Analysis Method	Sampling Method
Analytical Chemistry		
Nitrite Nitrogen (NO_2-N)	EPA 353.2	Depth Integrated
Nitrate Nitrogen (NO_3-N)	EPA 353.2	Depth Integrated
Total Kjeldahl Nitrogen (TKN)	EPA 351.2	Depth Integrated
Total Nitrogen (TN)[1]	Calculated	Depth Integrated
Ammonia Nitrogen (NH4-N)	EPA 350.1	Depth Integrated
Sulfide	SM 4500S2 D	Depth Integrated
Total Phosphorus (TP)	EPA 365.3	Depth Integrated
Soluble Reactive Phosphorus (SRP / Ortho-P)	EPA 365.3, EPA 353.2	Depth Integrated
Chlorophyll-a	SM 10200H	Surface (0-2m) & Depth Integrated
Total Dissolved Solids (TDS)	SM 2540 C	Depth Integrated

US EPA - United States Environmental Protection Agency; m- meter; SM- standard method

[1] Total Nitrogen calculated as TKN+NO_2+NO_3

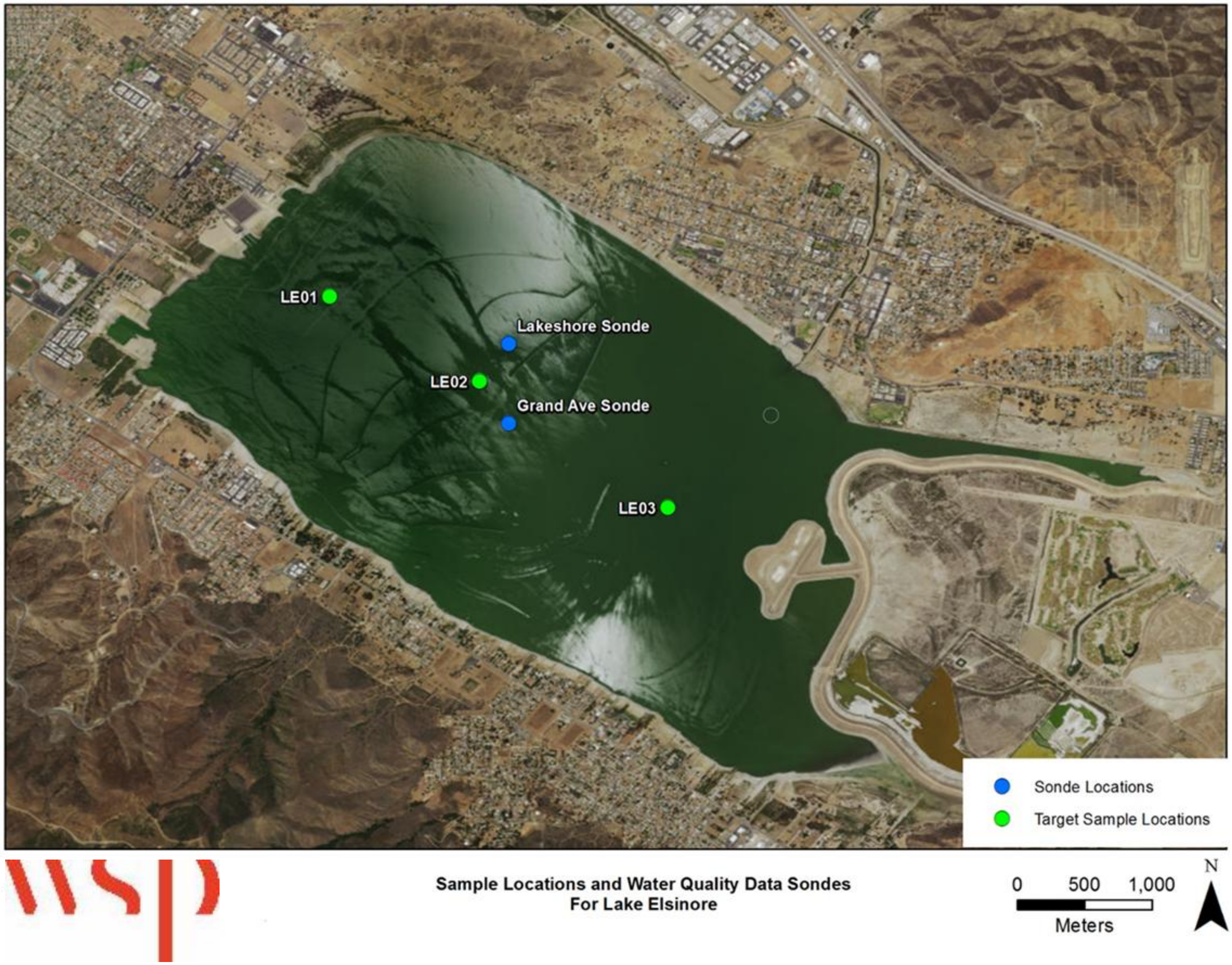


Figure 3-1. Lake Elsinore Sampling Locations

3.3.2 Sampling Methods

Depth-integrated composite samples for analytical chemistry were collected at Site LE02 by utilizing a peristaltic pump and lowering/raising an inlet tube through the water column at a uniform speed, creating a composite sample of the entire water column. Two samples were collected for chlorophyll-a: 1) a full depth-integrated composite sample as described above; and 2) a 0-2-meter (m) depth-integrated composite surface sample. All samples for chemical analysis were placed and held on wet ice immediately following collection and transferred to a local courier or shipping company on the same day of collection. Samples for analysis of nutrients, ammonia, sulfide, and total dissolved solids (TDS) were submitted to Weck Laboratories Inc., located in City of Industry, California. Samples for analysis of chlorophyll-a were submitted to Physis Environmental Laboratories Inc., located in Anaheim, California.

Secchi disk readings for water clarity, as well as in-situ water column profile data, were typically recorded between 7:00 and 9:00 in the morning at all three Lake Elsinore stations using pre-calibrated hand-held YSI field meters or equivalent for pH, temperature, DO, and specific conductivity at 1-m intervals throughout the water column. This data was used to assess lateral and vertical spatial variability within the lake. End-of-the-day water column profiles (i.e., after ~2:00pm) were also recorded for the same in-situ parameters at all three stations to assess any potential temporal variability in these parameters over the course of a day. For water quality reporting purposes, the morning and afternoon in situ measurements were averaged at each site on each date.

Satellite imagery was used as a tool to remotely measure chlorophyll-a concentrations at the water surface. These images provide a more complete picture of spatial variability that can exist for these two parameters at any given point in time. In-lake sampling dates were selected to correspond with satellite overpasses to enable comparison of analytical laboratory and satellite derived chlorophyll-a concentrations. Processed satellite imagery and associated reports were provided by EOMAP GmbH & co. KG (EOMAP) based in Germany (Castle Seefeld Schlosshof).

3.3.3 Water Quality Summary

A summary of the in-lake monitoring events for Lake Elsinore for the period of July 1, 2023 to June 30, 2024, is presented below. A total of eight Lake Elsinore events were sampled during this period under the TMDL monitoring program, with five occurring in 2023 (July 17, August 1, September 20, October 10 and December 4) and three in 2024 (February 27, April 17 and June 5). Complete monthly water column profile measurements are provided in Appendix B. Detailed analytical chemistry lab reports for each event are contained in Appendix C. Satellite imagery reports for each event are provided in Appendix D. Current data in the context of historical water quality monitoring results from 2002-present are presented in Appendix E.

A summary of mean water column profile values for each site and monitoring event are presented in **Tables 3-5 and 3-6**. Water column mean profile statistics for each site across the entire monitoring period are presented in **Table 3-7**. Mean values for water column measurements for each site, as well as the lake-wide mean are also summarized graphically in **Figures 3-2** through

Table 3-5. In-Situ Water Quality Parameter Measurements in Lake Elsinore – 2023 Monthly Means for Each Site (July – Dec 2023)

Site	Measure	Jul-23		Aug-23		Sep-23		Oct-23		Dec-23	
		Water Column Mean	1m from Bottom	Water Column Mean	1m from Bottom	Water Column Mean	1m from Bottom	Water Column Mean	1m from Bottom	Water Column Mean	1m from Bottom
LE01	**Temp (°C)**	26.9	25.2	27.9	28.0	24.8	24.3	22.6	22.6	14.2	13.9
	Cond (µS/cm)	3266	3259	3303	3303	3279	3279	3324	3326	3340	3340
	pH	*8.63*	8.26	*8.61*	*8.68*	*8.55*	8.42	*8.76*	*8.74*	*8.73*	*8.68*
	DO (mg/L)	3.8	**0.0**	0.3	**0.1**	4.3	**1.8**	5.1	**4.9**	9.4	8.5
LE02	**Temp (°C)**	26.7	25.1	27.9	28.0	24.4	24.2	22.7	22.2	14.1	13.8
	Cond (µS/cm)	3266	3260	3293	3293	3274	3274	3325	3329	3332	3337
	pH	*8.61*	8.34	*8.62*	*8.68*	*8.53*	8.50	*8.69*	8.42	*8.72*	*8.64*
	DO (mg/L)	3.4	**0.0**	0.2	**0.1**	4.5	**3.6**	4.4	**0.3**	9.2	7.4
LE03	**Temp (°C)**	26.7	25.5	27.7	27.3	24.6	24.4	22.8	22.0	14.2	14.0
	Cond (µS/cm)	3265	3261	3243	3279	3274	3274	3327	3330	3316	3326
	pH	*8.69*	8.40	*8.53*	8.28	8.47	8.45	*8.71*	8.41	*8.73*	*8.66*
	DO (mg/L)	4.0	**0.1**	0.3	**0.1**	3.8	**3.1**	4.8	**0.4**	8.5	7.1
Lake-wide Average	**Temp (°C)**	26.8	25.2	27.8	27.8	24.6	24.3	22.7	22.3	14.1	13.9
	Cond (µS/cm)	3266	3260	3279	3292	3276	3275	3325	3328	3329	3334
	pH	*8.64*	8.33	*8.59*	*8.55*	*8.52*	8.45	*8.72*	*8.52*	*8.73*	*8.66*
	DO (mg/L)	3.7	**0.1**	0.3	**0.1**	4.2	**2.8**	4.8	**1.8**	9.0	7.7

Notes:
°C = degrees Celsius; µS/cm = microSiemens per centimeter; m= meter; mg/L = milligrams per liter
2020 TMDL target for Dissolved Oxygen (DO) is no less than 5 mg/L in bottom 1m of sampling site
Bold Underline - Indicates not meeting the 2020 TMDL target
Italicize – Indicates exceedance of Basin Plan water quality objective

Table 3-6. In-Situ Water Quality Parameter Measurements in Lake Elsinore – 2024 Monthly Means for Each Site (February – June 2024)

Site	Measure	Feb-24		Apr-24		Jun-24		2023-2024 FY Mean	
		Water Column Mean	1m from Bottom	Water Column Mean	1m from Bottom	Water Column Mean	1m from Bottom	Water Column Mean	1m from Bottom
LE01	**Temp (°C)**	13.7	12.9	18.0	17.0	23.5	23.0	21.5	20.8
	Cond (µS/cm)	2660	2725	2478	2477	2559	2559	3026	3033
	pH	8.20	7.88	*8.58*	8.34	*8.95*	*8.88*	*8.63*	8.48
	DO (mg/L)	5.7	**1.5**	11.0	7.7	9.8	7.9	6.2	**4.1**
LE02	**Temp (°C)**	13.6	12.6	17.6	16.4	23.2	22.5	21.3	20.6
	Cond (µS/cm)	2660	2750	2481	2486	2560	2561	3024	3036
	pH	8.12	7.80	8.44	7.99	*8.87*	*8.69*	*8.58*	8.38
	DO (mg/L)	4.7	**0.4**	9.3	**3.8**	8.3	**4.6**	5.5	**2.5**
LE03	**Temp (°C)**	13.8	12.9	17.7	16.8	23.3	22.4	21.3	20.6
	Cond (µS/cm)	2635	2736	2480	2483	2562	2563	3013	3031
	pH	8.16	7.85	8.50	8.13	*8.78*	8.40	*8.57*	8.32
	DO (mg/L)	5.0	**0.3**	10.1	6.3	7.3	**0.5**	5.5	**2.2**
Lake-wide Mean	**Temp (°C)**	13.7	12.8	17.7	16.7	23.3	22.6	21.3	20.7
	Cond (µS/cm)	2652	2737	2480	2482	2560	2561	3021	3033
	pH	8.16	7.84	*8.51*	8.15	*8.87*	*8.65*	*8.59*	8.39
	DO (mg/L)	5.1	**0.7**	10.2	6.0	8.5	**4.4**	5.7	**2.9**

Notes:
°C = degrees Celsius; µS/cm = microSiemens per centimeter; m= meter; mg/L = milligrams per liter
2020 TMDL target for Dissolved Oxygen (DO) is no less than 5 mg/L in bottom 1m of sampling site
Bold Underline - Indicates not meeting the 2020 TMDL target
Italicize – Indicates exceedance of Basin Plan water quality objective

3-7. The measurements during the morning and afternoon of any given monitoring event were averaged prior to being summarized in the tables and figures.

In prior years, the greatest DO concentrations throughout the water column (both water column mean and 1-meter from bottom) have been observed in the winter and early spring across all three monitoring locations. However, this monitoring year, possibly as a result of the larger volume of incoming water from the storm season, the DO concentrations for the water column mean and 1-m from the bottom dropped in February 2024. Concentrations of DO near the bottom, while typically lower, resembled values usually observed in the summer months when the lake exhibits stratification. Notable decreases in pH and conductivity were also observed during the February monitoring event. All three sites then exhibited an increase in the water column mean and 1-meter from bottom DO concentration beginning in April 2024. It was at this time that a divergence between the two readings began to form as well. These diverging measurements indicate that the lake was beginning to stratify as it warmed, supported by the concurrent increased temperatures recorded during the April and June 2024 events and historical trends that demonstrate stratification of the lake typically beginning during this period. The 12-month rolling mean DO concentration 1-m above the lake bottom at Site LE02 ranged from 2.4 to 4.3 mg/L, never rising above the 2020 TMDL target of 5.0 mg/L (**Figure 3-2**).

Conductivity exhibited a gradual increase from July through December 2023, from a lake wide average of 3266 to 3329 microSiemens per centimeter (µS/cm) before decreasing each subsequent month through April 2024 to a low of 2,480 µS/cm. The low conductivity values observed in Spring 2024, particularly the large decrease between December 2023 and February 2024, were due to the substantial rainfall during that period, with the area receiving 9.05 inches of precipitation in February alone. In addition, on February 9, 2024 EVMWD ceased discharge of the recycled water to the lake when lake elevation surpassed 1247 feet (ft), the contractual threshold based on a 2003 settlement agreement between EVMWD and City of Lake Elsinore. While the recycled water had ceased during this period (restarted in August 6, 2024), it is unlikely that this contributed significantly to the decrease in overall lake specific conductivity.

The lake wide average water column mean pH for all monitoring events ranged from 8.16 to 8.87. In the three prior monitoring years higher pH values were observed above 9.0 standard units (SU), up to 9.31 last monitoring year when particularly intense algal bloom in late summer occurred. The lower pH values observed this monitoring year are likely the result of the two preceding winters which were wetter than normal, increasing the lake level and decreasing conductivity. In addition, the low conductivity values observed between February to April appeared to coincide with a cladoceran (Daphnia sp.) bloom which feed on algae. During this time, the high cladoceran density led to a reduction in the lake algal concentrations, which subsequently lowered the pH values. As highlighted in past monitoring reports, there is a strong correlation between algal photosynthesis processes and pH, especially in lakes with a significant algal biomass. Algal photosynthesis is a process that absorbs carbon dioxide from the water, promoting cell growth. As the algae extract carbon dioxide, the water’s pH levels rise due to a decrease in carbonate and bicarbonate levels.

This decrease in algal concentration between February and April 2024, presumably as a result of the decreased conductivity and explosion of the cladoceran (water flea) population, was also seen in a dramatic increase in water clarity as measured with Secchi disk. Water clarity increased from

0.66-ft in December 2023 to 5.6 ft in April 2024. (**Figure 3-7**). The pattern observed for the depth integrated and surface chlorophyll-a concentrations followed water clarity closely, with concentrations decreasing substantially between February and April 2024 (**Figure 3-10**).

For further inter-year comparisons of in-situ water quality parameters, **Table 3-7** includes lake-wide averages observed for the current 2023-24 monitoring year, as well as the prior 2019-20, 2020-21, and 2021-22 monitoring years.

Table 3-7. In-Situ Water Quality Parameter Measurements in Lake Elsinore for the Current and Prior Four Monitoring Years

		Measure	LE01	LE02	LE03	Lake-wide Average (July 2023-June 2024)	Lake-wide Average (July 2022-June 2023)	Lake-wide Average (July 2021-June 2022)	Lake-wide Average (July 2020-June 2021)	Lake-wide Average (July 2019-June 2020)	Lake-wide Average (July 2018-June 2019)
Water Column Mean	**Min**	**Temp (°C)**	13.7	13.6	13.8	13.7	10.7	11.7	13.0	12.0	11.4
		Cond (µS/cm)	2478	2481	2480	2480	2935	3610	3144	2880	3329
		pH	8.20	8.12	8.16	8.16	*8.75*	*8.67*	*8.56*	*8.97*	*8.76*
		DO (mg/L)	0.3	0.2	0.3	0.3	2.7	1.8	1.9	2.8	3.9
	Max	**Temp (°C)**	27.9	27.9	27.7	27.8	27.9	27.6	27.3	27.4	28.3
		Cond (µS/cm)	3340	3332	3327	3333	4509	4127	3474	3895	5224
		pH	*8.95*	*8.87*	*8.78*	*8.87*	*9.31*	*9.03*	*9.16*	*9.28*	*9.10*
		DO (mg/L)	11.0	9.3	10.1	10.2	10.5	10.7	8.5	11.6	10.4
	Average	**Temp (°C)**	21.5	21.3	21.3	21.3	20.6	21.4	21.5	20.5	20.9
		Cond (µS/cm)	3026	3024	3013	3021	3793	3819	3322	3562	4473
		pH	*8.63*	*8.58*	*8.57*	*8.59*	*8.98*	*8.79*	*8.81*	*9.15*	*8.93*
		DO (mg/L)	6.2	5.5	5.5	5.7	6.3	5.4	5.1	5.9	6.6
1m from Bottom	**Min**	**Temp (°C)**	12.9	12.6	12.9	12.8	10.6	11.4	12.9	11.6	11.2
		Cond (µS/cm)	2477	2486	2483	2482	2942	3608	3144	3007	3330
		pH	7.88	7.80	7.85	7.84	*8.67*	*8.60*	*8.50*	*8.85*	*8.70*
		DO (mg/L)	0.0	0.0	0.1	0.1	0.5	0.3	0.2	0.1	1.3
	Max	**Temp (°C)**	28.0	28.0	27.3	27.8	27.3	27.2	26.8	27.2	27.7
		Cond (µS/cm)	3340	3337	3330	3335	4509	4124	3478	3896	5232
		pH	*8.88*	*8.69*	*8.66*	*8.74*	*9.27*	*8.98*	*9.07*	*9.23*	*9.03*
		DO (mg/L)	8.5	7.4	7.1	7.7	9.5	10.5	8.1	8.3	8.8
	Average	**Temp (°C)**	20.8	20.6	20.6	20.7	20.2	21	21.0	20.1	20.5
		Cond (µS/cm)	3033	3036	3031	3033	3794	3817	3322	3578	4478
		pH	8.48	8.38	8.32	8.39	*8.92*	*8.74*	*8.73*	*9.07*	*8.88*
		DO (mg/L)	**4.1**	**2.5**	**2.2**	**2.9**	**4.8**	**3.8**	**3.0**	**3.7**	**4.5**

Notes:
Values are annual mean statistics for each site and annual lake wide averages.
°C = degrees Celsius; µS/cm = microSiemens per centimeter; m= meter; mg/L = milligrams per liter
2020 TMDL target for Dissolved Oxygen (DO) is no less than 5 mg/L in bottom 1m of sampling site
Bold Underline - Indicates not meeting the 2020 TMDL target
Italicize – Indicates exceedance of Basin Plan water quality objective

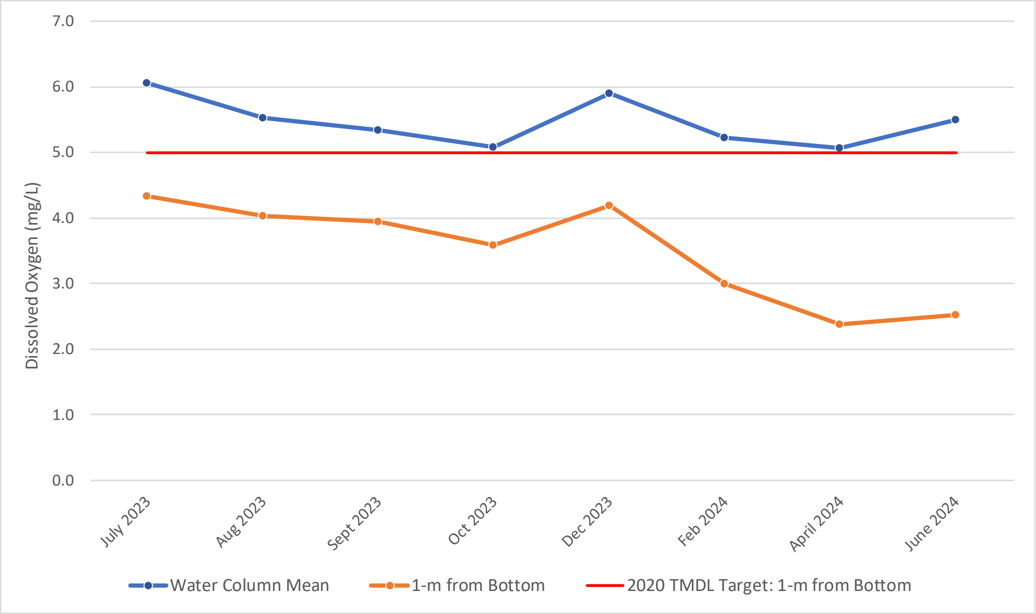
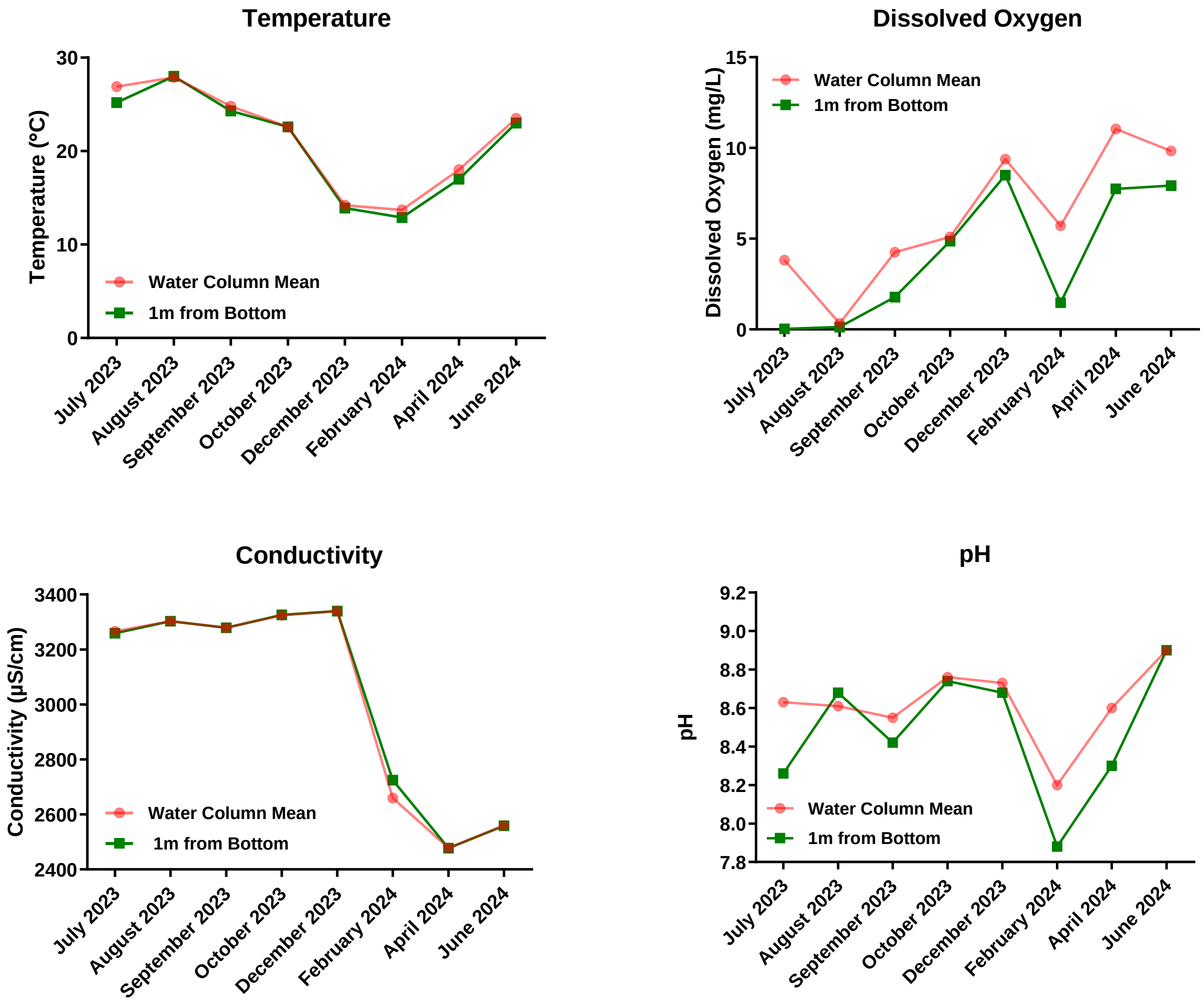


Figure 3-2. Water Column Mean Dissolved Oxygen 12-month Rolling Average – Lake Elsinore for Site LE02

Each data point is calculated by averaging the measurement from each event with the previous seven events (i.e., one year of data) to obtain a rolling average. Therefore, the full graph represents data collected from August 2022 to June 2024.


Temperature

Dissolved Oxygen

Conductivity

pH

Figure 3-3. In-Situ Physical Water Quality Parameters - Lake Elsinore - Site LE01

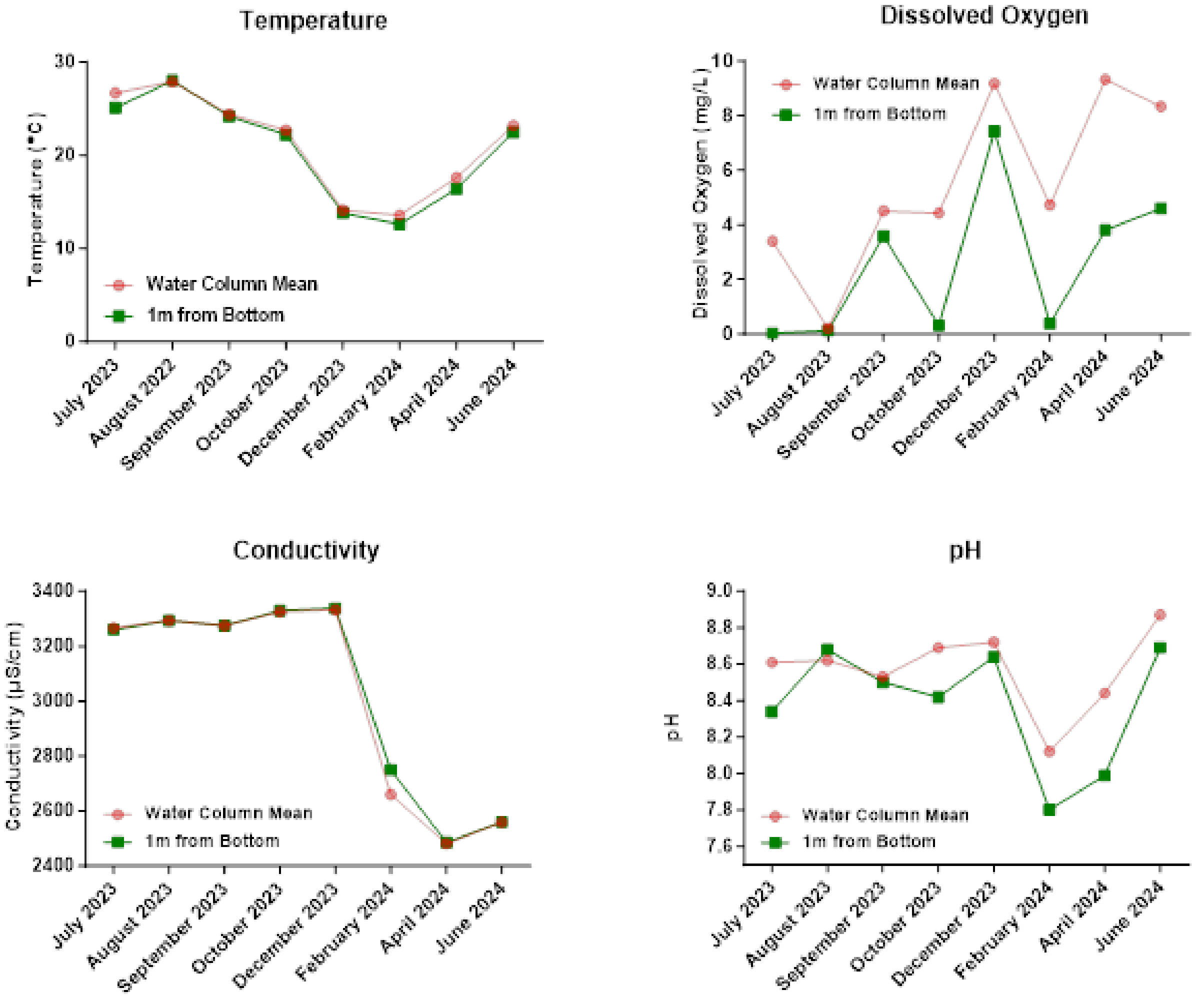


Figure 3-4. **In- Situ Physical Water Quality Parameters - Lake Elsinore Site LE02**

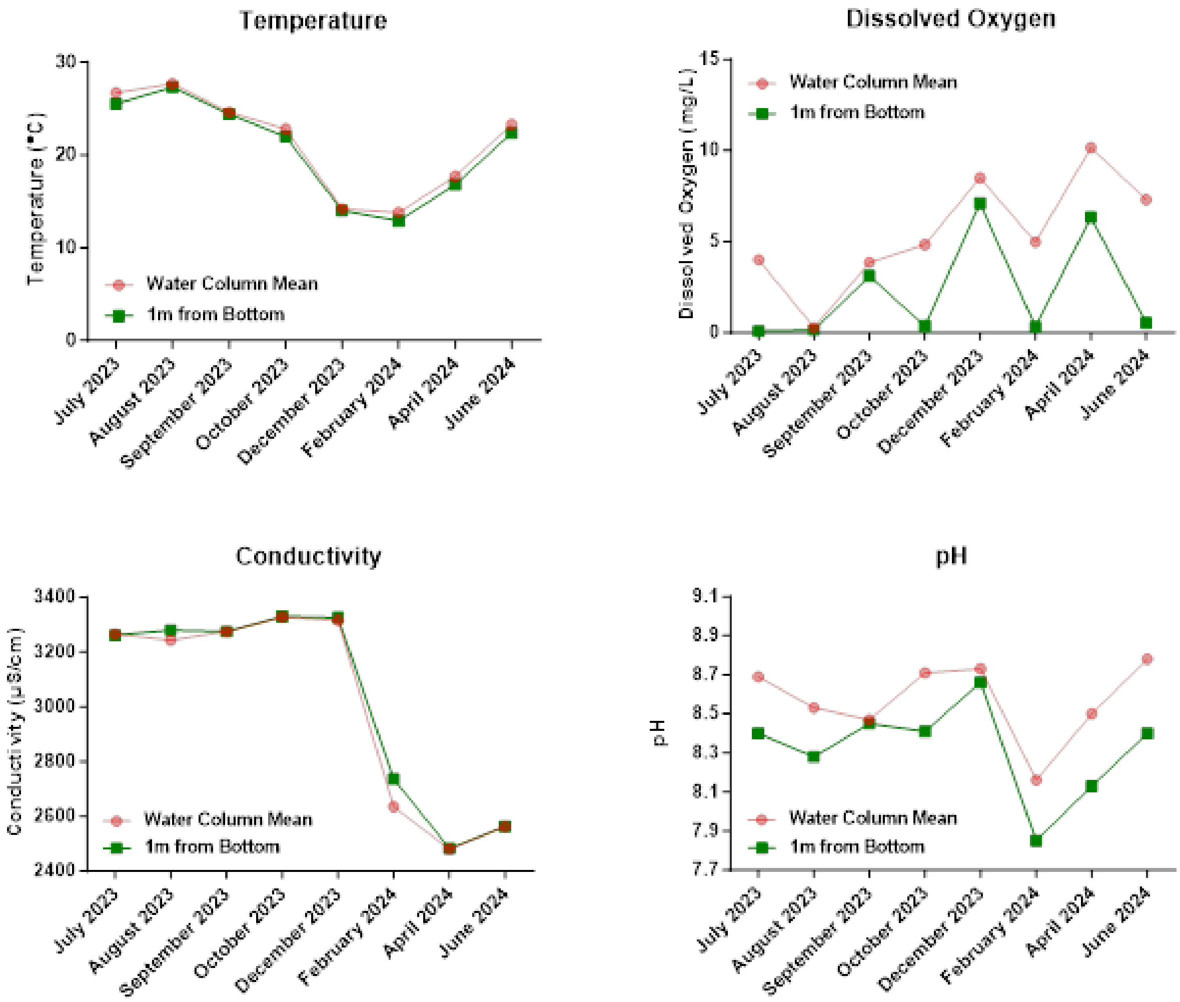


Figure 3-5. In- Situ Physical Water Quality Parameters - Lake Elsinore Site LE03

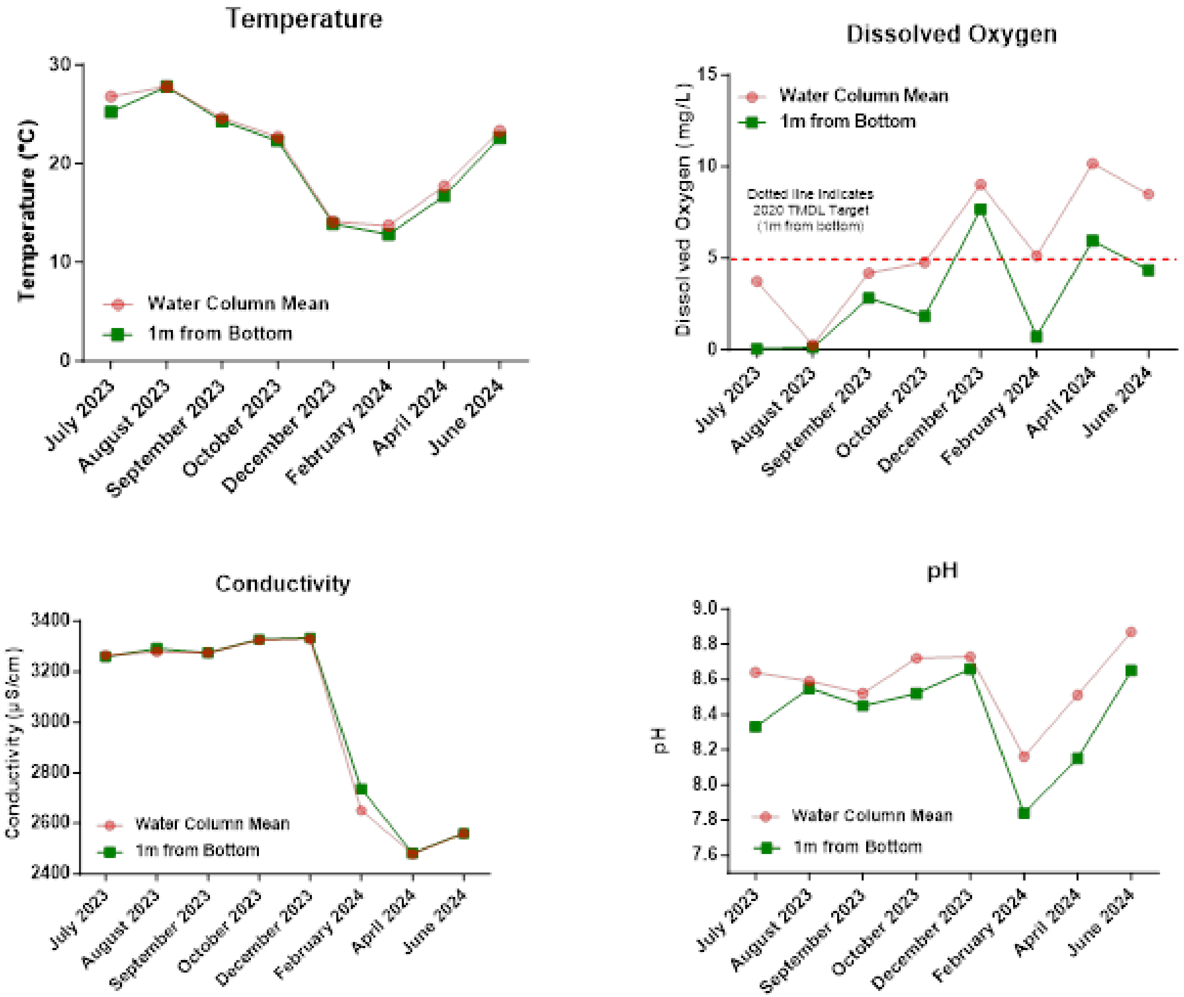


Figure 3-6. Monthly Lake-wide Mean of In-Situ Physical Water Quality Parameters – Mean of All Three Stations

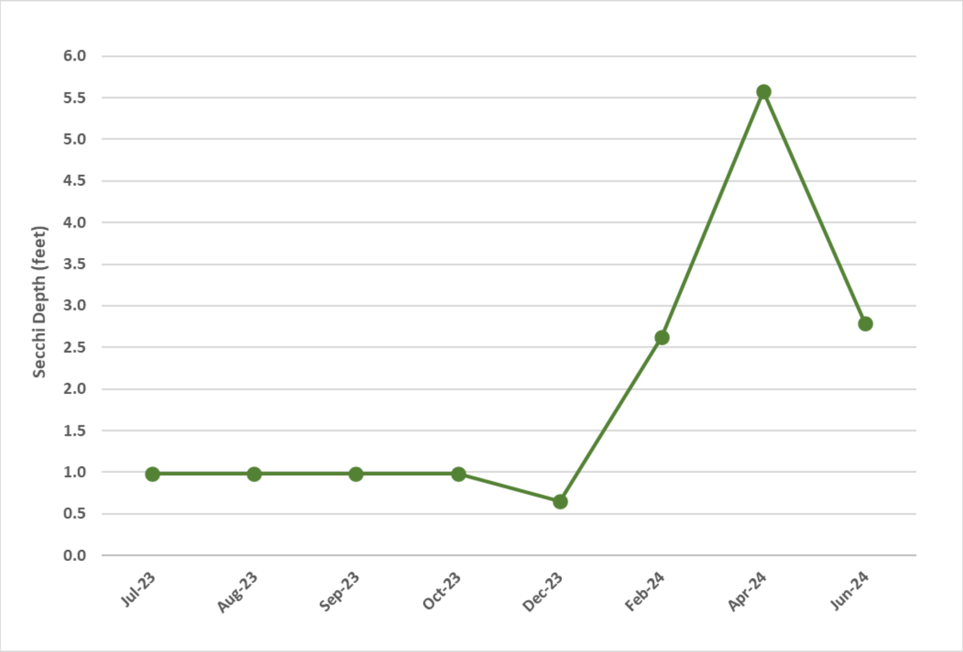


Figure 3-7. In- Situ Water Clarity Using a Secchi Disk - Lake Elsinore Site LE02

Analytical Chemistry

Monthly and annual summary analytical concentrations at Site LE02 are presented in **Tables 3-8 and 3-9**, respectively. Concentrations of analytes at Site LE02 are graphically presented in **Figures 3-8 through 3-10**.

Total nitrogen concentrations were generally steady from July to December 2023 ranging from 3.5 to 4.4, with a slight dip in August. The remaining monitoring months exhibited a continuous decrease to a low of 2.3 mg/L in June 2024 (**Figure 3-8**). The annual mean concentration of total nitrogen was 3.5 mg/L (4.8 mg/L in the previous monitoring year). The total nitrogen 1-year rolling average concentration, calculated by averaging the measurement from each event with the previous seven events (i.e., one year of data), is shown in **Figure 3-9**. While there is a decreasing trend in the rolling average total nitrogen concentration over time all values over the past 5 years exceeded the current 2020 TMDL annual target of 0.75 mg/L (**Figure 3-9**).

Total phosphorus concentrations ranged from 0.19 to 0.28 mg/L across all monitoring events, with an annual mean concentration of 0.23 mg/L (0.15 mg/L the previous year). Although some variability was observed, there was a general increase in total phosphorus between July and December 2023. Following this, concentrations of total phosphorus were lower February through June 2024 likely as a result of the substantial rainfall totals (**Figure 3-8**). Although concentrations of phosphorus declined during the 2024 monitoring events, the rolling average steadily increased from 0.16 to 0.23 mg/L over the course of the monitoring year. The 10-year rolling average for total phosphorus over the past 5 years exceeded the current 2020 TMDL annual target of 0.1 mg/L (**Figure 3-9**).

Total ammonia-N concentrations were variable across the monitoring year, with the highest concentration observed in July 2023 (0.90 mg/L). Monitoring year concentrations ranged from 0.080 to 0.90 mg/L, with an annual mean of 0.53 mg/L (**Table 3-8**). Concentrations followed a decreasing trend starting in July through December, then increased in February and April, before decreasing again in June. This decrease in total ammonia concentration in the late summer and winter is not uncommon in Lake Elsinore; the previous two monitoring years have shown a somewhat similar pattern and may be tied to the destratifcation cycle of the lake. Two exceedances of the 2004 TMDL total ammonia Criterion Continuous Concentration (CCC) objective were observed in July (0.90 mg/L) and August 2023 (0.69 mg/L). No samples exceeded the acute total ammonia Criterion Maximum Concentration (CMC) objective.[3]

Total dissolved solids (TDS) concentrations were stable between July and December before decreasing in February, as a result of stormwater input. December 2023 was the only month to reach the Basin Plan Water Quality Objective criteria of 2000 mg/L.

Depth-integrated concentrations of chlorophyll-a ranged from 23.5 to 161 µg/L across all eight sampling events, while the surface (0-2m) chlorophyll-a concentrations ranged from 36 to 169 µg/L. Variable concentrations were observed across the summer and early fall months, followed by a substantial decrease between December 2023 and February 2024 where the depth integrated chlorophyll-a concentration stayed near the 2020 TMDL target of 25 µg/L for the remainder of the monitoring year (**Figure 3-10**). These low concentrations of chlorophyll-a coincide with the decreased conductivity and is likely a result of both a dilution effect and the increased density of *Daphnia* sp. feeding on the phytoplanktonic algae. Surface chlorophyll-a concentrations increased in April to 85 µg/L, but then dropped down to 36 µg/L by June. The mean chlorophyll-a concentration observed in samples collected during the summer months (June 2023 through September 2023) was 123 µg/L for depth-integrated samples and 148 µg/L for surface samples, both exceeding the current 2020 TMDL summer average target of 25 µg/L**.** The mean annual chlorophyll-a concentration across the entire monitoring year was 83 µg/L for depth-integrated samples and 114 µg/L for surface samples**.**

---

[3] Note that the water quality objectives for total ammonia vary for each sampling event based on site-specific pH, temperature, and salinity values measured at the time of collection.

Table 3-8. Monthly Analytical Chemistry Results for Lake Elsinore in 2023-2024

Compound	Units	MDL	RL	Depth Integrated or Surface Sample	July 2023	August 2023	September 2023	October 2023	December 2023	February 2024	April 2024	June 2024	Annual Average
General Chemistry													
Total Dissolved Solids	mg/L	4.0	10	DI	1800	1900	1900	1900	*2000*	1500	1500	1500	1750
Sulfide	mg/L	0.05	0.1	DI	1.5	0.80	ND<0.05	0.10	ND<0.05	ND<0.05	ND<0.05	ND	0.30
Nitrate as N	mg/L	0.04	0.2	DI	ND<0.04	ND<0.04	ND<0.04	0.043 J	0.14 J	0.32	0.12	0.06	0.09
Nitrite as N	mg/L	0.029-0.042	0.1	DI	ND<0.042	ND<0.042	0.05 J	0.06 J	ND<0.042	ND<0.042	ND<0.029	0.05 J	0.02
Total Kjeldahl Nitrogen	mg/L	0.065-0.26	0.1-0.4	DI	4.0	3.5	4.3	4.2	4.2	2.7	2.4	2.2	3.4
Total Nitrogen[a]	mg/L	NA	NA	DI	4.0	3.5	4.4	4.3	4.3	3.0	2.5	2.3	**<u>3.5</u>**
Ammonia-Nitrogen	mg/L	0.017	0.1	DI	**<u>0.90*</u>**	**<u>0.69*</u>**	0.38	0.45	0.08 J	0.63	0.85	0.26	0.53
Unionized Ammonia[b]	mg/L	NA	NA	DI	0.16	0.15	0.05	0.08	0.01	0.02	0.06	0.07	0.08
Ortho Phosphate Phosphorus	mg/L	0.003-0.007	0.01	DI	0.12	0.02	0.01	0.02	0.02	0.15	0.17	0.09	0.07
Total Phosphorus	mg/L	0.0067	0.01	DI	0.23	0.22	0.26	0.24	0.28	0.20	0.23	0.19	**<u>0.23</u>**
Chlorophyll-a													
Chlorophyll-a	µg/L	NA	1.0	Surf	169	125	141	160	159	39.0	85.4	36.3	114
Chlorophyll-a	µg/L	NA	1.0	DI	104	91.0	147	80.8	161	23.5	26.7	27.6	83

Notes:
When a concentration was non-detect (ND), the annual mean value for compliance purposes was calculated by converting ND values to zero. If the result of the calculated mean was non-zero, but below the corresponding MDL, the mean value was reported as ND.

a - Total Nitrogen = TKN+NO_2+NO_3
b - The concentration of unionized ammonia was calculated using equation by Thursby (1986), based on site specific pH and temperature recorded at each location.
c – Sample measured out of holding time
ND – Not detected; NA – Not Applicable/ available
DI = Depth integrated; Surf = Surface 0-2m
µg/L – micrograms per liter; mg/L – milligrams per liter; MDL – method detection limit; RL – reporting limit; J - Reported value is an estimate as detection was above the MDL, but below the RL
<u>Bold Underline</u> - Indicates exceedance of 2020 TMDL Objective for annual average
***** Exceeds 2004 TMDL Permit NH3 CCC; ** Exceeds 2004 TMDL Permit NH3 CMC (ammonia exceedance is on an event basis due to its reliance upon pH and temperature at the time of collection)

Table 3-9. Analytical Chemistry Summary for Lake Elsinore – Annual Mean Statistics for 2023-2024

Compound	Units	MDL	RL	Basin Plan WQO or TMDL Target	Depth Integrated or Surface Sample	Min	Max	Summer Average[d]	Annual Average
General Chemistry									
Total Dissolved Solids	mg/L	4.0	10	2000 [2]	DI	1500	2000	1850	1750
Sulfide	mg/L	0.05	0.1	NA	DI	ND (<0.05)	1.5	0.58	0.30
Nitrate as N	mg/L	0.04	0.2	NA	DI	ND (<0.04)	0.32	ND (<0.04)	0.09
Nitrite as N	mg/L	0.029-0.042	0.1	NA	DI	ND (<0.04)	0.06	ND (<0.04)	0.02
Total Kjeldahl Nitrogen	mg/L	0.065-0.26	0.1-0.4	NA	DI	2.2	4.3	3.8	3.4
Total Nitrogen[a]	mg/L	NA	NA	0.75 [b1]	DI	2.3	4.4	3.8	**3.5**
Ammonia-Nitrogen	mg/L	0.017	0.1	2004 - CMC: 1.692-6.948[c1]; CCC: 0.351-2.097[c1]	DI	0.08	**0.90***	0.51	0.53
Unionized Ammonia[c]	mg/L	NA	NA	NA	DI	0.01	0.16	0.10	0.08
Ortho Phosphate Phosphorus	mg/L	0.003-0.007	0.01	NA	DI	0.01	0.17	0.04	0.07
Total Phosphorus	mg/L	0.0067	0.01	0.1[b1]	DI	0.19	0.28	0.22	**0.23**
Chlorophyll-a									
Chlorophyll-a	µg/L	NA	1.0	25 [d1]	Surf	36	169	**148**	114
Chlorophyll-a	µg/L	NA	1.0	25 [d1]	DI	24	161	**123**	83

Notes:

When a concentration was non-detect, the annual value for compliance purposes was calculated by converting non-detect (ND) values to zero. If the result of the calculation was below the corresponding MDL, the annual average value was reported as ND.

a - Total Nitrogen = $TKN+NO_2+NO_3$
b - Annual average
c - The range of TMDL target thresholds apply to individual samples, not applicable to annual means
d - Summer average (June 2023 – September 2023)
1 – 2020 TMDL Target, based on Table 5-9n of 2004 TMDL
2 – Santa Ana Region Basin Plan Water Quality Objective
NA – Not applicable/ available; ND – not detected
DI = Depth integrated; Surf = Surface 0-2m
mg/L – micrograms per liter; ug/L – milligrams per liter; MDL – method detection limit; RL – reporting limit; J –Reported value was detected above the MDL, but below the RL
Bold Underline - Indicates exceedance of 2020 TMDL target
***** Exceeds 2004 TMDL Permit NH3 CCC; ****** Exceeds 2004 TMDL Permit NH3 CMC (ammonia exceedance is on an event basis due to its reliance upon pH and temperature at the time of collection)

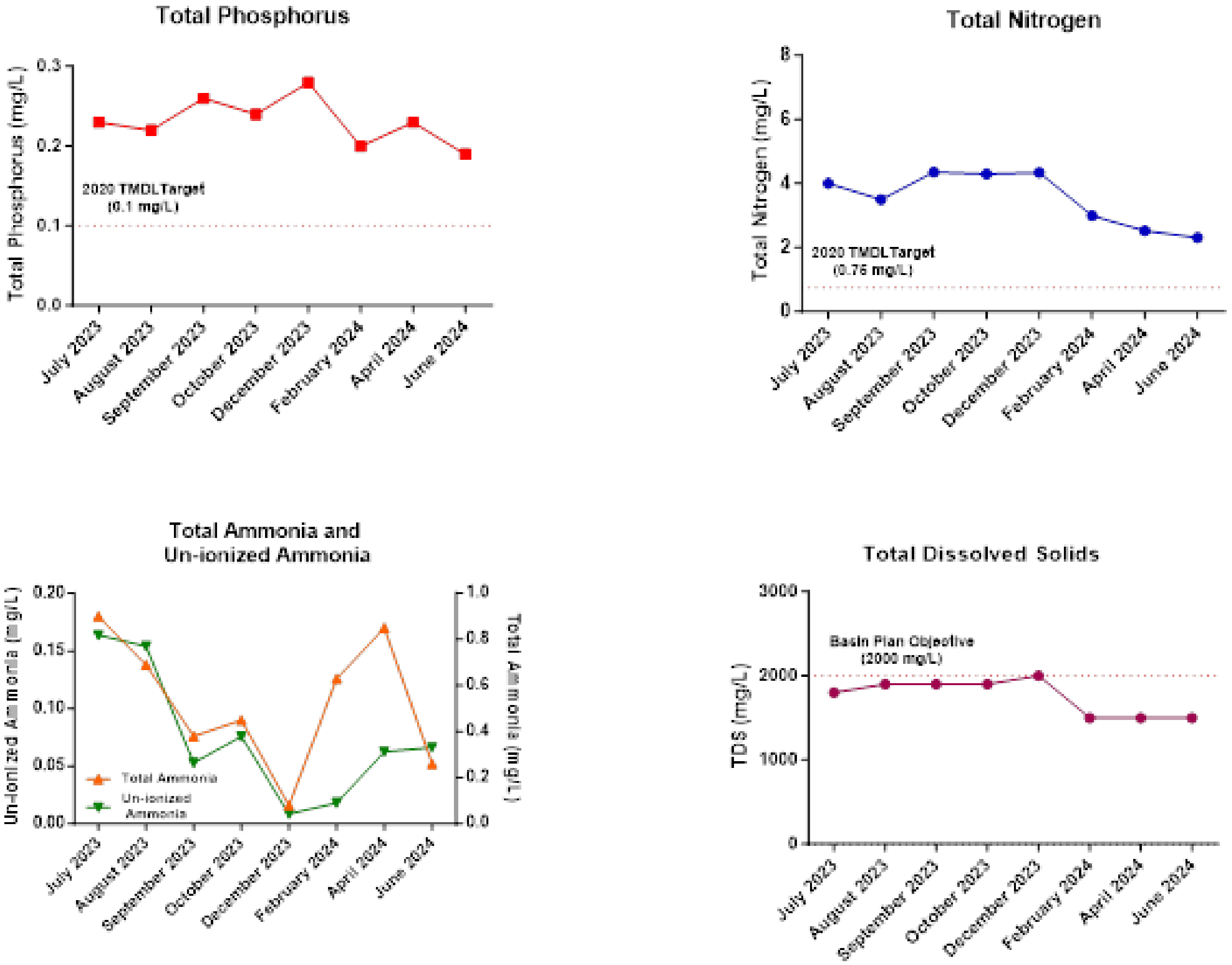
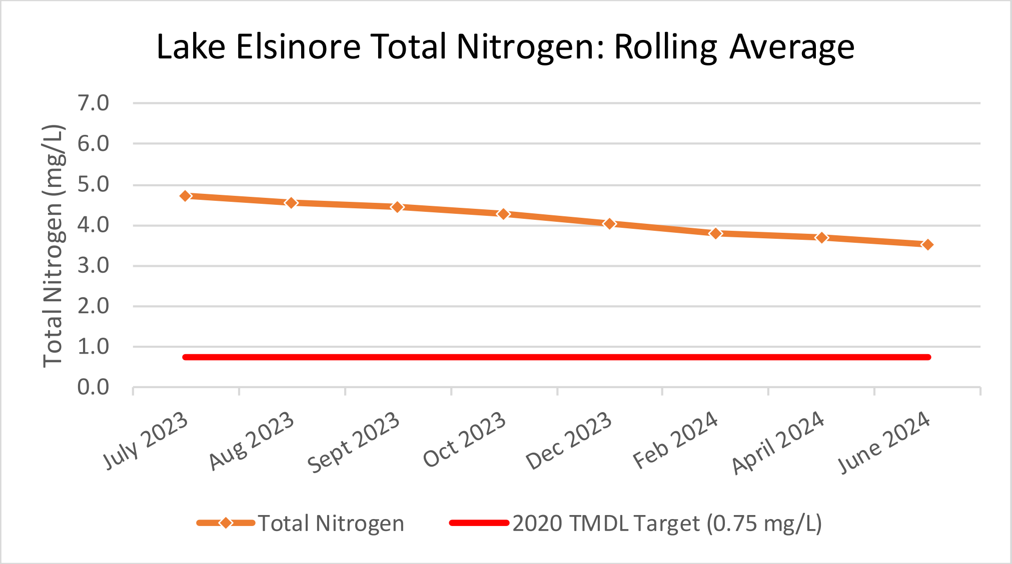


Figure 3-8. Lake Elsinore Analytical Chemistry – Depth-Integrated Samples Site LE02 (July 2023-June 2024)

Long term trends can be found in Appendix E



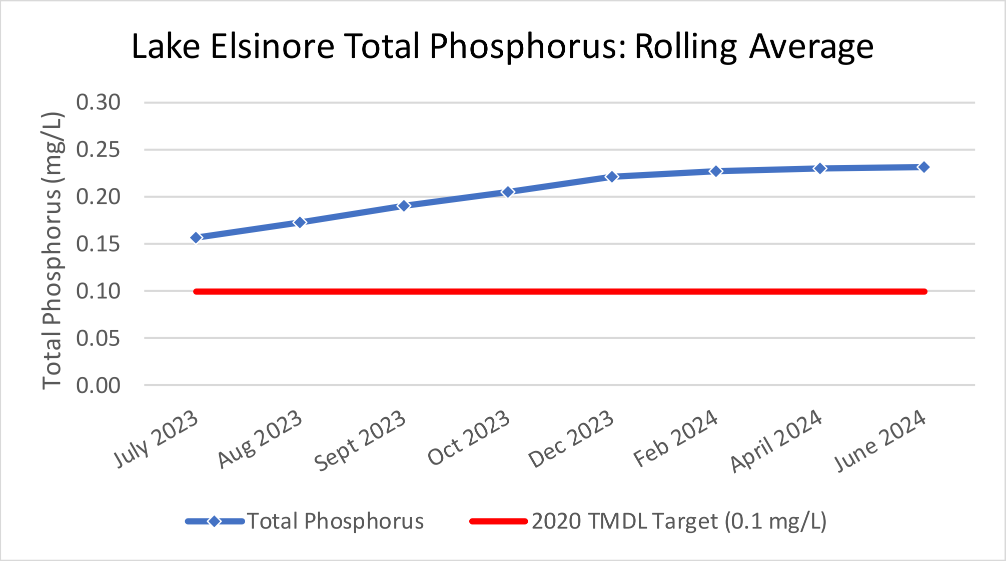


Figure 3-9. Lake Elsinore Analytical Chemistry – Total Nitrogen and Total Phosphorus Rolling Averages (July 2023 – June 2024)

Each data point is calculated by averaging the value of each event with the previous seven events (i.e., one year of data) to obtain a rolling average. Therefore, the graph represents data collected from August 2022 to June 2024.

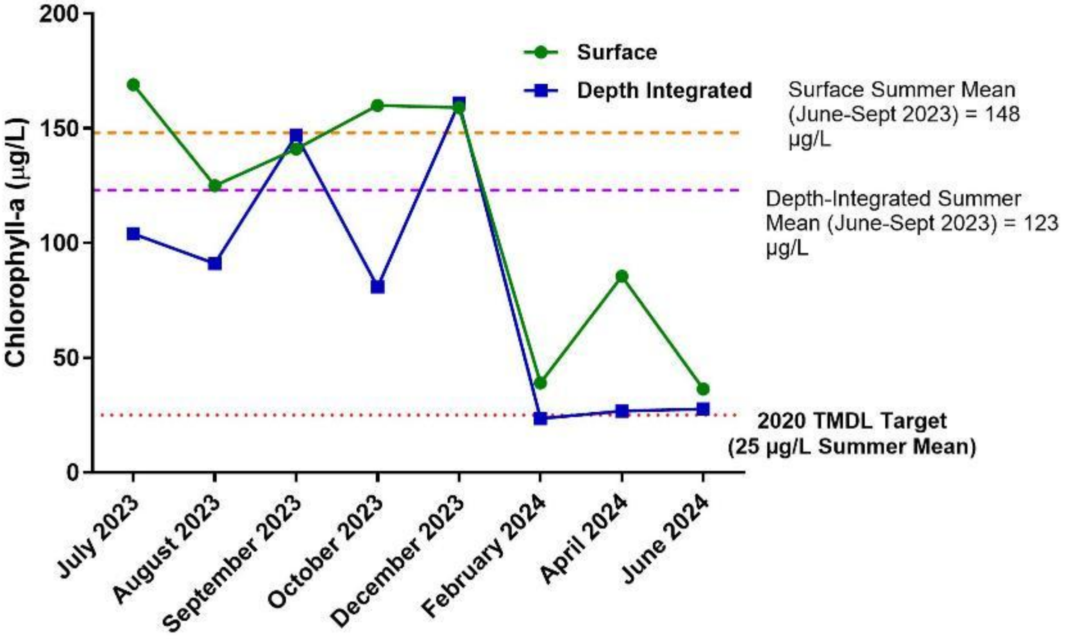


Figure 3-10. Lake Elsinore Analytical Chemistry – Depth-Integrated and Surface Chlorophyll-a at Site LE02

Long term trends can be found in Appendix E

3.4 Canyon Lake Monitoring

3.4.1 Sampling Station Locations and Frequency

As with Lake Elsinore, sampling parameters and locations in Canyon Lake were based on the TMDL monitoring conducted between 2006 and 2012 to provide consistency in assessing trends toward meeting compliance goals. The in-lake monitoring design halted in 2012 was resumed in July 2015 using the four stations outlined in the approved Lake Elsinore and Canyon Lake Nutrient TMDL Monitoring Plan (LESJWA, 2006; **Figure 3-11**, **Table 3-10)**. Two sites are located in the main body of the lake (CL07 near the dam and CL08 in the northern arm), and two in the East Bay (CL09 and CL10). Samples for analytical chemistry and chlorophyll-a were collected at all four sites, in addition to morning and afternoon in-situ water column profile readings.

Sampling in Canyon Lake was conducted bi-monthly (i.e., every other month) concurrent with the TMDL sampling in Lake Elsinore and was also coordinated with satellite overpass dates (see Section 3.4).

Table 3-10. Canyon Lake TMDL Monitoring Locations

Site	Latitude	Longitude
CL07	33.678027°	-117.275135°
CL08	33.688211°	-117.268944°
CL09	33.681100°	-117.258892°
CL10	33.679495°	-117.250669°

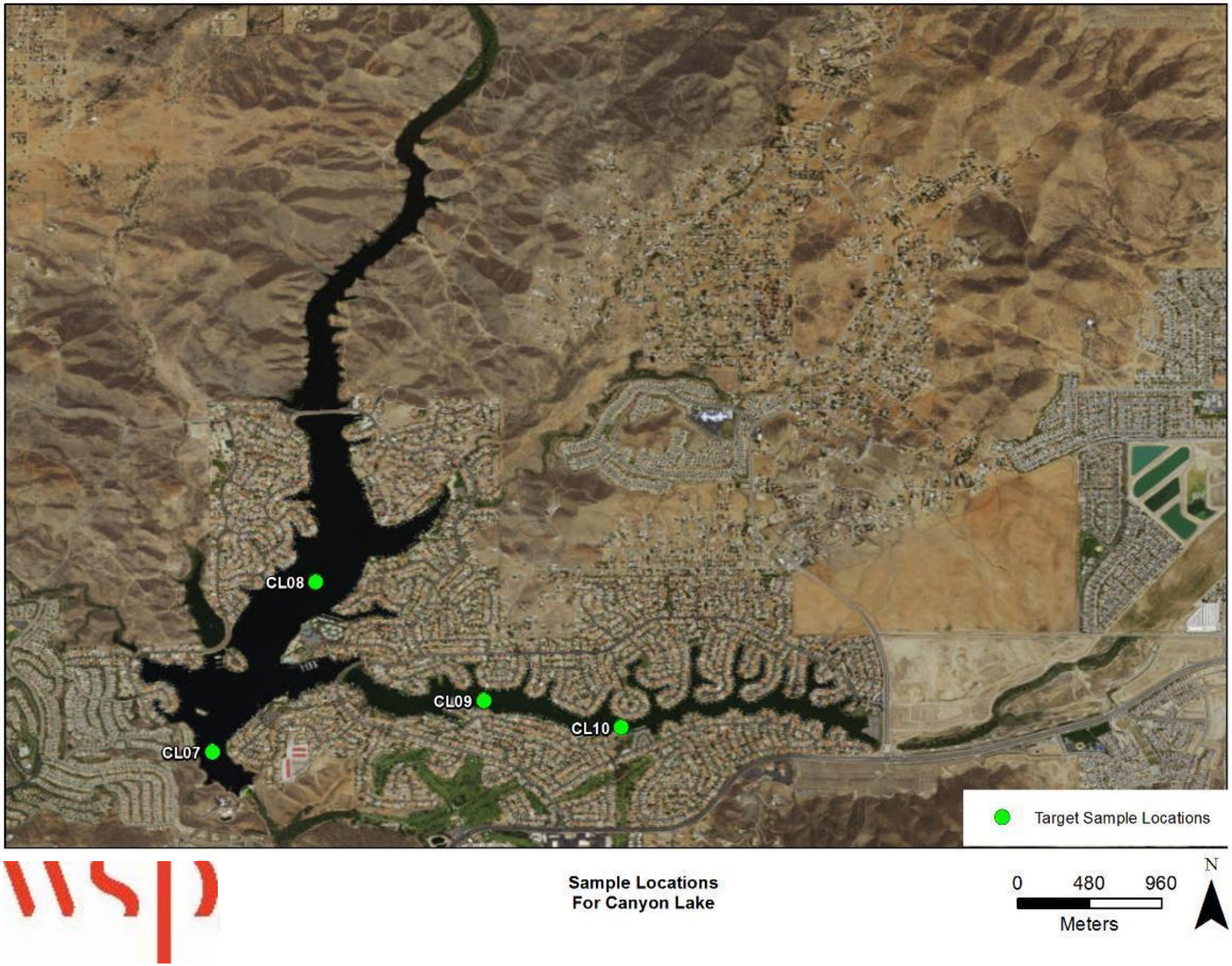


Figure 3-11. Canyon Lake Sampling Locations

3.4.2 Sampling Methods

Samples for analytical chemistry were collected in the same manner as in Lake Elsinore using a peristaltic pump to collect depth-integrated composite samples. Two samples were collected for chlorophyll-a: 1) a full depth-integrated composite sample; and 2) a 0-2-m depth-integrated composite surface sample. All analytical samples were held on wet ice immediately following collection and transferred to a local courier or shipping company on the same day of collection. Samples for analysis of nutrients, ammonia, sulfide, TDS, total suspended solids and chlorophyll-a were submitted to Weck Laboratories Inc., located in City of Industry, California with methods summarized in **Table 3-11**.

Beginning with the February 2017 sampling event, the TMDL Task Force directed that the pre- and post-alum application monitoring be integrated into the routine TMDL monitoring, given that the monitored analytes were largely identical to the TMDL monitoring, with the exception of aluminum and total suspended solids. Given this directive, total/dissolved aluminum and total suspended solids were added to the nutrient TMDL monitoring analyte list for all subsequent routine TMDL monitoring events on Canyon Lake. During the 2023-2024 monitoring period, Canyon Lake alum applications were performed during the weeks of October 2, 2023 and April 22, 2024. Pre-alum application monitoring events were performed on September 20, 2023 and on April 17, 2024. The subsequent respective bi-monthly TMDL events on October 10, 2023 and June 5, 2024 serving as the post-alum application monitoring.

In-situ water column profile data was recorded in the morning at all four Canyon Lake stations using pre-calibrated hand-held YSI field meters or equivalent for pH, temperature, DO, and specific conductivity at 1-m intervals throughout the water column. These data were used to assess lateral and vertical spatial variability within the lake. End-of-the-day water column profiles (i.e., after ~2:00pm) were also recorded for the same suite of in-situ parameters at all stations to assess any potential temporal variability in these parameters over the course of a day. Water clarity was also assessed with a Secchi disk at all stations. For water quality reporting purposes, the morning and afternoon in situ measurements were averaged at each site on each date.

Satellite imagery was used to remotely measure chlorophyll-a concentrations at the water surface in Canyon Lake.

Table 3-11. In-lake Analytical Constituents and Methods for Canyon Lake (2023-2024)

Parameter	Analysis SOP #	Sampling Method
Analytical Chemistry		
Nitrite Nitrogen (NO_2-N)	EPA 353.2	Depth Integrated
Nitrate Nitrogen (NO_3-N)	EPA 353.2	Depth Integrated
Total Kjeldahl Nitrogen (TKN)	EPA 351.2	Depth Integrated
Total Nitrogen (TN)	Calculated	Depth Integrated
Ammonia Nitrogen (NH4-N)	EPA 350.1	Depth Integrated
Sulfide	SM 4500S2 D	Depth Integrated
Total Phosphorus (TP)	EPA 365.3	Depth Integrated
Soluble Reactive Phosphorus (SRP / Ortho-P)	EPA 365.3	Depth Integrated
Chlorophyll-a	SM 10200H	Surface (0-2m) & Depth Integrated
Total Dissolved Solids (TDS)	SM 2540 C	Depth Integrated
Total Suspended Solids (TSS)	SM 2540D	Depth Integrated
Total Aluminum	EPA 200.7	Depth Integrated
Dissolved Aluminum	EPA 200.7	Depth Integrated

Notes:
US EPA - United States Environmental Protection Agency; m- meter; SM- standard method

3.4.3 Water Quality Summary

A summary of the in-lake monitoring events for Canyon Lake for the period of July 1, 2023 to June 30, 2024 is presented below. A total of six events were sampled under the TMDL monitoring program, with three occurring in 2023 (August 01, October 10, and December 04) and three in 2024 (February 27, April 17, and June 05). Complete monthly water column profiles can be found in Appendix B. Detailed analytical chemistry lab reports for each event are contained in Appendix C. Satellite imagery reports for each event are provided in Appendix D. Current data in the context of historical water quality monitoring results from 2002-present are presented in Appendix E.

Water Column Profiles

A summary of water column profile mean values for each site and monitoring event are presented in **Tables 3-12 and 3-13**. A summary of water column profile mean values for each basin (i.e., Main Lake and East) are presented in **Tables 3-14 and 3-15**. Water column profile mean statistics for each site across the entire monitoring period are presented in **Table 3-16**. Mean water column values across the annual cycle are also summarized graphically in **Figures 3-12 to 3-16**. Mean profile values are gathered by averaging morning and afternoon readings across sites.

For the purposes of this report, the epilimnion is defined as the region of the water column above the thermocline, while the hypolimnion is the region of the water column below the thermocline, with both regions exhibiting relatively stable temperatures. The thermocline portion of the water column is defined as the region between the epilimnion and hypolimnion where a marked drop in temperature per unit of depth is evident (i.e., >1.0°C change over 1-m depth differential). Measurements within the thermocline were excluded from epilimnion and hypolimnion averaging.

Full water column means included data recorded from all three zones when stratification was present.

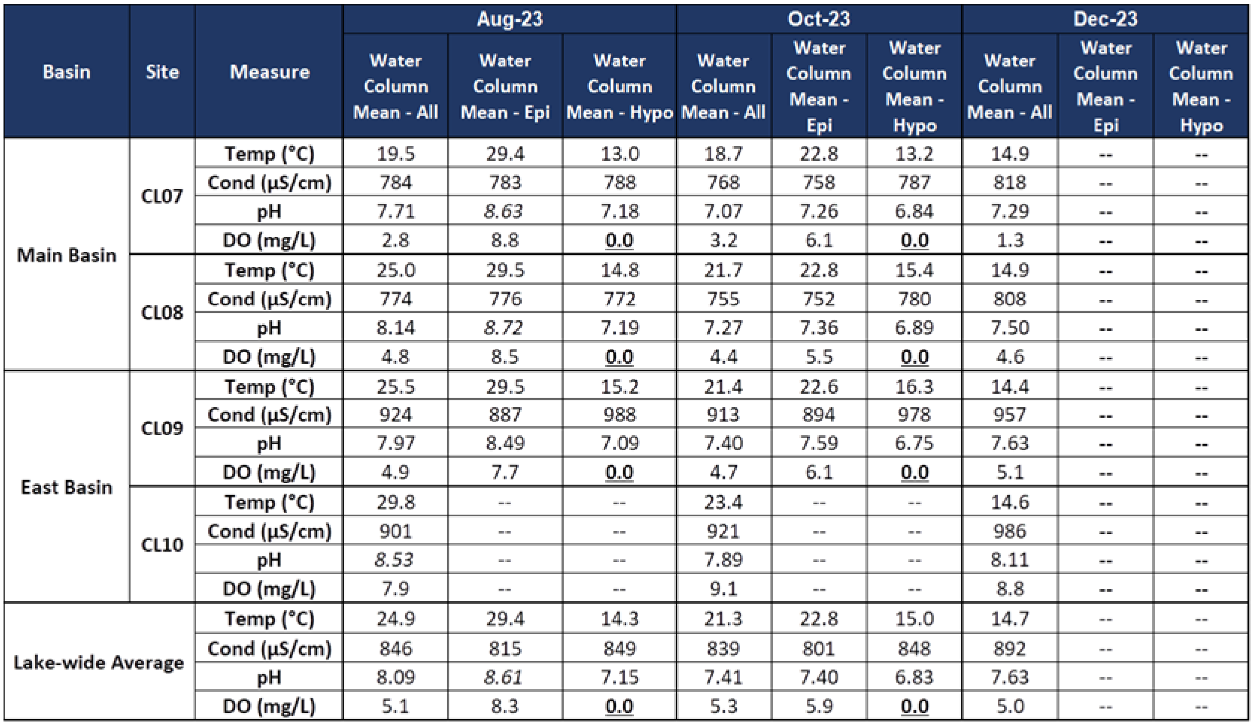
For both the Main Basin and East Basin, temperatures exhibited a similar pattern to the previous monitoring year with the lowest temperatures occurring during the winter months (December and February) and the highest temperatures in August and October. Dissolved oxygen concentrations (as water column mean) were relatively stable compared to the previous three monitoring years, remaining within a fairly narrow band across the monitoring period for both basins. As with previous years, the lake exhibited stratification in August and October 2023, becoming de-stratified December through April, before becoming stratified again in late Spring 2024 (**Figures 3-12 and 3-13**). When the thermocline develops, typically beginning in late spring and lasting through fall, DO concentrations within the epilimnion and hypolimnion diverge with hypolimnion concentrations falling substantially during that timeframe. Lake-wide water column mean DO for the current monitoring year was 5.3 mg/L, down from the mean of 6.7 mg/L in the 2022-2023 monitoring year. This year's DO concentration is more similar to the monitoring years of July 2018 to June 2021 (**Table 3-16**). The rolling 12-month DO concentration was never above the 2020 TMDL target of 5.0 mg/L in the hypolimnion (**Figure 3-14**). The rolling average of the full water column mean was above 5.0 mg/L for all monitoring dates (**Figure 3-15**).

Specific conductivity within the epilimnion and hypolimnion (when stratified) and the water column was stable through December. A large decline in specific conductivity was observed in February 2024 related to rainfall, followed by increases in April and June 2024. Mean specific conductivity in the full water column mean ranged from 465 to 813 µS/cm and 786 to 971 µS/cm, in the Main Basin and East Basin, respectively (**Tables 3-14 and 3-15, Figures 3-12 and 3-13**). Mean monthly full water column values for pH were similar between the two Basins, with values ranging from 7.64 to 8.42 and 7.17 to 8.05 for the East Basin and Main Basin, respectively.

Secchi depths between the two Basins showed slightly different patterns. A large increase in Secchi depth (increased clarity) was observed in October in the Main Basin, with a peak of 7.4 feet visibility, before decreasing through April to 1.8-ft. The East Basin had a steady decline in clarity from August through February before increasing then through June (**Figure 3-16**). The increase in water clarity within the Main Basin during the October 2023 event could be related to the alum application applied in the weeks prior to the event. The binding of phosphorus in the water column from alum applications reduces the available nutrients and in turn reduces the planktonic algae. This is also evident as chlorophyll-a exhibited a corresponding decline in October and December of 2023.

For further comparisons regarding in-situ water quality parameters, **Table 3-16** includes lake-wide averages observed for the current 2023-24 monitoring year, as well as the prior 5 monitoring years.

Table 3-12. In-Situ Water Quality Parameter Measurements for Canyon Lake - Monthly Means for Each Site (August – December 2023)



Basin	Site	Measure	Aug-23			Oct-23			Dec-23		
			Water Column Mean - All	Water Column Mean - Epi	Water Column Mean - Hypo	Water Column Mean - All	Water Column Mean - Epi	Water Column Mean - Hypo	Water Column Mean - All	Water Column Mean - Epi	Water Column Mean - Hypo
Main Basin	CL07	Temp (°C)	19.5	29.4	13.0	18.7	22.8	13.2	14.9	--	--
		Cond (µS/cm)	784	783	788	768	758	787	818	--	--
		pH	7.71	*8.63*	7.18	7.07	7.26	6.84	7.29	--	--
		DO (mg/L)	2.8	8.8	**<u>0.0</u>**	3.2	6.1	**<u>0.0</u>**	1.3	--	--
	CL08	Temp (°C)	25.0	29.5	14.8	21.7	22.8	15.4	14.9	--	--
		Cond (µS/cm)	774	776	772	755	752	780	808	--	--
		pH	8.14	*8.72*	7.19	7.27	7.36	6.89	7.50	--	--
		DO (mg/L)	4.8	8.5	**<u>0.0</u>**	4.4	5.5	**<u>0.0</u>**	4.6	--	--
East Basin	CL09	Temp (°C)	25.5	29.5	15.2	21.4	22.6	16.3	14.4	--	--
		Cond (µS/cm)	924	887	988	913	894	978	957	--	--
		pH	7.97	8.49	7.09	7.40	7.59	6.75	7.63	--	--
		DO (mg/L)	4.9	7.7	**<u>0.0</u>**	4.7	6.1	**<u>0.0</u>**	5.1	--	--
	CL10	Temp (°C)	29.8	--	--	23.4	--	--	14.6	--	--
		Cond (µS/cm)	901	--	--	921	--	--	986	--	--
		pH	*8.53*	--	--	7.89	--	--	8.11	--	--
		DO (mg/L)	7.9	--	--	9.1	--	--	8.8	--	--
Lake-wide Average		Temp (°C)	24.9	29.4	14.3	21.3	22.8	15.0	14.7	--	--
		Cond (µS/cm)	846	815	849	839	801	848	892	--	--
		pH	8.09	*8.61*	7.15	7.41	7.40	6.83	7.63	--	--
		DO (mg/L)	5.1	8.3	**<u>0.0</u>**	5.3	5.9	**<u>0.0</u>**	5.0	--	--

Notes:
Epi = epilimnion; Hypo = hypolimnion**;** **--** not applicable due to lack of thermocline
2020 TMDL target for Dissolved Oxygen (DO) is no less than 5 mg/L in the hypolimnion
<u>Bold Underline</u> - Indicates exceedance of 2020 TMDL target
Italicize – Indicates exceedance of Basin Plan Water Quality Objective

Table 3-13. In-Situ Water Quality Parameter Measurements for Canyon Lake - Monthly Means for Each Site (February – June 2024)

Basin	Site	Measure	Feb-24			Apr-24			Jun-24		
			Water Column Mean - All	Water Column Mean - Epi	Water Column Mean - Hypo	Water Column Mean - All	Water Column Mean - Epi	Water Column Mean - Hypo	Water Column Mean - All	Water Column Mean - Epi	Water Column Mean - Hypo
Main Basin	CL07	Temp (°C)	12.3	--	--	15.0	--	--	17.5	24.8	15.7
		Cond (µS/cm)	484	--	--	586	--	--	635	652	635
		pH	7.60	--	--	7.93	--	--	7.76	*9.16*	7.76
		DO (mg/L)	4.5	--	--	4.4	--	--	2.6	10.1	**2.6**
	CL08	Temp (°C)	12.5	--	--	15.7	--	--	20.5	25.0	17.4
		Cond (µS/cm)	447	--	--	581	--	--	648	657	633
		pH	7.72	--	--	8.17	--	--	8.19	*9.14*	7.72
		DO (mg/L)	5.8	--	--	5.8	--	--	4.0	9.4	**1.9**
East Basin	CL09	Temp (°C)	13.2	--	--	16.0	--	--	20.4	24.8	13.7
		Cond (µS/cm)	777	--	--	817	--	--	905	847	968
		pH	7.79	--	--	8.21	--	--	8.07	*9.00*	7.09
		DO (mg/L)	5.1	--	--	5.7	--	--	4.7	10.4	**0.0**
	CL10	Temp (°C)	14.4	--	--	18.6	--	--	25.0	--	--
		Cond (µS/cm)	796	--	--	837	--	--	927	--	--
		pH	8.08	--	--	*8.63*	--	--	*8.50*	--	--
		DO (mg/L)	8.2	--	--	8.2	--	--	7.3	--	--
Lake-wide Average		Temp (°C)	13.1	--	--	16.3	--	--	20.8	24.9	15.6
		Cond (µS/cm)	626	--	--	705	--	--	779	719	745
		pH	7.80	--	--	8.23	--	--	8.13	*9.10*	7.52
		DO (mg/L)	5.9	--	--	6.0	--	--	4.7	10.0	**1.5**

Notes:
Epi = epilimnion; Hypo = hypolimnion; -- not applicable due to lack of thermocline
2020 TMDL target for Dissolved Oxygen (DO) is no less than 5 mg/L in the hypolimnion
Bold Underline - Indicates exceedance of 2020 TMDL target
Italicize – Indicates exceedance of Basin Plan Water Quality Objective

Table 3-14. In-Situ Water Quality Parameter Measurements for Canyon Lake - Monthly Means for Each Basin (August – December 2023)

Basin	Measure	Aug-23			Oct-23			Dec-23		
		Water Column Mean - All	Water Column Mean - Epi	Water Column Mean - Hypo	Water Column Mean - All	Water Column Mean - Epi	Water Column Mean - Hypo	Water Column Mean - All	Water Column Mean - Epi	Water Column Mean - Hypo
Main	Temp (°C)	22.2	29.4	13.9	20.2	22.8	14.3	14.9	--	--
	Cond (µS/cm)	779	780	780	761	755	784	813	--	--
	pH	7.92	*8.67*	7.18	7.17	7.31	6.86	7.40	--	--
	DO (mg/L)	3.8	8.6	**0.0**	3.8	5.8	**0.0**	2.9	--	--
East	Temp (°C)	27.6	29.5	15.2	22.4	22.6	16.3	14.5	--	--
	Cond (µS/cm)	913	887	988	917	894	978	971	--	--
	pH	8.25	8.49	7.09	7.64	7.59	6.75	7.87	--	--
	DO (mg/L)	6.4	7.7	**0.0**	6.9	6.1	**0.0**	7.0	--	--
Lake-wide Average	Temp (°C)	24.9	29.5	14.5	21.3	22.7	15.3	14.7	--	--
	Cond (µS/cm)	846	833	884	839	824	881	892	--	--
	pH	8.09	*8.58*	7.13	7.41	7.45	6.81	7.63	--	--
	DO (mg/L)	5.1	8.2	**0.0**	5.3	6.0	**0.0**	5.0	--	--

Notes:
Epi = epilimnion; Hypo = hypolimnion**;** **--** not applicable due to lack of thermocline
2020 TMDL target for Dissolved Oxygen (DO) is no less than 5 mg/L in the hypolimnion
Bold Underline - Indicates exceedance of 2020 TMDL target
Italicize – Indicates exceedance of Basin Plan Water Quality Objective

Table 3-15. In-Situ Water Quality Parameter Measurements for Canyon Lake - Monthly Means for Each Basin (February – June 2024)

Basin	Measure	Feb-24			Apr-24			Jun-24		
		Water Column Mean - All	Water Column Mean - Epi	Water Column Mean - Hypo	Water Column Mean - All	Water Column Mean - Epi	Water Column Mean - Hypo	Water Column Mean - All	Water Column Mean - Epi	Water Column Mean - Hypo
Main	Temp (°C)	12.4	--	--	15.4	--	--	19.0	24.9	16.6
	Cond (µS/cm)	465	--	--	584	--	--	642	655	634
	pH	7.66	--	--	8.05	--	--	7.97	*9.15*	7.74
	DO (mg/L)	5.1	--	--	5.1	--	**--**	3.3	9.8	**2.2**
East	Temp (°C)	13.8	--	--	17.3	--	--	22.7	24.8	13.7
	Cond (µS/cm)	786	--	--	827	--	--	916	847	968
	pH	7.94	--	--	8.42	--	--	8.28	*9.00*	7.09
	DO (mg/L)	6.7	--	--	6.9	--	**--**	6.0	10.4	**0.0**
Lake-wide Average	Temp (°C)	13.1	--	--	16.3	--	--	20.8	24.9	15.1
	Cond (µS/cm)	626	--	--	705	--	--	779	751	801
	pH	7.80	--	--	8.23	--	--	8.13	*9.07*	7.41
	DO (mg/L)	5.9	--	--	6.0	--	**--**	4.7	10.1	**1.1**

Notes:
Epi = epilimnion; Hypo = hypolimnion**;** **--** not applicable due to lack of thermocline
2020 TMDL target for Dissolved Oxygen (DO) is no less than 5 mg/L in the hypolimnion
Bold Underline - Indicates exceedance of 2020 TMDL target
Italicize – Indicates exceedance of Basin Plan Water Quality Objective

Table 3-16. In-Situ Water Quality Parameter Measurements for Canyon Lake - Annual Mean Statistics for Each Site (August 2023 – June 2024) and Comparison to Previous Monitoring Events

		Measure	CL07	CL08	Main Basin	CL09	CL10	East Basin	Lake-wide Average (July 2023-June 2024)	Lake-wide Average (July 2022-June 2023)	Lake-wide Average (July 2021-June 2022)	Lake-wide Average (July 2020-June 2021)	Lake-wide Average (July 2019-June 2020)	Lake-wide Average (July 2018-June 2019)
Water Column Mean	**Min**	**Temp (°C)**	12.3	12.5	12.4	22.8	14.8	18.8	15.6	11.3	12.4	12.8	12.1	11.6
		Cond (µS/cm)	484	447	465	777	796	786	626	702	939	740	583	519
		pH	7.07	7.27	7.17	7.40	7.89	7.64	7.41	7.51	7.72	7.45	7.59	7.40
		DO (mg/L)	1.3	4.0	2.7	4.7	7.3	6.0	4.3	4.6	5.4	3.8	4.3	3.1
	Max	**Temp (°C)**	19.5	25.0	22.2	25.5	29.8	27.6	24.9	26.2	25.6	24.3	24.6	26.7
		Cond (µS/cm)	818	808	813	957	986	971	892	1157	1102	960	894	1069
		pH	7.93	8.19	8.06	8.21	*8.63*	8.42	8.24	8.32	8.29	8.26	*8.57*	8.20
		DO (mg/L)	4.5	5.8	5.2	5.7	9.1	7.4	6.3	10.4	9.1	7.6	8.7	8.3
	Average	**Temp (°C)**	16.3	18.4	17.3	18.5	21.0	19.7	18.5	18.2	19.4	18.9	17.8	18.6
		Cond (µS/cm)	679	669	674	882	895	888	781	969	1016	839	767	839
		pH	7.56	7.83	7.70	7.85	8.29	8.07	7.88	7.98	8.04	7.92	8.05	7.85
		DO (mg/L)	3.1	4.9	4.0	5.0	8.2	6.6	5.3	6.7	7.2	5.4	5.8	5.5
Epilimnion	**Min**	**Temp (°C)**	22.8	22.8	22.8	22.6	--	22.6	22.8	24.4	20.1	20.4	24.9	20.2
		Cond (µS/cm)	652	657	655	847	--	847	719	771	930	685	594	594
		pH	7.26	7.36	7.31	7.59	--	7.59	7.40	8.34	8.20	8.21	*8.58*	8.40
		DO (mg/L)	6.1	5.5	5.8	6.1	--	6.1	5.9	7.2	7.9	7.7	7.3	6.7
	Max	**Temp (°C)**	29.4	29.5	29.4	29.5	--	29.5	29.4	28.8	28.5	28.3	27.7	28.1
		Cond (µS/cm)	783	776	780	894	--	894	818	1138	1077	923	716	920
		pH	*9.16*	*9.14*	*9.15*	*9.00*	--	*9.00*	*9.10*	*8.58*	*8.60*	*9.13*	*9.55*	*8.91*
		DO (mg/L)	10.1	9.4	9.8	10.4	--	10.4	10.0	8.2	10.6	11.2	11.0	9.1
	Average	**Temp (°C)**	25.7	25.8	25.7	25.7	--	25.7	25.7	26.6	24.9	24.9	26.5	24.6
		Cond (µS/cm)	731	728	730	876	--	876	778	975	1012	803	660	734
		pH	8.35	8.41	8.38	8.36	--	8.36	8.37	8.45	8.42	8.61	*9.05*	8.60
		DO (mg/L)	8.3	7.8	8.1	8.1	--	8.1	8.1	7.7	9.5	9.2	9.0	7.8
Hypolimnion	**Min**	**Temp (°C)**	13.0	14.8	13.9	13.7	--	13.7	13.8	13.1	13.2	13.7	14.3	12.5
		Cond (µS/cm)	635	633	634	968	--	968	745	832	923	800	760	657
		pH	6.84	6.89	6.86	6.75	--	6.75	6.83	7.03	7.13	6.93	7.06	7.06
		DO (mg/L)	0.0	0.0	0.0	0.0	--	0.0	0.0	0.0	0.0	0.0	0.0	0.2
	Max	**Temp (°C)**	15.7	17.4	16.6	16.3	--	16.3	16.5	17.2	19.5	16.9	14.9	17.2
		Cond (µS/cm)	788	780	784	988	--	988	852	1062	1056	942	788	888
		pH	7.76	7.72	7.74	7.09	--	7.09	7.52	7.21	7.49	7.29	7.35	7.21
		DO (mg/L)	2.6	1.9	2.2	0.0	--	0.0	1.5	0.1	1.0	0.8	0.2	0.3
	Average	**Temp (°C)**	13.9	15.9	14.9	15.1	--	15.1	15.0	15.3	16.5	15.2	14.6	14.4
		Cond (µS/cm)	737	728	733	978	--	978	814	956	995	870	776	744
		pH	7.26	7.26	7.26	6.97	--	6.97	7.17	7.11	7.29	7.10	7.22	7.14
		DO (mg/L)	**0.9**	**0.6**	**0.7**	**0.0**	--	**0.0**	**0.5**	**0.1**	**0.4**	**0.2**	**0.1**	**0.2**

Notes:
-- not applicable due to lack of thermocline
Values reported for epilimnion and hypolimnion are the arithmetic mean of measurements collected across all months sampled in which stratification was present.
Main Basin = mean of Sites CL07 and CL08
East Basin = mean of Sites CL09 and CL10
2020 TMDL target for Dissolved Oxygen (DO) is no less than 5 mg/L in the hypolimnion
Bold Underline - Indicates exceedance of 2020 TMDL target

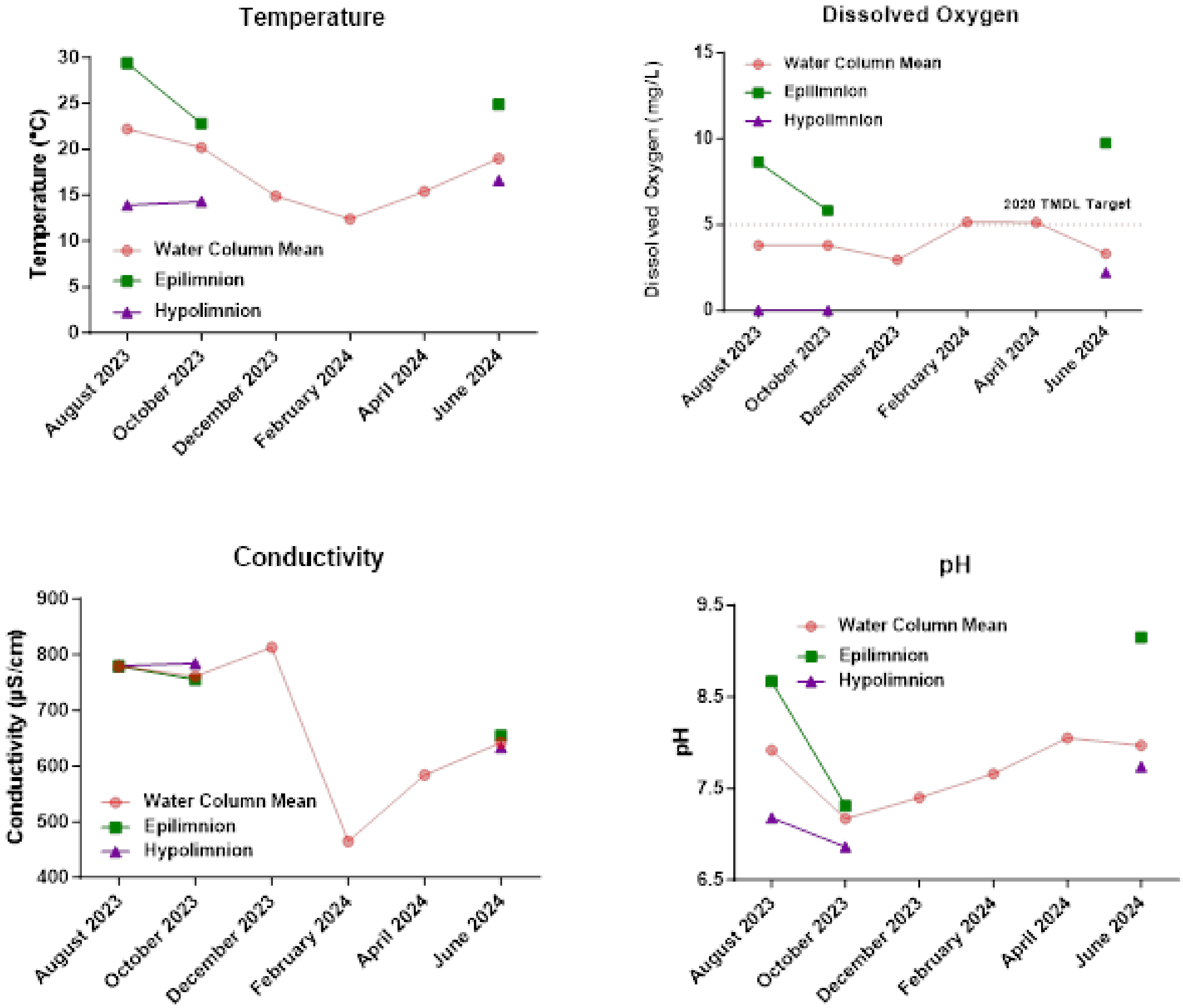


Figure 3-12. Mean In-Situ Physical Water Quality Parameters – Canyon Lake Main Basin

(Values represent the mean of Sites CL07 & CL08. Missing epilimnion and hypolimnion values represent time periods when no stratification was present)

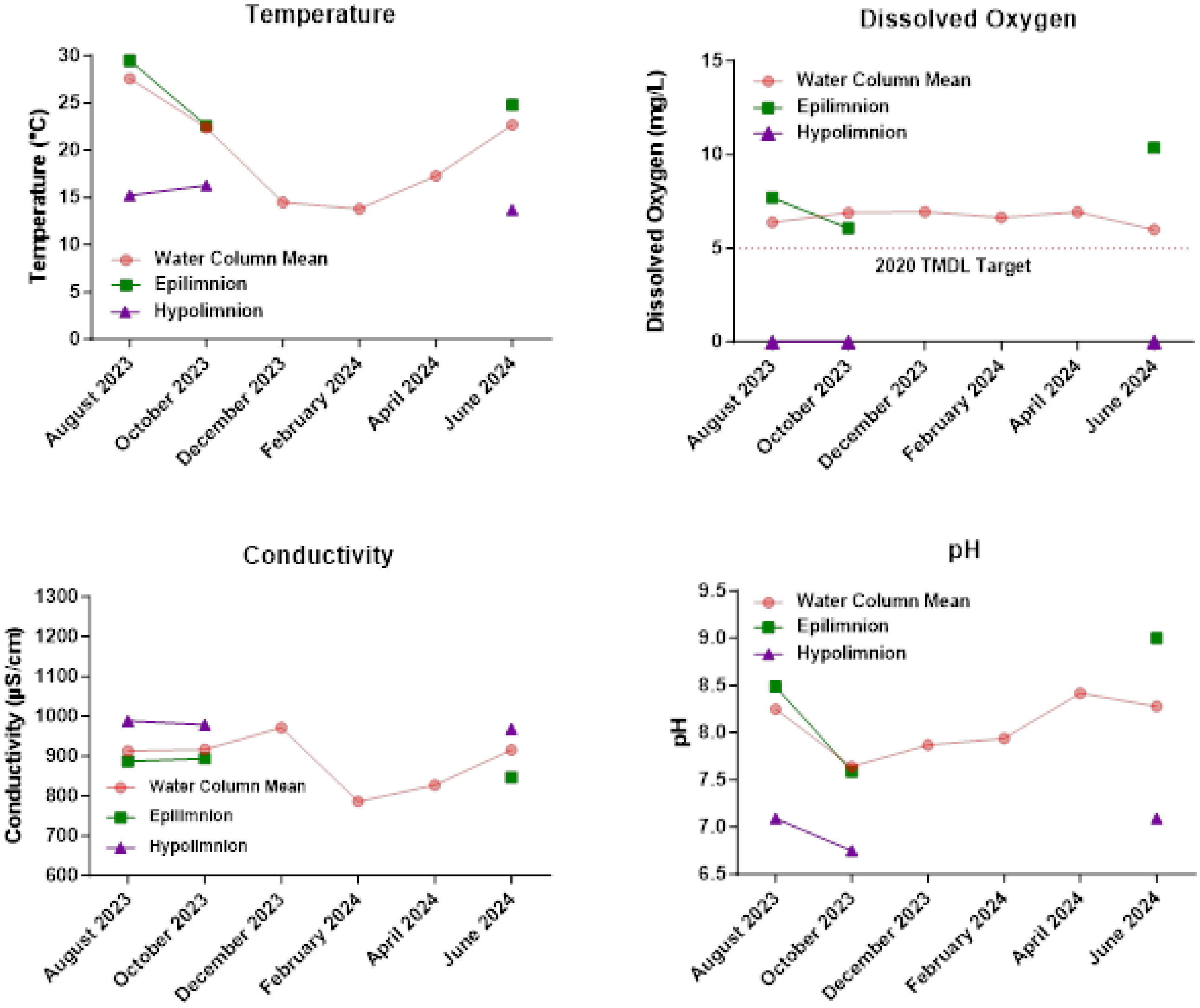


Figure 3-13. Mean In-Situ Physical Water Quality Parameters - Canyon Lake East Basin

(Values represent the mean of Sites CL09 & CL10. Missing epilimnion and hypolimnion values represent time periods when no stratification was present.)

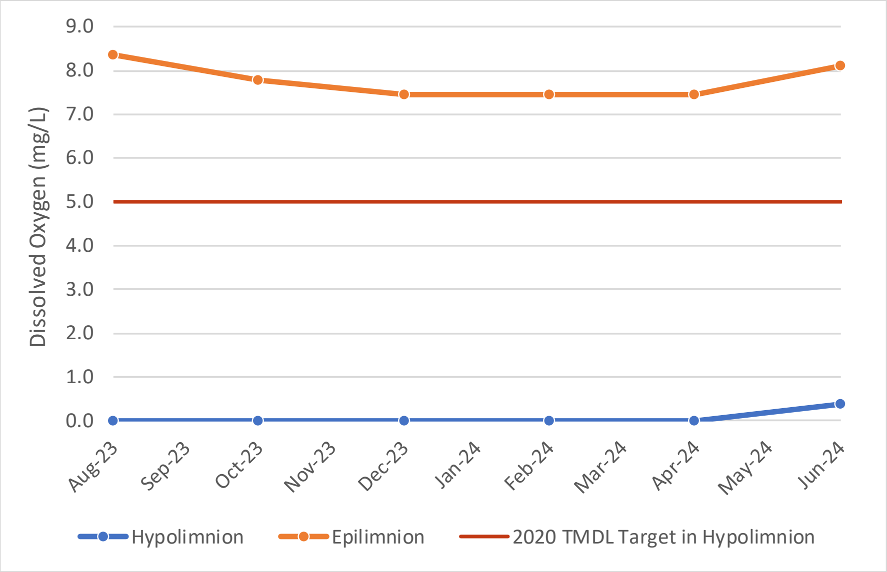


Figure 3-14. Rolling Average Concentrations of Dissolved Oxygen in the Epilimnion and Hypolimnion of Canyon Lake

Means are calculated by averaging the values from all 4 sites of each event with the previous five event values (i.e., one year of data) to obtain a rolling average. Therefore, the graph represents data collected from August 2022 to June 2024. Events in which a thermocline was not present were not included in rolling average.

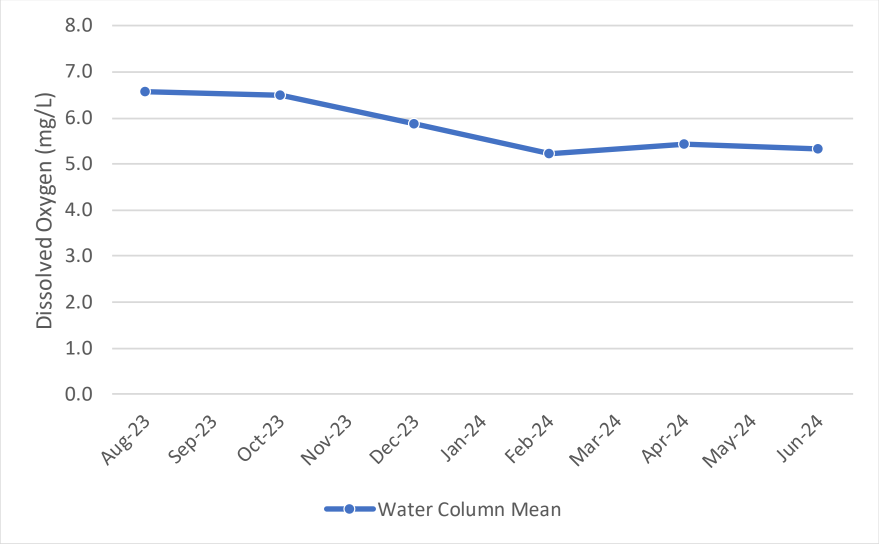


Figure 3-15. Rolling Average Concentration of Dissolved Oxygen - Full Vertical Water Column in Canyon Lake

Each data point is calculated by averaging the values from all 4 sites of each event with the previous five event values (i.e., one year of data) to obtain a rolling average. Therefore, the graph represents data collected from August 2022 to June 2024.

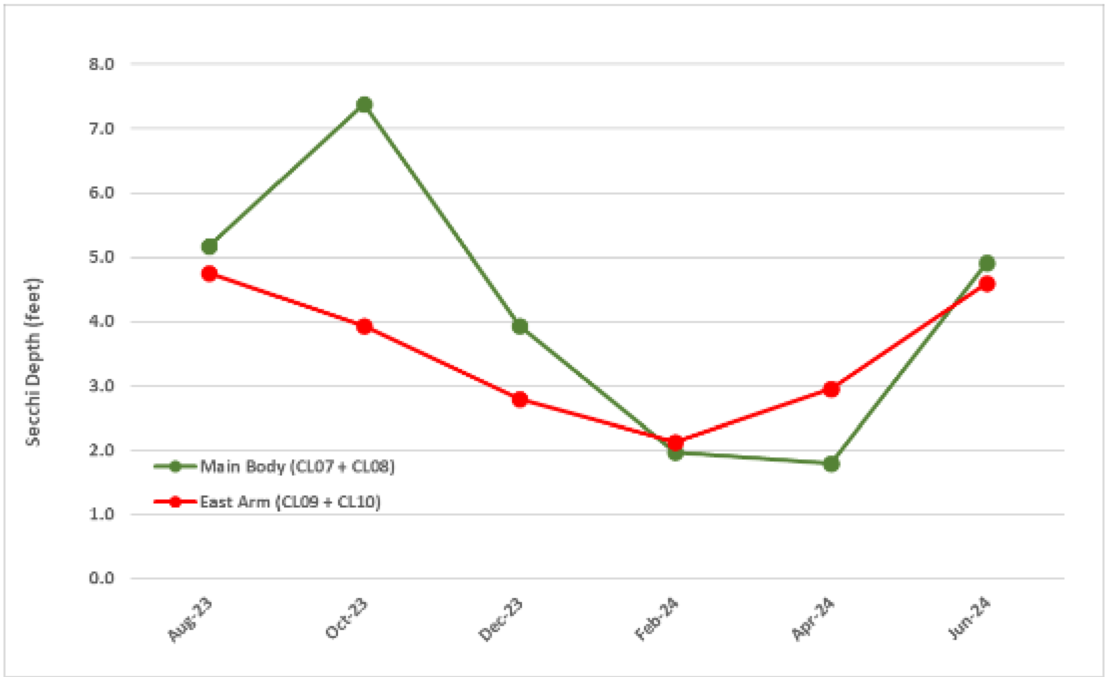


Figure 3-16. In-Situ Water Clarity Using a Secchi Disk– Main and East Basins

Analytical Chemistry

Analytical chemical concentration summaries for each monitoring event in Canyon Lake are presented in **Tables 3-17 and 3-18**. A summary of analytical chemistry mean statistics for each site across the entire monitoring period is presented in **Tables 3-19 through 3-21**. Concentrations of analytes are presented graphically in **Figures 3-17 and 3-18.**

Depth-integrated concentrations of individual total nitrogen samples in the Main Basin (Sites CL07 and CL08) ranged from 0.8 to 2.3 mg/L across the six sampling events, with a Main Basin annual mean of 1.5 mg/L (slight increase from the 2022-23 annual mean of 1.4 mg/L). Individual total nitrogen sample concentrations within the East Basin ranged from 0.8 to 2.6 mg/L across the six sampling events, with an annual mean of 1.5 mg/L (remaining the same as the 2022-23 annual mean). Lake-wide rolling average for total nitrogen saw an initial decrease in concentrations from the prior monitoring year before steadily increasing over the last few events. 10-year rolling average concentrations of total nitrogen over the past 5 years ranged from 1.3 to 1.6 mg/L; all exceeding the current 2020 TMDL target of 0.75 mg/L (**Figure 3-19**).

Depth-integrated total phosphorus concentrations in both basins remained low and relatively stable across the first three months of the monitoring period, but then rose sharply in February and April 2024 before dropping in June in the East Basin. The period between the December 2023 and April 2024 sampling events is when the majority of the rain fell in the region and likely contributed to the spike in total phosphorus. The total suspended solids increased in February 2024 likely as a result of the suspended fine sediment load brought into the lake by storm flows and could have been responsible for the increase in total phosphorus (i.e., elemental phosphorus). As total suspended solids began to decrease by April, total phosphorus levels remained steady before decreasing (East Basin only). Total phosphorus concentrations of individual samples in the Main Basin ranged from 0.04 to 0.32 mg/L, with an annual Main Basin mean of 0.19 mg/L (an increase from the 2022-23 annual mean of 0.09 mg/L). Total phosphorus concentrations in the East Basin ranged from 0.03 to 0.43 mg/L**,** with an annual mean of 0.19 mg/L (an increase from the 2022-23 annual mean of 0.13 mg/L). The lake-wide rolling average for total phosphorus in Canyon Lake ranged from 0.12 to 0.19 mg/L (**Figure 3-19**). 10-yr rolling average values over the past 5-years were all above the current 2020 TMDL target of 0.1 mg/L.

During the 2023-2024 monitoring year, two alum applications occurred in Canyon Lake. The first during the week of October 2, 2023, with pre-alum application water quality monitoring occurring before the application and being conducted by the application team. The second alum application was during the week of April 22, 2024, with the pre-alum monitoring occurring on April 17, 2024. Total phosphorus had a notable decrease following the first alum treatment in both basins, while a substantial decrease was noted only in the East Basin after the second application. Total phosphorus in the main basin following the second alum treatment remained steady after the April 2024 application. The regular application of alum since September 2013 has served to reduce the annual mean water column total phosphorus concentration in Canyon Lake in comparison to those measured prior to the alum applications (see historical figures in Appendix E).

Although pre-alum monitoring indicated good conditions for application, shortly following the April 2024 alum application a minor and transient fish die-off of exclusively shad occurred. As a conservative measure, WSP mobilized field staff to visit the lake at the request of Lake Elsinore and San Jacinto Watersheds Authority (LESJWA) staff to investigate a potential cause of the fish die off. While many factors were evaluated including, harmful algal blooms, as well as concentrations of DO, ammonia, and aluminum, no single definitive factor was identified as a cause for the limited die off of threadfin shad observed in late April 2024. Observations of elevated pH, and low DO in deeper waters, along with results showing higher concentrations of total aluminum, suggest that this alum application might be one of several possible causes. While the aluminum concentrations measured following the fish die off were below the EPA acute CMC, two of the three samples were only 100 µg/L below it and were greater than the CCC (samples collected at Sierra Park and Northern Causeway). These results indicate that it was possible the aluminum concentration could have exceeded the acute CMC for a short time period in limited portions of the lake, resulting in a limited short-term fish die off. It should be noted there have been prior samples collected in Canyon Lake with much higher aluminum concentrations (up to 6,300 ug/L) with no associated fish die off. A detailed technical memorandum summarizing the fish die-off investigation is included in Appendix F.

Depth-integrated concentrations of total ammonia in the Main Basin (Sites CL07 and CL08) ranged from 0.4 to 1.7 mg/L across the six sampling events, with a Main Basin annual mean of 0.60 mg/L (a slight increase from the 2022-23 annual mean of 0.56 mg/L). Individual total ammonia sample concentrations within the East Basin ranged from ND (<0.017) to 1.8 mg/L across the six sampling events, with an annual mean of 0.58 mg/L (up from the 2022-23 annual mean of 0.47 mg/L). Concentrations showed a similar pattern to previous years with the highest values in August, a decrease across the winter months, and then an increase in spring. This pattern is likely tied to the annual stratification cycle of the lake, where the Main Basin exhibits a stratification beginning in early spring (April) through early Fall (October). During this time low dissolved oxygen in the hypolimnion facilitates the release of phosphorus and ammonia from the sediments. Due to the increased depths in the Main Basin, stronger stratification develops accounting for higher ammonia concentrations (particularly at the deepest Site CL07) and longer periods of stratification. The total ammonia concentrations of 1.6 mg/L (June 2023) at Site CL09 exceeded the corresponding CCC objectives of 1.57 mg/L (**Table 3-17**). This same site exceeded the CCC during the previous monitoring year in August and October 2022. No other total ammonia concentrations exceeded the CCC or CMC.

Total dissolved solids concentration in both basins remained somewhat stable between August and December 2023. Both basins displayed a decrease in TDS from December to February as a result of winter storms, with the Main Basin exhibiting a sharper decline due to its higher volume input from the San Jacinto River. The TDS concentration of individual samples in the Main Basin ranged from 260 to 500 mg/L, with an average of 405 mg/L. The average concentration of individual sample TDS in the East Basin were slightly higher, ranging from 480 to 610 mg/L, with a average of 550 mg/L. All individual samples lake-wide fell below the Basin Plan water quality objective of 700 mg/L for TDS for Canyon Lake.

Mean chlorophyll-a concentrations in both basins exhibited a steady decline August through December 2023. Once falling below the 2020 TMDL target of 25 µg/L in October 2023, the mean depth-integrated concentration in the Main Basin remained below the target for the remainder of the monitoring year. The mean chlorophyll-a concentration in the East Basin also dropped below 25 µg/L in October 2023 but exhibited an increase to 41 and 34 µg/L in April and June 2024, respectively. The depth-integrated concentration of individual samples in the Main Basin across all six sampling events ranged from ND (<1.0 µg/L) to 34 µg/L, with a mean of 16 µg/L (**Figure 3-18**). Depth-integrated chlorophyll-a samples in the East Basin ranged from ND (<1.0 µg/L) to 80 µg/L, with an annual mean of 27 µg/L. Rolling 10-year average concentrations of depth-integrated lake-wide chlorophyll-a remained below the 2020 TMDL target of 25 µg/L for the entire monitoring period (**Figure 3-19**). Monthly average lake-wide depth-integrated chlorophyll-a concentrations were also below with the 2020 TMDL target except for June 2024 (25.1 µg/L).

Concentrations of total and dissolved aluminum are measured in Canyon Lake to assess any potential long-term influence that the alum additions may have on water column aluminum concentrations relative to existing water quality objectives. Concentrations of total aluminum individual samples ranged from 25 to 840 µg/L in the Main Basin and 70 to 310 µg/L in the East Basin.

All total aluminum concentrations measured as part of the TMDL monitoring events were below calculated chronic Criteria Continuous Concentration (CCC) and acute Criteria Maximum Concentration (CMC) values based on the US EPA's Final Aquatic Life Ambient Water Quality Criteria for Aluminum[4] (US EPA, 2018) when using the water column mean pH for each station/date combination, and a default total organic carbon and hardness value. Dissolved aluminum concentrations ranged from ND (<0.041 µg/L) to 110 µg/L in the Main Basin and ND (<0.041 µg/L) to 250 µg/L in the East Basin.

---

[4] Aquatic Life Criteria - Aluminum | US EPA

Table 3-17. Analytical Chemistry Results for Canyon Lake - Monthly Depth-Integrated Results (Aug – Dec 2023)

Compound	Units	MDL	RL	Depth Integrated or Surface Sample	August 2023				October 2023				December 2023			
					Main Basin		East Basin		Main Basin		East Basin		Main Basin		East Basin	
					CL07	CL08	CL09	CL10	CL07	CL08	CL09	CL10	CL07	CL08	CL09	CL10
General Chemistry																
Total Dissolved Solids	mg/L	4.0	10	DI	500	500	600	540	470	450	550	580	500	490	600	610
Total Suspended Solids	mg/L	5.0	5.0	DI	4.0J	4.0J	6.0	4.0J	4.0J	2.0J	6.0	6.0	3.0J	4.0J	6.0	7.0
Sulfide	mg/L	0.05-0.5	0.1	DI	3.5	0.30	3.5	ND<0.05	10	2.5	6.0	ND<0.05	0.90	ND<0.05	ND<0.05	ND<0.05
Nitrate as N	mg/L	0.04	0.2	DI	ND<0.04	ND<0.04	0.042J	0.11J	ND<0.04	0.052J	0.044J	ND<0.04	ND<0.04	0.048J	0.063J	0.078J
Nitrite as N	mg/L	0.042	0.1	DI	ND<0.042	ND<0.042	ND<0.042	ND<0.042	ND<0.042	ND<0.042	ND<0.042	ND<0.042	ND<0.042	ND<0.042	ND<0.042	ND<0.042
Total Kjeldahl Nitrogen	mg/L	0.065	0.1	DI	1.5	0.76	1.5	0.72	2.3	0.89	2.6	0.81	1.3	1.0	1.1	0.97
Total Nitrogen[a]	mg/L	NA	NA	DI	1.5	0.8	1.5	0.83	2.3	0.94	2.6	0.81	1.3	1.0	1.2	1.0
Ammonia-Nitrogen	mg/L	0.017	0.1	DI	0.88	0.04J	0.72	0.02J	1.7	0.33	1.8	0.02J	0.74	0.42	0.36	0.21
Unionized Ammonia[b]	mg/L	NA	NA	DI	0.015	0.003	0.035	0.004	0.007	0.003	0.018	0.001	0.004	0.003	0.004	0.005
Ortho Phosphate Phosphorus	mg/L	0.007	0.01	DI	0.13	0.03	0.05	ND<0.0071	0.14	0.03	0.11	0.01J	0.02	0.01	0.01	0.01
Total Phosphorus	mg/L	0.0067	0.01	DI	0.16	0.06	0.10	0.03	0.17	0.06	0.18	0.05	0.05	0.04	0.05	0.06
Total Aluminum	ug/L	22	50	DI	68	97	92	130	110	150	180	300	25J	44J	110	160
Dissolved Aluminum	ug/L	41	50	DI	58	85	71	110	51	110	140	250	ND<41	ND<41	ND<41	ND<41
Chlorophyll-a																
Chlorophyll-a	µg/L	NA	1.0	Surf (0-2m)	11.8	14.4	11	12	5.3	6	15	8	6	12	14	14
Chlorophyll-a	µg/L	NA	1.0	DI	25	34	65	10	10	14	24	18	6	14	14	16

Notes:

When a concentration was non-detect (ND), the annual mean value for compliance purposes was calculated by converting ND values to zero. If the result of the calculated mean was non-zero, but below the corresponding MDL, the mean value was reported as ND.
a - Total Nitrogen = TKN+NO_2+NO_3
b - The concentration of unionized ammonia was calculated using equation by Thursby (1986), based on site specific pH and temperature recorded at each location.
ND – Not detected; NA – Not Applicable/ available
DI = Depth integrated; Surf = Surface 0-2m
µg/L – micrograms per liter; mg/L – milligrams per liter; MDL – method detection limit; RL – reporting limit; J - Reported value is an estimate detection was above the MDL, but below the RL

Table 3-18. Analytical Chemistry Results for Canyon Lake- Monthly Depth-Integrated Results (Feb – June 2024)

Compound	Units	MDL	RL	Depth Integrated or Surface Sample	February 2024				April 2024				June 2024			
					Main Basin		East Basin		Main Basin		East Basin		Main Basin		East Basin	
					CL07	CL08	CL09	CL10	CL07	CL08	CL09	CL10	CL07	CL08	CL09	CL10
General Chemistry																
Total Dissolved Solids	mg/L	4.0	10	DI	270	260	480	540	350	330	500	510	370	370	530	560
Total Suspended Solids	mg/L	5	5	DI	12	13	6.0	9.0	ND<5.0	6.0	ND<5.0	7.0	ND<5.0	6.0	6.0	6.0
Sulfide	mg/L	0.05-0.5	0.1	DI	ND<0.05	ND<0.05	ND<0.05	ND<0.05	0.1	ND<0.05	2.0	0.2	0.4	0.4	0.6	ND<0.05
Nitrate as N	mg/L	0.022 - 0.04	0.2	DI	0.67	0.69	0.59	0.66	0.088J	1.1	0.056J	0.070J	ND<0.04	ND<0.04	ND<0.04	ND<0.04
Nitrite as N	mg/L	0.029 - 0.042	0.1	DI	ND<0.042	ND<0.042	ND<0.042	ND<0.042	ND<0.029	0.11J	ND<0.029	ND<0.029	ND<0.042	ND<0.042	ND<0.042	ND<0.042
Total Kjeldahl Nitrogen	mg/L	0.065	0.1	DI	1.1	0.82	1.2	1.2	1.1	0.87	2.1	1.2	2.0	1.4	2.5	0.87
Total Nitrogen[a]	mg/L	NA	NA	DI	1.8	1.5	1.8	1.9	1.2	2.1	2.2	1.3	2.0	1.4	2.5	0.87
Ammonia-Nitrogen	mg/L	0.017	0.1	DI	0.16	0.11	0.42	0.31	0.61	0.21	1.3	0.22	1.3	0.72	**1.6***	ND <0.017
Unionized Ammonia[b]	mg/L	NA	NA	DI	0.001	0.001	0.005	0.007	0.012	0.008	0.063	0.021	0.024	0.030	0.067	ND
Ortho Phosphate Phosphorus	mg/L	0.007	0.01	DI	0.25	0.24	0.36	0.34	0.28	0.19	0.38	0.24	0.29	0.21	0.20	0.01
Total Phosphorus	mg/L	0.0067	0.01	DI	0.29	0.29	0.39	0.37	0.31	0.25	0.43	0.33	0.32	0.25	0.26	0.064
Total Aluminum	ug/L	22	50	DI	770	840	220	310	41J	75	73	70	77	130	150	240
Dissolved Aluminum	ug/L	41	50	DI	71	99	ND<41	ND<41	ND<41	ND<41	ND<41	ND<41	78	110	130	240
Chlorophyll-a																
Chlorophyll-a	µg/L	NA	1.0	Surf (0-2m)	43	58	34	27	23	19	9	139	11	14	16	18
Chlorophyll-a	µg/L	NA	1.0	DI	21	21	11	11	8	8	3	80	17	17	47	20

Notes:
When a concentration was non-detect (ND), the annual mean value for compliance purposes was calculated by converting ND values to zero. If the result of the calculated mean was non-zero, but below the corresponding MDL, the mean value was reported as ND.
a - Total Nitrogen = $TKN+NO_2+NO_3$
b - The concentration of unionized ammonia was calculated using equation by Thursby (1986), based on site specific pH and temperature recorded at each location.
c – Sample measured out of holding time
ND – Not detected; NA – Not Applicable/ available
DI = Depth integrated; Surf = Surface 0-2m
µg/L – micrograms per liter; mg/L – milligrams per liter; MDL – *method* detection limit; RL – reporting limit; J - Reported value is an estimate detection was above the MDL, but below the RL
***** Exceeds 2004 TMDL Permit NH3 CCC; ****** Exceeds 2004 TMDL Permit NH3 CMC (ammonia exceedance is on an event basis due to its reliance upon pH and temperature at the time of collection)

Table 3-19. Analytical Chemistry Results for Canyon Lake - Annual Mean Statistics for Each Site in the Main Basin

Compound	Units	MDL	RL	Basin Plan WQO or TMDL Target	Depth Integrated or Surface Sample	CL07			CL08			Main Basin		
						Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
General Chemistry														
Total Dissolved Solids	mg/L	4.0	10	700^{2}	DI	270	500	410	260	500	400	260	500	405
Total Suspended Solids	mg/L	NA	5	NA	DI	ND (<5)	12.0	3.8	ND (<5)	13	6	ND (<5)	13	5
Sulfide	mg/L	0.05-0.5	0.1	NA	DI	ND (<0.05)	10.0	2.5	ND (<0.05)	2.5	0.53	ND (<0.05)	10.0	1.5
Nitrate as N	mg/L	0.04	0.2	NA	DI	ND (<0.04)	0.67	0.13	ND (<0.04)	1.10	0.32	ND (<0.04)	1.10	0.22
Nitrite as N	mg/L	0.042	0.1	NA	DI	ND (<0.04)	0.00	0.00	ND (<0.04)	ND (<0.04)	ND (<0.04)	ND (<0.04)	0.11	0.009
Total Kjeldahl Nitrogen	mg/L	0.065-0.13	0.1-0.2	NA	DI	1.10	2.3	1.6	0.76	1.4	1.0	0.76	2.3	1.3
Total Nitrogen[a]	mg/L	NA	NA	0.75^{b1}	DI	1.2	2.3	**1.7**	0.76	2.1	**1.3**	0.76	2.3	**1.5**
Ammonia-Nitrogen	mg/L	0.017	0.1	2004- CMC: 3.08-34.17^{c1}; CCC:0.49-4.95^{c1}	DI	0.16	1.7	0.9	0.04	0.72	0.31	0.04	1.7	0.60
Unionized Ammonia[c]	mg/L	NA	NA	NA	DI	0.001	0.024	0.011	0.001	0.030	0.008	0.001	0.030	0.009
Ortho Phosphate Phosphorus	mg/L	0.003-0.007	0.01	NA	DI	0.016	0.29	0.18	ND (<0.003)	0.24	0.12	ND (<0.003)	0.29	0.15
Total Phosphorus	mg/L	0.0067	0.01	0.1^{b1}	DI	0.05	0.32	**0.22**	0.04	0.29	**0.16**	0.04	0.32	**0.19**
Total Aluminum	ug/L	22-41	50	NA	DI	25	770	182	44	840	223	25	840	202
Dissolved Aluminum	ug/L	41	50	NA	DI	ND (<41)	78	43	ND (<41)	110	67	ND (<41)	110	55
Chlorophyll-a														
Chlorophyll-a	µg/L	NA	1.0	25^{b1}	Surf (0-2m)	ND (<1.0)	43	17	ND (<1.0)	58	21	ND (<1.0)	58	19
Chlorophyll-a	µg/L	NA	1.0	25^{b1}	DI	ND (<1.0)	25	15	ND (<1.0)	34	18	ND (<1.0)	34	16

Notes:
When a concentration was non-detect, the annual value for compliance purposes was calculated by converting non-detect (ND) values to zero. If the result of the calculation was below the corresponding MDL, the average value was reported as ND.
a - Total Nitrogen = TKN+NO_2+NO_3
b - Annual average
c - Values calculated using water column mean ammonia, temperature, salinity and pH. Calculated using equation by Thursby (1986). The range of TMDL target thresholds apply to individual samples, not applicable *to* annual means.
1 – 2020 TMDL Target, based on Table 5-9n of 2004 TMDL
2 – Santa Ana Region Basin Plan Objective
NA – Not applicable/ available; ND – not detected
DI = Depth integrated; Surf = Surface 0-2m
mg/L – micrograms per liter; ug/L – milligrams per liter; MDL – method detection limit; RL – reporting limit; J –Reported value was detected above the MDL, but below the RL
Bold Underline - Indicates exceedance of 2020 TMDL target. TN, TP, and CHL-a TMDL criteria are all based on annual average. Ammonia TMDL criteria are based on sample specific calculated criteria based pH and temperature at the time of collection.
Italicize – Indicates exceedance of Basin Plan Water Quality Objective

Table 3-20. Analytical Chemistry Results for Canyon Lake - Annual Mean Statistics for Each Site in the East Basin

Compound	Units	MDL	RL	Basin Plan WQO or TMDL Target	Depth Integrated or Surface Sample	CL09			CL10			East Basin		
						Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
General Chemistry														
Total Dissolved Solids	mg/L	4.0	10	700[2]	DI	480	600	543	510	610	557	480	610	550
Total Suspended Solids	mg/L	NA	5	NA	DI	0.0	6.0	5.0	4.00	9	6.5	0.00	9	5.8
Sulfide	mg/L	0.05-0.5	0.1	NA	DI	ND (<0.05)	6.0	2.0	ND (<0.05)	0.20	0.03	ND (<0.05)	6.0	1.0
Nitrate as N	mg/L	0.04	0.2	NA	DI	ND (<0.04)	0.59	0.13	ND (<0.04)	0.66	0.15	ND (<0.04)	0.66	0.14
Nitrite as N	mg/L	0.042	0.1	NA	DI	ND (<0.04)	ND (<0.04)	ND (<0.04)	ND (<0.04)	ND (<0.04)	ND (<0.04)	ND (<0.04)	ND (<0.04)	ND (<0.04)
Total Kjeldahl Nitrogen	mg/L	0.065-0.13	0.1-0.2	NA	DI	1.1	2.6	1.8	0.72	1.2	1.0	0.72	2.6	1.4
Total Nitrogen[a]	mg/L	NA	NA	0.75 [1]	DI	1.2	2.6	**2.0**	0.00	1.9	**1.0**	0.81	**2.6**	**1.5**
Ammonia-Nitrogen	mg/L	0.017	0.1	2004- CMC: 3.08-34.17[c1]; CCC:0.49-4.95[c1]	DI	0.36	1.8	1.03	ND (<0.017)	0.31	0.13	ND (<0.017)	1.8	0.58
Unionized Ammonia[c]	mg/L	NA	NA	NA	DI	0.0	0.067	0.03	0.0	0.02	0.01	0.0	0.07	0.02
Ortho Phosphate Phosphorus	mg/L	0.003-0.007	0.01	NA	DI	ND (<0.003)	0.38	0.18	ND (<0.003)	0.34	0.10	ND (<0.003)	0.38	0.14
Total Phosphorus	mg/L	0.0067	0.01	0.1 [1]	DI	0.05	0.43	**0.24**	0.03	0.37	**0.15**	0.03	0.43	**0.19**
Total Aluminum	ug/L	22-41	50	NA	DI	73	220	138	70	310	202	70	310	170
Dissolved Aluminum	ug/L	41	50	NA	DI	ND (<41)	ND (<41)	ND (<41)	ND (<41)	250	100	ND (<41)	250	78
Chlorophyll-a														
Chlorophyll-a	µg/L	NA	1.0	25 [1]	Surf (0-2m)	ND (<1.0)	34	16	ND (<1.0)	139	**36**	ND (<1.0)	139	**26**
Chlorophyll-a	µg/L	NA	1.0	25 [1]	DI	ND (<1.0)	65	**27**	ND (<1.0)	80	**26**	ND (<1.0)	80	**27**

Notes:

When a concentration was non-detect, the annual value for compliance purposes was calculated by converting non-detect (ND) values to zero. If the result of the calculation was below the corresponding MDL, the average value was reported as ND.

a - Total Nitrogen = TKN+NO_2+NO_3
b - Annual average
c - Values calculated using water column mean ammonia, temperature, salinity and pH. Calculated using equation by Thursby (1986). The range of TMDL target thresholds apply to individual samples, not applicable to annual means.
1 – 2020 TMDL Target, based on Table 5-9n of 2004 TMDL
2 – 2015 TMDL Target, based on Table 5-9n of 2004 TMDL
3 – Santa Ana Region Basin Plan Water Quality Objective
NA – Not applicable/ available; ND – not detected
DI = Depth integrated; Surf = Surface 0-2m
mg/L – micrograms per liter; ug/L – milligrams per liter; MDL – method detection limit; RL – reporting limit; J –Reported value was detected above the MDL, but below the RL
Bold Underline - Indicates exceedance of 2020 TMDL target. TN, TP, and CHL-a TMDL criteria are all based on annual average. Ammonia TMDL criteria are based on sample specific calculated criteria based pH and temperature at the time of collection.
Italicize – Indicates exceedance of Basin Plan Water Quality Objective

Table 3-21. Analytical Chemistry Results for Canyon Lake - Annual Mean Statistics for Main and East Basins

Compound	Units	MDL	RL	Basin Plan WQO or TMDL Target	Depth Integrated or Surface Sample	Main Basin			East Basin			Lake-wide Average		
						Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
General Chemistry														
Total Dissolved Solids	mg/L	4.0	10	700[2]	DI	260	500	405	480	610	550	260	610	478
Total Suspended Solids	mg/L	NA	5	NA	DI	ND (<5)	13	4.8	0.00	9	5.8	ND (<5)	13	5.3
Sulfide	mg/L	0.05-0.5	0.1	NA	DI	ND (<0.05)	10	1.5	ND (<0.05)	6.0	1.0	ND (<0.05)	10	1.3
Nitrate as N	mg/L	0.04	0.2	NA	DI	ND (<0.04)	1.1	0.22	ND (<0.04)	0.66	0.14	ND (<0.04)	1.1	0.18
Nitrite as N	mg/L	0.042	0.1	NA	DI	ND (<0.04)	0.11	0.01	ND (<0.04)	ND (<0.04)	ND (<0.04)	ND (<0.04)	0.11	0.005
Total Kjeldahl Nitrogen	mg/L	0.065-0.13	0.1-0.2	NA	DI	0.8	2.3	1.3	0.7	2.6	1.4	0.7	2.6	1.3
Total Nitrogen[a]	mg/L	NA	NA	0.75 [1]	DI	0.76	2.3	**1.5**	0.00	2.6	**1.5**	0.00	2.6	**1.5**
Ammonia-Nitrogen	mg/L	0.017	0.1	2004- CMC: 3.08-34.17[c1]; CCC:0.49-4.95[c1]	DI	0.04	1.7	0.6	ND (<0.017)	1.8	0.58	ND (<0.017)	1.8	0.6
Unionized Ammonia[c]	mg/L	NA	NA	NA	DI	0.0	0.03	0.01	0.0	0.07	0.02	0.0	0.07	0.01
Ortho Phosphate Phosphorus	mg/L	0.003-0.007	0.01	NA	DI	ND (<0.003)	0.29	0.15	ND (<0.003)	0.38	0.14	ND (<0.003)	0.38	0.15
Total Phosphorus	mg/L	0.0067	0.01	0.1 [1]	DI	0.04	0.32	**0.19**	0.03	0.43	**0.19**	0.03	0.43	**0.19**
Total Aluminum	ug/L	22-41	50	NA	DI	25	840	202	70	310	170	25	840	186
Dissolved Aluminum	ug/L	41	50	NA	DI	ND (<41)	110	55	ND (<41)	250	78	ND (<41)	250	67
Chlorophyll-a														
Chlorophyll-a	µg/L	NA	1.0	25 [1]	Surf (0-2m)	ND (<1.0)	58	19	ND (<1.0)	139	**26**	ND (<1.0)	139	22
Chlorophyll-a	µg/L	NA	1.0	25 [1]	DI	ND (<1.0)	34	16	ND (<1.0)	80	**27**	ND (<1.0)	80	21

Notes:

When a concentration was non-detect, the annual value for compliance purposes was calculated by converting non-detect (ND) values to zero. If the result of the calculation was below the corresponding MDL, the average value was reported as ND.

a - Total Nitrogen = TKN+NO_2+NO_3

b - Annual average

c - Values calculated using water column mean ammonia, temperature, salinity and pH. Calculated using equation by Thursby (1986). The range of TMDL target thresholds apply to individual samples, not applicable to annual means.

1 – 2020 TMDL Target, based on Table 5-9n of 2004 TMDL

2 – Santa Ana Region Basin Plan Water Quality Objective

NA – Not applicable/ available; ND – not detected

DI = Depth integrated; Surf = Surface 0-2m

mg/L – micrograms per liter; ug/L – milligrams per liter; MDL – method detection limit; RL – reporting limit; J –Reported value was detected above the MDL, but below the RL

Bold Underline - Indicates exceedance of 2020 TMDL target. TN, TP, and CHL-a TMDL criteria are all based on annual average. Ammonia TMDL criteria are based on sample specific calculated criteria based pH and temperature at the time of collection.

Italicize – Indicates exceedance of Basin Plan Water Quality Objective

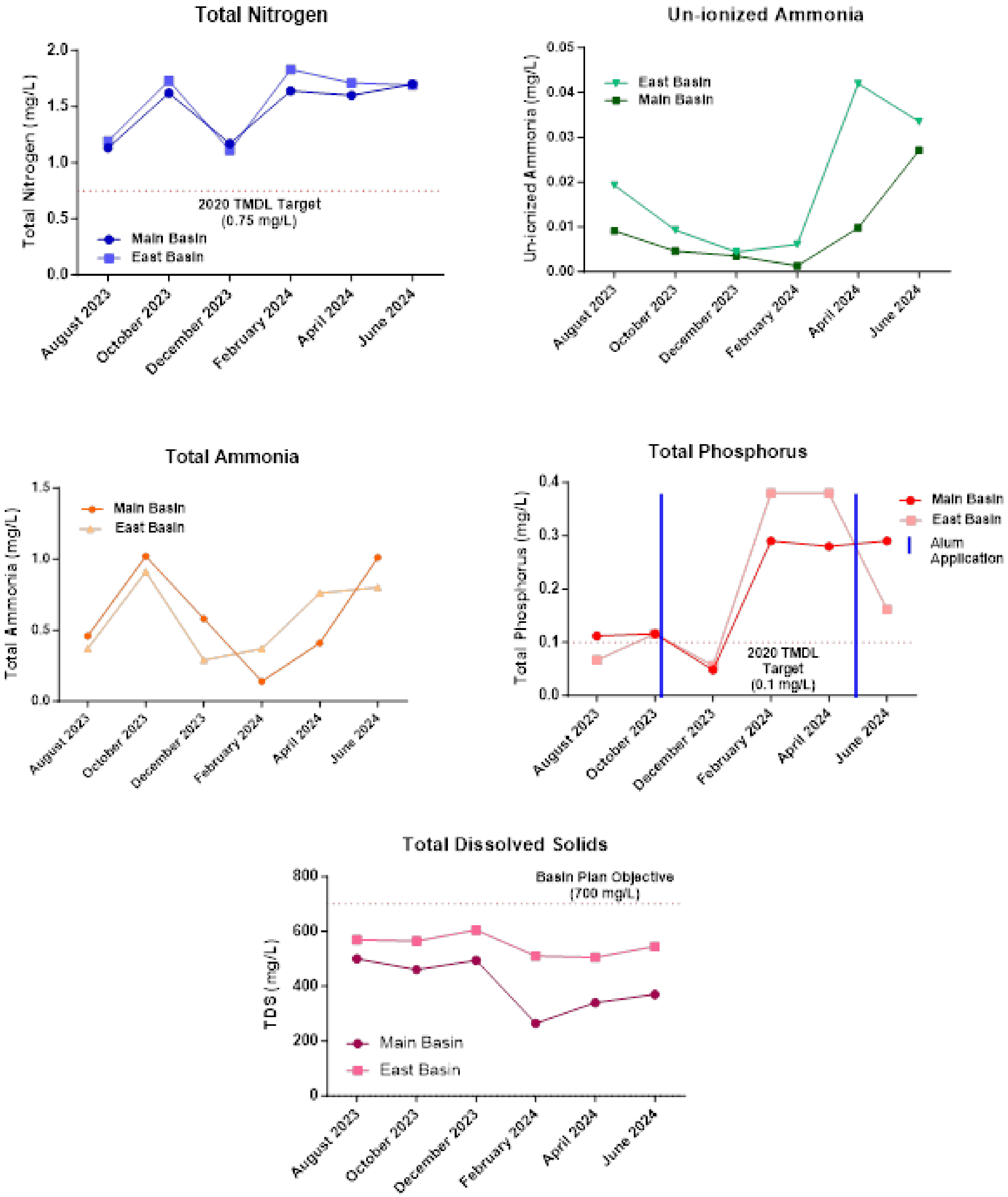


Figure 3-17. Canyon Lake Analytical Chemistry – Depth-Integrated Means

Main Basin values represent the mean of Sites CL07 & CL08, East Basin values represent the mean of Sites CL09 & CL10

Long term trends can be found in Appendix E

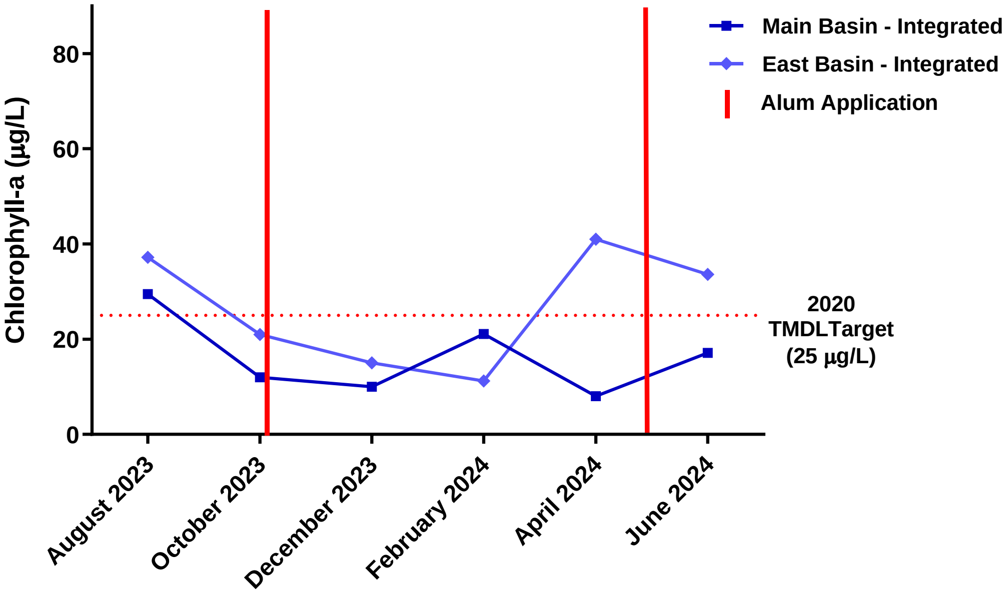


Figure 3-18. Canyon Lake Analytical Chemistry – Depth-Integrated Chlorophyll-a

Main Basin values represent the mean of Sites CL07 & CL08, East Basin values represent the mean of Sites CL09 & CL10
Long term trends can be found in Appendix E

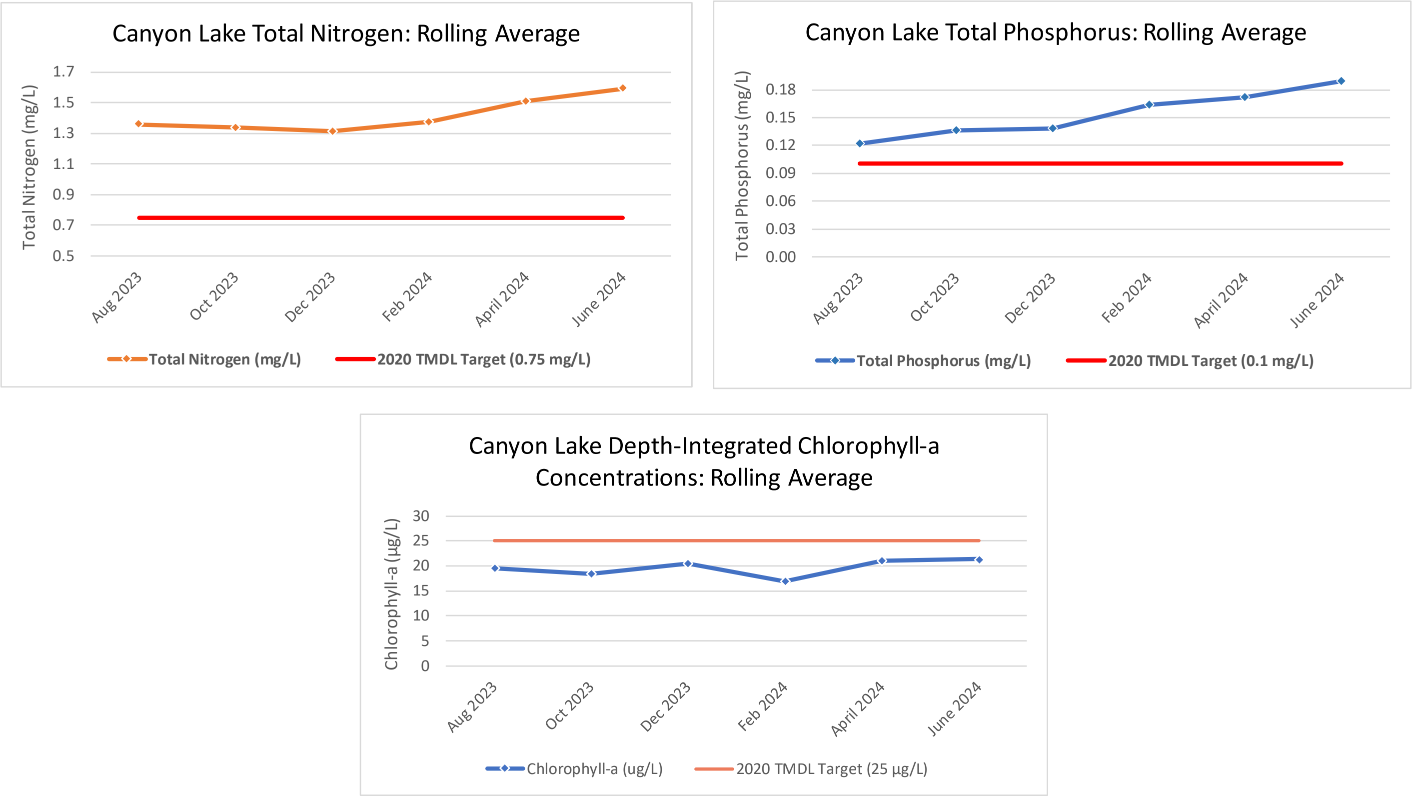


Figure 3-19. Canyon Lake Lake-wide Analytical Chemistry- Rolling Averages

Each data point is calculated by averaging the value from each event across all 4 sites with the previous five events across all 4 sites (i.e., one year of data) to obtain a rolling average. Therefore, each graph represents data collected from October 2022 to June 2024.

3.5 Satellite Imagery

In 2015-2016 and following, the TMDL Task Force contracted with satellite vendor EOMAP to conduct remote sensing using LandSat and Sentinel-2 satellite imagery to estimate chlorophyll-a and turbidity concentrations in Lake Elsinore and Canyon Lake. Using 30-m (LandSat) or 10-m (Sentinel-2) pixel resolution, this effort produced maps of the lakes showing graphical, color-coded images of chlorophyll-a and turbidity concentrations at up to approximately 1,000 unique data points across Canyon Lake and approximately 11,000 unique data points across Lake Elsinore. This tool provides a snapshot of conditions throughout the lakes at a given point in time, as opposed to the single data points provided at water quality collection locations and dates. The satellite images are also able to provide a sense of the relative variability in algae concentrations across the lake that can be rather dramatic and missed by measuring individual values from only a few discrete locations. However, the satellite imagery only represents approximately the upper 3-ft of the water column depending on water clarity, and therefore cannot completely replace manual sampling where depth-integrated values are required.

As part of the TMDL compliance monitoring, satellite imagery depicting surficial lake-wide chlorophyll-a and turbidity concentrations in Lake Elsinore and Canyon Lake were generated for each in-lake monitoring event. Satellite images for each lake during the eight monitoring events evaluated in the report are presented in **Figures 3-20 and 3-21**. Spatial variability in chlorophyll-a is evident, providing a more complete assessment of algal density conditions across each lake.

To quantify the data presented in the satellite images, cumulative frequency distribution (CDF) plots showing lake-wide chlorophyll-a concentrations based on individual pixel data from the satellite measurements are provided in **Figures 3-22 and 3-23**. Satellite derived mean and median concentrations along with measured in-lake chlorophyll-a concentrations in the surface composite (0-2m) sample are provided for each date showing how these single samples compare to concentrations throughout the entire lake. Mean and median lake-wide values were derived from satellite imagery data treating each pixel as a unique individual data point.

The satellite images for Lake Elsinore show mid to high concentrations of chlorophyll-a in July 2023, then a decrease in August. Images for September through December show an increase, and then a significant decline in chlorophyll-a in February. Satellite imagery then shows low chlorophyll-a concentrations through June. These patterns largely match the in-lake surface analytical values. The increase in surface analytical chlorophyll-a concentration in April to 85 µg/L was not identified with satellite imagery at the location of Site LE02. It is possible that a small patch of algae may have "spiked" this sample causing an analytical concentration that did not represent average the lower spatial average concentration of chlorophyll-a in the area near Site LE02.

Generally, the chlorophyll-a concentrations derived from Canyon Lake satellite imagery matched the in-lake analytical concentrations. The one exception to this was in February 2024 which showed high chlorophyll-a throughout much of the Main Basin. Higher satellite derived chlorophyll-a concentrations were also observed during February in the San Jacinto River just upstream of the causeway separating the Main Body of the lake from the North Ski Basin. A large series of storms had hit the region between January and February 2024 carrying large amounts of flow and suspended sediment likely causing interference with the satellite imagery due to the highly turbid water within the river and lake. It is unlikely that lake-wide chlorophyll-a concentrations were as high as the satellite imagery suggested, as indicated by the in-lake analytical chlorophyll-a concentrations in the Main Body which were 21 µg/L at both CL07 and CL08 for this sampling event.

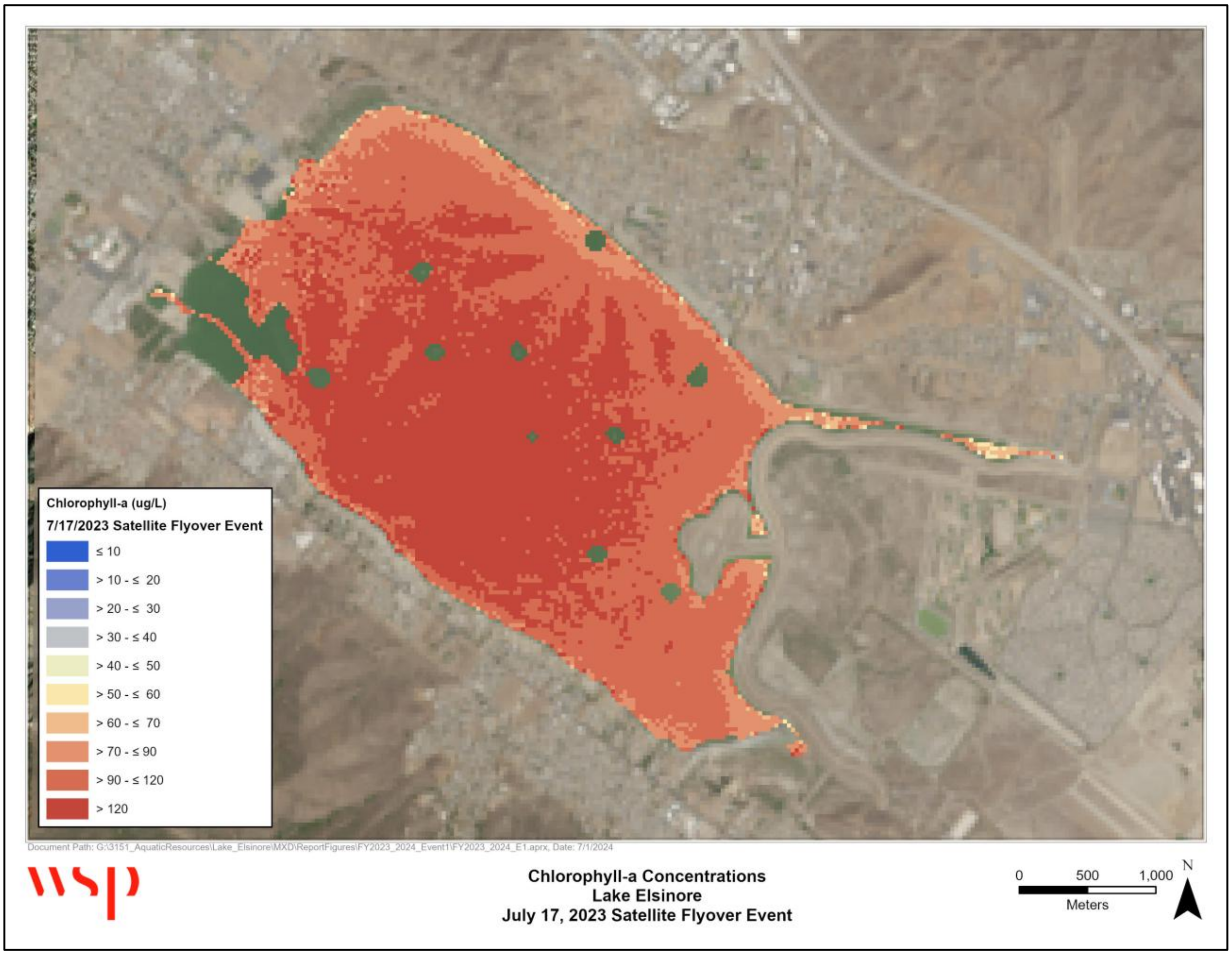


Figure 3-20a. Satellite Imagery of Chlorophyll-a Concentrations in Lake Elsinore

(Data gaps are due to sun glare)

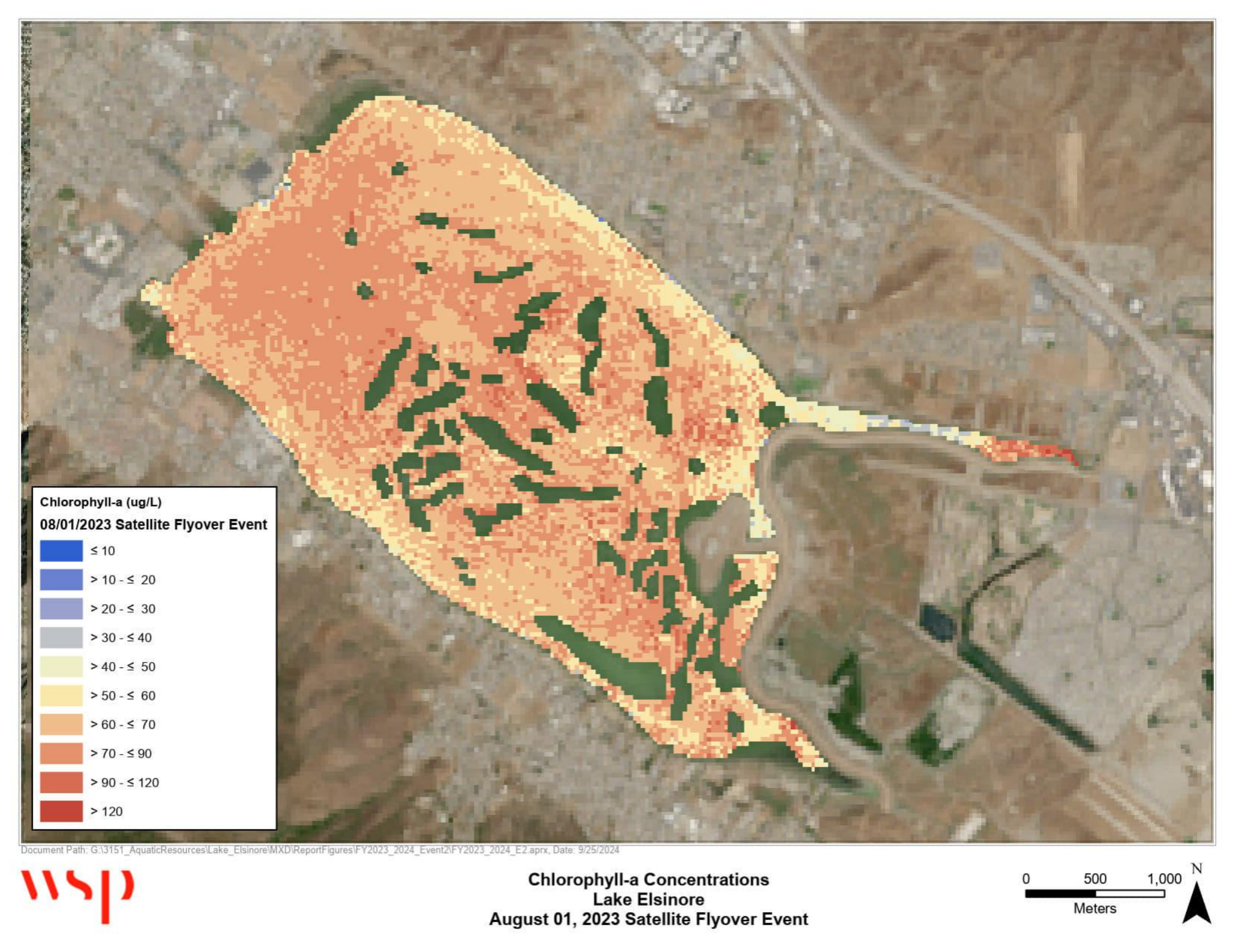


Figure 3-20b. Satellite Imagery of Chlorophyll-a Concentrations in Lake Elsinore
(Data gaps are due to sun glare)

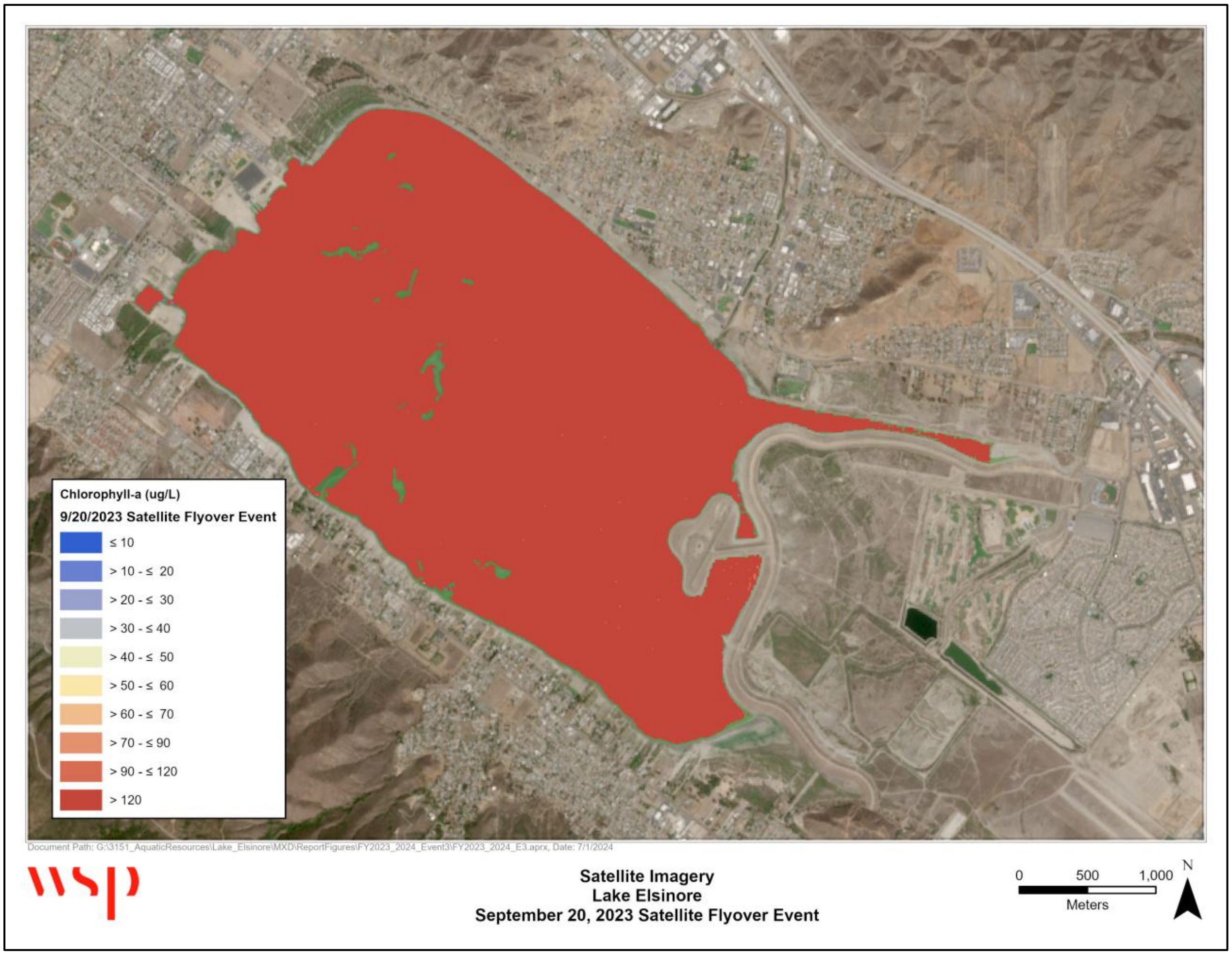


Figure 3-20c. Satellite Imagery of Chlorophyll-a Concentrations in Lake Elsinore

(Data gaps are due to sun glare)

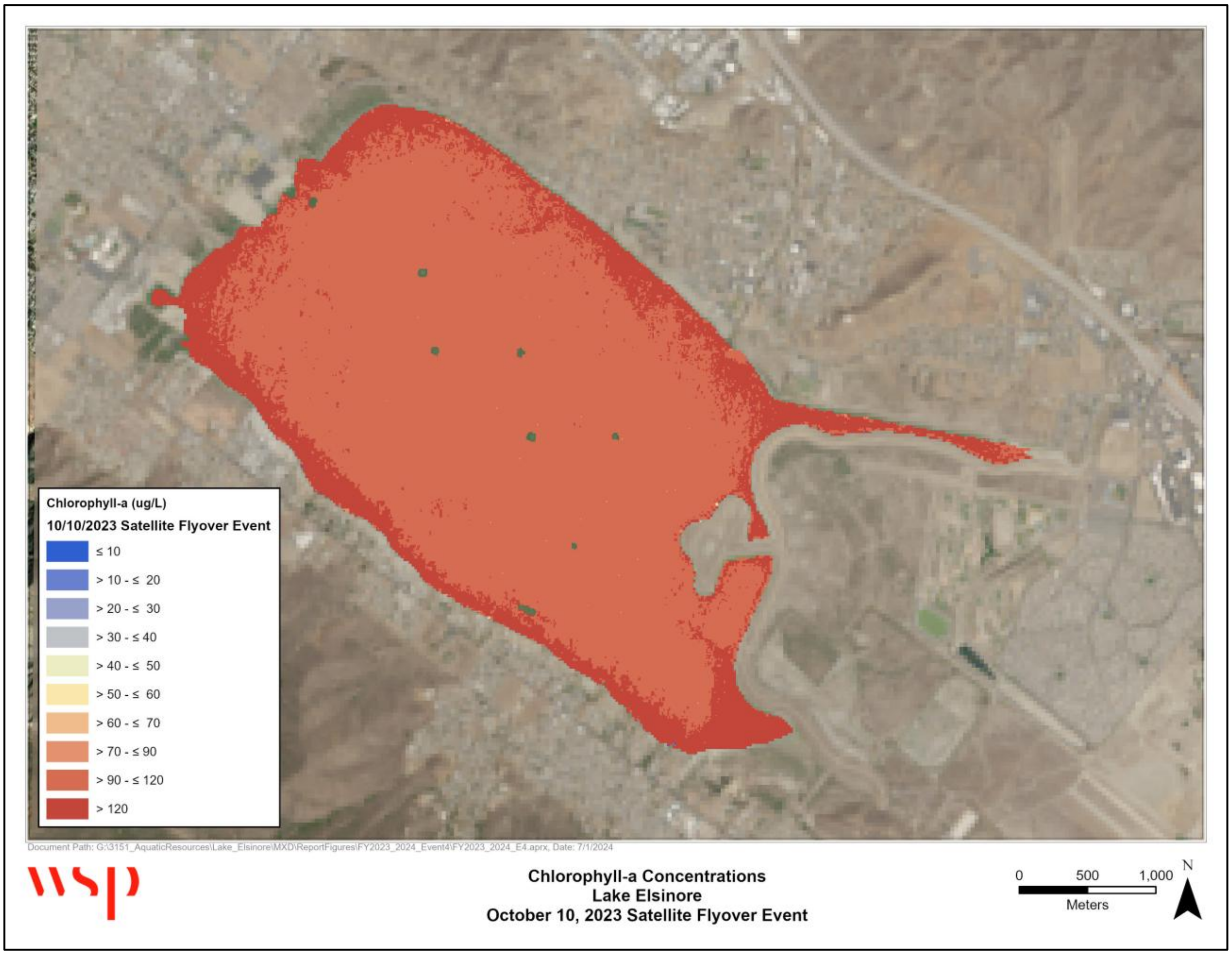


Figure 3-20d. Satellite Imagery of Chlorophyll-a Concentrations in Lake Elsinore

(Data gaps are due to sun glare)

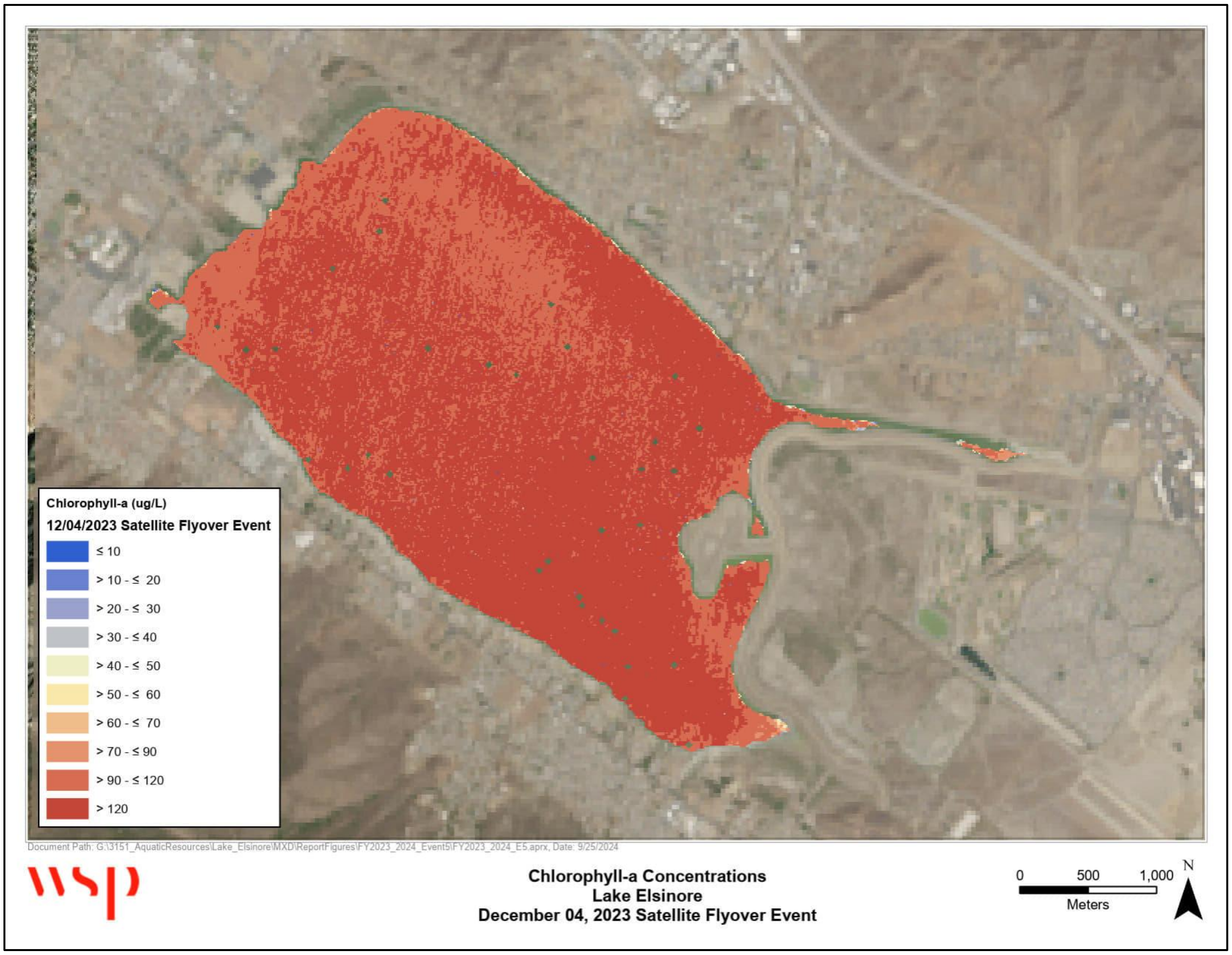


Figure 3-20e. Satellite Imagery of Chlorophyll-a Concentrations in Lake Elsinore

(Data gaps are due to sun glare)

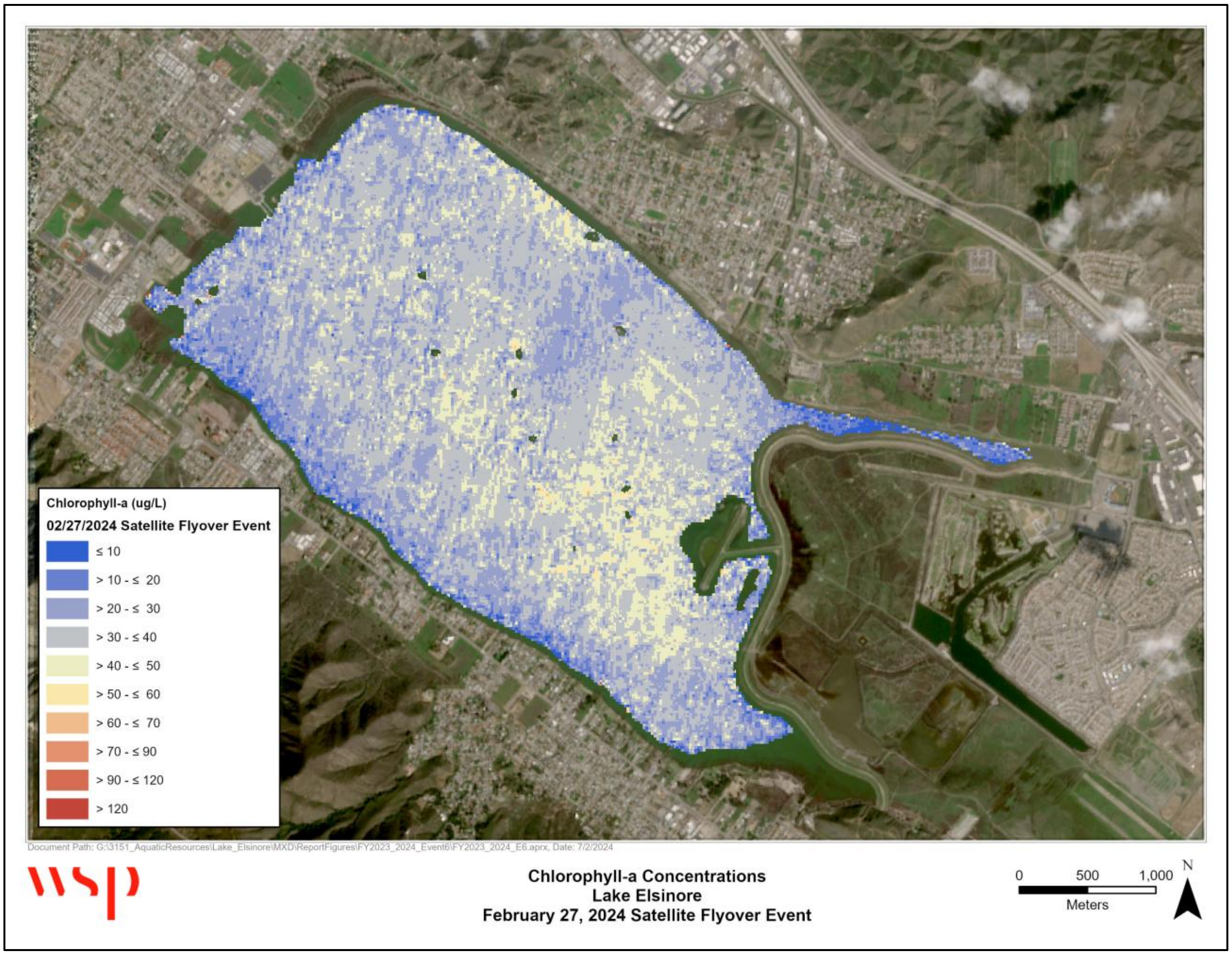


Figure 3-20f. Satellite Imagery of Chlorophyll-a Concentrations in Lake Elsinore

(Data gaps are due to sun glare)

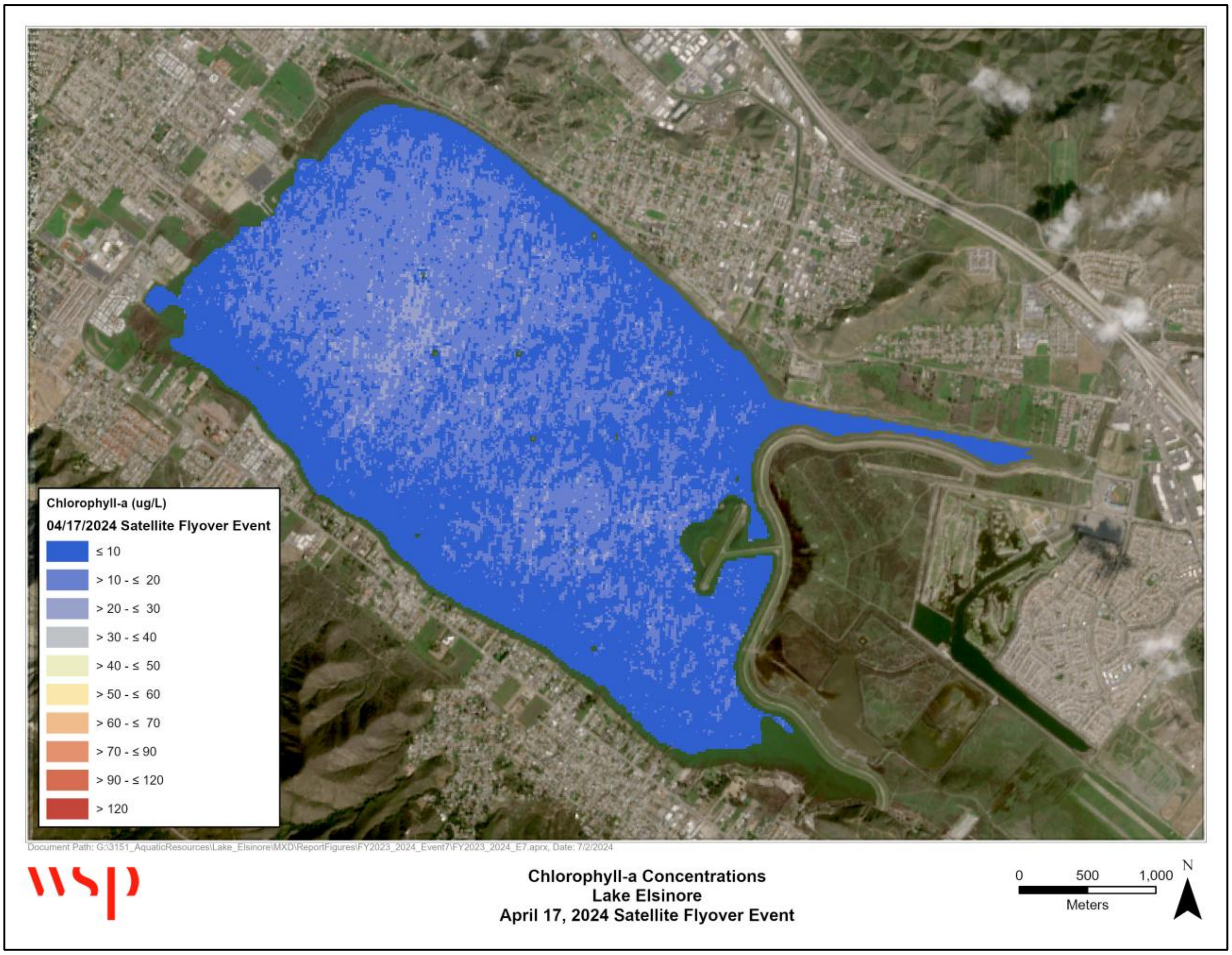


Figure 3-20g. Satellite Imagery of Chlorophyll-a Concentrations in Lake Elsinore

(Data gaps are due to sun glare)

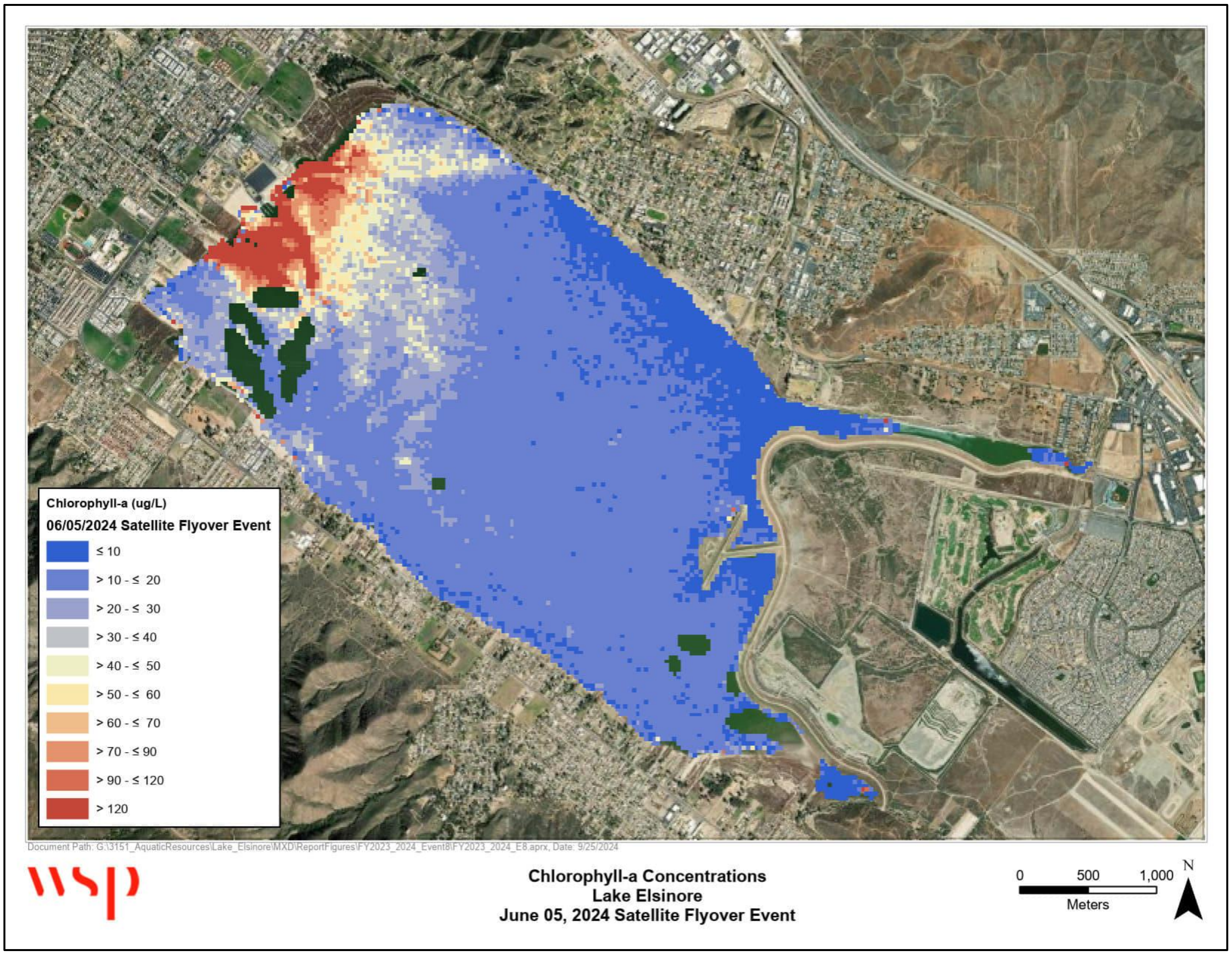


Figure 3-20h. Satellite Imagery of Chlorophyll-a Concentrations in Lake Elsinore

(Data gaps are due to sun glare)

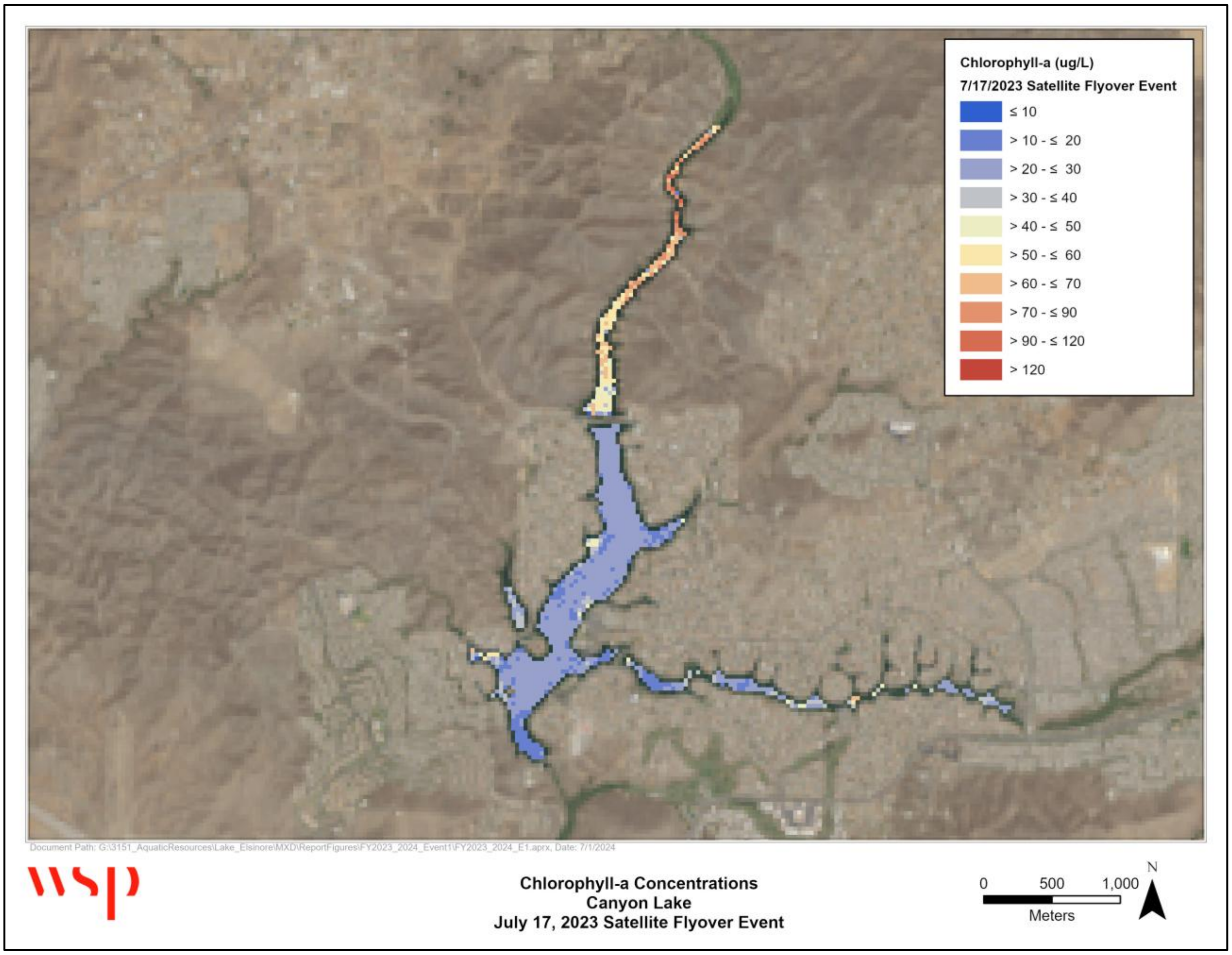


Figure 3-21a. Satellite Imagery of Chlorophyll-a Concentrations in Canyon Lake

(Data gaps are due to sun glare)

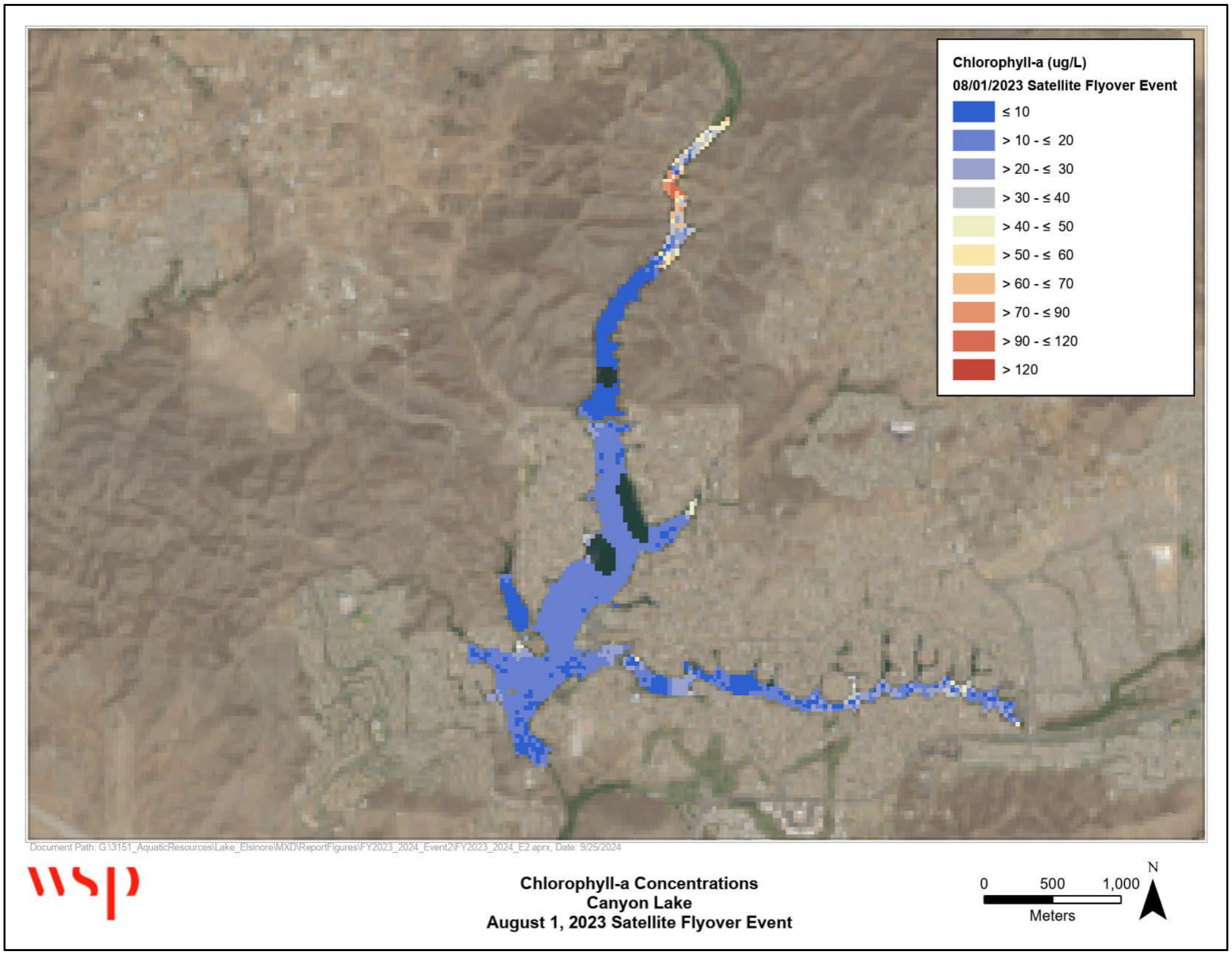


Figure 3-21b. Satellite Imagery of Chlorophyll-a Concentrations in Canyon Lake

(Data gaps are due to sun glare)

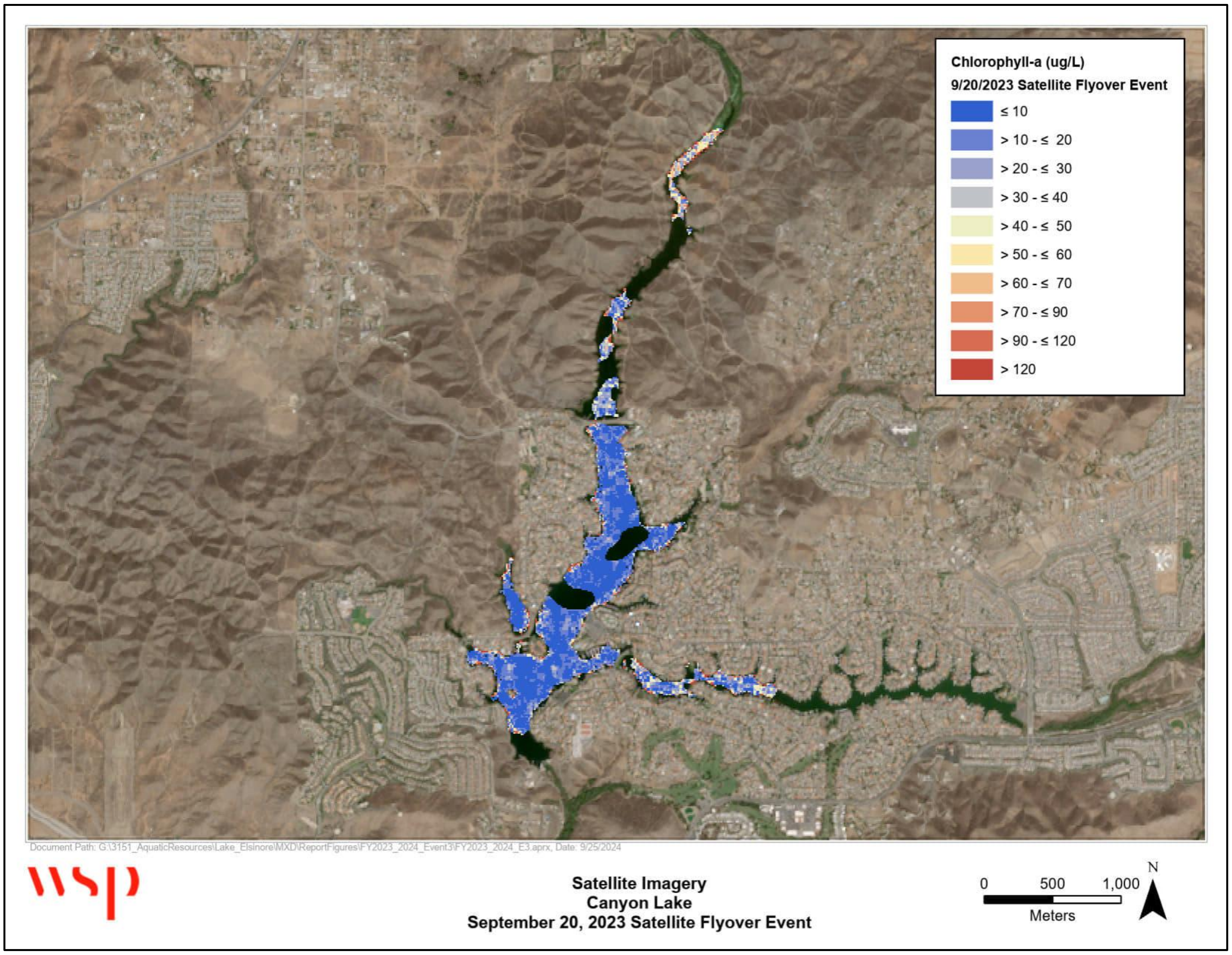
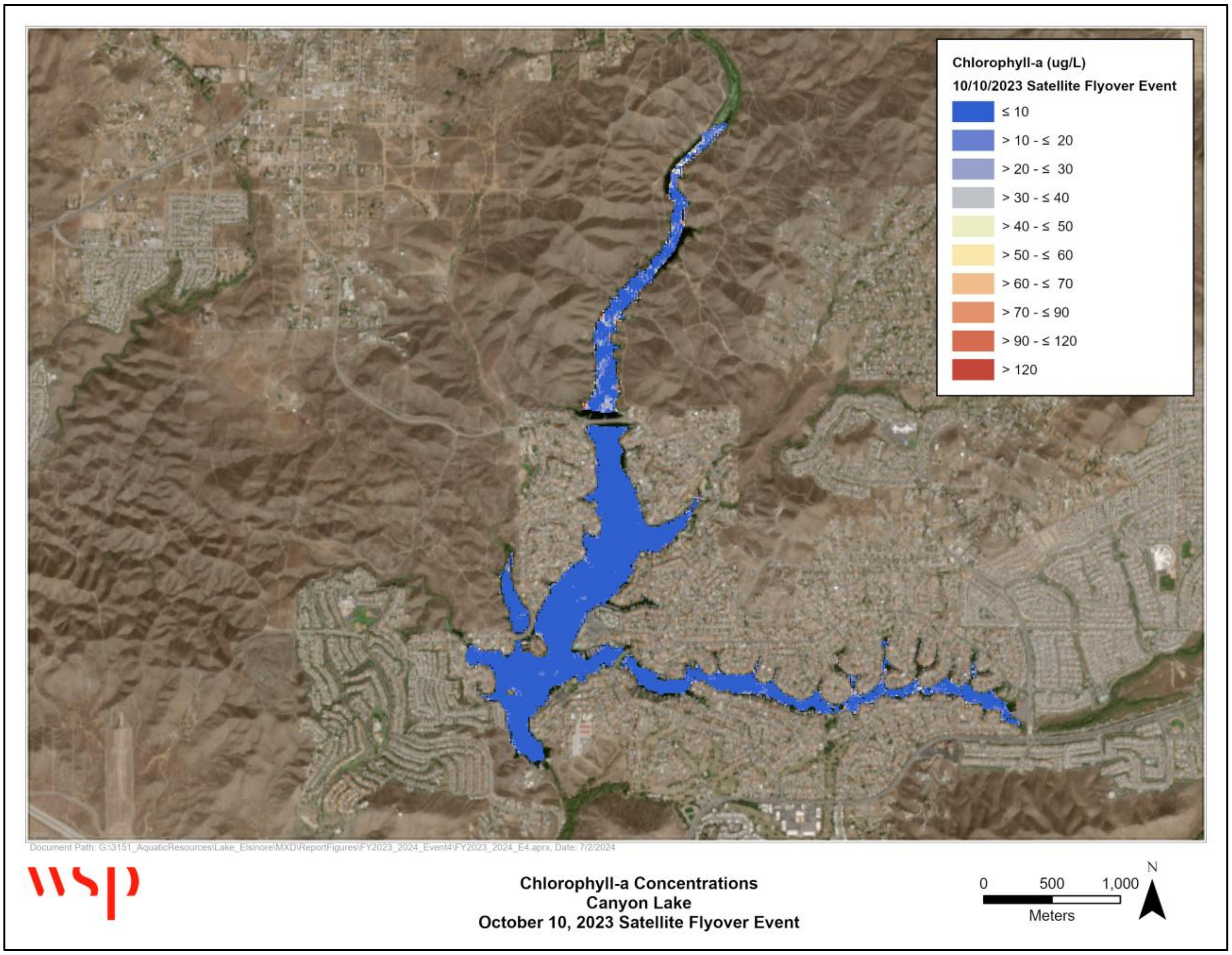


Figure 3-21c. Satellite Imagery of Chlorophyll-a Concentrations in Canyon Lake

(Data gaps are due to sun glare)



Document Path: G:\3151_AquaticResources\Lake_Elsinore\MXD\ReportFigures\FY2023_2024_Event4\FY2023_2024_E4.aprx, Date: 7/2/2024

Chlorophyll-a Concentrations
Canyon Lake
October 10, 2023 Satellite Flyover Event

Figure 3-21d. Satellite Imagery of Chlorophyll-a Concentrations in Canyon Lake

(Data gaps are due to sun glare)

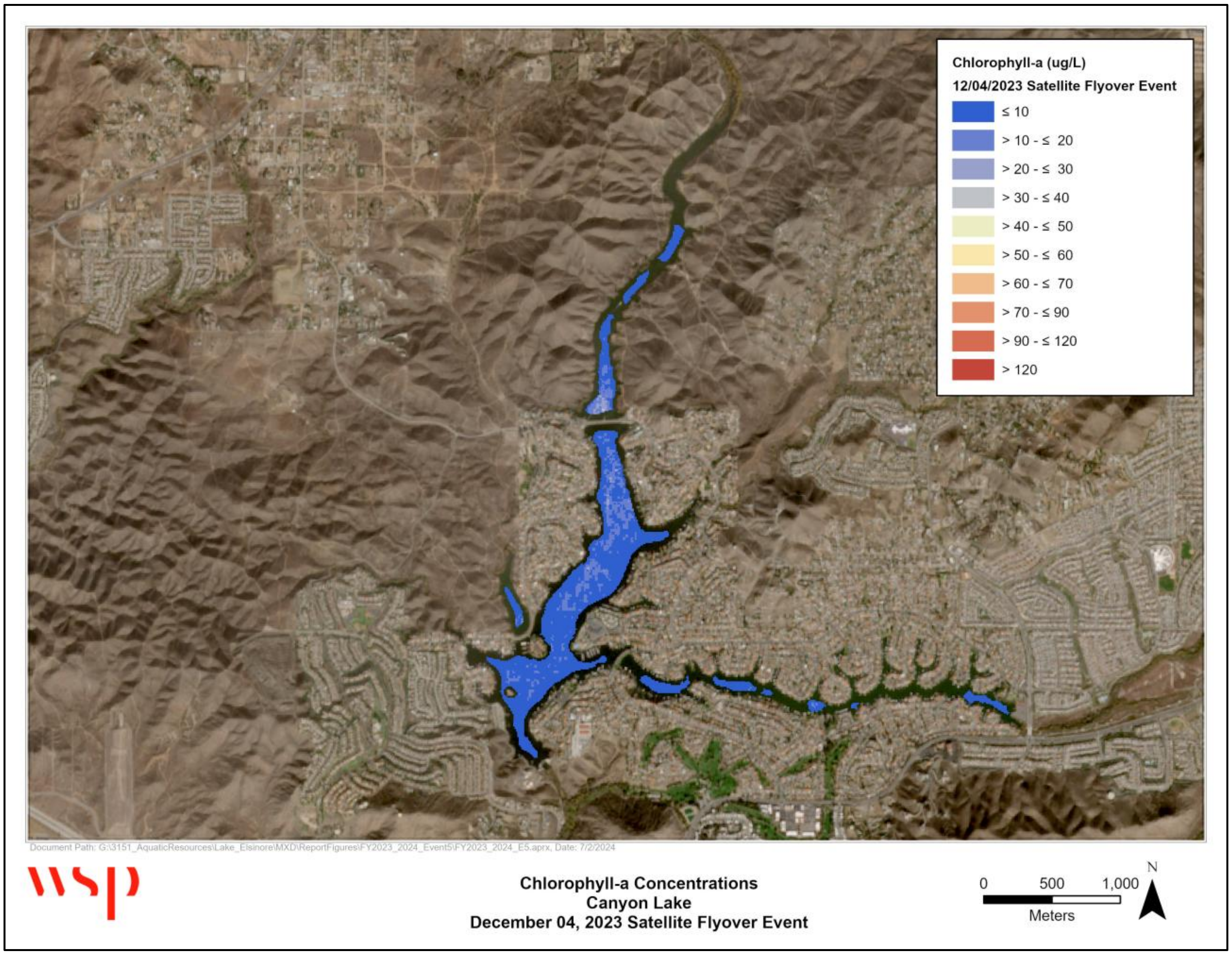


Figure 3-21e. Satellite Imagery of Chlorophyll-a Concentrations in Canyon Lake

(Data gaps are due to sun glare)

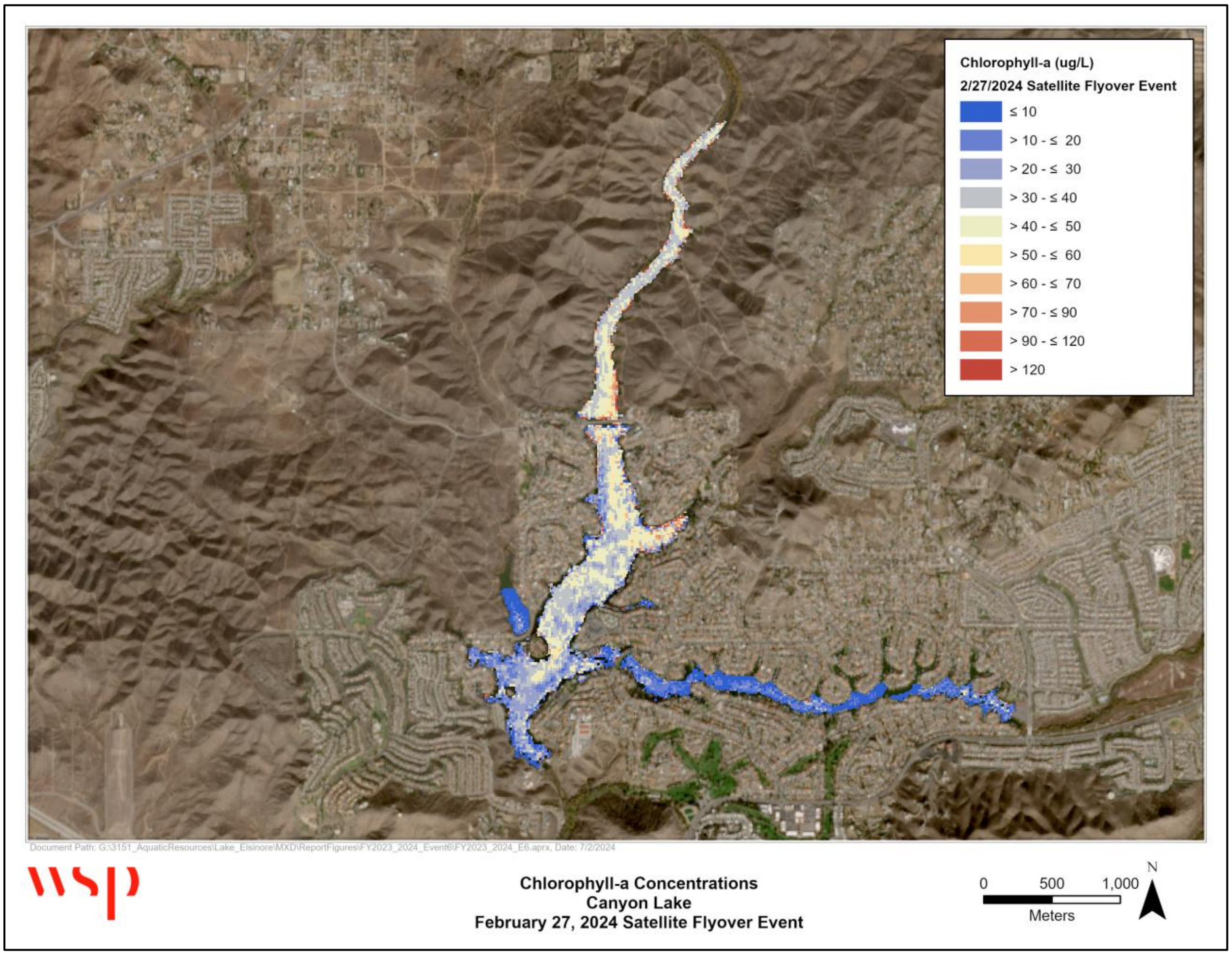


Figure 3-21f. Satellite Imagery of Chlorophyll-a Concentrations in Canyon Lake
(Data gaps are due to sun glare)

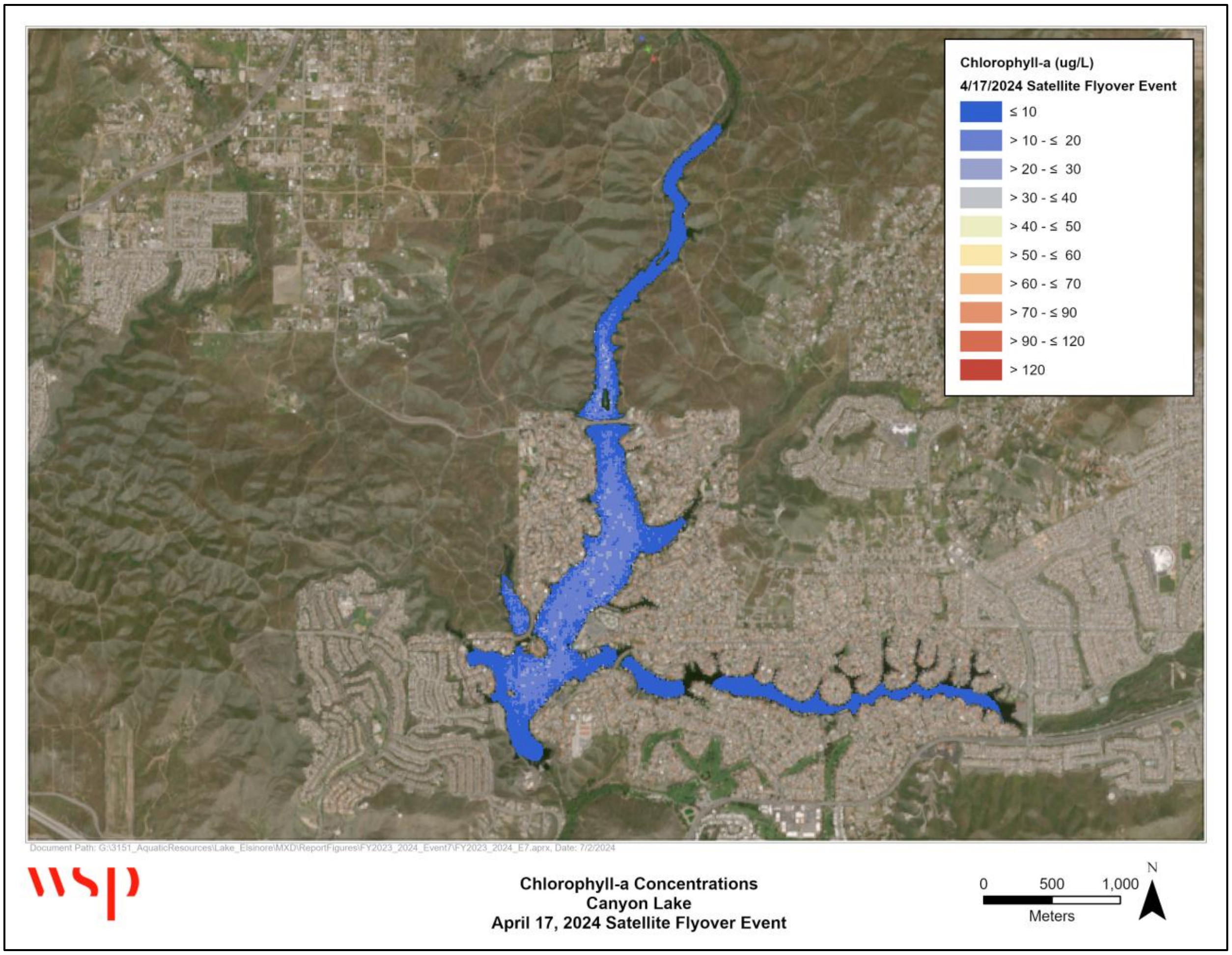


Figure 3-21g. Satellite Imagery of Chlorophyll-a Concentrations in Canyon Lake

(Data gaps are due to sun glare)

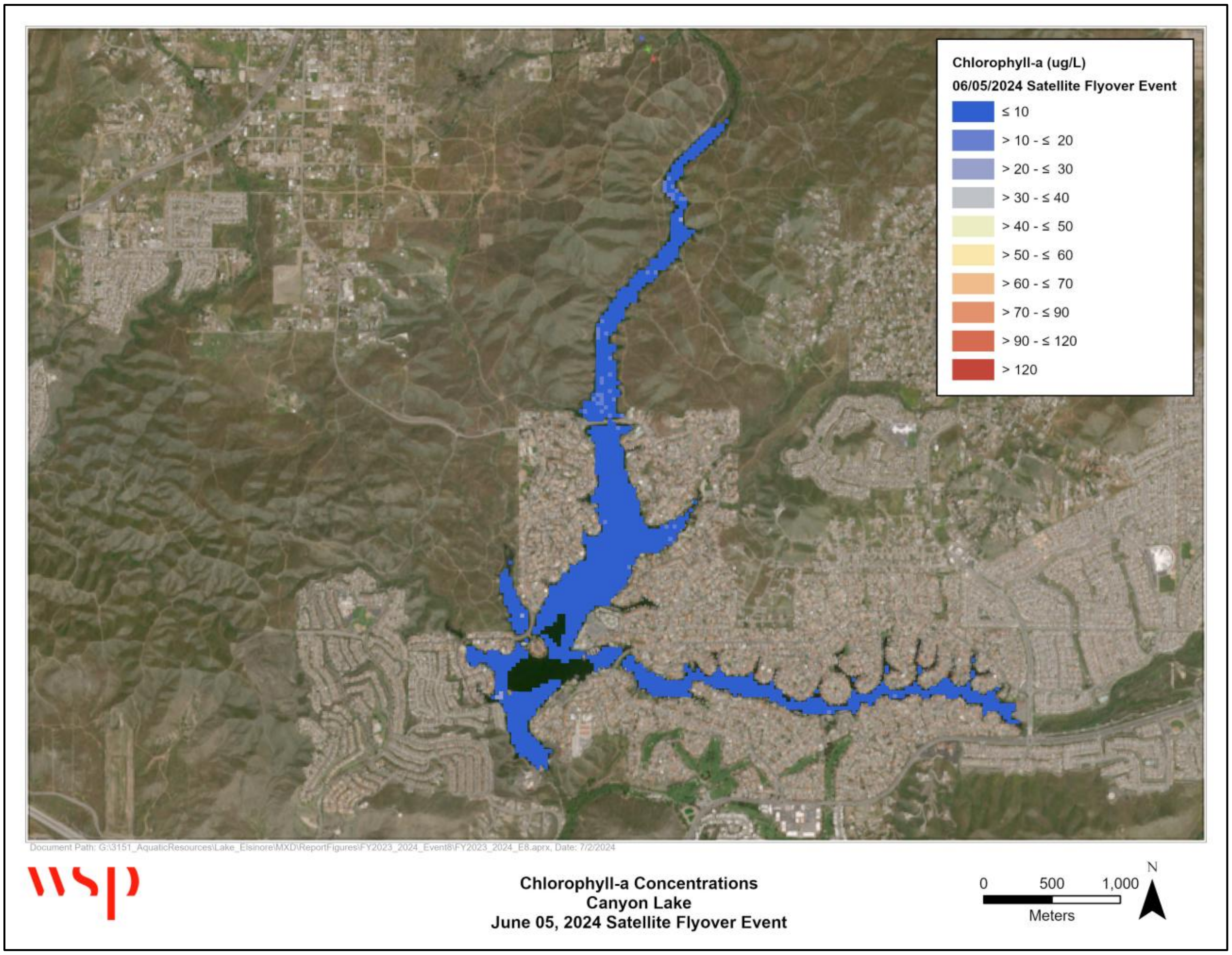


Figure 3-21h. Satellite Imagery of Chlorophyll-a Concentrations in Canyon Lake

(Data gaps are due to sun glare)

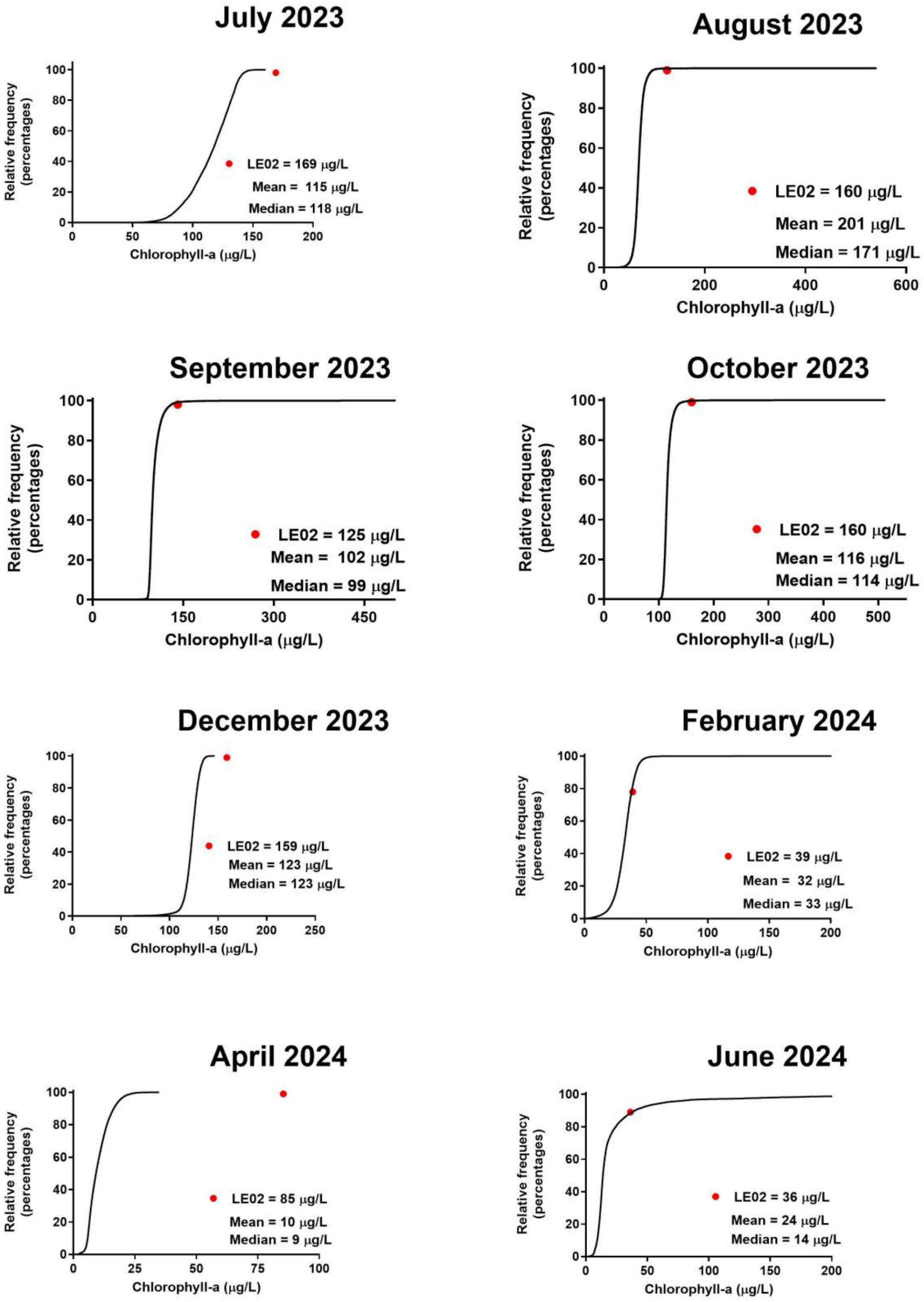


Figure 3-22. Cumulative Distribution of Satellite Derived Chlorophyll-a Concentrations in Lake Elsinore Relative to Measured Chlorophyll-a in Field Collected Samples

Colored dots represent the in-lake surface (0-2m) analytical measured concentration for each event

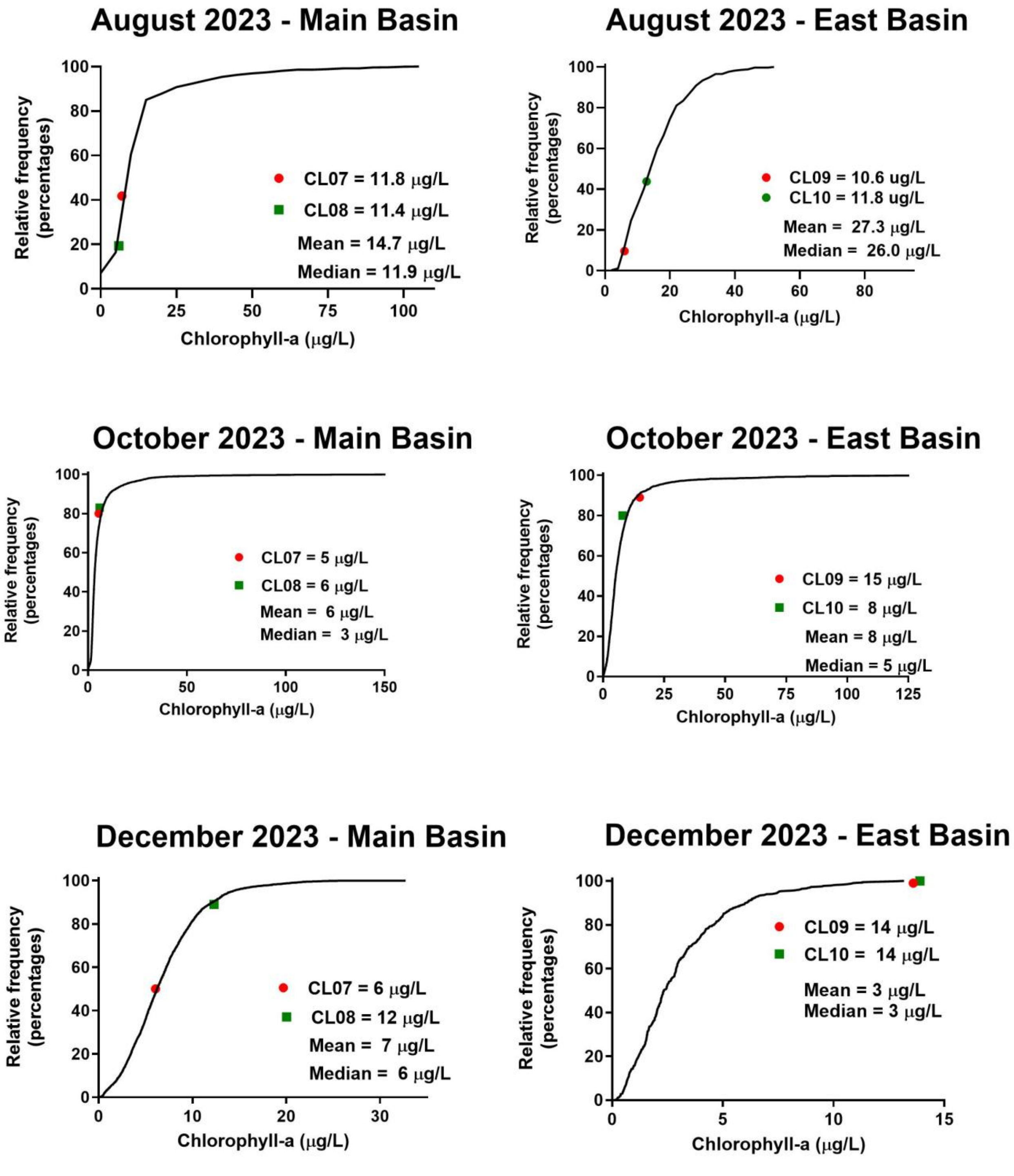


Figure 3-23. Cumulative Distribution of Satellite Derived Chlorophyll-a Concentrations in Canyon Lake Relative to Measured Chlorophyll-a in Field Collected Samples

Colored dots represent the in-lake surface (0-2m) analytical measured concentration for each event

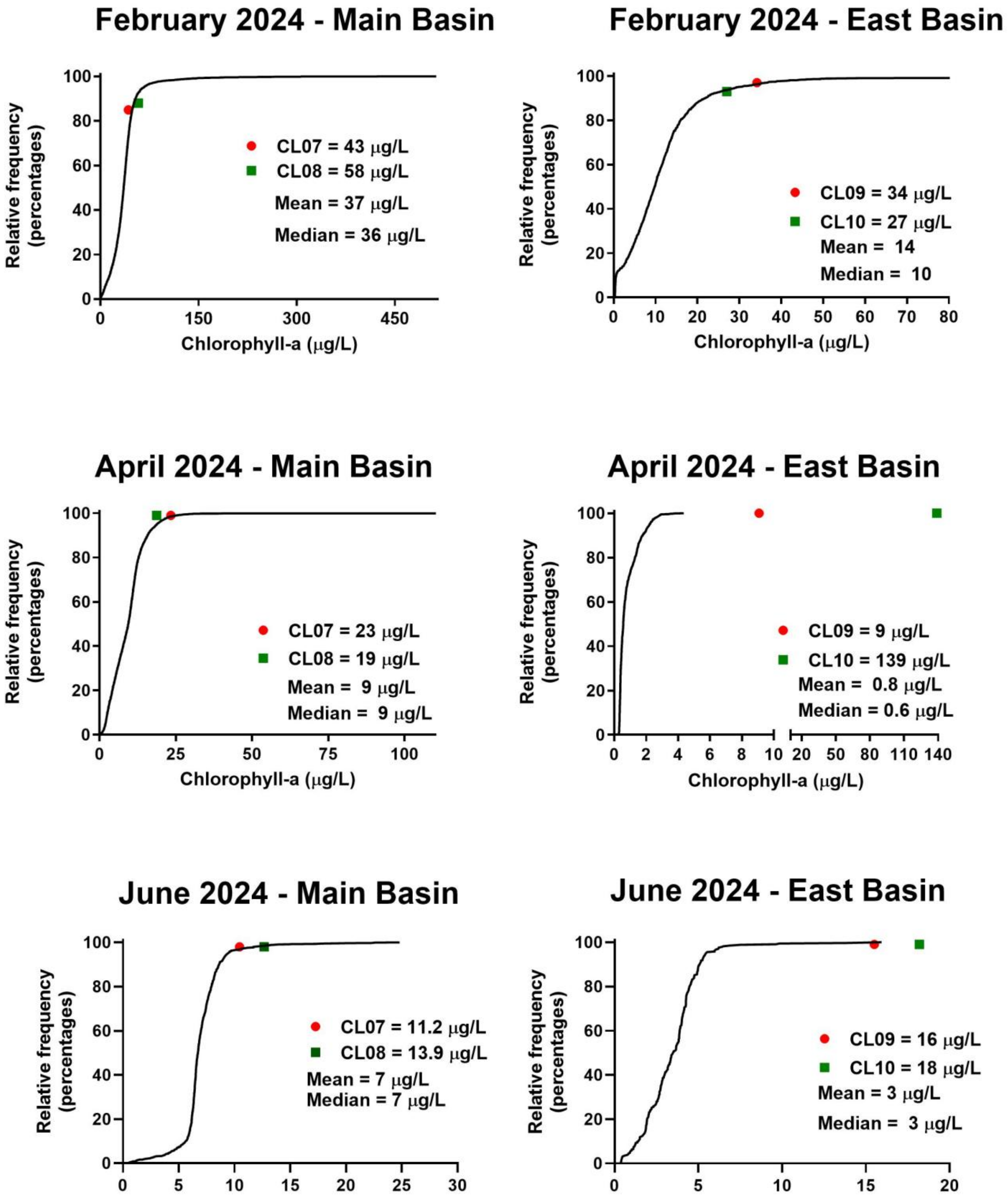


Figure 3-23 (continued). Cumulative Distribution of Satellite Derived Chlorophyll-a Concentrations in Canyon Lake Relative to Measured Chlorophyll-a in Field Collected Samples

Colored dots represent the in-lake surface (0-2m) analytical measured concentration for each event
No satellite data available for February 2023 East Basin. April 2023 East Basin satellite data below detection limit.

4.0 Conclusions

Sampling was conducted during the July 2023 to June 2024 monitoring year according to the Lake Elsinore and Canyon Lake Nutrient Monitoring Work Plan (Haley & Aldrich 2016) and companion Quality Assurance Project Plan (Amec Foster Wheeler 2016) to fulfill the requirements outlined in RWQCB Resolution No. R8-2004-0037. A total of 8 monitoring events were conducted in Lake Elsinore (monthly June to September, bi-monthly otherwise) and 6 monitoring events in Canyon Lake (bi-monthly). A total of three storm events were sampled in the watershed, occurring on January 20, 2024; February 1, 2024; and February 20, 2024.

The following summarizes the data collected during the 2023-2024 monitoring year, noting any exceedances of TMDL targets, and any relevant observations pertaining to results obtained.

4.1 Watershed Monitoring

A summary of watershed water quality monitoring data for each of the four monitoring locations for the monitoring period of July 1, 2023 through June 30, 2024 is provided below.

1. Concentrations of nutrients for the three storm events monitored at Salt Creek at Murrieta Road (Station ID 745) ranged from 1.9 to 2.3 mg/L for total nitrogen, and 0.41 to 0.44 mg/L for total phosphorus. Based on flow data provided by the nearby USGS stream gauge (Station ID 11070465), the total annual flow was estimated at 222,347,655 cf. The estimated annual nutrient load was calculated to be 13,312 kg for total nitrogen and 2,668 kg for total phosphorus.

2. Concentrations of nutrients for the three storm events monitored at San Jacinto River at Goetz Road (Station ID 759) ranged from 1.3 to 1.5 mg/L for total nitrogen, and 0.34 to 0.44 mg/L for total phosphorus. Based on flow data provided by the nearby USGS stream gauge (Station ID 11070365), the total annual flow was estimated at 686,760,435 cf. The estimated annual nutrient load was calculated to be 26,684 kg for total nitrogen and 7,371 kg for total phosphorus.

3. Concentrations of nutrients for the three storm events monitored at Canyon Lake Spillway (Station ID 841) ranged from 0.95 to 1.4 mg/L for total nitrogen, and from 0.06 to 0.30 mg/L for total phosphorus. Based on flow data provided by the nearby USGS stream gauge (Station ID 11070500), the total annual flow was estimated at 838,713,834 cf. The estimated annual nutrient load was calculated to be 27,399 kg for total nitrogen and 3,459 kg for total phosphorus.

4. No samples were collected from the sampling station at San Jacinto River at Ramona Expressway (Station ID 741) during the 2023-2024 monitoring year. Flows from the local area and from overflow of the upstream levee structure were observed at the San Jacinto River at Ramona Expressway (Station ID 741) from February 5, 2024, through February 14, 2024, and from February 22, 2024, through February 25, 2024. However, these flows did not originate from Mystic Lake.

4.2 In-Lake Monitoring

4.2.1 Lake Elsinore

1. The Lake Elsinore annual monitoring year means for total nitrogen and total phosphorus were 3.5 mg/L and 0.23 mg/L respectively, with both exceeding their associated 2020 TMDL limits. Annual mean total phosphorous concentration increased from the previous monitoring year (0.15 mg/L in 2022-2023), while total nitrogen exhibited a decrease (4.8 mg/L in 2022-2023).

2. The annual mean for total ammonia was 0.53 mg/L, an increase from the previous monitoring year mean (0.24 mg/L). All total ammonia concentrations were below CMC threshold, however two exceeded the CCC threshold in July 2023 (0.90 mg/L) and August 2023 (0.69 mg/L). The 2022-2023 monitoring year had two total ammonia exceedances of the CCC thresholds in July 2022 and December 2022.

3. The DO concentration 1-m above the lake bottom as a 12-month rolling average at Site LE02 remained below the 2020 TMDL target (>5.0 mg/L) for the entire monitoring year. Identical results were observed during the 2022-2023 monitoring year. The average full-water column DO concentration at LE02 during the 2023-2024 monitoring year was 5.7 mg/L, and the 12-month rolling average was above the 2020 TMDL target (>5.0 mg/L) for the entire monitoring year.

4. The mean chlorophyll-a concentration observed in samples collected during the summer TMDL compliance period (June 2023 through September 2023) was 123 µg/L for depth-integrated samples and 148 µg/L for surface samples. These concentrations both exceed the 2020 TMDL target of 25 µg/L chlorophyll-a. The mean summer depth-integrated 2023 chlorophyll-a value was lower than that observed during the previous summer of 2022 (160 µg/L), however the mean 2023 summer surface chlorophyll-a value was higher than that of the previous summer (122 µg/L).

4.2.2 Canyon Lake

1. The annual average lake-wide concentrations of total nitrogen and total phosphorus in Canyon Lake was 1.5 mg/L and 0.19 mg/L, respectively. Both the total nitrogen and total phosphorus mean exceeded their 2020 TMDL limits of 0.75 mg/L and 0.1 mg/L, respectively. The annual mean total nitrogen concentration increased slightly from the previous monitoring year (1.4 mg/L in 2022-2023). While the lake-wide annual mean for total phosphorus at 0.19 mg/L was above its 2020 TMDL target of 0.1 mg/L, this was likely due to the higher volumes of storms and their associated suspended sediment loads during the wet season this monitoring year.

2. The annual mean lake-wide concentration of total ammonia was 0.59 mg/L. This value is higher than the previous two monitoring years which had a mean total ammonia of 0.50 mg/L and 0.48 mg/L. One sample, Site CL09 exceeded its corresponding total ammonia CCC threshold value (1.60 mg/L in June 2024; The only site to exceed its CCC

in the previous two monitoring years was also CL09. No samples exceeded the total ammonia CMC value.

3. The lake-wide DO concentration in the hypolimnion (when the lake was stratified) ranged from 0.0 to 0.9 mg/L. The rolling 12-month mean DO concentration in the hypolimnion was never above the 2020 TMDL target of >5.0 mg/L. The magnitude of stratification in Canyon Lake, particularly in the Main Basin, as well as its duration limits the ability of the lake to meet the 2020 TMDL target for DO. The lake is stratified during large portions of the year, during which there is almost no mixing between the upper epilimnion and lower hypolimnion. During this time, the DO in the hypolimnion declines substantially as sediment processes deplete the oxygen. However, the lake-wide average DO concentration was 5.3 mg/L when averaging values across all monitored sites and depths during the 2023-2024 period.

4. The mean annual lake-wide depth-integrated chlorophyll-a concentration was 21 µg/L (depth-integrated) and 22 µg/L for surface samples. Both concentrations are below the 2020 TMDL target of 25 µg/L. These values are similar to the previous monitoring year of 23 µg/L and 19 µg/L, for the depth-integrated and surface samples.

5. Although pre-alum monitoring indicated good conditions for application, shortly following the April 2024 alum application a minor and transient fish die-off of a singles species, threadfin shad, occurred. Although no single definitive factor was identified as a cause for the limited die off of threadfin shad observed in late April 2024, observations of elevated pH, and low DO in deeper waters, along with results showing higher concentrations of total aluminum, suggest that this alum application might be one of several possible causes. Results of this investigation indicate that it was possible the aluminum concentration could have exceeded the acute CMC for a short time period in limited portions of the lake, resulting in a limited short-term fish die off. It should be noted there have been prior samples collected in Canyon Lake with much higher aluminum concentrations (up to 6,300 ug/L) with no associated fish die off. A more detailed technical memorandum summarizing the fish die-off investigation is included in Appendix F.

   The highest total aluminum concentration was measured at 840 µg/L at Site CL08 in the Main Basin in February 2024. None of the samples collected as part of the TMDL monitoring effort exceeded the 2018 EPA water chronic water quality objective (CCC) or the Criterion Maximum Concentration (CMC). It appears that alum continues to have the desired effect of lowering total phosphorus and chlorophyll-a.

5.0 References

Amec Foster Wheeler. 2016. Quality Assurance Project Plan for Lake Elsinore, Canyon Lake, and San Jacinto River Watershed TMDL Monitoring Program. May 2016.

Amec Foster Wheeler. 2017. Lake Elsinore and Canyon Lake Watersheds Nutrient TMDL Monitoring, 2016-2017 Annual Report. Prepared for the Lake Elsinore & San Jacinto Watersheds Project Authority, August 2017.

Haley & Aldrich, Inc. 2016. Lake Elsinore and Canyon Lake Nutrient TMDL Compliance Monitoring Work Plan for Lake Elsinore and San Jacinto Watershed Authority. Riverside, CA. April 2016.

Lake Elsinore and San Jacinto Watersheds Authority (LESJWA). 2006. Lake Elsinore and Canyon Lake Nutrient TMDL Monitoring Plan. CA Regional Water Quality Control Board, Santa Ana Region. February.

Montgomery Watson and Elsinore Valley Municipal Water District (MWH/ EVMWD). 2009. Canyon Lake Bacteria Characterization Study. Technical Memorandum prepared for the Lake Elsinore and Canyon Lake TMDL Task Force. December 1, 2009

Riverside County Flood Control and Water Conservation District (RCFCWCD). 2021. Hydrologic Data Collection, Rain Fall Reports.

Santa Ana Regional Water Quality Control Board. 2007. Resolution Amending the Water Quality Control Plan for the Santa Ana River Basin to Incorporate Nutrient Total Maximum Daily Loads (TMDLs) for Lake Elsinore and Canyon Lake, No. R8-2004-0037.

Santa Ana Regional Water Quality Control Board. 2007. Resolution Approving Plans and Schedules Submitted by the Canyon Lake/Lake Elsinore TMDL Task Force and Individual Discharger Groups Pursuant to the Lake Elsinore and Canyon Lake Nutrient Total Maximum Daily Loads Specified in the Water Quality Control Plan for the Santa Ana River Basin. Resolution R8-2007-0083.

Thursby, C.B. 1986. Memorandum to David J. Hansen, U.S. EPA, Narragansett, Rhode Island.

United States Environmental Protection Agency (US EPA). 2018. 2018 Final Aquatic Life Ambient Water Quality Criteria for Aluminum. EPA-822-R-18-001. U.S. EPA Office of Water. December 2018. EPA-822-R-18-001

This page intentionally left blank.

APPENDIX A

WATERSHED ANALYTICAL REPORTS

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders: 4A22097

Project: Lake Elsinore and Canyon Lake Nutrient TMDL

Attn: Garth Engelhorn

Client: NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Report Date: 2/09/2024
Received Date: 01/22/2024
Turnaround Time: Normal
Phones: (562) 495-5777
Fax: (562) 495-5877
P.O. #:
Billing Code:

ELAP-CA #1132 • EPA-UCMR #CA00211 • LACSD #10143

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

Dear Garth Engelhorn,

Enclosed are the results of analyses for samples received 1/22/24 with the Chain-of-Custody document. The samples were received in good condition, at 1.9 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Kim Tu

Kim G. Tu
Project Manager

NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL

Project Manager: Garth Engelhorn

Reported:
02/09/2024 09:40

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
S-03-012124	Austin Kay	4A22097-01	Water	01/21/24 08:10	
S-04-012124	Austin Kay	4A22097-02	Water	01/21/24 08:40	
CLS-012124	Austin Kay	4A22097-03	Water	01/21/24 07:40	

Sample Results

Sample: S-03-012124
Sampled: 01/21/24 8:10 by Austin Kay
4A22097-01 (Water)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: EPA 410.4 **Instr:** UVVIS04
Batch ID: W4A1742 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/22/24 17:20 **Analyst:** UVVIS04

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chemical Oxygen Demand	**29**	2.9	5.0	mg/l	1	01/24/24	

Method: SM 5210B **Instr:** INC07
Batch ID: W4A1726 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/22/24 13:52 **Analyst:** JLS

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Biochemical Oxygen Demand	**4.4**	2.0	2.0	mg/l	1	01/27/24	

Sample Results

Sample: S-04-012124
Sampled: 01/21/24 8:40 by Austin Kay
4A22097-02 (Water)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: EPA 410.4 **Instr:** UVVIS04
Batch ID: W4A1742 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/22/24 17:20 **Analyst:** UVVIS04

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chemical Oxygen Demand	**30**	2.9	5.0	mg/l	1	01/24/24	

Method: SM 5210B **Instr:** INC07
Batch ID: W4A1726 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/22/24 13:52 **Analyst:** JLS

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Biochemical Oxygen Demand	**6.2**	2.0	2.0	mg/l	1	01/27/24	

Sample Results

Sample: CLS-012124
Sampled: 01/21/24 7:40 by Austin Kay
4A22097-03 (Water)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: EPA 410.4 **Instr:** UVVIS04
Batch ID: W4A1742 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/22/24 17:20 **Analyst:** UVVIS04

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chemical Oxygen Demand	**32**	2.9	5.0	mg/l	1	01/24/24	

Method: SM 5210B **Instr:** INC07
Batch ID: W4A1726 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/22/24 13:52 **Analyst:** JLS

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Biochemical Oxygen Demand	**3.2**	2.0	2.0	mg/l	1	01/27/24	

Quality Control Results

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4A1726 - SM 5210B											
Blank (W4A1726-BLK1)				**Prepared: 01/22/24**		**Analyzed: 01/27/24**					
Biochemical Oxygen Demand	ND	2.0	2.0	mg/l							
Blank (W4A1726-BLK2)				**Prepared: 01/22/24**		**Analyzed: 01/27/24**					
Biochemical Oxygen Demand	ND	2.0	2.0	mg/l							
Blank (W4A1726-BLK3)				**Prepared: 01/22/24**		**Analyzed: 01/27/24**					
Biochemical Oxygen Demand	ND	2.0	2.0	mg/l							
LCS (W4A1726-BS1)				**Prepared: 01/22/24**		**Analyzed: 01/27/24**					
Biochemical Oxygen Demand	202	2.0	2.0	mg/l	198		102	85-115			
Duplicate (W4A1726-DUP1)	**Source: 4A22089-01**			**Prepared: 01/22/24**		**Analyzed: 01/27/24**					
Biochemical Oxygen Demand	4.43	2.0	2.0	mg/l		4.45			0.3	20	
Batch: W4A1742 - EPA 410.4											
Blank (W4A1742-BLK1)				**Prepared: 01/22/24**		**Analyzed: 01/24/24**					
Chemical Oxygen Demand	ND	2.9	5.0	mg/l							
LCS (W4A1742-BS1)				**Prepared: 01/22/24**		**Analyzed: 01/24/24**					
Chemical Oxygen Demand	104	2.9	5.0	mg/l	100		104	90-110			
Duplicate (W4A1742-DUP1)	**Source: 4A22131-04**			**Prepared: 01/22/24**		**Analyzed: 01/24/24**					
Chemical Oxygen Demand	1680	12	20	mg/l		1640			3	15	
Matrix Spike (W4A1742-MS1)	**Source: 4A22135-01**			**Prepared: 01/22/24**		**Analyzed: 01/24/24**					
Chemical Oxygen Demand	202	12	20	mg/l	200	ND	101	90-110			
Matrix Spike (W4A1742-MS2)	**Source: 4A22131-02**			**Prepared: 01/22/24**		**Analyzed: 01/24/24**					
Chemical Oxygen Demand	2350	12	20	mg/l	2000	397	97	90-110			
Matrix Spike Dup (W4A1742-MSD1)	**Source: 4A22135-01**			**Prepared: 01/22/24**		**Analyzed: 01/24/24**					
Chemical Oxygen Demand	214	12	20	mg/l	200	ND	107	90-110	6	15	
Matrix Spike Dup (W4A1742-MSD2)	**Source: 4A22131-02**			**Prepared: 01/22/24**		**Analyzed: 01/24/24**					
Chemical Oxygen Demand	2300	12	20	mg/l	2000	397	95	90-110	2	15	

Notes and Definitions

Item	Definition
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

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

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders: 4A25085

Project: Lake Elsinore and Canyon Lake Nutrient TMDL

Attn: Garth Engelhorn

Client: NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Report Date: 2/26/2024
Received Date: 1/25/2024
Turnaround Time: Normal
Phones: (562) 495-5777
Fax: (562) 495-5877
P.O. #:
Billing Code:

DoD-ELAP ANAB #ADE-2882 • DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015 • NV-DEP #NAC 445A • SCAQMD #93LA1006

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

Dear Garth Engelhorn,

Enclosed are the results of analyses for samples received 1/25/24 with the Chain-of-Custody document. The samples were received in good condition, at 11.2 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Kenneth Oda

Kenneth C. Oda For Kim G. Tu
Project Manager

NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL

Project Manager: Garth Engelhorn

Reported: 02/26/2024 12:27

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
S-04-012524	Austin Kay	4A25085-01	Water	01/25/24 08:00	
S-03-012524	Austin Kay	4A25085-02	Water	01/25/24 06:35	
CLS-012524	Austin Kay	4A25085-03	Water	01/25/24 09:00	

Certificate of Analysis

FINAL REPORT

NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL

Project Manager: Garth Engelhorn

Reported: 02/26/2024 12:27

Sample Results

Sample: S-04-012524

Sampled: 01/25/24 8:00 by Austin Kay

4A25085-01 (Water)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: [CALC] **Instr:** [CALC]
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 02/12/24 12:33 **Analyst:** YMT

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrogen, Total	**1.3**	0.036	0.20	mg/l		02/14/24	

Method: _Various **Instr:** [CALC]
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 02/12/24 12:33 **Analyst:** YMT

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Organic Nitrogen, Total	**0.72**	0.017	0.10	mg/l		02/14/24	

Method: EPA 350.1 **Instr:** AA06
Batch ID: W4B0278 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/05/24 11:30 **Analyst:** ymt

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Ammonia as N	**0.031**	0.017	0.10	mg/l	1	02/06/24	J

Method: EPA 351.2 **Instr:** AA06
Batch ID: W4B0924 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/12/24 12:33 **Analyst:** YMT

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
TKN	**0.75**	0.13	0.20	mg/l	1	02/14/24	M-02

Method: EPA 353.2 **Instr:** AA01
Batch ID: W4A2238 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/26/24 16:32 **Analyst:** ISM

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrate as N	**0.57**	0.040	0.20	mg/l	1	01/26/24 18:14	
Nitrite as N	ND	42	100	ug/l	1	01/26/24 18:14	
NO2+NO3 as N	**600**	36	200	ug/l	1	01/26/24	

Method: EPA 365.3 **Instr:** UVVIS04
Batch ID: W4A2109 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/25/24 13:59 **Analyst:** rob

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
o-Phosphate as P	**0.20**	0.0071	0.010	mg/l	1	01/25/24 18:14	

Method: EPA 365.3 **Instr:** UVVIS05
Batch ID: W4B1213 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/14/24 14:59 **Analyst:** rob

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Phosphorus as P, Total	**0.34**	0.0067	0.010	mg/l	1	02/16/24	

Method: SM 2540C **Instr:** OVEN17
Batch ID: W4A2344 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/29/24 12:59 **Analyst:** bel

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Dissolved Solids	**150**	4.0	10	mg/l	1	01/29/24	

Method: SM 2540D **Instr:** OVEN15
Batch ID: W4A2596 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/31/24 12:00 **Analyst:** kac

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Suspended Solids	**53**		5	mg/l	1	01/31/24	

Metals by EPA 200 Series Methods

Method: [CALC] **Instr:** [CALC]
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 01/30/24 13:13 **Analyst:** kvm

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Hardness as CaCO3, Total	**63.3**	0.121	3.31	mg/l		02/09/24	

Method: EPA 200.7 **Instr:** ICP03
Batch ID: W4A2472 **Preparation:** EPA 200.2 **Prepared:** 01/30/24 13:13 **Analyst:** kvm

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Calcium, Total	**18.0**	0.0240	0.500	mg/l	1	02/09/24	
Magnesium, Total	**4.44**	0.0148	0.500	mg/l	1	02/09/24	

Sample Results

(Continued)

Sample: S-04-012524 Sampled: 01/25/24 8:00 by Austin Kay

4A25085-01 (Water) (Continued)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Metals by EPA 200 Series Methods (Continued)							
Method: EPA 200.7 **Instr:** ICP03							
Batch ID: W4A2472 **Preparation:** EPA 200.2 **Prepared:** 01/30/24 13:13 **Analyst:** kvm							

Sample Results

(Continued)

Sample: S-03-012524 Sampled: 01/25/24 6:35 by Austin Kay

4A25085-02 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: [CALC] **Instr:** [CALC]							
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 02/12/24 12:33 **Analyst:** YMT							
Nitrogen, Total	**2.3**	0.036	0.20	mg/l		02/14/24	
Method: _Various **Instr:** [CALC]							
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 02/12/24 12:33 **Analyst:** YMT							
Organic Nitrogen, Total	**1.7**	0.017	0.10	mg/l		02/14/24	
Method: EPA 350.1 **Instr:** AA06							
Batch ID: W4B0278 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/05/24 11:30 **Analyst:** ymt							
Ammonia as N	**0.071**	0.017	0.10	mg/l	1	02/06/24	J
Method: EPA 351.2 **Instr:** AA06							
Batch ID: W4B0924 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/12/24 12:33 **Analyst:** YMT							
TKN	**1.8**	0.13	0.20	mg/l	1	02/14/24	M-02
Method: EPA 353.2 **Instr:** AA01							
Batch ID: W4A2238 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/26/24 16:32 **Analyst:** ISM							
Nitrate as N	**0.49**	0.040	0.20	mg/l	1	01/26/24 18:15	
Nitrite as N	ND	42	100	ug/l	1	01/26/24 18:15	
NO2+NO3 as N	**520**	36	200	ug/l	1	01/26/24	
Method: EPA 365.3 **Instr:** UVVIS04							
Batch ID: W4A2109 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/25/24 13:59 **Analyst:** rob							
o-Phosphate as P	**0.26**	0.0071	0.010	mg/l	1	01/25/24 18:14	
Method: EPA 365.3 **Instr:** UVVIS05							
Batch ID: W4B1213 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/14/24 14:59 **Analyst:** rob							
Phosphorus as P, Total	**0.44**	0.0067	0.010	mg/l	1	02/16/24	
Method: SM 2540C **Instr:** OVEN17							
Batch ID: W4A2344 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/29/24 12:59 **Analyst:** bel							
Total Dissolved Solids	**430**	4.0	10	mg/l	1	01/29/24	
Method: SM 2540D **Instr:** OVEN15							
Batch ID: W4A2596 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/31/24 12:00 **Analyst:** kac							
Total Suspended Solids	**70**		5	mg/l	1	01/31/24	

Sample Results

(Continued)

Sample: S-03-012524

Sampled: 01/25/24 6:35 by Austin Kay

4A25085-02 (Water)

(Continued)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)							
Method: SM 2540D **Instr:** OVEN15							
Batch ID: W4A2596 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/31/24 12:00 **Analyst:** kac							
Metals by EPA 200 Series Methods							
Method: [CALC] **Instr:** [CALC]							
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 01/30/24 13:13 **Analyst:** kvm							
Hardness as CaCO3, Total	**156**	0.121	3.31	mg/l		02/09/24	
Method: EPA 200.7 **Instr:** ICP03							
Batch ID: W4A2472 **Preparation:** EPA 200.2 **Prepared:** 01/30/24 13:13 **Analyst:** kvm							
Calcium, Total	**37.2**	0.0240	0.500	mg/l	1	02/09/24	
Magnesium, Total	**15.4**	0.0148	0.500	mg/l	1	02/09/24	

Certificate of Analysis

FINAL REPORT

NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL
Project Manager: Garth Engelhorn

Reported: 02/26/2024 12:27

Sample Results

(Continued)

Sample: CLS-012524
Sampled: 01/25/24 9:00 by Austin Kay

4A25085-03 (Water)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: [CALC] **Instr:** [CALC]
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 02/12/24 12:33 **Analyst:** YMT

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrogen, Total	**1.1**	0.036	0.10	mg/l		02/14/24	

Method: _Various **Instr:** [CALC]
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 02/12/24 12:33 **Analyst:** YMT

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Organic Nitrogen, Total	**0.74**	0.017	0.10	mg/l		02/14/24	

Method: EPA 350.1 **Instr:** AA06
Batch ID: W4B0278 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/05/24 11:30 **Analyst:** ymt

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Ammonia as N	**0.021**	0.017	0.10	mg/l	1	02/06/24	J

Method: EPA 351.2 **Instr:** AA06
Batch ID: W4B0924 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/12/24 12:33 **Analyst:** YMT

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
TKN	**0.76**	0.065	0.10	mg/l	1	02/14/24	

Method: EPA 353.2 **Instr:** AA01
Batch ID: W4A2238 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/26/24 16:32 **Analyst:** ISM

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrate as N	**0.29**	0.040	0.20	mg/l	1	01/26/24 18:16	
Nitrite as N	ND	42	100	ug/l	1	01/26/24 18:16	
NO2+NO3 as N	**300**	36	200	ug/l	1	01/26/24	

Method: EPA 365.3 **Instr:** UVVIS04
Batch ID: W4A2109 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/25/24 13:59 **Analyst:** rob

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
o-Phosphate as P	ND	0.0071	0.010	mg/l	1	01/25/24 18:15	

Method: EPA 365.3 **Instr:** UVVIS05
Batch ID: W4B1213 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/14/24 14:59 **Analyst:** rob

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Phosphorus as P, Total	**0.061**	0.0067	0.010	mg/l	1	02/16/24	

Method: SM 2540C **Instr:** OVEN17
Batch ID: W4A2344 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/29/24 12:59 **Analyst:** bel

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Dissolved Solids	**500**	4.0	10	mg/l	1	01/29/24	

Method: SM 2540D **Instr:** OVEN15
Batch ID: W4A2596 **Preparation:** _NONE (WETCHEM) **Prepared:** 01/31/24 12:00 **Analyst:** kac

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Suspended Solids	**10**		5	mg/l	1	01/31/24	

Metals by EPA 200 Series Methods

Method: [CALC] **Instr:** [CALC]
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 01/30/24 13:13 **Analyst:** kvm

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Hardness as CaCO3, Total	**239**	0.121	3.31	mg/l		02/09/24	

Method: EPA 200.7 **Instr:** ICP03
Batch ID: W4A2472 **Preparation:** EPA 200.2 **Prepared:** 01/30/24 13:13 **Analyst:** kvm

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Calcium, Total	**64.0**	0.0240	0.500	mg/l	1	02/09/24	
Magnesium, Total	**19.1**	0.0148	0.500	mg/l	1	02/09/24	

NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL
Project Manager: Garth Engelhorn

Reported:
02/26/2024 12:27

Sample Results

(Continued)

Sample: CLS-012524 Sampled: 01/25/24 9:00 by Austin Kay

4A25085-03 (Water) (Continued)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier

Metals by EPA 200 Series Methods (Continued)

Method: EPA 200.7 **Instr:** ICP03

Batch ID: W4A2472 **Preparation:** EPA 200.2 **Prepared:** 01/30/24 13:13 **Analyst:** kvm

Quality Control Results

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4A2109 - EPA 365.3											
Blank (W4A2109-BLK1)				**Prepared & Analyzed: 01/25/24**							
o-Phosphate as P	ND	0.0071	0.010	mg/l							
LCS (W4A2109-BS1)				**Prepared & Analyzed: 01/25/24**							
o-Phosphate as P	0.205	0.0071	0.010	mg/l	0.200		102	88-111			
Matrix Spike (W4A2109-MS1)	**Source: 4A24037-03**			**Prepared & Analyzed: 01/25/24**							
o-Phosphate as P	41.5	0.71	1.0	mg/l	20.0	21.8	98	85-112			
Matrix Spike Dup (W4A2109-MSD1)	**Source: 4A24037-03**			**Prepared & Analyzed: 01/25/24**							
o-Phosphate as P	41.4	0.71	1.0	mg/l	20.0	21.8	98	85-112	0.2	20	
Batch: W4A2238 - EPA 353.2											
Blank (W4A2238-BLK1)				**Prepared & Analyzed: 01/26/24**							
Nitrate as N	ND	0.040	0.20	mg/l							
Nitrite as N	ND	42	100	ug/l							
NO2+NO3 as N	ND	36	200	ug/l							
Blank (W4A2238-BLK2)				**Prepared & Analyzed: 01/26/24**							
Nitrate as N	ND	0.040	0.20	mg/l							A-01
Nitrite as N	ND	42	100	ug/l							A-01
NO2+NO3 as N	ND	36	200	ug/l							A-01
LCS (W4A2238-BS1)				**Prepared & Analyzed: 01/26/24**							
Nitrate as N	0.984	0.040	0.20	mg/l	1.00		98	90-110			
Nitrite as N	1010	42	100	ug/l	1000		101	90-110			
NO2+NO3 as N	984	36	200	ug/l	1000		98	90-110			
LCS (W4A2238-BS2)				**Prepared & Analyzed: 01/26/24**							
Nitrate as N	0.973	0.040	0.20	mg/l	1.00		97	90-110			A-01
Nitrite as N	1040	42	100	ug/l	1000		104	90-110			A-01
NO2+NO3 as N	973	36	200	ug/l	1000		97	90-110			A-01
Matrix Spike (W4A2238-MS1)	**Source: 3L21002-02**			**Prepared & Analyzed: 01/26/24**							
Nitrate as N	2.37	0.040	0.20	mg/l	2.00	0.407	98	90-110			
Nitrite as N	997	42	100	ug/l	1000	ND	100	90-110			
NO2+NO3 as N	2370	36	200	ug/l	2000	407	98	90-110			
Matrix Spike (W4A2238-MS2)	**Source: 4A23001-01**			**Prepared & Analyzed: 01/26/24**							
Nitrate as N	1.94	0.040	0.20	mg/l	2.00	ND	97	90-110			
Nitrite as N	1020	42	100	ug/l	1000	ND	102	90-110			
NO2+NO3 as N	1940	36	200	ug/l	2000	ND	97	90-110			
Matrix Spike Dup (W4A2238-MSD1)	**Source: 3L21002-02**			**Prepared & Analyzed: 01/26/24**							
Nitrate as N	2.34	0.040	0.20	mg/l	2.00	0.407	97	90-110	1	20	
Nitrite as N	995	42	100	ug/l	1000	ND	100	90-110	0.2	20	
NO2+NO3 as N	2340	36	200	ug/l	2000	407	97	90-110	1	20	
Matrix Spike Dup (W4A2238-MSD2)	**Source: 4A23001-01**			**Prepared & Analyzed: 01/26/24**							
Nitrate as N	1.93	0.040	0.20	mg/l	2.00	ND	96	90-110	0.5	20	

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4A2238 - EPA 353.2 (Continued)											
Matrix Spike Dup (W4A2238-MSD2)	**Source: 4A23001-01**			**Prepared & Analyzed: 01/26/24**							
Nitrite as N	1010	42	100	ug/l	1000	ND	101	90-110	1	20	
NO2+NO3 as N	1930	36	200	ug/l	2000	ND	96	90-110	0.5	20	
Batch: W4A2344 - SM 2540C											
Blank (W4A2344-BLK1)				**Prepared & Analyzed: 01/29/24**							
Total Dissolved Solids	ND	4.0	10	mg/l							
LCS (W4A2344-BS1)				**Prepared & Analyzed: 01/29/24**							
Total Dissolved Solids	807	4.0	10	mg/l	824		98	97-103			
Duplicate (W4A2344-DUP1)	**Source: 4A26032-01**			**Prepared & Analyzed: 01/29/24**							
Total Dissolved Solids	35600	4.0	10	mg/l		36200			2	10	
Duplicate (W4A2344-DUP2)	**Source: 4A26057-01**			**Prepared & Analyzed: 01/29/24**							
Total Dissolved Solids	38300	4.0	10	mg/l		38800			1	10	
Batch: W4A2596 - SM 2540D											
Blank (W4A2596-BLK1)				**Prepared & Analyzed: 01/31/24**							
Total Suspended Solids	0.400		5	mg/l							J
LCS (W4A2596-BS1)				**Prepared & Analyzed: 01/31/24**							
Total Suspended Solids	61.6		5	mg/l	58.8		105	90-110			
Duplicate (W4A2596-DUP1)	**Source: 4A25078-01**			**Prepared & Analyzed: 01/31/24**							
Total Suspended Solids	1150		5	mg/l		1170			2	10	
Duplicate (W4A2596-DUP2)	**Source: 4A26073-01**			**Prepared & Analyzed: 01/31/24**							
Total Suspended Solids	184		5	mg/l		182			1	10	
Batch: W4B0278 - EPA 350.1											
Blank (W4B0278-BLK1)				**Prepared: 02/05/24 Analyzed: 02/06/24**							
Ammonia as N	ND	0.017	0.10	mg/l							
Blank (W4B0278-BLK2)				**Prepared: 02/05/24 Analyzed: 02/06/24**							
Ammonia as N	ND	0.017	0.10	mg/l							
LCS (W4B0278-BS1)				**Prepared: 02/05/24 Analyzed: 02/06/24**							
Ammonia as N	0.248	0.017	0.10	mg/l	0.250		99	90-110			
LCS (W4B0278-BS2)				**Prepared: 02/05/24 Analyzed: 02/06/24**							
Ammonia as N	0.247	0.017	0.10	mg/l	0.250		99	90-110			
Matrix Spike (W4B0278-MS1)	**Source: 4A25049-01**			**Prepared: 02/05/24 Analyzed: 02/06/24**							
Ammonia as N	0.400	0.017	0.10	mg/l	0.250	0.159	97	90-110			
Matrix Spike (W4B0278-MS2)	**Source: 4A26100-05**			**Prepared: 02/05/24 Analyzed: 02/06/24**							
Ammonia as N	0.252	0.017	0.10	mg/l	0.250	ND	101	90-110			
Matrix Spike Dup (W4B0278-MSD1)	**Source: 4A25049-01**			**Prepared: 02/05/24 Analyzed: 02/06/24**							
Ammonia as N	0.400	0.017	0.10	mg/l	0.250	0.159	97	90-110	0.04	15	
Matrix Spike Dup (W4B0278-MSD2)	**Source: 4A26100-05**			**Prepared: 02/05/24 Analyzed: 02/06/24**							
Ammonia as N	0.254	0.017	0.10	mg/l	0.250	ND	101	90-110	0.6	15	

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4B0924 - EPA 351.2											
Blank (W4B0924-BLK1)				**Prepared: 02/12/24**		**Analyzed: 02/14/24**					
TKN	ND	0.065	0.10	mg/l							
LCS (W4B0924-BS1)				**Prepared: 02/12/24**		**Analyzed: 02/14/24**					
TKN	0.996	0.065	0.10	mg/l	1.00		100	90-110			
Matrix Spike (W4B0924-MS1)	**Source: 4B01152-03**			**Prepared: 02/12/24**		**Analyzed: 02/14/24**					
TKN	2.07	0.065	0.10	mg/l	1.00	1.06	101	90-110			
Matrix Spike Dup (W4B0924-MSD1)	**Source: 4B01152-03**			**Prepared: 02/12/24**		**Analyzed: 02/14/24**					
TKN	2.07	0.065	0.10	mg/l	1.00	1.06	101	90-110	0.08	10	
Batch: W4B1213 - EPA 365.3											
Blank (W4B1213-BLK1)				**Prepared: 02/14/24**		**Analyzed: 02/16/24**					
Phosphorus as P, Total	ND	0.0067	0.010	mg/l							
LCS (W4B1213-BS1)				**Prepared: 02/14/24**		**Analyzed: 02/16/24**					
Phosphorus as P, Total	0.196	0.0067	0.010	mg/l	0.200		98	90-110			
Matrix Spike (W4B1213-MS1)	**Source: 4A23128-07**			**Prepared: 02/14/24**		**Analyzed: 02/16/24**					
Phosphorus as P, Total	0.208	0.0067	0.010	mg/l	0.200	0.0160	96	90-110			
Matrix Spike Dup (W4B1213-MSD1)	**Source: 4A23128-07**			**Prepared: 02/14/24**		**Analyzed: 02/16/24**					
Phosphorus as P, Total	0.212	0.0067	0.010	mg/l	0.200	0.0160	98	90-110	2	20	

Quality Control Results

(Continued)

Metals by EPA 200 Series Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4A2472 - EPA 200.7											
Blank (W4A2472-BLK1)				**Prepared: 01/30/24**	**Analyzed: 02/09/24**						
Calcium, Total	ND	0.0240	0.500	mg/l							
Magnesium, Total	ND	0.0148	0.500	mg/l							
LCS (W4A2472-BS1)				**Prepared: 01/30/24**	**Analyzed: 02/09/24**						
Calcium, Total	48.7	0.0240	0.500	mg/l	50.2		97	85-115			
Magnesium, Total	48.5	0.0148	0.500	mg/l	50.2		97	85-115			
Matrix Spike (W4A2472-MS1)	**Source: 4A24054-17**			**Prepared: 01/30/24**	**Analyzed: 02/09/24**						
Calcium, Total	146	0.0240	0.500	mg/l	50.2	101	91	70-130			
Magnesium, Total	108	0.0148	0.500	mg/l	50.2	60.6	94	70-130			
Matrix Spike (W4A2472-MS2)	**Source: 4A24054-20**			**Prepared: 01/30/24**	**Analyzed: 02/09/24**						
Calcium, Total	147	0.0240	0.500	mg/l	50.2	100	93	70-130			
Magnesium, Total	108	0.0148	0.500	mg/l	50.2	60.0	95	70-130			
Matrix Spike Dup (W4A2472-MSD1)	**Source: 4A24054-17**			**Prepared: 01/30/24**	**Analyzed: 02/09/24**						
Calcium, Total	148	0.0240	0.500	mg/l	50.2	101	93	70-130	0.8	30	
Magnesium, Total	109	0.0148	0.500	mg/l	50.2	60.6	96	70-130	0.8	30	
Matrix Spike Dup (W4A2472-MSD2)	**Source: 4A24054-20**			**Prepared: 01/30/24**	**Analyzed: 02/09/24**						
Calcium, Total	146	0.0240	0.500	mg/l	50.2	100	91	70-130	0.6	30	
Magnesium, Total	107	0.0148	0.500	mg/l	50.2	60.0	94	70-130	0.5	30	

Certificate of Analysis

FINAL REPORT

NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL

Project Manager: Garth Engelhorn

Reported: 02/26/2024 12:27

Notes and Definitions

Item	Definition
A-01	Filtered.
J	Estimated conc. detected <MRL and >MDL.
M-02	Due to the nature of matrix interferences, sample was diluted prior to preparation. The MDL and MRL were raised due to the dilution.
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.
[CALC]	An automated calculation using unrounded values then rounding the final result (scientific rounding rules). Calculations do not contain direct qualifiers; please refer to the individual components of the calculation for any qualifiers

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

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

Hardness as CaCO3, Total consist of the following components Magnesium, Total; and Calcium, Total

Nitrogen, Total consist of the following components NO2+NO3 as N; and TKN

Organic Nitrogen, Total consist of the following components TKN; and Ammonia as N

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders: 4B02110

Project: Lake Elsinore and Canyon Lake Nutrient TMDL

Attn: Garth Engelhorn

Client: NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Report Date: 2/21/2024
Received Date: 2/2/2024
Turnaround Time: Normal
Phones: (562) 495-5777
Fax: (562) 495-5877
P.O. #:
Billing Code:

DoD-ELAP ANAB #ADE-2882 • DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015 • NV-DEP #NAC 445A • SCAQMD #93LA1006

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

Dear Garth Engelhorn,

Enclosed are the results of analyses for samples received 2/02/24 with the Chain-of-Custody document. The samples were received in good condition, at 1.6 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Kenneth Oda

Kenneth C. Oda For Kim G. Tu
Project Manager

Certificate of Analysis

FINAL REPORT

NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL

Project Manager: Garth Engelhorn

Reported: 02/21/2024 12:29

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
S-03-020124-01	Austin Kay	4B02110-01	Water	02/01/24 14:40	
S-03-020124-02	Austin Kay	4B02110-02	Water	02/01/24 14:40	
S-03-020124-03	Austin Kay	4B02110-03	Water	02/01/24 14:50	
S-04-020124-01	Austin Kay	4B02110-04	Water	02/01/24 15:10	
CLS-020 24-01	Austin Kay	4B02110-05	Water	02/01/24 16:00	

Sample Results

Sample: S-03-020124-01 Sampled: 02/01/24 14:40 by Austin Kay

4B02110-01 (Water)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: EPA 410.4 **Instr:** UVVIS05
Batch ID: W4B1073 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/13/24 16:42 **Analyst:** jls

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chemical Oxygen Demand	**21**	2.9	5.0	mg/l	1	02/14/24	

Method: SM 5210B **Instr:** INC14
Batch ID: W4B0195 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/02/24 13:33 **Analyst:** JLS

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Biochemical Oxygen Demand	**4.2**	2.0	2.0	mg/l	1	02/07/24	

Sample Results

Sample: S-03-020124-02 Sampled: 02/01/24 14:40 by Austin Kay

4B02110-02 (Water)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: EPA 410.4 **Instr:** UVVIS05
Batch ID: W4B1073 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/13/24 16:42 **Analyst:** jls

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chemical Oxygen Demand	**20**	2.9	5.0	mg/l	1	02/14/24	

Method: SM 5210B **Instr:** INC14
Batch ID: W4B0195 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/02/24 13:33 **Analyst:** JLS

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Biochemical Oxygen Demand	**4.4**	2.0	2.0	mg/l	1	02/07/24	

Sample Results

Sample: S-03-020124-03 Sampled: 02/01/24 14:50 by Austin Kay

4B02110-03 (Water)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: EPA 410.4 **Instr:** UVVIS05
Batch ID: W4B1073 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/13/24 16:42 **Analyst:** jls

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chemical Oxygen Demand	ND	2.9	5.0	mg/l	1	02/14/24	

Method: SM 5210B **Instr:** INC14
Batch ID: W4B0195 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/02/24 13:33 **Analyst:** JLS

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Biochemical Oxygen Demand	ND	2.0	2.0	mg/l	1	02/07/24	

Sample Results

(Continued)

Sample: S-04-020124-01 — Sampled: 02/01/24 15:10 by Austin Kay

4B02110-04 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 410.4 — **Instr:** UVVIS05							
Batch ID: W4B1073 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 02/13/24 16:42 — **Analyst:** jls							
Chemical Oxygen Demand	**65**	2.9	5.0	mg/l	1	02/14/24	
Method: SM 5210B — **Instr:** INC14							
Batch ID: W4B0195 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 02/02/24 13:33 — **Analyst:** JLS							
Biochemical Oxygen Demand	**14**	2.0	2.0	mg/l	1	02/07/24	

Sample Results

(Continued)

Sample: CLS-020 24-01 — Sampled: 02/01/24 16:00 by Austin Kay

4B02110-05 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 410.4 — **Instr:** UVVIS05							
Batch ID: W4B1073 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 02/13/24 16:42 — **Analyst:** jls							
Chemical Oxygen Demand	**23**	2.9	5.0	mg/l	1	02/14/24	
Method: SM 5210B — **Instr:** INC14							
Batch ID: W4B0195 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 02/02/24 13:33 — **Analyst:** JLS							
Biochemical Oxygen Demand	**3.2**	2.0	2.0	mg/l	1	02/07/24	

Quality Control Results

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4B0195 - SM 5210B											
Blank (W4B0195-BLK1)				**Prepared: 02/02/24 Analyzed: 02/07/24**							
Biochemical Oxygen Demand	ND	2.0	2.0	mg/l							
Blank (W4B0195-BLK2)				**Prepared: 02/02/24 Analyzed: 02/07/24**							
Biochemical Oxygen Demand	ND	2.0	2.0	mg/l							
Blank (W4B0195-BLK3)				**Prepared: 02/02/24 Analyzed: 02/07/24**							
Biochemical Oxygen Demand	ND	2.0	2.0	mg/l							
LCS (W4B0195-BS1)				**Prepared: 02/02/24 Analyzed: 02/07/24**							
Biochemical Oxygen Demand	208	2.0	2.0	mg/l	198		105	85-115			
Duplicate (W4B0195-DUP1)	**Source: 4B02051-04**			**Prepared: 02/02/24 Analyzed: 02/07/24**							
Biochemical Oxygen Demand	6.22	2.0	2.0	mg/l		7.85			23	20	QR-03
Batch: W4B1073 - EPA 410.4											
Blank (W4B1073-BLK1)				**Prepared: 02/13/24 Analyzed: 02/14/24**							
Chemical Oxygen Demand	ND	2.9	5.0	mg/l							
LCS (W4B1073-BS1)				**Prepared: 02/13/24 Analyzed: 02/14/24**							
Chemical Oxygen Demand	94.7	2.9	5.0	mg/l	100		95	90-110			
Duplicate (W4B1073-DUP1)	**Source: 4B09089-01**			**Prepared: 02/13/24 Analyzed: 02/14/24**							
Chemical Oxygen Demand	ND	2.9	5.0	mg/l		ND				15	
Matrix Spike (W4B1073-MS1)	**Source: 4B02110-03**			**Prepared: 02/13/24 Analyzed: 02/14/24**							
Chemical Oxygen Demand	196	12	20	mg/l	200	ND	98	90-110			
Matrix Spike (W4B1073-MS2)	**Source: 4B05060-01**			**Prepared: 02/13/24 Analyzed: 02/14/24**							
Chemical Oxygen Demand	194	12	20	mg/l	200	ND	97	90-110			
Matrix Spike Dup (W4B1073-MSD1)	**Source: 4B02110-03**			**Prepared: 02/13/24 Analyzed: 02/14/24**							
Chemical Oxygen Demand	197	12	20	mg/l	200	ND	98	90-110	0.3	15	
Matrix Spike Dup (W4B1073-MSD2)	**Source: 4B05060-01**			**Prepared: 02/13/24 Analyzed: 02/14/24**							
Chemical Oxygen Demand	187	12	20	mg/l	200	ND	93	90-110	4	15	

Notes and Definitions

Item	Definition
QR-03	The RPD value for the sample duplicate or MS/MSD was outside of QC acceptance limits due to matrix interference. QC batch accepted based on LCS and/or LCSD recovery and/or RPD values.
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

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

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders: 4B05082

Project: Lake Elsinore and Canyon Lake Nutrient TMDL

Attn: Garth Engelhorn

Client: NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Report Date: 3/19/2024
Received Date: 2/5/2024
Turnaround Time: Normal
Phones: (562) 495-5777
Fax: (562) 495-5877
P.O. #:
Billing Code:

DoD-ELAP ANAB #ADE-2882 • DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015 • NV-DEP #NAC 445A • SCAQMD #93LA1006

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

Dear Garth Engelhorn,

Enclosed are the results of analyses for samples received 2/05/24 with the Chain-of-Custody document. The samples were received in good condition, at 12.8 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Kenneth Oda

Kenneth C. Oda For Kim G. Tu
Project Manager

Certificate of Analysis

FINAL REPORT

NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL

Project Manager: Garth Engelhorn

Reported: 03/19/2024 08:22

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
S-03-020424-01	Austin Kay, Matt Millenburg	4B05082-01	Water	02/04/24 21:00	
S-03-020424-02	Austin Kay, Matt Millenburg	4B05082-02	Water	02/04/24 21:00	
S-03-020524-03	Austin Kay, Matt Millenburg	4B05082-03	Water	02/05/24 08:30	
S-04-020524-01	Austin Kay, Matt Millenburg	4B05082-04	Water	02/05/24 01:00	
CLS-020424-01	Austin Kay, Matt Millenburg	4B05082-05	Water	02/04/24 22:00	

Sample Results

Sample: S-03-020424-01
4B05082-01 (Water)

Sampled: 02/04/24 21:00 by Austin Kay, Matt Millenburg

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: [CALC]			**Instr:** [CALC]				
Batch ID: [CALC] **Preparation:** [CALC]			**Prepared:** 02/22/24 11:31				**Analyst:** ymt
Nitrogen, Total	**1.9**	0.036	0.10	mg/l		02/28/24	
Method: _Various			**Instr:** [CALC]				
Batch ID: [CALC] **Preparation:** [CALC]			**Prepared:** 02/22/24 11:31				**Analyst:** ymt
Organic Nitrogen, Total	**1.1**	0.017	0.10	mg/l		02/29/24	
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W4B1848 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/22/24 11:00				**Analyst:** YMT
Ammonia as N	**0.17**	0.017	0.10	mg/l	1	02/29/24	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W4B1868 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/22/24 11:31				**Analyst:** ymt
TKN	**1.3**	0.065	0.10	mg/l	1	02/28/24	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W4B0420 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/06/24 13:49				**Analyst:** ISM
Nitrate as N	**0.57**	0.040	0.20	mg/l	1	02/06/24 17:20	
Nitrite as N	**48**	42	100	ug/l	1	02/06/24 17:20	J
NO2+NO3 as N	**620**	36	200	ug/l	1	02/06/24	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W4B0400 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/06/24 11:49				**Analyst:** rob
o-Phosphate as P	**0.30**	0.0071	0.010	mg/l	1	02/06/24 15:48	
Method: EPA 365.3			**Instr:** UVVIS05				
Batch ID: W4B1872 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/22/24 11:37				**Analyst:** rob
Phosphorus as P, Total	**0.42**	0.0067	0.010	mg/l	1	02/26/24	
Method: EPA 410.4			**Instr:** UVVIS05				
Batch ID: W4B1555 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/20/24 11:56				**Analyst:** jls
Chemical Oxygen Demand	**31**	2.9	5.0	mg/l	1	02/21/24	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W4B0379 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/06/24 10:36				**Analyst:** bel
Total Dissolved Solids	**310**	4.0	10	mg/l	1	02/06/24	
Method: SM 2540D			**Instr:** OVEN15				
Batch ID: W4B0682 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/08/24 12:27				**Analyst:** kac
Total Suspended Solids	**59**		5	mg/l	1	02/08/24	
Method: SM 5210B			**Instr:** INC07				
Batch ID: W4B0298 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/05/24 14:03				**Analyst:** jls
Biochemical Oxygen Demand	**4.5**	2.0	2.0	mg/l	1	02/11/24	BS-H
Metals by EPA 200 Series Methods							

Sample Results

(Continued)

Sample: S-03-020424-01
Sampled: 02/04/24 21:00 by Austin Kay, Matt Millenburg
4B05082-01 (Water)
(Continued)

Metals by EPA 200 Series Methods (Continued)

Method: [CALC] **Instr:** [CALC]
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 02/09/24 09:51 **Analyst:** kvm

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Hardness as CaCO3, Total	**140**	0.121	3.31	mg/l		02/20/24	

Method: EPA 200.7 **Instr:** ICP03
Batch ID: W4B0765 **Preparation:** EPA 200.2 **Prepared:** 02/09/24 09:51 **Analyst:** kvm

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Calcium, Total	**35.4**	0.0240	0.500	mg/l	1	02/20/24	
Magnesium, Total	**12.5**	0.0148	0.500	mg/l	1	02/20/24	

Sample Results

(Continued)

Sample: S-03-020424-02
Sampled: 02/04/24 21:00 by Austin Kay, Matt Millenburg

4B05082-02 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: [CALC] **Instr:** [CALC]							
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 02/22/24 11:31 **Analyst:** ymt							
Nitrogen, Total	**2.0**	0.036	0.10	mg/l		02/28/24	
Method: _Various **Instr:** [CALC]							
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 02/22/24 11:31 **Analyst:** ymt							
Organic Nitrogen, Total	**1.2**	0.017	0.10	mg/l		02/29/24	
Method: EPA 350.1 **Instr:** AA06							
Batch ID: W4B1848 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/22/24 11:00 **Analyst:** YMT							
Ammonia as N	**0.17**	0.017	0.10	mg/l	1	02/29/24	
Method: EPA 351.2 **Instr:** AA06							
Batch ID: W4B1868 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/22/24 11:31 **Analyst:** ymt							
TKN	**1.3**	0.065	0.10	mg/l	1	02/28/24	
Method: EPA 353.2 **Instr:** AA01							
Batch ID: W4B0420 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/06/24 13:49 **Analyst:** ISM							
Nitrate as N	**0.56**	0.040	0.20	mg/l	1	02/06/24 17:21	
Nitrite as N	**56**	42	100	ug/l	1	02/06/24 17:21	J
NO2+NO3 as N	**620**	36	200	ug/l	1	02/06/24	
Method: EPA 365.3 **Instr:** UVVIS04							
Batch ID: W4B0400 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/06/24 11:49 **Analyst:** rob							
o-Phosphate as P	**0.30**	0.0071	0.010	mg/l	1	02/06/24 15:48	
Method: EPA 365.3 **Instr:** UVVIS05							
Batch ID: W4B1872 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/22/24 11:37 **Analyst:** rob							
Phosphorus as P, Total	**0.42**	0.0067	0.010	mg/l	1	02/26/24	
Method: EPA 410.4 **Instr:** UVVIS05							
Batch ID: W4B1555 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/20/24 11:56 **Analyst:** jls							
Chemical Oxygen Demand	**29**	2.9	5.0	mg/l	1	02/21/24	
Method: SM 2540C **Instr:** OVEN17							
Batch ID: W4B0379 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/06/24 10:36 **Analyst:** bel							
Total Dissolved Solids	**310**	4.0	10	mg/l	1	02/06/24	
Method: SM 2540D **Instr:** OVEN15							
Batch ID: W4B0682 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/08/24 12:27 **Analyst:** kac							
Total Suspended Solids	**55**		5	mg/l	1	02/08/24	
Method: SM 5210B **Instr:** INC07							
Batch ID: W4B0298 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/05/24 14:03 **Analyst:** jls							
Biochemical Oxygen Demand	**4.7**	2.0	2.0	mg/l	1	02/11/24	BS-H
Metals by EPA 200 Series Methods							

Sample Results

(Continued)

Sample: S-03-020424-02

4B05082-02 (Water)

Sampled: 02/04/24 21:00 by Austin Kay, Matt Millenburg

(Continued)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Metals by EPA 200 Series Methods (Continued)							
Method: [CALC] **Instr:** [CALC]							
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 02/09/24 09:51 **Analyst:** kvm							
Hardness as CaCO3, Total	**136**	0.121	3.31	mg/l		02/20/24	
Method: EPA 200.7 **Instr:** ICP03							
Batch ID: W4B0765 **Preparation:** EPA 200.2 **Prepared:** 02/09/24 09:51 **Analyst:** kvm							
Calcium, Total	**34.6**	0.0240	0.500	mg/l	1	02/20/24	
Magnesium, Total	**12.2**	0.0148	0.500	mg/l	1	02/20/24	

Sample Results

(Continued)

Sample: S-03-020524-03
4B05082-03 (Water)

Sampled: 02/05/24 8:30 by Austin Kay, Matt Millenburg

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: [CALC] **Instr:** [CALC]
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 02/22/24 11:31 **Analyst:** ymt

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrogen, Total	ND	0.036	0.10	mg/l		02/28/24	

Method: _Various **Instr:** [CALC]
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 02/22/24 11:31 **Analyst:** ymt

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Organic Nitrogen, Total	ND	0.017	0.10	mg/l		02/29/24	

Method: EPA 350.1 **Instr:** AA06
Batch ID: W4B1848 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/22/24 11:00 **Analyst:** YMT

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Ammonia as N	ND	0.017	0.10	mg/l	1	02/29/24	

Method: EPA 351.2 **Instr:** AA06
Batch ID: W4B1868 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/22/24 11:31 **Analyst:** ymt

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
TKN	ND	0.065	0.10	mg/l	1	02/28/24	

Method: EPA 353.2 **Instr:** AA01
Batch ID: W4B0420 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/06/24 13:49 **Analyst:** ISM

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrate as N	ND	0.040	0.20	mg/l	1	02/06/24 17:22	
Nitrite as N	ND	42	100	ug/l	1	02/06/24 17:22	
NO2+NO3 as N	ND	36	200	ug/l	1	02/06/24	

Method: EPA 365.3 **Instr:** UVVIS04
Batch ID: W4B0400 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/06/24 11:49 **Analyst:** rob

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
o-Phosphate as P	ND	0.0071	0.010	mg/l	1	02/06/24 15:44	

Method: EPA 365.3 **Instr:** UVVIS05
Batch ID: W4B1872 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/22/24 11:37 **Analyst:** rob

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Phosphorus as P, Total	ND	0.0067	0.010	mg/l	1	02/26/24	

Method: EPA 410.4 **Instr:** UVVIS05
Batch ID: W4B1555 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/20/24 11:56 **Analyst:** jls

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chemical Oxygen Demand	ND	2.9	5.0	mg/l	1	02/21/24	

Method: SM 2540C **Instr:** OVEN17
Batch ID: W4B0379 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/06/24 10:36 **Analyst:** bel

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Dissolved Solids	ND	4.0	10	mg/l	1	02/06/24	

Method: SM 2540D **Instr:** OVEN15
Batch ID: W4B0816 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/09/24 13:24 **Analyst:** kac

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Suspended Solids	ND		5	mg/l	1	02/09/24	

Method: SM 5210B **Instr:** INC07
Batch ID: W4B0298 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/05/24 14:03 **Analyst:** jls

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Biochemical Oxygen Demand	ND	2.0	2.0	mg/l	1	02/11/24	Q-08

Metals by EPA 200 Series Methods

Sample Results

(Continued)

Sample: S-03-020524-03 Sampled: 02/05/24 8:30 by Austin Kay, Matt Millenburg

4B05082-03 (Water) (Continued)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Metals by EPA 200 Series Methods (Continued)							
Method: [CALC]			**Instr:** [CALC]				
Batch ID: [CALC] **Preparation:** [CALC]			**Prepared:** 02/09/24 09:51				**Analyst:** kvm
Hardness as CaCO3, Total	ND	0.121	3.31	mg/l		02/20/24	
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W4B0765 **Preparation:** EPA 200.2			**Prepared:** 02/09/24 09:51				**Analyst:** kvm
Calcium, Total	**0.0356**	0.0240	0.500	mg/l	1	02/20/24	J
Magnesium, Total	ND	0.0148	0.500	mg/l	1	02/20/24	

Sample Results

(Continued)

Sample: S-04-020524-01 — Sampled: 02/05/24 1:00 by Austin Kay, Matt Millenburg

4B05082-04 (Water)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: [CALC] **Instr:** [CALC]
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 02/22/24 11:31 **Analyst:** ymt

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrogen, Total	**1.3**	0.036	0.10	mg/l		02/28/24	

Method: _Various **Instr:** [CALC]
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 02/22/24 11:31 **Analyst:** ymt

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Organic Nitrogen, Total	**0.67**	0.017	0.10	mg/l		02/29/24	

Method: EPA 350.1 **Instr:** AA06
Batch ID: W4B1848 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/22/24 11:00 **Analyst:** YMT

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Ammonia as N	**0.080**	0.017	0.10	mg/l	1	02/29/24	J

Method: EPA 351.2 **Instr:** AA06
Batch ID: W4B1868 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/22/24 11:31 **Analyst:** ymt

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
TKN	**0.75**	0.065	0.10	mg/l	1	02/28/24	

Method: EPA 353.2 **Instr:** AA01
Batch ID: W4B0420 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/06/24 13:49 **Analyst:** ISM

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrate as N	**0.53**	0.040	0.20	mg/l	1	02/06/24 17:23	
Nitrite as N	ND	42	100	ug/l	1	02/06/24 17:23	
NO2+NO3 as N	**560**	36	200	ug/l	1	02/06/24	

Method: EPA 365.3 **Instr:** UVVIS04
Batch ID: W4B0400 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/06/24 11:49 **Analyst:** rob

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
o-Phosphate as P	**0.22**	0.0071	0.010	mg/l	1	02/06/24 15:49	

Method: EPA 365.3 **Instr:** UVVIS05
Batch ID: W4B1872 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/22/24 11:37 **Analyst:** rob

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Phosphorus as P, Total	**0.35**	0.0067	0.010	mg/l	1	02/26/24	

Method: EPA 410.4 **Instr:** UVVIS05
Batch ID: W4B1555 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/20/24 11:56 **Analyst:** jls

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chemical Oxygen Demand	**23**	2.9	5.0	mg/l	1	02/21/24	

Method: SM 2540C **Instr:** OVEN17
Batch ID: W4B0379 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/06/24 10:36 **Analyst:** bel

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Dissolved Solids	**160**	4.0	10	mg/l	1	02/06/24	

Method: SM 2540D **Instr:** OVEN15
Batch ID: W4B0816 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/09/24 13:24 **Analyst:** kac

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Suspended Solids	**45**		5	mg/l	1	02/09/24	

Method: SM 5210B **Instr:** INC07
Batch ID: W4B0298 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/05/24 14:03 **Analyst:** jls

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Biochemical Oxygen Demand	**3.1**	2.0	2.0	mg/l	1	02/11/24	BS-H

Metals by EPA 200 Series Methods

Sample Results

(Continued)

Sample: S-04-020524-01
4B05082-04 (Water)

Sampled: 02/05/24 1:00 by Austin Kay, Matt Millenburg

(Continued)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Metals by EPA 200 Series Methods (Continued)							
Method: [CALC] **Instr:** [CALC]							
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 02/09/24 09:51 **Analyst:** kvm							
Hardness as CaCO3, Total	**73.6**	0.121	3.31	mg/l		02/20/24	
Method: EPA 200.7 **Instr:** ICP03							
Batch ID: W4B0765 **Preparation:** EPA 200.2 **Prepared:** 02/09/24 09:51 **Analyst:** kvm							
Calcium, Total	**20.8**	0.0240	0.500	mg/l	1	02/20/24	
Magnesium, Total	**5.23**	0.0148	0.500	mg/l	1	02/20/24	

Sample Results

(Continued)

Sample: CLS-020424-01
4B05082-05 (Water)

Sampled: 02/04/24 22:00 by Austin Kay, Matt Millenburg

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: [CALC]			**Instr:** [CALC]				
Batch ID: [CALC]	**Preparation:** [CALC]		**Prepared:** 02/22/24 11:31				**Analyst:** ymt
Nitrogen, Total	**0.95**	0.036	0.10	mg/l		02/28/24	
Method: _Various			**Instr:** [CALC]				
Batch ID: [CALC]	**Preparation:** [CALC]		**Prepared:** 02/22/24 11:31				**Analyst:** ymt
Organic Nitrogen, Total	**0.68**	0.017	0.10	mg/l		02/29/24	
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W4B1848	**Preparation:** _NONE (WETCHEM)		**Prepared:** 02/22/24 11:00				**Analyst:** YMT
Ammonia as N	**0.066**	0.017	0.10	mg/l	1	02/29/24	J
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W4B1868	**Preparation:** _NONE (WETCHEM)		**Prepared:** 02/22/24 11:31				**Analyst:** ymt
TKN	**0.74**	0.065	0.10	mg/l	1	02/28/24	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W4B0420	**Preparation:** _NONE (WETCHEM)		**Prepared:** 02/06/24 13:49				**Analyst:** ISM
Nitrate as N	**0.21**	0.040	0.20	mg/l	1	02/06/24 17:24	
Nitrite as N	ND	42	100	ug/l	1	02/06/24 17:24	
NO2+NO3 as N	**210**	36	200	ug/l	1	02/06/24	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W4B0400	**Preparation:** _NONE (WETCHEM)		**Prepared:** 02/06/24 11:49				**Analyst:** rob
o-Phosphate as P	**0.011**	0.0071	0.010	mg/l	1	02/06/24 15:50	
Method: EPA 365.3			**Instr:** UVVIS05				
Batch ID: W4B1872	**Preparation:** _NONE (WETCHEM)		**Prepared:** 02/22/24 11:37				**Analyst:** rob
Phosphorus as P, Total	**0.081**	0.0067	0.010	mg/l	1	02/26/24	
Method: EPA 410.4			**Instr:** UVVIS05				
Batch ID: W4B1555	**Preparation:** _NONE (WETCHEM)		**Prepared:** 02/20/24 11:56				**Analyst:** jls
Chemical Oxygen Demand	**22**	2.9	5.0	mg/l	1	02/21/24	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W4B0379	**Preparation:** _NONE (WETCHEM)		**Prepared:** 02/06/24 10:36				**Analyst:** bel
Total Dissolved Solids	**440**	4.0	10	mg/l	1	02/06/24	
Method: SM 2540D			**Instr:** OVEN15				
Batch ID: W4B0682	**Preparation:** _NONE (WETCHEM)		**Prepared:** 02/08/24 12:27				**Analyst:** kac
Total Suspended Solids	**9**		5	mg/l	1	02/08/24	
Method: SM 5210B			**Instr:** INC07				
Batch ID: W4B0298	**Preparation:** _NONE (WETCHEM)		**Prepared:** 02/05/24 14:03				**Analyst:** jls
Biochemical Oxygen Demand	**2.6**	2.0	2.0	mg/l	1	02/11/24	BS-H

Quality Control Results

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4B0298 - SM 5210B											
Blank (W4B0298-BLK1)				**Prepared: 02/05/24**	**Analyzed: 02/11/24**						
Biochemical Oxygen Demand	ND	2.0	2.0	mg/l							
Blank (W4B0298-BLK2)				**Prepared: 02/05/24**	**Analyzed: 02/11/24**						
Biochemical Oxygen Demand	ND	2.0	2.0	mg/l							
Blank (W4B0298-BLK3)				**Prepared: 02/05/24**	**Analyzed: 02/11/24**						
Biochemical Oxygen Demand	ND	2.0	2.0	mg/l							
LCS (W4B0298-BS1)				**Prepared: 02/05/24**	**Analyzed: 02/11/24**						
Biochemical Oxygen Demand	236	2.0	2.0	mg/l	198		119	85-115			BS-H
Duplicate (W4B0298-DUP1)	**Source: 4B05086-02**			**Prepared: 02/05/24**	**Analyzed: 02/11/24**						
Biochemical Oxygen Demand	ND	2.0	2.0	mg/l		ND				20	
Batch: W4B0379 - SM 2540C											
Blank (W4B0379-BLK1)				**Prepared & Analyzed: 02/06/24**							
Total Dissolved Solids	ND	4.0	10	mg/l							
LCS (W4B0379-BS1)				**Prepared & Analyzed: 02/06/24**							
Total Dissolved Solids	803	4.0	10	mg/l	824		97	97-103			
Duplicate (W4B0379-DUP1)	**Source: 4B05088-01**			**Prepared & Analyzed: 02/06/24**							
Total Dissolved Solids	579	4.0	10	mg/l		577			0.3	10	
Duplicate (W4B0379-DUP2)	**Source: 4B05127-01**			**Prepared & Analyzed: 02/06/24**							
Total Dissolved Solids	477	4.0	10	mg/l		479			0.4	10	
Batch: W4B0400 - EPA 365.3											
Blank (W4B0400-BLK1)				**Prepared & Analyzed: 02/06/24**							
o-Phosphate as P	ND	0.0071	0.010	mg/l							
LCS (W4B0400-BS1)				**Prepared & Analyzed: 02/06/24**							
o-Phosphate as P	0.198	0.0071	0.010	mg/l	0.200		99	88-111			
Matrix Spike (W4B0400-MS1)	**Source: 4B05082-03**			**Prepared & Analyzed: 02/06/24**							
o-Phosphate as P	0.198	0.0071	0.010	mg/l	0.200	ND	99	85-112			
Matrix Spike Dup (W4B0400-MSD1)	**Source: 4B05082-03**			**Prepared & Analyzed: 02/06/24**							
o-Phosphate as P	0.210	0.0071	0.010	mg/l	0.200	ND	105	85-112	6	20	
Batch: W4B0420 - EPA 353.2											
Blank (W4B0420-BLK1)				**Prepared & Analyzed: 02/06/24**							
Nitrate as N	ND	0.040	0.15	mg/l							
Nitrite as N	ND	42	100	ug/l							
NO2+NO3 as N	37.9	36	200	ug/l							J
Blank (W4B0420-BLK2)				**Prepared & Analyzed: 02/06/24**							
Nitrate as N	ND	0.040	0.15	mg/l							A-01
Nitrite as N	ND	42	100	ug/l							A-01
NO2+NO3 as N	ND	36	200	ug/l							A-01
LCS (W4B0420-BS1)				**Prepared & Analyzed: 02/06/24**							

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4B0420 - EPA 353.2 (Continued)											
LCS (W4B0420-BS1)					**Prepared & Analyzed: 02/06/24**						
Nitrate as N	0.990	0.040	0.15	mg/l	1.00		99	90-110			
Nitrite as N	997	42	100	ug/l	1000		100	90-110			
NO2+NO3 as N	990	36	200	ug/l	1000		99	90-110			
LCS (W4B0420-BS2)					**Prepared & Analyzed: 02/06/24**						
Nitrate as N	0.997	0.040	0.15	mg/l	1.00		100	90-110			A-01
Nitrite as N	1010	42	100	ug/l	1000		101	90-110			A-01
NO2+NO3 as N	997	36	200	ug/l	1000		100	90-110			A-01
Matrix Spike (W4B0420-MS1)	**Source: 4B05088-03**				**Prepared & Analyzed: 02/06/24**						
Nitrate as N	2.37	0.040	0.15	mg/l	2.00	0.389	99	90-110			
Nitrite as N	981	42	100	ug/l	1000	ND	98	90-110			
NO2+NO3 as N	2370	36	200	ug/l	2000	389	99	90-110			
Matrix Spike (W4B0420-MS2)	**Source: 4B05122-01**				**Prepared & Analyzed: 02/06/24**						
Nitrate as N	6.32	0.040	0.15	mg/l	2.00	4.23	104	90-110			
Nitrite as N	1030	42	100	ug/l	1000	ND	103	90-110			
NO2+NO3 as N	6320	36	200	ug/l	2000	4230	104	90-110			
Matrix Spike Dup (W4B0420-MSD1)	**Source: 4B05088-03**				**Prepared & Analyzed: 02/06/24**						
Nitrate as N	2.36	0.040	0.15	mg/l	2.00	0.389	99	90-110	0.4	20	
Nitrite as N	985	42	100	ug/l	1000	ND	98	90-110	0.4	20	
NO2+NO3 as N	2360	36	200	ug/l	2000	389	99	90-110	0.4	20	
Matrix Spike Dup (W4B0420-MSD2)	**Source: 4B05122-01**				**Prepared & Analyzed: 02/06/24**						
Nitrate as N	6.33	0.040	0.15	mg/l	2.00	4.23	105	90-110	0.2	20	
Nitrite as N	1050	42	100	ug/l	1000	ND	105	90-110	2	20	
NO2+NO3 as N	6330	36	200	ug/l	2000	4230	105	90-110	0.2	20	
Batch: W4B0682 - SM 2540D											
Blank (W4B0682-BLK1)					**Prepared & Analyzed: 02/08/24**						
Total Suspended Solids	0.300		1	mg/l							J
LCS (W4B0682-BS1)					**Prepared & Analyzed: 02/08/24**						
Total Suspended Solids	62.3		1	mg/l	57.8		108	90-110			
Duplicate (W4B0682-DUP1)	**Source: 4B02131-01**				**Prepared & Analyzed: 02/08/24**						
Total Suspended Solids	235		1	mg/l		225			4	10	
Duplicate (W4B0682-DUP2)	**Source: 4B06127-01**				**Prepared & Analyzed: 02/08/24**						
Total Suspended Solids	560		1	mg/l		550			2	10	
Batch: W4B0816 - SM 2540D											
Blank (W4B0816-BLK1)					**Prepared & Analyzed: 02/09/24**						
Total Suspended Solids	ND		5	mg/l							
LCS (W4B0816-BS1)					**Prepared & Analyzed: 02/09/24**						
Total Suspended Solids	55.5		5	mg/l	55.4		100	90-110			
Duplicate (W4B0816-DUP1)	**Source: 4B05088-01**				**Prepared & Analyzed: 02/09/24**						

Quality Control Results
(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4B0816 - SM 2540D (Continued)											
Duplicate (W4B0816-DUP1)	**Source: 4B05088-01**			**Prepared & Analyzed: 02/09/24**							
Total Suspended Solids	140		5	mg/l		138			1	10	
Duplicate (W4B0816-DUP2)	**Source: 4B05139-01**			**Prepared & Analyzed: 02/09/24**							
Total Suspended Solids	30.7		5	mg/l		30.7			0	10	
Batch: W4B1555 - EPA 410.4											
Blank (W4B1555-BLK1)				**Prepared: 02/20/24**		**Analyzed: 02/21/24**					
Chemical Oxygen Demand	ND	2.9	5.0	mg/l							
LCS (W4B1555-BS1)				**Prepared: 02/20/24**		**Analyzed: 02/21/24**					
Chemical Oxygen Demand	95.0	2.9	5.0	mg/l	100		95	90-110			
Duplicate (W4B1555-DUP1)	**Source: 4B08112-01**			**Prepared: 02/20/24**		**Analyzed: 02/21/24**					
Chemical Oxygen Demand	2370	12	20	mg/l		2360			0.6	15	
Matrix Spike (W4B1555-MS1)	**Source: 4B05082-03**			**Prepared: 02/20/24**		**Analyzed: 02/21/24**					
Chemical Oxygen Demand	185	5.8	10	mg/l	200	ND	92	90-110			
Matrix Spike (W4B1555-MS2)	**Source: 4B09138-01**			**Prepared: 02/20/24**		**Analyzed: 02/21/24**					
Chemical Oxygen Demand	2400	5.8	10	mg/l	2000	499	95	90-110			
Matrix Spike Dup (W4B1555-MSD1)	**Source: 4B05082-03**			**Prepared: 02/20/24**		**Analyzed: 02/21/24**					
Chemical Oxygen Demand	193	5.8	10	mg/l	200	ND	97	90-110	4	15	
Matrix Spike Dup (W4B1555-MSD2)	**Source: 4B09138-01**			**Prepared: 02/20/24**		**Analyzed: 02/21/24**					
Chemical Oxygen Demand	2540	5.8	10	mg/l	2000	499	102	90-110	6	15	
Batch: W4B1848 - EPA 350.1											
Blank (W4B1848-BLK1)				**Prepared: 02/22/24**		**Analyzed: 02/29/24**					
Ammonia as N	ND	0.017	0.10	mg/l							
Blank (W4B1848-BLK2)				**Prepared: 02/22/24**		**Analyzed: 02/29/24**					
Ammonia as N	ND	0.017	0.10	mg/l							
LCS (W4B1848-BS1)				**Prepared: 02/22/24**		**Analyzed: 02/29/24**					
Ammonia as N	0.256	0.017	0.10	mg/l	0.250		102	90-110			
LCS (W4B1848-BS2)				**Prepared: 02/22/24**		**Analyzed: 02/29/24**					
Ammonia as N	0.243	0.017	0.10	mg/l	0.250		97	90-110			
Matrix Spike (W4B1848-MS1)	**Source: 4B06037-03**			**Prepared: 02/22/24**		**Analyzed: 02/29/24**					
Ammonia as N	0.370	0.017	0.10	mg/l	0.250	0.136	94	90-110			
Matrix Spike (W4B1848-MS2)	**Source: 4B07015-01**			**Prepared: 02/22/24**		**Analyzed: 02/29/24**					
Ammonia as N	0.238	0.017	0.10	mg/l	0.250	ND	95	90-110			
Matrix Spike Dup (W4B1848-MSD1)	**Source: 4B06037-03**			**Prepared: 02/22/24**		**Analyzed: 02/29/24**					
Ammonia as N	0.370	0.017	0.10	mg/l	0.250	0.136	94	90-110	0.06	15	
Matrix Spike Dup (W4B1848-MSD2)	**Source: 4B07015-01**			**Prepared: 02/22/24**		**Analyzed: 02/29/24**					
Ammonia as N	0.238	0.017	0.10	mg/l	0.250	ND	95	90-110	0.2	15	
Batch: W4B1868 - EPA 351.2											
Blank (W4B1868-BLK1)				**Prepared: 02/22/24**		**Analyzed: 02/28/24**					

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4B1868 - EPA 351.2 (Continued)											
Blank (W4B1868-BLK1)				**Prepared: 02/22/24**		**Analyzed: 02/28/24**					
TKN	ND	0.065	0.10	mg/l							
Blank (W4B1868-BLK2)				**Prepared: 02/22/24**		**Analyzed: 02/28/24**					
TKN	ND	0.065	0.10	mg/l							
LCS (W4B1868-BS1)				**Prepared: 02/22/24**		**Analyzed: 02/28/24**					
TKN	0.940	0.065	0.10	mg/l	1.00		94	90-110			
LCS (W4B1868-BS2)				**Prepared: 02/22/24**		**Analyzed: 02/28/24**					
TKN	0.931	0.065	0.10	mg/l	1.00		93	90-110			
Matrix Spike (W4B1868-MS1)	**Source: 4B16059-01**			**Prepared: 02/22/24**		**Analyzed: 02/28/24**					
TKN	2.17	0.065	0.10	mg/l	1.00	1.10	106	90-110			
Matrix Spike (W4B1868-MS2)	**Source: 4B16059-02**			**Prepared: 02/22/24**		**Analyzed: 02/28/24**					
TKN	1.85	0.065	0.10	mg/l	1.00	0.848	100	90-110			
Matrix Spike Dup (W4B1868-MSD1)	**Source: 4B16059-01**			**Prepared: 02/22/24**		**Analyzed: 02/28/24**					
TKN	2.12	0.065	0.10	mg/l	1.00	1.10	102	90-110	2	10	
Matrix Spike Dup (W4B1868-MSD2)	**Source: 4B16059-02**			**Prepared: 02/22/24**		**Analyzed: 02/28/24**					
TKN	1.73	0.065	0.10	mg/l	1.00	0.848	88	90-110	7	10	MS-01
Batch: W4B1872 - EPA 365.3											
Blank (W4B1872-BLK1)				**Prepared: 02/22/24**		**Analyzed: 02/26/24**					
Phosphorus as P, Total	ND	0.0067	0.010	mg/l							
LCS (W4B1872-BS1)				**Prepared: 02/22/24**		**Analyzed: 02/26/24**					
Phosphorus as P, Total	0.194	0.0067	0.010	mg/l	0.200		97	90-110			
Matrix Spike (W4B1872-MS1)	**Source: 4B05082-03**			**Prepared: 02/22/24**		**Analyzed: 02/26/24**					
Phosphorus as P, Total	0.194	0.0067	0.010	mg/l	0.200	ND	97	90-110			
Matrix Spike Dup (W4B1872-MSD1)	**Source: 4B05082-03**			**Prepared: 02/22/24**		**Analyzed: 02/26/24**					
Phosphorus as P, Total	0.197	0.0067	0.010	mg/l	0.200	ND	98	90-110	2	20	

NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL

Project Manager: Garth Engelhorn

Reported: 03/19/2024 08:22

Quality Control Results

(Continued)

Metals by EPA 200 Series Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4B0765 - EPA 200.7											
Blank (W4B0765-BLK1)				**Prepared: 02/09/24**	**Analyzed: 02/20/24**						
Calcium, Total	ND	0.0240	0.500	mg/l							
Magnesium, Total	ND	0.0148	0.500	mg/l							
LCS (W4B0765-BS1)				**Prepared: 02/09/24**	**Analyzed: 02/20/24**						
Calcium, Total	51.0	0.0240	0.500	mg/l	50.2		102	85-115			
Magnesium, Total	49.9	0.0148	0.500	mg/l	50.2		99	85-115			
Matrix Spike (W4B0765-MS1)	**Source: 4B02136-01**			**Prepared: 02/09/24**	**Analyzed: 02/20/24**						
Calcium, Total	52.3	0.0240	0.500	mg/l	50.2	2.00	100	70-130			
Magnesium, Total	49.3	0.0148	0.500	mg/l	50.2	0.110	98	70-130			
Matrix Spike (W4B0765-MS2)	**Source: 4B05058-01**			**Prepared: 02/09/24**	**Analyzed: 02/20/24**						
Calcium, Total	53.1	0.0240	0.500	mg/l	50.2	1.70	102	70-130			
Magnesium, Total	50.4	0.0148	0.500	mg/l	50.2	0.326	100	70-130			
Matrix Spike Dup (W4B0765-MSD1)	**Source: 4B02136-01**			**Prepared: 02/09/24**	**Analyzed: 02/20/24**						
Calcium, Total	51.6	0.0240	0.500	mg/l	50.2	2.00	99	70-130	1	30	
Magnesium, Total	48.6	0.0148	0.500	mg/l	50.2	0.110	97	70-130	2	30	
Matrix Spike Dup (W4B0765-MSD2)	**Source: 4B05058-01**			**Prepared: 02/09/24**	**Analyzed: 02/20/24**						
Calcium, Total	52.2	0.0240	0.500	mg/l	50.2	1.70	101	70-130	2	30	
Magnesium, Total	49.6	0.0148	0.500	mg/l	50.2	0.326	98	70-130	2	30	

Notes and Definitions

Item	Definition
A-01	Filtered
BS-H	The recovery of this analyte in the BS/LCS was over the control limit. Sample result is suspect.
J	Estimated conc. detected <MRL and >MDL.
MS-01	The spike recovery for this QC sample is outside of established control limits possibly due to sample matrix interference.
Q-08	High bias in the QC sample does not affect sample result since analyte was not detected or below the reporting limit.
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	Method Reporting Limit (MRL) is the minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.
[CALC]	An automated calculation using unrounded values then rounding the final result (scientific rounding rules). Calculations do not contain direct qualifiers; please refer to the individual components of the calculation for any qualifiers

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

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

Hardness as CaCO3, Total consist of the following components Magnesium, Total; and Calcium, Total

Nitrogen, Total consist of the following components NO2+NO3 as N; and TKN

Organic Nitrogen, Total consist of the following components TKN; and Ammonia as N

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders: 4B20174

Project: Lake Elsinore and Canyon Lake Nutrient TMDL

Attn: Garth Engelhorn

Client: NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Report Date: 3/06/2024
Received Date: 2/20/2024
Turnaround Time: Normal
Phones: (562) 495-5777
Fax: (562) 495-5877
P.O. #:
Billing Code:

DoD-ELAP ANAB #ADE-2882 • DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015 • NV-DEP #NAC 445A • SCAQMD #93LA1006

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

Dear Garth Engelhorn,

Enclosed are the results of analyses for samples received 2/20/24 with the Chain-of-Custody document. The samples were received in good condition, at 3.8 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Kenneth Oda

Kenneth C. Oda For Kim G. Tu
Project Manager

Certificate of Analysis

FINAL REPORT

NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL

Project Manager: Garth Engelhorn

Reported:
03/06/2024 09:07

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
S-03-012124	Matt Muilenburg	4B20174-01	Water	02/20/24 15:20	
S-04-012124	Matt Muilenburg	4B20174-02	Water	02/20/24 15:56	
LLS-012124	Matt Muilenburg	4B20174-03	Water	02/20/24 14:05	

NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL
Project Manager: Garth Engelhorn

Reported: 03/06/2024 09:07

Sample Results

Sample: S-03-012124
4B20174-01 (Water)
Sampled: 02/20/24 15:20 by Matt Muilenburg

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: EPA 410.4 **Instr:** UVVIS05
Batch ID: W4C0098 **Preparation:** _NONE (WETCHEM) **Prepared:** 03/01/24 17:30 **Analyst:** jls

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chemical Oxygen Demand	**24**	2.9	5.0	mg/l	1	03/04/24	

Method: SM 5210B **Instr:** INC07
Batch ID: W4B1662 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/21/24 10:10 **Analyst:** JLS

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Biochemical Oxygen Demand	**4.2**	2.0	2.0	mg/l	1	02/26/24	

Sample Results

Sample: S-04-012124
4B20174-02 (Water)
Sampled: 02/20/24 15:56 by Matt Muilenburg

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: EPA 410.4 **Instr:** UVVIS05
Batch ID: W4C0098 **Preparation:** _NONE (WETCHEM) **Prepared:** 03/01/24 17:30 **Analyst:** jls

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chemical Oxygen Demand	**18**	2.9	5.0	mg/l	1	03/04/24	

Method: SM 5210B **Instr:** INC07
Batch ID: W4B1662 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/21/24 10:10 **Analyst:** JLS

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Biochemical Oxygen Demand	**3.9**	2.0	2.0	mg/l	1	02/26/24	

Sample Results

Sample: LLS-012124
4B20174-03 (Water)
Sampled: 02/20/24 14:05 by Matt Muilenburg

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: EPA 410.4 **Instr:** UVVIS05
Batch ID: W4C0098 **Preparation:** _NONE (WETCHEM) **Prepared:** 03/01/24 17:30 **Analyst:** jls

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Chemical Oxygen Demand	**18**	2.9	5.0	mg/l	1	03/04/24	

Method: SM 5210B **Instr:** INC07
Batch ID: W4B1662 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/21/24 10:10 **Analyst:** JLS

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Biochemical Oxygen Demand	**2.1**	2.0	2.0	mg/l	1	02/26/24	

Quality Control Results

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4B1662 - SM 5210B											
Blank (W4B1662-BLK1)				**Prepared: 02/21/24**		**Analyzed: 02/26/24**					
Biochemical Oxygen Demand	ND	2.0	2.0	mg/l							
Blank (W4B1662-BLK2)				**Prepared: 02/21/24**		**Analyzed: 02/26/24**					
Biochemical Oxygen Demand	ND	2.0	2.0	mg/l							
Blank (W4B1662-BLK3)				**Prepared: 02/21/24**		**Analyzed: 02/26/24**					
Biochemical Oxygen Demand	ND	2.0	2.0	mg/l							
LCS (W4B1662-BS1)				**Prepared: 02/21/24**		**Analyzed: 02/26/24**					
Biochemical Oxygen Demand	210	2.0	2.0	mg/l	198		106	85-115			
LCS (W4B1662-BS2)				**Prepared: 02/21/24**		**Analyzed: 02/29/24**					
Biochemical Oxygen Demand	213	2.0	2.0	mg/l	198		108	85-115			
LCS (W4B1662-BS3)				**Prepared: 02/21/24**		**Analyzed: 02/29/24**					
Biochemical Oxygen Demand	224	2.0	2.0	mg/l	198		113	85-115			
LCS (W4B1662-BS4)				**Prepared: 02/21/24**		**Analyzed: 02/29/24**					
Biochemical Oxygen Demand	216	2.0	2.0	mg/l	198		109	85-115			
LCS (W4B1662-BS5)				**Prepared: 02/21/24**		**Analyzed: 02/29/24**					
Biochemical Oxygen Demand	210	2.0	2.0	mg/l	198		106	85-115			
Duplicate (W4B1662-DUP1)	**Source: 4B20174-03**			**Prepared: 02/21/24**		**Analyzed: 02/26/24**					
Biochemical Oxygen Demand	2.03	2.0	2.0	mg/l		2.08			2	20	
Batch: W4C0098 - EPA 410.4											
Blank (W4C0098-BLK1)				**Prepared: 03/01/24**		**Analyzed: 03/02/24**					
Chemical Oxygen Demand	ND	2.9	5.0	mg/l							
LCS (W4C0098-BS1)				**Prepared: 03/01/24**		**Analyzed: 03/02/24**					
Chemical Oxygen Demand	94.3	2.9	5.0	mg/l	100		94	90-110			
Duplicate (W4C0098-DUP1)	**Source: 4B22061-01**			**Prepared: 03/01/24**		**Analyzed: 03/02/24**					
Chemical Oxygen Demand	3680	12	20	mg/l		3620			2	15	
Matrix Spike (W4C0098-MS1)	**Source: 4B21160-03**			**Prepared: 03/01/24**		**Analyzed: 03/04/24**					
Chemical Oxygen Demand	197	12	20	mg/l	200	ND	98	90-110			
Matrix Spike (W4C0098-MS2)	**Source: 4B22136-01**			**Prepared: 03/01/24**		**Analyzed: 03/02/24**					
Chemical Oxygen Demand	2310	12	20	mg/l	2000	265	102	90-110			
Matrix Spike Dup (W4C0098-MSD1)	**Source: 4B21160-03**			**Prepared: 03/01/24**		**Analyzed: 03/04/24**					
Chemical Oxygen Demand	193	12	20	mg/l	200	ND	97	90-110	2	15	
Matrix Spike Dup (W4C0098-MSD2)	**Source: 4B22136-01**			**Prepared: 03/01/24**		**Analyzed: 03/02/24**					
Chemical Oxygen Demand	2360	12	20	mg/l	2000	265	105	90-110	2	15	

NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL

Project Manager: Garth Engelhorn

Reported: 03/06/2024 09:07

Notes and Definitions

Item	Definition
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

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

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders: 4B23077

Project: Lake Elsinore and Canyon Lake Nutrient TMDL

Attn: Garth Engelhorn

Client: NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Report Date: 3/26/2024
Received Date: 2/23/2024
Turnaround Time: Normal
Phones: (562) 495-5777
Fax: (562) 495-5877
P.O. #:
Billing Code:

DoD-ELAP ANAB #ADE-2882 • DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015 • NV-DEP #NAC 445A • SCAQMD #93LA1006

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. The report may include analytes that are not currently accreditable by some state agencies or accrediting bodies. This analytical report must be reproduced in its entirety.

Dear Garth Engelhorn,

Enclosed are the results of analyses for samples received 2/23/24 with the Chain-of-Custody document. The samples were received in good condition, at 4.5 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Kenneth Oda

Kenneth C. Oda For Kim G. Tu
Project Manager

NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL

Project Manager: Garth Engelhorn

Reported: 03/26/2024 09:50

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
S-03-022324	Matt M.	4B23077-01	Water	02/23/24 07:00	
S-04-022324	Matt M.	4B23077-02	Water	02/23/24 08:00	
CLS-022324	Matt M.	4B23077-03	Water	02/23/24 08:00	

Sample Results

Sample: S-03-022324 Sampled: 02/23/24 7:00 by Matt M.

4B23077-01 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: [CALC]			**Instr:** [CALC]				
Batch ID: [CALC] **Preparation:** [CALC]			**Prepared:** 03/15/24 14:18				**Analyst:** YMT
Nitrogen, Total	**2.1**	0.036	0.20	mg/l		03/18/24	
Method: _Various			**Instr:** [CALC]				
Batch ID: [CALC] **Preparation:** [CALC]			**Prepared:** 03/15/24 14:18				**Analyst:** YMT
Organic Nitrogen, Total	**1.1**	0.017	0.10	mg/l		03/18/24	
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W4C1185 **Preparation:** _NONE (WETCHEM)			**Prepared:** 03/14/24 18:43				**Analyst:** YMT
Ammonia as N	**0.15**	0.017	0.10	mg/l	1	03/15/24	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W4C1267 **Preparation:** _NONE (WETCHEM)			**Prepared:** 03/15/24 14:18				**Analyst:** YMT
TKN	**1.2**	0.13	0.20	mg/l	1	03/18/24	M-02
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W4B2023 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/23/24 17:28				**Analyst:** ISM
Nitrate as N	**0.83**	0.040	0.20	mg/l	1	02/23/24 18:32	
Nitrite as N	**50**	42	100	ug/l	1	02/23/24 18:32	J
NO2+NO3 as N	**880**	36	200	ug/l	1	02/23/24	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W4B2025 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/23/24 17:31				**Analyst:** rob
o-Phosphate as P	**0.30**	0.0071	0.010	mg/l	1	02/23/24 18:24	
Method: EPA 365.3			**Instr:** UVVIS05				
Batch ID: W4C1413 **Preparation:** _NONE (WETCHEM)			**Prepared:** 03/18/24 18:44				**Analyst:** rob
Phosphorus as P, Total	**0.41**	0.0067	0.010	mg/l	1	03/21/24	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W4B2072 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/26/24 09:25				**Analyst:** bel
Total Dissolved Solids	**410**	4.0	10	mg/l	1	02/26/24	
Method: SM 2540D			**Instr:** OVEN15				
Batch ID: W4B2510 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/29/24 15:43				**Analyst:** hhl
Total Suspended Solids	**39**		5	mg/l	1	02/29/24	
Metals by EPA 200 Series Methods							
Method: [CALC]			**Instr:** [CALC]				
Batch ID: [CALC] **Preparation:** [CALC]			**Prepared:** 02/27/24 13:20				**Analyst:** kvm
Hardness as CaCO3, Total	**173**	0.121	3.31	mg/l		03/04/24	
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W4B2216 **Preparation:** EPA 200.2			**Prepared:** 02/27/24 13:20				**Analyst:** kvm
Calcium, Total	**43.3**	0.0240	0.500	mg/l	1	03/04/24	
Magnesium, Total	**15.7**	0.0148	0.500	mg/l	1	03/04/24	

Sample Results
(Continued)

Sample: S-03-022324
Sampled: 02/23/24 7:00 by Matt M.
4B23077-01 (Water)
(Continued)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier

Metals by EPA 200 Series Methods (Continued)

Method: EPA 200.7 **Instr:** ICP03
Batch ID: W4B2216 **Preparation:** EPA 200.2 **Prepared:** 02/27/24 13:20 **Analyst:** kvm

Sample Results
(Continued)

Sample: S-04-022324
Sampled: 02/23/24 8:00 by Matt M.
4B23077-02 (Water)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: [CALC] **Instr:** [CALC]
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 03/15/24 14:18 **Analyst:** YMT

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrogen, Total	**1.5**	0.036	0.20	mg/l		03/18/24	

Method: _Various **Instr:** [CALC]
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 03/15/24 14:18 **Analyst:** YMT

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Organic Nitrogen, Total	**0.56**	0.017	0.10	mg/l		03/18/24	

Method: EPA 350.1 **Instr:** AA06
Batch ID: W4C1185 **Preparation:** _NONE (WETCHEM) **Prepared:** 03/14/24 18:43 **Analyst:** YMT

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Ammonia as N	**0.12**	0.017	0.10	mg/l	1	03/15/24	

Method: EPA 351.2 **Instr:** AA06
Batch ID: W4C1267 **Preparation:** _NONE (WETCHEM) **Prepared:** 03/15/24 14:18 **Analyst:** YMT

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
TKN	**0.68**	0.13	0.20	mg/l	1	03/18/24	M-02

Method: EPA 353.2 **Instr:** AA01
Batch ID: W4B2023 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/23/24 17:28 **Analyst:** ISM

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrate as N	**0.74**	0.040	0.20	mg/l	1	02/23/24 18:33	
Nitrite as N	**63**	42	100	ug/l	1	02/23/24 18:33	J
NO2+NO3 as N	**800**	36	200	ug/l	1	02/23/24	

Method: EPA 365.3 **Instr:** UVVIS04
Batch ID: W4B2025 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/23/24 17:31 **Analyst:** rob

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
o-Phosphate as P	**0.31**	0.0071	0.010	mg/l	1	02/23/24 18:24	

Method: EPA 365.3 **Instr:** UVVIS05
Batch ID: W4C1413 **Preparation:** _NONE (WETCHEM) **Prepared:** 03/18/24 18:44 **Analyst:** rob

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Phosphorus as P, Total	**0.44**	0.0067	0.010	mg/l	1	03/21/24	

Method: SM 2540C **Instr:** OVEN17
Batch ID: W4B2072 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/26/24 09:25 **Analyst:** bel

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Dissolved Solids	**120**	4.0	10	mg/l	1	02/26/24	

Method: SM 2540D **Instr:** OVEN15
Batch ID: W4B2510 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/29/24 15:43 **Analyst:** hhl

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Suspended Solids	**39**		5	mg/l	1	02/29/24	

Sample Results

(Continued)

Sample: S-04-022324 Sampled: 02/23/24 8:00 by Matt M.

4B23077-02 (Water) (Continued)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)							
Method: SM 2540D **Instr:** OVEN15							
Batch ID: W4B2510 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/29/24 15:43 **Analyst:** hhl							
Metals by EPA 200 Series Methods							
Method: [CALC] **Instr:** [CALC]							
Batch ID: [CALC] **Preparation:** [CALC] **Prepared:** 02/27/24 13:20 **Analyst:** kvm							
Hardness as CaCO3, Total	**61.5**	0.121	3.31	mg/l		03/04/24	
Method: EPA 200.7 **Instr:** ICP03							
Batch ID: W4B2216 **Preparation:** EPA 200.2 **Prepared:** 02/27/24 13:20 **Analyst:** kvm							
Calcium, Total	**18.0**	0.0240	0.500	mg/l	1	03/04/24	
Magnesium, Total	**4.03**	0.0148	0.500	mg/l	1	03/04/24	

Sample Results

(Continued)

Sample: CLS-022324

Sampled: 02/23/24 8:00 by Matt M.

4B23077-03 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: [CALC]			**Instr:** [CALC]				
Batch ID: [CALC]	**Preparation:** [CALC]		**Prepared:** 03/15/24 14:18				**Analyst:** YMT
Nitrogen, Total	**1.4**	0.036	0.10	mg/l		03/18/24	
Method: _Various			**Instr:** [CALC]				
Batch ID: [CALC]	**Preparation:** [CALC]		**Prepared:** 03/15/24 14:18				**Analyst:** YMT
Organic Nitrogen, Total	**0.66**	0.017	0.10	mg/l		03/18/24	
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W4C1185	**Preparation:** _NONE (WETCHEM)		**Prepared:** 03/14/24 18:43				**Analyst:** YMT
Ammonia as N	**0.087**	0.017	0.10	mg/l	1	03/15/24	J
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W4C1267	**Preparation:** _NONE (WETCHEM)		**Prepared:** 03/15/24 14:18				**Analyst:** YMT
TKN	**0.74**	0.065	0.10	mg/l	1	03/18/24	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W4B2023	**Preparation:** _NONE (WETCHEM)		**Prepared:** 02/23/24 17:28				**Analyst:** ISM
Nitrate as N	**0.63**	0.040	0.20	mg/l	1	02/23/24 18:34	
Nitrite as N	ND	42	100	ug/l	1	02/23/24 18:34	
NO2+NO3 as N	**670**	36	200	ug/l	1	02/23/24	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W4B2025	**Preparation:** _NONE (WETCHEM)		**Prepared:** 02/23/24 17:31				**Analyst:** rob
o-Phosphate as P	**0.22**	0.0071	0.010	mg/l	1	02/23/24 18:22	
Method: EPA 365.3			**Instr:** UVVIS05				
Batch ID: W4C1413	**Preparation:** _NONE (WETCHEM)		**Prepared:** 03/18/24 18:44				**Analyst:** rob
Phosphorus as P, Total	**0.30**	0.0067	0.010	mg/l	1	03/21/24	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W4B2072	**Preparation:** _NONE (WETCHEM)		**Prepared:** 02/26/24 09:25				**Analyst:** bel
Total Dissolved Solids	**250**	4.0	10	mg/l	1	02/26/24	
Method: SM 2540D			**Instr:** OVEN15				
Batch ID: W4B2510	**Preparation:** _NONE (WETCHEM)		**Prepared:** 02/29/24 15:43				**Analyst:** hhl
Total Suspended Solids	**15**		5	mg/l	1	02/29/24	
Metals by EPA 200 Series Methods							
Method: [CALC]			**Instr:** [CALC]				
Batch ID: [CALC]	**Preparation:** [CALC]		**Prepared:** 02/27/24 13:20				**Analyst:** kvm
Hardness as CaCO3, Total	**131**	0.121	3.31	mg/l		03/04/24	
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W4B2216	**Preparation:** EPA 200.2		**Prepared:** 02/27/24 13:20				**Analyst:** kvm
Calcium, Total	**35.3**	0.0240	0.500	mg/l	1	03/04/24	
Magnesium, Total	**10.3**	0.0148	0.500	mg/l	1	03/04/24	

Sample Results

(Continued)

Sample: CLS-022324

Sampled: 02/23/24 8:00 by Matt M.

4B23077-03 (Water)

(Continued)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier

Metals by EPA 200 Series Methods (Continued)

Method: EPA 200.7 **Instr:** ICP03

Batch ID: W4B2216 **Preparation:** EPA 200.2 **Prepared:** 02/27/24 13:20 **Analyst:** kvm

Quality Control Results

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4B2023 - EPA 353.2											
Blank (W4B2023-BLK1)				**Prepared & Analyzed: 02/23/24**							
Nitrate as N	ND	0.040	0.15	mg/l							
Nitrite as N	ND	42	100	ug/l							
NO2+NO3 as N	ND	36	200	ug/l							
LCS (W4B2023-BS1)				**Prepared & Analyzed: 02/23/24**							
Nitrate as N	0.981	0.040	0.15	mg/l	1.00		98	90-110			
Nitrite as N	999	42	100	ug/l	1000		100	90-110			
NO2+NO3 as N	981	36	200	ug/l	1000		98	90-110			
Matrix Spike (W4B2023-MS1)	**Source: 4B22114-01**			**Prepared & Analyzed: 02/23/24**							
Nitrate as N	2.40	0.040	0.15	mg/l	2.00	0.484	96	90-110			
Nitrite as N	1010	42	100	ug/l	1000	ND	101	90-110			
NO2+NO3 as N	2400	36	200	ug/l	2000	497	95	90-110			
Matrix Spike (W4B2023-MS2)	**Source: 4B22129-01**			**Prepared & Analyzed: 02/23/24**							
Nitrate as N	5.17	0.040	0.15	mg/l	2.00	3.21	98	90-110			
Nitrite as N	1020	42	100	ug/l	1000	ND	102	90-110			
NO2+NO3 as N	5170	36	200	ug/l	2000	3210	98	90-110			
Matrix Spike Dup (W4B2023-MSD1)	**Source: 4B22114-01**			**Prepared & Analyzed: 02/23/24**							
Nitrate as N	2.40	0.040	0.15	mg/l	2.00	0.484	96	90-110	0	20	
Nitrite as N	1010	42	100	ug/l	1000	ND	101	90-110	0	20	
NO2+NO3 as N	2400	36	200	ug/l	2000	497	95	90-110	0	20	
Matrix Spike Dup (W4B2023-MSD2)	**Source: 4B22129-01**			**Prepared & Analyzed: 02/23/24**							
Nitrate as N	5.16	0.040	0.15	mg/l	2.00	3.21	97	90-110	0.2	20	
Nitrite as N	1020	42	100	ug/l	1000	ND	102	90-110	0	20	
NO2+NO3 as N	5160	36	200	ug/l	2000	3210	98	90-110	0.2	20	
Batch: W4B2025 - EPA 365.3											
Blank (W4B2025-BLK1)				**Prepared & Analyzed: 02/23/24**							
o-Phosphate as P	ND	0.0071	0.010	mg/l							
LCS (W4B2025-BS1)				**Prepared & Analyzed: 02/23/24**							
o-Phosphate as P	0.202	0.0071	0.010	mg/l	0.200		101	88-111			
Matrix Spike (W4B2025-MS1)	**Source: 4B23077-03**			**Prepared & Analyzed: 02/23/24**							
o-Phosphate as P	0.423	0.0071	0.010	mg/l	0.200	0.221	101	85-112			
Matrix Spike Dup (W4B2025-MSD1)	**Source: 4B23077-03**			**Prepared & Analyzed: 02/23/24**							
o-Phosphate as P	0.422	0.0071	0.010	mg/l	0.200	0.221	100	85-112	0.2	20	
Batch: W4B2072 - SM 2540C											
Blank (W4B2072-BLK1)				**Prepared & Analyzed: 02/26/24**							
Total Dissolved Solids	ND	4.0	10	mg/l							
LCS (W4B2072-BS1)				**Prepared & Analyzed: 02/26/24**							
Total Dissolved Solids	804	4.0	10	mg/l	824		98	97-103			
Duplicate (W4B2072-DUP1)	**Source: 4B22090-02**			**Prepared & Analyzed: 02/26/24**							

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4B2072 - SM 2540C (Continued)											
Duplicate (W4B2072-DUP1)	**Source: 4B22090-02**			**Prepared & Analyzed: 02/26/24**							
Total Dissolved Solids	4730	4.0	10	mg/l		4640			2	10	
Duplicate (W4B2072-DUP2)	**Source: 4B22123-01**			**Prepared & Analyzed: 02/26/24**							
Total Dissolved Solids	6100	4.0	10	mg/l		5880			4	10	
Batch: W4B2510 - SM 2540D											
Blank (W4B2510-BLK1)				**Prepared & Analyzed: 02/29/24**							
Total Suspended Solids	ND		5	mg/l							
LCS (W4B2510-BS1)				**Prepared & Analyzed: 02/29/24**							
Total Suspended Solids	69.0		5	mg/l	63.0		110	90-110			
Duplicate (W4B2510-DUP1)	**Source: 4B22105-01**			**Prepared & Analyzed: 02/29/24**							
Total Suspended Solids	248		5	mg/l		270			8	10	
Duplicate (W4B2510-DUP2)	**Source: 4B23102-01**			**Prepared & Analyzed: 02/29/24**							
Total Suspended Solids	394		5	mg/l		379			4	10	
Batch: W4C1185 - EPA 350.1											
Blank (W4C1185-BLK1)				**Prepared: 03/14/24 Analyzed: 03/15/24**							
Ammonia as N	ND	0.017	0.10	mg/l							
Blank (W4C1185-BLK2)				**Prepared: 03/14/24 Analyzed: 03/15/24**							
Ammonia as N	ND	0.017	0.10	mg/l							
LCS (W4C1185-BS1)				**Prepared: 03/14/24 Analyzed: 03/15/24**							
Ammonia as N	0.234	0.017	0.10	mg/l	0.250		94	90-110			
LCS (W4C1185-BS2)				**Prepared: 03/14/24 Analyzed: 03/15/24**							
Ammonia as N	0.233	0.017	0.10	mg/l	0.250		93	90-110			
Matrix Spike (W4C1185-MS1)	**Source: 4B21113-12**			**Prepared: 03/14/24 Analyzed: 03/15/24**							
Ammonia as N	0.233	0.017	0.10	mg/l	0.250	ND	93	90-110			
Matrix Spike (W4C1185-MS2)	**Source: 4B23057-01**			**Prepared: 03/14/24 Analyzed: 03/15/24**							
Ammonia as N	0.277	0.017	0.10	mg/l	0.250	0.0353	97	90-110			
Matrix Spike Dup (W4C1185-MSD1)	**Source: 4B21113-12**			**Prepared: 03/14/24 Analyzed: 03/15/24**							
Ammonia as N	0.238	0.017	0.10	mg/l	0.250	ND	95	90-110	2	15	
Matrix Spike Dup (W4C1185-MSD2)	**Source: 4B23057-01**			**Prepared: 03/14/24 Analyzed: 03/15/24**							
Ammonia as N	0.276	0.017	0.10	mg/l	0.250	0.0353	96	90-110	0.2	15	
Batch: W4C1267 - EPA 351.2											
Blank (W4C1267-BLK1)				**Prepared: 03/15/24 Analyzed: 03/18/24**							
TKN	ND	0.065	0.10	mg/l							
Blank (W4C1267-BLK2)				**Prepared: 03/15/24 Analyzed: 03/18/24**							
TKN	ND	0.065	0.10	mg/l							
LCS (W4C1267-BS1)				**Prepared: 03/15/24 Analyzed: 03/18/24**							
TKN	1.04	0.065	0.10	mg/l	1.00		104	90-110			
LCS (W4C1267-BS2)				**Prepared: 03/15/24 Analyzed: 03/18/24**							

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4C1267 - EPA 351.2 (Continued)											
LCS (W4C1267-BS2)				**Prepared: 03/15/24**	**Analyzed: 03/18/24**						
TKN	1.02	0.065	0.10	mg/l	1.00		102	90-110			
Matrix Spike (W4C1267-MS1)	**Source: 4B22090-02**			**Prepared: 03/15/24**	**Analyzed: 03/18/24**						
TKN	3.32	0.13	0.20	mg/l	2.00	1.25	104	90-110			
Matrix Spike (W4C1267-MS2)	**Source: 4B29072-04**			**Prepared: 03/15/24**	**Analyzed: 03/18/24**						
TKN	1.76	0.065	0.10	mg/l	1.00	0.815	94	90-110			
Matrix Spike Dup (W4C1267-MSD1)	**Source: 4B22090-02**			**Prepared: 03/15/24**	**Analyzed: 03/18/24**						
TKN	3.34	0.13	0.20	mg/l	2.00	1.25	104	90-110	0.4	10	
Matrix Spike Dup (W4C1267-MSD2)	**Source: 4B29072-04**			**Prepared: 03/15/24**	**Analyzed: 03/18/24**						
TKN	1.69	0.065	0.10	mg/l	1.00	0.815	88	90-110	4	10	MS-01
Batch: W4C1413 - EPA 365.3											
Blank (W4C1413-BLK1)				**Prepared: 03/18/24**	**Analyzed: 03/21/24**						
Phosphorus as P, Total	ND	0.0067	0.010	mg/l							
LCS (W4C1413-BS1)				**Prepared: 03/18/24**	**Analyzed: 03/21/24**						
Phosphorus as P, Total	0.198	0.0067	0.010	mg/l	0.200		99	90-110			
Matrix Spike (W4C1413-MS1)	**Source: 4B06002-01**			**Prepared: 03/18/24**	**Analyzed: 03/21/24**						
Phosphorus as P, Total	0.263	0.0067	0.010	mg/l	0.200	0.0650	99	90-110			
Matrix Spike Dup (W4C1413-MSD1)	**Source: 4B06002-01**			**Prepared: 03/18/24**	**Analyzed: 03/21/24**						
Phosphorus as P, Total	0.266	0.0067	0.010	mg/l	0.200	0.0650	100	90-110	1	20	

NV5 - Alta Environmental - Oceanside
15092 Avenue of Science, Suite 200
San Diego, CA 92128

Project Number: Lake Elsinore and Canyon Lake Nutrient TMDL

Project Manager: Garth Engelhorn

Reported: 03/26/2024 09:50

Quality Control Results

(Continued)

Metals by EPA 200 Series Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4B2216 - EPA 200.7											
Blank (W4B2216-BLK1)				**Prepared: 02/27/24**	**Analyzed: 03/04/24**						
Calcium, Total	ND	0.0240	0.500	mg/l							
Magnesium, Total	ND	0.0148	0.500	mg/l							
LCS (W4B2216-BS1)				**Prepared: 02/27/24**	**Analyzed: 03/04/24**						
Calcium, Total	50.9	0.0240	0.500	mg/l	50.2		101	85-115			
Magnesium, Total	50.5	0.0148	0.500	mg/l	50.2		101	85-115			
Matrix Spike (W4B2216-MS1)	**Source: 4B22091-01**			**Prepared: 02/27/24**	**Analyzed: 03/04/24**						
Calcium, Total	53.2	0.0240	0.500	mg/l	50.2	3.56	99	70-130			
Magnesium, Total	50.9	0.0148	0.500	mg/l	50.2	1.60	98	70-130			
Matrix Spike (W4B2216-MS2)	**Source: 4B23057-01**			**Prepared: 02/27/24**	**Analyzed: 03/04/24**						
Calcium, Total	65.9	0.0240	0.500	mg/l	50.2	15.6	100	70-130			
Magnesium, Total	53.7	0.0148	0.500	mg/l	50.2	4.02	99	70-130			
Matrix Spike Dup (W4B2216-MSD1)	**Source: 4B22091-01**			**Prepared: 02/27/24**	**Analyzed: 03/04/24**						
Calcium, Total	52.7	0.0240	0.500	mg/l	50.2	3.56	98	70-130	0.8	30	
Magnesium, Total	50.4	0.0148	0.500	mg/l	50.2	1.60	97	70-130	0.9	30	
Matrix Spike Dup (W4B2216-MSD2)	**Source: 4B23057-01**			**Prepared: 02/27/24**	**Analyzed: 03/04/24**						
Calcium, Total	66.0	0.0240	0.500	mg/l	50.2	15.6	100	70-130	0.2	30	
Magnesium, Total	53.8	0.0148	0.500	mg/l	50.2	4.02	99	70-130	0.1	30	

Notes and Definitions

Item	Definition
J	Estimated conc. detected <MRL and >MDL.
M-02	Due to the nature of matrix interferences, sample was diluted prior to preparation. The MDL and MRL were raised due to the dilution.
MS-01	The spike recovery for this QC sample is outside of established control limits possibly due to sample matrix interference.
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	Method Reporting Limit (MRL) is the minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.
[CALC]	An automated calculation using unrounded values then rounding the final result (scientific rounding rules). Calculations do not contain direct qualifiers; please refer to the individual components of the calculation for any qualifiers

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

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

Hardness as CaCO3, Total consist of the following components Magnesium, Total; and Calcium, Total

Nitrogen, Total consist of the following components NO2+NO3 as N; and TKN

Organic Nitrogen, Total consist of the following components TKN; and Ammonia as N

APPENDIX B

WATER COLUMN PROFILE DATASHEETS

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 7/17/23 Location (Circle): Lake Elsinore/Canyon Lake Station: LE01

Time on Station: 1025 Time off Station: 1030 Staff Initials: NJ/HK

Weather Conditions: clear Wind (mph & direction): 1-2 mph E

Lat: on target Long: on

Water Depth (m): 6.8m Secchi Depth (m): 0.3m

Water Chemistry Sample?: Y/[✓ N]
SAMPLE TIME: ____

Chl-a Sample?: Y/[✓ N]
Surface volume filtered (ml): ____

Depth-Integrated volume filtered (ml): ____

Plankton Sample?: Y /[✓ N]

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	28.6	3274	9.02	10.00	12				
1	28.8	3274	9.00	8.72	13				
2	28.3	3272	8.96	6.56	14				
3	26.6	3263	8.57	0.25	15				
4	25.6	3257	8.52	0.08	16				
5	25.1	3258	8.31	0.03	17				
6	25.0	3259	8.19	0.02	18				
~~7~~ 6.5	24.7	3262	8.17	0.00	19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore TNTP Offset Monitoring
2023-24

FIELD DATASHEET

Date: 7/17 Location: Lake Elsinore Station: LE02

Time on Station: 0750 Time off Station: 0935 Staff Initials: NJ/HK

Weather Conditions: Wind (mph & direction): 1-2mph E

Lat: on Long: on

Water Depth (m): 7.7m Secchi Depth (m): 0.3m

Water Chemistry Sample Times: **Chl-a Samples**? [✓ Y] N **Algae Taxonomy Sample**? [✓ Y] N 0805

Surface: 0805
Surface DUP: 0845
Depth Int: 0815
Depth Int. DUP: 0900
Bottom: 0830
Bottom DUP: 0905
Surface TMDL: 0920

Surface volume filtered (ml): 190mL
Surface DUP volume filtered *(ml)*: 220
Depth Int. volume filtered (ml): 210
Depth Int. DUP volume filtered (ml): 230
Surface TMDL: volume filtered (ml): 215

Do not exceed **7 PSI or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250mL filter volume).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)
0	27.8	3267	8.91	6.85	31.4	24.45
0.5	27.8	3269	8.91	6.90	34.7	24.42
1	27.8	3269	8.91	6.83	37.0	23.76
2	27.8	3270	8.90	6.72	40.1	25.47
3	26.4	3261	8.57	0.18	-11.8	21.27
4	26.1	3262	8.53	0.06	-175.7	23.75
5	25.0	3262	8.29	0.01	-270.9	10.64
6	24.8	3261	8.24	0.00	-300.3	10.10
7	24.6	3262	8.11	0.00	-313.2	5.93
8						
9						
10						
11						

FIELD DATASHEET

Date: 7/17 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE03

Time on Station: 0735 Time off Station: 0745 Staff Initials: NJ/HK

Weather Conditions: Clear Wind (mph & direction): 1-2 mph E

Lat: on Long: on

Water Depth (m): 6.0m Secchi Depth (m): 0.3m

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

checked DO drop twice and both were the same between 3+4 meters
large drop from 7 to 0

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	27.6	3267	8.93	7.60	12				
1	27.6	3268	8.93	7.81	13				
2	27.6	3267	8.93	7.80	14				
3	26.7	3268	8.92	7.70	15				
4	25.9	3261	8.54	0.32	16				
5	25.6	3261	8.46	0.17	17				
~~6~~ 5.5	25.4	3260	8.45	0.08	18				
7					19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 7/17/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: Grand

Time on Station: 0955 Time off Station: 1000 Staff Initials: NJ/HK

Weather Conditions: Clear Wind (mph & direction): 1-2 mph E

Lat: on Long: on

Water Depth (m): 7.2m Secchi Depth (m): 0.3m

Water Chemistry Sample?: Y/[✓ N] Chl-a Sample?: Y/[✓ N] Plankton Sample?: Y/[✓ N]

SAMPLE TIME: ____

Surface volume filtered (ml): ____

Depth-Integrated volume filtered (ml): ____

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	28.5	3276	9.08	11.95	12				
1	28.4	3268	9.03	8.98	13				
2	27.8	3269	8.90	6.48	14				
3	27.0	3270	8.60	0.46	15				
4	25.7	3260	8.52	0.15	16				
5	25.1	3261	8.28	0.09	17				
6	24.9	3261	8.24	0.07	18				
6.5 ~~7~~	24.7	3262	8.16	0.05	19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 7/17/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: lakeview

Time on Station: 1005 Time off Station: 1010 Staff Initials: NJ/HK

Weather Conditions: Clear Wind (mph & direction): 1-2 mph E

Lat: on Long: on

Water Depth (m): 8.3m Secchi Depth (m): 0.3m

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME: ______

Surface volume filtered (ml): ______

Depth-Integrated volume filtered (ml): ______

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	28.9	3277	9.02	10.44	12				
1	28.3	3270	9.00	7.77	13				
2	27.2	3268	8.72	2.54	14				
3	26.7	3264	8.59	0.15	15				
4	25.5	3263	8.50	0.07	16				
5	25.4	3257	8.46	0.04	17				
6	25.2	3258	8.40	0.02	18				
7	24.9	3263	8.14	0.00	19				
8	24.6	3264	8.11	0.00	20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 7/17 Location (Circle): Lake Elsinore/Canyon Lake Station: DO line

Time on Station: 10.15 Time off Station: Staff Initials: NJ/HK

Weather Conditions: Wind (mph & direction):

Lat: Long:

Water Depth (m): 7.5 Secchi Depth (m):

Water Chemistry Sample?: [✓ Y] N Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME: ✓ phosphate

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:
odor: phosphorous/anoxic

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	2			2.76	**12**				
1				4.00	**13**				
2				3.21	**14**				
3				2.42	**15**				
4				0.05	**16**				
5				0.01	**17**				
6				0.00	**18**				
7				0.00	**19**				
8					**20**				
9					**21**				
10					**22**				
11					**23**				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 7/17/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE01

Time on Station: 1310 Time off Station: 1315 Staff Initials: NJ

Weather Conditions: clear, hot Wind (mph & direction): 5 mph SW

Lat: on Long: on

Water Depth (m): 6.8m Secchi Depth (m): /

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME: ____

Surface volume filtered (ml): ____

Depth-Integrated volume filtered (ml): ____

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	31.2	3284	9.14	15.06	12				
1	28.4	3272	9.01	10.12	13				
2	28.1	3272	8.93	5.57	14				
3	27.0	3265	8.56	0.18	15				
4	26.3	3257	8.55	0.08	16				
5	25.3	3258	8.33	0.04	17				
6	24.7	3262	8.16	0.01	18				
7					19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 7/17/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE02

Time on Station: 1300 Time off Station: 1305 Staff Initials: NJ/HK

Weather Conditions: clear; hot Wind (mph & direction): 5 mph

Lat: On Long: On

Water Depth (m): 7.7m Secchi Depth (m): /

Water Chemistry Sample?: Y / [✓ N]
SAMPLE TIME:

Chl-a Sample?: Y / [✓ N]
Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Plankton Sample?: Y / [✓ N]

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	30.7	3287	9.16	15.83	12				
1	28.6	3277	9.12	12.88	13				
2	28.0	3272	8.84	4.30	14				
3	27.1	3267	8.60	0.30	15				
4	26.5	3262	8.56	0.16	16				
5	26.0	3260	8.50	0.09	17				
6	25.3	3258	8.43	0.06	18				
7	24.9	3264	8.11	0.03	19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 7/17/23

Location (Circle): [✓ Lake Elsinore]/Canyon Lake

Station: LE03

Time on Station: 1250

Time off Station: 1255

Staff Initials: NJ/HK

Weather Conditions: clear, hot

Wind (mph & direction): 1-5 mph [illegible] SW

Lat: on

Long: On

Water Depth (m): 6.0m

Secchi Depth (m):

Water Chemistry Sample?: Y/[✓ N]

SAMPLE TIME:

Chl-a Sample?: Y/[✓ N]

Plankton Sample?: Y/[✓ N]

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (μS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (μS/cm)	pH (units)	DO (mg/L)
0	28.7	3260	9.13	14.40	12				
1	28.0	3270	8.88	6.72	13				
2	27.0	3284	8.71	3.03	14				
3	26.7	3263	8.64	0.11	15				
4	26.1	3261	8.53	0.05	16				
5	25.4	3260	8.34	0.01	17				
~~6~~ 5.5	25.0	3264	8.20	0.00	18				
7					19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 8/1/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE01

Time on Station: 1125 Time off Station: 1130 Staff Initials: NJ KP

Weather Conditions: slight cloud Wind (mph & direction): 1-2 SE

Lat: On Long: On

Water Depth (m): 6.5 Secchi Depth (m): 0.3

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME: ___________

Surface volume filtered (ml): ___________

Depth-Integrated volume filtered (ml): ___________

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

7 dead carp

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	28.2	3299	8.73	1.10	12				
1	28.1	3300	8.71	0.50	13				
2	28.1	3301	8.69	0.20	14				
3	28.0	3302	8.69	0.15	15				
4	28.0	3302	8.68	0.13	16				
5	28.0	3303	8.68	0.13	17				
6	26.7	3311	8.09	0.12	18				
7					19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 08/1/23 Location: Lake Elsinore Station: LE02

Time on Station: 0912 Time off Station: 1105 Staff Initials: NJ/KP

Weather Conditions: partly cloudy; drizzle Wind (mph & direction): 1-2 SE

Lat: on Long: on

Water Depth (m): 7.6m Secchi Depth (m): 0.3

Water Chemistry Sample Times: **Chl-a Samples?**: [✓ Y] / N **Algae Taxonomy Sample?**: [✓ Y] / N

Surface: 0930
Surface DUP: 1010
Depth Int: 0933
Depth Int. DUP: 1018
Bottom: 0950
Bottom DUP: 1030
Surface TMDL: 1050

Surface volume filtered (ml): 180
Surface DUP volume filtered *(ml)*: 175 mL
Depth Int. volume filtered (ml): 185 mL
Depth Int. DUP volume filtered (ml): 220 mL
Surface TMDL: volume filtered (ml): 255

Do not exceed **7 PSI or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250mL filter volume).

Comments: pre recording

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)
0	27.9	3282	8.69	0.61	31.6	22.33
0.5	28.0	3289	8.70	0.40	22.6	22.76
1	28.0	3290	8.69	0.21	-102.6	20.23
2	28.0	3292	8.69	0.13	-102.6	21.41
3	28.0	3292	8.69	0.13	-102.4	24.18
4	28.0	3292	8.68	0.13	-102.3	23.56
5	28.0	3292	8.68	0.12	-102.3	22.54
6	28.0	3293	8.68	0.12	-102.3	23.48
7	27.3	3309	8.18	0.11	-256.7	4.58
8						
9						
10						
11						

FIELD DATASHEET

Date: 8/1/23 Location (Circle): [✓ Lake Elsinore] / Canyon Lake Station: LE03

Time on Station: 0845 Time off Station: 0855 Staff Initials: NJ/KP

Weather Conditions: partly cloudy; light rain Wind (mph & direction): 1-2 mph SE

Lat: on Long: on

Water Depth (m): 5.8m Secchi Depth (m): 0.3m

Water Chemistry Sample?: Y / [✓ N]
SAMPLE TIME: __________

Chl-a Sample?: Y / [✓ N]
Surface volume filtered (ml): __________

Depth-Integrated volume filtered (ml): __________

Plankton Sample?: Y / [✓ N]

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	27.9	3290	8.68	10.73	12				
1	28.0	3193	8.64	0.41	13				
2	28.0	3200	8.65	0.18	14				
3	28.0	3216	8.65	0.16	15				
4	28.0	3223	8.68	0.15	16				
5	27.3	3279	8.28	0.14	17				
~~6~~ 5.5	26.8	3298	8.11	0.15	18				
7					19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 8/1/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: Grand

Time on Station: 0900 Time off Station: 0910 Staff Initials: NJ/KP

Weather Conditions: partly cloudy; drizzle Wind (mph & direction): 1-2 SE

Lat: on Long: on

Water Depth (m): 7.1m Secchi Depth (m): 0.3m

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME: ____________

Surface volume filtered (ml):__________

Depth-Integrated volume filtered (ml):__________

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	27.9	3285	8.70	0.64	12				
1	27.9	3285	8.70	0.43	13				
2	27.9	3286	8.70	0.26	14				
3	27.9	3287	8.69	0.18	15				
4	27.9	3288	8.69	0.16	16				
5	27.9	3288	8.69	0.14	17				
6	27.6	3292	8.48	0.15	18				
~~7~~ 6.5m	26.7	3299	8.08	0.14	19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 8/1/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: Lakeview

Time on Station: 1110 Time off Station: 1118 Staff Initials: NJ·KP

Weather Conditions: slight clouds Wind (mph & direction): 1-2 SE

Lat: On Long: ON

Water Depth (m): 8.0m Secchi Depth (m): 0.3m

Water Chemistry Sample?: Y/[✓ N] Chl-a Sample?: Y/[✓ N] Plankton Sample?: Y/[✓ N]

SAMPLE TIME: ______

Surface volume filtered (ml): ______

Depth-Integrated volume filtered (ml): ______

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	28.3	3294.	8.85	2.17	12				
1	28.0	3295	8.72	0.32	13				
2	28.0	3297	8.70	0.16	14				
3	28.0	3297	8.69	0.15	15				
4	28.0	3298	8.69	0.13	16				
5	27.9	3299	8.69	0.13	17				
6	27.9	3299	8.69	0.12	18				
7	26.5	3309	8.02	0.11	19				
~~8~~ 7.5	26.5	3309	8.01	0.11	20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 8/1/23 Location (Circle): Lake Elsinore/Canyon Lake Station: CL07

Time on Station: 1045 Time off Station: 1123 Staff Initials: HK/KB

Weather Conditions: Partly Cloudy Wind (mph & direction): 0-2 W

Lat: on Long: on

Water Depth (m): 15.0 Secchi Depth (m): 1.65

Water Chemistry Sample?: [✓ Y] N Chl-a Sample?: [✓ Y] N Plankton Sample?: Y [✓ N]

SAMPLE TIME: 1100 Surface volume filtered (ml): 500

CL-A Surf: 1115 Depth-Integrated volume filtered (ml): 500

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	29.6	779	8.74	9.35	12	12.6	792	7.12	0.00
1	29.5	779	8.74	9.39	13	12.5	795	7.11	0.00
2	29.3	779	8.74	9.32	14	12.4	798	7.09	0.00
3	29.2	780	8.71	9.10	14.5 ~~15~~	12.4	799	7.08	0.00
4	28.8	795	8.12	8.11	16				
5	24.0	794	7.74	0.20	17				
6	20.7	763	7.68	0.73	18				
7	17.0	756	7.35	0.02	19				
8	14.2	765	7.19	0.00	20				
9	14.4	777	7.16	0.00	21				
10	13.4	780	7.14	0.00	22				
11	12.8	787	7.14	0.00	23				

Lake Elsinore and Canyon Lake TMDL Monitoring
~~2021-22~~
2022-23

FIELD DATASHEET

Date: 8/1/23 Location (Circle): Lake Elsinore/Canyon Lake Station: CL08

Time on Station: 1000 Time off Station: 1040 Staff Initials: HK/KB

Weather Conditions: Partly Cloudy Wind (mph & direction): West 0-2

Lat: On Long: On

Water Depth (m): 8.5 Secchi Depth (m): 1.5

Water Chemistry Sample?: [✓ Y] / N Chl-a Sample? [✓ Y] N Plankton Sample?: Y / [✓ N]

SAMPLE TIME: 1015 Surface volume filtered (ml): 500 mL

CL-A SURF: 1030 Depth-Integrated volume filtered (ml): 450 mL

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	29.4	776	8.74	8.97	12				
1	29.4	776	8.70	8.70	13				
2	29.3	775	8.69	8.87	14				
3	29.2	776	8.66	8.67	15				
4	29.1	776	8.63	4.01	16				
5	25.8	800	7.65	0.23	17				
6	21.7	757	7.52	0.24	18				
7	16.2	756	7.18	0.00	19				
8	14.6	775	7.14	0.00	20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 8/1/23 Location (Circle): Lake Elsinore/Canyon Lake Station: CL09

Time on Station: 0910 Time off Station: 0950 Staff Initials: HK/KB

Weather Conditions: Sunny/Partly Cloudy Wind (mph & direction): 0-2, W

Lat: On Long: On

Water Depth (m): 7.1 Secchi Depth (m): 1.6

Water Chemistry Sample?: [✓ Y] N
SAMPLE TIME: 0915
CL-A SURF: 0930

Chl-a Sample? [✓ Y] N
Surface volume filtered (ml): 480
Depth-Integrated volume filtered (ml): 375mL

Plankton Sample?: Y [✓ N]

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

AM Rainshower prior to sampling

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	29.2	883	8.55	7.75	12				
1	29.3	884	8.53	7.76	13				
2	29.2	882	8.52	7.72	14				
3	29.2	883	8.49	7.54	15				
4	28.9	895	8.21	8.22	16				
5	23.3	991	7.16	0.29	17				
6	18.1	988	7.08	0.06	18				
~~7~~ 6.5	15.7	991	7.07	0.00	19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 8/1/23 Location (Circle): Lake Elsinore/Canyon Lake Station: CL10

Time on Station: 0820 Time off Station: 0900 Staff Initials: HK

Weather Conditions: Sunny & Slight Wind Wind (mph & direction): 0-2 West

Lat: on Long: on

Water Depth (m): 3 Secchi Depth (m): 1.3

Water Chemistry Sample?: [✓ Y] N Chl-a Sample? [✓ Y] N Plankton Sample?: Y [✓ N]

SAMPLE TIME: 0840

Surface volume filtered (ml): 500

CL-A SURF: 0845

Depth-Integrated volume filtered (ml): 500

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	29.1	904	8.43	7.52	12				
1	29.2	904	8.42	7.42	13				
2	29.2	905	8.41	7.44	14				
3	29.2	907	8.39	7.27	15				
4					16				
5					17				
6					18				
7					19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 8/1/23 Location (Circle): Lake Elsinore/Canyon Lake Station: CL07

Time on Station: 1400 Time off Station: 1415 Staff Initials: ~~0~~ HK / KB

Weather Conditions: Partly Cloudy Wind (mph & direction): 0-2

Lat: On Long: On

Water Depth (m): 15.0 Secchi Depth (m): /

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y [✓ N] Plankton Sample?: Y [✓ N]

SAMPLE TIME: ____

Surface volume filtered (ml): ____

Depth-Integrated volume filtered (ml): ____

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	30.7	781	8.82	9.64	12	12.5	~~8~~ 798	7.22	0.00
1	30.0	778	8.85	10.03	13	12.5	799	7.21	0.00
2	29.5	779	8.86	10.05	14	12.4	798	7.22	1.00
3	29.3	778	8.81	9.65	~~15~~ 14.5	12.4	797	7.22	0.00
4	27.7	804	7.88	3.34	16				
5	24.5	802	7.64	0.32	17				
6	19.6	759	7.65	0.95	18				
7	16.7	755	7.41	0.08	19				
8	14.5	769	7.27	0.00	20				
9	13.2	775	7.27	0.00	21				
10	12.8	788	7.27	0.00	22				
11	12.6	797	7.24	0.00	23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 8/1/23 Location (Circle): Lake Elsinore/Canyon Lake Station: CL-08

Time on Station: 1420 Time off Station: 1430 Staff Initials: HK / KB

Weather Conditions: Partly cloudy Wind (mph & direction): 0-2 W

Lat: On Long: On

Water Depth (m): 8.5 Secchi Depth (m): /

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y [✓ N]

SAMPLE TIME: ________

Surface volume filtered (ml): ________

Depth-Integrated volume filtered (ml): ________

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (μS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (μS/cm)	pH (units)	DO (mg/L)
0	30.6	777	8.81	9.46	12				
1	30.2	776	8.83	9.72	13				
2	29.7	775	8.85	9.91	14				
3	29.3	774	8.79	9.38	15				
4	28.7	783	8.47	6.87	16				
5	24.2	787	7.68	0.42	17				
6	20.1	758	7.60	0.57	18				
7	16.8	757	7.30	0.00	19				
8	15.0	769	7.23	0.00	20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 8/1/23 Location (Circle): Lake Elsinore/Canyon Lake Station: CL09

Time on Station: 1508 Time off Station: 1515 Staff Initials: HK/KB

Weather Conditions: partly cloudy Wind (mph & direction): 0-2 W

Lat: O/n Long: O/n

Water Depth (m): 7.1 Secchi Depth (m):

Water Chemistry Sample?: Y/ [✓ N] Chl-a Sample?: Y/ [✓ N] Plankton Sample?: Y/ [✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	30.9	869	8.70	8.63	12				
1	30.2	880	8.75	9.13	13				
2	29.6	889	8.67	8.53	14				
3	29.4	891	8.60	7.92	15				
4	29.0	910	7.86	3.93	16				
5	23.0	977	7.17	0.19	17				
6	17.7	992	7.09	0.07	18				
~~7~~ 65	14.7	984	7.10	0.00	19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 8\1\23 Location (Circle): Lake Elsinore/Canyon Lake Station: CL10

Time on Station: 1452 Time off Station: 1455 Staff Initials: HF/KB

Weather Conditions: Partly Cloudy Wind (mph & direction): 2-4MPH W

Lat: On Long: On

Water Depth (m): 3 Secchi Depth (m): /

Water Chemistry Sample?: Y/ [✓ N] Chl-a Sample?: Y/ [✓ N] Plankton Sample?: Y/ [✓ N]

SAMPLE TIME: ___________

Surface volume filtered (ml): ___________

Depth-Integrated volume filtered (ml): ___________

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	31.0	887	8.67	8.49	12				
1	30.8	887	8.67	8.57	13				
2	30.2	899	8.66	8.67	14				
3	29.7	916	8.56	8.21	15				
4					16				
5					17				
6					18				
7					19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 9/20/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE01

Time on Station: 1020 Time off Station: 1025 Staff Initials: NJ/HK

Weather Conditions: overcast Wind (mph & direction): 4mph S

Lat: On Long: On

Water Depth (m): 6.6m Secchi Depth (m): 0.2m

Water Chemistry Sample?: Y /[✓ N]
SAMPLE TIME: ___________

Chl-a Sample?: Y /[✓ N]
Surface volume filtered (ml): ___________

Depth-Integrated volume filtered (ml): ___________

Plankton Sample?: Y /[✓ N]

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	24.9	3278	8.65	6.25	12				
1	24.9	3278	8.64	6.13	13				
2	24.8	3278	8.59	4.34	14				
3	24.5	3279	8.49	2.81	15				
4	24.3	3279	8.46	2.34	16				
5	24.3	3278	8.44	1.86	17				
6	24.3	3279	8.43	1.89	18				
7					19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 9/20/23 Location: Lake Elsinore Station: LE02

Time on Station: 0755 Time off Station: 0955 Staff Initials: NT/HK

Weather Conditions: overcast Wind (mph & direction): 2-3 mph S

Lat: on Long: on

Water Depth (m): 7.6m Secchi Depth (m): 0.3m

Water Chemistry Sample Times: **Chl-a Samples**?: Y / N **Algae Taxonomy Sample**?: Y / N

Surface: 0810
Surface DUP: 0855
Depth Int: 0825
Depth Int. DUP: 0855
Bottom: 0835
Bottom DUP: 0920
Surface TMDL: 0935
Clox

Surface volume filtered (ml): 140
Surface DUP volume filtered *(ml):* 135
Depth Int. volume filtered (ml): 145
Depth Int. DUP volume filtered (ml): 145
Surface TMDL: volume filtered (ml): 190

Do not exceed **7 PSI or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250mL filter volume).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)
0	24.2	3272	8.48	4.15	152.6	11.67
0.5	24.2	3273	8.48	3.99	147.6	12.16
1	24.2	3273	8.48	3.96	144.2	11.86
2	24.2	3273	8.48	3.91	141.4	11.40
3	24.2	3273	8.48	3.87	139.2	11.29
4	24.2	3273	8.49	3.86	137.5	11.86
5	24.2	3273	8.49	3.84	136.0	11.98
6	24.2	3273	8.49	3.84	133.8	11.53
7	24.2	3273	8.49	3.85	132.4	11.47
8						
9						
10						
11						

FIELD DATASHEET

Date: 9/20/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE03

Time on Station: 0745 Time off Station: 0750 Staff Initials: NJ/HK

Weather Conditions: overcast Wind (mph & direction): 2-3mph S

Lat: on Long: on

Water Depth (m): 5.9 Secchi Depth (m): 0.3m

Water Chemistry Sample?: Y/[✓ N] Chl-a Sample?: Y/[✓ N] Plankton Sample?: Y/[✓ N]

SAMPLE TIME: ____

Surface volume filtered (ml): ____

Depth-Integrated volume filtered (ml): ____

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	24.4	3273	8.39	3.34	12				
1	24.4	3273	8.40	3.19	13				
2	24.4	3274	8.40	3.13	14				
3	24.4	3274	8.40	3.08	15				
4	24.4	3273	8.41	3.02	16				
5	24.4	3274	8.41	3.03	17				
~~6~~ 5.5	24.4	3274	8.42	3.05	18				
7					19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 9/20/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE01

Time on Station: 1322 Time off Station: 1326 Staff Initials: VJ/HK

Weather Conditions: Clear, Sunny Wind (mph & direction): 4-5mph SW

Lat: On Long: On

Water Depth (m): 6.6m Secchi Depth (m): ______

Water Chemistry Sample?: Y / N Chl-a Sample?: Y / N Plankton Sample?: Y / N

SAMPLE TIME: ______

Surface volume filtered (ml): ______

Depth-Integrated volume filtered (ml): ______

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	26.2	3283	8.84	11.90	12				
1	26.0	3280	8.82	10.24	13				
2	25.2	3279	8.57	4.20	14				
3	24.7	3279	8.50	2.54	15				
4	24.4	3279	8.42	1.96	16				
5	24.3	3279	8.40	1.69	17				
6	24.3	3279	8.39	1.55	18				
7					19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 9/20/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE02

Time on Station: 0 1313 Time off Station: 1319 Staff Initials: NJ/HK

Weather Conditions: Clear, sunny Wind (mph & direction): 4-5 mph SW

Lat: On Long: On

Water Depth (m): 7.6m Secchi Depth (m): —

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME: ____

Surface volume filtered (ml): ____

Depth-Integrated volume filtered (ml): ____

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	26.3	3280	8.82	11.04	12				
1	24.7	3274	8.78	8.85	13				
2	24.5	3274	8.55	4.31	14				
3	24.4	3275	8.51	3.76	15				
4	24.2	3275	8.50	3.32	16				
5	24.2	3274	8.50	3.38	17				
6	24.2	3274	8.50	3.32	18				
7	24.2	3276	8.47	2.71	19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 9/20/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE03

Time on Station: 1305 Time off Station: 1310 Staff Initials: NJ/HK

Weather Conditions: Clear, Sunny Wind (mph & direction): 4-5 mph SW

Lat: On Long: On

Water Depth (m): 5.9m Secchi Depth (m):

Water Chemistry Sample?: Y / N
SAMPLE TIME:

Chl-a Sample?: Y / N
Surface volume filtered (ml):
Depth-Integrated volume filtered (ml):

Plankton Sample?: Y / N

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	25.8	8.80	3279	~~10.97~~	12	9.82 NJ			
1	25.3	3276	8.68	7.36	13				
2	24.7	3276	8.44	3.20	14				
3	24.4	3276	8.40	2.68	15				
4	24.4	3274	8.47	2.74	16				
5	24.3	3273	8.48	3.17	17				
~~6~~ 5.5	24.3	3273	8.49	3.07	18				
7					19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 9/20/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: Grand

Time on Station: 1000 Time off Station: 1005 Staff Initials: HK/NJ

Weather Conditions: partly cloudy Wind (mph & direction): 3-4 mph S

Lat: Long: On targ

Water Depth (m): 7.1 Secchi Depth (m): 0.3

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y [✓ N] Plankton Sample?: Y [✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	24.3	3274	8.58	4.42	12				
1	24.3	3274	8.56	4.11	13				
2	24.3	3274	8.56	4.07	14				
3	24.3	3274	8.54	3.71	15				
4	24.3	3275	8.54	3.59	16				
5	24.3	3275	8.53	3.48	17				
6	24.3	3275	8.52	3.26	18				
~~7~~ 6.5	~~23~~ 24.3	3275	8.51	3.07	19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 9/20/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: Lake View

Time on Station: 1011 Time off Station: 1016 Staff Initials: HK/NJ

Weather Conditions: Partly Cloudy Wind (mph & direction): 4 mph S

Lat: On target Long:

Water Depth (m): 7.9 Secchi Depth (m): 0.3

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	24.4	3273	8.65	6.43	12				
1	24.3	3273	8.59	5.24	13				
2	24.3	3274	8.53	3.70	14				
3	24.2	3274	8.53	3.63	15				
4	24.2	3274	8.52	3.54	16				
5	24.2	3275	8.51	3.33	17				
6	24.1	3276	8.49	2.91	18				
7	24.1	3276	8.49	2.83	19				
~~8~~ 7.5	24.1	3276	8.48	2.65	20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 10/10/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE01

Time on Station: 1000 Time off Station: 1003 Staff Initials: VJ/TD

Weather Conditions: Clear; Sunny Wind (mph & direction): 2-3mph SSE

Lat: on Long: on

Water Depth (m): 6.5m Secchi Depth (m): 0.3m

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME: ________

Surface volume filtered (ml): ________

Depth-Integrated volume filtered (ml): ________

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (μS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (μS/cm)	pH (units)	DO (mg/L)
0	22.5	3315	8.82	6.73	12				
1	22.7	3322	8.80	5.79	13				
2	22.6	3323	8.78	5.40	14				
3	22.6	3324	8.76	5.22	15				
4	22.6	3323	8.75	5.13	16				
5	22.6	3324	8.74	4.96	17				
6	22.5	3326	8.45	0.40	18				
7					19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore TNTP Offset Monitoring
2023-24

FIELD DATASHEET

Date: 10/10/23 Location: Lake Elsinore Station: LE02

Time on Station: 0755 Time off Station: 0935 Staff Initials: NJ/TD

Weather Conditions: fog Wind (mph & direction): 2-3mph SSE

Lat: on Long: on

Water Depth (m): 7.6m Secchi Depth (m): 0.3m

Water Chemistry Sample Times: **Chl-a Samples**? [✓ Y]/N **Algae Taxonomy Sample**? [✓ Y]/N 0810

Surface: 0810
Surface DUP: 0850
Depth Int: 0825
Depth Int. DUP: 0900
Bottom: 0830
Bottom DUP: 0910
Surface TMDL: 0920

Surface volume filtered (ml): 176
Surface DUP volume filtered *(ml)*: 185
Depth Int. volume filtered (ml): 189
Depth Int. DUP volume filtered (ml): 195
Surface TMDL: volume filtered (ml): 155

Do not exceed **7 PSI or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250mL filter volume).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)
0	22.9	3319	8.78	6.39	37.8	12.3
0.5	22.9	3321	8.79	6.42	43.7	13.4
1	22.9	3321	8.80	6.41	47.7	12.5
2	22.9	3322	8.79	6.30	51.4	13.0
3	22.9	3323	8.77	5.86	54.7	13.8
4	22.9	3324	8.74	4.75	57.8	12.4
5	22.1	3334	8.44	0.46	-14.1	11.3
6	21.9	3327	8.39	0.29	-165.2	11.3
7	21.9	3327	8.37	0.23	-182.7	11.6
8						
9						
10						
11						

FIELD DATASHEET

Date: 10/10/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE03

Time on Station: 0745 Time off Station: 0750 Staff Initials: NJ/TD

Weather Conditions: fog Wind (mph & direction): 2-3mph SSE

Lat: on Long: on

Water Depth (m): 5.8 Secchi Depth (m): 0.3m

Water Chemistry Sample?: Y / [✓ N]
SAMPLE TIME:

Chl-a Sample?: Y / [✓ N]
Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

Plankton Sample?: Y / [✓ N]

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	22.9	3321	8.78	6.08	12				
1	22.9	3321	8.77	6.04	13				
2	22.9	3322	8.75	5.98	14				
3	22.9	3322	8.74	5.78	15				
4	22.8	3324	8.71	4.90	16				
5	22.0	3327	8.36	0.41	17				
~~6~~ 5.5	22.0	3327	8.36	0.29	18				
7					19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 10/10/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE01

Time on Station: 1433 Time off Station: 1440 Staff Initials: NJ/TA

Weather Conditions: Clear, Sunny Wind (mph & direction): 5 mph S

Lat: on Long: on

Water Depth (m): 6.5m Secchi Depth (m):

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	23.1	3321	9.04	11.30	12				
1	22.8	3326	8.81	5.46	13				
2	22.7	3327	8.75	5.16	14				
3	22.7	3327	8.75	4.91	15				
4	22.6	3327	8.74	4.71	16				
5	22.6	3328	8.74	4.78	17				
6	22.4	3329	8.74	1.50	18				
7					19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 10/10/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE02

Time on Station: 1425 Time off Station: 1430 Staff Initials: NS/TD

Weather Conditions: clear; sunny Wind (mph & direction): 5 mph S

Lat: On Long: On

Water Depth (m): 7.6m Secchi Depth (m):

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	23.5	3323	9.08	12.25	**12**				
1	23.3	3322	8.89	7.11	**13**				
2	22.9	3324	8.84	5.53	**14**				
3	22.8	3325	8.78	5.02	**15**				
4	22.8	3325	8.77	4.81	**16**				
5	22.7	3325	8.75	4.69	**17**				
6	22.5	3330	8.45	0.33	**18**				
7	21.9	3330	8.40	0.27	**19**				
8					**20**				
9					**21**				
10					**22**				
11					**23**				

FIELD DATASHEET

Date: 10/10/23   Location (Circle): [✓ Lake Elsinore]/Canyon Lake   Station: LE03

Time on Station: 1415   Time off Station: 1420   Staff Initials: NJ/TD

Weather Conditions: Clear   Wind (mph & direction): 5mph S

Lat: on   Long: on

Water Depth (m): 5.8m   Secchi Depth (m): NA

Water Chemistry Sample?: Y / N   Chl-a Sample?: Y / N   Plankton Sample?: Y / N

SAMPLE TIME: ____

Surface volume filtered (ml): ____

Depth-Integrated volume filtered (ml): ____

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	25.3	3345	9.40	19.96	12				
1	23.0	3327	8.94	7.32	13				
2	22.8	3322	8.87	5.30	14				
3	22.7	3319	8.81	4.53	15				
4	22.5	3330	8.60	0.46	16				
5	22.0	3332	8.45	0.29	17				
6	22.0	3332	8.44	0.25	18				
7					19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 10/10/23 Location (Circle): [✓ Lake Elsinore] / Canyon Lake Station: Grand

Time on Station: 0940 Time off Station: 0945 Staff Initials: NJ/TP

Weather Conditions: Clear, Sunny Wind (mph & direction): 2-3mph SSE

Lat: On Long: On

Water Depth (m): 7.0m Secchi Depth (m): 0.3m

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y [✓ N] Plankton Sample?: Y [✓ N]

SAMPLE TIME: ____

Surface volume filtered (ml): ____

Depth-Integrated volume filtered (ml): ____

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	23.0	3316	8.88	7.82	12				
1	23.0	3321	8.87	7.75	13				
2	22.9	3322	8.80	6.21	14				
3	22.9	3322	8.79	5.58	15				
4	22.8	3324	8.74	2.21	16				
5	22.2	3327	8.48	0.29	17				
6	22.0	3326	8.46	0.24	18				
~~7~~ 6.5	21.9	3328	8.44	0.23	19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 10/10/23

Location (Circle): [✓ Lake Elsinore]/Canyon Lake

Station: Lakeshore

Time on Station: 0950

Time off Station: 0955

Staff Initials: NJ/TD

Weather Conditions: clear, sunny

Wind (mph & direction): 2-3mph SSE

Lat: On

Long: On

Water Depth (m): 7.8m

Secchi Depth (m): 0.3

Water Chemistry Sample?: Y/[✓ N]

SAMPLE TIME:

Chl-a Sample?: Y/[✓ N]

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI or 14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Plankton Sample?: Y/[✓ N]

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	23.2	3323	8.90	8.42	12				
1	23.1	3322	8.89	7.90	13				
2	23.0	3323	8.86	6.75	14				
3	23.0	3323	8.84	6.53	15				
4	22.9	3323	8.83	6.24	16				
5	22.9	3323	8.80	5.46	17				
6	22.4	3328	8.46	0.46	18				
7	21.8	3328	8.38	0.31	19				
~~8~~ 7.5	21.8	3329	8.36	0.27	20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 10/10/23 Location (Circle): Lake Elsinore/Canyon Lake Station: CL07

Time on Station: 1025 Time off Station: 1100 Staff Initials: HK/KB

Weather Conditions: Clear & sunny Wind (mph & direction): 0-1

Lat: Long: on target

Water Depth (m): 15.2 Secchi Depth (m): 2.1

Water Chemistry Sample?: Y / N Chl-a Sample?: [✓ Y] / N Plankton Sample?: Y / [✓ N]

SAMPLE TIME: 1040 Surface volume filtered (ml): 500

Surface : 1050 Depth-Integrated volume filtered (ml): 500

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	23.3	753	7.40	8.63	**12**	13.2	777	6.92	0.00
1	23.3	754	7.37	8.62	**13**	13.0	784	6.90	0.00
2	23.2	754	7.36	8.44	**14**	12.9	790	6.85	0.00
3	23.1	753	7.34	8.25	**15**	12.9	839	6.62	0.00
4	23.0	753	7.33	8.22	**16**				
5	23.0	757	7.19	3.80	**17**				
6	22.1	766	7.04	1.25	**18**				
7	21.0	767	6.98	0.00	**19**				
8	18.3	757	6.90	0.00	**20**				
9	15.0	767	6.93	0.00	**21**				
10	13.9	771	6.95	0.00	**22**				
11	13.4	773	6.94	0.00	**23**				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 10/10 Location (Circle): Lake Elsinore/Canyon Lake Station: CL08

Time on Station: 0950 Time off Station: 1020 Staff Initials: HK /KP

Weather Conditions: Clear and Sunny Wind (mph & direction): 0

Lat: Long: On target

Water Depth (m): 9.2 Secchi Depth (m): 2.4

Water Chemistry Sample?: Y / N
SAMPLE TIME: 1000
0-2m 1015

Chl-a Sample?: [✓ Y] / N
Surface volume filtered (ml): 500
Depth-Integrated volume filtered (ml): 500

Plankton Sample?: Y / [✓ N]

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	23.2	747	7.65	8.71	12				
1	23.3	747	7.59	8.71	13				
2	23.2	747	7.57	8.58	14				
3	23.2	747	7.55	8.52	15				
4	22.7	765	7.23	5.13	16				
5	22.4	752	7.18	2.67	17				
6	22.1	760	7.10	0.40	18				
7	21.0	757	6.99	0.00	19				
8	17.7	760	6.91	0.00	20				
9	15.2	783	6.89	0.00	21				
10					22				
11					23				

FIELD DATASHEET

Date: 10|10|23 Location (Circle): Lake Elsinore/Canyon Lake Station: CL 09

Time on Station: 0904 Time off Station: 0934 Staff Initials: HK/KS

Weather Conditions: clear & sunny Wind (mph & direction): 0-1

Lat: Long: on target

Water Depth (m): 7.7 Secchi Depth (m): 1.2

Water Chemistry Sample?: Y / N Chl-a Sample? [✓ Y] N Plankton Sample?: Y / N

SAMPLE TIME: ~~9~~ 0915

Surface volume filtered (ml): 500

Depth-Integrated volume filtered (ml): 450

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	23.0	890	7.88	9.87	12				
1	23.0	888	7.85	9.83	13				
2	23.0	889	7.83	9.69	14				
3	23.0	890	7.81	9.62	15				
4	22.4	886	7.44	0.40	16				
5	22.0	876	7.23	0.18	17				
6	20.7	938	6.81	0.06	18				
7	17.4	988	6.77	0.00	19				
7.5 ~~8~~	15.5	983	6.77	0.00	20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 10/10/2023 Location (Circle): Lake Elsinore/[✓ Canyon Lake] Station: CL 10

Time on Station: 0825 Time off Station: 0855 Staff Initials: HK / KB

Weather Conditions: Clear & Sunny Wind (mph & direction): 0-1mph

Lat: Long: on target

Water Depth (m): 3.4 Secchi Depth (m): 1.2

Water Chemistry Sample?: Y / N Chl-a Sample?: [✓ Y] / N Plankton Sample?: Y / [✓ N]

SAMPLE TIME: 0835 Surface volume filtered (ml): 500

Depth-Integrated volume filtered (ml): 500

0-2m CL-A: 0850

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	23.1	921	7.95	9.85	12				
1	23.3	922	7.95	9.75	13				
2	23.3	925	7.88	9.19	14				
3	22.8	917	7.59	2.84	15				
4					16				
5					17				
6					18				
7					19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 10/10/23 Location (Circle): Lake Elsinore/Canyon Lake Station: CL07

Time on Station: 1432 Time off Station: 1441 Staff Initials: HK/KB

Weather Conditions: Clear ; sunny Wind (mph & direction): 7 mph SW

Lat:

Long: on target

Water Depth (m): 14.2

Secchi Depth (m): 2.1

Water Chemistry Sample?: Y [✓ N]
SAMPLE TIME:

Chl-a Sample?: Y [✓ N]
Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

Plankton Sample?: Y / N

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	24.3	756	7.42	8.87	12	13.2	782	6.91	0.0
1	23.9	756	7.43	9.25	13	13.1	784	6.89	0.0
2	23.3	755	~~8~~7.40	8.71	14	13.1	789	6.64	0.0
3	23.2	754	7.38	8.68	15				
4	23.1	754	7.35	8.46	16				
5	22.6	762	7.16	4.72	17				
6	22.2	765	7.07	1.90	18				
7	20.1	766	6.96	0.10 ~~0.22~~	19				
8	18.4	755	6.90	0.02	20				
9	16.2	762	6.90	0.00	21				
10	14.5	768	6.92	0.0	22				
11	13.6	773	6.93	0.0	23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 10\10\23 Location (Circle): Lake Elsinore/Canyon Lake Station: CL 08

Time on Station: 1412 Time off Station: 1420 Staff Initials: HK|KB

Weather Conditions: Clear & Sunny Wind (mph & direction): 3-5 ~~NE~~ SW

Lat: Long: on target

Water Depth (m): 9.1 Secchi Depth (m): 1.5

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y [✓ N] Plankton Sample?: Y / N

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	24.5	749	7.69	9.07	12				
1	24.2	748	7.70	9.41	13				
2	23.4	749	7.65	9.11	14				
3	23.1	754	~~7.6~~ 7.46	8.72	15				
4	22.8	762	7.24	5.58	16				
5	22.5	752	7.15	3.34	17				
6	22.1	747	7.07	0.38	18				
7	21.6	746	7.01	0.05	19				
8	19.4	758	6.91	0.0	20				
9	15.6	777	6.88	0.0	21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 10\10\23 Location (Circle): Lake Elsinore/Canyon Lake Station: CL09

Time on Station: ~~1249~~ 1349 Time off Station: 1358 Staff Initials: HK|KB

Weather Conditions: Clear & sunny Wind (mph & direction): 3-5 ~~NE~~ SW

Lat: Long: on target

Water Depth (m): 7.7 Secchi Depth (m): 1.1

Water Chemistry Sample?: Y / N
SAMPLE TIME:

Chl-a Sample?: Y / [✓ N]
Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

Plankton Sample?: Y / [✓ N]

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	24.7	891	8.12	10.98	12				
1	23.6	890	8.14	11.53	13				
2	23.3	890	8.14	11.26	14				
3	23.0	890	~~7.89~~ 7.80	9.60	15				
4	22.6	895	~~7.31~~ 7.20	~~2.18~~ 1.84	16				
5	22.1	878	7.15	0.25	17				
6	20.6	921	6.79	0.05	18				
7	18.3	976	6.73	0.00	19				
~~8~~ 7.5	17.1	973	~~6.72~~ 6.73	0.00	20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 10\10\23 Location (Circle): Lake Elsinore/Canyon Lake Station: CL10

Time on Station: 1336 Time off Station: 1339 Staff Initials: HK/KB

Weather Conditions: Clear & sunny Wind (mph & direction): 3-5 ~~NE~~ SW

Lat: Long: on target

Water Depth (m): ~~3.5~~ 3.9 Secchi Depth (m): 1.2

Water Chemistry Sample?: Y / N Chl-a Sample?: Y [✓ N] Plankton Sample?: Y / N

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	24.3	930	8.05	11.26	12				
1	24.0	932	8.11	11.81	13				
2	23.3	912	7.94	10.35	14				
3	23.1	910	7.65	7.59	15				
4					16				
5					17				
6					18				
7					19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 12/4/23 Location: Lake Elsinore Station: LE02

Time on Station: 0820 Time off Station: 1002 Staff Initials: NJ/HK

Weather Conditions: partly Cloudy Wind (mph & direction): 2-3mph NE

Lat: on Long: on

Water Depth (m): 7.7 Secchi Depth (m): 0.2m

Water Chemistry Sample Times: **Chl-a Samples**? [✓ Y] N **Algae Taxonomy Sample**? [✓ Y] N → 0835

Surface: 0835
Surface DUP: 0915
Depth Int: 0845
Depth Int. DUP: 0920
Bottom: 0900
Bottom DUP: 0930
0-2m chl-A intgl: 0950

Surface volume filtered (ml): 210
Surface DUP volume filtered *(ml)*: 200
Depth Int. volume filtered (ml): 255
Depth Int. DUP volume filtered (ml): 225

Do not exceed **7 PSI or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250mL filter volume).

Comments: Volume: 250 mL

pre-recordings

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)
0	14.0	3328	8.76	9.90	108.0	26.54
0.5	14.0	3331	8.75	9.93	106.5	27.14
1	14.0	3331	8.74	9.91	105.7	27.70
2	14.0	3331	8.73	9.89	105.2	27.77
3	14.0	3331	8.74	9.96	104.8	27.80
4	~~14.0~~ 13.9 NJ	3332	8.66	8.25	105.7	26.50
5	13.9	3332	8.64	7.50	105.7	24.99
6	13.8	3337	8.63	7.63	105.9	25.93
7	13.8	3337	8.62	7.33	106.0	27.84
8						
9						
10						
11						

FIELD DATASHEET

Date: 12/4 Location: Lake Elsinore Station: LE02

Time on Station: 0820 Time off Station: 1002 Staff Initials: NJ/HK

Weather Conditions: partly cloudy Wind (mph & direction): 2-3 NE

Lat: on target Long:

Water Depth (m): 7.7 Secchi Depth (m): 0.2 m

Water Chemistry Sample Times: **Chl-a Samples**?: Y / N **Algae Taxonomy Sample**?: Y / N

Surface:
Surface DUP:
Depth Int:
Depth Int. DUP:
Bottom:
Bottom DUP:

Surface volume filtered (ml):
Surface DUP volume filtered *(ml):*
Depth Int. volume filtered (ml):
Depth Int. DUP volume filtered (ml):

Do not exceed **7 PSI or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250mL filter volume).

Comments: post readings

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)
0	14.6	3333	8.92	12.44	195.5	27.49
0.5	14.4	3334	8.87	11.78	194.3	28.18
1	14.1	3332	8.80	10.81	193.9	28.71
2	14.1	3332	8.79	10.14	194.0	25.56
3	14.1	3332	8.75	9.75	193.4	26.43
4	14.0	3333	8.72	9.43	192.6	27.54
5	13.9	3333	8.64	7.39	193.1	25.64
6	13.8	3335	8.63	7.35	192.1	27.24
7	13.8	3338	8.63	7.27	190.6	26.75
8						
9						
10						
11						

FIELD DATASHEET

Date: 12/4/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE03

Time on Station: 810 Time off Station: 815 Staff Initials: NS/HK

Weather Conditions: partly cloudy Wind (mph & direction): 2-3mph NE

Lat: on Long: on

Water Depth (m): 5.8m Secchi Depth (m): 0.2m

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME: ______

Surface volume filtered (ml): ______

Depth-Integrated volume filtered (ml): ______

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	14.1	3312	8.79	8.95	12				
1	14.1	3313	8.77	8.61	13				
2	14.1	3312	8.75	8.69	14				
3	14.1	3313	8.74	8.52	15				
4	14.0	3314	8.72	7.89	16				
5	14.0	3328	8.67	6.87	17				
~~6~~ 5.5	14.0	3330	8.64	6.73	18				
7					19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 12/4/23 Location (Circle): Lake Elsinore/Canyon Lake Station: LE01

Time on Station: 1031 Time off Station: 1040 Staff Initials: NJ/HK

Weather Conditions: partly cloudy Wind (mph & direction): 2-3 mph NE

Lat: on target Long: ____

Water Depth (m): 6.8 Secchi Depth (m): 0.2 m

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y [✓ N] Plankton Sample?: Y [✓ N]

SAMPLE TIME: ____

Surface volume filtered (ml): ____

Depth-Integrated volume filtered (ml): ____

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	15.1	3343	8.87	11.23	12				
1	14.1	3338	8.74	8.68	13				
2	13.9	3338	8.69	8.46	14				
3	13.9	3339	8.68	8.17	15				
4	13.9	3340	8.67	8.00	16				
5	13.8	3340	8.66	7.94	17				
6	13.8	3342	8.64	7.60	18				
7					19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 12/4 Location (Circle): Lake Elsinore/Canyon Lake Station: LE01

Time on Station: 1446 Time off Station: 1452 Staff Initials: NJ/HK

Weather Conditions: Clear; Sunny Wind (mph & direction): 2-3mph NE

Lat: On Long: On

Water Depth (m): 6.8 Secchi Depth (m):

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y [✓ N] Plankton Sample?: Y/[✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	16.2	3343	8.97	15.37	12				
1	14.3	3344	8.83	12.12	13				
2	14.1	3338	8.70	8.84	14				
3	14.0	3338	8.68	8.87	15				
4	13.9	3339	8.69	9.15	16				
5	13.9	3340	8.69	9.05	17				
6	13.8	3341	8.66	7.85	18				
7					19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 12/4 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE02

Time on Station: 1437 Time off Station: 1442 Staff Initials: NJ/HK

Weather Conditions: clear, sunny Wind (mph & direction): 2-3 MPH NE

Lat: on Long: on

Water Depth (m): 7.7 Secchi Depth (m): /

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y [✓ N]

SAMPLE TIME: /

Surface volume filtered (ml): /

Depth-Integrated volume filtered (ml): /

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	15.4	3330	9.08	17.23	12				
1	14.3	3331	8.77	10.04	13				
2	14.1	3327	8.75	9.70	14				
3	14.1	3328	8.76	10.04	15				
4	14.0	3331	8.73	7.88	16				
5	13.9	3334	8.66	7.35	17				
6	13.8	3336	8.65	7.21	18				
7	13.8	3339	8.64	6.97	19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 12/4/23 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE03

Time on Station: 1427 Time off Station: 1434 Staff Initials: NJ/HK

Weather Conditions: clear: sunny Wind (mph & direction): 2-3 mph NE

Lat: on Long: on

Water Depth (m): 5.8 Secchi Depth (m): /

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME: /

Surface volume filtered (ml): /

Depth-Integrated volume filtered (ml): /

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	15.4	3295	9.12	16.50	12				
1	14.3	3307	8.75	8.57	13				
2	14.0	3313	8.69	8.00	14				
3	14.0	3317	8.67	7.60	15				
4	14.0	3321	8.66	7.35	16				
5	14.0	3323	8.65	7.31	17				
~~6~~ 5.5	14.0	3323	8.65	7.31	18				
7					19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: ~~##~~ 12/4/23 Location (Circle): Lake Elsinore/Canyon Lake Station: Lake Shore

Time on Station: 1020 Time off Station: 1028 Staff Initials: MJ/HK

Weather Conditions: partly Cloudy Wind (mph & direction): 2-3 mph NE

Lat: On target Long:

Water Depth (m): 8.1 m Secchi Depth (m): 0.2 m

Water Chemistry Sample?: Y /[✓ N] Chl-a Sample?: Y /[✓ N] Plankton Sample?: Y /[✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	**Temp (°C)**	**Sp. Cond (µS/cm)**	**pH (units)**	**DO (mg/L)**	**Depth (m)**	**Temp (°C)**	**Sp. Cond (µS/cm)**	**pH (units)**	**DO (mg/L)**
0	14.4	3342	8.85	10.95	12				
1	14.1	3335	8.79	~~8~~9.81	13				
2	14.0	3334	8.73	9.28	14				
3	14.0	3334	8.71	9.14	15				
4	13.9	3334	8.71	9.13	16				
5	13.9	3334	8.70	8.89	17				
6	13.9	3338	8.66	7.56	18				
7	13.8	3342	8.62	7.15	19				
~~8~~ 7.5	13.8	3343	8.62	7.04	20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 12/4/23 Location (Circle): Lake Elsinore/Canyon Lake Station: Grand

Time on Station: 1008 Time off Station: 1016 Staff Initials: NJ/HK

Weather Conditions: Partly Cloudy Wind (mph & direction): 2-3 NE

Lat: on target Long:

Water Depth (m): 7.0 Secchi Depth (m): 0.2m

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y [✓ N] Plankton Sample?: Y [✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	14.3	3315	8.87	11.58	12				
1	14.1	3324	8.79	10.43	13				
2	14.1	3322	8.78	10.04	14				
3	14.0	3324	8.76	9.38	15				
4	13.9	3339	8.64	7.37	16				
5	13.9	3342	8.63	6.92	17				
6	13.9	3342	8.62	6.93	18				
~~7~~ 6.5	13.9	3343	8.62	6.68	19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 12/4/23 Location (Circle): Lake Elsinore/ [✓ Canyon Lake] Station: CL07

Time on Station: 1100 Time off Station: 1140 Staff Initials: JR/TD

Weather Conditions: Sunny, slight clouds Wind (mph & direction): 1 mph EW

Lat: on target Long: on target

Water Depth (m): 14.61 (measuring tape) Secchi Depth (m): 1.3

Water Chemistry Sample? [✓ Y] / N Chl-a Sample? [✓ Y] / N Plankton Sample?: Y / [✓ N]

SAMPLE TIME: 1130
depth intergrated

Surface: 1140

Surface volume filtered (ml): 265

Depth-Integrated volume filtered (ml): 250

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Strong sulfur smell AM Readings

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	15.3	817	7.40	2.76	**12**	14.8	819	7.29	1.46
1	15.2	818	7.40	2.75	**13**	14.7	821	7.30	1.47
2	14.9	818	7.38	2.36	**14**	14.7	828	7.14	0.12
3	14.9	817	7.36	1.99	**15**				
4	14.9	817	7.34	1.64	**16**				
5	14.9	817	7.30	0.43	**17**				
6	14.8	817	7.26	0.10	**18**				
7	14.8	817	7.25	0	**19**				
8	14.8	817	7.24	0	**20**				
9	14.8	818	7.25	0.49	**21**				
10	14.8	818	7.26	0.81	**22**				
11	14.8	818	7.27	1.08	**23**				

FIELD DATASHEET

Date: 12/4/23 Location (Circle): Lake Elsinore [✓ Canyon Lake] Station: CL08

Time on Station: 1015 Time off Station: 1055 Staff Initials: JR/TD

Weather Conditions: Sunny, slightly Cloudy Wind (mph & direction): 1 mph W

Lat: on target Long: on target

Water Depth (m): 7.49 (measuring tape) Secchi Depth (m): 1.1

Water Chemistry Sample?: [✓ Y] / N Chl-a Sample? [✓ Y] / N Plankton Sample?: Y / [✓ N]

SAMPLE TIME: 1040 Depth intergrated

Surface:

Surface volume filtered (ml): 500

Depth-Integrated volume filtered (ml): 250

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

AM1 Moving Readings

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	15.0	806	7.53	4.85	12				
1	14.9	806	7.52	4.85	13				
2	14.8	806	7.50	4.50	14				
3	14.8	807	7.47	4.18	15				
4	14.8	808	7.45	3.86	16				
5	14.8	809	7.43	3.66	17				
6	14.8	810	7.42	3.57	18				
7	14.8	810	7.42	3.48	19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 12/4/23 Location (Circle): Lake Elsinore/ [✓ Canyon Lake] Station: CL09

Time on Station: 0920 Time off Station: 1000 Staff Initials: JR/TD

Weather Conditions: Sunny, slight clouds Wind (mph & direction): 1 mph EW

Lat: on target Long: on target

Water Depth (m): 5.3 (measuring tape) Secchi Depth (m): 6.8

Water Chemistry Sample?: Y / N

SAMPLE TIME: 0945

Depth integrate

Surface: 0955

Chl-a Sample?: [✓ Y] / N

Surface volume filtered (ml): ~~[illegible]~~ 255

Depth-Integrated volume filtered (ml): 255

Plankton Sample?: Y / [✓ N]

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Pre-readings / AM morning

Strong sulfur smell

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	14.5	954	7.64	4.92	**12**				
1	14.4	953	7.61	4.77	**13**				
2	14.3	953	7.59	4.66	**14**				
3	14.2	955	7.60	4.81	**15**				
4	14.2	960	7.62	5.~~07~~13	**16**				
5	14.2	961	7.63	5.10	**17**				
6					**18**				
7					**19**				
8					**20**				
9					**21**				
10					**22**				
11					**23**				

FIELD DATASHEET

Date: 12/4/2023 Location (Circle): Lake Elsinore/ [✓ Canyon Lake] Station: CL10

Time on Station: 0825 Time off Station: 0915 Staff Initials: JR/TD

Weather Conditions: Sunny, slight clouds Wind (mph & direction): 1mph ~~E~~W

Lat: on target Long: on target

Water Depth (m): 4.2 Secchi Depth (m): 0.9

Water Chemistry Sample?: [✓ Y] / N
SAMPLE TIME: 0855
Depth intergrated ↑

surface : 0905

Chl-a Sample?: [✓ Y] / N Plankton Sample?: Y [✓ N]
Surface volume filtered (ml): 250
Depth-Integrated volume filtered (ml): 250

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Pre-readings/morning

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	14.3	975	7.98	8.13	12				
1	14.3	975	7.95	7.98	13				
2	14.2	977	7.93	7.82	14				
3	14.2	976	7.94	7.88	15				
3.5 ~~4~~ *	14.2	1034	8.15	8.78	16				
5					17				
6					18				
7					19				
8					20				
9					21				
10					22				
11					23				

*Sediment distrubed at bottom reading

FIELD DATASHEET

Date: 12/4/23 Location (Circle): Lake Elsinore/[✓ Canyon Lake] Station: CL10

Time on Station: 1353 Time off Station: 1358 Staff Initials: JR/TD

Weather Conditions: Sunny w/ less clouds Wind (mph & direction): 5 mph N

Lat: on target Long: on target

Water Depth (m): 3.7 Secchi Depth (m): NA

~~Water Chemistry Sample?: Y / N~~ ~~Chl-a Sample?: Y / N~~ ~~Plankton Sample?: Y / N~~

~~SAMPLE TIME: ______~~ ~~Surface volume filtered (ml): ______~~

~~Depth-Integrated volume filtered (ml): ______~~

~~*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).~~

Comments:

PM Readings

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	16.8	979	8.23	9.97	12				
1	15.1	972	8.28	9.74	13				
2	14.3	969	8.07	8.53	14				
3	14.2	994	8.26	9.53	15				
3.5 ~~4~~	14.3	1006	8.29	9.57	16				
5					17				
6					18				
7					19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2022-23

FIELD DATASHEET

Date: 12/4/23 Location (Circle): Lake Elsinore/[✓ Canyon Lake] Station: CL09

Time on Station: 1405 Time off Station: 1410 Staff Initials: JR/TD

Weather Conditions: Sunny Wind (mph & direction): 5 mph NNW

Lat: on target Long: on target !

Water Depth (m): 6.8 (Garmin) Secchi Depth (m): NA

~~Water Chemistry Sample?: Y / N Chl-a Sample?: Y / N Plankton Sample?: Y / N~~

~~SAMPLE TIME: Surface volume filtered (ml):~~

~~Depth-Integrated volume filtered (ml):~~

~~*Do not exceed 7 PSI or 14 in. Hg when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).~~

Comments:

PM Readings

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	15.5	9,65	7.69	5.77	12				
1	14.8	9,50	7.68	5.63	13				
2	14.3	9,51	7.61	4.65	14				
3	14.3	9,55	7.58	4.69	15				
4	14.3	9,64	7.67	5.69	16				
5	14.3	9,64	7.68	5.66	17				
6					18				
7					19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2022-23

FIELD DATASHEET

Date: 12/4/23 Location (Circle): Lake Elsinore/[✓ Canyon Lake] Station: CL08

Time on Station: 1420 Time off Station: 1428 Staff Initials: JR/TM

Weather Conditions: Sunny w/ less clouds Wind (mph & direction): 5 mph NNW

Lat: On target Long: on target

Water Depth (m): 8.9 (Garmin) Secchi Depth (m): NA

~~Water Chemistry Sample?: Y / N~~ ~~Chl-a Sample?: Y / N~~ ~~Plankton Sample?: Y / N~~

~~SAMPLE TIME:~~ ~~Surface volume filtered (ml):~~

~~Depth-Integrated volume filtered (ml):~~

~~*Do not exceed **7 PSI or 14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).~~

Comments:

PM Readings

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	16.1	8,07	7.73	7.30	12				
1	15.3	8,05	7.74	7.43	13				
2	15.0	8,08	7.66	5.95	14				
3	14.8	8,06	7.52	4.68	15				
4	14.8	8,06	7.45	4.21	16				
5	14.8	808	7.42	3.90	17				
6	14.8	809	7.40	3.62	18				
7	14.8	810	7.38	3.35	19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 12/4/23 Location (Circle): Lake Elsinore/[✓ Canyon Lake] Station: CL07

Time on Station: 1433 Time off Station: 1446 Staff Initials: JR/TO

Weather Conditions: Sunny w/ less clouds Wind (mph & direction): 5 NNE

Lat: On target Long: on target

Water Depth (m): 15.4 (Garmin) Secchi Depth (m): NA

~~Water Chemistry Sample?: Y / N Chl-a Sample?: Y / N Plankton Sample?: Y / N~~

~~SAMPLE TIME: _____ Surface volume filtered (ml): _____~~

~~Depth Integrated volume filtered (ml): _____~~

~~*Do not exceed 7 PSI or 14 in. Hg when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).~~

Comments:

PM Readings

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	15.8	817	7.48	4.28	12	14.8	818	7.25	0.94
1	15.2	818	7.42	3.28	13	14.7	827	7.24	0.77
2	15.0	817	7.37	2.53	14	14.6	831	7.14	0.03
3	14.9	816	7.31	1.47	15				
4	14.9	816	7.24	0.12	16				
5	14.8	816	7.22	0.04	17				
6	14.8	816	7.22	0.44	18				
7	14.8	816	7.24	1.04	19				
8	14.8	818	7.27	1.84	20				
9	14.8	816	7.28	1.88	21				
10	14.8	817	7.27	1.53	22				
11	14.8	816	7.26	1.43	23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 2/27/24 Location (Circle): Lake Elsinore/Canyon Lake Station: LE01

Time on Station: 1010 Time off Station: 1015 Staff Initials: NJ/RV

Weather Conditions: partly cloudy Wind (mph & direction): 2-3mph SE

Lat: on Long: on

Water Depth (m): 8.4 Secchi Depth (m): 0.8m

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME: __________

Surface volume filtered (ml): __________

Depth-Integrated volume filtered (ml): __________

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	15.0	2559	8.62	11.45	12				
1	14.5	2562	8.62	11.47	13				
2	14.4	2574	8.55	10.04	14				
3	13.6	2689	8.16	5.34	15				
4	13.3	2702	8.01	3.84	16				
5	13.1	2705	7.95	3.02	17				
6	13.0	2727	7.87	1.16	18				
7	12.7	2742	7.81	0.37	19				
8	12.7	2744	7.81	0.31	20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 2/27/24 Location: Lake Elsinore Station: LE02

Time on Station: 0800 Time off Station: 0930 Staff Initials: NJ/RV

Weather Conditions: Cloudy Wind (mph & direction): 1 mph SE

Lat: 0n Long: 0n

Water Depth (m): 9.5 Secchi Depth (m): 0.8 m

Water Chemistry Sample Times: **Chl-a Samples?** [✓ Y] / N **Algae Taxonomy Sample?** [✓ Y] / N 0820

Surface: 0820
Surface DUP: 0855
Depth Int: 0830
Depth Int. DUP: 0855
Bottom: 0840
Bottom DUP: 0910
Surface TMDL: 0915

Surface volume filtered (ml): 500 mL
Surface DUP volume filtered *(ml)*: 500 mL
Depth Int. volume filtered (ml): 500 mL
Depth Int. DUP volume filtered (ml): 500
Surface TMDL: volume filtered (ml): 500

Do not exceed **7 PSI or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250mL filter volume).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)
0	14.5	2516	8.55	10.52	81.5	6.67
0.5	14.6	2515	8.54	10.56	84.9	6.77
1	14.6	2517	8.53	10.52	86.5	6.72
2	14.6	2532	8.50	9.54	89.7	7.32
3	13.7	2649	8.13	5.32	95.7	4.23
4	13.4	2705	8.01	3.84	98.2	3.18
5	13.2	2680	8.05	4.31	98.5	4.20
6	13.1	2712	7.90	2.26	100.7	2.75
7	12.8	2739	7.79	0.68	97.4	7.29
8	12.6	2752	7.78	0.36	-109.8 NS ~~10[illegible].8~~	10.34
9	12.6	2751	7.78	0.25	-153.2	9.96
10						
11						

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 2/27/24 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE03

Time on Station: 0745 Time off Station: ______ Staff Initials: NJ/RV

Weather Conditions: Cloudy Wind (mph & direction): 0755

Lat: on Long: on

Water Depth (m): 7.8 Secchi Depth (m): 0.8m

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

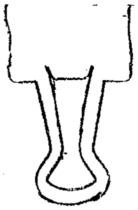
SAMPLE TIME: ______ Surface volume filtered (ml): ______

Depth-Integrated volume filtered (ml): ______

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	14.7	2509	8.53	9.96	12				
1	14.7	2509	8.51	9.93	13				
2	14.7	2511	8.49	9.77	14				
3	14.3	2584	8.29	7.04	15				
4	13.4	2665	8.11	5.04	16				
5	13.2	2703	7.93	2.33	17				
6	13.1	2718	7.84	1.47	18				
7	12.9	2736	7.81	0.32	19				
~~8~~ 7.5	12.9	2732	7.77	0.28	20				
9					21				
10					22				
11					23				



FIELD DATASHEET

Date: 2/27/24 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE01

Time on Station: 1510 Time off Station: 1515 Staff Initials: NJ/RV

Weather Conditions: partly cloudy Wind (mph & direction): 3-4 mph W

Lat: on Long: on

Water Depth (m): 8.4m Secchi Depth (m): 0.8m

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME: ____

Surface volume filtered (ml): ____

Depth-Integrated volume filtered (ml): ____

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	15.2	2552	8.67	11.72	12				
1	15.2	2553	8.66	11.79	13				
2	14.8	2555	8.61	11.23	14				
3	13.9	2652	8.31	6.58	15				
4	13.5	2705	8.07	4.33	16				
5	13.3	2703	8.03	3.63	17				
6	13.2	2703	8.01	3.40	18				
7	13.1	2707	7.94	2.56	19				
8	12.8	2738	7.84	0.57	20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 2/27/24 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE02

Time on Station: 1500 Time off Station: 1505 Staff Initials: NJ/RV

Weather Conditions: partly cloudy Wind (mph & direction): 3-4 mph W

Lat: On Long: On

Water Depth (m): 9.5 m Secchi Depth (m): 0.8 m

Water Chemistry Sample?: Y/[✓ N] Chl-a Sample?: Y/[✓ N] Plankton Sample?: Y/[✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	15.2	2532	8.66	10.99	12				
1	15.2	2534	8.63	11.22	13				
2	14.8	2545	8.53	10.11	14				
3	13.7	2675	8.19	5.16	15				
4	13.4	2703	8.05	3.45	16				
5	13.2	2711	7.97	2.89	17				
6	13.0	2718	7.92	1.52	18				
7	12.7	2741	7.84	0.73	19				
8	12.6	2748	7.82	0.40	20				
9	12.6	2748	7.81	0.34	21				
10					22				
11					23				

FIELD DATASHEET

Date: 2/27/24 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE03

Time on Station: 1450 Time off Station: 1455 Staff Initials: NS/RV

Weather Conditions: partly cloudy Wind (mph & direction): 3-4mph W

Lat: UA Long: UA

Water Depth (m): 7.8m Secchi Depth (m): 0.8m

Water Chemistry Sample?: Y/[✓ N] Chl-a Sample?: Y/[✓ N] Plankton Sample?: Y/[✓ N]

SAMPLE TIME: ________

Surface volume filtered (ml): ________

Depth-Integrated volume filtered (ml): ________

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	15.5	2502	8.65	11.02	12				
1	15.5	2501	8.64	10.94	13				
2	14.7	2502	8.55	9.54	14				
3	13.5	2656	8.23	4.94	15				
4	13.3	2681	8.05	3.65	16				
5	13.1	2720	7.93	1.96	17				
6	12.9	2732	7.85	0.48	18				
7	12.8	2736	7.88	0.32	19				
~~8~~ 7.5	12.8	2735	7.87	0.31	20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 2/27/24 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LakeShore

Time on Station: 0950 Time off Station: 1000 Staff Initials: NJ / RV

Weather Conditions: Cloudy Wind (mph & direction): 2-3 mpH SE

Lat: ON Long: ON

Water Depth (m): 10 m Secchi Depth (m): 0.8m

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME: ____________

Surface volume filtered (ml): ____________

Depth-Integrated volume filtered (ml): ____________

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	14.8	2524	8.58	10.76	12				
1	14.7	2528	8.57	10.66	13				
2	14.5	2534	8.54	10.40	14				
3	14.4	2557	8.45	8.98	15				
4	14.1	2677	8.14	5.33	16				
5	13.4	2688	8.08	4.52	17				
6	13.1	2706	7.87	1.76	18				
7	13.0	2742	7.84	1.43	19				
8	12.6	2746	7.80	0.38	20				
9	12.6	2750	7.79	0.33	21				
ev ~~10~~ 9.5	12.6	2750	7.78	0.27	22				
11					23				

FIELD DATASHEET

Date: 2 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: Grand

Time on Station: 0935 Time off Station: 0945 Staff Initials: NJ / RV

Weather Conditions: Partly cloudy Wind (mph & direction): 2-3 mpH SE

Lat: ON Long: ON

Water Depth (m): 9.0 m Secchi Depth (m): 0.8 m

Water Chemistry Sample?: Y / [✓ N]
SAMPLE TIME: ________

Chl-a Sample?: Y / [✓ N]
Surface volume filtered (ml): ________

Depth-Integrated volume filtered (ml): ________

Plankton Sample?: Y / [✓ N]

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	14.9	2520	8.57	10.64	12				
1	14.7	2528	8.56	10.60	13				
2	14.4	2552	8.46	9.37	14				
3	13.8	2660	8.20	6.27	15				
4	13.4	2677	8.10	4.54	16				
5	13.2	2673	8.07	4.38	17				
6	13.1	2704	7.91	2.08	18				
7	12.8	2741	7.83	0.64	19				
8	12.7	2750	7.80	0.39	20				
~~9~~ 8.5	12.7	2750	7.81	0.33	21				
10					22				
11					23				

FIELD DATASHEET

Date: 2/27/24 Location (Circle): Lake Elsinore/[✓ Canyon Lake] Station: CL07

Time on Station: 1125 Time off Station: 1225 Staff Initials: HK/TD

Weather Conditions: 90% cloud coverage Wind (mph & direction):

Lat: on target Long: on target

Water Depth (m): 14.4 Secchi Depth (m): 0.5

Water Chemistry Sample?: [✓ Y] N
SAMPLE TIME: 1150

Surface intergrated: 1205

Chl-a Sample? [✓ Y] N
Surface volume filtered (ml): 500

Depth-Integrated volume filtered (ml): 500

Plankton Sample?: Y [✓ N]

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Pre Reading

Depth (m)	**Temp (°C)**	**Sp. Cond (µS/cm)**	**pH (units)**	**DO (mg/L)**	**Depth (m)**	**Temp (°C)**	**Sp. Cond (µS/cm)**	**pH (units)**	**DO (mg/L)**
0	14.4	416	9.14	14.0	12	11.5	541	7.15	1.2
1	14.0	421	8.97	12.5	13	11.5	543	7.14	0.8
2	13.2	432	8.19	8.0	14	11.5	549	7.08	0.6
3	12.6	429	7.68	5.5	15				
4	12.3	439	7.47	4.3	16				
5	12.1	450	7.40	4.0	17				
6	11.9	458	7.33	3.7	18				
7	11.8	483	7.31	3.1	19				
8	11.6	503	7.26	2.7	20				
9	11.6	512	7.23	2.5	21				
10	11.5	530	7.20	1.9	22				
11	11.5	536	7.18	1.6	23				

FIELD DATASHEET

Date: 2/27/24 Location (Circle): Lake Elsinore/[✓ Canyon Lake] Station: CL08

Time on Station: 1030 Time off Station: 1120 Staff Initials: HK/TD

Weather Conditions: 60% cloud coverage Wind (mph & direction): 2 mph S

Lat: On target Long: On target

Water Depth (m): 9.5 Secchi Depth (m): 0.7

Water Chemistry Sample?: [✓ Y] N Chl-a Sample? [✓ Y] N Plankton Sample?: Y/[✓ N]

SAMPLE TIME: 1050 Surface volume filtered (ml): 355

Depth-Integrated volume filtered (ml): 500mL

Surface intergrated: 1105

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Pre Readings

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	14.0	403	9.02	13.1	12				
1	13.4	416	8.16	9.0	13				
2	13.2	422	7.89	7.5	14				
3	13.0	411	7.70	5.8	15				
4	12.4	407	7.55	4.7	16				
5	12.3	443	7.45	4.2	17				
6	11.8	467	7.34	3.3	18				
7	11.6	480	7.29	3.0	19				
8	11.5	507	7.25	2.3	20				
9	11.5	529	7.20	1.2	21				
10					22				
11					23				

FIELD DATASHEET

Date: 2/27/24 Location (Circle): Lake Elsinore/[✓ Canyon Lake] Station: CL09

Time on Station: 0930 Time off Station: 1015 Staff Initials: HK/TD

Weather Conditions: 100% Cloud coverage Wind (mph & direction): ~~[illegible]~~

Lat: On target Long: on target

Water Depth (m): 6.7 Secchi Depth (m): 0.65

Water Chemistry Sample?: [✓ Y]/ N Chl-a Sample?: [✓ Y]/ N Plankton Sample?: Y /[✓ N]

SAMPLE TIME: 0950 Surface volume filtered (ml): ~~500~~ 500

Depth-Integrated volume filtered (ml): 500

surface intergrated: 1000

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Pre Reading

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	14.4	603	8.78	13.0	12				
1	14.4	604	8.73	12.7	13				
2	14.0	647	7.91	7.4	14				
3	13.2	840	7.45	3.1	15				
4	12.8	911	7.28	1.1	16				
5	12.4	883	7.22	0.6	17				
6	11.9	855	7.18	0.2	18				
~~7~~ 6.5	11.7	852	7.14	0.06	19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 2/27/24 Location (Circle): Lake Elsinore/ [✓ Canyon Lake] Station: CL10

Time on Station: 0820 Time off Station: 0920 Staff Initials: HK/TD

Weather Conditions: 80% cloud coverage Wind (mph & direction): 2mph S

Lat: on target Long: on target

Water Depth (m): 4.1 Secchi Depth (m): 0.65

Water Chemistry Sample?: [✓ Y] N
SAMPLE TIME: 0920

surface intergrated = 0855

Chl-a Sample?: [✓ Y] N Plankton Sample?: Y [✓ N]
Surface volume filtered (ml): ~~500~~ HK 475 HK
Depth-Integrated volume filtered (ml): ~~475~~ HK 500 HK

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Pre Readings

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	14.6	650	8.61	12.6	12				
1	14.6	651	8.61	12.5	13				
2	14.6	768	8.14	9.6	14				
3	13.7	926	7.~~64~~33	2.6	15				
~~4~~ 3.5	13.3	988	7.23	1.2	16				
5					17				
6					18				
7					19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 2/27/24 Location (Circle): Lake Elsinore/[✓ Canyon Lake] Station: CL07

Time on Station: 1352 Time off Station: 1400 Staff Initials: HK HD

Weather Conditions: Partly Cloudy Wind (mph & direction): 5 mph SW

Lat: Long: On target

Water Depth (m): 15.2 Secchi Depth (m): 0.5

Water Chemistry Sample?: Y/[✓ N] Chl-a Sample?: Y/[✓ N] Plankton Sample?: Y/[✓ N]

SAMPLE TIME: ___________

Surface volume filtered (ml):___________

Depth-Integrated volume filtered (ml):___________

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Afternoon

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	15.8	414	9.44	16.0	12	11.5	539	7.20	1.4
1	14.0	421	9.16	14.3	13	11.5	544	7.17	0.8
2	13.4	420	8.13	8.4	14	11.5	551	7.15	0.9
3	12.6	429	7.64	5.4	14.5 ~~15~~	11.5	556	7.14	0.5
4	12.3	433	7.50	4.5	16				
5	12.1	442	7.40	4.2	17				
6	12.0	455	7.33	3.8	18				
7	11.8	481	7.31	3.2	19				
8	11.7	498	7.28	2.6	20				
9	11.6	508	7.26	2.5	21				
10	11.6	518	7.25	2.2	22				
11	11.5	528	7.23	2.0	23				

FIELD DATASHEET

Date: 2/27/2024 Location (Circle): Lake Elsinore/Canyon Lake Station: CL 0~~8~~ ~~7~~ 8

Time on Station: 1410 Time off Station: 1419 Staff Initials: HK/TD

Weather Conditions: Cloudy Wind (mph & direction): 5mph SW

Lat: Long: on target

Water Depth (m): 9.5 Secchi Depth (m): 0.7

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y [✓ N] Plankton Sample?: Y [✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Afternoon

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	14.9	398	9.42	16.3	12				
1	13.8	396	8.85	12.6	13				
2	13.7	374	8.12	9.1	14				
3	12.5	399	7.46	5.6	15				
4	12.2	426	7.47	4.2	16				
5	11.9	452	7.35	3.9	17				
6	11.8	475	7.29	3.3	18				
7	11.5	505	7.23	2.4	19				
8	11.5	504	7.21	1.9	20				
9	11.5	523	7.19	1.6	21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 2/27/2024 Location (Circle): Lake Elsinore/Canyon Lake Station: HK

Time on Station: 1455 Time off Station: 1500 Staff Initials: CL 09

Weather Conditions: partly sunny Wind (mph & direction): 5 mph SW

Lat: ______ Long: on target

Water Depth (m): 8.0 Secchi Depth (m): 0.65

Water Chemistry Sample?: Y [✓ N]
SAMPLE TIME: ______

Chl-a Sample?: Y [✓ N]
Surface volume filtered (ml): ______

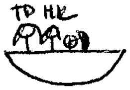
Depth-Integrated volume filtered (ml): ______

Plankton Sample?: Y [✓ N]

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Afternoon Readings



Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	16.4	622	9.24	15.8	12				
1	14.9	598	9.20	15.7	13				
2	14.2	613	8.35	10.3	14				
3	13.4	801	7.66	4.3	15				
4	12.9	915	7.42	1.7	16				
5	12.0	865	7.32	0.7	17				
6	11.8	853	7.28	0.3	18				
7	11.7	853	7.24	0.1	19				
7.5 ~~8~~	11.7	894	7.18	0.07	20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 2/27/2024 Location (Circle): Lake Elsinore/Canyon Lake Station: CL 10

Time on Station: 1443 Time off Station: 1447 Staff Initials: HK/TD

Weather Conditions: partly cloudy Wind (mph & direction): 5 SW

Lat:

Long: on target

Water Depth (m): 3.9

Secchi Depth (m): 0.65

Water Chemistry Sample?: Y [✓ N]
SAMPLE TIME:

Chl-a Sample?: Y [✓ N]
Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

Plankton Sample?: Y [✓ N]

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Afternoon

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	~~17.6~~ 16.8	~~486~~ 655	~~7.26~~ 9.07	~~3.80~~ 16.0	12				
1	~~16.8~~ 15.3	651	9.05	15.0	13				
2	14.4	695	7.93	8.8	14				
3	13.9	989	7.47	2.5	15				
3.5 ~~4~~	13.2	987	7.36	1.2	16				
5					17				
6					18				
7					19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 4/17/24 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE01

Time on Station: 1502 Time off Station: 1510 Staff Initials: NJ/KP

Weather Conditions: clear; breezy Wind (mph & direction): 6-8 mph SW

Lat: NA Long: NA

Water Depth (m): 8.6 m Secchi Depth (m):

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	20.7	2482	8.79	14.25	12				
1	19.0	2484	8.86	15.34	13				
2	18.5	2475	8.84	15.23	14				
3	18.1	2478	8.73	13.40	15				
4	17.9	2475	8.70	12.73	16				
5	17.7	2477	8.57	10.70	17				
6	17.2	2477	8.42	8.92	18				
7	17.1	2477	8.39	8.45	19				
8	16.9	2477	8.30	7.39	20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 4/17/24 Location: Lake Elsinore Station: LE02

Time on Station: 0815 Time off Station: 1020 Staff Initials: N/KP

Weather Conditions: Clear, Sunny Wind (mph & direction): 1-2mph N

Lat: on Long: on

Water Depth (m): 10.1m Secchi Depth (m): 1.70m

Water Chemistry Sample Times: **Chl-a Samples**? [✓ Y] N **Algae Taxonomy Sample**? [✓ Y] N 0845

Surface: 0845
Surface DUP: 0920
Depth Int: 0855
Depth Int. DUP: 0935
Bottom: 0905
Bottom DUP: 0940
Surface TMDL: 1010

Surface volume filtered (ml): 500
Surface DUP volume filtered *(ml)*: 500
Depth Int. volume filtered (ml): 500
Depth Int. DUP volume filtered (ml): 500
Surface TMDL: volume filtered (ml): 500

Do not exceed **7 PSI or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250mL filter volume).

Comments: pre readings

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)
0	18.4	2477	8.76	12.93	88.1	-2.54
0.5	18.4	2477	8.74	12.93	91.1	-2.63
1	18.4	2476	8.73	12.90	93.7	-2.65
2	18.1	2476	8.62	11.53	98.4	-2.95
3	17.8	2478	8.55	10.59	101.7	-3.64
4	17.7	2479	8.53	10.13	104.2	-3.54
5	17.6	2478	8.50	9.71	106.5	-3.29
6	17.5	2478	8.50	9.77	107.7	-3.55
7	17.1	2477	8.37	8.16	112.2	-3.54
8	16.4	2485	8.01	4.13	117.6	-3.46
9	16.2	2487	7.93	3.15	105.6	-3.20
~~10~~ 9.5	16.2	2488	7.93	3.08	99.1	-3.53
11						

FIELD DATASHEET

Date: 4/17/24 Location: Lake Elsinore Station: LE02

Time on Station: 0815 Time off Station: 1020 Staff Initials: NJ/KP

Weather Conditions: Clear; sunny Wind (mph & direction): 1-2 mph N

Lat: on Long: on

Water Depth (m): 10.1 Secchi Depth (m): 1.70

Water Chemistry Sample Times: **Chl-a Samples**?: Y [✓ N] **Algae Taxonomy Sample**?: Y [✓ N]

Surface: ______
Surface DUP: ______
Depth Int: ______
Depth Int. DUP: ______
Bottom: ______
Bottom DUP: ______
Surface TMDL: ______

Surface volume filtered (ml): ______
Surface DUP volume filtered *(ml):* ______
Depth Int. volume filtered (ml): ______
Depth Int. DUP volume filtered (ml): ______
Surface TMDL: volume filtered (ml): ______
Do not exceed **7 PSI or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250mL filter volume).

Comments: post readings

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)
0	19.1	2475	8.82	13.82	90.8	-3.21
0.5	18.8	2478	8.86	13.78	95.1	-1.86
1	18.4	2477	8.85	13.46	99.0	-2.42
2	18.0	2478	8.70	11.22	106.7	-3.35
3	17.9	2478	8.66	10.66	109.3	-3.31
4	17.8	2478	8.63	10.45	112.1	-3.31
5	17.7	2478	8.60	10.17	115.2	-3.40
6	17.5	2479	8.58	9.88	118.2	-3.60
7	17.1	2484	8.33	7.34	124.4	-3.81
8	16.6	2485	8.16	4.42	127.8	-3.12
9	16.3	2488	8.03	3.26	127.7	-3.54
9.5 ~~10~~	16.3	2488	7.99	3.12	125.6	-3.16
11						

FIELD DATASHEET

Date: 4/7/24 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE03

Time on Station: 0750 Time off Station: 0810 Staff Initials: NJ/KP

Weather Conditions: Clear; Sunny Wind (mph & direction): 1-2mph N

Lat: on Long: on

Water Depth (m): 8.1 Secchi Depth (m): 1.65m

Water Chemistry Sample?: Y [✓ N]
SAMPLE TIME: ____

Chl-a Sample?: Y [✓ N]
Surface volume filtered (ml): ____

Depth-Integrated volume filtered (ml): ____

Plankton Sample?: Y [✓ N]

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	18.2	2478	8.68	12.51	12				
1	18.0	2475	8.61	11.71	13				
2	17.9	2475	8.59	11.32	14				
3	17.8	2475	8.55	10.85	15				
4	17.6	2476	8.49	10.18	16				
5	17.1	2479	8.35	8.49	17				
6	16.9	2480	8.24	7.45	18				
7	16.6	2486	7.99	4.29	19				
~~8~~ 7.5	16.5	2489	7.95	3.73	20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 4/17/24 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: Grand Avenue

Time on Station: 1025 Time off Station: 1035 Staff Initials: NJ/KP

Weather Conditions: clear, sunny Wind (mph & direction): 1-2mph N

Lat: on Long: on

Water Depth (m): 9.5 Secchi Depth (m): N/A

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME: N/A

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	19.1	2478	8.84	13.53	12				
1	18.6	2479	8.81	12.97	13				
2	18.2	2479	8.73	11.16	14				
3	17.8	2477	8.63	10.62	15				
4	17.7	2478	8.58	10.27	16				
5	17.5	2479	8.53	9.68	17				
6	17.3	2478	8.50	9.36	18				
7	17.0	2479	8.33	7.52	19				
8	16.5	2485	8.08	4.53	20				
9	16.4	2488	8.01	3.71	21				
10					22				
11					23				

FIELD DATASHEET

Date: 4/17/24 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: Lakeshore

Time on Station: 1040 Time off Station: 1050 Staff Initials: NJ/KP

Weather Conditions: clear; sunny Wind (mph & direction): 1-2 mph N

Lat: on Long: on

Water Depth (m): 10.5 Secchi Depth (m): N/A

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y [✓ N] Plankton Sample?: Y [✓ N]

SAMPLE TIME: ____

Surface volume filtered (ml): ____

Depth-Integrated volume filtered (ml): ____

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	19.5	2477	8.82	13.42	12				
1	18.9	2477	8.84	14.07	13				
2	18.6	2479	8.84	13.97	14				
3	18.4	2477	8.77	13.06	15				
4	18.2	2477	8.68	11.81	16				
5	17.6	2478	8.58	10.28	17				
6	17.5	2477	8.53	9.83	18				
7	17.0	2480	8.33	6.98	19				
8	16.5	2484	8.08	4.49	20				
9	16.3	2487	7.97	3.33	21				
10	16.2	2487	7.95	3.15	22				
~~11~~					23				

FIELD DATASHEET

Date: 4/17/24 Location (Circle): [✓ Lake Elsinore] / Canyon Lake Station: LE-01

Time on Station: 1055 Time off Station: 1105 Staff Initials: NJ/KP

Weather Conditions: clear, sunny Wind (mph & direction): 1-2 mph N

Lat: on Long: on

Water Depth (m): 8.9 Secchi Depth (m): 1.52

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	19.3	2477	8.76	12.87	12				
1	19.1	2480	8.76	12.98	13				
2	18.3	2477	8.77	13.33	14				
3	18.0	2477	8.71	12.46	15				
4	18.0	2477	8.70	12.20	16				
5	17.9	2476	8.64	11.43	17				
6	17.1	2476	8.44	8.72	18				
7	17.0	2477	8.38	8.21	19				
8	16.9	2477	8.28	7.03	20				
8.5 ~~9~~	16.4	2486	8.02	3.51	21				
10					22				
11					23				

FIELD DATASHEET

Date: 4/17/24 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE02

Time on Station: 1450 Time off Station: 1457 Staff Initials: NJ/KP

Weather Conditions: Clear : breezy Wind (mph & direction): 6-8mph SW

Lat: on Long: on

Water Depth (m): 10.0 Secchi Depth (m):

Water Chemistry Sample?: Y/ [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y/ [✓ N]

SAMPLE TIME: ____ Surface volume filtered (ml): ____

Depth-Integrated volume filtered (ml): ____

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	20.2	2489	8.84	14.51	12				
1	19.0	2486	8.91	15.64	13				
2	18.3	2482	8.83	14.98	14				
3	18.1	2482	8.68	12.60	15				
4	17.9	2477	8.59	11.12	16				
5	17.7	2479	8.53	10.22	17				
6	17.1	2478	8.39	8.52	18				
7	16.9	2479	8.27	7.13	19				
8	16.7	2481	8.15	5.72	20				
9	16.5	2485	8.05	4.45	21				
~~10~~ 9.5	16.5	2486	8.01	3.96	22				
11					23				

FIELD DATASHEET

Date: 4/17/24 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE03

Time on Station: 1430 Time off Station: 1443 Staff Initials: NJ/KP

Weather Conditions: Clear, Sunny Wind (mph & direction): 4-5 mph SW

Lat: on Long: on

Water Depth (m): 8.0 Secchi Depth (m):

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y [✓ N] Plankton Sample?: Y [✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	**Temp (°C)**	**Sp. Cond (µS/cm)**	**pH (units)**	**DO (mg/L)**	**Depth (m)**	**Temp (°C)**	**Sp. Cond (µS/cm)**	**pH (units)**	**DO (mg/L)**
0	20.2	2495	8.95	14.13	12				
1	18.8	2482	8.89	14.85	13				
2	18.2	2480	8.84	14.56	14				
3	18.0	2475	8.71	12.46	15				
4	17.7	2475	8.60	10.91	16				
5	17.4	2476	8.51	9.92	17				
6	17.0	2480	8.33	8.71	18				
7	17.0	2480	8.27	8.37	19				
~~8~~ 7.5	17.3	2477	8.44	8.19	20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 4/17/24 Location (Circle): Lake Elsinore/ [✓ Canyon Lake] Station: CL07

Time on Station: 1010 Time off Station: 1047 Staff Initials: HK/RV

Weather Conditions: Clear & Sunny Wind (mph & direction): 1mph N/NE

Lat: on target Long:

Water Depth (m): 15.8 Secchi Depth (m): 0.6

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y [✓ N] Plankton Sample?: Y / N

SAMPLE TIME: 1030 Surface volume filtered (ml): ~~500~~ RV

Depth-Integrated volume filtered (ml): 500

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	18.9	560	9.65	16.12	12	13.1	592	7.23	0.00
1	18.7	556	9.64	16.10	13	13.1	591	7.21	0.00
2	~~18.6~~ 17.6	~~559~~ 579	~~9.58~~ 9.45	~~15.49~~ 14.01 RV	14	13.0	590	7.21	0.00
3 16.5	~~17.6~~	~~559~~ 562	~~9.45~~ 9.15	11.60	15	13.0	587	7.19	0.00
4	15.6	581	8.38	3.64	~~16~~ 15.5	12.9	592	6.89	0.00
5	14.5	593	7.95	1.44	17				
6	14.2	593	7.46	1.03	18				
7	13.9	604	7.37	0.08	19				
8	13.6	605	7.32	0.01	20				
9	13.5	600	7.30	0.00	21				
10	13.3	596	7.27	0.00	22				
11	13.2	594	7.25	0.00	23				

FIELD DATASHEET

Date: 4/17/24 Location (Circle): Lake Elsinore/Canyon Lake Station: CL08

Time on Station: 0929 Time off Station: 1000 Staff Initials: HV/RV

Weather Conditions: clear ; sunny Wind (mph & direction): 1 mph N/NE

Lat: Long: on target

Water Depth (m): 9.6 Secchi Depth (m): 0.5

Water Chemistry Sample?: Y / N Chl-a Sample?: [✓ Y] / N Plankton Sample?: Y / [✓ N]

SAMPLE TIME: 0950 Surface volume filtered (ml): ~~500~~ RV RV

Depth-Integrated volume filtered (ml): RV 500

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	**Temp (°C)**	**Sp. Cond (µS/cm)**	**pH (units)**	**DO (mg/L)**	**Depth (m)**	**Temp (°C)**	**Sp. Cond (µS/cm)**	**pH (units)**	**DO (mg/L)**
0	19.5	556	9.68	16.37	12				
1	18.8	555	9.68	16.52	13				
2	17.4	563	9.34	12.49	14				
3	16.3	572	8.82	8.34	15				
4	15.5	580	8.03	4.~~0~~72 RV	16				
5	14.6	583	7.58	1.37	17				
6	14.2	594	RV 7.41	0.85	18				
7	14.0	594	7.33	0.21	19				
8	13.9	596	7.31	0.29	20				
9	13.7	602	7.29	0.00	21				
~~10~~ 9.5	13.6	602	7.29	0.00	22				
11					23				

FIELD DATASHEET

Date: 4/17/24 Location (Circle): Lake Elsinore/Canyon Lake Station: ~~CL10~~ CL09

Time on Station: 0853 Time off Station: 0915 Staff Initials: HK/RV

Weather Conditions: Clear & Sunny Wind (mph & direction): 1 mph N/NE

Lat: on target Long:

Water Depth (m): 8.4 Secchi Depth (m): 0.8

Water Chemistry Sample?: [✓ Y] / N Chl-a Sample? [✓ Y] / N Plankton Sample?: Y / [✓ N]

SAMPLE TIME: 0910 Surface volume filtered (ml): ~~500~~ RV

Depth-Integrated volume filtered (ml): 500

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Sulfuric Smell

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	18.7	765	9.32	13.10	12				
1	18.5	766	9.29	12.78	13				
2	18.1	758	9.10	11.45	14				
3	17.0	732	8.64	6.74	15				
4	15.6	818	7.72	1.12	16				
5	14.2	846	7.37	0.15	17				
6	13.3	880	7.29	0.05	18				
7	12.8	927	7.19	0.00	19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 4/17/2024 Location (Circle): Lake Elsinore/Canyon Lake Station: CL 10

Time on Station: 0813 Time off Station: 0847 Staff Initials: HK/RV

Weather Conditions: Clear & Sunny Wind (mph & direction): 1mph N/NE

Lat: on target Long:

Water Depth (m): 4.2 Secchi Depth (m): 1 m

Water Chemistry Sample?: [✓ Y] / N Chl-a Sample?: [✓ Y] / N Plankton Sample?: Y / [✓ N]

SAMPLE TIME: 0835

Surface volume filtered (ml): ~~500~~ RV

Depth-Integrated volume filtered (ml): 500

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	19.2	806	9.17	12.64	12				
1	19.2	815	9.16	12.15	13				
2	17.9	815	8.82	7.84 ~~8.94~~ RV	14				
3	16.6	848	7.98	2.19	15				
4	16.0	960	7.49	0.50	16				
5					17				
6					18				
7					19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 4/17/24 Location (Circle): Lake Elsinore/ [✓ Canyon Lake] Station: CL07

Time on Station: 1445 Time off Station: 1455 Staff Initials: HK/RV

Weather Conditions: Sunny & Clear Wind (mph & direction): 6 mph NE

Lat: on target Long:

Water Depth (m): 15.4 Secchi Depth (m): 0.7

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME: /

Surface volume filtered (ml): /

Depth-Integrated volume filtered (ml): /

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

PM WQR

Depth (m)	**Temp (°C)**	**Sp. Cond (µS/cm)**	**pH (units)**	**DO (mg/L)**	**Depth (m)**	**Temp (°C)**	**Sp. Cond (µS/cm)**	**pH (units)**	**DO (mg/L)**
0	23.0	564	9.68	17.29	**12**	13.1	593	7.26	0.00
1	19.5	~~56~~557	9.75	18.87	**13**	13.1	590	7.22	0.00
2	17.9	554	9.50	15.96	**14**	13.0	588	7.17	0.00
3	16.3	562	9.10	10.67	**15**	13.0	605	7.07	0.00
4	15.5	582	8.07	5.22	**16**				
5	14.5	588	7.77	1.96	**17**				
6	14.0	599	7.55	0.70	**18**				
7	13.8	605	7.45	0.24	**19**				
8	13.7	604	7.39	0.11	**20**				
9	13.5	6.01	7.35	0.06	**21**				
10	13.3	5.97	7.31	0.03	**22**				
11	13.2	5.94	7.28	0.01	**23**				

FIELD DATASHEET

Date: 4/17/24 Location (Circle): Lake Elsinore/Canyon Lake Station: CL08

Time on Station: 1428 Time off Station: 1437 Staff Initials: RV/HK

Weather Conditions: clear & sunny Wind (mph & direction): 9 W

Lat: Long: on target

Water Depth (m): 9.7 Secchi Depth (m): 0.8

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME: /

Surface volume filtered (ml): /

Depth-Integrated volume filtered (ml): /

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments: PM WQR

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	21.4	557	9.79	18.33	**12**				
1	19.3	556	9.76	18.38	**13**				
2	17.4	560	9.40	13.90	**14**				
3	16.3	568	8.89	9.21	**15**				
4	15.4	577	8.06	4.16	**16**				
5	14.6	582	7.51	1.72	**17**				
6	14.3	588	7.37	0.62	**18**				
7	14.0	600	7.32	0.24	**19**				
8	13.8	599	7.29	0.00	**20**				
9	13.6	600	7.27	0.00	**21**				
9.5 ~~**10**~~	13.6	600	7.25	0.00	**22**				
11					**23**				

FIELD DATASHEET

Date: 4/17/24 Location (Circle): Lake Elsinore/Canyon Lake Station: CL09

Time on Station: 1405 Time off Station: 1411 Staff Initials: RV/HK

Weather Conditions: Clear & Sunny Wind (mph & direction): 9mph W

Lat: Long: on target

Water Depth (m): 8.1 Secchi Depth (m): 1.0

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments: PM WQR

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	21.0	770	9.44	15.30	**12**				
1	19.0	768	9.39	14.85	**13**				
2	18.4	755	9.24	12.78	**14**				
3	16.9	732	8.59	7.94	**15**				
4	15.1	818	7.79	0.47	**16**				
5	14.2	844	7.43	0.19	**17**				
6	13.2	844	7.28	0.11	**18**				
7	13.0	925	7.19	0.07	**19**				
7.5 ~~**8**~~	12.7	947	7.12	0.04	**20**				
9					**21**				
10					**22**				
11					**23**				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 4/17/24 Location (Circle): Lake Elsinore/[✓ Canyon Lake] Station: CL 10

Time on Station: 1342 Time off Station: 1354 Staff Initials: HK/RV

Weather Conditions: sunny & clear Wind (mph & direction): 5 mph SW

Lat: on target Long:

Water Depth (m): 3.9 Secchi Depth (m): 0.7

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / N

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments: PM WQR

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	24.4	822	9.28	14.05	12				
1	20.2	816	9.32	14.28	13				
2	18.5	794	9.09	11.01	14				
3	17.3	808	8.22	4.72	15				
3.5 ~~4~~	16.7	885	7.74.	2.25	16				
5					17				
6					18				
7					19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 4/6/24 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE01

Time on Station: 1450 Time off Station: 1455 Staff Initials: NS/KP

Weather Conditions: clear : hot Wind (mph & direction): 4-5mph SW

Lat: on Long: on

Water Depth (m): 8.4 Secchi Depth (m):

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y [✓ N] Plankton Sample?: Y [✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments: PM

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	27.5	2567	9.18	17.10	12				
1	24.8	2562	9.14	15.12	13				
2	23.7	2559	9.05	12.15	14				
3	23.5	2558	9.02	11.53	15				
4	23.3	2557	8.98	10.20	16				
5	23.0	2560	8.91	8.19	17				
6	23.0	2559	8.90	8.10	18				
7	23.0	2559	8.89	7.92	19				
8	22.7	2559	8.79	6.04	20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 6/5/24 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE02

Time on Station: 1440 Time off Station: 1445 Staff Initials: NJ/KP

Weather Conditions: Clear : hot Wind (mph & direction): 4-5 mph SW

Lat: UN Long: UN

Water Depth (m): 9.5m Secchi Depth (m): ~~9.5~~

Water Chemistry Sample?: Y / [✓ N]
SAMPLE TIME: __________

Chl-a Sample?: Y / [✓ N]
Surface volume filtered (ml): __________

Depth-Integrated volume filtered (ml): __________

Plankton Sample?: Y / [✓ N]

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments: ~~Post~~ PM

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	25.4	2568	9.24	17.17	12				
1	24.3	2558	9.18	15.90	13				
2	23.7	2558	9.03	11.74	14				
3	23.4	2560	8.91	8.72	15				
4	23.1	2560	8.85	7.02	16				
5	22.8	2560	8.81	6.60	17				
6	22.8	2559	8.81	6.50	18				
7	22.6	2560	8.76	5.58	19				
8	22.5	2561	8.68	4.25	20				
9	22.4	2563	8.61	2.74	21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 6/5/24 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: LE03

Time on Station: 1425 Time off Station: 1435 Staff Initials: NJ/KP

Weather Conditions: Clear ; hot Wind (mph & direction): 4-5 mph SW

Lat: na Long: na

Water Depth (m): 7.7m Secchi Depth (m):

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y/[✓ N] Plankton Sample?: Y/[✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments: ~~POST~~ PM

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	26.0	2564	9.37	19.86	12				
1	24.3	2562	9.24	14.74	13				
2	23.7	2562	9.00	9.82	14				
3	22.7	2565	8.59	2.50	15				
4	22.5	2562	8.51	1.76	16				
5	22.4	2562	8.47	1.15	17				
6	22.3	2563	8.39	0.30	18				
7	22.2	2566	8.32	0.25	19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore TNTP Offset Monitoring
2023-24

FIELD DATASHEET

Date: 6/5/24 Location: Lake Elsinore Station: LE02

Time on Station: 0820 Time off Station: 1005 Staff Initials: NJ/KP

Weather Conditions: Clear, sunny Wind (mph & direction): 1 mph W

Lat: On target Long: on target

Water Depth (m): 9.5 Secchi Depth (m): 0.85

Water Chemistry Sample Times: **Chl-a Samples**?: Y / N **Algae Taxonomy Sample**?: Y / N

Surface:
Surface DUP:
Depth Int:
Depth Int. DUP:
Bottom:
Bottom DUP:
Surface TMDL:

Surface volume filtered (ml):
Surface DUP volume filtered *(ml)*:
Depth Int. volume filtered (ml):
Depth Int. DUP volume filtered (ml):
Surface TMDL: volume filtered (ml):

Do not exceed **7 PSI or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250mL filter volume).

Comments: post

Depth (m)	Temp (°C)	Sp. Cond (μS/cm)	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)
0	24.5	2571	9.18	14,47	119.9	5,74
0.5	24.2	2560	9.10	12.51	139.6	5,27
1	23.7	2558	9.05	11,95	144.6	4.59
2	23.7	2558	9.03	11.15	147.7	3,79
3	23.5	2560	8.94	9.36	151.8	3.76
4	23.3	2561	8.90	8.07	154.3	3.20
5	22.8	2562	8.78	6.11	159.2	2.54
6	22.7	2560	8.76	5.75	161.3	2.45
7	22.5	2561	8.73	4.96	163.5	2.57
8	22.4	2561	8.68	4.23	164.4	3.48
9	22.4	2561	8.67	4.02	162.2	3.83
10						
11						

FIELD DATASHEET

Date: ~~6/4/24~~ 6/5/24 Location: Lake Elsinore Station: LE-02

Time on Station: 0820 Time off Station: 1005 Staff Initials: NJ/KP

Weather Conditions: Clear & sunny Wind (mph & direction): 1 mph W

Lat: on target Long: on target

Water Depth (m): 9.5 Secchi Depth (m): 0.85

Water Chemistry Sample Times: **Chl-a Samples**?: [✓ Y] / N **Algae Taxonomy Sample**?: Y / N

Surface: 0840
Surface DUP: 0920
Depth Int: 0850
Depth Int. DUP: 0925
Bottom: 0905
Bottom DUP: 0935
Surface TMDL: 0955

Surface volume filtered (ml): 350 mL
Surface DUP volume filtered *(ml)*: ~~425 mL~~ 325 mL
Depth Int. volume filtered (ml): 425 mL
Depth Int. DUP volume filtered (ml):
Surface TMDL: volume filtered (ml):

Do not exceed **7 PSI or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250mL filter volume).

Comments: PPE

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)
0	23.7	2555	8.99	11.39	98.9	3.91
0.5	23.6	2557	8.99	11.39	105.4	4.64
1	23.5	2558	8.98	10.98	111.2	4.56
2	23.5	2558	8.96	10.38	116.3	4.47
3	23.5	2559	8.95	10.12	120.3	3.76
4	23.4	2559	8.92	9.11	127.4	3.56
5	23.2	2559	8.87	8.14	134.0	3.43
6	22.8	2561	8.74	5.79	140.5	2.62
7	22.6	2559	8.73	5.66	142.5	2.28
8	22.4	2560	8.70	4.93	144.7	2.90
9	22.4	2561	8.64	3.89	117.2	4.03
10						
11						

FIELD DATASHEET

Date: 6/4/24 Location (Circle): Lake Elsinore/Canyon Lake Station: LE03

Time on Station: 0805 Time off Station: 815 Staff Initials: NJ/KP

Weather Conditions: clear + sunny Wind (mph & direction): 1 mph out of west

Lat: on target Long: on target

Water Depth (m): 7.7 Secchi Depth (m): 0.75

Water Chemistry Sample?: Y [✓ N] Chl-a Sample?: Y [✓ N] Plankton Sample?: Y [✓ N]

SAMPLE TIME: N/A

Surface volume filtered (ml): N/A

Depth-Integrated volume filtered (ml): N/A

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments: AM

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	24.2	2558	9.20	15.25	12				
1	24.2	2558	9.19	15.09	13				
2	24.1	2558	9.14	14.31	14				
3	23.9	2557	9.11	13.46	15				
4	23.2	2561	8.77	6.06	16				
5	22.6	2568	8.43	0.96	17				
6	22.4	2562	8.40	0.76	18				
7	22.2	2564	8.38	0.29	19				
8					20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 6/5/24 Location (Circle): [✓ Lake Elsinore] / Canyon Lake Station: LE-01

Time on Station: 1045 Time off Station: 1050 Staff Initials: NJ/KP

Weather Conditions: clear & sunny Wind (mph & direction): 1 mph out of west

Lat: on target Long: on target

Water Depth (m): 8.4 Secchi Depth (m): 0.65

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME: N/A Surface volume filtered (ml): N/A

Depth-Integrated volume filtered (ml): N/A

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments: AM

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	24.6	2563	9.08	12.48	12				
1	23.2	2558	8.98	9.77	13				
2	23.1	2558	8.91	9.80	14				
3	23.1	2558	8.89	8.58	15				
4	23.0	2558	8.88	8.44	16				
5	23.0	2558	8.88	8.46	17				
6	23.0	2559	8.89	8.53	18				
7	22.9	2559	8.86	7.94	19				
8	22.7	2559	8.80	6.58	20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: 6/5/24 Location (Circle): [✓ Lake Elsinore]/Canyon Lake Station: Lakeshore

Time on Station: 1025 Time off Station: 1040 Staff Initials: NJ/KP

Weather Conditions: clear & Sunny Wind (mph & direction): 1 mph out of West

Lat: on target Long: on target

Water Depth (m): 9.9 Secchi Depth (m): 0.75

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME: N/A

Surface volume filtered (ml): N/A

Depth-Integrated volume filtered (ml): N/A

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	24.6	2561	9.21	14.5	12				
1	23.7	2559	9.05	11.40	13				
2	23.6	2559	9.01	10.44	14				
3	23.3	2560	8.93	8.81	15				
4	22.9	2561	8.83	6.64	16				
5	22.7	2560	8.79	6.05	17				
6	22.5	2560	8.75	5.25	18				
7	22.4	2562	8.69	4.12	19				
8	22.3	2562	8.64	3.31	20				
9	22.2	2563	8.55	1.82	21				
9.5 ~~10~~	22.2	2564	8.54	1.74	22				
11					23				

FIELD DATASHEET

Date: 6/5/24

Location (Circle): [✓ Lake Elsinore]/Canyon Lake

Station: Grand Avenue

Time on Station: 1015

Time off Station: 1020

Staff Initials: NJ/KP

Weather Conditions: clear & sunny

Wind (mph & direction): 1 mph out of west

Lat: on target

Long: on target

Water Depth (m): 8.9

Secchi Depth (m): 0.75

Water Chemistry Sample?: Y / [✓ N]

SAMPLE TIME: N/A

Chl-a Sample?: Y / [✓ N]

Plankton Sample?: Y / [✓ N]

Surface volume filtered (ml): N/A

Depth-Integrated volume filtered (ml): N/A

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	24.7	2558	9.24	15.03	12				
1	24.0	2559	9.14	13.02	13				
2	23.5	2561	9.09	10.27	14				
3	23.2	2560	8.96	8.12	15				
4	22.9	2561	8.86	7.02	16				
5	22.7	2560	8.82	6.73	17				
6	22.6	2560	8.81	6.08	18				
7	22.4	2563	8.65	3.45	19				
8	22.4	2562	8.63	3.06	20				
8.5 ~~9~~	22.4	2562	8.60	2.72	21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 6/5/24 Location (Circle): Lake Elsinore/[✓ Canyon Lake] Station: CL09

Time on Station: 1355 Time off Station: 1415 Staff Initials: KS

Weather Conditions: Clear Wind (mph & direction): 5-10 NW

Lat: On Target Long:

Water Depth (m): 7.8 Secchi Depth (m): 1.4

Water Chemistry Sample?: Y / [✓ N] Chl-a Sample?: Y / [✓ N] Plankton Sample?: Y / [✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	26.9	823	9.10	11.13	12				
1	25.4	860	9.14	11.78	13				
2	24.6	833	9.14	11.50	14				
3	24.1	873	8.73	7.36	15				
4	23.3	909	7.97	6.64	16				
5	17.6	957	7.27	0.12	17				
6	15.0	945	7.22	0.05	18				
7	14.2	960	7.15	0.01	19				
7.5 ~~8~~	13.7	970	7.12	0	20				
9					21				
10					22				
11					23				

FIELD DATASHEET

Date: ~~[illegible]~~ 6/5/24 Location (Circle): Lake Elsinore/[✓ Canyon Lake] Station: CL10

Time on Station: 1345 Time off Station: 1350 Staff Initials: KS

Weather Conditions: Over Wind (mph & direction): 5-10 NW

Lat: On Target Long:

Water Depth (m): 4.1 Secchi Depth (m): 1.4

Water Chemistry Sample?: Y /[✓ N] Chl-a Sample?: Y /[✓ N] Plankton Sample?: Y /[✓ N]

SAMPLE TIME:

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	27.1	897	8.98	10.51	12				
1	27.0	903	9.00	10.82	13				
2	25.2	909	9.01	10.97	14				
3	24.4	946	8.54	6.45	15				
4	23.7	977	7.66	0.46	16				
5					17				
6					18				
7					19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 6/5/24 Location (Circle): Lake Elsinore/[✓ Canyon Lake] Station: CL08

Time on Station: 1320 Time off Station: 1340 Staff Initials: KS HK

Weather Conditions: Ovr Wind (mph & direction): 5 NW

Lat: On Target Long:

Water Depth (m): 8.7 Secchi Depth (m): 1.5

Water Chemistry Sample?: Y / [✓ N]
SAMPLE TIME:

Chl-a Sample?: Y / [✓ N]
Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Plankton Sample?: Y / [✓ N]

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	27.0	656	9.18	10.52	12				
1	26.0	654	9.20	10.84	13				
2	24.6	660	9.21	9.63	14				
3	23.9	663	9.03	6.71	15				
4	22.1	666	8.07	1.52	16				
5	20.7	669	7.84	0.16	17				
6	17.8	643	7.61	0.05	18				
7	15.6	620	7.41	0	19				
8	14.7	619	7.33	0	20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 6/5/2024 Location (Circle): Lake Elsinore/[✓ Canyon Lake] Station: CL07

Time on Station: 1305 Time off Station: 1315 Staff Initials: KS / HK

Weather Conditions: Clear Wind (mph & direction): 5mph NW

Lat: On Target Long:

Water Depth (m): 16.5 Secchi Depth (m): 1.5

Water Chemistry Sample?: Y/[✓ N] Chl-a Sample?: Y/[✓ N] Plankton Sample?: Y/[✓ N]
SAMPLE TIME: Surface volume filtered (ml):

Depth-Integrated volume filtered (ml):

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	27.0	655	9.09	10,21	**12**	13.6	618	7.10	0
1	25.0	658	9.17	10.53	**13**	13.5	615	7.09	0
2	24.6	651	9.19	10.74	**14**	13.5	614	7.08	0
3	24.0	650	9.11	9.07	**15**	13.4	618	7.06	0
4	21.9	676	8.14	0.90	**16**	13.4	631	6.82	0
5	19.5	670	7.80	0.24	**17**				
6	16.6	643	7.52	0.05	**18**				
7	15.7	629	7.42	0	**19**				
8	14.3	619	7.32	0	**20**				
9	13.8	617	7.24	0	**21**				
10	13.7	617	7.19	0	**22**				
11	13.6	619	7.15	0	**23**				

FIELD DATASHEET

Date: 6/5/2024 Location (Circle): Lake Elsinore/[✓ Canyon Lake] Station: CL10

Time on Station: 0750 Time off Station: 0815 Staff Initials: KS/HK

Weather Conditions: Clear, Calm Wind (mph & direction): 0

Lat: On target Long:

Water Depth (m): 4.2 Secchi Depth (m): 1.4

Water Chemistry Sample?: [✓ Y] / N Chl-a Sample?: [✓ Y] / N Plankton Sample?: Y / [✓ N]

SAMPLE TIME: 0800 / 0810 Surface volume filtered (ml): 500 mL

Depth-Integrated volume filtered (ml): 500 mL

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	24.8	911	8.71	9.69	12				
1	24.9	901	8.76	9.65	13				
2	24.7	918	8.74	9.52	14				
3	24.2	955	8.01	4.12	15				
4	23.6	956	7.58	0.45	16				
5					17				
6					18				
7					19				
8					20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 6/5/2024 Location (Circle): Lake Elsinore/[✓ Canyon Lake] Station: CL09

Time on Station: 0835 Time off Station: 0900 Staff Initials: KS/HF

Weather Conditions: Clear, Calm Wind (mph & direction): 0

Lat: On Target Long:

Water Depth (m): 8.5 Secchi Depth (m): 1.4

Water Chemistry Sample?: Y / N Chl-a Sample?: Y / N Plankton Sample?: Y / [✓ N]

SAMPLE TIME: 08[illegible]30 / 0840

Surface volume filtered (ml):

Depth-Integrated volume filtered (ml): 450 mL

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	24.6	848	8.99	10.49	12				
1	24.5	846	9.00	10.59	13				
2	24.4	847	8.97	10.38	14				
3	24.1	842	8.92	9.81	15				
4	23.3	899	7.98	1.25	16				
5	18.6	978	7.30	0.21	17				
6	15.1	952	7.18	0.16	18				
7	13.6	966	7.10	0.04	19				
8	13.3	974	6.98	0.02	20				
9					21				
10					22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 6/5/2024 Location (Circle): Lake Elsinore/[✓ Canyon Lake] Station: CL08

Time on Station: 0910 Time off Station: 0935 Staff Initials: KS/HK

Weather Conditions: Clear, Calm Wind (mph & direction): 0

Lat: On Target Long:

Water Depth (m): 10.4 Secchi Depth (m): 1.5

Water Chemistry Sample?: Y / N Chl-a Sample?: [✓ Y] / N Plankton Sample?: Y / [✓ N]

SAMPLE TIME: 0915 Surface volume filtered (ml): 500

Depth-Integrated volume filtered (ml): 500

0925

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	25.1	654	9.20	10.28	12				
1	25.1	654	9.19	10.25	13				
2	24.6	655	9.17	9.87	14				
3	23.8	661	8.93	7.32	15				
4	22.4	679	8.18	3.01	16				
5	20.6	665	7.75	0.10	17				
6	17.7	644	7.51	0.01	18				
7	15.3	630	7.30	0.00	19				
8	14.7	621	7.20	0.00	20				
9	13.8	619	7.16	0.00	21				
10	13.7	622	7.12	0.00	22				
11					23				

Lake Elsinore and Canyon Lake TMDL Monitoring
2023-24

FIELD DATASHEET

Date: 6/5/2024 Location (Circle): Lake Elsinore/[✓ Canyon Lake] Station: CL07

Time on Station: 0940 Time off Station: 1015 Staff Initials: KS/HK

Weather Conditions: Clear, Calm Wind (mph & direction): 0

Lat: On Target Long:

Water Depth (m): 16.0 Secchi Depth (m): 1.5

Water Chemistry Sample?: Y / N
SAMPLE TIME: 0945

Chl-a Sample?: [✓ Y] / N 1000 Plankton Sample?: Y / N
Surface volume filtered (ml): ~~500~~ 500
Depth-Integrated volume filtered (ml): 500

*Do not exceed **7 PSI** or **14 in. Hg** when filtering chlorophyll (~500 mL fill volume preferred). Discard lower chamber when full (after first 250 mL are filtered).

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)	Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH (units)	DO (mg/L)
0	25.0	653	9.18	10.09	**12**	13.6	617	7.13	0.00
1	24.6	652	9.17	9.99	**13**	13.5	616	7.13	0.00
2	24.2	651	9.16	9.89	**14**	13.5	619	7.12	0.00
3	24.2	649	9.17	10.21	**15**	13.5	625	6.95	0.00
4	22.8	671	8.58	4.77	**16**	13.5	626	6.94	0.00
5	20.2	673	7.96	0.35	**17**				
6	17.2	650	7.47	0.08	**18**				
7	14.9	625	7.38	0.01	**19**				
8	14.7	621	7.29	0.00	**20**				
9	14.2	616	7.27	0.00	**21**				
10	13.7	617	7.18	0.00	**22**				
11	13.6	618	7.14	0.00	**23**				

APPENDIX C

LAKE MONITORING ANALYTICAL REPORTS

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders: 3G10009

Project: 2315100200.0004.WECK, LECL TMDL Monitoring

Attn: John Rudolph

Client: WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Report Date: 8/18/2023

Received Date: 07/17/2023

Turnaround Time: Normal

Phones: (858) 514-6465

Fax: (858) 278-5300

P.O. #: C016900152

Billing Code:

DoD-ELAP ANAB #ADE-2882 • DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • ISO17025 ANAB #L2457.01 • LACSD #10143

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

Dear John Rudolph,

Enclosed are the results of analyses for samples received 7/17/23 with the Chain-of-Custody document. The samples were received in good condition, at 1.0 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Kim Tu

Kim G. Tu
Project Manager

Certificate of Analysis

FINAL REPORT

WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: 2315100200.0004.WECK, LECL TMDL Monitoring

Project Manager: John Rudolph

Reported: 08/18/2023 12:18

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
LE02	Nicholas Jernack	3G10009-01	Water	07/17/23 09:00	

Certificate of Analysis

FINAL REPORT

WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: 2315100200.0004.WECK, LECL TMDL Monitoring

Project Manager: John Rudolph

Reported:
08/18/2023 12:18

Sample Results

Sample: LE02
3G10009-01 (Water)

Sampled: 07/17/23 9:00 by Nicholas Jernack

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W3H0217 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/02/23 11:34				**Analyst:** YMT/AEC
Ammonia as N	**0.90**	0.017	0.10	mg/l	1	08/07/23	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W3H0528 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/07/23 09:52				**Analyst:** YMT
TKN	**4.0**	0.13	0.20	mg/l	1	08/08/23	M-02
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W3G1339 **Preparation:** _NONE (WETCHEM)			**Prepared:** 07/18/23 15:07				**Analyst:** ism
Nitrate as N	ND	0.040	0.20	mg/l	1	07/18/23 17:17	
Nitrite as N	ND	0.042	0.10	mg/l	1	07/18/23 17:17	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3G1320 **Preparation:** _NONE (WETCHEM)			**Prepared:** 07/18/23 12:09				**Analyst:** UVVIS04
o-Phosphate as P	**0.12**	0.0071	0.010	mg/l	1	07/18/23 14:19	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3G1688 **Preparation:** _NONE (WETCHEM)			**Prepared:** 07/21/23 18:05				**Analyst:** cpt
Phosphorus as P, Total	**0.23**	0.0067	0.010	mg/l	1	07/25/23	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W3G1371 **Preparation:** _NONE (WETCHEM)			**Prepared:** 07/18/23 21:47				**Analyst:** bel
Total Dissolved Solids	**1800**	4.0	10	mg/l	1	07/19/23	
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W3G1593 **Preparation:** _NONE (WETCHEM)			**Prepared:** 07/21/23 18:00				**Analyst:** ymt
Sulfide, Total	**1.5**	0.25	0.50	mg/l	5	07/21/23	

Quality Control Results

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W3G1320 - EPA 365.3											
Blank (W3G1320-BLK1)					**Prepared & Analyzed: 07/18/23**						
o-Phosphate as P	ND	0.0071	0.010	mg/l							
LCS (W3G1320-BS1)					**Prepared & Analyzed: 07/18/23**						
o-Phosphate as P	0.215	0.0071	0.010	mg/l	0.200		108	88-111			
Matrix Spike (W3G1320-MS1)	**Source: 3G17107-01**				**Prepared & Analyzed: 07/18/23**						
o-Phosphate as P	0.206	0.0071	0.010	mg/l	0.200	0.00900	98	85-112			
Matrix Spike Dup (W3G1320-MSD1)	**Source: 3G17107-01**				**Prepared & Analyzed: 07/18/23**						
o-Phosphate as P	0.219	0.0071	0.010	mg/l	0.200	0.00900	105	85-112	6	20	
Batch: W3G1339 - EPA 353.2											
Blank (W3G1339-BLK1)					**Prepared & Analyzed: 07/18/23**						
Nitrate as N	ND	0.040	0.20	mg/l							
Nitrite as N	ND	0.042	0.10	mg/l							
LCS (W3G1339-BS1)					**Prepared & Analyzed: 07/18/23**						
Nitrate as N	0.988	0.040	0.20	mg/l	1.00		99	90-110			
Nitrite as N	0.989	0.042	0.10	mg/l	1.00		99	90-110			
Matrix Spike (W3G1339-MS1)	**Source: 3G07005-01**				**Prepared & Analyzed: 07/18/23**						
Nitrate as N	2.03	0.040	0.20	mg/l	2.00	ND	102	90-110			
Nitrite as N	0.983	0.042	0.10	mg/l	1.00	ND	98	90-110			
Matrix Spike (W3G1339-MS2)	**Source: 3G07005-02**				**Prepared & Analyzed: 07/18/23**						
Nitrate as N	3.03	0.040	0.20	mg/l	2.00	1.07	98	90-110			
Nitrite as N	1.02	0.042	0.10	mg/l	1.00	ND	102	90-110			
Matrix Spike Dup (W3G1339-MSD1)	**Source: 3G07005-01**				**Prepared & Analyzed: 07/18/23**						
Nitrate as N	2.03	0.040	0.20	mg/l	2.00	ND	102	90-110	0	20	
Nitrite as N	0.987	0.042	0.10	mg/l	1.00	ND	99	90-110	0.4	20	
Matrix Spike Dup (W3G1339-MSD2)	**Source: 3G07005-02**				**Prepared & Analyzed: 07/18/23**						
Nitrate as N	3.03	0.040	0.20	mg/l	2.00	1.07	98	90-110	0	20	
Nitrite as N	1.02	0.042	0.10	mg/l	1.00	ND	102	90-110	0	20	
Batch: W3G1371 - SM 2540C											
Blank (W3G1371-BLK1)					**Prepared: 07/18/23 Analyzed: 07/19/23**						
Total Dissolved Solids	ND	4.0	10	mg/l							
LCS (W3G1371-BS1)					**Prepared: 07/18/23 Analyzed: 07/19/23**						
Total Dissolved Solids	811	4.0	10	mg/l	824		98	97-103			
Duplicate (W3G1371-DUP1)	**Source: 3G18146-04**				**Prepared: 07/18/23 Analyzed: 07/19/23**						
Total Dissolved Solids	8100	4.0	10	mg/l		8100			0	10	
Duplicate (W3G1371-DUP2)	**Source: 3G18146-05**				**Prepared: 07/18/23 Analyzed: 07/19/23**						
Total Dissolved Solids	7960	4.0	10	mg/l		8110			2	10	
Batch: W3G1593 - SM 4500S2-D											
Blank (W3G1593-BLK1)					**Prepared & Analyzed: 07/21/23**						

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W3G1593 - SM 4500S2-D (Continued)											
Blank (W3G1593-BLK1)					**Prepared & Analyzed: 07/21/23**						
Sulfide, Total	ND	0.050	0.10	mg/l							
LCS (W3G1593-BS1)					**Prepared & Analyzed: 07/21/23**						
Sulfide, Total	0.100	0.050	0.10	mg/l	0.100		100	90-110			
Duplicate (W3G1593-DUP1)	**Source: 3G10009-01**				**Prepared & Analyzed: 07/21/23**						
Sulfide, Total	1.50	0.15	0.30	mg/l		1.50			0	20	
Matrix Spike (W3G1593-MS1)	**Source: 3G18010-01**				**Prepared & Analyzed: 07/21/23**						
Sulfide, Total	0.200	0.050	0.10	mg/l	0.200	ND	100	80-120			
Matrix Spike Dup (W3G1593-MSD1)	**Source: 3G18010-01**				**Prepared & Analyzed: 07/21/23**						
Sulfide, Total	0.200	0.050	0.10	mg/l	0.200	ND	100	80-120	0	20	
Batch: W3G1688 - EPA 365.3											
Blank (W3G1688-BLK1)					**Prepared: 07/21/23 Analyzed: 07/25/23**						
Phosphorus as P, Total	ND	0.0067	0.010	mg/l							
LCS (W3G1688-BS1)					**Prepared: 07/21/23 Analyzed: 07/25/23**						
Phosphorus as P, Total	0.203	0.0067	0.010	mg/l	0.200		102	90-110			
Matrix Spike (W3G1688-MS1)	**Source: 3G07061-03**				**Prepared: 07/21/23 Analyzed: 07/25/23**						
Phosphorus as P, Total	0.241	0.0067	0.010	mg/l	0.200	0.0390	101	90-110			
Matrix Spike Dup (W3G1688-MSD1)	**Source: 3G07061-03**				**Prepared: 07/21/23 Analyzed: 07/25/23**						
Phosphorus as P, Total	0.249	0.0067	0.010	mg/l	0.200	0.0390	105	90-110	3	20	
Batch: W3H0217 - EPA 350.1											
Blank (W3H0217-BLK1)					**Prepared: 08/02/23 Analyzed: 08/07/23**						
Ammonia as N	ND	0.017	0.10	mg/l							
Blank (W3H0217-BLK2)					**Prepared: 08/02/23 Analyzed: 08/07/23**						
Ammonia as N	ND	0.017	0.10	mg/l							
LCS (W3H0217-BS1)					**Prepared: 08/02/23 Analyzed: 08/07/23**						
Ammonia as N	0.253	0.017	0.10	mg/l	0.250		101	90-110			
LCS (W3H0217-BS2)					**Prepared: 08/02/23 Analyzed: 08/07/23**						
Ammonia as N	0.247	0.017	0.10	mg/l	0.250		99	90-110			
Matrix Spike (W3H0217-MS1)	**Source: 3G17123-07**				**Prepared: 08/02/23 Analyzed: 08/07/23**						
Ammonia as N	0.278	0.017	0.10	mg/l	0.250	0.0314	99	90-110			
Matrix Spike (W3H0217-MS2)	**Source: 3G18035-01**				**Prepared: 08/02/23 Analyzed: 08/07/23**						
Ammonia as N	0.247	0.017	0.10	mg/l	0.250	ND	99	90-110			
Matrix Spike Dup (W3H0217-MSD1)	**Source: 3G17123-07**				**Prepared: 08/02/23 Analyzed: 08/07/23**						
Ammonia as N	0.281	0.017	0.10	mg/l	0.250	0.0314	100	90-110	1	15	
Matrix Spike Dup (W3H0217-MSD2)	**Source: 3G18035-01**				**Prepared: 08/02/23 Analyzed: 08/07/23**						
Ammonia as N	0.247	0.017	0.10	mg/l	0.250	ND	99	90-110	0.3	15	
Batch: W3H0528 - EPA 351.2											
Blank (W3H0528-BLK1)					**Prepared: 08/07/23 Analyzed: 08/08/23**						

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W3H0528 - EPA 351.2 (Continued)											
Blank (W3H0528-BLK1)					**Prepared: 08/07/23**	**Analyzed: 08/08/23**					
TKN	ND	0.065	0.10	mg/l							
Blank (W3H0528-BLK2)					**Prepared: 08/07/23**	**Analyzed: 08/08/23**					
TKN	ND	0.065	0.10	mg/l							
LCS (W3H0528-BS1)					**Prepared: 08/07/23**	**Analyzed: 08/08/23**					
TKN	0.975	0.065	0.10	mg/l	1.00		97	90-110			
LCS (W3H0528-BS2)					**Prepared: 08/07/23**	**Analyzed: 08/08/23**					
TKN	0.956	0.065	0.10	mg/l	1.00		96	90-110			
Matrix Spike (W3H0528-MS1)	**Source: 3G18028-05**				**Prepared: 08/07/23**	**Analyzed: 08/08/23**					
TKN	1.25	0.065	0.10	mg/l	1.00	0.271	97	90-110			
Matrix Spike (W3H0528-MS2)	**Source: 3G18028-06**				**Prepared: 08/07/23**	**Analyzed: 08/08/23**					
TKN	1.30	0.065	0.10	mg/l	1.00	0.296	100	90-110			
Matrix Spike Dup (W3H0528-MSD1)	**Source: 3G18028-05**				**Prepared: 08/07/23**	**Analyzed: 08/08/23**					
TKN	1.27	0.065	0.10	mg/l	1.00	0.271	100	90-110	2	10	
Matrix Spike Dup (W3H0528-MSD2)	**Source: 3G18028-06**				**Prepared: 08/07/23**	**Analyzed: 08/08/23**					
TKN	1.43	0.065	0.10	mg/l	1.00	0.296	114	90-110	10	10	MS-01

Notes and Definitions

Item	Definition
M-02	Due to the nature of matrix interferences, sample was diluted prior to preparation. The MDL and MRL were raised due to the dilution.
MS-01	The spike recovery for this QC sample is outside of established control limits possibly due to sample matrix interference.
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

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

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

Chain of Custody & Sample Information Record

36/0009

Client: WSP USA E&I Inc. **Contact:** John Rudolph **Phone No.** 858-243-8158

Project Name: LECL TMDL Monitoring **Email:** john.rudolph@wsp.com

Project Number: 2315100200.0004.WECK

PO#: C016900152

GL Code: 573000

Org# 3151

Turn Around Time: Routine *3-5 Day Rush *48 Hour Rush *24 Hour Rush

Lab TAT Approval: By: *Additional Charges May Apply

Additional Reporting Requests

Include QC Data Package: ☐ Yes ☐ No

FAX Results: ☐ Yes ☐ No

Email Results: ☐ Yes ☐ No

State EDT: ☐ Yes ☐ No

(Include Source Number in Notes)

Sampler Information

Name: Nicholas Jenack

Employer: WSP USA E&I Inc.

Signature:

Matrix

DW = Drinking Water

WW = Wastewater

GW = Groundwater

S = Soil

SG = Sludge

L = Liquid

M = Miscellaneous

Notes

Ortho-P is field filtered.

please include all red codes on invoices

Sample ID	Date	Time	Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	NaOH/ZnAcetate	NH4Cl	MCAA	Frozen		Total # of Containers	Routine	Resample	Special	TSS	Nitrate - Nitrite (EPA 353.2)	TDS (SM2540 C)	TKN (EPA 351.2	Ammonia (EPA 350.1)	Total Phosphorus (EPA 365.3)	SRP/Ortho-P (EPA 365.3)	Total Sulfide (SM4500S)	Total AL (EPA 200.7)	Total AL (EPA 200.7)	Matrix	Notes
LE02	7/17/23	0900																	X	X	X	X	X	X	X				

Relinquished By (Sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company
	Nick Jenack/WSP	7/17/23/1230	DeLeon 7/17/23 1230	
DeLeon	DeLeon	7/17/23 1:40	7/17/23	L. Alvarez 13:40

(For Lab Use Only) **Sample Integrity Upon Receipt**

Sample(s) Submitted on Ice? Yes No

Custody Seal(s) Intact? Yes No N/A

Sample(s) Intact? Yes No

Temperature 1 °C

☐ Cooler Blank

Lab Notes

TMEI

Lab No. ____________

Page 1 **of** 1

WECK LABORATORIES, INC.

Sample Receipt Checklist

Weck WKO: **3G10009**
WKO Logged by: Lester Abad
Samples Checked by: Lester Abad

Date/Time Received: 07/17/23 @ 13:40
# of Samples: 01
Delivered by: Client

	Task	Yes	No	N/A	Comments
COC	COC present at receipt?	☒	☐		
	COC properly completed?	☒	☐		
	COC matches sample labels?	☒	☐		
	Project Manager notified about COC discrepancy?	☐	☐	☒	
Receipt Information	Sample Temperature	1°C			
	Samples received on ice?	☒	☐		
	Ice Type (Blue/Wet)	WET			
	All samples intact?	☒	☐		
	Samples in proper containers?	☒	☐		
	Sufficient sample volume?	☒	☐		
	Samples intact?	☒	☐		
	Received within holding time?	☐	☐		
	Project Manager notified about receipt info?	☐	☐	☒	
Sample Preservation Verification?	Sample labels checked for correct preservation?	☒	☐	☐	
	VOC Headspace: (No) none, If Yes (see comment) 524.2, 524.3, 624.1, 8260, 1666 P/T, LUFT	☐	☐	☒	☐<6mm/Pea Size?
	pH verified upon receipt? Metals <2; H2SO4 pres tests <2; 522<4; TOC <2; 508.1, 525.2<2, 6710B<2, 608.3 5-9	☒	☐	☐	pH paper Lot#
	Free Chlorine Tested <0.1 (Organics Analyses)	☐	☐	☒	Cl Test Strip Lot#
	O&G pH <2 verified?	☐	☐	☐	pH paper Lot# pH Reading:
	pH adjusted for O&G	☐	☐	☐	Acid Lot# Amt added:
	Project Manager notified about sample preservation?	☐	☐	☒	

PM Comments

Sample Receipt Checklist Completed by:

Signature: Lester Abad

Date: 07/17/23

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

August 07, 2023

John D. Rudolph
WSP USA
9177 Sky Park Court
San Diego, CA 92123-

Project Name: LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C3141034799 GL Code 57300 Org # 3151
Physis Project ID: 2302004.009

Dear John,

Enclosed are the analytical results for samples submitted to PHYSIS Environmental Laboratories, Inc. (PHYSIS) on 7/21/2023. A total of 2 samples were received for analysis in accordance with the attached chain of custody (COC). Per the COC, the samples were analyzed for:

Conventionals
Chlorophyll-a (mg/m3) by SM 10200 H

Analytical results in this report apply only to samples submitted to PHYSIS in accordance with the COC and are intended to be considered in their entirety.

Please feel free to contact me at any time with any questions. PHYSIS appreciates the opportunity to provide you with our analytical and support services.

Regards,

Misty Mercier
714 602-5320
Extension 202
mistymercier@physislabs.com

PROJECT SAMPLE LIST

WSP USA PHYSIS Project ID: 2302004-00

LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C014105479 Total Samples: 2

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
108503	LE02 - Int		7/17/2023	9:00	Biologic	Not Specified
108504	LE02 - Surf		7/17/2023	9:20	Biologic	Not Specified

ABBREVIATIONS and ACRONYMS

QM	Quality Manual
QA	Quality Assurance
QC	Quality Control
MDL	method detection limit
RL	reporting limit
R1	project sample
R2	project sample replicate
MS1	matrix spike
MS2	matrix spike replicate
B1	procedural blank
B2	procedural blank replicate
BS1	blank spike
BS2	blank spike replicate
LCS1	laboratory control spike
LCS2	laboratory control spike replicate
LCM1	laboratory control material
LCM2	laboratory control material replicate
CRM1	certified reference material
CRM2	certified reference material replicate
RPD	relative percent difference
LMW	low molecular weight
HMW	high molecular weight

QUALITY ASSURANCE SUMMARY

LABORATORY BATCH: Physis' QM defines a laboratory batch as a group of 20 or fewer project samples of similar matrix, processed together under the same conditions and with the same reagents. QC samples are associated with each batch and were used to assess the validity of the sample analyses.

PROCEDURAL BLANK: Laboratory contamination introduced during method use is assessed through the preparation and analysis of procedural blanks is provided at a minimum frequency of one per batch.

ACCURACY: Accuracy of analytical measurements is the degree of closeness based on percent recovery calculations between measured values and the actual or true value and includes a combination of reproducibility error and systematic bias due to sampling and analytical operations. Accuracy of the project data was indicated by analysis of MS, BS, LCS, LCM, CRM, and/or surrogate spikes on a minimum frequency of one per batch. Physis' QM requires that 95% of the target compounds greater than 10 times the MDL be within the specified acceptance limits.

PRECISION: Precision is the agreement among a set of replicate measurements without assumption of knowledge of the true value and is based on RPD calculations between repeated values. Precision of the project data was determined by analysis of replicate MS1/MS2, BS1/BS2, LCS1/LCS2, LCM1/LCM2, CRM1/CRM2, surrogate spikes and/or replicate project sample analysis (R1/R2) on a minimum frequency of one per batch. Physis' QM requires that for 95% of the compounds greater than 10 times the MDL, the percent RPD should be within the specified acceptance range.

BLANK SPIKES: BS is the introduction of a known concentration of analyte into the procedural blank. BS demonstrates performance of the preparation and analytical methods on a clean matrix void of potential matrix related interferences. The BS is performed in laboratory deionized water, making these recoveries a better indicator of the efficiency of the laboratory method per se.

MATRIX SPIKES: MS is the introduction of a known concentration of analyte into a sample. MS samples demonstrate the effect a particular project sample matrix has on the accuracy of a measurement. Individually, MS samples also indicate the bias of analytical measurements due to chemical interferences inherent in the in the specific project sample spiked. Intrinsic target analyte concentration in the specific project sample can also significantly impact MS recovery.

CERTIFIED REFERENCE MATERIALS: CRMs are materials of various matrices for which analytical information has been determined and certified by a recognized authority. These are used to provide a quantitative assessment of the accuracy of an analytical method. CRMs provide evidence that the laboratory preparation and analysis produces results that are comparable to those obtained by an independent organization.

LABORATORY CONTROL MATERIAL: LCM is provided because a suitable natural seawater CRM is not available and can be used to indicate accuracy of the method. Physis' internal LCM is seawater collected at ~800 meters in the Southern California San Pedro Basin and can be used as a reference for background concentrations in clean, natural seawater for comparison to project samples.

LABORATORY CONTROL SPIKES: LCS is the introduction of a known concentration of analyte into Physis' LCM. LCS samples were employed to assess the effect the seawater matrix has on the accuracy of a measurement. LCS also indicate the bias of this method due to chemical interferences inherent in the in the seawater matrix. Intrinsic LCM concentration can also significantly impact LCS recovery.

SURROGATES: A surrogate is a pure analyte unlikely to be found in any project sample, behaves similarly to

the target analyte and most often used with organic analytical procedures. Surrogates are added in known concentration to all samples and are measured to indicate overall efficiency of the method including processing and analyses.

HOLDING TIME: Method recommended holding times are the length of time a project sample can be stored under specific conditions after collection and prior to analysis without significantly affecting the analyte's concentration. Holding times can be extended if preservation techniques are employed to reduce biodegradation, volatilization, oxidation, sorption, precipitation, and other physical and chemical processes.

SAMPLE STORAGE/RETENTION: In order to maintain chemical integrity prior to analysis, all samples submitted to Physis are refrigerated (liquids) or frozen (solids) upon receipt unless otherwise recommended by applicable methods. Solid samples are retained for 1 year from collection while liquid samples are retained until method recommended holding times elapse.

TOTAL/DISSOLVED FRACTION: In some instances, the results for the dissolved fraction may be higher than the total fraction for a particular analyte (e.g. trace metals). This is typically caused by the analytical variation for each result and indicates that the target analyte is primarily in the dissolved phase, within the sample.

PHYSIS QUALIFIER CODES

CODE	*DEFINITION*
#	see Case Narrative
ND	analyte not detected at or above the MDL
B	analyte was detected in the procedural blank greater than 10 times the MDL
E	analyte concentration exceeds the upper limit of the linear calibration range, reported value is estimated
H	sample received and/or analyzed past the recommended holding time
J	analyte was detected at a concentration below the RL and above the MDL, reported value is estimated
N	insufficient sample, analysis could not be performed
M	analyte was outside the specified accuracy and/or precision acceptance limits due to matrix interference. The associated B/BS were within limits, therefore the sample data was reported without further clarification
SH	analyte concentration in the project sample exceeded the spike concentration, therefore accuracy and/or precision acceptance limits do not apply
SL	analyte results were lower than 10 times the MDL, therefore accuracy and/or precision acceptance limits do not apply
NH	project sample was heterogeneous and sample homogeneity could not be readily achieved using routine laboratory practices, therefore accuracy and/or precision acceptance limits do not apply
Q	analyte was outside the specified QAPP acceptance limits for precision and/or accuracy but within Physis derived acceptance limits, therefore the sample data was reported without further clarification
R	Physis' QM allows for 5% of the target compounds greater than 10 times the MDL to be outside the specified acceptance limits for precision and/or accuracy. This is often due to random error and does not indicate any significant problems with the analysis of these project samples

ANALYTICAL REPORT

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 108503-R1	**LE02 - Int**		**Matrix: Biologic**				**Sampled:**	**17-Jul-23**	**9:00**	**Received:**	**21-Jul-23**
Chlorophyll-a	SM 10200 H	mg/m3	104	1	1	2	NA		C-72131	03-Aug-23	03-Aug-23
Sample ID: 108504-R1	**LE02 - Surf**		**Matrix: Biologic**				**Sampled:**	**17-Jul-23**	**9:20**	**Received:**	**21-Jul-23**
Chlorophyll-a	SM 10200 H	mg/m3	169	1	1	2	NA		C-72131	03-Aug-23	03-Aug-23

QUALITY CONTROL REPORT

Conventionals

QUALITY CONTROL REPORT

Chlorophyll-a **Method:** SM 10200 H **Fraction:** NA **Prepared:** 03-Aug-23 **Analyzed:** 03-Aug-23

SAMPLE ID		BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS		QA CODE
108502-B1	QAQC Procedural Blank	C-72131	ND	1	1	2	mg/m3									
108502-BS1	QAQC Procedural Blank	C-72131	37.4	1	1	2	mg/m3	44.3	0	84	70 - 130%	PASS				
108502-BS2	QAQC Procedural Blank	C-72131	35.2	1	1	2	mg/m3	44.3	0	79	70 - 130%	PASS	6	30	PASS	

CHAIN OF CUSTODY

Chain of Custody & Sample Information Record

Client: WSP USA E&I Inc.
Contact: John Rudolph
Phone No. 858-243-8158

Project Name: LECL TMDL Monitoring
Email: john.rudolph@wsp.com
Project Number: 2315100200.0004.PHYSIS
PO#: C014105479
GL Code: 57300
Org# 3151

Turn Around Time: Routine *3-5 Day Rush *48 Hour Rush *24 Hour Rush
***Lab TAT Approval:** By:
*Additional Charges May Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Nick Jenack
Employer: WSP USA E&I Inc.
Signature:

Matrix
DW = Drinking Water
WW = Wastewater
GW = Groundwater
S = Soil
SG = Sludge
L = Liquid
M = Miscellaneous

Notes
Chl-a samples on 0.7 um GFF

			# of Containers & Preservatives											Sample Type			Analysis Requested								
Sample ID	Date	Time	Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	NaOH/ZnAcetate	NH4Cl	MCAA	Frozen		Total # of Containers	Routine	Resample	Special	Total Sulfide	Nitrate - Nitrite	TDS	TKN	Ammonia	Total Phosphorus	SRP/Ortho-P	Chlorophyll-a (SM10200 H	Matrix	Notes
LE02 - Int	7/17/23	0900																							X		Filter Volume: 230mL
LE02 - Surf	7/17/23	0920																							X		Filter Volume: 215mL
																											Filter Volume:
																											Filter Volume:
																											Filter Volume:
																											Filter Volume:

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company
	Nicholas Jernack/WSP	7/20/23 - 1600		MOUNGA NOMI / PHYSIS 7/21/23 0930

(For Lab Use Only) Sample Integrity Upon Receipt					Lab Notes
Sample(s) Submitted on Ice?	Yes	No		Temperature	
Custody Seal(s) Intact?	Yes	No	N/A	°C	
Sample(s) Submitted on Ice?	Yes	No		Temperature	
Custody Seal(s) Intact?	Yes	No	N/A	°C	
Sample(s) Intact?	Yes	No		☐ Cooler Blank	

Lab No.

Lab No.

Page 1 of 1

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

Sample Receipt Summary

Project Iteration ID: 2302004-009
Client Name: WSP USA
Project Name: LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C014105479 GL Code 57300 Org # 3151
COC Page Number: 2 of 2
Bottle Label Color: NA

Receiving Info

1. Initials Received By: MN
2. Date Received: 7/21/23
3. Time Received: 0930
4. Client Name: WSP
5. Courier Information: (Please circle)
   - Client
   - [✓ FedEx]
   - PHYSIS Driver:
     - i. Start Time: ____
     - ii. End Time: ____
     - iii. Total Mileage: ____
     - iv. Number of Pickups: ____
   - UPS
   - GSO/GLS
   - Area Fast
   - Ontrac
   - DRS
   - PAMS
6. Container Information: (Please put the # of containers or circle none)
   - 1 Cooler
   - __ Carboy(s)
   - __ Styrofoam Cooler
   - __ Carboy Trash Can(s)
   - __ Boxes
   - __ Carboy Cap(s)
   - None
   - Other ____
7. What type of ice was used: (Please circle any that apply)
   - Wet Ice
   - [✓ Blue Ice]
   - Dry Ice
   - Water
   - None
8. Randomly Selected Samples Temperature (°C): 22.3 Used I/R Thermometer # 1-2

Inspection Info

1. Initials Inspected By: RGH

Sample Integrity Upon Receipt:

1. COC(s) included and completely filled out.......... [✓ Yes] / No
2. All sample containers arrived intact.......... [✓ Yes] / No
3. All samples listed on COC(s) are present.......... [✓ Yes] / No
4. Information on containers consistent with information on COC(s).......... [✓ Yes] / No
5. Correct containers and volume for all analyses indicated.......... [✓ Yes] / No
6. All samples received within method holding time.......... [✓ Yes] / No
7. Correct preservation used for all analyses indicated.......... Yes / [✓ No]
8. Name of sampler included on COC(s).......... [✓ Yes] / No

Notes:

See temp.

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders: 3G25006

Project: LECL TMDL Monitoring

Attn: John Rudolph

Client: WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Report Date: 9/06/2023

Received Date: 08/01/2023

Turnaround Time: Normal

Phones: (858) 514-6465

Fax: (858) 278-5300

P.O. #: C015101084

Billing Code:

DoD-ELAP ANAB #ADE-2882 • DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • ISO17025 ANAB #L2457.01 • LACSD #10143

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

Dear John Rudolph,

Enclosed are the results of analyses for samples received 8/01/23 with the Chain-of-Custody document. The samples were received in good condition, at 2.0 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Kim Tu

Kim G. Tu
Project Manager

Certificate of Analysis

FINAL REPORT

WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: LECL TMDL Monitoring

Project Manager: John Rudolph

Reported:
09/06/2023 17:48

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CL07	Nicholas Jernack	3G25006-01	Water	08/01/23 11:00	
CL08	Nicholas Jernack	3G25006-02	Water	08/01/23 10:15	
CL09	Nicholas Jernack	3G25006-03	Water	08/01/23 09:15	
CL10	Nicholas Jernack	3G25006-04	Water	08/01/23 08:40	
LE02	Nicholas Jernack	3G25006-05	Water	08/01/23 10:18	

Certificate of Analysis

FINAL REPORT

WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: LECL TMDL Monitoring

Project Manager: John Rudolph

Reported:
09/06/2023 17:48

Sample Results

Sample: CL07 — Sampled: 08/01/23 11:00 by Nicholas Jernack
3G25006-01 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W3H1190 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/14/23 10:52				**Analyst:** YMT/AEC
Ammonia as N	**0.88**	0.017	0.10	mg/l	1	08/15/23	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W3H1355 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/15/23 16:41				**Analyst:** YMT/AEC
TKN	**1.5**	0.065	0.10	mg/l	1	08/16/23	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W3H0280 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/02/23 18:41				**Analyst:** ymt
Nitrate as N	ND	0.040	0.20	mg/l	1	08/02/23 21:02	
Nitrite as N	ND	0.042	0.10	mg/l	1	08/02/23 21:02	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3H0265 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/02/23 16:20				**Analyst:** ymt/jsg
o-Phosphate as P	**0.13**	0.0071	0.010	mg/l	1	08/02/23 18:09	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3H1727 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/18/23 12:56				**Analyst:** ymt
Phosphorus as P, Total	**0.16**	0.0067	0.010	mg/l	1	08/28/23	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W3H0363 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/03/23 13:59				**Analyst:** bel
Total Dissolved Solids	**500**	4.0	10	mg/l	1	08/04/23	
Method: SM 2540D			**Instr:** OVEN15				
Batch ID: W3H0451 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/04/23 10:26				**Analyst:** rem
Total Suspended Solids	**4**		5	mg/l	1	08/07/23	J
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W3H0543 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/07/23 11:23				**Analyst:** ymt
Sulfide, Total	**3.5**	0.25	0.50	mg/l	5	08/07/23	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W3H0636 **Preparation:** EPA 200.2			**Prepared:** 08/08/23 10:42				**Analyst:** kvm
Aluminum, Dissolved	**0.058**	0.041	0.050	mg/l	1	08/15/23	
Aluminum, Total	**0.068**	0.022	0.050	mg/l	1	08/15/23	

Sample Results

(Continued)

Sample: CL08
3G25006-02 (Water)

Sampled: 08/01/23 10:15 by Nicholas Jernack

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W3H1190 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/14/23 10:52				**Analyst:** YMT/AEC
Ammonia as N	**0.043**	0.017	0.10	mg/l	1	08/15/23	J
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W3H1355 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/15/23 16:41				**Analyst:** YMT/AEC
TKN	**0.76**	0.065	0.10	mg/l	1	08/16/23	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W3H0280 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/02/23 18:41				**Analyst:** ymt
Nitrate as N	ND	0.040	0.20	mg/l	1	08/02/23 20:55	
Nitrite as N	ND	0.042	0.10	mg/l	1	08/02/23 20:55	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3H0265 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/02/23 16:20				**Analyst:** ymt/jsg
o-Phosphate as P	**0.025**	0.0071	0.010	mg/l	1	08/02/23 18:10	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3H1727 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/18/23 12:56				**Analyst:** ymt
Phosphorus as P, Total	**0.064**	0.0067	0.010	mg/l	1	08/28/23	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W3H0363 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/03/23 13:59				**Analyst:** bel
Total Dissolved Solids	**500**	4.0	10	mg/l	1	08/04/23	
Method: SM 2540D			**Instr:** OVEN15				
Batch ID: W3H0451 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/04/23 10:26				**Analyst:** rem
Total Suspended Solids	**4**		5	mg/l	1	08/07/23	J
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W3H0543 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/07/23 11:23				**Analyst:** ymt
Sulfide, Total	**0.30**	0.050	0.10	mg/l	1	08/07/23	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W3H0636 **Preparation:** EPA 200.2			**Prepared:** 08/08/23 10:42				**Analyst:** kvm
Aluminum, Dissolved	**0.085**	0.041	0.050	mg/l	1	08/15/23	
Aluminum, Total	**0.097**	0.022	0.050	mg/l	1	08/15/23	

Sample Results

(Continued)

Sample: CL09
3G25006-03 (Water)

Sampled: 08/01/23 9:15 by Nicholas Jernack

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W3H1190	**Preparation:** _NONE (WETCHEM)		**Prepared:** 08/14/23 10:52				**Analyst:** YMT/AEC
Ammonia as N	**0.72**	0.017	0.10	mg/l	1	08/15/23	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W3H1355	**Preparation:** _NONE (WETCHEM)		**Prepared:** 08/15/23 16:41				**Analyst:** YMT/AEC
TKN	**1.5**	0.065	0.10	mg/l	1	08/16/23	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W3H0280	**Preparation:** _NONE (WETCHEM)		**Prepared:** 08/02/23 18:41				**Analyst:** ymt
Nitrate as N	**0.042**	0.040	0.20	mg/l	1	08/02/23 20:50	J
Nitrite as N	ND	0.042	0.10	mg/l	1	08/02/23 20:50	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3H0265	**Preparation:** _NONE (WETCHEM)		**Prepared:** 08/02/23 16:20				**Analyst:** ymt/jsg
o-Phosphate as P	**0.046**	0.0071	0.010	mg/l	1	08/02/23 18:10	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3H1727	**Preparation:** _NONE (WETCHEM)		**Prepared:** 08/18/23 12:56				**Analyst:** ymt
Phosphorus as P, Total	**0.099**	0.0067	0.010	mg/l	1	08/28/23	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W3H0362	**Preparation:** _NONE (WETCHEM)		**Prepared:** 08/03/23 13:53				**Analyst:** bel
Total Dissolved Solids	**600**	4.0	10	mg/l	1	08/04/23	
Method: SM 2540D			**Instr:** OVEN15				
Batch ID: W3H0451	**Preparation:** _NONE (WETCHEM)		**Prepared:** 08/04/23 10:26				**Analyst:** rem
Total Suspended Solids	**6**		5	mg/l	1	08/07/23	
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W3H0543	**Preparation:** _NONE (WETCHEM)		**Prepared:** 08/07/23 11:23				**Analyst:** ymt
Sulfide, Total	**3.5**	0.25	0.50	mg/l	5	08/07/23	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W3H0636	**Preparation:** EPA 200.2		**Prepared:** 08/08/23 10:42				**Analyst:** kvm
Aluminum, Dissolved	**0.071**	0.041	0.050	mg/l	1	08/15/23	
Aluminum, Total	**0.092**	0.022	0.050	mg/l	1	08/15/23	

Sample Results

(Continued)

Sample: CL10
3G25006-04 (Water)

Sampled: 08/01/23 8:40 by Nicholas Jernack

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W3H1190 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/14/23 10:52				**Analyst:** YMT/AEC
Ammonia as N	**0.022**	0.017	0.10	mg/l	1	08/15/23	J
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W3H1355 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/15/23 16:41				**Analyst:** YMT/AEC
TKN	**0.72**	0.065	0.10	mg/l	1	08/16/23	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W3H0280 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/02/23 18:41				**Analyst:** ymt
Nitrate as N	**0.11**	0.040	0.20	mg/l	1	08/02/23 20:43	J
Nitrite as N	ND	0.042	0.10	mg/l	1	08/02/23 20:43	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3H0265 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/02/23 16:20				**Analyst:** ymt/jsg
o-Phosphate as P	ND	0.0071	0.010	mg/l	1	08/02/23 18:11	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3H1727 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/18/23 12:56				**Analyst:** ymt
Phosphorus as P, Total	**0.034**	0.0067	0.010	mg/l	1	08/28/23	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W3H0362 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/03/23 13:53				**Analyst:** bel
Total Dissolved Solids	**540**	4.0	10	mg/l	1	08/04/23	
Method: SM 2540D			**Instr:** OVEN15				
Batch ID: W3H0451 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/04/23 10:26				**Analyst:** rem
Total Suspended Solids	**4**		5	mg/l	1	08/07/23	J
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W3H0543 **Preparation:** _NONE (WETCHEM)			**Prepared:** 08/07/23 11:23				**Analyst:** ymt
Sulfide, Total	ND	0.050	0.10	mg/l	1	08/07/23	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W3H0636 **Preparation:** EPA 200.2			**Prepared:** 08/08/23 10:42				**Analyst:** kvm
Aluminum, Dissolved	**0.11**	0.041	0.050	mg/l	1	08/15/23	
Aluminum, Total	**0.13**	0.022	0.050	mg/l	1	08/15/23	

Sample Results

(Continued)

Sample: LE02
3G25006-05 (Water)

Sampled: 08/01/23 10:18 by Nicholas Jernack

Analyte		Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods								
Method: EPA 350.1				**Instr:** AA06				
Batch ID: W3H1190	**Preparation:** _NONE (WETCHEM)			**Prepared:** 08/14/23 10:52				**Analyst:** YMT/AEC
Ammonia as N		**0.69**	0.017	0.10	mg/l	1	08/15/23	
Method: EPA 351.2				**Instr:** AA06				
Batch ID: W3H1355	**Preparation:** _NONE (WETCHEM)			**Prepared:** 08/15/23 16:41				**Analyst:** YMT/AEC
TKN		**3.5**	0.13	0.20	mg/l	1	08/16/23	M-02
Method: EPA 353.2				**Instr:** AA01				
Batch ID: W3H0280	**Preparation:** _NONE (WETCHEM)			**Prepared:** 08/02/23 18:41				**Analyst:** ymt
Nitrate as N		ND	0.040	0.20	mg/l	1	08/02/23 20:56	
Nitrite as N		ND	0.042	0.10	mg/l	1	08/02/23 20:56	
Method: EPA 365.3				**Instr:** UVVIS04				
Batch ID: W3H0265	**Preparation:** _NONE (WETCHEM)			**Prepared:** 08/02/23 16:20				**Analyst:** ymt/jsg
o-Phosphate as P		**0.018**	0.0071	0.010	mg/l	1	08/02/23 18:12	
Method: EPA 365.3				**Instr:** UVVIS04				
Batch ID: W3H1727	**Preparation:** _NONE (WETCHEM)			**Prepared:** 08/18/23 12:56				**Analyst:** ymt
Phosphorus as P, Total		**0.22**	0.0067	0.010	mg/l	1	08/28/23	
Method: SM 2540C				**Instr:** OVEN17				
Batch ID: W3H0363	**Preparation:** _NONE (WETCHEM)			**Prepared:** 08/03/23 13:59				**Analyst:** bel
Total Dissolved Solids		**1900**	4.0	10	mg/l	1	08/04/23	
Method: SM 4500S2-D				**Instr:** _ANALYST				
Batch ID: W3H0543	**Preparation:** _NONE (WETCHEM)			**Prepared:** 08/07/23 11:23				**Analyst:** ymt
Sulfide, Total		**0.80**	0.050	0.10	mg/l	1	08/07/23	

Quality Control Results

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W3H0265 - EPA 365.3											
Blank (W3H0265-BLK1)					**Prepared & Analyzed: 08/02/23**						
o-Phosphate as P	ND	0.0071	0.010	mg/l							
LCS (W3H0265-BS1)					**Prepared & Analyzed: 08/02/23**						
o-Phosphate as P	0.204	0.0071	0.010	mg/l	0.200		102	88-111			
Matrix Spike (W3H0265-MS1)	**Source: 3H01099-01**				**Prepared & Analyzed: 08/02/23**						
o-Phosphate as P	0.300	0.0071	0.010	mg/l	0.200	0.0960	102	85-112			
Matrix Spike Dup (W3H0265-MSD1)	**Source: 3H01099-01**				**Prepared & Analyzed: 08/02/23**						
o-Phosphate as P	0.293	0.0071	0.010	mg/l	0.200	0.0960	98	85-112	2	20	
Batch: W3H0280 - EPA 353.2											
Blank (W3H0280-BLK1)					**Prepared & Analyzed: 08/02/23**						
Nitrate as N	ND	0.040	0.20	mg/l							
Nitrite as N	ND	0.042	0.10	mg/l							
LCS (W3H0280-BS1)					**Prepared & Analyzed: 08/02/23**						
Nitrate as N	0.997	0.040	0.20	mg/l	1.00		100	90-110			
Nitrite as N	0.945	0.042	0.10	mg/l	1.00		94	90-110			
Matrix Spike (W3H0280-MS1)	**Source: 3G25006-04**				**Prepared & Analyzed: 08/02/23**						
Nitrate as N	2.13	0.040	0.20	mg/l	2.00	0.113	101	90-110			
Nitrite as N	0.969	0.042	0.10	mg/l	1.00	ND	97	90-110			
Matrix Spike (W3H0280-MS2)	**Source: 3G25006-01**				**Prepared & Analyzed: 08/02/23**						
Nitrate as N	2.08	0.040	0.20	mg/l	2.00	ND	104	90-110			
Nitrite as N	1.01	0.042	0.10	mg/l	1.00	ND	101	90-110			
Matrix Spike Dup (W3H0280-MSD1)	**Source: 3G25006-04**				**Prepared & Analyzed: 08/02/23**						
Nitrate as N	2.11	0.040	0.20	mg/l	2.00	0.113	100	90-110	0.9	20	
Nitrite as N	0.971	0.042	0.10	mg/l	1.00	ND	97	90-110	0.2	20	
Matrix Spike Dup (W3H0280-MSD2)	**Source: 3G25006-01**				**Prepared & Analyzed: 08/02/23**						
Nitrate as N	2.07	0.040	0.20	mg/l	2.00	ND	104	90-110	0.5	20	
Nitrite as N	1.01	0.042	0.10	mg/l	1.00	ND	101	90-110	0	20	
Batch: W3H0362 - SM 2540C											
Blank (W3H0362-BLK1)					**Prepared: 08/03/23 Analyzed: 08/04/23**						
Total Dissolved Solids	ND	4.0	10	mg/l							
LCS (W3H0362-BS1)					**Prepared: 08/03/23 Analyzed: 08/04/23**						
Total Dissolved Solids	812	4.0	10	mg/l	824		99	97-103			
Duplicate (W3H0362-DUP1)	**Source: 3G28003-01**				**Prepared: 08/03/23 Analyzed: 08/04/23**						
Total Dissolved Solids	110000	200	500	mg/l		109000			0.9	10	
Duplicate (W3H0362-DUP2)	**Source: 3H02016-01**				**Prepared: 08/03/23 Analyzed: 08/04/23**						
Total Dissolved Solids	2670	4.0	10	mg/l		2670			0.1	10	
Batch: W3H0363 - SM 2540C											
Blank (W3H0363-BLK1)					**Prepared: 08/03/23 Analyzed: 08/04/23**						

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W3H0363 - SM 2540C (Continued)											
Blank (W3H0363-BLK1)					**Prepared: 08/03/23 Analyzed: 08/04/23**						
Total Dissolved Solids	ND	4.0	10	mg/l							
LCS (W3H0363-BS1)					**Prepared: 08/03/23 Analyzed: 08/04/23**						
Total Dissolved Solids	804	4.0	10	mg/l	824		98	97-103			
Duplicate (W3H0363-DUP1)	**Source: 3H01044-01**				**Prepared: 08/03/23 Analyzed: 08/04/23**						
Total Dissolved Solids	22200	4.0	10	mg/l		22800			3	10	
Duplicate (W3H0363-DUP2)	**Source: 3H02016-02**				**Prepared: 08/03/23 Analyzed: 08/04/23**						
Total Dissolved Solids	3350	4.0	10	mg/l		3270			2	10	
Batch: W3H0451 - SM 2540D											
Blank (W3H0451-BLK1)					**Prepared: 08/04/23 Analyzed: 08/07/23**						
Total Suspended Solids	ND		1	mg/l							
LCS (W3H0451-BS1)					**Prepared: 08/04/23 Analyzed: 08/07/23**						
Total Suspended Solids	68.0		1	mg/l	63.6		107	90-110			
Duplicate (W3H0451-DUP1)	**Source: 3G31073-03**				**Prepared: 08/04/23 Analyzed: 08/07/23**						
Total Suspended Solids	100		1	mg/l		95.0			6	10	
Duplicate (W3H0451-DUP2)	**Source: 3G31079-02**				**Prepared: 08/04/23 Analyzed: 08/07/23**						
Total Suspended Solids	394		1	mg/l		362			8	10	
Batch: W3H0543 - SM 4500S2-D											
Blank (W3H0543-BLK1)					**Prepared & Analyzed: 08/07/23**						
Sulfide, Total	ND	0.050	0.10	mg/l							
LCS (W3H0543-BS1)					**Prepared & Analyzed: 08/07/23**						
Sulfide, Total	0.100	0.050	0.10	mg/l	0.100		100	90-110			
Duplicate (W3H0543-DUP1)	**Source: 3G07013-01**				**Prepared & Analyzed: 08/07/23**						
Sulfide, Total	1.50	0.15	0.30	mg/l		1.50			0	20	
Duplicate (W3H0543-DUP2)	**Source: 3G07013-02**				**Prepared & Analyzed: 08/07/23**						
Sulfide, Total	1.50	0.15	0.30	mg/l		1.50			0	20	
Duplicate (W3H0543-DUP3)	**Source: 3H03105-01**				**Prepared & Analyzed: 08/07/23**						
Sulfide, Total	0.400	0.050	0.10	mg/l		0.400			0	20	
Matrix Spike (W3H0543-MS1)	**Source: 3H03105-01**				**Prepared & Analyzed: 08/07/23**						
Sulfide, Total	0.600	0.050	0.10	mg/l	0.200	0.400	100	80-120			
Matrix Spike Dup (W3H0543-MSD1)	**Source: 3H03105-01**				**Prepared & Analyzed: 08/07/23**						
Sulfide, Total	0.600	0.050	0.10	mg/l	0.200	0.400	100	80-120	0	20	
Batch: W3H1190 - EPA 350.1											
Blank (W3H1190-BLK1)					**Prepared: 08/14/23 Analyzed: 08/15/23**						
Ammonia as N	ND	0.017	0.10	mg/l							
Blank (W3H1190-BLK2)					**Prepared: 08/14/23 Analyzed: 08/15/23**						
Ammonia as N	ND	0.017	0.10	mg/l							
LCS (W3H1190-BS2)					**Prepared: 08/14/23 Analyzed: 08/15/23**						

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W3H1190 - EPA 350.1 (Continued)											
LCS (W3H1190-BS2)					**Prepared: 08/14/23**	**Analyzed: 08/15/23**					
Ammonia as N	0.246	0.017	0.10	mg/l	0.250		98	90-110			
Matrix Spike (W3H1190-MS1)	**Source: 3H03058-03**				**Prepared: 08/14/23**	**Analyzed: 08/15/23**					
Ammonia as N	2.77	0.085	0.50	mg/l	1.25	1.56	96	90-110			
Matrix Spike (W3H1190-MS2)	**Source: 3H04055-07**				**Prepared: 08/14/23**	**Analyzed: 08/15/23**					
Ammonia as N	0.296	0.017	0.10	mg/l	0.250	0.0397	103	90-110			
Matrix Spike Dup (W3H1190-MSD1)	**Source: 3H03058-03**				**Prepared: 08/14/23**	**Analyzed: 08/15/23**					
Ammonia as N	2.77	0.085	0.50	mg/l	1.25	1.56	97	90-110	0.09	15	
Matrix Spike Dup (W3H1190-MSD2)	**Source: 3H04055-07**				**Prepared: 08/14/23**	**Analyzed: 08/15/23**					
Ammonia as N	0.294	0.017	0.10	mg/l	0.250	0.0397	102	90-110	0.9	15	
Batch: W3H1355 - EPA 351.2											
Blank (W3H1355-BLK1)					**Prepared: 08/15/23**	**Analyzed: 08/16/23**					
TKN	ND	0.065	0.10	mg/l							
Blank (W3H1355-BLK2)					**Prepared: 08/15/23**	**Analyzed: 08/16/23**					
TKN	ND	0.065	0.10	mg/l							
LCS (W3H1355-BS1)					**Prepared: 08/15/23**	**Analyzed: 08/16/23**					
TKN	0.900	0.065	0.10	mg/l	1.00		90	90-110			
LCS (W3H1355-BS2)					**Prepared: 08/15/23**	**Analyzed: 08/16/23**					
TKN	0.939	0.065	0.10	mg/l	1.00		94	90-110			
Matrix Spike (W3H1355-MS1)	**Source: 3H03106-01**				**Prepared: 08/15/23**	**Analyzed: 08/16/23**					
TKN	1.17	0.065	0.10	mg/l	1.00	0.179	99	90-110			
Matrix Spike (W3H1355-MS2)	**Source: 3H03106-02**				**Prepared: 08/15/23**	**Analyzed: 08/16/23**					
TKN	1.18	0.065	0.10	mg/l	1.00	0.202	98	90-110			
Matrix Spike Dup (W3H1355-MSD1)	**Source: 3H03106-01**				**Prepared: 08/15/23**	**Analyzed: 08/16/23**					
TKN	1.18	0.065	0.10	mg/l	1.00	0.179	100	90-110	0.9	10	
Matrix Spike Dup (W3H1355-MSD2)	**Source: 3H03106-02**				**Prepared: 08/15/23**	**Analyzed: 08/16/23**					
TKN	1.21	0.065	0.10	mg/l	1.00	0.202	101	90-110	3	10	
Batch: W3H1727 - EPA 365.3											
Blank (W3H1727-BLK1)					**Prepared: 08/18/23**	**Analyzed: 08/28/23**					
Phosphorus as P, Total	ND	0.0067	0.010	mg/l							
LCS (W3H1727-BS1)					**Prepared: 08/18/23**	**Analyzed: 08/28/23**					
Phosphorus as P, Total	0.198	0.0067	0.010	mg/l	0.200		99	90-110			
Matrix Spike (W3H1727-MS1)	**Source: 3G20007-01**				**Prepared: 08/18/23**	**Analyzed: 08/28/23**					
Phosphorus as P, Total	0.435	0.0067	0.010	mg/l	0.200	0.237	99	90-110			
Matrix Spike Dup (W3H1727-MSD1)	**Source: 3G20007-01**				**Prepared: 08/18/23**	**Analyzed: 08/28/23**					
Phosphorus as P, Total	0.443	0.0067	0.010	mg/l	0.200	0.237	103	90-110	2	20	

Quality Control Results

(Continued)

Metals by EPA 200 Series Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W3H0636 - EPA 200.7											
Blank (W3H0636-BLK1)					**Prepared: 08/08/23**	**Analyzed: 08/15/23**					
Aluminum, Dissolved	ND	0.041	0.050	mg/l							
Aluminum, Total	ND	0.022	0.050	mg/l							
LCS (W3H0636-BS1)					**Prepared: 08/08/23**	**Analyzed: 08/15/23**					
Aluminum, Dissolved	0.227	0.041	0.050	mg/l	0.200		113	85-115			
Aluminum, Total	0.227	0.022	0.050	mg/l	0.200		113	85-115			
Matrix Spike (W3H0636-MS1)	**Source: 3G25006-02**				**Prepared: 08/08/23**	**Analyzed: 08/15/23**					
Aluminum, Dissolved	0.333	0.041	0.050	mg/l	0.200	0.0850	124	70-130			
Aluminum, Total	0.333	0.022	0.050	mg/l	0.200	0.0970	118	70-130			
Matrix Spike (W3H0636-MS2)	**Source: 3H01084-01**				**Prepared: 08/08/23**	**Analyzed: 08/15/23**					
Aluminum, Dissolved	0.238	0.041	0.050	mg/l	0.200	ND	119	70-130			
Aluminum, Total	0.238	0.022	0.050	mg/l	0.200	ND	119	70-130			
Matrix Spike Dup (W3H0636-MSD1)	**Source: 3G25006-02**				**Prepared: 08/08/23**	**Analyzed: 08/15/23**					
Aluminum, Dissolved	0.339	0.041	0.050	mg/l	0.200	0.0850	127	70-130	2	30	
Aluminum, Total	0.339	0.022	0.050	mg/l	0.200	0.0970	121	70-130	2	30	
Matrix Spike Dup (W3H0636-MSD2)	**Source: 3H01084-01**				**Prepared: 08/08/23**	**Analyzed: 08/15/23**					
Aluminum, Dissolved	0.240	0.041	0.050	mg/l	0.200	ND	120	70-130	0.8	30	
Aluminum, Total	0.240	0.022	0.050	mg/l	0.200	ND	120	70-130	0.8	30	

Notes and Definitions

Item	Definition
J	Estimated conc. detected <MRL and >MDL.
M-02	Due to the nature of matrix interferences, sample was diluted prior to preparation. The MDL and MRL were raised due to the dilution.
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

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

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

Chain of Custody & Sample Information Record

3G25006

Client: WSP USA E&I Inc.
Contact: John Rudolph
Phone No. 858-243-8158

Project Name: LECL TMDL Monitoring
Email: john.rudolph@woodplc.com
Project Number: 2315100200.0004.WECK
PO#: C016900152
GL Code: 573000
Org# 3151

Turn Around Time: Routine *3-5 Day Rush *48 Hour Rush *24 Hour Rush
Lab TAT Approval: By:
*Additional Charges May Apply

Additional Reporting Requests
Include QC Data Package: ☐Yes ☐ No
FAX Results: ☐Yes ☐ No
Email Results: ☐Yes ☐ No
State EDT: ☐Yes ☐ No
(Include Source Number in Notes)

Sampler Information

Name: Nick Jernack
Employer: WSP USA E&I Inc.
Signature:

Sample ID	Date	Time	Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	NaOH/ZnAcetate	NH4Cl	MCAA	Frozen	Total # of Containers	Routine	Resample	Special	TSS	Nitrate - Nitrite (EPA 353.2)	TDS (SM2540 C)	TKN (EPA 351.2	Ammonia (EPA 350.1)	Total Phosphorus (EPA 365.3)	SRP/Ortho-P (EPA 365.3)	Total Sulfide (SM4500S)	Total AL (EPA 200.7)	Dissolved AL (EPA 200.7)	Matrix	Notes
			# of Containers & Preservatives											Sample Type			Analysis Requested											
CL07	8/1/23	1100															X	X	X	X	X	X	X	X	X	X		
CL08	↓	1015															X	X	X	X	X	X	X	X	X	X		
CL09		0915															X	X	X	X	X	X	X	X	X	X		
CL10		0840															X	X	X	X	X	X	X	X	X	X		
LE02		1018																X	X	X	X	X	X	X				

Matrix
DW = Drinking Water
WW = Wastewater
GW = Groundwater
S = Soil
SG = Sludge
L = Liquid
M = Miscellaneous

Notes
Ortho-P is field filtered (0.45 um)

Dissolved Al is field filtered (0.45 um)

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company
	Nick Jernack / WSP	8/1/23 - 1345		RMS
SAM	RMS	8/1/23	Jamin	08/01/23 17:10

(For Lab Use Only) **Sample Integrity Upon Receipt**

Sample(s) Submitted on Ice? [✓ Yes] No
Custody Seal(s) Intact? Yes [✓ No] N/A
Sample(s) Intact? [✓ Yes] No

Temperature 2.0 °C
☐ Cooler Blank

Lab Notes
Ice1

Lab No. ______

Page 1 of 1

WECK LABORATORIES, INC.

Sample Receipt Checklist

Weck WKO: **3G25006**
WKO Logged by: Lester Abad
Samples Checked by: Lester Abad

Date/Time Received: 08/01/23 @ 17:20
# of Samples: 05
Delivered by: Client

	Task	Yes	No	N/A	Comments
COC	COC present at receipt?	☒	☐		
	COC properly completed?	☒	☐		
	COC matches sample labels?	☒	☐		
	Project Manager notified about COC discrepancy?	☐	☐	☒	
Receipt Information	Sample Temperature	2°C			
	Samples received on ice?	☒	☐		
	Ice Type (Blue/Wet)	Wet			
	All samples intact?	☒	☐		
	Samples in proper containers?	☒	☐		
	Sufficient sample volume?	☒	☐		
	Samples intact?	☒	☐		
	Received within holding time?	☐	☐		
	Project Manager notified about receipt info?	☐	☐	☒	
Sample Preservation Verification?	Sample labels checked for correct preservation?	☒	☐	☐	
	VOC Headspace: (No) none, If Yes (see comment) 524.2, 524.3, 624.1, 8260, 1666 P/T, LUFT	☐	☐	☒	☐<6mm/Pea Size?
	pH verified upon receipt? Metals <2; H2SO4 pres tests <2; 522<4; TOC <2; 508.1, 525.2<2, 6710B<2, 608.3 5-9	☒	☐	☐	pH paper Lot#
	Free Chlorine Tested <0.1 (Organics Analyses)	☐	☐	☒	Cl Test Strip Lot#
	O&G pH <2 verified?	☐	☐	☐	pH paper Lot# pH Reading:
	pH adjusted for O&G	☐	☐	☐	Acid Lot# Amt added:
	Project Manager notified about sample preservation?	☐	☐	☐	

PM Comments

Sample Receipt Checklist Completed by:

Signature: Lester Abad

Date: 08/01/23

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

September 18, 2023

John D. Rudolph
WSP USA
9177 Sky Park Court
San Diego, CA 92123-

Project Name: LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C014105479 GL Code 57300 Org # 3151
Physis Project ID: 2302004-011

Dear John,

Enclosed are the analytical results for samples submitted to PHYSIS Environmental Laboratories, Inc. (PHYSIS) on 8/3/2023. A total of 10 samples were received for analysis in accordance with the attached chain of custody (COC). Per the COC, the samples were analyzed for:

Conventionals
Chlorophyll-a (mg/m3) by SM 10200 H

Analytical results in this report apply only to samples submitted to PHYSIS in accordance with the COC and are intended to be considered in their entirety.

Please feel free to contact me at any time with any questions. PHYSIS appreciates the opportunity to provide you with our analytical and support services.

Regards,

Misty Mercier
714 602-5320
Extension 202
mistymercier@physislabs.com

PROJECT SAMPLE LIST

WSP USA PHYSIS Project ID: 2302004-011

LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C014105479 Total Samples: 10

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
109229	CL07 - Int		8/1/2023	11:00	Biologic	Not Specified
109230	CL07 - Surf		8/1/2023	11:15	Biologic	Not Specified
109231	CL08 - Int		8/1/2023	10:15	Biologic	Not Specified
109232	CL08 - Surf		8/1/2023	10:30	Biologic	Not Specified
109233	CL09 - Int		8/1/2023	9:15	Biologic	Not Specified
109234	CL09 - Surf		8/1/2023	9:30	Biologic	Not Specified
109235	CL10 - Int		8/1/2023	8:40	Biologic	Not Specified
109236	CL10 - Surf		8/1/2023	8:45	Biologic	Not Specified
109237	LE02 - Int		8/1/2023	10:18	Biologic	Not Specified
109238	LE02 - Surf		8/1/2023	10:50	Biologic	Not Specified

ABBREVIATIONS and ACRONYMS

QM	Quality Manual
QA	Quality Assurance
QC	Quality Control
MDL	method detection limit
RL	reporting limit
R1	project sample
R2	project sample replicate
MS1	matrix spike
MS2	matrix spike replicate
B1	procedural blank
B2	procedural blank replicate
BS1	blank spike
BS2	blank spike replicate
LCS1	laboratory control spike
LCS2	laboratory control spike replicate
LCM1	laboratory control material
LCM2	laboratory control material replicate
CRM1	certified reference material
CRM2	certified reference material replicate
RPD	relative percent difference
LMW	low molecular weight
HMW	high molecular weight

QUALITY ASSURANCE SUMMARY

LABORATORY BATCH: Physis' QM defines a laboratory batch as a group of 20 or fewer project samples of similar matrix, processed together under the same conditions and with the same reagents. QC samples are associated with each batch and were used to assess the validity of the sample analyses.

PROCEDURAL BLANK: Laboratory contamination introduced during method use is assessed through the preparation and analysis of procedural blanks is provided at a minimum frequency of one per batch.

ACCURACY: Accuracy of analytical measurements is the degree of closeness based on percent recovery calculations between measured values and the actual or true value and includes a combination of reproducibility error and systematic bias due to sampling and analytical operations. Accuracy of the project data was indicated by analysis of MS, BS, LCS, LCM, CRM, and/or surrogate spikes on a minimum frequency of one per batch. Physis' QM requires that 95% of the target compounds greater than 10 times the MDL be within the specified acceptance limits.

PRECISION: Precision is the agreement among a set of replicate measurements without assumption of knowledge of the true value and is based on RPD calculations between repeated values. Precision of the project data was determined by analysis of replicate MS1/MS2, BS1/BS2, LCS1/LCS2, LCM1/LCM2, CRM1/CRM2, surrogate spikes and/or replicate project sample analysis (R1/R2) on a minimum frequency of one per batch. Physis' QM requires that for 95% of the compounds greater than 10 times the MDL, the percent RPD should be within the specified acceptance range.

BLANK SPIKES: BS is the introduction of a known concentration of analyte into the procedural blank. BS demonstrates performance of the preparation and analytical methods on a clean matrix void of potential matrix related interferences. The BS is performed in laboratory deionized water, making these recoveries a better indicator of the efficiency of the laboratory method per se.

MATRIX SPIKES: MS is the introduction of a known concentration of analyte into a sample. MS samples demonstrate the effect a particular project sample matrix has on the accuracy of a measurement. Individually, MS samples also indicate the bias of analytical measurements due to chemical interferences inherent in the in the specific project sample spiked. Intrinsic target analyte concentration in the specific project sample can also significantly impact MS recovery.

CERTIFIED REFERENCE MATERIALS: CRMs are materials of various matrices for which analytical information has been determined and certified by a recognized authority. These are used to provide a quantitative assessment of the accuracy of an analytical method. CRMs provide evidence that the laboratory preparation and analysis produces results that are comparable to those obtained by an independent organization.

LABORATORY CONTROL MATERIAL: LCM is provided because a suitable natural seawater CRM is not available and can be used to indicate accuracy of the method. Physis' internal LCM is seawater collected at ~800 meters in the Southern California San Pedro Basin and can be used as a reference for background concentrations in clean, natural seawater for comparison to project samples.

LABORATORY CONTROL SPIKES: LCS is the introduction of a known concentration of analyte into Physis' LCM. LCS samples were employed to assess the effect the seawater matrix has on the accuracy of a measurement. LCS also indicate the bias of this method due to chemical interferences inherent in the in the seawater matrix. Intrinsic LCM concentration can also significantly impact LCS recovery.

SURROGATES: A surrogate is a pure analyte unlikely to be found in any project sample, behaves similarly to

the target analyte and most often used with organic analytical procedures. Surrogates are added in known concentration to all samples and are measured to indicate overall efficiency of the method including processing and analyses.

HOLDING TIME: Method recommended holding times are the length of time a project sample can be stored under specific conditions after collection and prior to analysis without significantly affecting the analyte's concentration. Holding times can be extended if preservation techniques are employed to reduce biodegradation, volatilization, oxidation, sorption, precipitation, and other physical and chemical processes.

SAMPLE STORAGE/RETENTION: In order to maintain chemical integrity prior to analysis, all samples submitted to Physis are refrigerated (liquids) or frozen (solids) upon receipt unless otherwise recommended by applicable methods. Solid samples are retained for 1 year from collection while liquid samples are retained until method recommended holding times elapse.

TOTAL/DISSOLVED FRACTION: In some instances, the results for the dissolved fraction may be higher than the total fraction for a particular analyte (e.g. trace metals). This is typically caused by the analytical variation for each result and indicates that the target analyte is primarily in the dissolved phase, within the sample.

PHYSIS QUALIFIER CODES

CODE	*DEFINITION*
#	see Case Narrative
ND	analyte not detected at or above the MDL
B	analyte was detected in the procedural blank greater than 10 times the MDL
E	analyte concentration exceeds the upper limit of the linear calibration range, reported value is estimated
H	sample received and/or analyzed past the recommended holding time
J	analyte was detected at a concentration below the RL and above the MDL, reported value is estimated
N	insufficient sample, analysis could not be performed
M	analyte was outside the specified accuracy and/or precision acceptance limits due to matrix interference. The associated B/BS were within limits, therefore the sample data was reported without further clarification
SH	analyte concentration in the project sample exceeded the spike concentration, therefore accuracy and/or precision acceptance limits do not apply
SL	analyte results were lower than 10 times the MDL, therefore accuracy and/or precision acceptance limits do not apply
NH	project sample was heterogeneous and sample homogeneity could not be readily achieved using routine laboratory practices, therefore accuracy and/or precision acceptance limits do not apply
Q	analyte was outside the specified QAPP acceptance limits for precision and/or accuracy but within Physis derived acceptance limits, therefore the sample data was reported without further clarification
R	Physis' QM allows for 5% of the target compounds greater than 10 times the MDL to be outside the specified acceptance limits for precision and/or accuracy. This is often due to random error and does not indicate any significant problems with the analysis of these project samples

ANALYTICAL

REPORT

PHYSIS Project ID: 2302004-011
Client: WSP USA
Project: LECL TMDL Monitoring Project # 2315100200.0004.PHY

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 109229-R1	**CL07 - Int**		**Matrix: Biologic**				**Sampled:**	**01-Aug-23 11:00**		**Received:**	**03-Aug-23**
Chlorophyll-a	SM 10200 H	mg/m3	25.1	1	1	2	NA		C-75006	29-Aug-23	29-Aug-23
Sample ID: 109230-R1	**CL07 - Surf**		**Matrix: Biologic**				**Sampled:**	**01-Aug-23 11:15**		**Received:**	**03-Aug-23**
Chlorophyll-a	SM 10200 H	mg/m3	11.8	1	1	2	NA		C-75006	29-Aug-23	29-Aug-23
Sample ID: 109231-R1	**CL08 - Int**		**Matrix: Biologic**				**Sampled:**	**01-Aug-23 10:15**		**Received:**	**03-Aug-23**
Chlorophyll-a	SM 10200 H	mg/m3	33.8	1	1	2	NA		C-75006	29-Aug-23	29-Aug-23
Sample ID: 109232-R1	**CL08 - Surf**		**Matrix: Biologic**				**Sampled:**	**01-Aug-23 10:30**		**Received:**	**03-Aug-23**
Chlorophyll-a	SM 10200 H	mg/m3	14.4	1	1	2	NA		C-75006	29-Aug-23	29-Aug-23
Sample ID: 109233-R1	**CL09 - Int**		**Matrix: Biologic**				**Sampled:**	**01-Aug-23 9:15**		**Received:**	**03-Aug-23**
Chlorophyll-a	SM 10200 H	mg/m3	64.8	1	1	2	NA		C-75006	29-Aug-23	29-Aug-23
Sample ID: 109234-R1	**CL09 - Surf**		**Matrix: Biologic**				**Sampled:**	**01-Aug-23 9:30**		**Received:**	**03-Aug-23**
Chlorophyll-a	SM 10200 H	mg/m3	10.6	1	1	2	NA		C-75006	29-Aug-23	29-Aug-23
Sample ID: 109235-R1	**CL10 - Int**		**Matrix: Biologic**				**Sampled:**	**01-Aug-23 8:40**		**Received:**	**03-Aug-23**
Chlorophyll-a	SM 10200 H	mg/m3	9.61	1	1	2	NA		C-75006	29-Aug-23	29-Aug-23
Sample ID: 109236-R1	**CL10 - Surf**		**Matrix: Biologic**				**Sampled:**	**01-Aug-23 8:45**		**Received:**	**03-Aug-23**
Chlorophyll-a	SM 10200 H	mg/m3	11.8	1	1	2	NA		C-75006	29-Aug-23	29-Aug-23
Sample ID: 109237-R1	**LE02 - Int**		**Matrix: Biologic**				**Sampled:**	**01-Aug-23 10:18**		**Received:**	**03-Aug-23**
Chlorophyll-a	SM 10200 H	mg/m3	91	1	1	2	NA		C-75006	29-Aug-23	29-Aug-23
Sample ID: 109238-R1	**LE02 - Surf**		**Matrix: Biologic**				**Sampled:**	**01-Aug-23 10:50**		**Received:**	**03-Aug-23**
Chlorophyll-a	SM 10200 H	mg/m3	125	1	1	2	NA		C-75006	29-Aug-23	29-Aug-23

QUALITY CONTROL REPORT

Conventionals

QUALITY CONTROL REPORT

Chlorophyll-a **Method:** SM 10200 H **Fraction:** NA **Prepared:** 29-Aug-23 **Analyzed:** 29-Aug-23

SAMPLE ID		BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS		QA CODE
109228-B1	QAQC Procedural Blank	C-75006	ND	1	1	2	mg/m3									
109228-BS1	QAQC Procedural Blank	C-75006	37400	1	1	2	mg/m3	44200	0	85	70 - 130%	PASS				
109228-BS2	QAQC Procedural Blank	C-75006	37400	1	1	2	mg/m3	44200	0	85	70 - 130%	PASS	0	30	PASS	

CHAIN OF CUSTODY

Chain of Custody & Sample Information Record

Client:	WSP USA E&I Inc.	**Contact:** John Rudolph		**Phone No.**	858-243-8158
Project Name:	**LECL TMDL Monitoring**	**Email:**	john.rudolph@wsp.com		
Project Number:	2315100200.0004.PHYSIS				
PO#:	C014105479	**Turn Around Time:**	Routine	*3-5 Day Rush	*48 Hour Rush / *24 Hour Rush
GL Code:	57300				
Org#	3151	***Lab TAT Approval:**	By:	*Additional Charges May Apply	

Additional Reporting Requests

Include QC Data Package: ___Yes ☐ No
FAX Results: ___Yes ☐ No
Email Results: ___Yes ☐ No
State EDT: ___Yes ☐ No
(Include Source Number in Notes)

Sampler Information

Name: Nicholas Jernack
Employer: WSP USA
Signature:

Matrix

DW = Drinking Water
WW = Wastewater
GW = Groundwater
S = Soil
SG = Sludge
L = Liquid
M = Miscellaneous

Notes

Chl-a samples on 0.7 um GFF

			# of Containers & Preservatives											Sample Type			Analysis Requested									
Sample ID	**Date**	**Time**	Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	NaOH/ZnAcetate	NH4Cl	MCAA	Frozen	**Total # of Containers**	*Routine*	*Resample*	*Special*	Total Sulfide	*Nitrate - Nitrite*	TDS	TKN	Ammonia	Total Phosphorus	SRP/Ortho-P	Chlorophyll-a (SM10200 H	**Matrix**	**Notes**
CL07 - Int	8/1/23	1100																						X		Filter Volume: 500 mL
CL07 - Surf	8/1/23	1115																						X		Filter Volume: 500 mL
CL08 - Int	8/1/23	1015																						X		Filter Volume: 450 mL
CL08 - Surf	8/1/23	1030																						X		Filter Volume: 500 mL
CL09 - Int	8/1/23	915																						X		Filter Volume: 375 mL
CL09 - Surf	8/1/23	930																						X		Filter Volume: 480 mL
CL10 - Int	8/1/23	840																						X		Filter Volume: 500 mL
CL10 - Surf	8/1/23	845																						X		Filter Volume: 500 mL
LE02 - Int	8/1/23	1018																						X		Filter Volume: 220 mL
LE02 - Surf	8/1/23	1050																						X		Filter Volume: 255 mL

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company
	Nick Jernack - WSP	8/2/2023 - 1600		Richard Hanken Physis
				8/3/23 920

(For Lab Use Only)	**Sample Integrity Upon Receipt**				**Lab Notes**
	Sample(s) Submitted on Ice?	**Yes**	**No**		**Temperature**
	Custody Seal(s) Intact?	**Yes**	**No**	**N/A**	**°C**
	Sample(s) Intact?	**Yes**	**No**		☐ **Cooler Blank**

Lab No. ____________

Page 1 **of** 1

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

Sample Receipt Summary

PHYSIS
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

Project Iteration ID:	2302004-011
Client Name:	WSP USA
Project Name:	LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C014105479 GL Code 57300 Org # 3151
COC Page Number:	2 of 2
Bottle Label Color:	NA

Receiving Info

1. Initials Received By: RGH
2. Date Received: 8/3/23
3. Time Received: 920
4. Client Name: WSP
5. Courier Information: (Please circle)
   - Client
   - [✓ FedEx]
   - UPS
   - GSO/GLS
   - Area Fast
   - Ontrac
   - DRS
   - PAMS
   - PHYSIS Driver:
     - i. Start Time: ________
     - ii. End Time: ________
     - iii. Total Mileage: ________
     - iv. Number of Pickups: ________
6. Container Information: (Please put the # of containers or circle none)
   - 1 Cooler
   - __ Styrofoam Cooler
   - __ Boxes
   - None
   - __ Carboy(s)
   - __ Carboy Trash Can(s)
   - __ Carboy Cap(s)
   - Other ______
7. What type of ice was used: (Please circle any that apply)
   - Wet Ice
   - [✓ Blue Ice]
   - Dry Ice
   - Water
   - None
8. Randomly Selected Samples Temperature (°C): 23.2 Used I/R Thermometer # 1-2

Inspection Info

1. Initials Inspected By: EG

Sample Integrity Upon Receipt:

1. COC(s) included and completely filled out........ [✓ Yes] / No
2. All sample containers arrived intact........ [✓ Yes] / No
3. All samples listed on COC(s) are present........ [✓ Yes] / No
4. Information on containers consistent with information on COC(s)........ [✓ Yes] / No
5. Correct containers and volume for all analyses indicated........ [✓ Yes] / No
6. All samples received within method holding time........ [✓ Yes] / No
7. Correct preservation used for all analyses indicated........ Yes / [✓ No]
8. Name of sampler included on COC(s)........ [✓ Yes] / No

Notes:

See temp

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders: 3I20082

Project: LECL TMDL Monitoring

Attn: John Rudolph

Client: WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Report Date: 10/09/2023

Received Date: 09/20/2023

Turnaround Time: Normal

Phones: (858) 514-6465

Fax: (858) 278-5300

P.O. #: C016900152

Billing Code: Prjct 2315100200.0004.WECK,GL Code 573000,Org#3151

ELAP-CA #1132 • EPA-UCMR #CA00211 • LACSD #10143

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

Dear John Rudolph,

Enclosed are the results of analyses for samples received 9/20/23 with the Chain-of-Custody document. The samples were received in good condition, at 3.3 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Kim Tu

Kim G. Tu
Project Manager

WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: LECL TMDL Monitoring

Project Manager: John Rudolph

Reported:
10/09/2023 16:53

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
LE02	Nicholas Jernack	3I20082-01	Water	09/20/23 08:55	

Sample Results

Sample: LE02
3I20082-01 (Water)

Sampled: 09/20/23 8:55 by Nicholas Jernack

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W3I1830 **Preparation:** _NONE (WETCHEM)			**Prepared:** 09/22/23 10:24				**Analyst:** aec
Ammonia as N	**0.38**	0.017	0.10	mg/l	1	09/28/23	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W3I2466 **Preparation:** _NONE (WETCHEM)			**Prepared:** 09/29/23 10:40				**Analyst:** AEC
TKN	**4.3**	0.065	0.10	mg/l	1	10/03/23	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W3I1712 **Preparation:** _NONE (WETCHEM)			**Prepared:** 09/21/23 11:00				**Analyst:** ISM
Nitrate as N	ND	0.040	0.20	mg/l	1	09/21/23 12:45	
Nitrite as N	**0.054**	0.042	0.10	mg/l	1	09/21/23 12:45	J
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3I1651 **Preparation:** _NONE (WETCHEM)			**Prepared:** 09/20/23 15:57				**Analyst:** JSG
o-Phosphate as P	**0.011**	0.0071	0.010	mg/l	1	09/20/23 17:01	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3J0072 **Preparation:** _NONE (WETCHEM)			**Prepared:** 10/02/23 13:49				**Analyst:** JSG
Phosphorus as P, Total	**0.26**	0.0067	0.010	mg/l	1	10/05/23	
Method: SM 2540C			**Instr:** _ANALYST				
Batch ID: W3I1660 **Preparation:** _NONE (WETCHEM)			**Prepared:** 09/20/23 18:06				**Analyst:** bel
Total Dissolved Solids	**1900**	4.0	10	mg/l	1	09/21/23	
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W3I2114 **Preparation:** _NONE (WETCHEM)			**Prepared:** 09/26/23 14:59				**Analyst:** ymt
Sulfide, Total	ND	0.050	0.10	mg/l	1	09/27/23	

WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: LECL TMDL Monitoring

Project Manager: John Rudolph

Reported:
10/09/2023 16:53

Quality Control Results

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W3I1651 - EPA 365.3											
Blank (W3I1651-BLK1)					**Prepared & Analyzed: 09/20/23**						
o-Phosphate as P	ND	0.0071	0.010	mg/l							
LCS (W3I1651-BS1)					**Prepared & Analyzed: 09/20/23**						
o-Phosphate as P	0.193	0.0071	0.010	mg/l	0.200		96	88-111			
Matrix Spike (W3I1651-MS1)	**Source: 3I19077-01**				**Prepared & Analyzed: 09/20/23**						
o-Phosphate as P	0.316	0.0071	0.010	mg/l	0.200	0.118	99	85-112			
Matrix Spike Dup (W3I1651-MSD1)	**Source: 3I19077-01**				**Prepared & Analyzed: 09/20/23**						
o-Phosphate as P	0.320	0.0071	0.010	mg/l	0.200	0.118	101	85-112	1	20	
Batch: W3I1660 - SM 2540C											
Blank (W3I1660-BLK1)					**Prepared: 09/20/23 Analyzed: 09/21/23**						
Total Dissolved Solids	ND	4.0	10	mg/l							
LCS (W3I1660-BS1)					**Prepared: 09/20/23 Analyzed: 09/21/23**						
Total Dissolved Solids	825	4.0	10	mg/l	824		100	97-103			
Duplicate (W3I1660-DUP1)	**Source: 3I20115-04**				**Prepared: 09/20/23 Analyzed: 09/21/23**						
Total Dissolved Solids	6730	4.0	10	mg/l		6780			0.8	10	
Duplicate (W3I1660-DUP2)	**Source: 3I19124-01**				**Prepared: 09/20/23 Analyzed: 09/21/23**						
Total Dissolved Solids	3530	4.0	10	mg/l		3450			2	10	
Batch: W3I1712 - EPA 353.2											
Blank (W3I1712-BLK1)					**Prepared & Analyzed: 09/21/23**						
Nitrate as N	ND	0.040	0.20	mg/l							
Nitrite as N	ND	0.042	0.10	mg/l							
LCS (W3I1712-BS1)					**Prepared & Analyzed: 09/21/23**						
Nitrate as N	0.937	0.040	0.20	mg/l	1.00		94	90-110			
Nitrite as N	1.07	0.042	0.10	mg/l	1.00		107	90-110			
Matrix Spike (W3I1712-MS1)	**Source: 3I08004-01**				**Prepared & Analyzed: 09/21/23**						
Nitrate as N	5.44	0.040	0.20	mg/l	2.00	3.60	92	90-110			
Matrix Spike (W3I1712-MS2)	**Source: 3I20029-01**				**Prepared & Analyzed: 09/21/23**						
Nitrate as N	5.07	0.040	0.20	mg/l	2.00	3.13	97	90-110			
Nitrite as N	1.00	0.042	0.10	mg/l	1.00	ND	100	90-110			
Matrix Spike (W3I1712-MS3)	**Source: 3I08004-01**				**Prepared & Analyzed: 09/21/23**						
Nitrite as N	4.84	0.21	0.50	mg/l	5.00	ND	97	90-110			
Matrix Spike Dup (W3I1712-MSD1)	**Source: 3I08004-01**				**Prepared & Analyzed: 09/21/23**						
Nitrate as N	5.43	0.040	0.20	mg/l	2.00	3.60	92	90-110	0.2	20	
Matrix Spike Dup (W3I1712-MSD2)	**Source: 3I20029-01**				**Prepared & Analyzed: 09/21/23**						
Nitrate as N	4.99	0.040	0.20	mg/l	2.00	3.13	93	90-110	2	20	
Nitrite as N	1.01	0.042	0.10	mg/l	1.00	ND	101	90-110	1	20	
Matrix Spike Dup (W3I1712-MSD3)	**Source: 3I08004-01**				**Prepared & Analyzed: 09/21/23**						
Nitrite as N	4.84	0.21	0.50	mg/l	5.00	ND	97	90-110	0.1	20	

WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: LECL TMDL Monitoring

Project Manager: John Rudolph

Reported:
10/09/2023 16:53

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W3I1830 - EPA 350.1											
Blank (W3I1830-BLK1)					**Prepared: 09/22/23**	**Analyzed: 09/28/23**					
Ammonia as N	ND	0.017	0.10	mg/l							
Blank (W3I1830-BLK2)					**Prepared: 09/22/23**	**Analyzed: 09/28/23**					
Ammonia as N	ND	0.017	0.10	mg/l							
LCS (W3I1830-BS1)					**Prepared: 09/22/23**	**Analyzed: 09/28/23**					
Ammonia as N	0.252	0.017	0.10	mg/l	0.250		101	90-110			
LCS (W3I1830-BS2)					**Prepared: 09/22/23**	**Analyzed: 09/28/23**					
Ammonia as N	0.246	0.017	0.10	mg/l	0.250		98	90-110			
Matrix Spike (W3I1830-MS1)	**Source: 3I20093-01**				**Prepared: 09/22/23**	**Analyzed: 09/28/23**					
Ammonia as N	3.54	0.085	0.50	mg/l	1.25	2.35	95	90-110			
Matrix Spike (W3I1830-MS2)	**Source: 3I20093-02**				**Prepared: 09/22/23**	**Analyzed: 09/28/23**					
Ammonia as N	3.46	0.085	0.50	mg/l	1.25	2.28	95	90-110			
Matrix Spike Dup (W3I1830-MSD1)	**Source: 3I20093-01**				**Prepared: 09/22/23**	**Analyzed: 09/28/23**					
Ammonia as N	3.52	0.085	0.50	mg/l	1.25	2.35	94	90-110	0.5	15	
Matrix Spike Dup (W3I1830-MSD2)	**Source: 3I20093-02**				**Prepared: 09/22/23**	**Analyzed: 09/28/23**					
Ammonia as N	3.48	0.085	0.50	mg/l	1.25	2.28	96	90-110	0.4	15	
Batch: W3I2114 - SM 4500S2-D											
Blank (W3I2114-BLK1)					**Prepared: 09/26/23**	**Analyzed: 09/27/23**					
Sulfide, Total	ND	0.050	0.10	mg/l							
LCS (W3I2114-BS1)					**Prepared: 09/26/23**	**Analyzed: 09/27/23**					
Sulfide, Total	0.100	0.050	0.10	mg/l	0.100		100	90-110			
Duplicate (W3I2114-DUP1)	**Source: 3I20082-01**				**Prepared: 09/26/23**	**Analyzed: 09/27/23**					
Sulfide, Total	ND	0.050	0.10	mg/l		ND				20	
Matrix Spike (W3I2114-MS1)	**Source: 3I21056-01**				**Prepared: 09/26/23**	**Analyzed: 09/27/23**					
Sulfide, Total	0.200	0.050	0.10	mg/l	0.200	ND	100	80-120			
Matrix Spike Dup (W3I2114-MSD1)	**Source: 3I21056-01**				**Prepared: 09/26/23**	**Analyzed: 09/27/23**					
Sulfide, Total	0.200	0.050	0.10	mg/l	0.200	ND	100	80-120	0	20	
Batch: W3I2466 - EPA 351.2											
Blank (W3I2466-BLK1)					**Prepared: 09/29/23**	**Analyzed: 10/03/23**					
TKN	ND	0.065	0.10	mg/l							
Blank (W3I2466-BLK2)					**Prepared: 09/29/23**	**Analyzed: 10/03/23**					
TKN	ND	0.065	0.10	mg/l							
LCS (W3I2466-BS1)					**Prepared: 09/29/23**	**Analyzed: 10/03/23**					
TKN	1.00	0.065	0.10	mg/l	1.00		100	90-110			
LCS (W3I2466-BS2)					**Prepared: 09/29/23**	**Analyzed: 10/03/23**					
TKN	0.967	0.065	0.10	mg/l	1.00		97	90-110			
Duplicate (W3I2466-DUP1)	**Source: 3I25066-01**				**Prepared: 09/29/23**	**Analyzed: 10/03/23**					
TKN	ND	0.065	0.10	mg/l		ND				10	

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W3I2466 - EPA 351.2 (Continued)											
Matrix Spike (W3I2466-MS1)	**Source: 3I20064-04**				**Prepared: 09/29/23**	**Analyzed: 10/03/23**					
TKN	0.974	0.065	0.10	mg/l	1.00	0.0763	90	90-110			
Matrix Spike (W3I2466-MS2)	**Source: 3I22083-01**				**Prepared: 09/29/23**	**Analyzed: 10/03/23**					
TKN	1.98	0.065	0.10	mg/l	1.00	0.942	103	90-110			
Matrix Spike Dup (W3I2466-MSD1)	**Source: 3I20064-04**				**Prepared: 09/29/23**	**Analyzed: 10/03/23**					
TKN	0.998	0.065	0.10	mg/l	1.00	0.0763	92	90-110	3	10	
Matrix Spike Dup (W3I2466-MSD2)	**Source: 3I22083-01**				**Prepared: 09/29/23**	**Analyzed: 10/03/23**					
TKN	1.98	0.065	0.10	mg/l	1.00	0.942	104	90-110	0.2	10	
Batch: W3J0072 - EPA 365.3											
Blank (W3J0072-BLK1)					**Prepared: 10/02/23**	**Analyzed: 10/05/23**					
Phosphorus as P, Total	ND	0.0067	0.010	mg/l							
LCS (W3J0072-BS1)					**Prepared: 10/02/23**	**Analyzed: 10/05/23**					
Phosphorus as P, Total	0.201	0.0067	0.010	mg/l	0.200		100	90-110			
Matrix Spike (W3J0072-MS1)	**Source: 3I20009-01**				**Prepared: 10/02/23**	**Analyzed: 10/05/23**					
Phosphorus as P, Total	0.309	0.0067	0.010	mg/l	0.200	0.0990	105	90-110			
Matrix Spike Dup (W3J0072-MSD1)	**Source: 3I20009-01**				**Prepared: 10/02/23**	**Analyzed: 10/05/23**					
Phosphorus as P, Total	0.300	0.0067	0.010	mg/l	0.200	0.0990	100	90-110	3	20	

WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: LECL TMDL Monitoring

Project Manager: John Rudolph

Reported:
10/09/2023 16:53

Notes and Definitions

Item	Definition
J	Estimated conc. detected <MRL and >MDL.
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

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

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

Chain of Custody & Sample Information Record

3I20082

Client: WSP USA E&I Inc.
Contact: John Rudolph
Phone No. 858-243-8158

Project Name: LECL TMDL Monitoring
Email: john.rudolph@wsp.com
Project Number: 2315100200.0004.WECK
PO#: C016900152
GL Code: 573000
Org# 3151

Turn Around Time: Routine *3-5 Day Rush *48 Hour Rush *24 Hour Rush
Lab TAT Approval: By:
*Additional Charges May Apply

Additional Reporting Requests
Include QC Data Package: ☐Yes ☐ No
FAX Results: ☐Yes ☐ No
Email Results: ☐Yes ☐ No
State EDT: ☐Yes ☐ No
(Include Source Number in Notes)

Sampler Information

Name: Nick Jernack
Employer: WSP USA E&I Inc.
Signature:

Matrix
DW = Drinking Water
WW = Wastewater
GW = Groundwater
S = Soil
SG = Sludge
L = Liquid
M = Miscellaneous

Notes
Ortho-P is field filtered.

please include all red codes on invoices

			# of Containers & Preservatives												Sample Type			Analysis Requested											
Sample ID	Date	Time	Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	NaOH/ZnAcetate	NH4Cl	MCAA	Frozen		Total # of Containers	*Routine*	*Resample*	*Special*	TSS	Nitrate - Nitrite (EPA 353.2)	TDS (SM2540 C)	TKN (EPA 351.2	Ammonia (EPA 350.1)	Total Phosphorus (EPA 365.3)	SRP/Ortho-P (EPA 365.3)	Total Sulfide (SM4500S)	Total AL (EPA 200.7)	Total AL (EPA 200.7)	Matrix	Notes
LE02	9/20/23	0855																	X	X	X	X	X	X	X				LE02 bottles arrived labeled
																													incorrectly as CL07 -
																													crossed out and labeled
																													as LE02
																													follow COC as issued.

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company
	Nick Jenack / WSP	9/20/23		
		9/20/2 12:46		

(For Lab Use Only) Sample Integrity Upon Receipt					Lab Notes
Sample(s) Submitted on Ice?	[✓ Yes]	No	Wet	Temperature	
Custody Seal(s) Intact?	Yes	No	N/A	3.3 °C	
Sample(s) Intact?	Yes	No		☐ Cooler Blank T-0282	

Lab No. ____________

Page 1 of 1

WECK LABORATORIES, INC.

Sample Receipt Checklist

Weck WKO: **3I20082**
WKO Logged by: Jaime Gomez
Samples Checked by: Jaime Gomez

Date/Time Received: 09/20/23 12:46
# of Samples: 01
Delivered by: RMS

	Task	Yes	No	N/A	Comments
COC	COC present at receipt?	☒	☐		
	COC properly completed?	☒	☐		
	COC matches sample labels?	☒	☐		
	Project Manager notified about COC discrepancy?	☐	☐	☒	
Receipt Information	Sample Temperature	3.3 °C			
	Samples received on ice?	☒	☐		
	Ice Type (Blue/Wet)				
	All samples intact?	☒	☐		
	Samples in proper containers?	☒	☐		
	Sufficient sample volume?	☒	☐		
	Samples intact?	☒	☐		
	Received within holding time?	☒	☐		
	Project Manager notified about receipt info?	☐	☐	☒	
Sample Preservation Verification?	Sample labels checked for correct preservation?	☒	☐	☐	
	VOC Headspace: (No) none, If Yes (see comment) 524.2, 524.3, 624.1, 8260, 1666 P/T, LUFT	☐	☐	☒	☐<6mm/Pea Size?
	pH verified upon receipt? Metals <2; H2SO4 pres tests <2; 522<4; TOC <2; 508.1, 525.2<2, 6710B<2, 608.3 5-9	☒	☐	☐	pH paper Lot# 3082366
	Free Chlorine Tested <0.1 (Organics Analyses)	☐	☒	☐	Cl Test Strip Lot#
	O&G pH <2 verified?	☐	☐	☐	pH paper Lot# pH Reading:
	pH adjusted for O&G	☐	☐	☐	Acid Lot# Amt added:
	Project Manager notified about sample preservation?	☐	☐	☒	

PM Comments

Sample Receipt Checklist Completed by:

Signature: Jaime Gomez

Date: 09/20/23

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

October 19, 2023

John D. Rudolph
WSP USA
9177 Sky Park Court
San Diego, CA 92123-

Project Name: LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C6014105479 5GL 57300 Org # 3151
Physis Project ID: 23092004-015

Dear John,

Enclosed are the analytical results for samples submitted to PHYSIS Environmental Laboratories, Inc. (PHYSIS) on 9/26/2023. A total of 2 samples were received for analysis in accordance with the attached chain of custody (COC). Per the COC, the samples were analyzed for:

Conventionals
Chlorophyll-a (mg/m3) by SM 10200 H

Analytical results in this report apply only to samples submitted to PHYSIS in accordance with the COC and are intended to be considered in their entirety.

Please feel free to contact me at any time with any questions. PHYSIS appreciates the opportunity to provide you with our analytical and support services.

Regards,
misty mercier
Misty Mercier
714 602-5320
Extension 202
mistymercier@physislabs.com

PROJECT SAMPLE LIST

WSP USA PHYSIS Project ID: 2302004-015

LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C014105479 Total Samples: 2

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
111456	LE02 - Int		9/20/2023	8:55	Biologic	Not Specified
111457	LE02 - Surf		9/20/2023	9:35	Biologic	Not Specified

ABBREVIATIONS and ACRONYMS

QM	Quality Manual
QA	Quality Assurance
QC	Quality Control
MDL	method detection limit
RL	reporting limit
R1	project sample
R2	project sample replicate
MS1	matrix spike
MS2	matrix spike replicate
B1	procedural blank
B2	procedural blank replicate
BS1	blank spike
BS2	blank spike replicate
LCS1	laboratory control spike
LCS2	laboratory control spike replicate
LCM1	laboratory control material
LCM2	laboratory control material replicate
CRM1	certified reference material
CRM2	certified reference material replicate
RPD	relative percent difference
LMW	low molecular weight
HMW	high molecular weight

QUALITY ASSURANCE SUMMARY

LABORATORY BATCH: Physis' QM defines a laboratory batch as a group of 20 or fewer project samples of similar matrix, processed together under the same conditions and with the same reagents. QC samples are associated with each batch and were used to assess the validity of the sample analyses.

PROCEDURAL BLANK: Laboratory contamination introduced during method use is assessed through the preparation and analysis of procedural blanks is provided at a minimum frequency of one per batch.

ACCURACY: Accuracy of analytical measurements is the degree of closeness based on percent recovery calculations between measured values and the actual or true value and includes a combination of reproducibility error and systematic bias due to sampling and analytical operations. Accuracy of the project data was indicated by analysis of MS, BS, LCS, LCM, CRM, and/or surrogate spikes on a minimum frequency of one per batch. Physis' QM requires that 95% of the target compounds greater than 10 times the MDL be within the specified acceptance limits.

PRECISION: Precision is the agreement among a set of replicate measurements without assumption of knowledge of the true value and is based on RPD calculations between repeated values. Precision of the project data was determined by analysis of replicate MS1/MS2, BS1/BS2, LCS1/LCS2, LCM1/LCM2, CRM1/CRM2, surrogate spikes and/or replicate project sample analysis (R1/R2) on a minimum frequency of one per batch. Physis' QM requires that for 95% of the compounds greater than 10 times the MDL, the percent RPD should be within the specified acceptance range.

BLANK SPIKES: BS is the introduction of a known concentration of analyte into the procedural blank. BS demonstrates performance of the preparation and analytical methods on a clean matrix void of potential matrix related interferences. The BS is performed in laboratory deionized water, making these recoveries a better indicator of the efficiency of the laboratory method per se.

MATRIX SPIKES: MS is the introduction of a known concentration of analyte into a sample. MS samples demonstrate the effect a particular project sample matrix has on the accuracy of a measurement. Individually, MS samples also indicate the bias of analytical measurements due to chemical interferences inherent in the in the specific project sample spiked. Intrinsic target analyte concentration in the specific project sample can also significantly impact MS recovery.

CERTIFIED REFERENCE MATERIALS: CRMs are materials of various matrices for which analytical information has been determined and certified by a recognized authority. These are used to provide a quantitative assessment of the accuracy of an analytical method. CRMs provide evidence that the laboratory preparation and analysis produces results that are comparable to those obtained by an independent organization.

LABORATORY CONTROL MATERIAL: LCM is provided because a suitable natural seawater CRM is not available and can be used to indicate accuracy of the method. Physis' internal LCM is seawater collected at ~800 meters in the Southern California San Pedro Basin and can be used as a reference for background concentrations in clean, natural seawater for comparison to project samples.

LABORATORY CONTROL SPIKES: LCS is the introduction of a known concentration of analyte into Physis' LCM. LCS samples were employed to assess the effect the seawater matrix has on the accuracy of a measurement. LCS also indicate the bias of this method due to chemical interferences inherent in the in the seawater matrix. Intrinsic LCM concentration can also significantly impact LCS recovery.

SURROGATES: A surrogate is a pure analyte unlikely to be found in any project sample, behaves similarly to

the target analyte and most often used with organic analytical procedures. Surrogates are added in known concentration to all samples and are measured to indicate overall efficiency of the method including processing and analyses.

HOLDING TIME: Method recommended holding times are the length of time a project sample can be stored under specific conditions after collection and prior to analysis without significantly affecting the analyte's concentration. Holding times can be extended if preservation techniques are employed to reduce biodegradation, volatilization, oxidation, sorption, precipitation, and other physical and chemical processes.

SAMPLE STORAGE/RETENTION: In order to maintain chemical integrity prior to analysis, all samples submitted to Physis are refrigerated (liquids) or frozen (solids) upon receipt unless otherwise recommended by applicable methods. Solid samples are retained for 1 year from collection while liquid samples are retained until method recommended holding times elapse.

TOTAL/DISSOLVED FRACTION: In some instances, the results for the dissolved fraction may be higher than the total fraction for a particular analyte (e.g. trace metals). This is typically caused by the analytical variation for each result and indicates that the target analyte is primarily in the dissolved phase, within the sample.

PHYSIS QUALIFIER CODES

CODE	DEFINITION
#	see Case Narrative
ND	analyte not detected at or above the MDL
B	analyte was detected in the procedural blank greater than 10 times the MDL
E	analyte concentration exceeds the upper limit of the linear calibration range, reported value is estimated
H	sample received and/or analyzed past the recommended holding time
J	analyte was detected at a concentration below the RL and above the MDL, reported value is estimated
N	insufficient sample, analysis could not be performed
M	analyte was outside the specified accuracy and/or precision acceptance limits due to matrix interference. The associated B/BS were within limits, therefore the sample data was reported without further clarification
SH	analyte concentration in the project sample exceeded the spike concentration, therefore accuracy and/or precision acceptance limits do not apply
SL	analyte results were lower than 10 times the MDL, therefore accuracy and/or precision acceptance limits do not apply
NH	project sample was heterogeneous and sample homogeneity could not be readily achieved using routine laboratory practices, therefore accuracy and/or precision acceptance limits do not apply
Q	analyte was outside the specified QAPP acceptance limits for precision and/or accuracy but within Physis derived acceptance limits, therefore the sample data was reported without further clarification
R	Physis’ QM allows for 5% of the target compounds greater than 10 times the MDL to be outside the specified acceptance limits for precision and/or accuracy. This is often due to random error and does not indicate any significant problems with the analysis of these project samples

ANALYTICAL REPORT

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 111456-R1 LE02 - Int			**Matrix: Biologic**				**Sampled: 20-Sep-23 8:55**			**Received: 26-Sep-23**	
Chlorophyll-a	SM 10200 H	mg/m3	147	1	1	2	NA		C-75075	11-Oct-23	11-Oct-23
Sample ID: 111457-R1 LE02 - Surf			**Matrix: Biologic**				**Sampled: 20-Sep-23 9:35**			**Received: 26-Sep-23**	
Chlorophyll-a	SM 10200 H	mg/m3	141	1	1	2	NA		C-75075	11-Oct-23	11-Oct-23

QUALITY CONTROL REPORT

ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2302004-015
Client: WSP USA
Project: LECL TMDL Monitoring Project # 2315100200.0004.PHY

Conventionals

QUALITY CONTROL REPORT

Chlorophyll-a **Method:** SM 10200 H **Fraction:** NA **Prepared:** 11-Oct-23 **Analyzed:** 11-Oct-23

SAMPLE ID	BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS		QA CODE
111455-B1 QAQC Procedural Blank	C-75075	ND	1	1	2	mg/m3									
111455-BS1 QAQC Procedural Blank	C-75075	43800	1	1	2	mg/m3	43600	0	100	70 - 130%	PASS				
111455-BS2 QAQC Procedural Blank	C-75075	41700	1	1	2	mg/m3	43600	0	96	70 - 130%	PASS	4	30	PASS	

CHAIN OF CUSTODY

Chain of Custody & Sample Information Record

Client: WSP USA E&I Inc.
Contact: John Rudolph
Phone No. 858-243-8158

Project Name: **LECL TMDL Monitoring**
Email: john.rudolph@wsp.com
Project Number: 2315100200.0004.PHYSIS
PO#: C014105479
GL Code: 57300
Org# 3151

Turn Around Time: Routine *3-5 Day Rush *48 Hour Rush *24 Hour Rush
***Lab TAT Approval:** By: *Additional Charges May Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Nick Jernack
Employer: WSP USA E&I Inc.
Signature:

Matrix
DW = Drinking Water
WW = Wastewater
GW = Groundwater
S = Soil
SG = Sludge
L = Liquid
M = Miscellaneous

Notes
Chl-a samples on 0.7 um GFF

			# of Containers & Preservatives											Sample Type			Analysis Requested									Matrix	Notes
Sample ID	Date	Time	Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	NaOH/ZnAcetate	NH4Cl	MCAA	Frozen	Total # of Containers	*Routine*	*Resample*	*Special*	Total Sulfide	Nitrate - Nitrite	TDS	TKN	Ammonia	Total Phosphorus	SRP/Ortho-P	Chlorophyll-a (SM10200 H)			
LE02 - Int	9/20/23	0855																						x			Filter Volume: 145 mL
LE02 - Surf	⊥	0935																						x			Filter Volume: 190 mL
																											Filter Volume:
																											Filter Volume:
																											Filter Volume:
																											Filter Volume:

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company
	Nick Jernack / WSP	9/25/23 - 1600		Richard Hanka Physis
		9/26/23 1000		

(For Lab Use Only) **Sample Integrity Upon Receipt**

Sample(s) Submitted on Ice? Yes No **Temperature**
Custody Seal(s) Intact? Yes No N/A °C

Sample(s) Submitted on Ice? Yes No **Temperature**
Custody Seal(s) Intact? Yes No N/A °C
Sample(s) Intact? Yes No ☐ Cooler Blank

Lab Notes

Lab No.

Lab No.

Page 1 **of** 1

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

Sample Receipt Summary

PHYSIS
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

Project Iteration ID: 2302004-015
Client Name: WSP USA
Project Name: LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C014105479 GL 57300 Org # 3151
COC Page Number: 2 of 2
Bottle Label Color: NA

Receiving Info

1. Initials Received By: RGH
2. Date Received: 9/26/23
3. Time Received: 1000
4. Client Name: WSP
5. Courier Information: (Please circle)
   - Client
   - UPS
   - Area Fast
   - DRS
   - [✓ FedEx]
   - GSO/GLS
   - Ontrac
   - PAMS
   - PHYSIS Driver:
     - i. Start Time: ______
     - ii. End Time: ______
     - iii. Total Mileage: ______
     - iv. Number of Pickups: ______
6. Container Information: (Please put the # of containers or circle none)
   - 1 Cooler
   - __ Styrofoam Cooler
   - ____ Boxes
   - None
   - ___ Carboy(s)
   - __Carboy Trash Can(s)
   - ____ Carboy Cap(s)
   - Other ______
7. What type of ice was used: (Please circle any that apply)
   - Wet Ice
   - [✓ Blue Ice]
   - Dry Ice
   - Water
   - None
8. Randomly Selected Samples Temperature (°C): 10.4 Used I/R Thermometer # ____

Inspection Info

1. Initials Inspected By: ______

Sample Integrity Upon Receipt:

1. COC(s) included and completely filled out........ [✓ Yes] / No
2. All sample containers arrived intact........ [✓ Yes] / No
3. All samples listed on COC(s) are present........ [✓ Yes] / No
4. Information on containers consistent with information on COC(s)........ [✓ Yes] / No
5. Correct containers and volume for all analyses indicated........ [✓ Yes] / No
6. All samples received within method holding time........ [✓ Yes] / No
7. Correct preservation used for all analyses indicated........ Yes / [✓ No]
8. Name of sampler included on COC(s)........ [✓ Yes] / No

Notes:

See temp.

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders: 3I26013

Project: 2315100200.0004.WECK

Attn: John Rudolph

Client: WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Report Date: 11/10/2023
Received Date: 10/10/2023
Turnaround Time: Normal
Phones: (858) 514-6465
Fax: (858) 278-5300
P.O. #: C016900152
Billing Code:

ELAP-CA #1132 • EPA-UCMR #CA00211 • LACSD #10143

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

Dear John Rudolph,

Enclosed are the results of analyses for samples received 10/10/23 with the Chain-of-Custody document. The samples were received in good condition, at 1.6 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Kim Tu

Kim G. Tu
Project Manager

WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: 2315100200.0004.WECK

Project Manager: John Rudolph

Reported:
11/10/2023 12:01

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CL07	Nick Jernack	3I26013-01	Water	10/10/23 10:40	
CL08	Nick Jernack	3I26013-02	Water	10/10/23 09:50	
CL09	Nick Jernack	3I26013-03	Water	10/10/23 09:15	
CL10	Nick Jernack	3I26013-04	Water	10/10/23 08:35	
LE02	Nick Jernack	3I26013-05	Water	10/10/23 09:00	

Certificate of Analysis

FINAL REPORT

WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: 2315100200.0004.WECK

Project Manager: John Rudolph

Reported:
11/10/2023 12:01

Sample Results

Sample: CL07
3I26013-01 (Water)

Sampled: 10/10/23 10:40 by Nick Jernack

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W3J1335	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/16/23 12:52				**Analyst:** AEC
Ammonia as N	**1.7**	0.017	0.10	mg/l	1	10/18/23	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W3J0954	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/11/23 09:38				**Analyst:** AEC
TKN	**2.3**	0.065	0.10	mg/l	1	10/12/23	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W3J0911	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/10/23 19:50				**Analyst:** ISM
Nitrate as N	ND	0.040	0.20	mg/l	1	10/10/23 20:47	
Nitrite as N	ND	0.042	0.10	mg/l	1	10/10/23 20:47	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3J0958	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/11/23 09:49				**Analyst:** JSG
o-Phosphate as P	**0.14**	0.0071	0.010	mg/l	1	10/11/23 15:03	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3J2366	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/27/23 12:59				**Analyst:** ymt/rob
Phosphorus as P, Total	**0.17**	0.0067	0.010	mg/l	1	10/30/23	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W3J1027	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/11/23 13:55				**Analyst:** bel
Total Dissolved Solids	**470**	4.0	10	mg/l	1	10/12/23	
Method: SM 2540D			**Instr:** OVEN15				
Batch ID: W3J1124	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/12/23 10:27				**Analyst:** kac
Total Suspended Solids	**4**		5	mg/l	1	10/12/23	J
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W3J1148	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/12/23 13:41				**Analyst:** ymt
Sulfide, Total	**10**	0.50	1.0	mg/l	10	10/13/23	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W3J1314	**Preparation:** EPA 200.2		**Prepared:** 10/16/23 11:07				**Analyst:** kvm
Aluminum, Dissolved	**0.051**	0.041	0.050	mg/l	1	10/18/23	
Aluminum, Total	**0.11**	0.022	0.050	mg/l	1	10/18/23	

Sample Results

(Continued)

Sample: CL08
3I26013-02 (Water)

Sampled: 10/10/23 9:50 by Nick Jernack

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W3J1335	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/16/23 12:52				**Analyst:** AEC
Ammonia as N	**0.33**	0.017	0.10	mg/l	1	10/18/23	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W3J0954	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/11/23 09:38				**Analyst:** AEC
TKN	**0.89**	0.065	0.10	mg/l	1	10/12/23	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W3J0911	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/10/23 19:50				**Analyst:** ISM
Nitrate as N	**0.052**	0.040	0.20	mg/l	1	10/10/23 20:48	J
Nitrite as N	ND	0.042	0.10	mg/l	1	10/10/23 20:48	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3J0958	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/11/23 09:49				**Analyst:** JSG
o-Phosphate as P	**0.025**	0.0071	0.010	mg/l	1	10/11/23 15:04	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3J2366	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/27/23 12:59				**Analyst:** ymt/rob
Phosphorus as P, Total	**0.061**	0.0067	0.010	mg/l	1	10/30/23	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W3J1027	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/11/23 13:55				**Analyst:** bel
Total Dissolved Solids	**450**	4.0	10	mg/l	1	10/12/23	
Method: SM 2540D			**Instr:** OVEN15				
Batch ID: W3J1124	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/12/23 10:27				**Analyst:** kac
Total Suspended Solids	**2**		5	mg/l	1	10/12/23	J
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W3J1148	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/12/23 13:41				**Analyst:** ymt
Sulfide, Total	**2.5**	0.25	0.50	mg/l	5	10/13/23	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W3J1314	**Preparation:** EPA 200.2		**Prepared:** 10/16/23 11:07				**Analyst:** kvm
Aluminum, Dissolved	**0.11**	0.041	0.050	mg/l	1	10/18/23	
Aluminum, Total	**0.15**	0.022	0.050	mg/l	1	10/18/23	

Sample Results

(Continued)

Sample: CL09
3I26013-03 (Water)

Sampled: 10/10/23 9:15 by Nick Jernack

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W3J1335 **Preparation:** _NONE (WETCHEM)			**Prepared:** 10/16/23 12:52				**Analyst:** AEC
Ammonia as N	**1.8**	0.017	0.10	mg/l	1	10/18/23	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W3J0954 **Preparation:** _NONE (WETCHEM)			**Prepared:** 10/11/23 09:38				**Analyst:** AEC
TKN	**2.6**	0.065	0.10	mg/l	1	10/12/23	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W3J0911 **Preparation:** _NONE (WETCHEM)			**Prepared:** 10/10/23 19:50				**Analyst:** ISM
Nitrate as N	**0.044**	0.040	0.20	mg/l	1	10/10/23 20:49	J
Nitrite as N	ND	0.042	0.10	mg/l	1	10/10/23 20:49	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3J0958 **Preparation:** _NONE (WETCHEM)			**Prepared:** 10/11/23 09:49				**Analyst:** JSG
o-Phosphate as P	**0.11**	0.0071	0.010	mg/l	1	10/11/23 15:04	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3J2366 **Preparation:** _NONE (WETCHEM)			**Prepared:** 10/27/23 12:59				**Analyst:** ymt/rob
Phosphorus as P, Total	**0.18**	0.0067	0.010	mg/l	1	10/30/23	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W3J1027 **Preparation:** _NONE (WETCHEM)			**Prepared:** 10/11/23 13:55				**Analyst:** bel
Total Dissolved Solids	**550**	4.0	10	mg/l	1	10/12/23	
Method: SM 2540D			**Instr:** OVEN15				
Batch ID: W3J1124 **Preparation:** _NONE (WETCHEM)			**Prepared:** 10/12/23 10:27				**Analyst:** kac
Total Suspended Solids	**6**		5	mg/l	1	10/12/23	
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W3J1148 **Preparation:** _NONE (WETCHEM)			**Prepared:** 10/12/23 13:41				**Analyst:** ymt
Sulfide, Total	**6.0**	0.50	1.0	mg/l	10	10/13/23	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W3J1314 **Preparation:** EPA 200.2			**Prepared:** 10/16/23 11:07				**Analyst:** kvm
Aluminum, Dissolved	**0.14**	0.041	0.050	mg/l	1	10/18/23	
Aluminum, Total	**0.18**	0.022	0.050	mg/l	1	10/18/23	

Sample Results

(Continued)

Sample: CL10
3I26013-04 (Water)

Sampled: 10/10/23 8:35 by Nick Jernack

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W3J1335 **Preparation:** _NONE (WETCHEM)			**Prepared:** 10/16/23 12:52				**Analyst:** AEC
Ammonia as N	**0.023**	0.017	0.10	mg/l	1	10/18/23	J
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W3J0954 **Preparation:** _NONE (WETCHEM)			**Prepared:** 10/11/23 09:38				**Analyst:** AEC
TKN	**0.81**	0.065	0.10	mg/l	1	10/12/23	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W3J0911 **Preparation:** _NONE (WETCHEM)			**Prepared:** 10/10/23 19:50				**Analyst:** ISM
Nitrate as N	ND	0.040	0.20	mg/l	1	10/10/23 20:50	
Nitrite as N	ND	0.042	0.10	mg/l	1	10/10/23 20:50	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3J0958 **Preparation:** _NONE (WETCHEM)			**Prepared:** 10/11/23 09:49				**Analyst:** JSG
o-Phosphate as P	**0.0080**	0.0071	0.010	mg/l	1	10/11/23 14:59	J
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3J2366 **Preparation:** _NONE (WETCHEM)			**Prepared:** 10/27/23 12:59				**Analyst:** ymt/rob
Phosphorus as P, Total	**0.051**	0.0067	0.010	mg/l	1	10/30/23	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W3J1027 **Preparation:** _NONE (WETCHEM)			**Prepared:** 10/11/23 13:55				**Analyst:** bel
Total Dissolved Solids	**580**	4.0	10	mg/l	1	10/12/23	
Method: SM 2540D			**Instr:** OVEN15				
Batch ID: W3J1124 **Preparation:** _NONE (WETCHEM)			**Prepared:** 10/12/23 10:27				**Analyst:** kac
Total Suspended Solids	**6**		5	mg/l	1	10/12/23	
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W3J1148 **Preparation:** _NONE (WETCHEM)			**Prepared:** 10/12/23 13:41				**Analyst:** ymt
Sulfide, Total	ND	0.050	0.10	mg/l	1	10/13/23	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W3J1314 **Preparation:** EPA 200.2			**Prepared:** 10/16/23 11:07				**Analyst:** kvm
Aluminum, Dissolved	**0.25**	0.041	0.050	mg/l	1	10/18/23	
Aluminum, Total	**0.30**	0.022	0.050	mg/l	1	10/18/23	

Sample Results

(Continued)

Sample: LE02
3I26013-05 (Water)

Sampled: 10/10/23 9:00 by Nick Jernack

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W3J1335	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/16/23 12:52				**Analyst:** AEC
Ammonia as N	**0.45**	0.017	0.10	mg/l	1	10/18/23	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W3J0954	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/11/23 09:38				**Analyst:** AEC
TKN	**4.2**	0.065	0.10	mg/l	1	10/12/23	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W3J0911	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/10/23 19:50				**Analyst:** ISM
Nitrate as N	**0.043**	0.040	0.20	mg/l	1	10/10/23 20:51	J
Nitrite as N	**0.056**	0.042	0.10	mg/l	1	10/10/23 20:51	J
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3J0958	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/11/23 09:49				**Analyst:** JSG
o-Phosphate as P	**0.015**	0.0071	0.010	mg/l	1	10/11/23 15:05	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3J2366	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/27/23 12:59				**Analyst:** ymt/rob
Phosphorus as P, Total	**0.24**	0.0067	0.010	mg/l	1	10/30/23	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W3J1027	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/11/23 13:55				**Analyst:** bel
Total Dissolved Solids	**1900**	4.0	10	mg/l	1	10/12/23	
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W3J1148	**Preparation:** _NONE (WETCHEM)		**Prepared:** 10/12/23 13:41				**Analyst:** ymt
Sulfide, Total	**0.10**	0.050	0.10	mg/l	1	10/13/23	

Quality Control Results

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W3J0911 - EPA 353.2											
Blank (W3J0911-BLK1)					**Prepared & Analyzed: 10/10/23**						
Nitrate as N	ND	0.040	0.20	mg/l							
Nitrite as N	ND	0.042	0.10	mg/l							
LCS (W3J0911-BS1)					**Prepared & Analyzed: 10/10/23**						
Nitrate as N	1.02	0.040	0.20	mg/l	1.00		102	90-110			
Nitrite as N	1.02	0.042	0.10	mg/l	1.00		102	90-110			
Matrix Spike (W3J0911-MS1)	**Source: 3J10136-01**				**Prepared & Analyzed: 10/10/23**						
Nitrate as N	6.06	0.040	0.20	mg/l	2.00	4.01	102	90-110			
Nitrite as N	1.01	0.042	0.10	mg/l	1.00	ND	101	90-110			
Matrix Spike (W3J0911-MS2)	**Source: 3J10138-01**				**Prepared & Analyzed: 10/10/23**						
Nitrate as N	8.80	0.040	0.20	mg/l	2.00	6.83	99	90-110			
Nitrite as N	1.03	0.042	0.10	mg/l	1.00	ND	103	90-110			
Matrix Spike Dup (W3J0911-MSD1)	**Source: 3J10136-01**				**Prepared & Analyzed: 10/10/23**						
Nitrate as N	6.05	0.040	0.20	mg/l	2.00	4.01	102	90-110	0.2	20	
Nitrite as N	1.02	0.042	0.10	mg/l	1.00	ND	102	90-110	1	20	
Matrix Spike Dup (W3J0911-MSD2)	**Source: 3J10138-01**				**Prepared & Analyzed: 10/10/23**						
Nitrate as N	8.79	0.040	0.20	mg/l	2.00	6.83	98	90-110	0.1	20	
Nitrite as N	1.02	0.042	0.10	mg/l	1.00	ND	102	90-110	1	20	
Batch: W3J0954 - EPA 351.2											
Blank (W3J0954-BLK1)					**Prepared: 10/11/23 Analyzed: 10/12/23**						
TKN	ND	0.065	0.10	mg/l							
Blank (W3J0954-BLK2)					**Prepared: 10/11/23 Analyzed: 10/12/23**						
TKN	ND	0.065	0.10	mg/l							
LCS (W3J0954-BS1)					**Prepared: 10/11/23 Analyzed: 10/12/23**						
TKN	0.995	0.065	0.10	mg/l	1.00		100	90-110			
LCS (W3J0954-BS2)					**Prepared: 10/11/23 Analyzed: 10/12/23**						
TKN	0.999	0.065	0.10	mg/l	1.00		100	90-110			
Duplicate (W3J0954-DUP1)	**Source: 3J10139-03**				**Prepared: 10/11/23 Analyzed: 10/12/23**						
TKN	0.529	0.065	0.10	mg/l		0.630			18	10	R-02
Matrix Spike (W3J0954-MS1)	**Source: 3J10132-01**				**Prepared: 10/11/23 Analyzed: 10/12/23**						
TKN	1.17	0.065	0.10	mg/l	1.00	0.176	99	90-110			
Matrix Spike (W3J0954-MS2)	**Source: 3J10134-01**				**Prepared: 10/11/23 Analyzed: 10/12/23**						
TKN	1.30	0.065	0.10	mg/l	1.00	0.274	102	90-110			
Matrix Spike Dup (W3J0954-MSD1)	**Source: 3J10132-01**				**Prepared: 10/11/23 Analyzed: 10/12/23**						
TKN	1.13	0.065	0.10	mg/l	1.00	0.176	95	90-110	3	10	
Matrix Spike Dup (W3J0954-MSD2)	**Source: 3J10134-01**				**Prepared: 10/11/23 Analyzed: 10/12/23**						
TKN	1.24	0.065	0.10	mg/l	1.00	0.274	97	90-110	4	10	
Batch: W3J0958 - EPA 365.3											

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W3J0958 - EPA 365.3 (Continued)											
Blank (W3J0958-BLK1)					**Prepared & Analyzed: 10/11/23**						
o-Phosphate as P	ND	0.0071	0.010	mg/l							
LCS (W3J0958-BS1)					**Prepared & Analyzed: 10/11/23**						
o-Phosphate as P	0.204	0.0071	0.010	mg/l	0.200		102	88-111			
Matrix Spike (W3J0958-MS1)	**Source: 3I26013-04**				**Prepared & Analyzed: 10/11/23**						
o-Phosphate as P	0.207	0.0071	0.010	mg/l	0.200	0.00800	100	85-112			
Matrix Spike Dup (W3J0958-MSD1)	**Source: 3I26013-04**				**Prepared & Analyzed: 10/11/23**						
o-Phosphate as P	0.208	0.0071	0.010	mg/l	0.200	0.00800	100	85-112	0.5	20	
Batch: W3J1027 - SM 2540C											
Blank (W3J1027-BLK1)					**Prepared: 10/11/23 Analyzed: 10/12/23**						
Total Dissolved Solids	ND	4.0	10	mg/l							
LCS (W3J1027-BS1)					**Prepared: 10/11/23 Analyzed: 10/12/23**						
Total Dissolved Solids	823	4.0	10	mg/l	824		100	97-103			
Duplicate (W3J1027-DUP1)	**Source: 3J11028-06**				**Prepared: 10/11/23 Analyzed: 10/12/23**						
Total Dissolved Solids	36000	4.0	10	mg/l		36600			2	10	
Duplicate (W3J1027-DUP2)	**Source: 3J11028-16**				**Prepared: 10/11/23 Analyzed: 10/12/23**						
Total Dissolved Solids	32600	4.0	10	mg/l		31800			2	10	
Batch: W3J1124 - SM 2540D											
Blank (W3J1124-BLK1)					**Prepared & Analyzed: 10/12/23**						
Total Suspended Solids	ND		5	mg/l							
LCS (W3J1124-BS1)					**Prepared & Analyzed: 10/12/23**						
Total Suspended Solids	47.8		5	mg/l	52.6		91	90-110			
Duplicate (W3J1124-DUP1)	**Source: 3I29007-01**				**Prepared & Analyzed: 10/12/23**						
Total Suspended Solids	58.0		5	mg/l		63.0			8	10	
Duplicate (W3J1124-DUP2)	**Source: 3J10084-01**				**Prepared & Analyzed: 10/12/23**						
Total Suspended Solids	120		5	mg/l		128			7	10	
Batch: W3J1148 - SM 4500S2-D											
Blank (W3J1148-BLK1)					**Prepared: 10/12/23 Analyzed: 10/13/23**						
Sulfide, Total	ND	0.050	0.10	mg/l							
LCS (W3J1148-BS1)					**Prepared: 10/12/23 Analyzed: 10/13/23**						
Sulfide, Total	0.100	0.050	0.10	mg/l	0.0999		100	90-110			
Duplicate (W3J1148-DUP1)	**Source: 3I26013-01**				**Prepared: 10/12/23 Analyzed: 10/13/23**						
Sulfide, Total	10.0	1.0	2.0	mg/l		10.0			0	20	
Duplicate (W3J1148-DUP2)	**Source: 3I26013-03**				**Prepared: 10/12/23 Analyzed: 10/13/23**						
Sulfide, Total	6.00	1.0	2.0	mg/l		6.00			0	20	
Matrix Spike (W3J1148-MS1)	**Source: 3J10017-01**				**Prepared: 10/12/23 Analyzed: 10/13/23**						
Sulfide, Total	0.200	0.050	0.10	mg/l	0.200	ND	100	80-120			
Matrix Spike Dup (W3J1148-MSD1)	**Source: 3J10017-01**				**Prepared: 10/12/23 Analyzed: 10/13/23**						

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W3J1148 - SM 4500S2-D (Continued)											
Matrix Spike Dup (W3J1148-MSD1)	**Source: 3J10017-01**				**Prepared: 10/12/23**	**Analyzed: 10/13/23**					
Sulfide, Total	0.200	0.050	0.10	mg/l	0.200	ND	100	80-120	0	20	
Batch: W3J1335 - EPA 350.1											
Blank (W3J1335-BLK1)					**Prepared: 10/16/23**	**Analyzed: 10/18/23**					
Ammonia as N	ND	0.017	0.10	mg/l							
Blank (W3J1335-BLK2)					**Prepared: 10/16/23**	**Analyzed: 10/18/23**					
Ammonia as N	ND	0.017	0.10	mg/l							
LCS (W3J1335-BS1)					**Prepared: 10/16/23**	**Analyzed: 10/18/23**					
Ammonia as N	0.243	0.017	0.10	mg/l	0.250		97	90-110			
LCS (W3J1335-BS2)					**Prepared: 10/16/23**	**Analyzed: 10/18/23**					
Ammonia as N	0.252	0.017	0.10	mg/l	0.250		101	90-110			
Matrix Spike (W3J1335-MS1)	**Source: 3J04002-01**				**Prepared: 10/16/23**	**Analyzed: 10/18/23**					
Ammonia as N	0.469	0.017	0.10	mg/l	0.250	0.225	98	90-110			
Matrix Spike (W3J1335-MS2)	**Source: 3J10017-03**				**Prepared: 10/16/23**	**Analyzed: 10/18/23**					
Ammonia as N	0.596	0.017	0.10	mg/l	0.250	0.345	100	90-110			
Matrix Spike Dup (W3J1335-MSD1)	**Source: 3J04002-01**				**Prepared: 10/16/23**	**Analyzed: 10/18/23**					
Ammonia as N	0.472	0.017	0.10	mg/l	0.250	0.225	99	90-110	0.5	15	
Matrix Spike Dup (W3J1335-MSD2)	**Source: 3J10017-03**				**Prepared: 10/16/23**	**Analyzed: 10/18/23**					
Ammonia as N	0.595	0.017	0.10	mg/l	0.250	0.345	100	90-110	0.2	15	
Batch: W3J2366 - EPA 365.3											
Blank (W3J2366-BLK1)					**Prepared: 10/27/23**	**Analyzed: 10/30/23**					
Phosphorus as P, Total	ND	0.0067	0.010	mg/l							
LCS (W3J2366-BS1)					**Prepared: 10/27/23**	**Analyzed: 10/30/23**					
Phosphorus as P, Total	0.198	0.0067	0.010	mg/l	0.200		99	90-110			
Matrix Spike (W3J2366-MS1)	**Source: 3J17076-01**				**Prepared: 10/27/23**	**Analyzed: 10/30/23**					
Phosphorus as P, Total	0.311	0.0067	0.010	mg/l	0.200	0.121	95	90-110			
Matrix Spike Dup (W3J2366-MSD1)	**Source: 3J17076-01**				**Prepared: 10/27/23**	**Analyzed: 10/30/23**					
Phosphorus as P, Total	0.324	0.0067	0.010	mg/l	0.200	0.121	102	90-110	4	20	

Quality Control Results

(Continued)

Metals by EPA 200 Series Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W3J1314 - EPA 200.7											
Blank (W3J1314-BLK1)				**Prepared: 10/16/23**	**Analyzed: 10/18/23**						
Aluminum, Dissolved	ND	0.041	0.050	mg/l							
Aluminum, Total	ND	0.022	0.050	mg/l							
LCS (W3J1314-BS1)				**Prepared: 10/16/23**	**Analyzed: 10/18/23**						
Aluminum, Dissolved	0.219	0.041	0.050	mg/l	0.200		109	85-115			
Aluminum, Total	0.219	0.022	0.050	mg/l	0.200		109	85-115			
Matrix Spike (W3J1314-MS1)	**Source: 3I26012-02**			**Prepared: 10/16/23**	**Analyzed: 10/18/23**						
Aluminum, Total	0.297	0.022	0.050	mg/l	0.200	0.0252	136	70-130			MS-02
Matrix Spike (W3J1314-MS2)	**Source: 3I26013-01**			**Prepared: 10/16/23**	**Analyzed: 10/18/23**						
Aluminum, Total	0.352	0.022	0.050	mg/l	0.200	0.107	123	70-130			
Matrix Spike Dup (W3J1314-MSD1)	**Source: 3I26012-02**			**Prepared: 10/16/23**	**Analyzed: 10/18/23**						
Aluminum, Total	0.291	0.022	0.050	mg/l	0.200	0.0252	133	70-130	2	30	MS-02
Matrix Spike Dup (W3J1314-MSD2)	**Source: 3I26013-01**			**Prepared: 10/16/23**	**Analyzed: 10/18/23**						
Aluminum, Total	0.359	0.022	0.050	mg/l	0.200	0.107	126	70-130	2	30	

Notes and Definitions

Item	Definition
J	Estimated conc. detected <MRL and >MDL.
MS-02	The RPD and/or percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte inherent in the sample.
R-02	The RPD was outside of QC acceptance limits due to possible matrix interference.
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

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

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

Chain of Custody & Sample Information Record

3I26013

Client: WSP USA E&I Inc.
Contact: John Rudolph
Phone No. 858-243-8158

Project Name: LECL TMDL Monitoring
Email: john.rudolph@woodplc.com
Project Number: 2315100200.0004.WECK
PO#: C016900152
GL Code: 573000
Org# 3151

*Please include Marissa Cuevas (marissa.cuevas@wsp.com) on all invoicing

Turn Around Time: [✓ Routine] *3-5 Day Rush *48 Hour Rush *24 Hour Rush
Lab TAT Approval: By:
*Additional Charges May Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Nick Jernack
Employer: WSP USA E&I Inc.
Signature:

Matrix
DW = Drinking Water
WW = Wastewater
GW = Groundwater
S = Soil
SG = Sludge
L = Liquid
M = Miscellaneous

Notes
Ortho-P is field filtered (0.45 um)

Dissolved Al is field filtered (0.45 um)

			# of Containers & Preservatives											Sample Type			Analysis Requested										Matrix	Notes
Sample ID	Date	Time	Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	NaOH/ZnAcetate	NH4Cl	MCAA	Frozen	Total # of Containers	Routine	Resample	Special	TSS	Nitrate - Nitrite (EPA 353.2)	TDS (SM2540 C)	TKN (EPA 351.2	Ammonia (EPA 350.1)	Total Phosphorus (EPA 365.3)	SRP/Ortho-P (EPA 365.3)	Total Sulfide (SM4500S)	Total AL (EPA 200.7)	Dissolved AL (EPA 200.7)		
CL07	10/10/23	1040															X	X	X	X	X	X	X	X	X	X		
CL08		0950															X	X	X	X	X	X	X	X	X	X		
CL09		0915															X	X	X	X	X	X	X	X	X	X		
CL10		0835															X	X	X	X	X	X	X	X	X	X		
LE02		0900																X	X	X	X	X	X	X				

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company
	Nick Jernack / WSP	10/10/23 - 1340	SAM	SAM RMS
	SAM RMS	10/10/23		Weck 10/10/23 15:30

(For Lab Use Only) **Sample Integrity Upon Receipt**

Sample(s) Submitted on Ice? [✓ Yes] No
Custody Seal(s) Intact? [✓ Yes] No N/A
Sample(s) Intact? [✓ Yes] No

Temperature 1.6 °C
☐ Cooler Blank

Lab Notes
T-0281

Lab No. ______________

Page 1 **of** 1

WECK LABORATORIES, INC.

Sample Receipt Checklist

Weck WKO: **3I26013**
WKO Logged by: Jaime Gomez
Samples Checked by: Jaime Gomez

Date/Time Received: 10/10/23 15:39
# of Samples: 05
Delivered by: RMS

	Task	Yes	No	N/A	Comments
COC	COC present at receipt?	☒	☐		
	COC properly completed?	☒	☐		
	COC matches sample labels?	☒	☐		
	Project Manager notified about COC discrepancy?	☐	☐	☒	
Receipt Information	Sample Temperature	1.6 °C			
	Samples received on ice?	☒	☐		
	Ice Type (Blue/Wet)				
	All samples intact?	☒	☐		
	Samples in proper containers?	☒	☐		
	Sufficient sample volume?	☒	☐		
	Samples intact?	☒	☐		
	Received within holding time?	☒	☐		
	Project Manager notified about receipt info?	☐	☒	☐	
Sample Preservation Verification?	Sample labels checked for correct preservation?	☒	☐	☐	
	VOC Headspace: (No) none, If Yes (see comment) 524.2, 524.3, 624.1, 8260, 1666 P/T, LUFT	☐	☒	☐	☐<6mm/Pea Size?
	pH verified upon receipt? Metals <2; H2SO4 pres tests <2; 522<4; TOC <2; 508.1, 525.2<2, 6710B<2, 608.3 5-9	☒	☐	☐	pH paper Lot# 3082367
	Free Chlorine Tested <0.1 (Organics Analyses)	☐	☒	☐	Cl Test Strip Lot#
	O&G pH <2 verified?	☐	☐	☐	pH paper Lot# pH Reading:
	pH adjusted for O&G	☐	☐	☐	Acid Lot# Amt added:
	Project Manager notified about sample preservation?	☐	☐	☐	

PM Comments

Sample Receipt Checklist Completed by:

Signature: Jaime Gomez

Date: 10/10/23

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

December 15, 2023

John D. Rudolph
WSP USA
9177 Sky Park Court
San Diego, CA 92123-

Project Name: LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C3014105479GL # 57300 Org # 3151
Physis Project ID: 2302004-017

Dear John,

Enclosed are the analytical results for samples submitted to PHYSIS Environmental Laboratories, Inc. (PHYSIS) on 10/12/2023. A total of 10 samples were received for analysis in accordance with the attached chain of custody (COC). Per the COC, the samples were analyzed for:

Conventionals
Chlorophyll-a (mg/m3) by SM 10200 H

Analytical results in this report apply only to samples submitted to PHYSIS in accordance with the COC and are intended to be considered in their entirety.

Please feel free to contact me at any time with any questions. PHYSIS appreciates the opportunity to provide you with our analytical and support services.

Regards,
misty mercier

Misty Mercier
714 602-5320
Extension 202
mistymercier@physislabs.com

PROJECT SAMPLE LIST

WSP USA PHYSIS Project ID: 2302004-017

LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C014105479 Total Samples: 10

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
111950	CL07 - Int		10/10/2022	10:40	Biologic	Not Specified
111951	CL07 - Surf		10/10/2022	10:50	Biologic	Not Specified
111952	CL08 - Int		10/10/2022	10:00	Biologic	Not Specified
111953	CL08 - Surf		10/10/2022	10:15	Biologic	Not Specified
111954	CL09 - Int		10/10/2022	9:15	Biologic	Not Specified
111955	CL09 - Surf		10/10/2022	9:25	Biologic	Not Specified
111956	CL10 - Int		10/10/2022	8:35	Biologic	Not Specified
111957	CL10 - Surf		10/10/2022	8:50	Biologic	Not Specified
111958	LE02 - Int		10/10/2022	9:00	Biologic	Not Specified
111959	LE02 - Surf		10/10/2022	9:20	Biologic	Not Specified

ABBREVIATIONS and ACRONYMS

QM	Quality Manual
QA	Quality Assurance
QC	Quality Control
MDL	method detection limit
RL	reporting limit
R1	project sample
R2	project sample replicate
MS1	matrix spike
MS2	matrix spike replicate
B1	procedural blank
B2	procedural blank replicate
BS1	blank spike
BS2	blank spike replicate
LCS1	laboratory control spike
LCS2	laboratory control spike replicate
LCM1	laboratory control material
LCM2	laboratory control material replicate
CRM1	certified reference material
CRM2	certified reference material replicate
RPD	relative percent difference
LMW	low molecular weight
HMW	high molecular weight

QUALITY ASSURANCE SUMMARY

LABORATORY BATCH: Physis' QM defines a laboratory batch as a group of 20 or fewer project samples of similar matrix, processed together under the same conditions and with the same reagents. QC samples are associated with each batch and were used to assess the validity of the sample analyses.

PROCEDURAL BLANK: Laboratory contamination introduced during method use is assessed through the preparation and analysis of procedural blanks is provided at a minimum frequency of one per batch.

ACCURACY: Accuracy of analytical measurements is the degree of closeness based on percent recovery calculations between measured values and the actual or true value and includes a combination of reproducibility error and systematic bias due to sampling and analytical operations. Accuracy of the project data was indicated by analysis of MS, BS, LCS, LCM, CRM, and/or surrogate spikes on a minimum frequency of one per batch. Physis' QM requires that 95% of the target compounds greater than 10 times the MDL be within the specified acceptance limits.

PRECISION: Precision is the agreement among a set of replicate measurements without assumption of knowledge of the true value and is based on RPD calculations between repeated values. Precision of the project data was determined by analysis of replicate MS1/MS2, BS1/BS2, LCS1/LCS2, LCM1/LCM2, CRM1/CRM2, surrogate spikes and/or replicate project sample analysis (R1/R2) on a minimum frequency of one per batch. Physis' QM requires that for 95% of the compounds greater than 10 times the MDL, the percent RPD should be within the specified acceptance range.

BLANK SPIKES: BS is the introduction of a known concentration of analyte into the procedural blank. BS demonstrates performance of the preparation and analytical methods on a clean matrix void of potential matrix related interferences. The BS is performed in laboratory deionized water, making these recoveries a better indicator of the efficiency of the laboratory method per se.

MATRIX SPIKES: MS is the introduction of a known concentration of analyte into a sample. MS samples demonstrate the effect a particular project sample matrix has on the accuracy of a measurement. Individually, MS samples also indicate the bias of analytical measurements due to chemical interferences inherent in the in the specific project sample spiked. Intrinsic target analyte concentration in the specific project sample can also significantly impact MS recovery.

CERTIFIED REFERENCE MATERIALS: CRMs are materials of various matrices for which analytical information has been determined and certified by a recognized authority. These are used to provide a quantitative assessment of the accuracy of an analytical method. CRMs provide evidence that the laboratory preparation and analysis produces results that are comparable to those obtained by an independent organization.

LABORATORY CONTROL MATERIAL: LCM is provided because a suitable natural seawater CRM is not available and can be used to indicate accuracy of the method. Physis' internal LCM is seawater collected at ~800 meters in the Southern California San Pedro Basin and can be used as a reference for background concentrations in clean, natural seawater for comparison to project samples.

LABORATORY CONTROL SPIKES: LCS is the introduction of a known concentration of analyte into Physis' LCM. LCS samples were employed to assess the effect the seawater matrix has on the accuracy of a measurement. LCS also indicate the bias of this method due to chemical interferences inherent in the in the seawater matrix. Intrinsic LCM concentration can also significantly impact LCS recovery.

SURROGATES: A surrogate is a pure analyte unlikely to be found in any project sample, behaves similarly to

the target analyte and most often used with organic analytical procedures. Surrogates are added in known concentration to all samples and are measured to indicate overall efficiency of the method including processing and analyses.

HOLDING TIME: Method recommended holding times are the length of time a project sample can be stored under specific conditions after collection and prior to analysis without significantly affecting the analyte's concentration. Holding times can be extended if preservation techniques are employed to reduce biodegradation, volatilization, oxidation, sorption, precipitation, and other physical and chemical processes.

SAMPLE STORAGE/RETENTION: In order to maintain chemical integrity prior to analysis, all samples submitted to Physis are refrigerated (liquids) or frozen (solids) upon receipt unless otherwise recommended by applicable methods. Solid samples are retained for 1 year from collection while liquid samples are retained until method recommended holding times elapse.

TOTAL/DISSOLVED FRACTION: In some instances, the results for the dissolved fraction may be higher than the total fraction for a particular analyte (e.g. trace metals). This is typically caused by the analytical variation for each result and indicates that the target analyte is primarily in the dissolved phase, within the sample.

PHYSIS QUALIFIER CODES

CODE	*DEFINITION*
#	see Case Narrative
ND	analyte not detected at or above the MDL
B	analyte was detected in the procedural blank greater than 10 times the MDL
E	analyte concentration exceeds the upper limit of the linear calibration range, reported value is estimated
H	sample received and/or analyzed past the recommended holding time
J	analyte was detected at a concentration below the RL and above the MDL, reported value is estimated
N	insufficient sample, analysis could not be performed
M	analyte was outside the specified accuracy and/or precision acceptance limits due to matrix interference. The associated B/BS were within limits, therefore the sample data was reported without further clarification
SH	analyte concentration in the project sample exceeded the spike concentration, therefore accuracy and/or precision acceptance limits do not apply
SL	analyte results were lower than 10 times the MDL, therefore accuracy and/or precision acceptance limits do not apply
NH	project sample was heterogeneous and sample homogeneity could not be readily achieved using routine laboratory practices, therefore accuracy and/or precision acceptance limits do not apply
Q	analyte was outside the specified QAPP acceptance limits for precision and/or accuracy but within Physis derived acceptance limits, therefore the sample data was reported without further clarification
R	Physis' QM allows for 5% of the target compounds greater than 10 times the MDL to be outside the specified acceptance limits for precision and/or accuracy. This is often due to random error and does not indicate any significant problems with the analysis of these project samples

ANALYTICAL REPORT

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2302004-017
Client: WSP USA
Project: LECL TMDL Monitoring Project # 2315100200.0004.PHY

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 111950-R1	**CL07 - Int**		**Matrix: Biologic**				**Sampled:**	**10-Oct-23 10:40**		**Received:**	**12-Oct-23**
Chlorophyll-a	SM 10200 H	mg/m3	9.61	1	1	2	NA		C-75101	31-Oct-23	31-Oct-23
Sample ID: 111951-R1	**CL07 - Surf**		**Matrix: Biologic**				**Sampled:**	**10-Oct-23 10:50**		**Received:**	**12-Oct-23**
Chlorophyll-a	SM 10200 H	mg/m3	5.34	1	1	2	NA		C-75101	31-Oct-23	31-Oct-23
Sample ID: 111952-R1	**CL08 - Int**		**Matrix: Biologic**				**Sampled:**	**10-Oct-23 10:00**		**Received:**	**12-Oct-23**
Chlorophyll-a	SM 10200 H	mg/m3	14.4	1	1	2	NA		C-75101	31-Oct-23	31-Oct-23
Sample ID: 111953-R1	**CL08 - Surf**		**Matrix: Biologic**				**Sampled:**	**10-Oct-23 10:15**		**Received:**	**12-Oct-23**
Chlorophyll-a	SM 10200 H	mg/m3	5.87	1	1	2	NA		C-75101	31-Oct-23	31-Oct-23
Sample ID: 111954-R1	**CL09 - Int**		**Matrix: Biologic**				**Sampled:**	**10-Oct-23 9:15**		**Received:**	**12-Oct-23**
Chlorophyll-a	SM 10200 H	mg/m3	23.7	1	1	2	NA		C-75101	31-Oct-23	31-Oct-23
Sample ID: 111955-R1	**CL09 - Surf**		**Matrix: Biologic**				**Sampled:**	**10-Oct-23 9:25**		**Received:**	**12-Oct-23**
Chlorophyll-a	SM 10200 H	mg/m3	15	1	1	2	NA		C-75101	31-Oct-23	31-Oct-23
Sample ID: 111956-R1	**CL10 - Int**		**Matrix: Biologic**				**Sampled:**	**10-Oct-23 8:35**		**Received:**	**12-Oct-23**
Chlorophyll-a	SM 10200 H	mg/m3	18.2	1	1	2	NA		C-75101	31-Oct-23	31-Oct-23
Sample ID: 111957-R1	**CL10 - Surf**		**Matrix: Biologic**				**Sampled:**	**10-Oct-23 8:50**		**Received:**	**12-Oct-23**
Chlorophyll-a	SM 10200 H	mg/m3	8.01	1	1	2	NA		C-75101	31-Oct-23	31-Oct-23
Sample ID: 111958-R1	**LE02 - Int**		**Matrix: Biologic**				**Sampled:**	**10-Oct-23 9:00**		**Received:**	**12-Oct-23**
Chlorophyll-a	SM 10200 H	mg/m3	80.8	1	1	2	NA		C-75101	31-Oct-23	31-Oct-23
Sample ID: 111959-R1	**LE02 - Surf**		**Matrix: Biologic**				**Sampled:**	**10-Oct-23 9:20**		**Received:**	**12-Oct-23**
Chlorophyll-a	SM 10200 H	mg/m3	160	1	1	2	NA		C-75101	31-Oct-23	31-Oct-23

QUALITY CONTROL REPORT

Conventionals

QUALITY CONTROL REPORT

Chlorophyll-a **Method:** SM 10200 H **Fraction:** NA **Prepared:** 31-Oct-23 **Analyzed:** 31-Oct-23

SAMPLE ID	BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	LIMITS		PRECISION %	LIMITS		QA CODE
111949-B1 QAQC Procedural Blank	C-75101	ND	1	1	2	mg/m3									
111949-BS1 QAQC Procedural Blank	C-75101	39500	1	1	2	mg/m3	43600	0	91	70 - 130%	PASS				
111949-BS2 QAQC Procedural Blank	C-75101	41700	1	1	2	mg/m3	43600	0	96	70 - 130%	PASS	5	30	PASS	

CHAIN OF CUSTODY

Chain of Custody & Sample Information Record

Client: WSP USA E&I Inc.
Contact: John Rudolph
Phone No. 858-243-8158

Project Name: LECL TMDL Monitoring
Email: john.rudolph@wsp.com
Project Number: 2315100200.0004.PHYSIS
PO#: C014105479
GL Code: 57300
Org# 3151

Turn Around Time: Routine *3-5 Day Rush *48 Hour Rush *24 Hour Rush
***Lab TAT Approval:** By:
*Additional Charges May Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Nick Jernack
Employer: WSP USA
Signature:

Sample ID	Date	Time	Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	NaOH/ZnAcetate	NH4Cl	MCAA	Frozen		Total # of Containers	*Routine*	*Resample*	*Special*	Total Sulfide	Nitrate - Nitrite	TDS	TKN	Ammonia	Total Phosphorus	SRP/Ortho-P	Chlorophyll-a		Matrix DW = Drinking Water WW = Wastewater GW = Groundwater S = Soil SG = Sludge L = Liquid M = Miscellaneous	Notes Chl-a samples on 0.7 um GFF
CL07 - Int	10/10/23	1040																							X			Filter Volume: 500
CL07 - Surf		1050																							X			Filter Volume: 500
CL08 - Int		1000																							X			Filter Volume: 500
CL08 - Surf		1015																							X			Filter Volume: 500
CL09 - Int		0915																							X			Filter Volume: 450
CL09 - Surf		0925																							X			Filter Volume: 500
CL10 - Int		0835																							X			Filter Volume: 500
CL10 - Surf		0850																							X			Filter Volume: 500
LE02 - Int		0900																							X			Filter Volume: 195
LE02 - Surf		0920																							X			Filter Volume: 155

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company
	Nick Jernack / WSP	10/11/23 - 1600		Mitch Wagner / Physis 10/12/23 1032

(For Lab Use Only) **Sample Integrity Upon Receipt**
Sample(s) Submitted on Ice? Yes No
Custody Seal(s) Intact? Yes No N/A
Sample(s) Intact? Yes No
Temperature °C
☐ Cooler Blank

Lab Notes

Lab No.

Page 1 of 1

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

Project Iteration ID:	2302004-017
Client Name:	WSP USA
Project Name:	LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C014105479 GL # 57300 Org # 3151
COC Page Number:	2 of 2
Bottle Label Color:	NA

Sample Receipt Summary

Receiving Info

1. Initials Received By: MW
2. Date Received: 10/12/23
3. Time Received: 10:32
4. Client Name: WSP
5. Courier Information: (Please circle)
   - Client
   - [✓ FedEx]
   - UPS
   - GSO/GLS
   - Area Fast
   - Ontrac
   - DRS
   - PAMS
   - PHYSIS Driver:
     - i. Start Time: ____
     - ii. End Time: ____
     - iii. Total Mileage: ____
     - iv. Number of Pickups: ____
6. Container Information: (Please put the # of containers or circle none)
   - 1 Cooler
   - __ Styrofoam Cooler
   - ____ Boxes
   - None
   - ____ Carboy(s)
   - __ Carboy Trash Can(s)
   - ____ Carboy Cap(s)
   - Other ____
7. What type of ice was used: (Please circle any that apply)
   - [✓ Wet Ice]
   - Blue Ice
   - Dry Ice
   - Water
   - None
8. Randomly Selected Samples Temperature (°C): 2.7 Used I/R Thermometer # 1-2

Inspection Info

1. Initials Inspected By: RGH

Sample Integrity Upon Receipt:

1. COC(s) included and completely filled out.......................... [✓ Yes] / No
2. All sample containers arrived intact.......................... [✓ Yes] / No
3. All samples listed on COC(s) are present.......................... [✓ Yes] / No
4. Information on containers consistent with information on COC(s).............. [✓ Yes] / No
5. Correct containers and volume for all analyses indicated.......................... [✓ Yes] / No
6. All samples received within method holding time.......................... [✓ Yes] / No
7. Correct preservation used for all analyses indicated.......................... [✓ Yes] / No
8. Name of sampler included on COC(s).......................... [✓ Yes] / No

Notes:

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders: 3K28002

Project: Project No. 2315100200.0004.WECK

Attn: John Rudolph

Client: WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Report Date: 1/09/2024

Received Date: 12/04/2023

Turnaround Time: Normal

Phones: (858) 514-6465

Fax: (858) 278-5300

P.O. #: C016900152

Billing Code:

ELAP-CA #1132 • EPA-UCMR #CA00211 • LACSD #10143

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

Dear John Rudolph,

Enclosed are the results of analyses for samples received 12/04/23 with the Chain-of-Custody document. The samples were received in good condition, at 1.9 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Kim Tu

Kim G. Tu
Project Manager

Certificate of Analysis

FINAL REPORT

WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: Project No. 2315100200.0004.WECK

Project Manager: John Rudolph

Reported:
01/09/2024 10:37

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CL07	Nick Jernack	3K28002-01	Water	12/04/23 11:30	
CL08	Nick Jernack	3K28002-02	Water	12/04/23 10:40	
CL09	Nick Jernack	3K28002-03	Water	12/04/23 09:45	
CL10	Nick Jernack	3K28002-04	Water	12/04/23 08:55	
LE02	Nick Jernack	3K28002-05	Water	12/04/23 09:20	

Sample Results

Sample: CL07

3K28002-01 (Water)

Sampled: 12/04/23 11:30 by Nick Jernack

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: EPA 350.1 **Instr:** AA06
Batch ID: W3L0758 **Preparation:** _NONE (WETCHEM) **Prepared:** 12/11/23 17:07 **Analyst:** AEC

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Ammonia as N	**0.74**	0.017	0.10	mg/l	1	12/12/23	

Method: EPA 351.2 **Instr:** AA06
Batch ID: W3L1094 **Preparation:** _NONE (WETCHEM) **Prepared:** 12/14/23 11:21 **Analyst:** YMT

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
TKN	**1.3**	0.065	0.10	mg/l	1	12/20/23	

Method: EPA 353.2 **Instr:** AA01
Batch ID: W3L0280 **Preparation:** _NONE (WETCHEM) **Prepared:** 12/05/23 12:55 **Analyst:** ISM

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrate as N	ND	0.040	0.20	mg/l	1	12/05/23 16:40	
Nitrite as N	ND	0.042	0.10	mg/l	1	12/05/23 16:40	

Method: EPA 365.3 **Instr:** UVVIS04
Batch ID: W3L0264 **Preparation:** _NONE (WETCHEM) **Prepared:** 12/05/23 11:32 **Analyst:** rob

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
o-Phosphate as P	**0.016**	0.0071	0.010	mg/l	1	12/05/23 13:26	

Method: EPA 365.3 **Instr:** UVVIS05
Batch ID: W3L0957 **Preparation:** _NONE (WETCHEM) **Prepared:** 12/13/23 11:24 **Analyst:** UVVIS05

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Phosphorus as P, Total	**0.051**	0.0067	0.010	mg/l	1	12/18/23	

Method: SM 2540C **Instr:** OVEN17
Batch ID: W3L0260 **Preparation:** _NONE (WETCHEM) **Prepared:** 12/05/23 11:19 **Analyst:** bel

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Dissolved Solids	**500**	4.0	10	mg/l	1	12/05/23	

Method: SM 2540D **Instr:** OVEN15
Batch ID: W3L0266 **Preparation:** _NONE (WETCHEM) **Prepared:** 12/05/23 14:48 **Analyst:** kac

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Suspended Solids	**3**		5	mg/l	1	12/05/23	J

Method: SM 4500S2-D **Instr:** _ANALYST
Batch ID: W3L0396 **Preparation:** _NONE (WETCHEM) **Prepared:** 12/06/23 11:50 **Analyst:** ymt

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Sulfide, Total	**0.90**	0.050	0.10	mg/l	1	12/07/23	

Metals by EPA 200 Series Methods

Method: EPA 200.7 **Instr:** ICP03
Batch ID: W3L0528 **Preparation:** EPA 200.2 **Prepared:** 12/07/23 11:26 **Analyst:** kvm

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Aluminum, Dissolved	ND	0.041	0.050	mg/l	1	12/13/23	
Aluminum, Total	**0.025**	0.022	0.050	mg/l	1	12/13/23	J

Sample Results

(Continued)

Sample: CL08
Sampled: 12/04/23 10:40 by Nick Jernack

3K28002-02 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W3L0758 **Preparation:** _NONE (WETCHEM)			**Prepared:** 12/11/23 17:07				**Analyst:** AEC
Ammonia as N	**0.42**	0.017	0.10	mg/l	1	12/12/23	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W3L1094 **Preparation:** _NONE (WETCHEM)			**Prepared:** 12/14/23 11:21				**Analyst:** YMT
TKN	**1.0**	0.065	0.10	mg/l	1	12/20/23	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W3L0280 **Preparation:** _NONE (WETCHEM)			**Prepared:** 12/05/23 12:55				**Analyst:** ISM
Nitrate as N	**0.048**	0.040	0.20	mg/l	1	12/05/23 16:41	J
Nitrite as N	ND	0.042	0.10	mg/l	1	12/05/23 16:41	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3L0264 **Preparation:** _NONE (WETCHEM)			**Prepared:** 12/05/23 11:32				**Analyst:** rob
o-Phosphate as P	**0.0090**	0.0071	0.010	mg/l	1	12/05/23 13:27	J
Method: EPA 365.3			**Instr:** UVVIS05				
Batch ID: W3L0957 **Preparation:** _NONE (WETCHEM)			**Prepared:** 12/13/23 11:24				**Analyst:** UVVIS05
Phosphorus as P, Total	**0.044**	0.0067	0.010	mg/l	1	12/18/23	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W3L0260 **Preparation:** _NONE (WETCHEM)			**Prepared:** 12/05/23 11:19				**Analyst:** bel
Total Dissolved Solids	**490**	4.0	10	mg/l	1	12/05/23	
Method: SM 2540D			**Instr:** OVEN15				
Batch ID: W3L0266 **Preparation:** _NONE (WETCHEM)			**Prepared:** 12/05/23 14:48				**Analyst:** kac
Total Suspended Solids	**4**		5	mg/l	1	12/05/23	J
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W3L0396 **Preparation:** _NONE (WETCHEM)			**Prepared:** 12/06/23 11:50				**Analyst:** ymt
Sulfide, Total	ND	0.050	0.10	mg/l	1	12/07/23	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W3L0528 **Preparation:** EPA 200.2			**Prepared:** 12/07/23 11:26				**Analyst:** kvm
Aluminum, Dissolved	ND	0.041	0.050	mg/l	1	12/13/23	
Aluminum, Total	**0.044**	0.022	0.050	mg/l	1	12/13/23	J

Sample Results

(Continued)

Sample: CL09

3K28002-03 (Water)

Sampled: 12/04/23 9:45 by Nick Jernack

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W3L0758	**Preparation:** _NONE (WETCHEM)		**Prepared:** 12/11/23 17:07				**Analyst:** AEC
Ammonia as N	**0.36**	0.017	0.10	mg/l	1	12/12/23	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W3L1094	**Preparation:** _NONE (WETCHEM)		**Prepared:** 12/14/23 11:21				**Analyst:** YMT
TKN	**1.1**	0.065	0.10	mg/l	1	12/20/23	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W3L0280	**Preparation:** _NONE (WETCHEM)		**Prepared:** 12/05/23 12:55				**Analyst:** ISM
Nitrate as N	**0.063**	0.040	0.20	mg/l	1	12/05/23 16:42	J
Nitrite as N	ND	0.042	0.10	mg/l	1	12/05/23 16:42	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3L0264	**Preparation:** _NONE (WETCHEM)		**Prepared:** 12/05/23 11:32				**Analyst:** rob
o-Phosphate as P	**0.011**	0.0071	0.010	mg/l	1	12/05/23 13:27	
Method: EPA 365.3			**Instr:** UVVIS05				
Batch ID: W3L0957	**Preparation:** _NONE (WETCHEM)		**Prepared:** 12/13/23 11:24				**Analyst:** UVVIS05
Phosphorus as P, Total	**0.052**	0.0067	0.010	mg/l	1	12/18/23	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W3L0260	**Preparation:** _NONE (WETCHEM)		**Prepared:** 12/05/23 11:19				**Analyst:** bel
Total Dissolved Solids	**600**	4.0	10	mg/l	1	12/05/23	
Method: SM 2540D			**Instr:** OVEN15				
Batch ID: W3L0266	**Preparation:** _NONE (WETCHEM)		**Prepared:** 12/05/23 14:48				**Analyst:** kac
Total Suspended Solids	**6**		5	mg/l	1	12/05/23	
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W3L0396	**Preparation:** _NONE (WETCHEM)		**Prepared:** 12/06/23 11:50				**Analyst:** ymt
Sulfide, Total	ND	0.050	0.10	mg/l	1	12/07/23	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W3L0528	**Preparation:** EPA 200.2		**Prepared:** 12/07/23 11:26				**Analyst:** kvm
Aluminum, Dissolved	ND	0.041	0.050	mg/l	1	12/13/23	
Aluminum, Total	**0.11**	0.022	0.050	mg/l	1	12/13/23	

Sample Results

(Continued)

Sample: CL10

Sampled: 12/04/23 8:55 by Nick Jernack

3K28002-04 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W3L0758	**Preparation:** _NONE (WETCHEM)		**Prepared:** 12/11/23 17:07				**Analyst:** AEC
Ammonia as N	**0.21**	0.017	0.10	mg/l	1	12/12/23	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W3L1094	**Preparation:** _NONE (WETCHEM)		**Prepared:** 12/14/23 11:21				**Analyst:** YMT
TKN	**0.97**	0.065	0.10	mg/l	1	12/20/23	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W3L0280	**Preparation:** _NONE (WETCHEM)		**Prepared:** 12/05/23 12:55				**Analyst:** ISM
Nitrate as N	**0.078**	0.040	0.20	mg/l	1	12/05/23 16:43	J
Nitrite as N	ND	0.042	0.10	mg/l	1	12/05/23 16:43	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W3L0264	**Preparation:** _NONE (WETCHEM)		**Prepared:** 12/05/23 11:32				**Analyst:** rob
o-Phosphate as P	**0.010**	0.0071	0.010	mg/l	1	12/05/23 13:28	
Method: EPA 365.3			**Instr:** UVVIS05				
Batch ID: W3L0957	**Preparation:** _NONE (WETCHEM)		**Prepared:** 12/13/23 11:24				**Analyst:** UVVIS05
Phosphorus as P, Total	**0.059**	0.0067	0.010	mg/l	1	12/18/23	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W3L0260	**Preparation:** _NONE (WETCHEM)		**Prepared:** 12/05/23 11:19				**Analyst:** bel
Total Dissolved Solids	**610**	4.0	10	mg/l	1	12/05/23	
Method: SM 2540D			**Instr:** OVEN15				
Batch ID: W3L0266	**Preparation:** _NONE (WETCHEM)		**Prepared:** 12/05/23 14:48				**Analyst:** kac
Total Suspended Solids	**7**		5	mg/l	1	12/05/23	
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W3L0396	**Preparation:** _NONE (WETCHEM)		**Prepared:** 12/06/23 11:50				**Analyst:** ymt
Sulfide, Total	ND	0.050	0.10	mg/l	1	12/07/23	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W3L0528	**Preparation:** EPA 200.2		**Prepared:** 12/07/23 11:26				**Analyst:** kvm
Aluminum, Dissolved	ND	0.041	0.050	mg/l	1	12/13/23	
Aluminum, Total	**0.16**	0.022	0.050	mg/l	1	12/13/23	

Sample Results

(Continued)

Sample: LE02 Sampled: 12/04/23 9:20 by Nick Jernack

3K28002-05 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1 **Instr:** AA06							
Batch ID: W3L0758 **Preparation:** _NONE (WETCHEM) **Prepared:** 12/11/23 17:07 **Analyst:** AEC							
Ammonia as N	**0.080**	0.017	0.10	mg/l	1	12/12/23	J
Method: EPA 351.2 **Instr:** AA06							
Batch ID: W3L1094 **Preparation:** _NONE (WETCHEM) **Prepared:** 12/14/23 11:21 **Analyst:** YMT							
TKN	**4.2**	0.13	0.20	mg/l	1	12/20/23	M-02
Method: EPA 353.2 **Instr:** AA01							
Batch ID: W3L0280 **Preparation:** _NONE (WETCHEM) **Prepared:** 12/05/23 12:55 **Analyst:** ISM							
Nitrate as N	**0.14**	0.040	0.20	mg/l	1	12/05/23 16:44	J
Nitrite as N	ND	0.042	0.10	mg/l	1	12/05/23 16:44	
Method: EPA 365.3 **Instr:** UVVIS04							
Batch ID: W3L0264 **Preparation:** _NONE (WETCHEM) **Prepared:** 12/05/23 11:32 **Analyst:** rob							
o-Phosphate as P	**0.017**	0.0071	0.010	mg/l	1	12/05/23 13:21	
Method: EPA 365.3 **Instr:** UVVIS05							
Batch ID: W3L0957 **Preparation:** _NONE (WETCHEM) **Prepared:** 12/13/23 11:24 **Analyst:** UVVIS05							
Phosphorus as P, Total	**0.28**	0.0067	0.010	mg/l	1	12/18/23	
Method: SM 2540C **Instr:** OVEN17							
Batch ID: W3L0260 **Preparation:** _NONE (WETCHEM) **Prepared:** 12/05/23 11:19 **Analyst:** bel							
Total Dissolved Solids	**2000**	4.0	10	mg/l	1	12/05/23	
Method: SM 4500S2-D **Instr:** _ANALYST							
Batch ID: W3L0396 **Preparation:** _NONE (WETCHEM) **Prepared:** 12/06/23 11:50 **Analyst:** ymt							
Sulfide, Total	ND	0.050	0.10	mg/l	1	12/07/23	

Quality Control Results

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W3L0260 - SM 2540C											
Blank (W3L0260-BLK1)					**Prepared & Analyzed: 12/05/23**						
Total Dissolved Solids	ND	4.0	10	mg/l							
LCS (W3L0260-BS1)					**Prepared & Analyzed: 12/05/23**						
Total Dissolved Solids	813	4.0	10	mg/l	824		99	97-103			
Duplicate (W3L0260-DUP1)	**Source: 3K28002-04**				**Prepared & Analyzed: 12/05/23**						
Total Dissolved Solids	603	4.0	10	mg/l		614			2	10	
Duplicate (W3L0260-DUP2)	**Source: 3K28002-05**				**Prepared & Analyzed: 12/05/23**						
Total Dissolved Solids	1970	4.0	10	mg/l		2000			2	10	
Batch: W3L0264 - EPA 365.3											
Blank (W3L0264-BLK1)					**Prepared & Analyzed: 12/05/23**						
o-Phosphate as P	ND	0.0071	0.010	mg/l							
LCS (W3L0264-BS1)					**Prepared & Analyzed: 12/05/23**						
o-Phosphate as P	0.210	0.0071	0.010	mg/l	0.200		105	88-111			
Matrix Spike (W3L0264-MS1)	**Source: 3K28002-05**				**Prepared & Analyzed: 12/05/23**						
o-Phosphate as P	0.214	0.0071	0.010	mg/l	0.200	0.0170	98	85-112			
Matrix Spike Dup (W3L0264-MSD1)	**Source: 3K28002-05**				**Prepared & Analyzed: 12/05/23**						
o-Phosphate as P	0.220	0.0071	0.010	mg/l	0.200	0.0170	102	85-112	3	20	
Batch: W3L0266 - SM 2540D											
Blank (W3L0266-BLK1)					**Prepared & Analyzed: 12/05/23**						
Total Suspended Solids	ND		5	mg/l							
LCS (W3L0266-BS1)					**Prepared & Analyzed: 12/05/23**						
Total Suspended Solids	60.7		5	mg/l	55.7		109	90-110			
Duplicate (W3L0266-DUP1)	**Source: 3L04146-01**				**Prepared & Analyzed: 12/05/23**						
Total Suspended Solids	373		5	mg/l		390			4	10	
Duplicate (W3L0266-DUP2)	**Source: 3L05025-01**				**Prepared & Analyzed: 12/05/23**						
Total Suspended Solids	42.9		5	mg/l		40.0			7	10	
Batch: W3L0280 - EPA 353.2											
Blank (W3L0280-BLK1)					**Prepared & Analyzed: 12/05/23**						
Nitrate as N	ND	0.040	0.20	mg/l							
Nitrite as N	ND	0.042	0.10	mg/l							
LCS (W3L0280-BS1)					**Prepared & Analyzed: 12/05/23**						
Nitrate as N	0.973	0.040	0.20	mg/l	1.00		97	90-110			
Nitrite as N	0.994	0.042	0.10	mg/l	1.00		99	90-110			
Matrix Spike (W3L0280-MS1)	**Source: 3L01002-01**				**Prepared & Analyzed: 12/05/23**						
Nitrate as N	9.51	0.040	0.20	mg/l	2.00	7.56	98	90-110			
Nitrite as N	0.998	0.042	0.10	mg/l	1.00	ND	100	90-110			
Matrix Spike (W3L0280-MS2)	**Source: 3L01002-02**				**Prepared & Analyzed: 12/05/23**						
Nitrate as N	9.51	0.040	0.20	mg/l	2.00	7.53	99	90-110			

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W3L0280 - EPA 353.2 (Continued)											
Matrix Spike (W3L0280-MS2)	**Source: 3L01002-02**			**Prepared & Analyzed: 12/05/23**							
Nitrite as N	1.03	0.042	0.10	mg/l	1.00	ND	103	90-110			
Matrix Spike Dup (W3L0280-MSD1)	**Source: 3L01002-01**			**Prepared & Analyzed: 12/05/23**							
Nitrate as N	9.50	0.040	0.20	mg/l	2.00	7.56	97	90-110	0.1	20	
Nitrite as N	0.998	0.042	0.10	mg/l	1.00	ND	100	90-110	0	20	
Matrix Spike Dup (W3L0280-MSD2)	**Source: 3L01002-02**			**Prepared & Analyzed: 12/05/23**							
Nitrate as N	9.51	0.040	0.20	mg/l	2.00	7.53	99	90-110	0	20	
Nitrite as N	1.04	0.042	0.10	mg/l	1.00	ND	104	90-110	1	20	
Batch: W3L0396 - SM 4500S2-D											
Blank (W3L0396-BLK1)				**Prepared: 12/06/23**		**Analyzed: 12/07/23**					
Sulfide, Total	ND	0.050	0.10	mg/l							
LCS (W3L0396-BS1)				**Prepared: 12/06/23**		**Analyzed: 12/07/23**					
Sulfide, Total	0.100	0.050	0.10	mg/l	0.0998		100	90-110			
Duplicate (W3L0396-DUP1)	**Source: 3I01016-01**			**Prepared: 12/06/23**		**Analyzed: 12/07/23**					
Sulfide, Total	1.40	0.35	0.70	mg/l		1.40			0	20	
Matrix Spike (W3L0396-MS1)	**Source: 3I01016-05**			**Prepared: 12/06/23**		**Analyzed: 12/07/23**					
Sulfide, Total	0.200	0.050	0.10	mg/l	0.200	ND	100	80-120			
Matrix Spike Dup (W3L0396-MSD1)	**Source: 3I01016-05**			**Prepared: 12/06/23**		**Analyzed: 12/07/23**					
Sulfide, Total	0.200	0.050	0.10	mg/l	0.200	ND	100	80-120	0	20	
Batch: W3L0758 - EPA 350.1											
Blank (W3L0758-BLK1)				**Prepared: 12/11/23**		**Analyzed: 12/12/23**					
Ammonia as N	ND	0.017	0.10	mg/l							
Blank (W3L0758-BLK2)				**Prepared: 12/11/23**		**Analyzed: 12/12/23**					
Ammonia as N	ND	0.017	0.10	mg/l							
LCS (W3L0758-BS1)				**Prepared: 12/11/23**		**Analyzed: 12/12/23**					
Ammonia as N	0.247	0.017	0.10	mg/l	0.250		99	90-110			
LCS (W3L0758-BS2)				**Prepared: 12/11/23**		**Analyzed: 12/12/23**					
Ammonia as N	0.252	0.017	0.10	mg/l	0.250		101	90-110			
Matrix Spike (W3L0758-MS1)	**Source: 3K27011-02**			**Prepared: 12/11/23**		**Analyzed: 12/12/23**					
Ammonia as N	0.545	0.017	0.10	mg/l	0.250	0.295	100	90-110			
Matrix Spike (W3L0758-MS2)	**Source: 3K27011-04**			**Prepared: 12/11/23**		**Analyzed: 12/12/23**					
Ammonia as N	0.514	0.017	0.10	mg/l	0.250	0.266	99	90-110			
Matrix Spike Dup (W3L0758-MSD1)	**Source: 3K27011-02**			**Prepared: 12/11/23**		**Analyzed: 12/12/23**					
Ammonia as N	0.533	0.017	0.10	mg/l	0.250	0.295	95	90-110	2	15	
Matrix Spike Dup (W3L0758-MSD2)	**Source: 3K27011-04**			**Prepared: 12/11/23**		**Analyzed: 12/12/23**					
Ammonia as N	0.517	0.017	0.10	mg/l	0.250	0.266	100	90-110	0.6	15	
Batch: W3L0957 - EPA 365.3											
Blank (W3L0957-BLK1)				**Prepared: 12/13/23**		**Analyzed: 12/18/23**					

WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: Project No. 2315100200.0004.WECK

Project Manager: John Rudolph

Reported:
01/09/2024 10:37

(Continued)

Quality Control Results

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W3L0957 - EPA 365.3 (Continued)											
Blank (W3L0957-BLK1)				**Prepared: 12/13/23**	**Analyzed: 12/18/23**						
Phosphorus as P, Total	ND	0.0067	0.010	mg/l							
LCS (W3L0957-BS1)				**Prepared: 12/13/23**	**Analyzed: 12/18/23**						
Phosphorus as P, Total	0.194	0.0067	0.010	mg/l	0.200		97	90-110			
Matrix Spike (W3L0957-MS1)	**Source: 3L05069-02**			**Prepared: 12/13/23**	**Analyzed: 12/18/23**						
Phosphorus as P, Total	0.228	0.0067	0.010	mg/l	0.200	0.0500	89	90-110			MS-01
Matrix Spike Dup (W3L0957-MSD1)	**Source: 3L05069-02**			**Prepared: 12/13/23**	**Analyzed: 12/18/23**						
Phosphorus as P, Total	0.228	0.0067	0.010	mg/l	0.200	0.0500	89	90-110	0	20	MS-01
Batch: W3L1094 - EPA 351.2											
Blank (W3L1094-BLK1)				**Prepared: 12/14/23**	**Analyzed: 12/20/23**						
TKN	ND	0.065	0.10	mg/l							
Blank (W3L1094-BLK2)				**Prepared: 12/14/23**	**Analyzed: 12/20/23**						
TKN	ND	0.065	0.10	mg/l							
LCS (W3L1094-BS1)				**Prepared: 12/14/23**	**Analyzed: 12/20/23**						
TKN	0.986	0.065	0.10	mg/l	1.00		99	90-110			
LCS (W3L1094-BS2)				**Prepared: 12/14/23**	**Analyzed: 12/20/23**						
TKN	0.955	0.065	0.10	mg/l	1.00		95	90-110			
Matrix Spike (W3L1094-MS1)	**Source: 3L07080-01**			**Prepared: 12/14/23**	**Analyzed: 12/20/23**						
TKN	1.21	0.065	0.10	mg/l	1.00	0.238	97	90-110			
Matrix Spike (W3L1094-MS2)	**Source: 3L07080-02**			**Prepared: 12/14/23**	**Analyzed: 12/20/23**						
TKN	1.21	0.065	0.10	mg/l	1.00	0.240	97	90-110			
Matrix Spike Dup (W3L1094-MSD1)	**Source: 3L07080-01**			**Prepared: 12/14/23**	**Analyzed: 12/20/23**						
TKN	1.22	0.065	0.10	mg/l	1.00	0.238	98	90-110	0.7	10	
Matrix Spike Dup (W3L1094-MSD2)	**Source: 3L07080-02**			**Prepared: 12/14/23**	**Analyzed: 12/20/23**						
TKN	1.18	0.065	0.10	mg/l	1.00	0.240	95	90-110	2	10	

WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: Project No. 2315100200.0004.WECK

Project Manager: John Rudolph

Reported: 01/09/2024 10:37

Quality Control Results

(Continued)

Metals by EPA 200 Series Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W3L0528 - EPA 200.7											
Blank (W3L0528-BLK1)				**Prepared: 12/07/23**	**Analyzed: 12/13/23**						
Aluminum, Dissolved	ND	0.041	0.050	mg/l							
Aluminum, Total	ND	0.022	0.050	mg/l							
LCS (W3L0528-BS1)				**Prepared: 12/07/23**	**Analyzed: 12/13/23**						
Aluminum, Dissolved	0.215	0.041	0.050	mg/l	0.200		108	85-115			
Aluminum, Total	0.215	0.022	0.050	mg/l	0.200		108	85-115			
Matrix Spike (W3L0528-MS1)	**Source: 3K28003-03**			**Prepared: 12/07/23**	**Analyzed: 12/13/23**						
Aluminum, Total	0.506	0.022	0.050	mg/l	0.200	0.159	173	70-130			MS-02
Matrix Spike (W3L0528-MS2)	**Source: 3K28003-05**			**Prepared: 12/07/23**	**Analyzed: 12/13/23**						
Aluminum, Total	0.462	0.022	0.050	mg/l	0.200	0.119	172	70-130			MS-02
Matrix Spike Dup (W3L0528-MSD1)	**Source: 3K28003-03**			**Prepared: 12/07/23**	**Analyzed: 12/13/23**						
Aluminum, Total	0.510	0.022	0.050	mg/l	0.200	0.159	175	70-130	0.8	30	MS-02
Matrix Spike Dup (W3L0528-MSD2)	**Source: 3K28003-05**			**Prepared: 12/07/23**	**Analyzed: 12/13/23**						
Aluminum, Total	0.478	0.022	0.050	mg/l	0.200	0.119	180	70-130	3	30	MS-02

Notes and Definitions

Item	Definition
J	Estimated conc. detected <MRL and >MDL.
M-02	Due to the nature of matrix interferences, sample was diluted prior to preparation. The MDL and MRL were raised due to the dilution.
MS-01	The spike recovery for this QC sample is outside of established control limits possibly due to sample matrix interference.
MS-02	The RPD and/or percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte inherent in the sample.
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	The minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

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

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

Chain of Custody & Sample Information Record

3K28002

Client: WSP USA E&I Inc. **Contact:** John Rudolph **Phone No.** 858-243-8158

Project Name: LECL TMDL Monitoring **Email:** john.rudolph@woodplc.com

Project Number: 2315100200.0004.WECK
PO#: C016900152
GL Code: 573000
Org# 3151

*Please include Marissa Cuevas (marissa.cuevas@wsp.com) on all invoicing

Turn Around Time: Routine *3-5 Day Rush *48 Hour Rush *24 Hour Rush

Lab TAT Approval: By: *Additional Charges May Apply

Additional Reporting Requests

Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information

Name: Nick Jenack
Employer: WSP USA E&I Inc.
Signature:

Matrix

DW = Drinking Water
WW = Wastewater
GW = Groundwater
S = Soil
SG = Sludge
L = Liquid
M = Miscellaneous

Notes

Ortho-P is field filtered (0.45 um)

Dissolved Al is field filtered (0.45 um)

			# of Containers & Preservatives											Sample Type			Analysis Requested										Matrix	Notes
Sample ID	Date	Time	Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	NaOH/ZnAcetate	NH4Cl	MCAA	Frozen	Total # of Containers	*Routine*	*Resample*	*Special*	TSS	Nitrate - Nitrite (EPA 353.2)	TDS (SM2540 C)	TKN (EPA 351.2	Ammonia (EPA 350.1)	Total Phosphorus (EPA 365.3)	SRP/Ortho-P (EPA 365.3)	Total Sulfide (SM4500S)	Total AL (EPA 200.7)	Dissolved AL (EPA 200.7)		
CL07	12/4/23	1130															X	X	X	X	X	X	X	X	X	X		
CL08		1040															X	X	X	X	X	X	X	X	X	X		
CL09		0945															X	X	X	X	X	X	X	X	X	X		
CL10		0855															X	X	X	X	X	X	X	X	X	X		
LE02	12/4/23	0920																X	X	X	X	X	X	X				

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company
	Nick Jenack/WSP	12/4/23 1330		
		12/4/23 5:13	12/04/23 17:13	

(For Lab Use Only) **Sample Integrity Upon Receipt**

Sample(s) Submitted on Ice? Yes No
Custody Seal(s) Intact? Yes No N/A
Sample(s) Intact? Yes No

Temperature 1.9 °C
☐ **Cooler Blank**

Lab Notes

T-OM

Lab No. ____________

Page 1 **of** 1

WECK LABORATORIES, INC.

Sample Receipt Checklist

Weck WKO: **3K28002**
WKO Logged by: Jerico Bolotano
Samples Checked by: Jerico Bolotano

Date/Time Received: 12/04/23 @ 17:13
# of Samples: 05
Delivered by: RMS

	Task	Yes	No	N/A	Comments
COC	COC present at receipt?	☒	☐		
	COC properly completed?	☒	☐		
	COC matches sample labels?	☒	☐		
	Project Manager notified about COC discrepancy?	☐	☐	☒	
Receipt Information	Sample Temperature	1.9°C			
	Samples received on ice?	☒	☐		
	Ice Type (Blue/Wet)	Wet			
	All samples intact?	☒	☐		
	Samples in proper containers?	☒	☐		
	Sufficient sample volume?	☒	☐		
	Samples intact?	☒	☐		
	Received within holding time?	☒	☐		
	Project Manager notified about receipt info?	☐	☐	☒	
Sample Preservation Verification?	Sample labels checked for correct preservation?	☒	☐	☐	
	VOC Headspace: (No) none, If Yes (see comment) 524.2, 524.3, 624.1, 8260, 1666 P/T, LUFT	☐	☐	☒	☐<6mm/Pea Size?
	pH verified upon receipt? Metals <2; H2SO4 pres tests <2; 522<4; TOC <2; 508.1, 525.2<2, 6710B<2, 608.3 5-9	☒	☐	☐	pH paper Lot# 3082367
	Free Chlorine Tested <0.1 (Organics Analyses)	☐	☐	☒	Cl Test Strip Lot#
	O&G pH <2 verified?	☐	☐	☐	pH paper Lot# pH Reading:
	pH adjusted for O&G	☐	☐	☐	Acid Lot# Amt added:
	Project Manager notified about sample preservation?	☐	☐	☐	

PM Comments

Sample Receipt Checklist Completed by:
Signature: Jerico Bolotano
Date: 12/05/23

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

January 25, 2024

John D. Rudolph
WSP USA
9177 Sky Park Court
San Diego, CA 92123-

Project Name: LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C0141054799 GL # 57300 Org # 3151
Physis Project ID: 2302004-032

Dear John,

Enclosed are the analytical results for samples submitted to PHYSIS Environmental Laboratories, Inc. (PHYSIS) on 12/8/2023. A total of 10 samples were received for analysis in accordance with the attached chain of custody (COC). Per the COC, the samples were analyzed for:

Conventionals
Chlorophyll-a (mg/m3) by SM 10200 H

Analytical results in this report apply only to samples submitted to PHYSIS in accordance with the COC and are intended to be considered in their entirety.

Please feel free to contact me at any time with any questions. PHYSIS appreciates the opportunity to provide you with our analytical and support services.

Regards,
misty mercier
Misty Mercier
714 602-5320
Extension 202
mistymercier@physislabs.com

PROJECT SAMPLE LIST

WSP USA PHYSIS Project ID: 2302004-022

LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C014105479 Total Samples: 10

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
113401	CL07 - Int		12/4/2023	11:30	Biologic	Not Specified
113402	CL07 - Surf		12/4/2023	11:40	Biologic	Not Specified
113403	CL08 - Int		12/4/2023	10:40	Biologic	Not Specified
113404	CL08 - Surf		12/4/2023	10:50	Biologic	Not Specified
113405	CL09 - Int		12/4/2023	9:45	Biologic	Not Specified
113406	CL09 - Surf		12/4/2023	9:55	Biologic	Not Specified
113407	CL10 - Int		12/4/2023	8:55	Biologic	Not Specified
113408	CL10 - Surf		12/4/2023	9:05	Biologic	Not Specified
113409	LE02 - Int		12/4/2023	9:20	Biologic	Not Specified
113410	LE02 - Surf		12/4/2023	9:50	Biologic	Not Specified

ABBREVIATIONS and ACRONYMS

QM	Quality Manual
QA	Quality Assurance
QC	Quality Control
MDL	method detection limit
RL	reporting limit
R1	project sample
R2	project sample replicate
MS1	matrix spike
MS2	matrix spike replicate
B1	procedural blank
B2	procedural blank replicate
BS1	blank spike
BS2	blank spike replicate
LCS1	laboratory control spike
LCS2	laboratory control spike replicate
LCM1	laboratory control material
LCM2	laboratory control material replicate
CRM1	certified reference material
CRM2	certified reference material replicate
RPD	relative percent difference
LMW	low molecular weight
HMW	high molecular weight

QUALITY ASSURANCE SUMMARY

LABORATORY BATCH: Physis' QM defines a laboratory batch as a group of 20 or fewer project samples of similar matrix, processed together under the same conditions and with the same reagents. QC samples are associated with each batch and were used to assess the validity of the sample analyses.

PROCEDURAL BLANK: Laboratory contamination introduced during method use is assessed through the preparation and analysis of procedural blanks is provided at a minimum frequency of one per batch.

ACCURACY: Accuracy of analytical measurements is the degree of closeness based on percent recovery calculations between measured values and the actual or true value and includes a combination of reproducibility error and systematic bias due to sampling and analytical operations. Accuracy of the project data was indicated by analysis of MS, BS, LCS, LCM, CRM, and/or surrogate spikes on a minimum frequency of one per batch. Physis' QM requires that 95% of the target compounds greater than 10 times the MDL be within the specified acceptance limits.

PRECISION: Precision is the agreement among a set of replicate measurements without assumption of knowledge of the true value and is based on RPD calculations between repeated values. Precision of the project data was determined by analysis of replicate MS1/MS2, BS1/BS2, LCS1/LCS2, LCM1/LCM2, CRM1/CRM2, surrogate spikes and/or replicate project sample analysis (R1/R2) on a minimum frequency of one per batch. Physis' QM requires that for 95% of the compounds greater than 10 times the MDL, the percent RPD should be within the specified acceptance range.

BLANK SPIKES: BS is the introduction of a known concentration of analyte into the procedural blank. BS demonstrates performance of the preparation and analytical methods on a clean matrix void of potential matrix related interferences. The BS is performed in laboratory deionized water, making these recoveries a better indicator of the efficiency of the laboratory method per se.

MATRIX SPIKES: MS is the introduction of a known concentration of analyte into a sample. MS samples demonstrate the effect a particular project sample matrix has on the accuracy of a measurement. Individually, MS samples also indicate the bias of analytical measurements due to chemical interferences inherent in the in the specific project sample spiked. Intrinsic target analyte concentration in the specific project sample can also significantly impact MS recovery.

CERTIFIED REFERENCE MATERIALS: CRMs are materials of various matrices for which analytical information has been determined and certified by a recognized authority. These are used to provide a quantitative assessment of the accuracy of an analytical method. CRMs provide evidence that the laboratory preparation and analysis produces results that are comparable to those obtained by an independent organization.

LABORATORY CONTROL MATERIAL: LCM is provided because a suitable natural seawater CRM is not available and can be used to indicate accuracy of the method. Physis' internal LCM is seawater collected at ~800 meters in the Southern California San Pedro Basin and can be used as a reference for background concentrations in clean, natural seawater for comparison to project samples.

LABORATORY CONTROL SPIKES: LCS is the introduction of a known concentration of analyte into Physis' LCM. LCS samples were employed to assess the effect the seawater matrix has on the accuracy of a measurement. LCS also indicate the bias of this method due to chemical interferences inherent in the in the seawater matrix. Intrinsic LCM concentration can also significantly impact LCS recovery.

SURROGATES: A surrogate is a pure analyte unlikely to be found in any project sample, behaves similarly to

the target analyte and most often used with organic analytical procedures. Surrogates are added in known concentration to all samples and are measured to indicate overall efficiency of the method including processing and analyses.

HOLDING TIME: Method recommended holding times are the length of time a project sample can be stored under specific conditions after collection and prior to analysis without significantly affecting the analyte's concentration. Holding times can be extended if preservation techniques are employed to reduce biodegradation, volatilization, oxidation, sorption, precipitation, and other physical and chemical processes.

SAMPLE STORAGE/RETENTION: In order to maintain chemical integrity prior to analysis, all samples submitted to Physis are refrigerated (liquids) or frozen (solids) upon receipt unless otherwise recommended by applicable methods. Solid samples are retained for 1 year from collection while liquid samples are retained until method recommended holding times elapse.

TOTAL/DISSOLVED FRACTION: In some instances, the results for the dissolved fraction may be higher than the total fraction for a particular analyte (e.g. trace metals). This is typically caused by the analytical variation for each result and indicates that the target analyte is primarily in the dissolved phase, within the sample.

PHYSIS QUALIFIER CODES

CODE	DEFINITION
#	see Case Narrative
ND	analyte not detected at or above the MDL
B	analyte was detected in the procedural blank greater than 10 times the MDL
E	analyte concentration exceeds the upper limit of the linear calibration range, reported value is estimated
H	sample received and/or analyzed past the recommended holding time
J	analyte was detected at a concentration below the RL and above the MDL, reported value is estimated
N	insufficient sample, analysis could not be performed
M	analyte was outside the specified accuracy and/or precision acceptance limits due to matrix interference. The associated B/BS were within limits, therefore the sample data was reported without further clarification
SH	analyte concentration in the project sample exceeded the spike concentration, therefore accuracy and/or precision acceptance limits do not apply
SL	analyte results were lower than 10 times the MDL, therefore accuracy and/or precision acceptance limits do not apply
NH	project sample was heterogeneous and sample homogeneity could not be readily achieved using routine laboratory practices, therefore accuracy and/or precision acceptance limits do not apply
Q	analyte was outside the specified QAPP acceptance limits for precision and/or accuracy but within Physis derived acceptance limits, therefore the sample data was reported without further clarification
R	Physis' QM allows for 5% of the target compounds greater than 10 times the MDL to be outside the specified acceptance limits for precision and/or accuracy. This is often due to random error and does not indicate any significant problems with the analysis of these project samples

ANALYTICAL REPORT

PHYSIS

ENVIRONMENTAL LABORATORIES, INC.

Innovative Solutions for Nature

PHYSIS ENVIRONMENTAL LABORATORIES, INC.
TERRA FAUNA FLORA AQUA AURA
Innovative Solutions for Nature

PHYSIS Project ID: 2302004-022
Client: WSP USA
Project: LECL TMDL Monitoring Project # 2315100200.0004.PHY

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 113401-R1 CL07 - Int			**Matrix: Biologic**				**Sampled:**	**04-Dec-23 11:30**		**Received:**	**08-Dec-23**
Chlorophyll-a	SM 10200 H	mg/m3	6.41	1	1	2	NA		C-75137	13-Dec-23	13-Dec-23
Sample ID: 113402-R1 CL07 - Surf			**Matrix: Biologic**				**Sampled:**	**04-Dec-23 11:40**		**Received:**	**08-Dec-23**
Chlorophyll-a	SM 10200 H	mg/m3	6.05	1	1	2	NA		C-75137	13-Dec-23	13-Dec-23
Sample ID: 113403-R1 CL08 - Int			**Matrix: Biologic**				**Sampled:**	**04-Dec-23 10:40**		**Received:**	**08-Dec-23**
Chlorophyll-a	SM 10200 H	mg/m3	9.61	1	1	2	NA		C-75137	13-Dec-23	13-Dec-23
Sample ID: 113404-R1 CL08 - Surf			**Matrix: Biologic**				**Sampled:**	**04-Dec-23 10:50**		**Received:**	**08-Dec-23**
Chlorophyll-a	SM 10200 H	mg/m3	12.3	1	1	2	NA		C-75137	13-Dec-23	13-Dec-23
Sample ID: 113405-R1 CL09 - Int			**Matrix: Biologic**				**Sampled:**	**04-Dec-23 9:45**		**Received:**	**08-Dec-23**
Chlorophyll-a	SM 10200 H	mg/m3	13.6	1	1	2	NA		C-75137	13-Dec-23	13-Dec-23
Sample ID: 113406-R1 CL09 - Surf			**Matrix: Biologic**				**Sampled:**	**04-Dec-23 9:55**		**Received:**	**08-Dec-23**
Chlorophyll-a	SM 10200 H	mg/m3	13.6	1	1	2	NA		C-75137	13-Dec-23	13-Dec-23
Sample ID: 113407-R1 CL10 - Int			**Matrix: Biologic**				**Sampled:**	**04-Dec-23 8:55**		**Received:**	**08-Dec-23**
Chlorophyll-a	SM 10200 H	mg/m3	16	1	1	2	NA		C-75137	13-Dec-23	13-Dec-23
Sample ID: 113408-R1 CL10 - Surf			**Matrix: Biologic**				**Sampled:**	**04-Dec-23 9:05**		**Received:**	**08-Dec-23**
Chlorophyll-a	SM 10200 H	mg/m3	13.9	1	1	2	NA		C-75137	13-Dec-23	13-Dec-23
Sample ID: 113409-R1 LE02 - Int			**Matrix: Biologic**				**Sampled:**	**04-Dec-23 9:20**		**Received:**	**08-Dec-23**
Chlorophyll-a	SM 10200 H	mg/m3	161	1	1	2	NA		C-75137	13-Dec-23	13-Dec-23
Sample ID: 113410-R1 LE02 - Surf			**Matrix: Biologic**				**Sampled:**	**04-Dec-23 9:50**		**Received:**	**08-Dec-23**
Chlorophyll-a	SM 10200 H	mg/m3	159	1	1	2	NA		C-75137	13-Dec-23	13-Dec-23

QUALITY CONTROL REPORT

Conventionals

QUALITY CONTROL REPORT

Chlorophyll-a **Method:** SM 10200 H **Fraction:** NA **Prepared:** 13-Dec-23 **Analyzed:** 13-Dec-23

SAMPLE ID	BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS	PRECISION %	PRECISION LIMITS	QA CODE
113400-B1 QAQC Procedural Blank	C-75137	ND	1	1	2	mg/m3							
113400-BS1 QAQC Procedural Blank	C-75137	51300	1	1	2	mg/m3	43600	0	118	70 - 130% PASS			
113400-BS2 QAQC Procedural Blank	C-75137	44900	1	1	2	mg/m3	43600	0	103	70 - 130% PASS	14	30 PASS	

CHAIN OF CUSTODY

Chain of Custody & Sample Information Record

Client: WSP USA E&I Inc.
Contact: John Rudolph
Phone No. 858-243-8158

Project Name: LECL TMDL Monitoring
Email: john.rudolph@wsp.com
Project Number: 2315100200.0004.PHYSIS
PO#: C014105479
GL Code: 57300
Org# 3151

Turn Around Time: Routine | *3-5 Day Rush | *48 Hour Rush | *24 Hour Rush
***Lab TAT Approval:** By:
*Additional Charges May Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Nick Jenack
Employer: WSP USA
Signature:

Matrix
DW = Drinking Water
WW = Wastewater
GW = Groundwater
S = Soil
SG = Sludge
L = Liquid
M = Miscellaneous

Notes
Chl-a samples on 0.7 um GFF

			# of Containers & Preservatives											Sample Type			Analysis Requested								Matrix	Notes
Sample ID	Date	Time	Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	NaOH/ZnAcetate	NH4Cl	MCAA	Frozen	Total # of Containers	Routine	Resample	Special	Total Sulfide	Nitrate - Nitrite	TDS	TKN	Ammonia	Total Phosphorus	SRP/Ortho-P	Chlorophyll-a		
CL07 - Int	12/4/23	1130																						x		Filter Volume: 250 mL
CL07 - Surf		1140																						x		Filter Volume: 265 mL
CL08 - Int		1040																						x		Filter Volume: 250 mL
CL08 - Surf		1050																						x		Filter Volume: 500 mL
CL09 - Int		0945																						x		Filter Volume: 255 mL
CL09 - Surf		0955																						x		Filter Volume: 255 mL
CL10 - Int		0855																						x		Filter Volume: 250 mL
CL10 - Surf		0905																						x		Filter Volume: 250 mL
LE02 - Int		0920																						x		Filter Volume: 225 mL
LE02 - Surf		0950																						x		Filter Volume: 250 mL

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company
	Nick Jenack/Wsp	12/7/23 - 1600		
		12/8/23 10:30		Ashley Gonzalez / Physis

(For Lab Use Only) **Sample Integrity Upon Receipt**

Sample(s) Submitted on Ice?	Yes	No		Temperature
Custody Seal(s) Intact?	Yes	No	N/A	°C
Sample(s) Intact?	Yes	No		☐ Cooler Blank

Lab Notes

Lab No. ______

Page 1 of 1

PHYSIS
TERRA FAUNA FLORA AQUA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

Project Iteration ID: 2302004-022
Client Name: WSP USA
Project Name: LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C014105479 GL # 57300 Org # 3151
COC Page Number: 2 of 2
Bottle Label Color: NA

Sample Receipt Summary

Receiving Info

1. Initials Received By: Ag
2. Date Received: 12/8/23
3. Time Received: 10:30
4. Client Name: WSP
5. Courier Information: (Please circle)
   - Client
   - [✓ FedEx]
   - UPS
   - GSO/GLS
   - Area Fast
   - Ontrac
   - DRS
   - PAMS
   - PHYSIS Driver:
     - i. Start Time: ____
     - ii. End Time: ____
     - iii. Total Mileage: ____
     - iv. Number of Pickups: ____
6. Container Information: (Please put the # of containers or circle none)
   - 1 Cooler
   - __ Carboy(s)
   - __ Styrofoam Cooler
   - __ Carboy Trash Can(s)
   - ____ Boxes
   - ____ Carboy Cap(s)
   - None
   - Other ____
7. What type of ice was used: (Please circle any that apply)
   - Wet Ice
   - [✓ Blue Ice] 2
   - Dry Ice
   - Water
   - None
8. Randomly Selected Samples Temperature (°C): 10.0 Used I/R Thermometer # 1

Inspection Info

1. Initials Inspected By: RGH

Sample Integrity Upon Receipt:

1. COC(s) included and completely filled out.......... [✓ Yes] / No
2. All sample containers arrived intact.......... [✓ Yes] / No
3. All samples listed on COC(s) are present.......... [✓ Yes] / No
4. Information on containers consistent with information on COC(s).......... [✓ Yes] / No
5. Correct containers and volume for all analyses indicated.......... [✓ Yes] / No
6. All samples received within method holding time.......... [✓ Yes] / No
7. Correct preservation used for all analyses indicated.......... Yes / [✓ No]
8. Name of sampler included on COC(s).......... [✓ Yes] / No

Notes:

See temp

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders: 4B08005

Project: LECL TMDL Monitoring 2315100200.0004.WECK

Attn: John Rudolph

Client: WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Report Date: 3/26/2024
Received Date: 2/27/2024
Turnaround Time: Normal
Phones: (858) 514-6465
Fax: (858) 278-5300
P.O. #: C016900152
Billing Code:

DoD-ELAP ANAB #ADE-2882 ● DoD-ISO ANAB # ● ELAP-CA #1132 ● EPA-UCMR #CA00211 ● ISO17025 ANAB #L2457.01 ● LACSD #10143 ● NELAP-OR #4047 ● NJ-DEP #CA015 ● NV-DEP #NAC 445A ● SCAQMD #93LA1006

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. The report may include analytes that are not currently accreditable by some state agencies or accrediting bodies. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 2/27/24 with the Chain-of-Custody document. The samples were received in good condition, at 5.0 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Kenneth Oda

Kenneth C. Oda For Kim G. Tu
Project Manager

Certificate of Analysis

FINAL REPORT

WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: LECL TMDL Monitoring
2315100200.0004.WECK

Project Manager: John Rudolph

Reported:
03/26/2024 08:24

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CL07	Nick Jernack	4B08005-01	Water	02/27/24 11:50	
CL08	Nick Jernack	4B08005-02	Water	02/27/24 10:50	
CL09	Nick Jernack	4B08005-03	Water	02/27/24 09:50	
CL10	Nick Jernack	4B08005-04	Water	02/27/24 09:20	
LE02	Nick Jernack	4B08005-05	Water	02/27/24 08:55	

Sample Results

Sample: CL07

Sampled: 02/27/24 11:50 by Nick Jernack

4B08005-01 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W4C1346 **Preparation:** _NONE (WETCHEM)			**Prepared:** 03/18/24 10:44				**Analyst:** YMT
Ammonia as N	**0.16**	0.017	0.10	mg/l	1	03/19/24	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W4C1466 **Preparation:** _NONE (WETCHEM)			**Prepared:** 03/19/24 11:27				**Analyst:** YMT
TKN	**1.1**	0.065	0.10	mg/l	1	03/21/24	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W4B2383 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/28/24 13:55				**Analyst:** ism
Nitrate as N	**0.67**	0.040	0.20	mg/l	1	02/28/24 18:22	
Nitrite as N	ND	0.042	0.10	mg/l	1	02/28/24 18:22	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W4B2379 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/28/24 13:42				**Analyst:** rob
o-Phosphate as P	**0.25**	0.0071	0.010	mg/l	1	02/28/24 16:57	
Method: EPA 365.3			**Instr:** UVVIS05				
Batch ID: W4C1413 **Preparation:** _NONE (WETCHEM)			**Prepared:** 03/18/24 18:44				**Analyst:** rob
Phosphorus as P, Total	**0.29**	0.0067	0.010	mg/l	1	03/21/24	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W4B2320 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/28/24 10:05				**Analyst:** bel
Total Dissolved Solids	**270**	4.0	10	mg/l	1	02/28/24	
Method: SM 2540D			**Instr:** OVEN15				
Batch ID: W4C0054 **Preparation:** _NONE (WETCHEM)			**Prepared:** 03/01/24 10:57				**Analyst:** hhl
Total Suspended Solids	**12**		5	mg/l	1	03/01/24	
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W4C0102 **Preparation:** _NONE (WETCHEM)			**Prepared:** 03/01/24 18:03				**Analyst:** ymt
Sulfide, Total	ND	0.050	0.10	mg/l	1	03/01/24	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W4C0138 **Preparation:** EPA 200.2			**Prepared:** 03/04/24 10:12				**Analyst:** kvm
Aluminum, Dissolved	**0.071**	0.041	0.050	mg/l	1	03/11/24	
Aluminum, Total	**0.77**	0.022	0.050	mg/l	1	03/11/24	

Sample Results

(Continued)

Sample: CL08
Sampled: 02/27/24 10:50 by Nick Jernack

4B08005-02 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1 — **Instr:** AA06							
Batch ID: W4C1346 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 03/18/24 10:44 — **Analyst:** YMT							
Ammonia as N	**0.11**	0.017	0.10	mg/l	1	03/19/24	
Method: EPA 351.2 — **Instr:** AA06							
Batch ID: W4C1466 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 03/19/24 11:27 — **Analyst:** YMT							
TKN	**0.82**	0.065	0.10	mg/l	1	03/21/24	
Method: EPA 353.2 — **Instr:** AA01							
Batch ID: W4B2383 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 02/28/24 13:55 — **Analyst:** ism							
Nitrate as N	**0.69**	0.040	0.20	mg/l	1	02/28/24 18:23	
Nitrite as N	ND	0.042	0.10	mg/l	1	02/28/24 18:23	
Method: EPA 365.3 — **Instr:** UVVIS04							
Batch ID: W4B2379 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 02/28/24 13:42 — **Analyst:** rob							
o-Phosphate as P	**0.24**	0.0071	0.010	mg/l	1	02/28/24 16:57	
Method: EPA 365.3 — **Instr:** UVVIS05							
Batch ID: W4C1413 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 03/18/24 18:44 — **Analyst:** rob							
Phosphorus as P, Total	**0.29**	0.0067	0.010	mg/l	1	03/21/24	
Method: SM 2540C — **Instr:** OVEN17							
Batch ID: W4B2320 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 02/28/24 10:05 — **Analyst:** bel							
Total Dissolved Solids	**260**	4.0	10	mg/l	1	02/28/24	
Method: SM 2540D — **Instr:** OVEN15							
Batch ID: W4C0054 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 03/01/24 10:57 — **Analyst:** hhl							
Total Suspended Solids	**13**		5	mg/l	1	03/01/24	
Method: SM 4500S2-D — **Instr:** _ANALYST							
Batch ID: W4C0102 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 03/01/24 18:03 — **Analyst:** ymt							
Sulfide, Total	ND	0.050	0.10	mg/l	1	03/01/24	
Metals by EPA 200 Series Methods							
Method: EPA 200.7 — **Instr:** ICP03							
Batch ID: W4C0138 — **Preparation:** EPA 200.2 — **Prepared:** 03/04/24 10:12 — **Analyst:** kvm							
Aluminum, Dissolved	**0.099**	0.041	0.050	mg/l	1	03/11/24	
Aluminum, Total	**0.84**	0.022	0.050	mg/l	1	03/11/24	

Sample Results

(Continued)

Sample: CL09
4B08005-03 (Water)

Sampled: 02/27/24 9:50 by Nick Jernack

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1 **Instr:** AA06							
Batch ID: W4C1346 **Preparation:** _NONE (WETCHEM) **Prepared:** 03/18/24 10:44 **Analyst:** YMT							
Ammonia as N	**0.42**	0.017	0.10	mg/l	1	03/19/24	
Method: EPA 351.2 **Instr:** AA06							
Batch ID: W4C1466 **Preparation:** _NONE (WETCHEM) **Prepared:** 03/19/24 11:27 **Analyst:** YMT							
TKN	**1.2**	0.065	0.10	mg/l	1	03/21/24	
Method: EPA 353.2 **Instr:** AA01							
Batch ID: W4B2383 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/28/24 13:55 **Analyst:** ism							
Nitrate as N	**0.59**	0.040	0.20	mg/l	1	02/28/24 18:25	
Nitrite as N	ND	0.042	0.10	mg/l	1	02/28/24 18:25	
Method: EPA 365.3 **Instr:** UVVIS04							
Batch ID: W4B2379 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/28/24 13:42 **Analyst:** rob							
o-Phosphate as P	**0.36**	0.0071	0.010	mg/l	1	02/28/24 16:58	
Method: EPA 365.3 **Instr:** UVVIS05							
Batch ID: W4C1413 **Preparation:** _NONE (WETCHEM) **Prepared:** 03/18/24 18:44 **Analyst:** rob							
Phosphorus as P, Total	**0.39**	0.0067	0.010	mg/l	1	03/21/24	
Method: SM 2540C **Instr:** OVEN17							
Batch ID: W4B2320 **Preparation:** _NONE (WETCHEM) **Prepared:** 02/28/24 10:05 **Analyst:** bel							
Total Dissolved Solids	**480**	4.0	10	mg/l	1	02/28/24	
Method: SM 2540D **Instr:** OVEN15							
Batch ID: W4C0054 **Preparation:** _NONE (WETCHEM) **Prepared:** 03/01/24 10:57 **Analyst:** hhl							
Total Suspended Solids	**6**		5	mg/l	1	03/01/24	
Method: SM 4500S2-D **Instr:** _ANALYST							
Batch ID: W4C0102 **Preparation:** _NONE (WETCHEM) **Prepared:** 03/01/24 18:03 **Analyst:** ymt							
Sulfide, Total	ND	0.050	0.10	mg/l	1	03/01/24	
Metals by EPA 200 Series Methods							
Method: EPA 200.7 **Instr:** ICP03							
Batch ID: W4C0138 **Preparation:** EPA 200.2 **Prepared:** 03/04/24 10:12 **Analyst:** kvm							
Aluminum, Dissolved	ND	0.041	0.050	mg/l	1	03/11/24	
Aluminum, Total	**0.22**	0.022	0.050	mg/l	1	03/11/24	

Sample Results

(Continued)

Sample: CL10 Sampled: 02/27/24 9:20 by Nick Jernack

4B08005-04 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W4C1346 **Preparation:** _NONE (WETCHEM)			**Prepared:** 03/18/24 10:44				**Analyst:** YMT
Ammonia as N	**0.31**	0.017	0.10	mg/l	1	03/19/24	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W4C1466 **Preparation:** _NONE (WETCHEM)			**Prepared:** 03/19/24 11:27				**Analyst:** YMT
TKN	**1.2**	0.065	0.10	mg/l	1	03/21/24	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W4B2383 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/28/24 13:55				**Analyst:** ism
Nitrate as N	**0.66**	0.040	0.20	mg/l	1	02/28/24 18:26	
Nitrite as N	ND	0.042	0.10	mg/l	1	02/28/24 18:26	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W4B2379 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/28/24 13:42				**Analyst:** rob
o-Phosphate as P	**0.34**	0.0071	0.010	mg/l	1	02/28/24 16:58	
Method: EPA 365.3			**Instr:** UVVIS05				
Batch ID: W4C1413 **Preparation:** _NONE (WETCHEM)			**Prepared:** 03/18/24 18:44				**Analyst:** rob
Phosphorus as P, Total	**0.37**	0.0067	0.010	mg/l	1	03/21/24	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W4B2448 **Preparation:** _NONE (WETCHEM)			**Prepared:** 02/29/24 09:55				**Analyst:** bel
Total Dissolved Solids	**540**	4.0	10	mg/l	1	02/29/24	
Method: SM 2540D			**Instr:** OVEN15				
Batch ID: W4C0054 **Preparation:** _NONE (WETCHEM)			**Prepared:** 03/01/24 10:57				**Analyst:** hhl
Total Suspended Solids	**9**		5	mg/l	1	03/01/24	
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W4C0102 **Preparation:** _NONE (WETCHEM)			**Prepared:** 03/01/24 18:03				**Analyst:** ymt
Sulfide, Total	ND	0.050	0.10	mg/l	1	03/01/24	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W4C0138 **Preparation:** EPA 200.2			**Prepared:** 03/04/24 10:12				**Analyst:** kvm
Aluminum, Dissolved	ND	0.041	0.050	mg/l	1	03/11/24	
Aluminum, Total	**0.31**	0.022	0.050	mg/l	1	03/11/24	

Sample Results

(Continued)

Sample: LE02 Sampled: 02/27/24 8:55 by Nick Jernack

4B08005-05 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W4C1346	**Preparation:** _NONE (WETCHEM)		**Prepared:** 03/18/24 10:44				**Analyst:** YMT
Ammonia as N	**0.63**	0.017	0.10	mg/l	1	03/19/24	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W4C1466	**Preparation:** _NONE (WETCHEM)		**Prepared:** 03/19/24 11:27				**Analyst:** YMT
TKN	**2.7**	0.065	0.10	mg/l	1	03/21/24	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W4B2383	**Preparation:** _NONE (WETCHEM)		**Prepared:** 02/28/24 13:55				**Analyst:** ism
Nitrate as N	**0.32**	0.040	0.20	mg/l	1	02/28/24 18:27	
Nitrite as N	ND	0.042	0.10	mg/l	1	02/28/24 18:27	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W4B2379	**Preparation:** _NONE (WETCHEM)		**Prepared:** 02/28/24 13:42				**Analyst:** rob
o-Phosphate as P	**0.15**	0.0071	0.010	mg/l	1	02/28/24 17:00	
Method: EPA 365.3			**Instr:** UVVIS05				
Batch ID: W4C1413	**Preparation:** _NONE (WETCHEM)		**Prepared:** 03/18/24 18:44				**Analyst:** rob
Phosphorus as P, Total	**0.20**	0.0067	0.010	mg/l	1	03/21/24	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W4B2448	**Preparation:** _NONE (WETCHEM)		**Prepared:** 02/29/24 09:55				**Analyst:** bel
Total Dissolved Solids	**1500**	4.0	10	mg/l	1	02/29/24	
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W4C0102	**Preparation:** _NONE (WETCHEM)		**Prepared:** 03/01/24 18:03				**Analyst:** ymt
Sulfide, Total	ND	0.050	0.10	mg/l	1	03/01/24	

Quality Control Results

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4B2320 - SM 2540C											
Blank (W4B2320-BLK1)					**Prepared & Analyzed: 02/28/24**						
Total Dissolved Solids	ND	4.0	10	mg/l							
LCS (W4B2320-BS1)					**Prepared & Analyzed: 02/28/24**						
Total Dissolved Solids	806	4.0	10	mg/l	824		98	97-103			
Duplicate (W4B2320-DUP1)	**Source: 4B28009-04**				**Prepared & Analyzed: 02/28/24**						
Total Dissolved Solids	1940	4.0	10	mg/l		1940			0.1	10	
Duplicate (W4B2320-DUP2)	**Source: 4B28009-13**				**Prepared & Analyzed: 02/28/24**						
Total Dissolved Solids	31900	4.0	10	mg/l		32000			0.4	10	
Batch: W4B2379 - EPA 365.3											
Blank (W4B2379-BLK1)					**Prepared & Analyzed: 02/28/24**						
o-Phosphate as P	ND	0.0071	0.010	mg/l							
LCS (W4B2379-BS1)					**Prepared & Analyzed: 02/28/24**						
o-Phosphate as P	0.209	0.0071	0.010	mg/l	0.200		104	88-111			
Matrix Spike (W4B2379-MS1)	**Source: 4B27067-02**				**Prepared & Analyzed: 02/28/24**						
o-Phosphate as P	0.347	0.0071	0.010	mg/l	0.200	0.144	102	85-112			
Matrix Spike Dup (W4B2379-MSD1)	**Source: 4B27067-02**				**Prepared & Analyzed: 02/28/24**						
o-Phosphate as P	0.346	0.0071	0.010	mg/l	0.200	0.144	101	85-112	0.3	20	
Batch: W4B2383 - EPA 353.2											
Blank (W4B2383-BLK1)					**Prepared & Analyzed: 02/28/24**						
Nitrate as N	ND	0.040	0.20	mg/l							
Nitrite as N	ND	0.042	0.10	mg/l							
LCS (W4B2383-BS1)					**Prepared & Analyzed: 02/28/24**						
Nitrate as N	0.985	0.040	0.20	mg/l	1.00		98	90-110			
Nitrite as N	1.02	0.042	0.10	mg/l	1.00		102	90-110			
Matrix Spike (W4B2383-MS1)	**Source: 4B20002-07**				**Prepared & Analyzed: 02/28/24**						
Nitrate as N	6.90	0.040	0.20	mg/l	2.00	4.89	100	90-110			
Nitrite as N	1.03	0.042	0.10	mg/l	1.00	ND	103	90-110			
Matrix Spike (W4B2383-MS2)	**Source: 4B23052-01**				**Prepared & Analyzed: 02/28/24**						
Nitrate as N	5.77	0.040	0.20	mg/l	2.00	3.81	98	90-110			
Nitrite as N	1.07	0.042	0.10	mg/l	1.00	ND	107	90-110			
Matrix Spike Dup (W4B2383-MSD1)	**Source: 4B20002-07**				**Prepared & Analyzed: 02/28/24**						
Nitrate as N	6.90	0.040	0.20	mg/l	2.00	4.89	100	90-110	0	20	
Nitrite as N	1.05	0.042	0.10	mg/l	1.00	ND	105	90-110	2	20	
Matrix Spike Dup (W4B2383-MSD2)	**Source: 4B23052-01**				**Prepared & Analyzed: 02/28/24**						
Nitrate as N	5.77	0.040	0.20	mg/l	2.00	3.81	98	90-110	0	20	
Nitrite as N	1.07	0.042	0.10	mg/l	1.00	ND	107	90-110	0	20	
Batch: W4B2448 - SM 2540C											
Blank (W4B2448-BLK1)					**Prepared & Analyzed: 02/29/24**						

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4B2448 - SM 2540C (Continued)											
Blank (W4B2448-BLK1)					**Prepared & Analyzed: 02/29/24**						
Total Dissolved Solids	ND	4.0	10	mg/l							
LCS (W4B2448-BS1)					**Prepared & Analyzed: 02/29/24**						
Total Dissolved Solids	813	4.0	10	mg/l	824		99	97-103			
Duplicate (W4B2448-DUP1)	**Source: 4B28015-01**				**Prepared & Analyzed: 02/29/24**						
Total Dissolved Solids	60500	4.0	10	mg/l		61600			2	10	
Duplicate (W4B2448-DUP2)	**Source: 4B28059-01**				**Prepared & Analyzed: 02/29/24**						
Total Dissolved Solids	5280	4.0	10	mg/l		5300			0.4	10	
Batch: W4C0054 - SM 2540D											
Blank (W4C0054-BLK1)					**Prepared & Analyzed: 03/01/24**						
Total Suspended Solids	0.200		5	mg/l							J
LCS (W4C0054-BS1)					**Prepared & Analyzed: 03/01/24**						
Total Suspended Solids	68.7		5	mg/l	62.7		110	90-110			
Duplicate (W4C0054-DUP1)	**Source: 4B27014-01**				**Prepared & Analyzed: 03/01/24**						
Total Suspended Solids	54.3		5	mg/l		55.7			3	10	
Duplicate (W4C0054-DUP2)	**Source: 4B27078-01**				**Prepared & Analyzed: 03/01/24**						
Total Suspended Solids	14.0		5	mg/l		15.0			7	10	
Batch: W4C0102 - SM 4500S2-D											
Blank (W4C0102-BLK1)					**Prepared & Analyzed: 03/01/24**						
Sulfide, Total	ND	0.050	0.10	mg/l							
LCS (W4C0102-BS1)					**Prepared & Analyzed: 03/01/24**						
Sulfide, Total	0.100	0.050	0.10	mg/l	0.102		98	90-110			
Duplicate (W4C0102-DUP1)	**Source: 4B08005-05**				**Prepared & Analyzed: 03/01/24**						
Sulfide, Total	ND	0.050	0.10	mg/l		ND				20	
Matrix Spike (W4C0102-MS1)	**Source: 4B07002-01**				**Prepared & Analyzed: 03/01/24**						
Sulfide, Total	0.200	0.050	0.10	mg/l	0.204	ND	98	80-120			
Matrix Spike Dup (W4C0102-MSD1)	**Source: 4B07002-01**				**Prepared & Analyzed: 03/01/24**						
Sulfide, Total	0.200	0.050	0.10	mg/l	0.204	ND	98	80-120	0	20	
Batch: W4C1346 - EPA 350.1											
Blank (W4C1346-BLK1)				**Prepared: 03/18/24 Analyzed: 03/19/24**							
Ammonia as N	ND	0.017	0.10	mg/l							
Blank (W4C1346-BLK2)				**Prepared: 03/18/24 Analyzed: 03/19/24**							
Ammonia as N	ND	0.017	0.10	mg/l							
LCS (W4C1346-BS1)				**Prepared: 03/18/24 Analyzed: 03/19/24**							
Ammonia as N	0.250	0.017	0.10	mg/l	0.250		100	90-110			
LCS (W4C1346-BS2)				**Prepared: 03/18/24 Analyzed: 03/19/24**							
Ammonia as N	0.261	0.017	0.10	mg/l	0.250		105	90-110			
Matrix Spike (W4C1346-MS1)	**Source: 4B28080-01**			**Prepared: 03/18/24 Analyzed: 03/19/24**							

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4C1346 - EPA 350.1 (Continued)											
Matrix Spike (W4C1346-MS1)	**Source: 4B28080-01**			**Prepared: 03/18/24**	**Analyzed: 03/19/24**						
Ammonia as N	0.253	0.017	0.10	mg/l	0.250	ND	101	90-110			
Matrix Spike (W4C1346-MS2)	**Source: 4B28116-01**			**Prepared: 03/18/24**	**Analyzed: 03/19/24**						
Ammonia as N	0.266	0.017	0.10	mg/l	0.250	ND	106	90-110			
Matrix Spike Dup (W4C1346-MSD1)	**Source: 4B28080-01**			**Prepared: 03/18/24**	**Analyzed: 03/19/24**						
Ammonia as N	0.255	0.017	0.10	mg/l	0.250	ND	102	90-110	0.6	15	
Matrix Spike Dup (W4C1346-MSD2)	**Source: 4B28116-01**			**Prepared: 03/18/24**	**Analyzed: 03/19/24**						
Ammonia as N	0.265	0.017	0.10	mg/l	0.250	ND	106	90-110	0.1	15	
Batch: W4C1413 - EPA 365.3											
Blank (W4C1413-BLK1)				**Prepared: 03/18/24**	**Analyzed: 03/21/24**						
Phosphorus as P, Total	ND	0.0067	0.010	mg/l							
LCS (W4C1413-BS1)				**Prepared: 03/18/24**	**Analyzed: 03/21/24**						
Phosphorus as P, Total	0.198	0.0067	0.010	mg/l	0.200		99	90-110			
Matrix Spike (W4C1413-MS1)	**Source: 4B06002-01**			**Prepared: 03/18/24**	**Analyzed: 03/21/24**						
Phosphorus as P, Total	0.263	0.0067	0.010	mg/l	0.200	0.0650	99	90-110			
Matrix Spike Dup (W4C1413-MSD1)	**Source: 4B06002-01**			**Prepared: 03/18/24**	**Analyzed: 03/21/24**						
Phosphorus as P, Total	0.266	0.0067	0.010	mg/l	0.200	0.0650	100	90-110	1	20	
Batch: W4C1466 - EPA 351.2											
Blank (W4C1466-BLK1)				**Prepared: 03/19/24**	**Analyzed: 03/21/24**						
TKN	ND	0.065	0.10	mg/l							
Blank (W4C1466-BLK2)				**Prepared: 03/19/24**	**Analyzed: 03/21/24**						
TKN	ND	0.065	0.10	mg/l							
LCS (W4C1466-BS1)				**Prepared: 03/19/24**	**Analyzed: 03/21/24**						
TKN	1.04	0.065	0.10	mg/l	1.00		104	90-110			
LCS (W4C1466-BS2)				**Prepared: 03/19/24**	**Analyzed: 03/21/24**						
TKN	1.03	0.065	0.10	mg/l	1.00		103	90-110			
Matrix Spike (W4C1466-MS1)	**Source: 4B08005-02**			**Prepared: 03/19/24**	**Analyzed: 03/21/24**						
TKN	1.90	0.065	0.10	mg/l	1.00	0.820	108	90-110			
Matrix Spike (W4C1466-MS2)	**Source: 4C11101-01**			**Prepared: 03/19/24**	**Analyzed: 03/21/24**						
TKN	1.85	0.065	0.10	mg/l	1.00	0.826	103	90-110			
Matrix Spike Dup (W4C1466-MSD1)	**Source: 4B08005-02**			**Prepared: 03/19/24**	**Analyzed: 03/21/24**						
TKN	1.95	0.065	0.10	mg/l	1.00	0.820	113	90-110	3	10	MS-01
Matrix Spike Dup (W4C1466-MSD2)	**Source: 4C11101-01**			**Prepared: 03/19/24**	**Analyzed: 03/21/24**						
TKN	1.91	0.065	0.10	mg/l	1.00	0.826	109	90-110	3	10	

Certificate of Analysis

FINAL REPORT

WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: LECL TMDL Monitoring
2315100200.0004.WECK

Project Manager: John Rudolph

Reported:
03/26/2024 08:24

Quality Control Results

(Continued)

Metals by EPA 200 Series Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4C0138 - EPA 200.7											
Blank (W4C0138-BLK1)				**Prepared: 03/04/24**	**Analyzed: 03/11/24**						
Aluminum, Dissolved	ND	0.041	0.050	mg/l							
Aluminum, Total	ND	0.022	0.050	mg/l							
LCS (W4C0138-BS1)				**Prepared: 03/04/24**	**Analyzed: 03/11/24**						
Aluminum, Dissolved	0.227	0.041	0.050	mg/l	0.200		114	85-115			
Aluminum, Total	0.227	0.022	0.050	mg/l	0.200		114	85-115			
Matrix Spike (W4C0138-MS1)	**Source: 4B08005-01**			**Prepared: 03/04/24**	**Analyzed: 03/11/24**						
Aluminum, Total	1.69	0.022	0.050	mg/l	0.200	0.770	459	70-130			MS-02
Matrix Spike (W4C0138-MS2)	**Source: 4B08006-03**			**Prepared: 03/04/24**	**Analyzed: 03/11/24**						
Aluminum, Total	0.319	0.022	0.050	mg/l	0.200	0.0397	140	70-130			MS-02
Matrix Spike Dup (W4C0138-MSD1)	**Source: 4B08005-01**			**Prepared: 03/04/24**	**Analyzed: 03/11/24**						
Aluminum, Total	1.68	0.022	0.050	mg/l	0.200	0.770	455	70-130	0.5	30	MS-02
Matrix Spike Dup (W4C0138-MSD2)	**Source: 4B08006-03**			**Prepared: 03/04/24**	**Analyzed: 03/11/24**						
Aluminum, Total	0.314	0.022	0.050	mg/l	0.200	0.0397	137	70-130	2	30	MS-02

Notes and Definitions

Item	Definition
J	Estimated conc. detected <MRL and >MDL.
MS-01	The spike recovery for this QC sample is outside of established control limits possibly due to sample matrix interference.
MS-02	The RPD and/or percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte inherent in the sample.
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	Method Reporting Limit (MRL) is the minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

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

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

Chain of Custody & Sample Information Record

4B08005

Client: WSP USA E&I Inc. **Contact:** John Rudolph **Phone No.** 858-243-8158

Project Name: LECL TMDL Monitoring **Email:** john.rudolph@woodplc.com

Project Number: 2315100200.0004.WECK

PO#: C016900152

GL Code: 573000

Org# 3151

Turn Around Time: Routine *3-5 Day Rush *48 Hour Rush *24 Hour Rush

Lab TAT Approval: By: *Additional Charges May Apply

Additional Reporting Requests

Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information

Name: Nick Jurnack

Employer: WSP USA E&I Inc.

Signature:

Matrix

DW = Drinking Water
WW = Wastewater
GW = Groundwater
S = Soil
SG = Sludge
L = Liquid
M = Miscellaneous

Notes

Ortho-P is field filtered (0.45 um)

Dissolved Al is field filtered (0.45 um)

			# of Containers & Preservatives											Sample Type			Analysis Requested										Matrix	Notes
Sample ID	Date	Time	Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	NaOH/ZnAcetate	NH4Cl	MCAA	Frozen	Total # of Containers	Routine	Resample	Special	TSS	Nitrate - Nitrite (EPA 353.2)	TDS (SM2540 C)	TKN (EPA 351.2	Ammonia (EPA 350.1)	Total Phosphorus (EPA 365.3)	SRP/Ortho-P (EPA 365.3)	Total Sulfide (SM4500S)	Total AL (EPA 200.7)	Dissolved AL (EPA 200.7)		
CL07	2/27/24	1150															X	X	X	X	X	X	X	X	X	X		
CL08		1050															X	X	X	X	X	X	X	X	X	X		
CL09		0950															X	X	X	X	X	X	X	X	X	X		
CL10		0920															X	X	X	X	X	X	X	X	X	X		
LE02		0855																X	X	X	X	X	X	X				

Relinquished By (Sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company
	Nick Jurnack / WSP	2/27/24 - 1345	2/27/24 1345	Jason Duran
	Jason Duran	2/27/24 1616		
		2/27/24 1620		Christopher Avila

(For Lab Use Only) **Sample Integrity Upon Receipt**

Sample(s) Submitted on Ice? Yes No **Temperature**
Custody Seal(s) Intact? Yes No N/A T-0281 5.0 °C
Sample(s) Intact? Yes No ☐ Cooler Blank

Lab Notes

Lab No.

Page 1 **of** 1

WECK LABORATORIES, INC.

Sample Receipt Checklist

Weck WKO: **4B08005**
WKO Logged by: Lester Abad
Samples Checked by: Lester Abad

Date/Time Received: 02/27/24 15:40
# of Samples: 05
Delivered by: Client

	Task	Yes	No	N/A	Comments
COC	COC present at receipt?	☒	☐		
	COC properly completed?	☒	☐		
	COC matches sample labels?	☒	☐		
	Project Manager notified about COC discrepancy?	☐	☐	☒	
Receipt Information	Sample Temperature	5°C			
	Samples received on ice?	☒	☐		
	Ice Type (Blue/Wet)	Blue			
	All samples intact?	☒	☐		
	Samples in proper containers?	☒	☐		
	Sufficient sample volume?	☒	☐		
	Samples intact?	☒	☐		
	Received within holding time?	☒	☐		
	Project Manager notified about receipt info?	☐	☒	☐	
11032201Sample Preservation Verification?	Sample labels checked for correct preservation?	☒	☐	☐	
	VOC Headspace: (No) none, If Yes (see comment) 524.2, 524.3, 624.1, 8260, 1666 P/T, LUFT	☐	☐	☒	☐<6mm/Pea Size?
	pH verified upon receipt? Metals <2; H2SO4 pres tests <2; 522<4; TOC <2; 508.1, 525.2<2, 6710B<2, 608.3 5-9	☒	☐	☐	pH paper Lot# 3082367
	Free Chlorine Tested <0.1 (Organics Analyses)	☐	☐	☒	Cl Test Strip Lot#
	O&G pH <2 verified?	☐	☐	☐	pH paper Lot# pH Reading:
	pH adjusted for O&G	☐	☐	☐	Acid Lot# Amt added:
	Project Manager notified about sample preservation?	☐	☐	☐	

PM Comments

Sample Receipt Checklist Completed by:

Signature: Lester Abad

Date: 02/27/24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

April 18, 2024

John D. Rudolph
WSP USA
9177 Sky Park Court
San Diego, CA 92123-

Project Name: LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C014105479
GL Code 57300 Org # 3151
Physis Project ID: 2302004-025

Dear John,

Enclosed are the analytical results for samples submitted to PHYSIS Environmental Laboratories, Inc. (PHYSIS) on 3/13/2024. A total of 10 samples were received for analysis in accordance with the attached chain of custody (COC). Per the COC, the samples were analyzed for:

Conventionals
Chlorophyll-a (mg/m3) by SM 10200 H

Analytical results in this report apply only to samples submitted to PHYSIS in accordance with the COC and are intended to be considered in their entirety.

Please feel free to contact me at any time with any questions. PHYSIS appreciates the opportunity to provide you with our analytical and support services.

Regards,
Rachel Hansen
Rachel Hansen
714 602-5320
Extension 203
rachelhansen@physislabs.com

PROJECT SAMPLE LIST

WSP USA PHYSIS Project ID: 2302004-025

LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C014105479 Total Samples: 10

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
116616	CL07 - Int		2/27/2024	11:50	Biologic	Not Specified
116617	CL07 - Surf		2/27/2024	12:05	Biologic	Not Specified
116618	CL08 - Int		2/27/2024	10:50	Biologic	Not Specified
116619	CL08 - Surf		2/27/2024	11:05	Biologic	Not Specified
116620	CL09 - Int		2/27/2024	9:50	Biologic	Not Specified
116621	CL09 - Surf		2/27/2024	10:00	Biologic	Not Specified
116622	CL10 - Int		2/27/2024	9:20	Biologic	Not Specified
116623	CL10 - Surf		2/27/2024	8:55	Biologic	Not Specified
116624	LE02 - Int		2/27/2024	8:55	Biologic	Not Specified
116625	LE02 - Surf		2/27/2024	9:15	Biologic	Not Specified

ABBREVIATIONS and ACRONYMS

QM	Quality Manual
QA	Quality Assurance
QC	Quality Control
MDL	method detection limit
RL	reporting limit
R1	project sample
R2	project sample replicate
MS1	matrix spike
MS2	matrix spike replicate
B1	procedural blank
B2	procedural blank replicate
BS1	blank spike
BS2	blank spike replicate
LCS1	laboratory control spike
LCS2	laboratory control spike replicate
LCM1	laboratory control material
LCM2	laboratory control material replicate
CRM1	certified reference material
CRM2	certified reference material replicate
RPD	relative percent difference
LMW	low molecular weight
HMW	high molecular weight

QUALITY ASSURANCE SUMMARY

LABORATORY BATCH: Physis' QM defines a laboratory batch as a group of 20 or fewer project samples of similar matrix, processed together under the same conditions and with the same reagents. QC samples are associated with each batch and were used to assess the validity of the sample analyses.

PROCEDURAL BLANK: Laboratory contamination introduced during method use is assessed through the preparation and analysis of procedural blanks is provided at a minimum frequency of one per batch.

ACCURACY: Accuracy of analytical measurements is the degree of closeness based on percent recovery calculations between measured values and the actual or true value and includes a combination of reproducibility error and systematic bias due to sampling and analytical operations. Accuracy of the project data was indicated by analysis of MS, BS, LCS, LCM, CRM, and/or surrogate spikes on a minimum frequency of one per batch. Physis' QM requires that 95% of the target compounds greater than 10 times the MDL be within the specified acceptance limits.

PRECISION: Precision is the agreement among a set of replicate measurements without assumption of knowledge of the true value and is based on RPD calculations between repeated values. Precision of the project data was determined by analysis of replicate MS1/MS2, BS1/BS2, LCS1/LCS2, LCM1/LCM2, CRM1/CRM2, surrogate spikes and/or replicate project sample analysis (R1/R2) on a minimum frequency of one per batch. Physis' QM requires that for 95% of the compounds greater than 10 times the MDL, the percent RPD should be within the specified acceptance range.

BLANK SPIKES: BS is the introduction of a known concentration of analyte into the procedural blank. BS demonstrates performance of the preparation and analytical methods on a clean matrix void of potential matrix related interferences. The BS is performed in laboratory deionized water, making these recoveries a better indicator of the efficiency of the laboratory method per se.

MATRIX SPIKES: MS is the introduction of a known concentration of analyte into a sample. MS samples demonstrate the effect a particular project sample matrix has on the accuracy of a measurement. Individually, MS samples also indicate the bias of analytical measurements due to chemical interferences inherent in the in the specific project sample spiked. Intrinsic target analyte concentration in the specific project sample can also significantly impact MS recovery.

CERTIFIED REFERENCE MATERIALS: CRMs are materials of various matrices for which analytical information has been determined and certified by a recognized authority. These are used to provide a quantitative assessment of the accuracy of an analytical method. CRMs provide evidence that the laboratory preparation and analysis produces results that are comparable to those obtained by an independent organization.

LABORATORY CONTROL MATERIAL: LCM is provided because a suitable natural seawater CRM is not available and can be used to indicate accuracy of the method. Physis' internal LCM is seawater collected at ~800 meters in the Southern California San Pedro Basin and can be used as a reference for background concentrations in clean, natural seawater for comparison to project samples.

LABORATORY CONTROL SPIKES: LCS is the introduction of a known concentration of analyte into Physis' LCM. LCS samples were employed to assess the effect the seawater matrix has on the accuracy of a measurement. LCS also indicate the bias of this method due to chemical interferences inherent in the in the seawater matrix. Intrinsic LCM concentration can also significantly impact LCS recovery.

SURROGATES: A surrogate is a pure analyte unlikely to be found in any project sample, behaves similarly to the target analyte and most often used with organic analytical procedures. Surrogates are added in known concentration to all samples and are measured to indicate overall efficiency of the method including processing and analyses.

HOLDING TIME: Method recommended holding times are the length of time a project sample can be stored under specific conditions after collection and prior to analysis without significantly affecting the analyte's concentration. Holding times can be extended if preservation techniques are employed to reduce biodegradation, volatilization, oxidation, sorption, precipitation, and other physical and chemical processes.

SAMPLE STORAGE/RETENTION: In order to maintain chemical integrity prior to analysis, all samples submitted to Physis are refrigerated (liquids) or frozen (solids) upon receipt unless otherwise recommended by applicable methods. Solid samples are retained for 1 year from collection while liquid samples are retained until method recommended holding times elapse.

TOTAL/DISSOLVED FRACTION: In some instances, the results for the dissolved fraction may be higher than the total fraction for a particular analyte (e.g. trace metals). This is typically caused by the analytical variation for each result and indicates that the target analyte is primarily in the dissolved phase, within the sample.

PHYSIS QUALIFIER CODES

CODE	DEFINITION
#	see Case Narrative
ND	analyte not detected at or above the MDL
B	analyte was detected in the procedural blank greater than 10 times the MDL
E	analyte concentration exceeds the upper limit of the linear calibration range, reported value is estimated
H	sample received and/or analyzed past the recommended holding time
J	analyte was detected at a concentration below the RL and above the MDL, reported value is estimated
N	insufficient sample, analysis could not be performed
M	analyte was outside the specified accuracy and/or precision acceptance limits due to matrix interference. The associated B/BS were within limits, therefore the sample data was reported without further clarification
SH	analyte concentration in the project sample exceeded the spike concentration, therefore accuracy and/or precision acceptance limits do not apply
SL	analyte results were lower than 10 times the MDL, therefore accuracy and/or precision acceptance limits do not apply
NH	project sample was heterogeneous and sample homogeneity could not be readily achieved using routine laboratory practices, therefore accuracy and/or precision acceptance limits do not apply
Q	analyte was outside the specified QAPP acceptance limits for precision and/or accuracy but within Physis derived acceptance limits, therefore the sample data was reported without further clarification
R	Physis' QM allows for 5% of the target compounds greater than 10 times the MDL to be outside the specified acceptance limits for precision and/or accuracy. This is often due to random error and does not indicate any significant problems with the analysis of these project samples

ANALYTICAL REPORT

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2302004-025
Client: WSP USA
Project: LECL TMDL Monitoring Project # 2315100200.0004.PHY

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 116616-R1	**CL07 - Int**		**Matrix: Biologic**				**Sampled:**	**27-Feb-24 11:50**		**Received:**	**13-Mar-24**
Chlorophyll-a	SM 10200 H	mg/m3	21.4	1	1	2	NA		C-80088	22-Mar-24	22-Mar-24
Sample ID: 116617-R1	**CL07 - Surf**		**Matrix: Biologic**				**Sampled:**	**27-Feb-24 12:05**		**Received:**	**13-Mar-24**
Chlorophyll-a	SM 10200 H	mg/m3	42.7	1	1	2	NA		C-80088	22-Mar-24	22-Mar-24
Sample ID: 116618-R1	**CL08 - Int**		**Matrix: Biologic**				**Sampled:**	**27-Feb-24 10:50**		**Received:**	**13-Mar-24**
Chlorophyll-a	SM 10200 H	mg/m3	20.8	1	1	2	NA		C-80088	22-Mar-24	22-Mar-24
Sample ID: 116619-R1	**CL08 - Surf**		**Matrix: Biologic**				**Sampled:**	**27-Feb-24 11:05**		**Received:**	**13-Mar-24**
Chlorophyll-a	SM 10200 H	mg/m3	57.9	1	1	2	NA		C-80088	22-Mar-24	22-Mar-24
Sample ID: 116620-R1	**CL09 - Int**		**Matrix: Biologic**				**Sampled:**	**27-Feb-24 9:50**		**Received:**	**13-Mar-24**
Chlorophyll-a	SM 10200 H	mg/m3	11.2	1	1	2	NA		C-80088	22-Mar-24	22-Mar-24
Sample ID: 116621-R1	**CL09 - Surf**		**Matrix: Biologic**				**Sampled:**	**27-Feb-24 10:00**		**Received:**	**13-Mar-24**
Chlorophyll-a	SM 10200 H	mg/m3	34.2	1	1	2	NA		C-80088	22-Mar-24	22-Mar-24
Sample ID: 116622-R1	**CL10 - Int**		**Matrix: Biologic**				**Sampled:**	**27-Feb-24 9:20**		**Received:**	**13-Mar-24**
Chlorophyll-a	SM 10200 H	mg/m3	11.2	1	1	2	NA		C-80088	22-Mar-24	22-Mar-24
Sample ID: 116623-R1	**CL10 - Surf**		**Matrix: Biologic**				**Sampled:**	**27-Feb-24 8:55**		**Received:**	**13-Mar-24**
Chlorophyll-a	SM 10200 H	mg/m3	27	1	1	2	NA		C-80088	22-Mar-24	22-Mar-24
Sample ID: 116624-R1	**LE02 - Int**		**Matrix: Biologic**				**Sampled:**	**27-Feb-24 8:55**		**Received:**	**13-Mar-24**
Chlorophyll-a	SM 10200 H	mg/m3	23.5	1	1	2	NA		C-80088	22-Mar-24	22-Mar-24
Sample ID: 116625-R1	**LE02 - Surf**		**Matrix: Biologic**				**Sampled:**	**27-Feb-24 9:15**		**Received:**	**13-Mar-24**
Chlorophyll-a	SM 10200 H	mg/m3	39	1	1	2	NA		C-80088	22-Mar-24	22-Mar-24

QUALITY CONTROL
REPORT

PHYSIS ENVIRONMENTAL LABORATORIES, INC.
TERRA FAUNA FLORA AQUA AURA
Innovative Solutions for Nature

PHYSIS Project ID: 2302004-025
Client: WSP USA
Project: LECL TMDL Monitoring Project # 2315100200.0004.PHY

Conventionals

QUALITY CONTROL REPORT

Chlorophyll-a **Method:** SM 10200 H **Fraction:** NA **Prepared:** 22-Mar-24 **Analyzed:** 22-Mar-24

SAMPLE ID		BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS	PRECISION %	PRECISION LIMITS	QA CODE
116615-B1	QAQC Procedural Blank	C-80088	ND	1	1	2	mg/m3							
116615-BS1	QAQC Procedural Blank	C-80088	40600	1	1	2	mg/m3	43600	0	93	70 - 130% PASS			
116615-BS2	QAQC Procedural Blank	C-80088	40600	1	1	2	mg/m3	43600	0	93	70 - 130% PASS	0	30 PASS	

CHAIN OF CUSTODY

Chain of Custody & Sample Information Record

Client: WSP USA E&I Inc.
Contact: John Rudolph
Phone No. 858-243-8158

Project Name: LECL TMDL Monitoring
Project Number: 2315100200.0004.PHYSIS
PO#: C014105479
GL Code: 57300
Org# 3151

Email: john.rudolph@wsp.com

Turn Around Time: Routine *3-5 Day Rush *48 Hour Rush *24 Hour Rush
***Lab TAT Approval:** By:
*Additional Charges May Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Nick Jenack
Employer: WSP USA
Signature:

Matrix
DW = Drinking Water
WW = Wastewater
GW = Groundwater
S = Soil
SG = Sludge
L = Liquid
M = Miscellaneous

Notes
Chl-a samples on 0.7 um GFF

Sample ID	Date	Time	# of Containers & Preservatives										Total # of Containers	Sample Type			Analysis Requested								Matrix	Notes
			Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	NaOH/ZnAcetate	NH4Cl	MCAA	Frozen		Routine	Resample	Special	Total Sulfide	Nitrate - Nitrite	TDS	TKN	Ammonia	Total Phosphorus	SRP/Ortho-P	Chlorophyll-a		
CL07 - Int	2/27/24	1150																						x		Filter Volume: 500
CL07 - Surf		1205																						x		Filter Volume: 500
CL08 - Int		1050																						x		Filter Volume: 500 mL
CL08 - Surf		1105																						x		Filter Volume: 355
CL09 - Int		0950																						x		Filter Volume: 500
CL09 - Surf		1000																						x		Filter Volume: 500
CL10 - Int		0920																						x		Filter Volume: 500
CL10 - Surf		0855																						x		Filter Volume: 475
LE02 - Int		0855																						x		Filter Volume: 500
LE02 - Surf		0915																						x		Filter Volume: 500

Relinquished By (Sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company
	Nick Jenack / WSP	3/2/24 - 1600	10:03 3/13/24	Mitch Wagner / Physis

(For Lab Use Only) **Sample Integrity Upon Receipt**

Sample(s) Submitted on Ice? Yes No
Custody Seal(s) Intact? Yes No N/A
Sample(s) Intact? Yes No
Temperature °C
☐ **Cooler Blank**

Lab Notes

Lab No. ____

Page 1 **of** 1

PHYSIS ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

Project Iteration ID: 2302004-025
Client Name: WSP USA
Project Name: LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C014105479 GL Code 57300 Org # 3151
COC Page Number: 2 of 2
Bottle Label Color: NA

Sample Receipt Summary

Receiving Info

1. Initials Received By: MW
2. Date Received: 3/13/24
3. Time Received: 10:03
4. Client Name: WSP
5. Courier Information: (Please circle)
   - Client
   - [✓ FedEx]
   - PHYSIS Driver:
     - i. Start Time:
     - ii. End Time:
     - iii. Total Mileage:
     - iv. Number of Pickups:
   - UPS
   - GSO/GLS
   - Area Fast
   - Ontrac
   - DRS
   - PAMS
6. Container Information: (Please put the # of containers or circle none)
   - 1 Cooler
   - __ Carboy(s)
   - __ Styrofoam Cooler
   - __ Carboy Trash Can(s)
   - ____ Boxes
   - ____ Carboy Cap(s)
   - None
   - Other ________
7. What type of ice was used: (Please circle any that apply)
   - Wet Ice
   - Blue Ice
   - Dry Ice
   - Water
   - [✓ None]
8. Randomly Selected Samples Temperature (°C): 12.2 Used I/R Thermometer # 1-2

Inspection Info

1. Initials Inspected By: CR

Sample Integrity Upon Receipt:

1. COC(s) included and completely filled out.. [✓ Yes] / No
2. All sample containers arrived intact.. [✓ Yes] / No
3. All samples listed on COC(s) are present.. [✓ Yes] / No
4. Information on containers consistent with information on COC(s)............... [✓ Yes] / No
5. Correct containers and volume for all analyses indicated............................. [✓ Yes] / No
6. All samples received within method holding time.. [✓ Yes] / No
7. Correct preservation used for all analyses indicated.................................... [✓ Yes] / No
8. Name of sampler included on COC(s).. [✓ Yes] / No

Notes:

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders: 4D02004

Project: 2315100200.0004.WECK

Attn: John Rudolph

Client: WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Report Date: 5/13/2024

Received Date: 4/17/2024

Turnaround Time: Normal

Phones: (858) 514-6465

Fax: (858) 278-5300

P.O. #: C016900152, Project No.

Billing Code: 2315100200.0004.WECK

DoD-ELAP ANAB #ADE-2882 • DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015 • NV-DEP #NAC 445A • SCAQMD #93LA1006

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. The report may include analytes that are not currently accreditable by some state agencies or accrediting bodies. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 4/17/24 with the Chain-of-Custody document. The samples were received in good condition, at 11.3 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Kenneth Oda

Kenneth C. Oda For Kim G. Tu
Project Manager

WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: 2315100200.0004.WECK

Project Manager: John Rudolph

Reported:
05/13/2024 08:49

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CL07	Nick Jernack	4D02004-01	Water	04/17/24 10:30	
CL08	Nick Jernack	4D02004-02	Water	04/17/24 09:50	
CL09	Nick Jernack	4D02004-03	Water	04/17/24 09:10	
CL10	Nick Jernack	4D02004-04	Water	04/17/24 08:35	
LE02	Nick Jernack	4D02004-05	Water	04/17/24 09:35	

WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: 2315100200.0004.WECK

Project Manager: John Rudolph

Reported:
05/13/2024 08:49

Sample Results

Sample: CL07

4D02004-01 (Water)

Sampled: 04/17/24 10:30 by Nick Jernack

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Anions by IC, EPA Method 300.0							
Method: EPA 300.0 — **Instr:** LC15							
Batch ID: W4D1531 — **Preparation:** _NONE (LC) — **Prepared:** 04/17/24 13:18 — **Analyst:** cam							
Nitrate as N	**88**	22	110	ug/l	1	04/17/24 17:55	J
Nitrite as N	ND	29	150	ug/l	1	04/17/24 17:55	
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1 — **Instr:** AA06							
Batch ID: W4D2191 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 04/29/24 13:52 — **Analyst:** YMT							
Ammonia as N	**0.61**	0.017	0.10	mg/l	1	05/02/24	
Method: EPA 351.2 — **Instr:** AA06							
Batch ID: W4D2103 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 04/24/24 16:46 — **Analyst:** YMT							
TKN	**1.1**	0.065	0.10	mg/l	1	04/25/24	
Method: EPA 365.3 — **Instr:** UVVIS04							
Batch ID: W4D1646 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 04/18/24 12:08 — **Analyst:** rob							
o-Phosphate as P	**0.28**	0.0071	0.010	mg/l	1	04/18/24 13:25	**
Method: EPA 365.3 — **Instr:** UVVIS05							
Batch ID: W4D2424 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 04/30/24 10:02 — **Analyst:** rob							
Phosphorus as P, Total	**0.31**	0.0067	0.010	mg/l	1	05/06/24	
Method: SM 2540C — **Instr:** OVEN17							
Batch ID: W4D1611 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 04/18/24 09:47 — **Analyst:** bel							
Total Dissolved Solids	**350**	4.0	10	mg/l	1	04/18/24	
Method: SM 2540D — **Instr:** OVEN15							
Batch ID: W4D1645 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 04/18/24 12:08 — **Analyst:** dig							
Total Suspended Solids	ND	5	5	mg/l	1	04/18/24	
Method: SM 4500S2-D — **Instr:** _ANALYST							
Batch ID: W4D1903 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 04/23/24 09:41 — **Analyst:** mes							
Sulfide, Total	**0.10**	0.050	0.10	mg/l	1	04/23/24	
Metals by EPA 200 Series Methods							
Method: EPA 200.7 — **Instr:** ICP03							
Batch ID: W4D1806 — **Preparation:** EPA 200.2 — **Prepared:** 04/22/24 10:40 — **Analyst:** kvm							
Aluminum, Dissolved	ND	0.041	0.050	mg/l	1	04/30/24	
Aluminum, Total	**0.041**	0.022	0.050	mg/l	1	04/30/24	J

Sample Results

(Continued)

Sample: CL08

Sampled: 04/17/24 9:50 by Nick Jernack

4D02004-02 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Anions by IC, EPA Method 300.0							
Method: EPA 300.0			**Instr:** LC15				
Batch ID: W4D1531 **Preparation:** _NONE (LC)			**Prepared:** 04/17/24 13:18				**Analyst:** cam
Nitrate as N	**1100**	22	110	ug/l	1	04/17/24 18:13	
Nitrite as N	**110**	29	150	ug/l	1	04/17/24 18:13	J
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W4D2191 **Preparation:** _NONE (WETCHEM)			**Prepared:** 04/29/24 13:52				**Analyst:** YMT
Ammonia as N	**0.21**	0.017	0.10	mg/l	1	05/02/24	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W4D2103 **Preparation:** _NONE (WETCHEM)			**Prepared:** 04/24/24 16:46				**Analyst:** YMT
TKN	**0.87**	0.065	0.10	mg/l	1	04/25/24	
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W4D1646 **Preparation:** _NONE (WETCHEM)			**Prepared:** 04/18/24 12:08				**Analyst:** rob
o-Phosphate as P	**0.19**	0.0071	0.010	mg/l	1	04/18/24 13:25	**
Method: EPA 365.3			**Instr:** UVVIS05				
Batch ID: W4D2424 **Preparation:** _NONE (WETCHEM)			**Prepared:** 04/30/24 10:02				**Analyst:** rob
Phosphorus as P, Total	**0.25**	0.0067	0.010	mg/l	1	05/06/24	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W4D1611 **Preparation:** _NONE (WETCHEM)			**Prepared:** 04/18/24 09:47				**Analyst:** bel
Total Dissolved Solids	**330**	4.0	10	mg/l	1	04/18/24	
Method: SM 2540D			**Instr:** OVEN15				
Batch ID: W4D1645 **Preparation:** _NONE (WETCHEM)			**Prepared:** 04/18/24 12:08				**Analyst:** dig
Total Suspended Solids	**6**	5	5	mg/l	1	04/18/24	
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W4D1903 **Preparation:** _NONE (WETCHEM)			**Prepared:** 04/23/24 09:41				**Analyst:** mes
Sulfide, Total	ND	0.050	0.10	mg/l	1	04/23/24	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W4D1806 **Preparation:** EPA 200.2			**Prepared:** 04/22/24 10:40				**Analyst:** kvm
Aluminum, Dissolved	ND	0.041	0.050	mg/l	1	04/30/24	
Aluminum, Total	**0.075**	0.022	0.050	mg/l	1	04/30/24	

Sample Results

(Continued)

Sample: CL09 Sampled: 04/17/24 9:10 by Nick Jernack

4D02004-03 (Water)

Anions by IC, EPA Method 300.0

Method: EPA 300.0 **Instr:** LC15
Batch ID: W4D1531 **Preparation:** _NONE (LC) **Prepared:** 04/17/24 13:18 **Analyst:** cam

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrate as N	**56**	22	110	ug/l	1	04/17/24 19:06	J
Nitrite as N	ND	29	150	ug/l	1	04/17/24 19:06	

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: EPA 350.1 **Instr:** AA06
Batch ID: W4D2191 **Preparation:** _NONE (WETCHEM) **Prepared:** 04/29/24 13:52 **Analyst:** YMT

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Ammonia as N	**1.3**	0.017	0.10	mg/l	1	05/02/24	

Method: EPA 351.2 **Instr:** AA06
Batch ID: W4D2103 **Preparation:** _NONE (WETCHEM) **Prepared:** 04/24/24 16:46 **Analyst:** YMT

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
TKN	**2.1**	0.065	0.10	mg/l	1	04/25/24	

Method: EPA 365.3 **Instr:** UVVIS04
Batch ID: W4D1646 **Preparation:** _NONE (WETCHEM) **Prepared:** 04/18/24 12:08 **Analyst:** rob

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
o-Phosphate as P	**0.38**	0.0071	0.010	mg/l	1	04/18/24 13:26	**

Method: EPA 365.3 **Instr:** UVVIS05
Batch ID: W4D2424 **Preparation:** _NONE (WETCHEM) **Prepared:** 04/30/24 10:02 **Analyst:** rob

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Phosphorus as P, Total	**0.43**	0.0067	0.010	mg/l	1	05/06/24	

Method: SM 2540C **Instr:** OVEN17
Batch ID: W4D1611 **Preparation:** _NONE (WETCHEM) **Prepared:** 04/18/24 09:47 **Analyst:** bel

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Dissolved Solids	**500**	4.0	10	mg/l	1	04/18/24	

Method: SM 2540D **Instr:** OVEN15
Batch ID: W4D1645 **Preparation:** _NONE (WETCHEM) **Prepared:** 04/18/24 12:08 **Analyst:** dig

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Suspended Solids	ND	5	5	mg/l	1	04/18/24	

Method: SM 4500S2-D **Instr:** _ANALYST
Batch ID: W4D1903 **Preparation:** _NONE (WETCHEM) **Prepared:** 04/23/24 09:41 **Analyst:** mes

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Sulfide, Total	**2.0**	0.50	1.0	mg/l	10	04/23/24	

Metals by EPA 200 Series Methods

Method: EPA 200.7 **Instr:** ICP03
Batch ID: W4D1806 **Preparation:** EPA 200.2 **Prepared:** 04/22/24 10:40 **Analyst:** kvm

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Aluminum, Dissolved	ND	0.041	0.050	mg/l	1	04/30/24	
Aluminum, Total	**0.073**	0.022	0.050	mg/l	1	04/30/24	

Sample Results

(Continued)

Sample: CL10

Sampled: 04/17/24 8:35 by Nick Jernack

4D02004-04 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Anions by IC, EPA Method 300.0							
Method: EPA 300.0 — **Instr:** LC15							
Batch ID: W4D1531 — **Preparation:** _NONE (LC) — **Prepared:** 04/17/24 13:18 — **Analyst:** cam							
Nitrate as N	**70**	22	110	ug/l	1	04/17/24 19:24	J
Nitrite as N	ND	29	150	ug/l	1	04/17/24 19:24	
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1 — **Instr:** AA06							
Batch ID: W4D2191 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 04/29/24 13:52 — **Analyst:** YMT							
Ammonia as N	**0.22**	0.017	0.10	mg/l	1	05/02/24	
Method: EPA 351.2 — **Instr:** AA06							
Batch ID: W4D2103 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 04/24/24 16:46 — **Analyst:** YMT							
TKN	**1.2**	0.065	0.10	mg/l	1	04/25/24	
Method: EPA 365.3 — **Instr:** UVVIS04							
Batch ID: W4D1646 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 04/18/24 12:08 — **Analyst:** rob							
o-Phosphate as P	**0.24**	0.0071	0.010	mg/l	1	04/18/24 13:26	**
Method: EPA 365.3 — **Instr:** UVVIS05							
Batch ID: W4D2424 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 04/30/24 10:02 — **Analyst:** rob							
Phosphorus as P, Total	**0.33**	0.0067	0.010	mg/l	1	05/06/24	
Method: SM 2540C — **Instr:** OVEN17							
Batch ID: W4D1611 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 04/18/24 09:47 — **Analyst:** bel							
Total Dissolved Solids	**510**	4.0	10	mg/l	1	04/18/24	
Method: SM 2540D — **Instr:** OVEN15							
Batch ID: W4D1645 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 04/18/24 12:08 — **Analyst:** dig							
Total Suspended Solids	**7**	5	5	mg/l	1	04/18/24	
Method: SM 4500S2-D — **Instr:** _ANALYST							
Batch ID: W4D1903 — **Preparation:** _NONE (WETCHEM) — **Prepared:** 04/23/24 09:41 — **Analyst:** mes							
Sulfide, Total	**0.20**	0.050	0.10	mg/l	1	04/23/24	
Metals by EPA 200 Series Methods							
Method: EPA 200.7 — **Instr:** ICP03							
Batch ID: W4D1806 — **Preparation:** EPA 200.2 — **Prepared:** 04/22/24 10:40 — **Analyst:** kvm							
Aluminum, Dissolved	ND	0.041	0.050	mg/l	1	04/30/24	
Aluminum, Total	**0.070**	0.022	0.050	mg/l	1	04/30/24	

Sample Results

(Continued)

Sample: LE02 Sampled: 04/17/24 9:35 by Nick Jernack

4D02004-05 (Water)

Anions by IC, EPA Method 300.0

Method: EPA 300.0 **Instr:** LC15
Batch ID: W4D1531 **Preparation:** _NONE (LC) **Prepared:** 04/17/24 13:18 **Analyst:** cam

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Nitrate as N	**120**	22	110	ug/l	1	04/17/24 20:17	
Nitrite as N	ND	29	150	ug/l	1	04/17/24 20:17	

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Method: EPA 350.1 **Instr:** AA06
Batch ID: W4D2191 **Preparation:** _NONE (WETCHEM) **Prepared:** 04/29/24 13:52 **Analyst:** YMT

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Ammonia as N	**0.85**	0.017	0.10	mg/l	1	05/02/24	

Method: EPA 351.2 **Instr:** AA06
Batch ID: W4D2103 **Preparation:** _NONE (WETCHEM) **Prepared:** 04/24/24 16:46 **Analyst:** YMT

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
TKN	**2.4**	0.26	0.40	mg/l	1	04/25/24	M-02

Method: EPA 365.3 **Instr:** UVVIS04
Batch ID: W4D1646 **Preparation:** _NONE (WETCHEM) **Prepared:** 04/18/24 12:08 **Analyst:** rob

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
o-Phosphate as P	**0.17**	0.0071	0.010	mg/l	1	04/18/24 13:27	

Method: EPA 365.3 **Instr:** UVVIS05
Batch ID: W4D2424 **Preparation:** _NONE (WETCHEM) **Prepared:** 04/30/24 10:02 **Analyst:** rob

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Phosphorus as P, Total	**0.23**	0.0067	0.010	mg/l	1	05/06/24	

Method: SM 2540C **Instr:** OVEN17
Batch ID: W4D1611 **Preparation:** _NONE (WETCHEM) **Prepared:** 04/18/24 09:47 **Analyst:** bel

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Total Dissolved Solids	**1500**	4.0	10	mg/l	1	04/18/24	

Method: SM 4500S2-D **Instr:** _ANALYST
Batch ID: W4D1903 **Preparation:** _NONE (WETCHEM) **Prepared:** 04/23/24 09:41 **Analyst:** mes

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Sulfide, Total	ND	0.050	0.10	mg/l	1	04/23/24	

Quality Control Results

Anions by IC, EPA Method 300.0

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4D1531 - EPA 300.0											
Blank (W4D1531-BLK1)				**Prepared & Analyzed: 04/17/24**							
Nitrate as N	ND	22	110	ug/l							
Nitrite as N	ND	29	150	ug/l							
LCS (W4D1531-BS1)				**Prepared & Analyzed: 04/17/24**							
Nitrate as N	2120	22	110	ug/l	2000		106	90-110			
Nitrite as N	2080	29	150	ug/l	2000		104	90-110			
Matrix Spike (W4D1531-MS1)	**Source: 4D17122-01**			**Prepared & Analyzed: 04/17/24**							
Nitrate as N	24200	220	1100	ug/l	20000	2780	107	84-115			
Nitrite as N	20800	290	1500	ug/l	20000	ND	104	87-108			
Matrix Spike (W4D1531-MS2)	**Source: 4D17122-02**			**Prepared & Analyzed: 04/17/24**							
Nitrate as N	22100	220	1100	ug/l	20000	646	107	84-115			
Nitrite as N	21200	290	1500	ug/l	20000	ND	106	87-108			
Matrix Spike Dup (W4D1531-MSD1)	**Source: 4D17122-01**			**Prepared & Analyzed: 04/17/24**							
Nitrate as N	24200	220	1100	ug/l	20000	2780	107	84-115	0	20	
Nitrite as N	21200	290	1500	ug/l	20000	ND	106	87-108	2	20	
Matrix Spike Dup (W4D1531-MSD2)	**Source: 4D17122-02**			**Prepared & Analyzed: 04/17/24**							
Nitrate as N	22000	220	1100	ug/l	20000	646	107	84-115	0.4	20	
Nitrite as N	20900	290	1500	ug/l	20000	ND	105	87-108	1	20	

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4D1611 - SM 2540C											
Blank (W4D1611-BLK1)					**Prepared & Analyzed: 04/18/24**						
Total Dissolved Solids	ND	4.0	10	mg/l							
LCS (W4D1611-BS1)					**Prepared & Analyzed: 04/18/24**						
Total Dissolved Solids	834	4.0	10	mg/l	824		101	97-103			
Duplicate (W4D1611-DUP1)	**Source: 4D02004-05**				**Prepared & Analyzed: 04/18/24**						
Total Dissolved Solids	1440	4.0	10	mg/l		1470			2	10	
Duplicate (W4D1611-DUP2)	**Source: 4D17058-01**				**Prepared & Analyzed: 04/18/24**						
Total Dissolved Solids	1520	4.0	10	mg/l		1460			4	10	
Batch: W4D1645 - SM 2540D											
Blank (W4D1645-BLK1)					**Prepared & Analyzed: 04/18/24**						
Total Suspended Solids	ND	5	5	mg/l							
LCS (W4D1645-BS1)					**Prepared & Analyzed: 04/18/24**						
Total Suspended Solids	64.2	5	5	mg/l	64.7		99	90-110			
Duplicate (W4D1645-DUP1)	**Source: 4D17032-01**				**Prepared & Analyzed: 04/18/24**						
Total Suspended Solids	740	5	5	mg/l		710			4	10	
Batch: W4D1646 - EPA 365.3											
Blank (W4D1646-BLK1)					**Prepared & Analyzed: 04/18/24**						
o-Phosphate as P	ND	0.0071	0.010	mg/l							
LCS (W4D1646-BS1)					**Prepared & Analyzed: 04/18/24**						
o-Phosphate as P	0.204	0.0071	0.010	mg/l	0.200		102	88-111			
Matrix Spike (W4D1646-MS1)	**Source: 4D02005-01**				**Prepared & Analyzed: 04/18/24**						
o-Phosphate as P	0.337	0.0071	0.010	mg/l	0.200	0.135	101	85-112			
Matrix Spike Dup (W4D1646-MSD1)	**Source: 4D02005-01**				**Prepared & Analyzed: 04/18/24**						
o-Phosphate as P	0.337	0.0071	0.010	mg/l	0.200	0.135	101	85-112	0	20	
Batch: W4D1903 - SM 4500S2-D											
Blank (W4D1903-BLK1)					**Prepared & Analyzed: 04/23/24**						
Sulfide, Total	ND	0.050	0.10	mg/l							
LCS (W4D1903-BS1)					**Prepared & Analyzed: 04/23/24**						
Sulfide, Total	0.100	0.050	0.10	mg/l	0.0980		102	90-110			
Duplicate (W4D1903-DUP1)	**Source: 4D02004-01**				**Prepared & Analyzed: 04/23/24**						
Sulfide, Total	0.100	0.050	0.10	mg/l		0.100			0	20	
Matrix Spike (W4D1903-MS1)	**Source: 4C20025-01**				**Prepared & Analyzed: 04/23/24**						
Sulfide, Total	0.200	0.050	0.10	mg/l	0.196	ND	102	80-120			
Matrix Spike Dup (W4D1903-MSD1)	**Source: 4C20025-01**				**Prepared & Analyzed: 04/23/24**						
Sulfide, Total	0.200	0.050	0.10	mg/l	0.196	ND	102	80-120	0	20	
Batch: W4D2103 - EPA 351.2											
Blank (W4D2103-BLK1)					**Prepared: 04/24/24 Analyzed: 04/25/24**						
TKN	ND	0.065	0.10	mg/l							

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4D2103 - EPA 351.2 (Continued)											
Blank (W4D2103-BLK2)				**Prepared: 04/24/24**		**Analyzed: 04/25/24**					
TKN	ND	0.065	0.10	mg/l							
LCS (W4D2103-BS1)				**Prepared: 04/24/24**		**Analyzed: 04/25/24**					
TKN	0.994	0.065	0.10	mg/l	1.00		99	90-110			
LCS (W4D2103-BS2)				**Prepared: 04/24/24**		**Analyzed: 04/25/24**					
TKN	0.940	0.065	0.10	mg/l	1.00		94	90-110			
Matrix Spike (W4D2103-MS1)	**Source: 4D02004-05**			**Prepared: 04/24/24**		**Analyzed: 04/25/24**					
TKN	6.38	0.26	0.40	mg/l	4.00	2.35	101	90-110			
Matrix Spike (W4D2103-MS2)	**Source: 4D17078-04**			**Prepared: 04/24/24**		**Analyzed: 04/25/24**					
TKN	1.03	0.065	0.10	mg/l	1.00	0.0894	94	90-110			
Matrix Spike Dup (W4D2103-MSD1)	**Source: 4D02004-05**			**Prepared: 04/24/24**		**Analyzed: 04/25/24**					
TKN	6.30	0.26	0.40	mg/l	4.00	2.35	99	90-110	1	10	
Matrix Spike Dup (W4D2103-MSD2)	**Source: 4D17078-04**			**Prepared: 04/24/24**		**Analyzed: 04/25/24**					
TKN	1.03	0.065	0.10	mg/l	1.00	0.0894	94	90-110	0.08	10	
Batch: W4D2191 - EPA 350.1											
Blank (W4D2191-BLK1)				**Prepared: 04/29/24**		**Analyzed: 05/02/24**					
Ammonia as N	ND	0.017	0.10	mg/l							
Blank (W4D2191-BLK2)				**Prepared: 04/29/24**		**Analyzed: 05/02/24**					
Ammonia as N	ND	0.017	0.10	mg/l							
LCS (W4D2191-BS1)				**Prepared: 04/29/24**		**Analyzed: 05/02/24**					
Ammonia as N	0.251	0.017	0.10	mg/l	0.250		100	90-110			
LCS (W4D2191-BS2)				**Prepared: 04/29/24**		**Analyzed: 05/02/24**					
Ammonia as N	0.245	0.017	0.10	mg/l	0.250		98	90-110			
Matrix Spike (W4D2191-MS1)	**Source: 4D09008-01**			**Prepared: 04/29/24**		**Analyzed: 05/02/24**					
Ammonia as N	0.307	0.017	0.10	mg/l	0.250	0.0670	96	90-110			
Matrix Spike (W4D2191-MS2)	**Source: 4D17017-01**			**Prepared: 04/29/24**		**Analyzed: 05/02/24**					
Ammonia as N	0.380	0.017	0.10	mg/l	0.250	0.143	95	90-110			
Matrix Spike Dup (W4D2191-MSD1)	**Source: 4D09008-01**			**Prepared: 04/29/24**		**Analyzed: 05/02/24**					
Ammonia as N	0.304	0.017	0.10	mg/l	0.250	0.0670	95	90-110	0.8	15	
Matrix Spike Dup (W4D2191-MSD2)	**Source: 4D17017-01**			**Prepared: 04/29/24**		**Analyzed: 05/02/24**					
Ammonia as N	0.384	0.017	0.10	mg/l	0.250	0.143	97	90-110	1	15	
Batch: W4D2424 - EPA 365.3											
Blank (W4D2424-BLK1)				**Prepared: 04/30/24**		**Analyzed: 05/06/24**					
Phosphorus as P, Total	ND	0.0067	0.010	mg/l							
LCS (W4D2424-BS1)				**Prepared: 04/30/24**		**Analyzed: 05/06/24**					
Phosphorus as P, Total	0.198	0.0067	0.010	mg/l	0.200		99	90-110			
Matrix Spike (W4D2424-MS1)	**Source: 4D02005-01**			**Prepared: 04/30/24**		**Analyzed: 05/06/24**					
Phosphorus as P, Total	0.416	0.0067	0.010	mg/l	0.200	0.223	96	90-110			

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4D2424 - EPA 365.3 (Continued)											
Matrix Spike Dup (W4D2424-MSD1)	**Source: 4D02005-01**			**Prepared: 04/30/24**		**Analyzed: 05/06/24**					
Phosphorus as P, Total	0.427	0.0067	0.010	mg/l	0.200	0.223	102	90-110	3	20	

Quality Control Results

(Continued)

Metals by EPA 200 Series Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4D1806 - EPA 200.7											
Blank (W4D1806-BLK1)				**Prepared: 04/22/24**		**Analyzed: 04/30/24**					
Aluminum, Dissolved	ND	0.041	0.050	mg/l							
Aluminum, Total	ND	0.022	0.050	mg/l							
LCS (W4D1806-BS1)				**Prepared: 04/22/24**		**Analyzed: 04/30/24**					
Aluminum, Dissolved	0.226	0.041	0.050	mg/l	0.200		113	85-115			
Aluminum, Total	0.226	0.022	0.050	mg/l	0.200		113	85-115			
Matrix Spike (W4D1806-MS1)	**Source: 4D02004-02**			**Prepared: 04/22/24**		**Analyzed: 04/30/24**					
Aluminum, Total	0.376	0.022	0.050	mg/l	0.200	0.0746	151	70-130			MS-02
Matrix Spike (W4D1806-MS2)	**Source: 4D02004-04**			**Prepared: 04/22/24**		**Analyzed: 04/30/24**					
Aluminum, Total	0.437	0.022	0.050	mg/l	0.200	0.0699	184	70-130			MS-02
Matrix Spike Dup (W4D1806-MSD1)	**Source: 4D02004-02**			**Prepared: 04/22/24**		**Analyzed: 04/30/24**					
Aluminum, Total	0.354	0.022	0.050	mg/l	0.200	0.0746	140	70-130	6	30	MS-02
Matrix Spike Dup (W4D1806-MSD2)	**Source: 4D02004-04**			**Prepared: 04/22/24**		**Analyzed: 04/30/24**					
Aluminum, Total	0.357	0.022	0.050	mg/l	0.200	0.0699	143	70-130	20	30	MS-02

Notes and Definitions

Item	Definition
**	The recommended holding time for field filtering is only 15 minutes. The sample was filtered as soon as possible but it was filtered past holding time. However, the sample was analyzed within holding time.
J	Estimated conc. detected <MRL and >MDL.
M-02	Due to the nature of matrix interferences, sample was diluted prior to preparation. The MDL and MRL were raised due to the dilution.
MS-02	The RPD and/or percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte inherent in the sample.
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	Method Reporting Limit (MRL) is the minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

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

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

Chain of Custody & Sample Information Record

4D02004

Client: WSP USA E&I Inc.
Contact: John Rudolph
Phone No. 858-243-8158

Project Name: LECL TMDL Monitoring
Email: john.rudolph@woodplc.com
Project Number: 2315100200.0004.WECK
PO#: C016900152
GL Code: 573000
Org# 3151

Turn Around Time: Routine | *3-5 Day Rush | *48 Hour Rush | *24 Hour Rush
Lab TAT Approval: By:
*Additional Charges May Apply

Additional Reporting Requests
Include QC Data Package: ☐Yes ☐ No
FAX Results: ☐Yes ☐ No
Email Results: ☐Yes ☐ No
State EDT: ☐Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Nick Jerack
Employer: WSP USA E&I Inc.
Signature:

			# of Containers & Preservatives											Sample Type			Analysis Requested										Matrix	Notes
Sample ID	Date	Time	Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	NaOH/ZnAcetate	NH4Cl	MCAA	Frozen	Total # of Containers	Routine	Resample	Special	TSS	Nitrate - Nitrite (EPA 353.2)	TDS (SM2540 C)	TKN (EPA 351.2)	Ammonia (EPA 350.1)	Total Phosphorus (EPA 365.3)	SRP/Ortho-P (EPA 365.3)	Total Sulfide (SM4500S)	Total AL (EPA 200.7)	Dissolved AL (EPA 200.7)	DW = Drinking Water WW = Wastewater GW = Groundwater S = Soil SG = Sludge L = Liquid M = Miscellaneous	Ortho-P is field filtered (0.45 um) Dissolved Al is field filtered (0.45 um)
CL07	4/17/24	1030															X	X	X	X	X	X	X	X	X	X		
CL08	↓	0950															X	X	X	X	X	X	X	X	X	X		
CL09	↓	0910															X	X	X	X	X	X	X	X	X	X		
CL10	↓	0835															X	X	X	X	X	X	X	X	X	X		
LE02	↓	0935																X	X	X	X	X	X	X				

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company
	Nick Jerack / WSP	4/17/24 - 1345		Laura Gastelum Weck
	Laura Gastelum	4/17/24		CSA Weck
		4/17/24 1550		

(For Lab Use Only)	Sample Integrity Upon Receipt			
Sample(s) Submitted on Ice?	Yes	No	T0307	Temperature
Custody Seal(s) Intact?	Yes	No	N/A	16.3 °C
Sample(s) Intact?	Yes	No		☐ Cooler Blank

Lab Notes

Lab No. ________

Page 1 of 1

WECK LABORATORIES, INC.

Sample Receipt Checklist

Weck WKO: **4D02004**
WKO Logged by: Lester Abad
Samples Checked by: Lester Abad

Date/Time Received: 04/17/24 @ 15:50
\# of Samples: 05
Delivered by: Client

	Task	Yes	No	N/A	Comments
COC	COC present at receipt?	☒	☐		
	COC properly completed?	☒	☐		
	COC matches sample labels?	☒	☐		
	Project Manager notified about COC discrepancy?	☐	☐	☒	
Receipt Information	Sample Temperature	11.3°C			
	Samples received on ice?	☒	☐		
	Ice Type (Blue/Wet)	WET			
	All samples intact?	☒	☐		
	Samples in proper containers?	☒	☐		
	Sufficient sample volume?	☒	☐		
	Samples intact?	☒	☐		
	Received within holding time?	☒	☐		
	Project Manager notified about receipt info?	☐	☐	☒	
1	Sample labels checked for correct preservation?	☒	☐	☐	
	VOC Headspace: (No) none, If Yes (see comment) 524.2, 524.3, 624.1, 8260, 1666 P/T, LUFT	☐	☐	☒	☐<6mm/Pea Size?
	pH verified upon receipt? Metals <2; H2SO4 pres tests <2; 522<4; TOC <2; 508.1, 525.2<2, 6710B<2, 608.3 5-9	☒	☐	☐	pH paper Lot# 3101689
	Free Chlorine Tested <0.1 (Organics Analyses)	☐	☐	☒	Cl Test Strip Lot#
	O&G pH <2 verified?	☐	☐	☐	pH paper Lot# pH Reading:
	pH adjusted for O&G	☐	☐	☐	Acid Lot# Amt added:
	Project Manager notified about sample preservation?	☐	☐	☒	

PM Comments

Sample Receipt Checklist Completed by:

Signature: Lester Abad

Date: 04/17/24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

June 12, 2024

John D. Rudolph
WSP USA
9177 Sky Park Court
San Diego, CA 92123-

Project Name:	LECL TMDL Monitoring PO # C014105479
Physis Project ID:	2302004-029

Dear John,

Enclosed are the analytical results for samples submitted to PHYSIS Environmental Laboratories, Inc. (PHYSIS) on 5/15/2024. A total of 10 samples were received for analysis in accordance with the attached chain of custody (COC). Per the COC, the samples were analyzed for:

Conventionals
Chlorophyll-a (mg/m3) by SM 10200 H

Analytical results in this report apply only to samples submitted to PHYSIS in accordance with the COC and are intended to be considered in their entirety.

Please feel free to contact me at any time with any questions. PHYSIS appreciates the opportunity to provide you with our analytical and support services.

Regards,
Rachel Hansen
Rachel Hansen
714 602-5320
Extension 203
rachelhansen@physislabs.com

PROJECT SAMPLE LIST

WSP USA

PHYSIS Project ID: 2302004-029

LECL TMDL Monitoring PO # C014105479

Total Samples: 10

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
117839	CL07-Int		4/17/2024	10:30	Biologic	Not Specified
117840	CL07-Surf		4/17/2024	12:52	Biologic	Not Specified
117841	CL08-Int		4/17/2024	9:50	Biologic	Not Specified
117842	CL08-Surf		4/17/2024	13:03	Biologic	Not Specified
117843	CL09-Int		4/17/2024	9:10	Biologic	Not Specified
117844	CL09-Surf		4/17/2024	13:30	Biologic	Not Specified
117845	CL10-Int		4/17/2024	8:35	Biologic	Not Specified
117846	CL10-Surf		4/17/2024	13:48	Biologic	Not Specified
117847	LE02-Int		4/17/2024	9:35	Biologic	Not Specified
117848	LE02-Surf		4/17/2024	10:10	Biologic	Not Specified

ABBREVIATIONS and ACRONYMS

QM	Quality Manual
QA	Quality Assurance
QC	Quality Control
MDL	method detection limit
RL	reporting limit
R1	project sample
R2	project sample replicate
MS1	matrix spike
MS2	matrix spike replicate
B1	procedural blank
B2	procedural blank replicate
BS1	blank spike
BS2	blank spike replicate
LCS1	laboratory control spike
LCS2	laboratory control spike replicate
LCM1	laboratory control material
LCM2	laboratory control material replicate
CRM1	certified reference material
CRM2	certified reference material replicate
RPD	relative percent difference
LMW	low molecular weight
HMW	high molecular weight

QUALITY ASSURANCE SUMMARY

LABORATORY BATCH: Physis' QM defines a laboratory batch as a group of 20 or fewer project samples of similar matrix, processed together under the same conditions and with the same reagents. QC samples are associated with each batch and were used to assess the validity of the sample analyses.

PROCEDURAL BLANK: Laboratory contamination introduced during method use is assessed through the preparation and analysis of procedural blanks is provided at a minimum frequency of one per batch.

ACCURACY: Accuracy of analytical measurements is the degree of closeness based on percent recovery calculations between measured values and the actual or true value and includes a combination of reproducibility error and systematic bias due to sampling and analytical operations. Accuracy of the project data was indicated by analysis of MS, BS, LCS, LCM, CRM, and/or surrogate spikes on a minimum frequency of one per batch. Physis' QM requires that 95% of the target compounds greater than 10 times the MDL be within the specified acceptance limits.

PRECISION: Precision is the agreement among a set of replicate measurements without assumption of knowledge of the true value and is based on RPD calculations between repeated values. Precision of the project data was determined by analysis of replicate MS1/MS2, BS1/BS2, LCS1/LCS2, LCM1/LCM2, CRM1/CRM2, surrogate spikes and/or replicate project sample analysis (R1/R2) on a minimum frequency of one per batch. Physis' QM requires that for 95% of the compounds greater than 10 times the MDL, the percent RPD should be within the specified acceptance range.

BLANK SPIKES: BS is the introduction of a known concentration of analyte into the procedural blank. BS demonstrates performance of the preparation and analytical methods on a clean matrix void of potential matrix related interferences. The BS is performed in laboratory deionized water, making these recoveries a better indicator of the efficiency of the laboratory method per se.

MATRIX SPIKES: MS is the introduction of a known concentration of analyte into a sample. MS samples demonstrate the effect a particular project sample matrix has on the accuracy of a measurement. Individually, MS samples also indicate the bias of analytical measurements due to chemical interferences inherent in the in the specific project sample spiked. Intrinsic target analyte concentration in the specific project sample can also significantly impact MS recovery.

CERTIFIED REFERENCE MATERIALS: CRMs are materials of various matrices for which analytical information has been determined and certified by a recognized authority. These are used to provide a quantitative assessment of the accuracy of an analytical method. CRMs provide evidence that the laboratory preparation and analysis produces results that are comparable to those obtained by an independent organization.

LABORATORY CONTROL MATERIAL: LCM is provided because a suitable natural seawater CRM is not available and can be used to indicate accuracy of the method. Physis' internal LCM is seawater collected at ~800 meters in the Southern California San Pedro Basin and can be used as a reference for background concentrations in clean, natural seawater for comparison to project samples.

LABORATORY CONTROL SPIKES: LCS is the introduction of a known concentration of analyte into Physis' LCM. LCS samples were employed to assess the effect the seawater matrix has on the accuracy of a measurement. LCS also indicate the bias of this method due to chemical interferences inherent in the in the seawater matrix. Intrinsic LCM concentration can also significantly impact LCS recovery.

SURROGATES: A surrogate is a pure analyte unlikely to be found in any project sample, behaves similarly to the target analyte and most often used with organic analytical procedures. Surrogates are added in known concentration to all samples and are measured to indicate overall efficiency of the method including processing and analyses.

HOLDING TIME: Method recommended holding times are the length of time a project sample can be stored under specific conditions after collection and prior to analysis without significantly affecting the analyte's concentration. Holding times can be extended if preservation techniques are employed to reduce biodegradation, volatilization, oxidation, sorption, precipitation, and other physical and chemical processes.

SAMPLE STORAGE/RETENTION: In order to maintain chemical integrity prior to analysis, all samples submitted to Physis are refrigerated (liquids) or frozen (solids) upon receipt unless otherwise recommended by applicable methods. Solid samples are retained for 1 year from collection while liquid samples are retained until method recommended holding times elapse.

TOTAL/DISSOLVED FRACTION: In some instances, the results for the dissolved fraction may be higher than the total fraction for a particular analyte (e.g. trace metals). This is typically caused by the analytical variation for each result and indicates that the target analyte is primarily in the dissolved phase, within the sample.

PHYSIS QUALIFIER CODES

CODE	DEFINITION
#	see Case Narrative
ND	analyte not detected at or above the MDL
B	analyte was detected in the procedural blank greater than 10 times the MDL
E	analyte concentration exceeds the upper limit of the linear calibration range, reported value is estimated
H	sample received and/or analyzed past the recommended holding time
J	analyte was detected at a concentration below the RL and above the MDL, reported value is estimated
N	insufficient sample, analysis could not be performed
M	analyte was outside the specified accuracy and/or precision acceptance limits due to matrix interference. The associated B/BS were within limits, therefore the sample data was reported without further clarification
SH	analyte concentration in the project sample exceeded the spike concentration, therefore accuracy and/or precision acceptance limits do not apply
SL	analyte results were lower than 10 times the MDL, therefore accuracy and/or precision acceptance limits do not apply
NH	project sample was heterogeneous and sample homogeneity could not be readily achieved using routine laboratory practices, therefore accuracy and/or precision acceptance limits do not apply
Q	analyte was outside the specified QAPP acceptance limits for precision and/or accuracy but within Physis derived acceptance limits, therefore the sample data was reported without further clarification
R	Physis' QM allows for 5% of the target compounds greater than 10 times the MDL to be outside the specified acceptance limits for precision and/or accuracy. This is often due to random error and does not indicate any significant problems with the analysis of these project samples

ANALYTICAL REPORT

PHYSIS Project ID: 2302004-029
Client: WSP USA
Project: LECL TMDL Monitoring PO # C014105479

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 117839-R1	**CL07-Int**		**Matrix: Biologic**				**Sampled:**	**17-Apr-24 10:30**		**Received:**	**15-May-24**
Chlorophyll-a	SM 10200 H	mg/m3	8.01	1	1	2	NA		C-82015	30-May-24	30-May-24
Sample ID: 117840-R1	**CL07-Surf**		**Matrix: Biologic**				**Sampled:**	**017-Apr-24 12:52**		**Received:**	**15-May-24**
Chlorophyll-a	SM 10200 H	mg/m3	23.4	1	1	2	NA		C-82015	30-May-24	30-May-24
Sample ID: 117841-R1	**CL08-Int**		**Matrix: Biologic**				**Sampled:**	**17-Apr-24 9:50**		**Received:**	**15-May-24**
Chlorophyll-a	SM 10200 H	mg/m3	8.01	1	1	2	NA		C-82015	30-May-24	30-May-24
Sample ID: 117842-R1	**CL08-Surf**		**Matrix: Biologic**				**Sampled:**	**17-Apr-24 13:03**		**Received:**	**15-May-24**
Chlorophyll-a	SM 10200 H	mg/m3	18.7	1	1	2	NA		C-82015	30-May-24	30-May-24
Sample ID: 117843-R1	**CL09-Int**		**Matrix: Biologic**				**Sampled:**	**17-Apr-24 9:10**		**Received:**	**15-May-24**
Chlorophyll-a	SM 10200 H	mg/m3	2.67	1	1	2	NA		C-82015	30-May-24	30-May-24
Sample ID: 117844-R1	**CL09-Surf**		**Matrix: Biologic**				**Sampled:**	**17-Apr-24 13:30**		**Received:**	**15-May-24**
Chlorophyll-a	SM 10200 H	mg/m3	9.08	1	1	2	NA		C-82015	30-May-24	30-May-24
Sample ID: 117845-R1	**CL10-Int**		**Matrix: Biologic**				**Sampled:**	**17-Apr-24 8:35**		**Received:**	**15-May-24**
Chlorophyll-a	SM 10200 H	mg/m3	80.1	1	1	2	NA		C-82015	30-May-24	30-May-24
Sample ID: 117846-R1	**CL10-Surf**		**Matrix: Biologic**				**Sampled:**	**17-Apr-24 13:48**		**Received:**	**15-May-24**
Chlorophyll-a	SM 10200 H	mg/m3	139	1	1	2	NA		C-82015	30-May-24	30-May-24
Sample ID: 117847-R1	**LE02-Int**		**Matrix: Biologic**				**Sampled:**	**17-Apr-24 9:35**		**Received:**	**15-May-24**
Chlorophyll-a	SM 10200 H	mg/m3	26.7	1	1	2	NA		C-82015	30-May-24	30-May-24
Sample ID: 117848-R1	**LE02-Surf**		**Matrix: Biologic**				**Sampled:**	**17-Apr-24 10:10**		**Received:**	**15-May-24**
Chlorophyll-a	SM 10200 H	mg/m3	85.4	1	1	2	NA		C-82015	30-May-24	30-May-24

QUALITY CONTROL REPORT

PHYSIS Project ID: 2302004-029
Client: WSP USA
Project: LECL TMDL Monitoring PO # C014105479

Conventionals

QUALITY CONTROL REPORT

Chlorophyll-a **Method:** SM 10200 H **Fraction:** NA **Prepared:** 30-May-24 **Analyzed:** 30-May-24

SAMPLE ID	BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS	PRECISION %	PRECISION LIMITS	QA CODE
117838-B1 QAQC Procedural Blank	C-82015	ND	1	1	2	mg/m3							
117838-BS1 QAQC Procedural Blank	C-82015	47000	1	1	2	mg/m3	51900	0	91	70 - 130% PASS			
117838-BS2 QAQC Procedural Blank	C-82015	52300	1	1	2	mg/m3	51900	0	101	70 - 130% PASS	10	30 PASS	

CHAIN OF CUSTODY

Chain of Custody & Sample Information Record

Client: WSP USA E&I Inc.

Contact: John Rudolph

Phone No. 858-243-8158

Project Name: LECL TMDL Monitoring

Email: john.rudolph@wsp.com

Project Number: 2315100200.0004.PHYSIS

PO#: C014105479

GL Code: 57300

Org# 3151

Turn Around Time: Routine *3-5 Day Rush *48 Hour Rush *24 Hour Rush

*Lab TAT Approval: By:

*Additional Charges May Apply

Additional Reporting Requests

Include QC Data Package: ☐ Yes ☐ No

FAX Results: ☐ Yes ☐ No

Email Results: ☐ Yes ☐ No

State EDT: ☐ Yes ☐ No

(Include Source Number in Notes)

Sampler Information

Name: Nick Jernack

Employer: WSP USA

Signature:

Matrix

DW = Drinking Water

WW = Wastewater

GW = Groundwater

S = Soil

SG = Sludge

L = Liquid

M = Miscellaneous

Notes

Chl-a samples on 0.7 um GFF

Sample ID	Date	Time	Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	NaOH/ZnAcetate	NH4Cl	MCAA	Frozen	Total # of Containers	Routine	Resample	Special	Total Sulfide	Nitrate - Nitrite	TDS	TKN	Ammonia	Total Phosphorus	SRP/Ortho-P	Chlorophyll-a	Matrix	Notes
CL07 - Int	4/17/24	1030																						x		Filter Volume: 500
CL07 - Surf		1252																						x		Filter Volume: 400
CL08 - Int		0950																						x		Filter Volume: 500
CL08 - Surf		1303																						x		Filter Volume: 500
CL09 - Int		0910																						x		Filter Volume: 500
CL09 - Surf		1330																						x		Filter Volume: 500
CL10 - Int		0835																						x		Filter Volume: 500
CL10 - Surf		1348																						x		Filter Volume: 500
LE02 - Int		0935																						x		Filter Volume: 500
LE02 - Surf	↓	1010																						x		Filter Volume: 500

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company
	Nick Jernack/WSP	5/8/24 / 1600 S		R. Haskins Physis 5/15/24 9:3

(For Lab Use Only) **Sample Integrity Upon Receipt**

Sample(s) Submitted on Ice? Yes No

Custody Seal(s) Intact? Yes No N/A

Sample(s) Intact? Yes No

Temperature °C

☐ Cooler Blank

Lab Notes

Lab No. ______

Page 1 of 1

PHYSIS
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS
ENVIRONMENTAL LABORATORIES, INC.

Project Iteration ID: 2302004-029
Client Name: WSP USA
Project Name: LECL TMDL Monitoring PO # C014105479
COC Page Number: 2 of 2
Bottle Label Color: NA

Sample Receipt Summary

Receiving Info

1. Initials Received By: BH
2. Date Received: 5/15/2024
3. Time Received: 9:30
4. Client Name: WSP
5. Courier Information: (Please circle)
   - Client
   - [✓ FedEx]
   - PHYSIS Driver:
     - i. Start Time: ____
     - ii. End Time: ____
     - iii. Total Mileage: ____
     - iv. Number of Pickups: ____
   - UPS
   - GSO/GLS
   - Area Fast
   - Ontrac
   - DRS
   - PAMS
6. Container Information: (Please put the # of containers or circle none)
   - 1 Cooler
   - __ Carboy(s)
   - __ Styrofoam Cooler
   - __ Carboy Trash Can(s)
   - ____ Boxes
   - ____ Carboy Cap(s)
   - None
   - Other ____
7. What type of ice was used: (Please circle any that apply)
   - Wet Ice
   - Blue Ice
   - Dry Ice
   - Water
   - [✓ None]
8. Randomly Selected Samples Temperature (°C): 17.1 Used I/R Thermometer # ____

Inspection Info

1. Initials Inspected By: CR

Sample Integrity Upon Receipt:

1. COC(s) included and completely filled out.......... [✓ Yes] / No
2. All sample containers arrived intact.......... [✓ Yes] / No
3. All samples listed on COC(s) are present.......... [✓ Yes] / No
4. Information on containers consistent with information on COC(s).......... [✓ Yes] / No
5. Correct containers and volume for all analyses indicated.......... [✓ Yes] / No
6. All samples received within method holding time.......... [✓ Yes] / No
7. Correct preservation used for all analyses indicated.......... [✓ Yes] / No
8. Name of sampler included on COC(s).......... [✓ Yes] / No

Notes:

WECK LABORATORIES, INC.

Certificate of Analysis

FINAL REPORT

Work Orders: 4E22007

Project: 2315100200.0004.WECK

Attn: John Rudolph

Client: WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Report Date: 6/26/2024

Received Date: 6/5/2024

Turnaround Time: Normal

Phones: (858) 514-6465

Fax: (858) 278-5300

P.O. #: C016900152, Project No.

Billing Code: 2315100200.0004.WECK

DoD-ELAP ANAB #ADE-2882 • DoD-ISO ANAB # • ELAP-CA #1132 • EPA-UCMR #CA00211 • ISO17025 ANAB #L2457.01 • LACSD #10143 • NELAP-OR #4047 • NJ-DEP #CA015 • NV-DEP #NAC 445A • SCAQMD #93LA1006

This is a complete final report. The information in this report applies to the samples analyzed in accordance with the chain-of-custody document. Weck Laboratories certifies that the test results meet all requirements of TNI unless noted by qualifiers or written in the Case Narrative. The report may include analytes that are not currently accreditable by some state agencies or accrediting bodies. This analytical report must be reproduced in its entirety.

Dear John Rudolph,

Enclosed are the results of analyses for samples received 6/05/24 with the Chain-of-Custody document. The samples were received in good condition, at 2.0 °C and on ice. All analyses met the method criteria except as noted in the case narrative or in the report with data qualifiers.

Reviewed by:

Kenneth Oda

Kenneth C. Oda For Kim G. Tu
Project Manager

WSP USA E&I Inc. - San Diego
9177 Sky Park Court, Ste A
San Diego, CA 92123

Project Number: 2315100200.0004.WECK

Project Manager: John Rudolph

Reported:
06/26/2024 09:01

Sample Summary

Sample Name	Sampled By	Lab ID	Matrix	Sampled	Qualifiers
CL07	Nick Jernack	4E22007-01	Water	06/05/24 09:45	
CL08	Nick Jernack	4E22007-02	Water	06/05/24 09:15	
CL09	Nick Jernack	4E22007-03	Water	06/05/24 08:30	
CL10	Nick Jernack	4E22007-04	Water	06/05/24 08:00	
LE02	Nick Jernack	4E22007-05	Water	06/05/24 09:25	

Sample Results

Sample: CL07

Sampled: 06/05/24 9:45 by Nick Jernack

4E22007-01 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W4F0645 **Preparation:** _NONE (WETCHEM)			**Prepared:** 06/09/24 11:27				**Analyst:** YMT
Ammonia as N	**1.3**	0.017	0.10	mg/l	1	06/10/24	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W4F1527 **Preparation:** _NONE (WETCHEM)			**Prepared:** 06/19/24 11:28				**Analyst:** YMT
TKN	**2.0**	0.065	0.10	mg/l	1	06/20/24	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W4F0473 **Preparation:** _NONE (WETCHEM)			**Prepared:** 06/06/24 10:21				**Analyst:** kac
Nitrate as N	ND	0.040	0.20	mg/l	1	06/06/24 16:09	FILT
Nitrite as N	ND	0.042	0.10	mg/l	1	06/06/24 16:15	FILT
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W4F0482 **Preparation:** _NONE (WETCHEM)			**Prepared:** 06/06/24 11:39				**Analyst:** rob
o-Phosphate as P	**0.29**	0.0071	0.010	mg/l	1	06/06/24 14:22	
Method: EPA 365.3			**Instr:** UVVIS05				
Batch ID: W4F0966 **Preparation:** _NONE (WETCHEM)			**Prepared:** 06/12/24 13:47				**Analyst:** rob
Phosphorus as P, Total	**0.32**	0.0067	0.010	mg/l	1	06/17/24	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W4F0612 **Preparation:** _NONE (WETCHEM)			**Prepared:** 06/07/24 12:21				**Analyst:** bel
Total Dissolved Solids	**370**	4.0	10	mg/l	1	06/07/24	
Method: SM 2540D			**Instr:** OVEN18				
Batch ID: W4F0585 **Preparation:** _NONE (WETCHEM)			**Prepared:** 06/07/24 09:28				**Analyst:** dig
Total Suspended Solids	ND	5	5	mg/l	1	06/07/24	
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W4F0510 **Preparation:** _NONE (WETCHEM)			**Prepared:** 06/06/24 13:16				**Analyst:** mes
Sulfide, Total	**0.40**	0.050	0.10	mg/l	1	06/06/24	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W4F0686 **Preparation:** EPA 200.2			**Prepared:** 06/10/24 11:28				**Analyst:** kvm
Aluminum, Dissolved	**0.078**	0.041	0.050	mg/l	1	06/13/24	
Aluminum, Total	**0.077**	0.022	0.050	mg/l	1	06/13/24	

Sample Results

(Continued)

Sample: CL08

Sampled: 06/05/24 9:15 by Nick Jernack

4E22007-02 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1 **Instr:** AA06							
Batch ID: W4F0645 **Preparation:** _NONE (WETCHEM) **Prepared:** 06/09/24 11:27 **Analyst:** YMT							
Ammonia as N	**0.72**	0.017	0.10	mg/l	1	06/10/24	
Method: EPA 351.2 **Instr:** AA06							
Batch ID: W4F1527 **Preparation:** _NONE (WETCHEM) **Prepared:** 06/19/24 11:28 **Analyst:** YMT							
TKN	**1.4**	0.065	0.10	mg/l	1	06/20/24	
Method: EPA 353.2 **Instr:** AA01							
Batch ID: W4F0473 **Preparation:** _NONE (WETCHEM) **Prepared:** 06/06/24 10:21 **Analyst:** kac							
Nitrate as N	ND	0.040	0.20	mg/l	1	06/06/24 16:16	FILT
Nitrite as N	ND	0.042	0.10	mg/l	1	06/06/24 16:16	FILT
Method: EPA 365.3 **Instr:** UVVIS04							
Batch ID: W4F0482 **Preparation:** _NONE (WETCHEM) **Prepared:** 06/06/24 11:39 **Analyst:** rob							
o-Phosphate as P	**0.21**	0.0071	0.010	mg/l	1	06/06/24 14:23	
Method: EPA 365.3 **Instr:** UVVIS05							
Batch ID: W4F0966 **Preparation:** _NONE (WETCHEM) **Prepared:** 06/12/24 13:47 **Analyst:** rob							
Phosphorus as P, Total	**0.25**	0.0067	0.010	mg/l	1	06/17/24	
Method: SM 2540C **Instr:** OVEN17							
Batch ID: W4F0612 **Preparation:** _NONE (WETCHEM) **Prepared:** 06/07/24 12:21 **Analyst:** bel							
Total Dissolved Solids	**370**	4.0	10	mg/l	1	06/07/24	
Method: SM 2540D **Instr:** OVEN18							
Batch ID: W4F0585 **Preparation:** _NONE (WETCHEM) **Prepared:** 06/07/24 09:28 **Analyst:** dig							
Total Suspended Solids	**6**	5	5	mg/l	1	06/07/24	
Method: SM 4500S2-D **Instr:** _ANALYST							
Batch ID: W4F0510 **Preparation:** _NONE (WETCHEM) **Prepared:** 06/06/24 13:16 **Analyst:** mes							
Sulfide, Total	**0.40**	0.050	0.10	mg/l	1	06/06/24	
Metals by EPA 200 Series Methods							
Method: EPA 200.7 **Instr:** ICP03							
Batch ID: W4F0686 **Preparation:** EPA 200.2 **Prepared:** 06/10/24 11:28 **Analyst:** kvm							
Aluminum, Dissolved	**0.11**	0.041	0.050	mg/l	1	06/13/24	
Aluminum, Total	**0.13**	0.022	0.050	mg/l	1	06/13/24	

Sample Results

(Continued)

Sample: CL09 Sampled: 06/05/24 8:30 by Nick Jernack

4E22007-03 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W4F0645	**Preparation:** _NONE (WETCHEM)		**Prepared:** 06/09/24 11:27				**Analyst:** YMT
Ammonia as N	**1.6**	0.017	0.10	mg/l	1	06/10/24	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W4F1527	**Preparation:** _NONE (WETCHEM)		**Prepared:** 06/19/24 11:28				**Analyst:** YMT
TKN	**2.5**	0.065	0.10	mg/l	1	06/20/24	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W4F0473	**Preparation:** _NONE (WETCHEM)		**Prepared:** 06/06/24 10:21				**Analyst:** kac
Nitrate as N	ND	0.040	0.20	mg/l	1	06/06/24 16:22	FILT
Nitrite as N	ND	0.042	0.10	mg/l	1	06/06/24 16:22	FILT
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W4F0482	**Preparation:** _NONE (WETCHEM)		**Prepared:** 06/06/24 11:39				**Analyst:** rob
o-Phosphate as P	**0.20**	0.0071	0.010	mg/l	1	06/06/24 14:23	
Method: EPA 365.3			**Instr:** UVVIS05				
Batch ID: W4F0966	**Preparation:** _NONE (WETCHEM)		**Prepared:** 06/12/24 13:47				**Analyst:** rob
Phosphorus as P, Total	**0.26**	0.0067	0.010	mg/l	1	06/17/24	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W4F0612	**Preparation:** _NONE (WETCHEM)		**Prepared:** 06/07/24 12:21				**Analyst:** bel
Total Dissolved Solids	**530**	4.0	10	mg/l	1	06/07/24	
Method: SM 2540D			**Instr:** OVEN18				
Batch ID: W4F0585	**Preparation:** _NONE (WETCHEM)		**Prepared:** 06/07/24 09:28				**Analyst:** dig
Total Suspended Solids	**6**	5	5	mg/l	1	06/07/24	
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W4F0510	**Preparation:** _NONE (WETCHEM)		**Prepared:** 06/06/24 13:16				**Analyst:** mes
Sulfide, Total	**0.60**	0.050	0.10	mg/l	1	06/06/24	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W4F0686	**Preparation:** EPA 200.2		**Prepared:** 06/10/24 11:28				**Analyst:** kvm
Aluminum, Dissolved	**0.13**	0.041	0.050	mg/l	1	06/13/24	
Aluminum, Total	**0.15**	0.022	0.050	mg/l	1	06/13/24	

Sample Results

(Continued)

Sample: CL10

Sampled: 06/05/24 8:00 by Nick Jernack

4E22007-04 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W4F0645 **Preparation:** _NONE (WETCHEM)			**Prepared:** 06/09/24 11:27				**Analyst:** YMT
Ammonia as N	ND	0.017	0.10	mg/l	1	06/10/24	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W4F1527 **Preparation:** _NONE (WETCHEM)			**Prepared:** 06/19/24 11:28				**Analyst:** YMT
TKN	**0.87**	0.065	0.10	mg/l	1	06/20/24	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W4F0473 **Preparation:** _NONE (WETCHEM)			**Prepared:** 06/06/24 10:21				**Analyst:** kac
Nitrate as N	ND	0.040	0.20	mg/l	1	06/06/24 16:23	FILT
Nitrite as N	ND	0.042	0.10	mg/l	1	06/06/24 16:23	FILT
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W4F0482 **Preparation:** _NONE (WETCHEM)			**Prepared:** 06/06/24 11:39				**Analyst:** rob
o-Phosphate as P	**0.0090**	0.0071	0.010	mg/l	1	06/06/24 14:24	J
Method: EPA 365.3			**Instr:** UVVIS05				
Batch ID: W4F0966 **Preparation:** _NONE (WETCHEM)			**Prepared:** 06/12/24 13:47				**Analyst:** rob
Phosphorus as P, Total	**0.064**	0.0067	0.010	mg/l	1	06/17/24	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W4F0612 **Preparation:** _NONE (WETCHEM)			**Prepared:** 06/07/24 12:21				**Analyst:** bel
Total Dissolved Solids	**560**	4.0	10	mg/l	1	06/07/24	
Method: SM 2540D			**Instr:** OVEN18				
Batch ID: W4F0508 **Preparation:** _NONE (WETCHEM)			**Prepared:** 06/06/24 12:46				**Analyst:** dig
Total Suspended Solids	**6**	5	5	mg/l	1	06/06/24	
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W4F0510 **Preparation:** _NONE (WETCHEM)			**Prepared:** 06/06/24 13:16				**Analyst:** mes
Sulfide, Total	ND	0.050	0.10	mg/l	1	06/06/24	
Metals by EPA 200 Series Methods							
Method: EPA 200.7			**Instr:** ICP03				
Batch ID: W4F0686 **Preparation:** EPA 200.2			**Prepared:** 06/10/24 11:28				**Analyst:** kvm
Aluminum, Dissolved	**0.24**	0.041	0.050	mg/l	1	06/13/24	
Aluminum, Total	**0.24**	0.022	0.050	mg/l	1	06/13/24	

Sample Results

(Continued)

Sample: LE02 Sampled: 06/05/24 9:25 by Nick Jernack

4E22007-05 (Water)

Analyte	Result	MDL	MRL	Units	Dil	Analyzed	Qualifier
Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods							
Method: EPA 350.1			**Instr:** AA06				
Batch ID: W4F0645	**Preparation:** _NONE (WETCHEM)		**Prepared:** 06/09/24 11:27				**Analyst:** YMT
Ammonia as N	**0.26**	0.017	0.10	mg/l	1	06/10/24	
Method: EPA 351.2			**Instr:** AA06				
Batch ID: W4F1527	**Preparation:** _NONE (WETCHEM)		**Prepared:** 06/19/24 11:28				**Analyst:** YMT
TKN	**2.2**	0.065	0.10	mg/l	1	06/20/24	
Method: EPA 353.2			**Instr:** AA01				
Batch ID: W4F0473	**Preparation:** _NONE (WETCHEM)		**Prepared:** 06/06/24 10:21				**Analyst:** kac
Nitrate as N	**0.057**	0.040	0.20	mg/l	1	06/06/24 16:24	FILT, J
Nitrite as N	**0.050**	0.042	0.10	mg/l	1	06/06/24 16:24	FILT, J
Method: EPA 365.3			**Instr:** UVVIS04				
Batch ID: W4F0482	**Preparation:** _NONE (WETCHEM)		**Prepared:** 06/06/24 11:39				**Analyst:** rob
o-Phosphate as P	**0.094**	0.0071	0.010	mg/l	1	06/06/24 14:24	
Method: EPA 365.3			**Instr:** UVVIS05				
Batch ID: W4F0966	**Preparation:** _NONE (WETCHEM)		**Prepared:** 06/12/24 13:47				**Analyst:** rob
Phosphorus as P, Total	**0.19**	0.0067	0.010	mg/l	1	06/17/24	
Method: SM 2540C			**Instr:** OVEN17				
Batch ID: W4F0612	**Preparation:** _NONE (WETCHEM)		**Prepared:** 06/07/24 12:21				**Analyst:** bel
Total Dissolved Solids	**1500**	4.0	10	mg/l	1	06/07/24	
Method: SM 4500S2-D			**Instr:** _ANALYST				
Batch ID: W4F0510	**Preparation:** _NONE (WETCHEM)		**Prepared:** 06/06/24 13:16				**Analyst:** mes
Sulfide, Total	ND	0.050	0.10	mg/l	1	06/06/24	

Quality Control Results

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4F0473 - EPA 353.2											
Blank (W4F0473-BLK1)				**Prepared & Analyzed: 06/06/24**							
Nitrate as N	ND	0.040	0.20	mg/l							
Nitrite as N	ND	0.042	0.10	mg/l							
Blank (W4F0473-BLK2)				**Prepared & Analyzed: 06/06/24**							
Nitrate as N	ND	0.040	0.20	mg/l							
Nitrite as N	ND	0.042	0.10	mg/l							
LCS (W4F0473-BS1)				**Prepared & Analyzed: 06/06/24**							
Nitrate as N	0.990	0.040	0.20	mg/l	1.00		99	90-110			
Nitrite as N	0.927	0.042	0.10	mg/l	1.00		93	90-110			
LCS (W4F0473-BS2)				**Prepared & Analyzed: 06/06/24**							
Nitrate as N	1.00	0.040	0.20	mg/l	1.00		100	90-110			
Nitrite as N	1.01	0.042	0.10	mg/l	1.00		101	90-110			
Matrix Spike (W4F0473-MS1)	**Source: 4E22007-01**			**Prepared & Analyzed: 06/06/24**							
Nitrate as N	1.94	0.040	0.20	mg/l	2.00	ND	97	90-110			
Nitrite as N	1.02	0.042	0.10	mg/l	1.00	ND	102	90-110			
Matrix Spike (W4F0473-MS2)	**Source: 4E22007-02**			**Prepared & Analyzed: 06/06/24**							
Nitrate as N	2.12	0.040	0.20	mg/l	2.00	ND	106	90-110			
Nitrite as N	1.03	0.042	0.10	mg/l	1.00	ND	103	90-110			
Matrix Spike Dup (W4F0473-MSD1)	**Source: 4E22007-01**			**Prepared & Analyzed: 06/06/24**							
Nitrate as N	1.94	0.040	0.20	mg/l	2.00	ND	97	90-110	0	20	
Nitrite as N	1.01	0.042	0.10	mg/l	1.00	ND	101	90-110	1	20	
Matrix Spike Dup (W4F0473-MSD2)	**Source: 4E22007-02**			**Prepared & Analyzed: 06/06/24**							
Nitrate as N	2.13	0.040	0.20	mg/l	2.00	ND	106	90-110	0.5	20	
Nitrite as N	1.04	0.042	0.10	mg/l	1.00	ND	104	90-110	1	20	
Batch: W4F0482 - EPA 365.3											
Blank (W4F0482-BLK1)				**Prepared & Analyzed: 06/06/24**							
o-Phosphate as P	ND	0.0071	0.010	mg/l							
LCS (W4F0482-BS1)				**Prepared & Analyzed: 06/06/24**							
o-Phosphate as P	0.205	0.0071	0.010	mg/l	0.200		102	88-111			
Matrix Spike (W4F0482-MS1)	**Source: 4F05108-04**			**Prepared & Analyzed: 06/06/24**							
o-Phosphate as P	0.212	0.0071	0.010	mg/l	0.200	0.00800	102	85-112			
Matrix Spike Dup (W4F0482-MSD1)	**Source: 4F05108-04**			**Prepared & Analyzed: 06/06/24**							
o-Phosphate as P	0.215	0.0071	0.010	mg/l	0.200	0.00800	104	85-112	1	20	
Batch: W4F0508 - SM 2540D											
Blank (W4F0508-BLK1)				**Prepared & Analyzed: 06/06/24**							
Total Suspended Solids	ND	5	5	mg/l							
LCS (W4F0508-BS1)				**Prepared & Analyzed: 06/06/24**							
Total Suspended Solids	62.7	5	5	mg/l	58.3		108	90-110			

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4F0508 - SM 2540D (Continued)											
Duplicate (W4F0508-DUP1)	**Source: 4F05085-01**			**Prepared & Analyzed: 06/06/24**							
Total Suspended Solids	750	5	5	mg/l		725			3	10	
Batch: W4F0510 - SM 4500S2-D											
Blank (W4F0510-BLK1)				**Prepared & Analyzed: 06/06/24**							
Sulfide, Total	ND	0.050	0.10	mg/l							
LCS (W4F0510-BS1)				**Prepared & Analyzed: 06/06/24**							
Sulfide, Total	0.100	0.050	0.10	mg/l	0.0998		100	90-110			
Duplicate (W4F0510-DUP1)	**Source: 4E22007-01**			**Prepared & Analyzed: 06/06/24**							
Sulfide, Total	0.400	0.050	0.10	mg/l		0.400			0	20	
Matrix Spike (W4F0510-MS1)	**Source: 4E22007-04**			**Prepared & Analyzed: 06/06/24**							
Sulfide, Total	0.200	0.050	0.10	mg/l	0.200	ND	100	80-120			
Matrix Spike Dup (W4F0510-MSD1)	**Source: 4E22007-04**			**Prepared & Analyzed: 06/06/24**							
Sulfide, Total	0.200	0.050	0.10	mg/l	0.200	ND	100	80-120	0	20	
Batch: W4F0585 - SM 2540D											
Blank (W4F0585-BLK1)				**Prepared & Analyzed: 06/07/24**							
Total Suspended Solids	ND	5	5	mg/l							
LCS (W4F0585-BS1)				**Prepared & Analyzed: 06/07/24**							
Total Suspended Solids	55.6	5	5	mg/l	54.2		103	90-110			
Duplicate (W4F0585-DUP1)	**Source: 4F06042-03**			**Prepared & Analyzed: 06/07/24**							
Total Suspended Solids	276	5	5	mg/l		260			6	10	
Batch: W4F0612 - SM 2540C											
Blank (W4F0612-BLK1)				**Prepared & Analyzed: 06/07/24**							
Total Dissolved Solids	ND	4.0	10	mg/l							
LCS (W4F0612-BS1)				**Prepared & Analyzed: 06/07/24**							
Total Dissolved Solids	51.0	4.0	10	mg/l	50.0		102	97-103			
Duplicate (W4F0612-DUP1)	**Source: 4E22007-05**			**Prepared & Analyzed: 06/07/24**							
Total Dissolved Solids	1510	4.0	10	mg/l		1490			2	10	
Batch: W4F0645 - EPA 350.1											
Blank (W4F0645-BLK1)				**Prepared: 06/09/24 Analyzed: 06/10/24**							
Ammonia as N	ND	0.017	0.10	mg/l							
Blank (W4F0645-BLK2)				**Prepared: 06/09/24 Analyzed: 06/10/24**							
Ammonia as N	ND	0.017	0.10	mg/l							
LCS (W4F0645-BS1)				**Prepared: 06/09/24 Analyzed: 06/10/24**							
Ammonia as N	0.250	0.017	0.10	mg/l	0.250		100	90-110			
LCS (W4F0645-BS2)				**Prepared: 06/09/24 Analyzed: 06/10/24**							
Ammonia as N	0.253	0.017	0.10	mg/l	0.250		101	90-110			
Matrix Spike (W4F0645-MS1)	**Source: 4F06066-02**			**Prepared: 06/09/24 Analyzed: 06/10/24**							
Ammonia as N	0.253	0.017	0.10	mg/l	0.250	0.0171	94	90-110			

Quality Control Results

(Continued)

Conventional Chemistry/Physical Parameters by APHA/EPA/ASTM Methods (Continued)

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4F0645 - EPA 350.1 (Continued)											
Matrix Spike (W4F0645-MS2)	**Source: 4F07068-02**			**Prepared: 06/09/24**		**Analyzed: 06/10/24**					
Ammonia as N	0.341	0.017	0.10	mg/l	0.250	0.0982	97	90-110			
Matrix Spike Dup (W4F0645-MSD1)	**Source: 4F06066-02**			**Prepared: 06/09/24**		**Analyzed: 06/10/24**					
Ammonia as N	0.254	0.017	0.10	mg/l	0.250	0.0171	95	90-110	0.7	15	
Matrix Spike Dup (W4F0645-MSD2)	**Source: 4F07068-02**			**Prepared: 06/09/24**		**Analyzed: 06/10/24**					
Ammonia as N	0.342	0.017	0.10	mg/l	0.250	0.0982	98	90-110	0.4	15	
Batch: W4F0966 - EPA 365.3											
Blank (W4F0966-BLK1)				**Prepared: 06/12/24**		**Analyzed: 06/17/24**					
Phosphorus as P, Total	ND	0.0067	0.010	mg/l							
LCS (W4F0966-BS1)				**Prepared: 06/12/24**		**Analyzed: 06/17/24**					
Phosphorus as P, Total	0.188	0.0067	0.010	mg/l	0.200		94	90-110			
Matrix Spike (W4F0966-MS1)	**Source: 4F04089-02**			**Prepared: 06/12/24**		**Analyzed: 06/17/24**					
Phosphorus as P, Total	0.456	0.0067	0.010	mg/l	0.200	0.263	96	90-110			
Matrix Spike Dup (W4F0966-MSD1)	**Source: 4F04089-02**			**Prepared: 06/12/24**		**Analyzed: 06/17/24**					
Phosphorus as P, Total	0.460	0.0067	0.010	mg/l	0.200	0.263	98	90-110	0.9	20	
Batch: W4F1527 - EPA 351.2											
Blank (W4F1527-BLK1)				**Prepared: 06/19/24**		**Analyzed: 06/20/24**					
TKN	ND	0.065	0.10	mg/l							
Blank (W4F1527-BLK2)				**Prepared: 06/19/24**		**Analyzed: 06/20/24**					
TKN	ND	0.065	0.10	mg/l							
LCS (W4F1527-BS1)				**Prepared: 06/19/24**		**Analyzed: 06/20/24**					
TKN	0.954	0.065	0.10	mg/l	1.00		95	90-110			
LCS (W4F1527-BS2)				**Prepared: 06/19/24**		**Analyzed: 06/20/24**					
TKN	0.950	0.065	0.10	mg/l	1.00		95	90-110			
Duplicate (W4F1527-DUP1)	**Source: 4F06048-01**			**Prepared: 06/19/24**		**Analyzed: 06/20/24**					
TKN	0.133	0.065	0.10	mg/l		0.134			0.5	10	
Matrix Spike (W4F1527-MS1)	**Source: 4F05108-04**			**Prepared: 06/19/24**		**Analyzed: 06/20/24**					
TKN	1.14	0.065	0.10	mg/l	1.00	0.164	98	90-110			
Matrix Spike (W4F1527-MS2)	**Source: 4F12111-01**			**Prepared: 06/19/24**		**Analyzed: 06/20/24**					
TKN	4.80	0.13	0.20	mg/l	2.00	2.75	102	90-110			
Matrix Spike Dup (W4F1527-MSD1)	**Source: 4F05108-04**			**Prepared: 06/19/24**		**Analyzed: 06/20/24**					
TKN	1.07	0.065	0.10	mg/l	1.00	0.164	91	90-110	6	10	
Matrix Spike Dup (W4F1527-MSD2)	**Source: 4F12111-01**			**Prepared: 06/19/24**		**Analyzed: 06/20/24**					
TKN	4.67	0.13	0.20	mg/l	2.00	2.75	96	90-110	3	10	

Quality Control Results
(Continued)

Metals by EPA 200 Series Methods

Analyte	Result	MDL	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qualifier
Batch: W4F0686 - EPA 200.7											
Blank (W4F0686-BLK1)				**Prepared: 06/10/24**	**Analyzed: 06/13/24**						
Aluminum, Dissolved	ND	0.041	0.050	mg/l							
Aluminum, Total	ND	0.022	0.050	mg/l							
LCS (W4F0686-BS1)				**Prepared: 06/10/24**	**Analyzed: 06/13/24**						
Aluminum, Dissolved	0.219	0.041	0.050	mg/l	0.200		109	85-115			
Aluminum, Total	0.219	0.022	0.050	mg/l	0.200		109	85-115			
Duplicate (W4F0686-DUP1)	**Source: 4F04064-01**			**Prepared: 06/10/24**	**Analyzed: 06/13/24**						
Aluminum, Dissolved	2.39	0.041	0.050	mg/l		2.36			2	30	
Aluminum, Total	2.39	0.022	0.050	mg/l		2.36			2	30	
Matrix Spike (W4F0686-MS1)	**Source: 4E22007-01**			**Prepared: 06/10/24**	**Analyzed: 06/13/24**						
Aluminum, Dissolved	0.312	0.041	0.050	mg/l	0.200	0.0779	117	70-130			
Aluminum, Total	0.312	0.022	0.050	mg/l	0.200	0.0768	118	70-130			
Matrix Spike Dup (W4F0686-MSD1)	**Source: 4E22007-01**			**Prepared: 06/10/24**	**Analyzed: 06/13/24**						
Aluminum, Dissolved	0.316	0.041	0.050	mg/l	0.200	0.0779	119	70-130	1	30	
Aluminum, Total	0.316	0.022	0.050	mg/l	0.200	0.0768	120	70-130	1	30	

Notes and Definitions

Item	Definition
FILT	The sample was filtered prior to analysis.
J	Estimated conc. detected <MRL and >MDL.
%REC	Percent Recovery
Dil	Dilution
MDL	Method Detection Limit
MRL	Method Reporting Limit (MRL) is the minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be reported with a specified degree of confidence. The MRL is also known as Limit of Quantitation (LOQ)
ND	NOT DETECTED at or above the Method Reporting Limit (MRL). If Method Detection Limit (MDL) is reported, then ND means not detected at or above the MDL.
RPD	Relative Percent Difference
Source	Sample that was matrix spiked or duplicated.

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

All results are expressed on wet weight basis unless otherwise specified.

All samples collected by Weck Laboratories have been sampled in accordance to laboratory SOP Number MIS002.

Chain of Custody & Sample Information Record

4E22007

Client: WSP USA E&I Inc. **Contact:** John Rudolph **Phone No.** 858-243-8158

Project Name: LECL TMDL Monitoring
Email: john.rudolph@woodplc.com
Project Number: 2315100200.0004.WECK
PO#: C016900152
GL Code: 573000
Org# 3151

Turn Around Time: Routine *3-5 Day Rush *48 Hour Rush *24 Hour Rush
Lab TAT Approval: By:
*Additional Charges May Apply

Additional Reporting Requests
Include QC Data Package: ☐ Yes ☐ No
FAX Results: ☐ Yes ☐ No
Email Results: ☐ Yes ☐ No
State EDT: ☐ Yes ☐ No
(Include Source Number in Notes)

Sampler Information
Name: Nick Jernack
Employer: WSP USA E&I Inc.
Signature:

Matrix
DW = Drinking Water
WW = Wastewater
GW = Groundwater
S = Soil
SG = Sludge
L = Liquid
M = Miscellaneous

Notes
Ortho-P is field filtered (0.45 um)
Dissolved Al is field filtered (0.45 um)

			# of Containers & Preservatives											Total # of Containers	Sample Type			Analysis Requested										Matrix	Notes
Sample ID	Date	Time	Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	NaOH/ZnAcetate	NH4Cl	MCAA	Frozen			Routine	Resample	Special	TSS	Nitrate - Nitrite (EPA 353.2)	TDS (SM2540 C)	TKN (EPA 351.2	Ammonia (EPA 350.1)	Total Phosphorus (EPA 365.3)	SRP/Ortho-P (EPA 365.3)	Total Sulfide (SM4500S)	Total AL (EPA 200.7)	Dissolved AL (EPA 200.7)		
CL07	6/5/24	0945																x	x	x	x	x	x	x	x	x	x		
CL08		0915																x	x	x	x	x	x	x	x	x	x		
CL09		0830																x	x	x	x	x	x	x	x	x	x		
CL10		0800																x	x	x	x	x	x	x	x	x	x		
LE02		0925																	x	x	x	x	x	x	x				

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company
	Nick Jernack / WSP	6/5/24 - 1345	C. Dom / Weck/RMS	Carla Dominguez Weck/RMS
C. Do	Carla Dominguez / Weck/RMS	6/5/24 - 4:05	06/05/24 1605	

(For Lab Use Only) **Sample Integrity Upon Receipt**

Sample(s) Submitted on Ice? [✓ Yes] No
Custody Seal(s) Intact? Yes [✓ No] N/A
Sample(s) Intact? [✓ Yes] No

Temperature 2.0 °C
☐ Cooler Blank

Lab Notes
T-0281

Lab No.

Page 1 of 1

JG 6/6/24

WECK LABORATORIES, INC.

Sample Receipt Checklist

Weck WKO: **4E22007**
WKO Logged by: Jaime Gomez
Samples Checked by: Jaime Gomez

Date/Time Received: 06/05/24 16:05
# of Samples: 05
Delivered by: Matt Navarro

	Task	Yes	No	N/A	Comments
COC	COC present at receipt?	☒	☐		
	COC properly completed?	☒	☐		
	COC matches sample labels?	☒	☐		
	Project Manager notified about COC discrepancy?	☐	☐	☒	
Receipt Information	Sample Temperature	2.0 °C			
	Samples received on ice?	☒	☐		
	Ice Type (Blue/Wet)				
	All samples intact?	☒	☐		
	Samples in proper containers?	☒	☐		
	Sufficient sample volume?	☒	☐		
	Samples intact?	☒	☐		
	Received within holding time?	☒	☐		
	Project Manager notified about receipt info?	☐	☒	☐	
Sample Preservation Verification?	Sample labels checked for correct preservation?	☒	☐	☐	
	VOC Headspace: (No) none, If Yes (see comment) 524.2, 524.3, 624.1, 8260, 1666 P/T, LUFT	☐	☐	☒	☐<6mm/Pea Size?
	pH verified upon receipt? Metals <2; H2SO4 pres tests <2; 522<4; TOC <2; 508.1, 525.2<2, 6710B<2, 608.3 5-9	☒	☐	☐	pH paper Lot# 310689
	Free Chlorine Tested <0.1 (Organics Analyses)	☐	☒	☐	Cl Test Strip Lot#
	O&G pH <2 verified?	☐	☐	☐	pH paper Lot# pH Reading:
	pH adjusted for O&G	☐	☐	☐	Acid Lot# Amt added:
	Project Manager notified about sample preservation?	☐	☐	☐	

PM Comments

Sample Receipt Checklist Completed by:
Signature: Jaime Gomez
Date: 06/06/24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

July 08, 2024

John D. Rudolph
WSP USA
9177 Sky Park Court
San Diego, CA 92123-

Project Name: LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO #
Physis Project ID: 2302004-032
C014103479 GL Code 57300 Org 3151

Dear John,

Enclosed are the analytical results for samples submitted to PHYSIS Environmental Laboratories, Inc. (PHYSIS) on 6/7/2024. A total of 10 samples were received for analysis in accordance with the attached chain of custody (COC). Per the COC, the samples were analyzed for:

Conventionals
Chlorophyll-a (mg/m3) by SM 10200 H

Analytical results in this report apply only to samples submitted to PHYSIS in accordance with the COC and are intended to be considered in their entirety.

Please feel free to contact me at any time with any questions. PHYSIS appreciates the opportunity to provide you with our analytical and support services.

Regards,
misty mercier
Misty Mercier
714 602-5320
Extension 202
mistymercier@physislabs.com

PROJECT SAMPLE LIST

WSP USA PHYSIS Project ID: 2302004-032

LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C014105479 Total Samples: 10

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
118794	CL07 - Int		6/5/2024	9:45	Biologic	Not Specified
118795	CL07 - Surf		6/5/2024	10:00	Biologic	Not Specified
118796	CL08 - Int		6/5/2024	9:15	Biologic	Not Specified
118797	CL08 - Surf		6/5/2024	9:25	Biologic	Not Specified
118798	CL09 - Int		6/5/2024	8:30	Biologic	Not Specified
118799	CL09 - Surf		6/5/2024	8:40	Biologic	Not Specified
118800	CL10 - Int		6/5/2024	8:00	Biologic	Not Specified
118801	CL10 - Surf		6/5/2024	8:10	Biologic	Not Specified
118802	LE02 - Int		6/5/2024	9:25	Biologic	Not Specified
118803	LE02 - Surf		6/5/2024	9:55	Biologic	Not Specified

ABBREVIATIONS and ACRONYMS

QM	Quality Manual
QA	Quality Assurance
QC	Quality Control
MDL	method detection limit
RL	reporting limit
R1	project sample
R2	project sample replicate
MS1	matrix spike
MS2	matrix spike replicate
B1	procedural blank
B2	procedural blank replicate
BS1	blank spike
BS2	blank spike replicate
LCS1	laboratory control spike
LCS2	laboratory control spike replicate
LCM1	laboratory control material
LCM2	laboratory control material replicate
CRM1	certified reference material
CRM2	certified reference material replicate
RPD	relative percent difference
LMW	low molecular weight
HMW	high molecular weight

QUALITY ASSURANCE SUMMARY

LABORATORY BATCH: Physis' QM defines a laboratory batch as a group of 20 or fewer project samples of similar matrix, processed together under the same conditions and with the same reagents. QC samples are associated with each batch and were used to assess the validity of the sample analyses.

PROCEDURAL BLANK: Laboratory contamination introduced during method use is assessed through the preparation and analysis of procedural blanks is provided at a minimum frequency of one per batch.

ACCURACY: Accuracy of analytical measurements is the degree of closeness based on percent recovery calculations between measured values and the actual or true value and includes a combination of reproducibility error and systematic bias due to sampling and analytical operations. Accuracy of the project data was indicated by analysis of MS, BS, LCS, LCM, CRM, and/or surrogate spikes on a minimum frequency of one per batch. Physis' QM requires that 95% of the target compounds greater than 10 times the MDL be within the specified acceptance limits.

PRECISION: Precision is the agreement among a set of replicate measurements without assumption of knowledge of the true value and is based on RPD calculations between repeated values. Precision of the project data was determined by analysis of replicate MS1/MS2, BS1/BS2, LCS1/LCS2, LCM1/LCM2, CRM1/CRM2, surrogate spikes and/or replicate project sample analysis (R1/R2) on a minimum frequency of one per batch. Physis' QM requires that for 95% of the compounds greater than 10 times the MDL, the percent RPD should be within the specified acceptance range.

BLANK SPIKES: BS is the introduction of a known concentration of analyte into the procedural blank. BS demonstrates performance of the preparation and analytical methods on a clean matrix void of potential matrix related interferences. The BS is performed in laboratory deionized water, making these recoveries a better indicator of the efficiency of the laboratory method per se.

MATRIX SPIKES: MS is the introduction of a known concentration of analyte into a sample. MS samples demonstrate the effect a particular project sample matrix has on the accuracy of a measurement. Individually, MS samples also indicate the bias of analytical measurements due to chemical interferences inherent in the in the specific project sample spiked. Intrinsic target analyte concentration in the specific project sample can also significantly impact MS recovery.

CERTIFIED REFERENCE MATERIALS: CRMs are materials of various matrices for which analytical information has been determined and certified by a recognized authority. These are used to provide a quantitative assessment of the accuracy of an analytical method. CRMs provide evidence that the laboratory preparation and analysis produces results that are comparable to those obtained by an independent organization.

LABORATORY CONTROL MATERIAL: LCM is provided because a suitable natural seawater CRM is not available and can be used to indicate accuracy of the method. Physis' internal LCM is seawater collected at ~800 meters in the Southern California San Pedro Basin and can be used as a reference for background concentrations in clean, natural seawater for comparison to project samples.

LABORATORY CONTROL SPIKES: LCS is the introduction of a known concentration of analyte into Physis' LCM. LCS samples were employed to assess the effect the seawater matrix has on the accuracy of a measurement. LCS also indicate the bias of this method due to chemical interferences inherent in the in the seawater matrix. Intrinsic LCM concentration can also significantly impact LCS recovery.

SURROGATES: A surrogate is a pure analyte unlikely to be found in any project sample, behaves similarly to

the target analyte and most often used with organic analytical procedures. Surrogates are added in known concentration to all samples and are measured to indicate overall efficiency of the method including processing and analyses.

HOLDING TIME: Method recommended holding times are the length of time a project sample can be stored under specific conditions after collection and prior to analysis without significantly affecting the analyte's concentration. Holding times can be extended if preservation techniques are employed to reduce biodegradation, volatilization, oxidation, sorption, precipitation, and other physical and chemical processes.

SAMPLE STORAGE/RETENTION: In order to maintain chemical integrity prior to analysis, all samples submitted to Physis are refrigerated (liquids) or frozen (solids) upon receipt unless otherwise recommended by applicable methods. Solid samples are retained for 1 year from collection while liquid samples are retained until method recommended holding times elapse.

TOTAL/DISSOLVED FRACTION: In some instances, the results for the dissolved fraction may be higher than the total fraction for a particular analyte (e.g. trace metals). This is typically caused by the analytical variation for each result and indicates that the target analyte is primarily in the dissolved phase, within the sample.

PHYSIS QUALIFIER CODES

CODE	DEFINITION
#	see Case Narrative
ND	analyte not detected at or above the MDL
B	analyte was detected in the procedural blank greater than 10 times the MDL
E	analyte concentration exceeds the upper limit of the linear calibration range, reported value is estimated
H	sample received and/or analyzed past the recommended holding time
J	analyte was detected at a concentration below the RL and above the MDL, reported value is estimated
N	insufficient sample, analysis could not be performed
M	analyte was outside the specified accuracy and/or precision acceptance limits due to matrix interference. The associated B/BS were within limits, therefore the sample data was reported without further clarification
SH	analyte concentration in the project sample exceeded the spike concentration, therefore accuracy and/or precision acceptance limits do not apply
SL	analyte results were lower than 10 times the MDL, therefore accuracy and/or precision acceptance limits do not apply
NH	project sample was heterogeneous and sample homogeneity could not be readily achieved using routine laboratory practices, therefore accuracy and/or precision acceptance limits do not apply
Q	analyte was outside the specified QAPP acceptance limits for precision and/or accuracy but within Physis derived acceptance limits, therefore the sample data was reported without further clarification
R	Physis’ QM allows for 5% of the target compounds greater than 10 times the MDL to be outside the specified acceptance limits for precision and/or accuracy. This is often due to random error and does not indicate any significant problems with the analysis of these project samples

ANALYTICAL REPORT

PHYSIS

TERRA AURA

ENVIRONMENTAL LABORATORIES, INC.

Innovative Solutions for Nature

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 118794-R1	**CL07 - Int**		**Matrix: Biologic**				**Sampled:**	**05-Jun-24 9:45**		**Received:**	**07-Jun-24**
Chlorophyll-a	SM 10200 H	mg/m3	17.1	1	1	2	NA		C-82070	21-Jun-24	21-Jun-24
Sample ID: 118795-R1	**CL07 - Surf**		**Matrix: Biologic**				**Sampled:**	**05-Jun-24 10:00**		**Received:**	**07-Jun-24**
Chlorophyll-a	SM 10200 H	mg/m3	11.2	1	1	2	NA		C-82070	21-Jun-24	21-Jun-24
Sample ID: 118796-R1	**CL08 - Int**		**Matrix: Biologic**				**Sampled:**	**05-Jun-24 9:15**		**Received:**	**07-Jun-24**
Chlorophyll-a	SM 10200 H	mg/m3	17.1	1	1	2	NA		C-82070	21-Jun-24	21-Jun-24
Sample ID: 118797-R1	**CL08 - Surf**		**Matrix: Biologic**				**Sampled:**	**05-Jun-24 9:25**		**Received:**	**07-Jun-24**
Chlorophyll-a	SM 10200 H	mg/m3	13.9	1	1	2	NA		C-82070	21-Jun-24	21-Jun-24
Sample ID: 118798-R1	**CL09 - Int**		**Matrix: Biologic**				**Sampled:**	**05-Jun-24 8:30**		**Received:**	**07-Jun-24**
Chlorophyll-a	SM 10200 H	mg/m3	46.9	1	1	2	NA		C-82070	21-Jun-24	21-Jun-24
Sample ID: 118799-R1	**CL09 - Surf**		**Matrix: Biologic**				**Sampled:**	**05-Jun-24 8:40**		**Received:**	**07-Jun-24**
Chlorophyll-a	SM 10200 H	mg/m3	15.5	1	1	2	NA		C-82070	21-Jun-24	21-Jun-24
Sample ID: 118800-R1	**CL10 - Int**		**Matrix: Biologic**				**Sampled:**	**05-Jun-24 8:00**		**Received:**	**07-Jun-24**
Chlorophyll-a	SM 10200 H	mg/m3	20.3	1	1	2	NA		C-82070	21-Jun-24	21-Jun-24
Sample ID: 118801-R1	**CL10 - Surf**		**Matrix: Biologic**				**Sampled:**	**05-Jun-24 8:10**		**Received:**	**07-Jun-24**
Chlorophyll-a	SM 10200 H	mg/m3	18.2	1	1	2	NA		C-82070	21-Jun-24	21-Jun-24
Sample ID: 118802-R1	**LE02 - Int**		**Matrix: Biologic**				**Sampled:**	**05-Jun-24 9:25**		**Received:**	**07-Jun-24**
Chlorophyll-a	SM 10200 H	mg/m3	27.6	1	1	2	NA		C-82070	21-Jun-24	21-Jun-24
Sample ID: 118803-R1	**LE02 - Surf**		**Matrix: Biologic**				**Sampled:**	**05-Jun-24 9:55**		**Received:**	**07-Jun-24**
Chlorophyll-a	SM 10200 H	mg/m3	36.3	1	1	2	NA		C-82070	21-Jun-24	21-Jun-24

QUALITY CONTROL REPORT

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2302004-032
Client: WSP USA
Project: LECL TMDL Monitoring Project # 2315100200.0004.PHY

Conventionals

QUALITY CONTROL REPORT

SAMPLE ID	BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE	SOURCE	ACCURACY			PRECISION			QA CODE
							LEVEL	RESULT	%	LIMITS		%	LIMITS		
Chlorophyll-a	**Method: SM 10200 H**			**Fraction: NA**				**Prepared: 21-Jun-24**				**Analyzed: 21-Jun-24**			
118793-B1 QAQC Procedural Blank	C-82070	ND	1	1	2	mg/m3									
118793-BS1 QAQC Procedural Blank	C-82070	54500	1	1	2	mg/m3	51900	0	105	70 - 130%	PASS				
118793-BS2 QAQC Procedural Blank	C-82070	55500	1	1	2	mg/m3	51900	0	107	70 - 130%	PASS	2	30	PASS	

CHAIN OF CUSTODY

Chain of Custody & Sample Information Record

Client: WSP USA E&I Inc.

Contact: John Rudolph

Phone No. 858-243-8158

Project Name: **LECL TMDL Monitoring**

Email: john.rudolph@wsp.com

Project Number: 2315100200.0004.PHYSIS

PO#: C014105479

GL Code: 57300

Org# 3151

Turn Around Time: Routine | *3-5 Day Rush | *48 Hour Rush | *24 Hour Rush

*Additional Charges May Apply

***Lab TAT Approval:** By:

Additional Reporting Requests

Include QC Data Package: ☐ Yes ☐ No

FAX Results: ☐ Yes ☐ No

Email Results: ☐ Yes ☐ No

State EDT: ☐ Yes ☐ No

(Include Source Number in Notes)

Sampler Information

Name: Nick Jernack

Employer: WSP USA

Signature:

Matrix

DW = Drinking Water

WW = Wastewater

GW = Groundwater

S = Soil

SG = Sludge

L = Liquid

M = Miscellaneous

Notes

Chl-a samples on 0.7 um GFF

Sample ID	Date	Time	Unpreserved	H2SO4	HCl	HNO3	Na2S2O3	NaOH	NaOH/ZnAcetate	NH4Cl	MCAA	Frozen	Total # of Containers	Routine	Resample	Special	Total Sulfide	Nitrate - Nitrite	TDS	TKN	Ammonia	Total Phosphorus	SRP/Ortho-P	Chlorophyll-a	Matrix	Notes
CL07 - Int	6/5/24	945																						X		Filter Volume: 500 mL
CL07 - Surf	6/5/24	1000																						X		Filter Volume: 500 mL
CL08 - Int	6/5/24	915																						X		Filter Volume: 500 mL
CL08 - Surf	6/5/24	925																						X		Filter Volume: 500 mL
CL09 - Int	6/5/24	830																						X		Filter Volume: 450 mL
CL09 - Surf	6/5/24	840																						X		Filter Volume: 500 mL
CL10 - Int	6/5/24	800																						X		Filter Volume: 500 mL
CL10 - Surf	6/5/24	810																						X		Filter Volume: 500 mL
LE02 - Int	6/5/24	925																						X		Filter Volume: 425 mL
LE02 - Surf	6/5/24	955																						X		Filter Volume: 375 mL

(Column groups: # of Containers & Preservatives: Unpreserved to Frozen; Sample Type: Routine, Resample, Special; Analysis Requested: Total Sulfide to Chlorophyll-a)

Relinquished By (sign)	Print Name / Company	Date / Time	Received By (Sign)	Print Name / Company
	Nick Jenack / WSP	6/6/24 - 1600	ycheng	Yvonne Cheng / Physis 6/7/24 1055

(For Lab Use Only) **Sample Integrity Upon Receipt**

Sample(s) Submitted on Ice? Yes No

Custody Seal(s) Intact? Yes No N/A

Sample(s) Intact? Yes No

Temperature °C

☐ Cooler Blank

Lab Notes

Lab No.

Page 1 of 1

PHYSIS ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

Sample Receipt Summary

Project Iteration ID:	2302004-032
Client Name:	WSP USA
Project Name:	LECL TMDL Monitoring Project # 2315100200.0004.PHYSIS PO # C014105479 GL Code 57300 Org 3151
COC Page Number:	2 of 2
Bottle Label Color:	NA

Receiving Info

1. Initials Received By: yc
2. Date Received: 6/7/24
3. Time Received: 1055
4. Client Name: WSP
5. Courier Information: (Please circle)
   - Client
   - [✓ FedEx]
   - UPS
   - GSO/GLS
   - Area Fast
   - Ontrac
   - DRS
   - PAMS
   - PHYSIS Driver:
     - i. Start Time: ________
     - ii. End Time: ________
     - iii. Total Mileage: ________
     - iv. Number of Pickups: ________
6. Container Information: (Please put the # of containers or circle none)
   - 1 Cooler
   - __ Styrofoam Cooler
   - __ Boxes
   - None
   - __ Carboy(s)
   - __ Carboy Trash Can(s)
   - __ Carboy Cap(s)
   - Other ________
7. What type of ice was used: (Please circle any that apply)
   - Wet Ice
   - [✓ Blue Ice]
   - Dry Ice
   - Water
   - None
8. Randomly Selected Samples Temperature (°C): 5.0 Used I/R Thermometer # 1-2

Inspection Info

1. Initials Inspected By: ________

Sample Integrity Upon Receipt:

1. COC(s) included and completely filled out.................. [✓ Yes] / No
2. All sample containers arrived intact.................. [✓ Yes] / No
3. All samples listed on COC(s) are present.................. [✓ Yes] / No
4. Information on containers consistent with information on COC(s).................. [✓ Yes] / No
5. Correct containers and volume for all analyses indicated.................. [✓ Yes] / No
6. All samples received within method holding time.................. [✓ Yes] / No
7. Correct preservation used for all analyses indicated.................. [✓ Yes] / No
8. Name of sampler included on COC(s).................. [✓ Yes] / No

Notes:

APPENDIX D

SATELLITE DATA REPORTS

Delivery report

Water Quality Monitoring: Lake Elsinore & Canyon Lake

Date: 2024-01-30
Version: 28

Clients: Wood Plc.
Reference: 2370_Delivery_EOMAP2WoodPlc

EOMAP GmbH & Co.KG,
Schlosshof 4, 82229 Seefeld
Germany

Authors:	Email	Phone
Hendrik Bernert	bernert@eomap.de	+49 8152 99861 14
Minha Sultan	sultan@eomap.de	+49 8152 99861 14

CONTENT

1. Service Provision Report

Contractor Details	Service Provider Details
Wood Environment & Infrastructure Solutions, Inc.	EOMAP GmbH & Co. KG
9210 Sky Park Court, Suite 200	Schlosshof 4, 82229 Seefeld, Germany
San Diego, CA 92123, USA	
Point of Contact	**Point of Contact**
John D. Rudolph	Hendrik Bernert
john.rudolph@woodplc.com	bernert@eomap.de, +49 (0)8152 9986114

Contractor PO / Reference number	
Contractor project title	
Service Provider reference number	2370
Date of delivery	2024-01-30
Version	28

1.1. List of all delivered scenes

Sensor	Time of record
Landsat-9	2023-07-13 18:22:09 UTC

1.2. Content

Product	Abbreviation	Yes/No
Total Absorption	ABS	☐
Aerosol Optical Thickness	AOT	☐
Yellow Substances	CDM	☐
Chlorophyll-a	CHL	☒
Ratio of Absorption and Scattering	DIV	☐
Harmful Algae Bloom Indicator	HAB	☒
Diffuse Attenuation Coefficient	KDC	☐
Quality Coding	QUC	☒
Total Quality	QUT	☒
True Color/False Color Composite	RGB	☒
Remote Sensing Reflectance	RRS	☐
Secchi Disc Depth	SDD	☐
Sum of Inorganic Absorption	SIA	☐
Sum if Organic Absorption	SOA	☐
Surface Temperature	SST	☐
Turbidity	TUR	☒
Trophic State Index (Chlorophyll)	TSC	☐
Total Suspended Matter	TSM	☐
Light Penetration Depth	Z90	☐
Water Body Extent	WEX	☐

1.3. List of delivered files (one product example)

File name	File format	Content
2370_Delivery_EOMAP2WoodPlc_Vs27_20240130.pdf	PDF	Delivery Report
CHL_us-california_040037_EOMAP_20230713_182209_LSAT9_m0030.tif	GeoTIFF	Product raster file, 8bit scaled and coloured
CHL_us-california_040037_EOMAP_20230713_182209_LSAT9_m0030_32bit.tif	GeoTIFF	Product raster file, 32bit real values
CHL_us-california_040037_EOMAP_20230713_182209_LSAT9_m0030_32bit_wgs84.txt	ASCII	Product text file, real values
CHL_us-california_040037_EOMAP_20230713_182209_LSAT9_m0030.kmz	KMZ	GoogleEarth overlay
CHL_us-california_040037_EOMAP_20230713_182209_LSAT9_m0030.xml	XML	Metadata
CHL_us-california_040037_EOMAP_20230713_182209_LSAT9_m0030_overview.pdf	PDF	Overview PDF, metadata and quicklook

1.4. File naming

[Product abbreviation]_[Country code]-[Area]_EOMAP_[Date of satellite image recording]_[Time of satellite image recording]_[sensor code]_[spatial resolution]_[optional]

With

[Product abbreviation]	see list of product abbreviations
[Country code]	Country ID following ISO 3166 ALPHA-2 standards
[Area]	name of city/region or other relevant area characterization
[Date of satellite image rec.]	Satellite image date used for the analysis in YYMMDD (YY= Year, MM = Month, DD = Date) in UTC
[Time of satellite image rec.]	Satellite image date used for the analysis in HHMMSS (HH= Hours, MM = Minute, SS = Seconds) in UTC time
[sensor code]	Sensor in use
[spatial resolution]	Spatial resolution/grid spacing in meters
[optional]	is an optional parameter which can is used to support the intuitive use of the data, such as ‘metadata’ or ‘XYZQ’ for metadata files and ASCII XYZQ files.

1.5. Notes (e.g. technical issues, exceptional conditions, etc.)

- None

Data Analyst

Hendrik Bernert

Hendrik Bernert

QA/QC

Minha Sultan

2. Methodology: Modular Inversion and Processing System (MIP)

For the retrieval of satellite-derived water quality data, the physics-based Modular Inversion and Processing System (MIP), developed by EOMAP, has been applied to the satellite imagery. This sensor-independent approach includes all the relevant processing steps to guarantee a robust, standardised and operational retrieval of water quality parameters from various satellite data sources. The advantage of physics-based methods is that they do not require a priori information about the study area and can therefore be applied independently of satellite type and study area.

MIP imbeds sensor-independent algorithms and processing modules to derive consistent water quality parameters for multiple scales through a number of different satellite sensors. The algorithms take all relevant environmental impacts into account and do so for each individual measurement and pixel according to the current state-of-the-art, including:

a. water, land, cloud identification
b. estimation and correction of atmosphere and aerosol impacts[1] [2]
c. correction altitude level impacts[3]
d. correction of adjacency impact (light scattering into the water signal from adjacent land surfaces)[4]
e. correction[5] or flagging[6] of sunglitter impact
f. retrieval of in-water absorption and scattering as physical measures[7]
g. accounting for varying spectral slopes of specific inherent optical properties[8]
h. provision of uncertainty measures and flagging procedures
i. accounting for the full bidirectional effects in the atmosphere, at the water-atmosphere boundary layers and in-water, using a fully coupled radiative transfer model
j. application of procedures to minimize errors, resulting from the coupled interaction of light between atmosphere, water surface and in-water on the signal, through coupled inversion procedures

The different workflow steps from satellite raw imagery import to value-added water quality retrieval are displayed in Figure 1.

---

[1] Heege, T., Kiselev, V., Wettle, M., Hung N.N. (2014): Operational multi-sensor monitoring of turbidity for the entire Mekong Delta . Int. J. Remote Sensing, Special Issues Remote Sensing of the Mekong, Vol. 35 (8), pp. 2910-2926

[2] Richter, R., Heege, T., Kiselev, V., Schläpfer, D. (2014): Correction of ozone influence on TOA radiance. Int. J. of Remote Sensing. Vol. 35(23), pp. 8044-8056, doi: 10.1080/01431161.2014.978041

[3] Heege, T., Fischer, J. (2004): Mapping of water constituents in Lake Constance using multispectral airborne scanner data and a physically based processing scheme. Can. J. Remote Sensing, Vol. 30, No. 1, pp. 77-86

[4] Kiselev, V., Bulgarelli, B. and Heege, T., (2015). Sensor independent adjacency correction algorithm for coastal and inland water systems. Remote Sensing of Environment, 157: 85-95. , ISSN 0034-4257, http://dx.doi.org/10.1016/j.rse.2014.07.025

[5] Heege, T. & Fischer, J. (2000): Sun glitter correction in remote sensing imaging spectrometry. SPIE Ocean Optics XV Conference, Monaco, Oct. 16-20.

[6] EU FP7-Projekt GLASS: WP4 Validation report (29.2.2016): www.glass-project.eu/assets/Deliverables/GLaSS-D4.2.pdf

[7] Bumberger J., Heege T., Klinger P., et al. (2017): Towards a Harmonized Validation Procedure for Inland Water Optical Remote Sensing Data using Inherent Optical Properties, Rem. Sens. 2017(9), 21p, submitted 28 Feb. 2017

[8] Heege T., Schenk K., Klinger P., Broszeit A., Wenzel J., Kiselev V. (2015): Monitoring status and trends of water quality in inland waters using earth observation technologies. Proceedings “Water Quality in Europe: Challenges and Best Practice” UNESCO-IHP European Regional Consultation Workshop, Koblenz, Germany, Dec 2015, p. 1-4

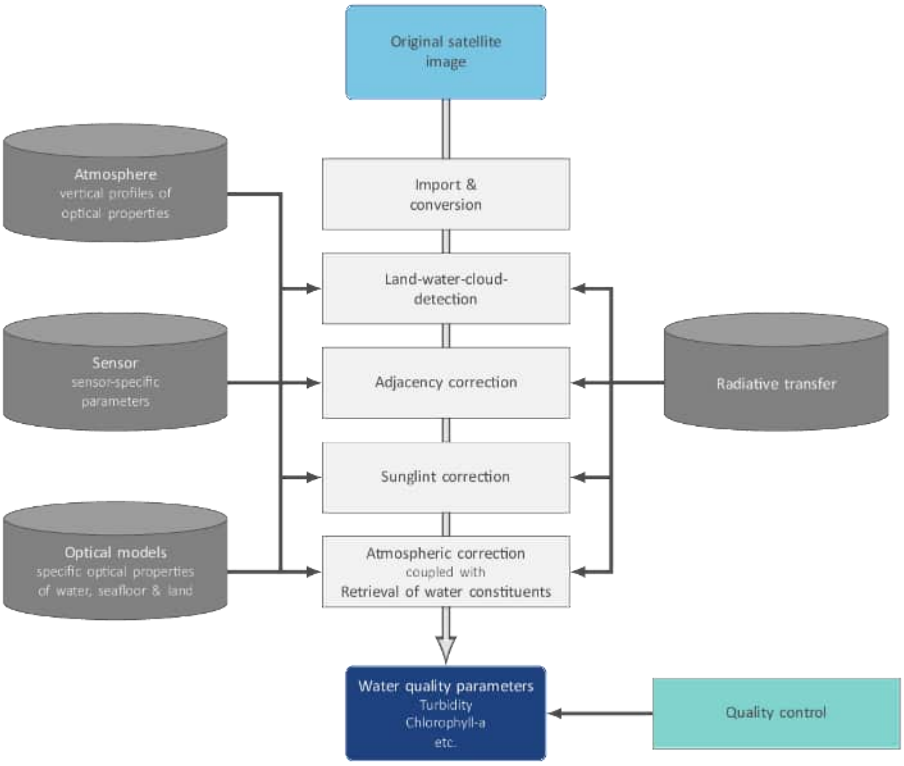


Figure 1: EOMAP's physics-based workflow to derive satellite-based water quality

MIP is the most established, sensor-independent and operational aquatic remote sensing processing system for the full range of high, medium and low-resolution satellite sensors. Fully-automated water monitoring processors are installed in satellite ground segments worldwide (Europe, Australia, Asia and America), to ensure fast and efficient access to a wide range of satellite data. The data processing and orchestration software, the EOMAP Workflow System (EWS) allows for continuous, daily production.

3. Products

3.1. Turbidity (TUR)

Turbidity (TUR) is a key parameter of water quality and is linearly related to the backward scattering of light of organic and inorganic particles in water. Turbidity is also linearly related to Total Suspended Matter (TSM) at low to moderate turbidity values. The measurement unit is Nephelometric Turbidity Unit (NTU). Satellite-derived turbidity is determined by the backward scattering of light between 450 to 800nm, which is physically retrieved using satellite data. The standard relation of EOMAP concentrations to inherent optical properties is defined as 1 NTU = 0.0118 1/m backward scattering at 550nm, or 1 NTU = 0.619 1/m total scattering at 550nm for an assumed ratio bb/b = 0.019. The linear relation between turbidity and suspended matter/solids in low to moderate concentrations is in most cases a regional constant, but can vary with particle size distribution. Note that the geometrical properties of an in-situ measurement device, and the wavelength in use, may differ in comparison to the satellite product. For example, the standard FTU determination, a measure of turbidity similar to NTU, is based on the measurement of light scattered within a 90° angle from a beam directed at the water sample. Alongside temporal differences in satellite and in situ measurements, different sampling depths and the measurement location, this needs to be considered when comparing and interpreting satellite derived vs. in situ measured turbidity values. The Turbidity product from 2023-07-13 is shown in Figure 2.

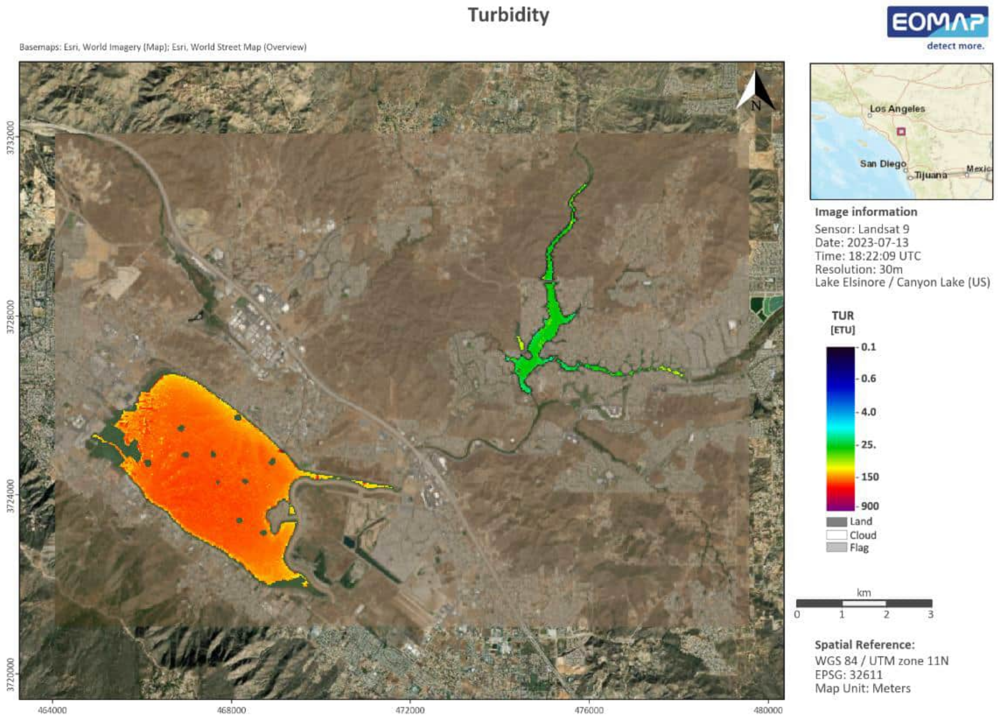


Figure 2: Turbidity product from 2023-07-13

3.2. Chlorophyll-a (CHL)

Chlorophyll-a (CHL) retrieval is based on the derived information of in-water organic absorption, in-water turbidity and spectral characteristics of each water body. Chlorophyll-a in [µg/l], is provided as a measure linearly related to the pigment-specific absorption at 440nm, with 1 µg/l Chl equal to 0.035 1/m pigment absorption. Phaeophytin and further pigments cannot be discriminated methodologically with the spectral resolution provided by Landsat 8/Sentinel-2 and similar sensors and is therefore included in this product. The pigment-related absorption is always smaller than the absorption of organic components (SOA). For clear water conditions (low chlorophyll/total suspended solids), the specific absorption chlorophyll increases significantly (Bricaud et al. 1995[9]). Chlorophyll values can vary over 4 magnitudes, for marine waters or clear lakes typical concentrations between 0.01 and 10 µg/l, while for eutrophic lakes concentrations can reach 100 µg/l and more. The chlorophyll products are typically reliable within a range of 10 – 50 % in comparison to in situ measures (Broszeit 2015[10]), which are typically based on one of three different methods, which include photometric, fluorescence and HPLC approaches and their subcategories. The Chlorophyll-a product from 2023-07-13 is shown in Figure 3.

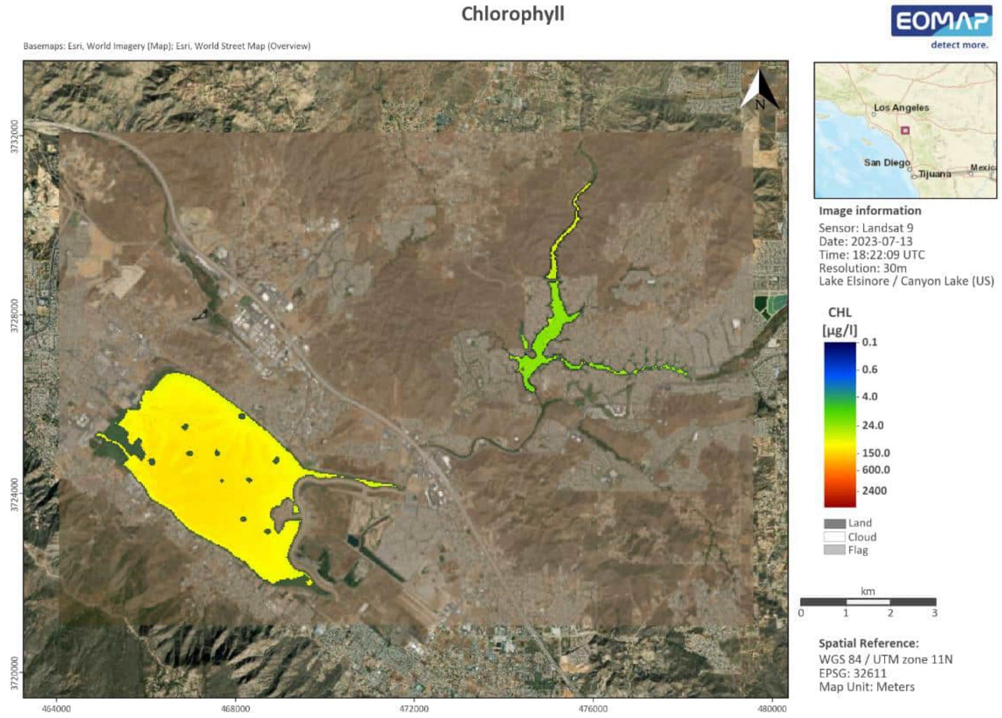


Figure 3: Chlorophyll-a product from 2023-07-13

---

[9] Bricaud, A., Babin, M., Morel, A., Claustre, H. (1995): Variability in the chlorophyll-specific absorption coefficients of natural phytoplankton: Analysis and parametrization. Journal of Geophysical Research Atmospheres, 100(C7):13,321-13,332

[10] Broszeit, A., 2015. Assessing long-term inland water quality using satellite imagery: A Feasibility and validation study of different lake types. MSc Thesis, Julius-Maximilian-University Würzburg, 96p

3.3. Harmful Algae Bloom Indicator (HAB)

The **Harmful Algae Bloom Indicator** (HAB) refers to the presence of cyanobacteria. It is sensitive to the appearance of cyanobacteria-related pigments, i.e. phycocyanin and phycoerythrin. Both pigments show absorption features in green wavelengths from 500 nm to approx. 640 nm; phycoerythrin shows its absorption maximum at 540-570 nm, phycocyanin at 610-620 (Colyer et al. 2005). Most satellite sensors support the identification of this feature with only two bands, i.e. one in the green wavelength region (e.g. L7 and L8 at 530 – 590 nm) and in the red wavelength region at approx. 640 – 670 nm. The used standard parameterisation of phytoplankton absorption in MIP as described above, however, does not account phycocyanin and phycoerythrin absorption in the retrieval process. The modelled phytoplankton absorption therefore lacks the absorption features of these pigments. Nonetheless, if these pigments are present in the water a slight spectral mismatch between modelled water leaving reflectance ($R_{modelled}$) and satellite derived reflectance ($R_{satellite}$) occurs. The algorithm then compares the slope of $R_{modelled}$ and $R_{satellite}$ between the green and red band ($\delta R = R_{green} - R_{red}$) in order to classify pixels with regard to phycocyanin and phycoerythrin occurrence, i.e. harmful algae bloom probability. The HAB indicator from 2023-07-13 is shown in Figure 4.

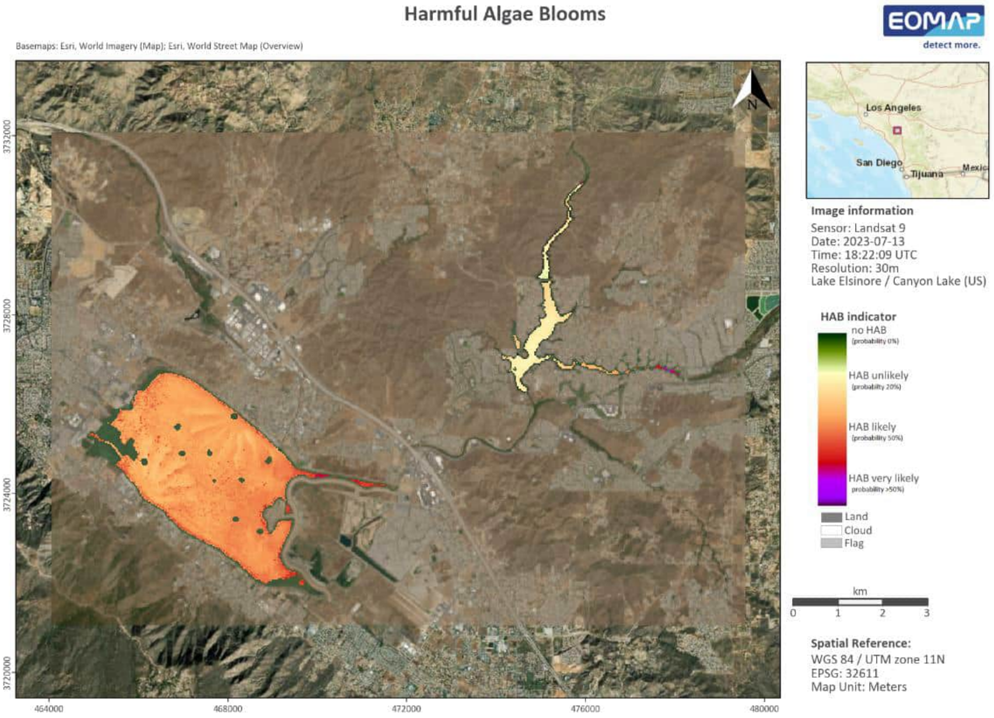


Figure 4: Harmful Algae Bloom Indicator product from 2023-07-13

3.4. True color composite (RGB)

RGB composite images represent the area of interest in true colour or false colour modes by combining predefined bands, depending on the sensor in use.

4. Quality Control and Flagging

As a standard output of the processing, an accuracy or quality indicator is calculated for each retrieved parameter and for each detected water pixel. This measure comprises a comprehensive range of factors that can impact the derived product quality, including:

- the geometry between sun, target, and sensor,
- the estimated sun glint probability,
- the retrieved aerosol optical depth,
- residuals of the measured and modelled sensor radiance and subsurface reflectance,
- the comparison of retrieved water species concentrations to extreme values as defined in the configuration files,
- pixels affected by cloud shadow and
- shallow water areas.

Threshold values define distinct values when a parameter is assumed to influence the quality. All parameters are integrated into one remaining quality parameter, allowing both an improved flagging and a quality weighting of pixels, that can later be merged into integrated 3rd level products.

The quality information is part of each standard geodata delivery and is visualized by two different 8bit GeoTIFFs:

- QUT - Total Quality, quantifying the overall quality of each pixel from low to high. Only valid water pixels - excluding land, cloud or flagged pixels - are represented in QUT indicator (Figure 5).
- QUC – EOMAP Quality coding (Figure 6), revealing the processor's internal quality check, split into the defined indicators (e.g. sunglint, shallow water risk, etc.). These are classified into 'no quality concerns', 'quality risk and 'bad quality' (flag). Note that 'quality risk' pixels are marked as such but not flagged.

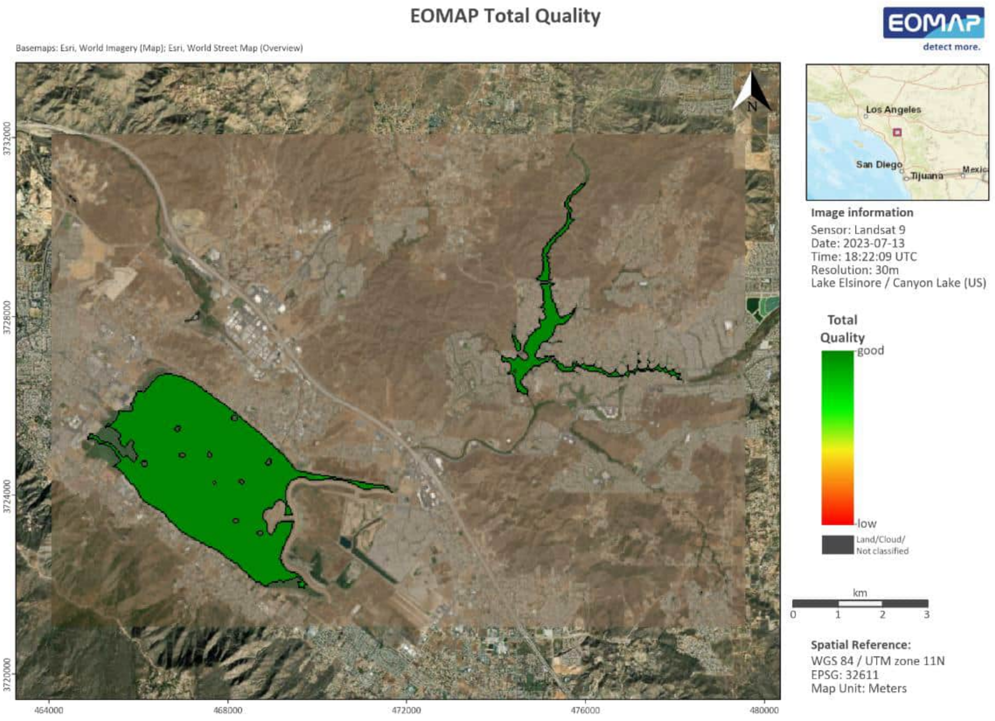


Figure 5: QUT product from 2023-07-13

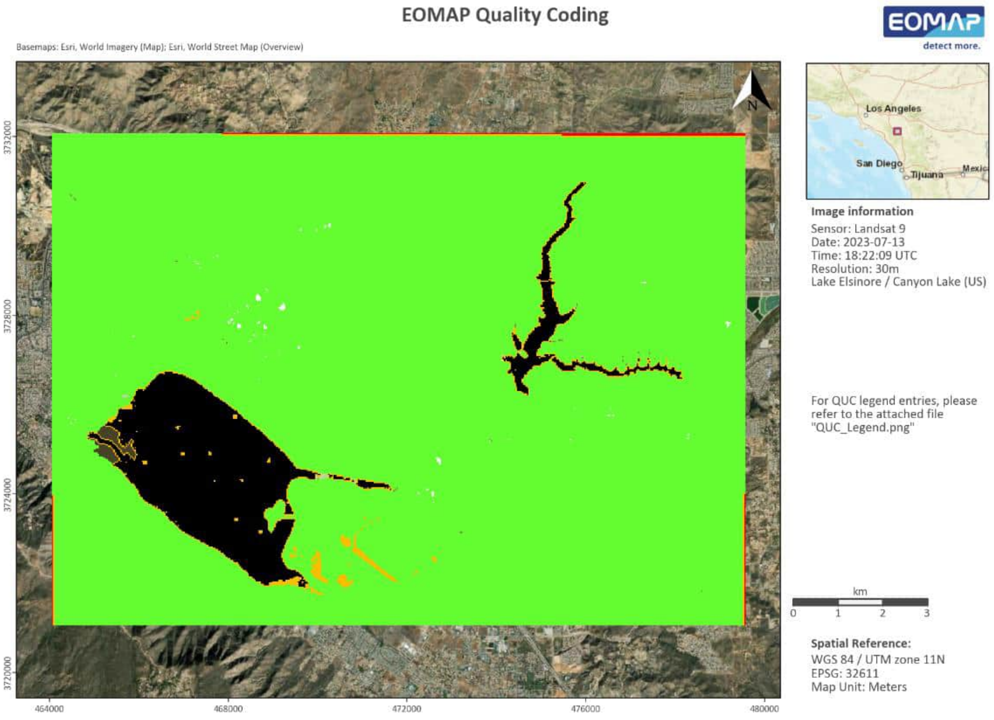
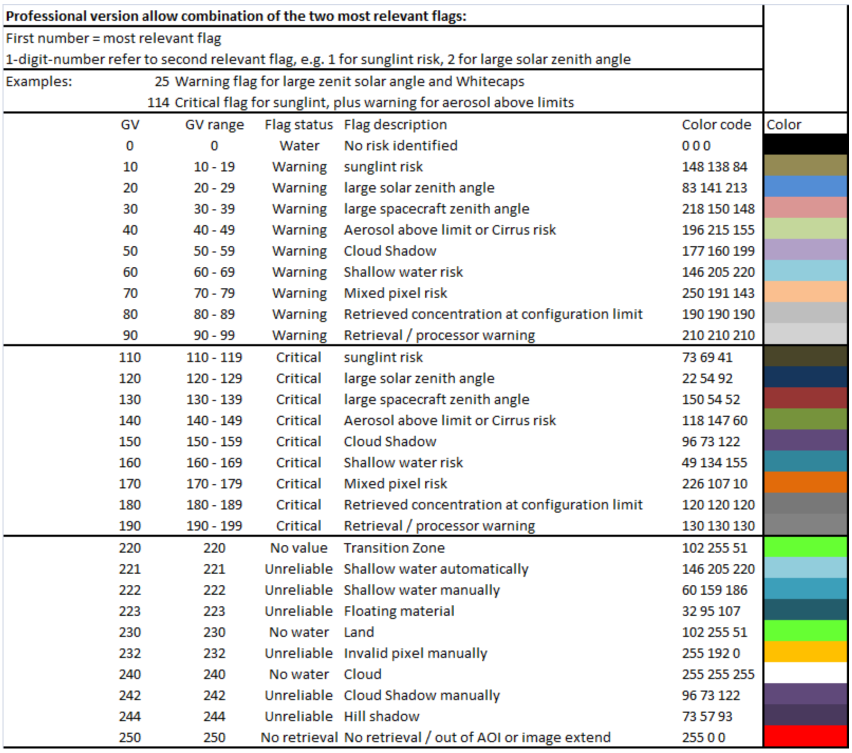


Figure 6: QUC product from 2023-07-13

The QUC file indicates the main quality influencing parameter using a specific EOMAP quality coding classification scheme with corresponding grey values (GV), shown in Figure 7.



Professional version allow combination of the two most relevant flags:

First number = most relevant flag
1-digit-number refer to second relevant flag, e.g. 1 for sunglint risk, 2 for large solar zenith angle

Examples: 25 Warning flag for large zenit solar angle and Whitecaps
114 Critical flag for sunglint, plus warning for aerosol above limits

GV	GV range	Flag status	Flag description	Color code	Color
0	0	Water	No risk identified	0 0 0	⬛
10	10 - 19	Warning	sunglint risk	148 138 84	🟫
20	20 - 29	Warning	large solar zenith angle	83 141 213	🟦
30	30 - 39	Warning	large spacecraft zenith angle	218 150 148	🟥
40	40 - 49	Warning	Aerosol above limit or Cirrus risk	196 215 155	🟩
50	50 - 59	Warning	Cloud Shadow	177 160 199	🟪
60	60 - 69	Warning	Shallow water risk	146 205 220	🟦
70	70 - 79	Warning	Mixed pixel risk	250 191 143	🟧
80	80 - 89	Warning	Retrieved concentration at configuration limit	190 190 190	⬜
90	90 - 99	Warning	Retrieval / processor warning	210 210 210	⬜
110	110 - 119	Critical	sunglint risk	73 69 41	🟫
120	120 - 129	Critical	large solar zenith angle	22 54 92	🟦
130	130 - 139	Critical	large spacecraft zenith angle	150 54 52	🟥
140	140 - 149	Critical	Aerosol above limit or Cirrus risk	118 147 60	🟩
150	150 - 159	Critical	Cloud Shadow	96 73 122	🟪
160	160 - 169	Critical	Shallow water risk	49 134 155	🟦
170	170 - 179	Critical	Mixed pixel risk	226 107 10	🟧
180	180 - 189	Critical	Retrieved concentration at configuration limit	120 120 120	⬛
190	190 - 199	Critical	Retrieval / processor warning	130 130 130	⬛
220	220	No value	Transition Zone	102 255 51	🟩
221	221	Unreliable	Shallow water automatically	146 205 220	🟦
222	222	Unreliable	Shallow water manually	60 159 186	🟦
223	223	Unreliable	Floating material	32 95 107	🟦
230	230	No water	Land	102 255 51	🟩
232	232	Unreliable	Invalid pixel manually	255 192 0	🟨
240	240	No water	Cloud	255 255 255	⬜
242	242	Unreliable	Cloud Shadow manually	96 73 122	🟪
244	244	Unreliable	Hill shadow	73 57 93	🟪
250	250	No retrieval	No retrieval / out of AOI or image extend	255 0 0	🟥

Figure 7: EOMAP QUC quality coding

EOMAP's water quality products are accompanied by the processor's internal quality control mechanisms QUT and QUC, resulting in pixel flagging in case of unreliable values. Moreover, a manual quality check and - if required - additional masking is applied to each product.

As an example, cloud shadow effects typically occur in the vicinity of clouds, resulting in unrealistically low water parameter values. In order to detect and flag these areas, EOMAP has developed a specific algorithm based on geometric models, considering the sun angle and sensor viewing geometry, the retrieved aerosol properties, the height of the clouds, an analysis of the blue channel radiances and a statistical anomaly detection of the water species concentrations. When applying this cloud shadow detection algorithm, approx. 85% of the cloud shadows are detected and masked. Remaining cloud shadows are manually flagged and can be identified in the QUC file by GV 242.

Due to the spatial extent of single pixels (Sentinel-2: 10*10m, Landsat 8/9: 30*30m), it is likely that spectral mixing of signals from land and water can affect the pixels along the edge of the water body, leading to unreliable retrieval of water parameter values. Such pixels are labelled with the quality flag 'transition zone'. EOMAP uses a high-resolution land-water-mask database to determine the land-water-boundary, which is then filtered to create a transition zone that is automatically flagged during processing. In the 8bit water constituent products the transition zone is marked by GV 251, whereas in the QUC product it is 220.

5. Data Format

The water quality data are delivered as 32bit real value GeoTIFFs as well as 8bit scaled and colored GeoTIFFs for easier visualization. These colors are only a suggestion a corresponding to EOMAPs standard except for the HAB visualization, which has been changed according to a client-specific request. In addition, KMZ- as well as XYZ-files are delivered as per client request.

6. Data Sources

EOMAP uses the following the AWS data hub (https://registry.opendata.aws/index.html) to access and download satellite raw data from different sensors.

- Landsat 8/9: https://registry.opendata.aws/usgs-landsat/index.html
- Sentinel-2: https://registry.opendata.aws/sentinel-2/

Disclaimer: This document contains confidential information that is intended only for the use by EOMAP's Client. It is not for public circulation or publication or to be used by any third party without the express permission of either the Client or EOMAP GmbH & Co. KG. The concepts and information contained in this document are the property of EOMAP GmbH & Co. KG. Use or copying of this document in whole or in part without the written permission of EOMAP GmbH & Co. KG constitutes an infringement of copyright.

While the findings presented in this report are based on information that EOMAP GmbH & Co. KG considers reliable un-less stated otherwise, the accuracy and completeness of source information cannot be guaranteed. Furthermore, the information compiled in this report addresses the specific needs of the client, so may not address the needs of third par-ties using this report for their own purposes. Thus, EOMAP GmbH & Co. KG and its employees accept no liability for any losses or damage for any action taken or not taken on the basis of any part of the contents of this report. Those acting on information provided in this report do so entirely at their own risk.

EOMAP
Schlosshof 4
82229 Seefeld
Germany
+49 (0)8152 99861 10
info@eomap.com
www.eomap.com

Delivery report

Water Quality Monitoring: Lake Elsinore & Canyon Lake

Date: 2024-01-30
Version: 27

Clients: Wood Plc.
Reference: 2370_Delivery_EOMAP2WoodPlc

EOMAP GmbH & Co.KG,
Schlosshof 4, 82229 Seefeld
Germany

Authors:	Email	Phone
Hendrik Bernert	bernert@eomap.de	+49 8152 99861 14
Minha Sultan	sultan@eomap.de	+49 8152 99861 14

CONTENT

1. Service Provision Report

Contractor Details	Service Provider Details
Wood Environment & Infrastructure Solutions, Inc.	EOMAP GmbH & Co. KG
9210 Sky Park Court, Suite 200	Schlosshof 4, 82229 Seefeld, Germany
San Diego, CA 92123, USA	
Point of Contact	**Point of Contact**
John D. Rudolph	Hendrik Bernert
john.rudolph@woodplc.com	bernert@eomap.de, +49 (0)8152 9986114

Contractor PO / Reference number	
Contractor project title	
Service Provider reference number	2370
Date of delivery	2024-01-30
Version	27

1.1. List of all delivered scenes

Sensor	Time of record
Landsat-8	2023-08-06 18:22:24 UTC

1.2. Content

Product	Abbreviation	Yes/No
Total Absorption	ABS	☐
Aerosol Optical Thickness	AOT	☐
Yellow Substances	CDM	☐
Chlorophyll-a	CHL	☒
Ratio of Absorption and Scattering	DIV	☐
Harmful Algae Bloom Indicator	HAB	☒
Diffuse Attenuation Coefficient	KDC	☐
Quality Coding	QUC	☒
Total Quality	QUT	☒
True Color/False Color Composite	RGB	☒
Remote Sensing Reflectance	RRS	☐
Secchi Disc Depth	SDD	☐
Sum of Inorganic Absorption	SIA	☐
Sum if Organic Absorption	SOA	☐
Surface Temperature	SST	☐
Turbidity	TUR	☒
Trophic State Index (Chlorophyll)	TSC	☐
Total Suspended Matter	TSM	☐
Light Penetration Depth	Z90	☐
Water Body Extent	WEX	☐

1.3. List of delivered files (one product example)

File name	File format	Content
2370_Delivery_EOMAP2WoodPlc_Vs27_20240130.pdf	PDF	Delivery Report
CHL_us-california_040037_EOMAP_20230806_182224_LSAT8_m0030.tif	GeoTIFF	Product raster file, 8bit scaled and coloured
CHL_us-california_040037_EOMAP_20230806_182224_LSAT8_m0030_32bit.tif	GeoTIFF	Product raster file, 32bit real values
CHL_us-california_040037_EOMAP_20230806_182224_LSAT8_m0030_32bit_wgs84.txt	ASCII	Product text file, real values
CHL_us-california_040037_EOMAP_20230806_182224_LSAT8_m0030.kmz	KMZ	GoogleEarth overlay
CHL_us-california_040037_EOMAP_20230806_182224_LSAT8_m0030.xml	XML	Metadata
CHL_us-california_040037_EOMAP_20230806_182224_LSAT8_m0030_overview.pdf	PDF	Overview PDF, metadata and quicklook

1.4. File naming

[Product abbreviation]_[Country code]-[Area]_EOMAP_[Date of satellite image recording]_[Time of satellite image recording]_[sensor code]_[spatial resolution]_[optional]

With

[Product abbreviation]	see list of product abbreviations
[Country code]	Country ID following ISO 3166 ALPHA-2 standards
[Area]	name of city/region or other relevant area characterization
[Date of satellite image rec.]	Satellite image date used for the analysis in YYMMDD (YY= Year, MM = Month, DD = Date) in UTC
[Time of satellite image rec.]	Satellite image date used for the analysis in HHMMSS (HH= Hours, MM = Minute, SS = Seconds) in UTC time
[sensor code]	Sensor in use
[spatial resolution]	Spatial resolution/grid spacing in meters
[optional]	is an optional parameter which can is used to support the intuitive use of the data, such as 'metadata' or 'XYZQ' for metadata files and ASCII XYZQ files.

1.5. Notes (e.g. technical issues, exceptional conditions, etc.)

- None

Data Analyst

Hendrik Bernert

Hendrik Bernert

QA/QC

Minha Sultan

2. Methodology: Modular Inversion and Processing System (MIP)

For the retrieval of satellite-derived water quality data, the physics-based Modular Inversion and Processing System (MIP), developed by EOMAP, has been applied to the satellite imagery. This sensor-independent approach includes all the relevant processing steps to guarantee a robust, standardised and operational retrieval of water quality parameters from various satellite data sources. The advantage of physics-based methods is that they do not require a priori information about the study area and can therefore be applied independently of satellite type and study area.

MIP imbeds sensor-independent algorithms and processing modules to derive consistent water quality parameters for multiple scales through a number of different satellite sensors. The algorithms take all relevant environmental impacts into account and do so for each individual measurement and pixel according to the current state-of-the-art, including:

a. water, land, cloud identification
b. estimation and correction of atmosphere and aerosol impacts[1] [2]
c. correction altitude level impacts[3]
d. correction of adjacency impact (light scattering into the water signal from adjacent land surfaces)[4]
e. correction[5] or flagging[6] of sunglitter impact
f. retrieval of in-water absorption and scattering as physical measures[7]
g. accounting for varying spectral slopes of specific inherent optical properties[8]
h. provision of uncertainty measures and flagging procedures
i. accounting for the full bidirectional effects in the atmosphere, at the water-atmosphere boundary layers and in-water, using a fully coupled radiative transfer model
j. application of procedures to minimize errors, resulting from the coupled interaction of light between atmosphere, water surface and in-water on the signal, through coupled inversion procedures

The different workflow steps from satellite raw imagery import to value-added water quality retrieval are displayed in Figure 1.

---

[1] Heege, T., Kiselev, V., Wettle, M., Hung N.N. (2014): Operational multi-sensor monitoring of turbidity for the entire Mekong Delta . Int. J. Remote Sensing, Special Issues Remote Sensing of the Mekong, Vol. 35 (8), pp. 2910-2926

[2] Richter, R., Heege, T., Kiselev, V., Schläpfer, D. (2014): Correction of ozone influence on TOA radiance. Int. J. of Remote Sensing. Vol. 35(23), pp. 8044-8056, doi: 10.1080/01431161.2014.978041

[3] Heege, T., Fischer, J. (2004): Mapping of water constituents in Lake Constance using multispectral airborne scanner data and a physically based processing scheme. Can. J. Remote Sensing, Vol. 30, No. 1, pp. 77-86

[4] Kiselev, V., Bulgarelli, B. and Heege, T., (2015). Sensor independent adjacency correction algorithm for coastal and inland water systems. Remote Sensing of Environment, 157: 85-95. , ISSN 0034-4257, http://dx.doi.org/10.1016/j.rse.2014.07.025

[5] Heege, T. & Fischer, J. (2000): Sun glitter correction in remote sensing imaging spectrometry. SPIE Ocean Optics XV Conference, Monaco, Oct. 16-20.

[6] EU FP7-Projekt GLASS: WP4 Validation report (29.2.2016): www.glass-project.eu/assets/Deliverables/GLaSS-D4.2.pdf

[7] Bumberger J., Heege T., Klinger P., et al. (2017): Towards a Harmonized Validation Procedure for Inland Water Optical Remote Sensing Data using Inherent Optical Properties, Rem. Sens. 2017(9), 21p, submitted 28 Feb. 2017

[8] Heege T., Schenk K., Klinger P., Broszeit A., Wenzel J., Kiselev V. (2015): Monitoring status and trends of water quality in inland waters using earth observation technologies. Proceedings "Water Quality in Europe: Challenges and Best Practice" UNESCO-IHP European Regional Consultation Workshop, Koblenz, Germany, Dec 2015, p. 1-4

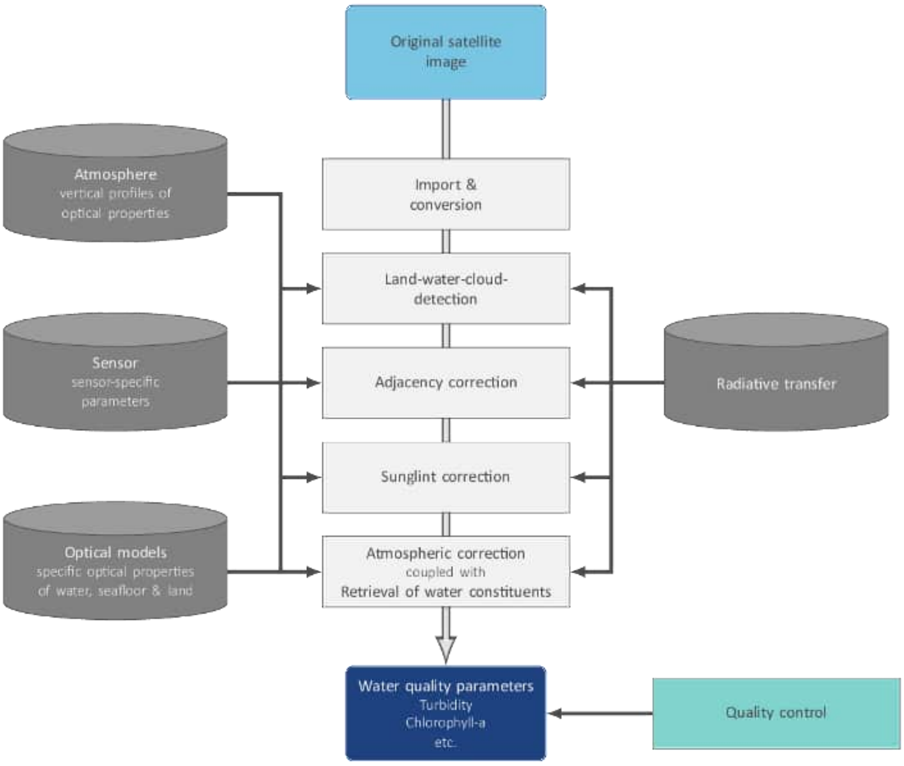


Figure 1: EOMAP's physics-based workflow to derive satellite-based water quality

MIP is the most established, sensor-independent and operational aquatic remote sensing processing system for the full range of high, medium and low-resolution satellite sensors. Fully-automated water monitoring processors are installed in satellite ground segments worldwide (Europe, Australia, Asia and America), to ensure fast and efficient access to a wide range of satellite data. The data processing and orchestration software, the EOMAP Workflow System (EWS) allows for continuous, daily production.

3. Products

3.1. Turbidity (TUR)

Turbidity (TUR) is a key parameter of water quality and is linearly related to the backward scattering of light of organic and inorganic particles in water. Turbidity is also linearly related to Total Suspended Matter (TSM) at low to moderate turbidity values. The measurement unit is Nephelometric Turbidity Unit (NTU). Satellite-derived turbidity is determined by the backward scattering of light between 450 to 800nm, which is physically retrieved using satellite data. The standard relation of EOMAP concentrations to inherent optical properties is defined as 1 NTU = 0.0118 1/m backward scattering at 550nm, or 1 NTU = 0.619 1/m total scattering at 550nm for an assumed ratio bb/b = 0.019. The linear relation between turbidity and suspended matter/solids in low to moderate concentrations is in most cases a regional constant, but can vary with particle size distribution. Note that the geometrical properties of an in-situ measurement device, and the wavelength in use, may differ in comparison to the satellite product. For example, the standard FTU determination, a measure of turbidity similar to NTU, is based on the measurement of light scattered within a 90° angle from a beam directed at the water sample. Alongside temporal differences in satellite and in situ measurements, different sampling depths and the measurement location, this needs to be considered when comparing and interpreting satellite derived vs. in situ measured turbidity values. The Turbidity product from 2023-08-06 is shown in Figure 2.

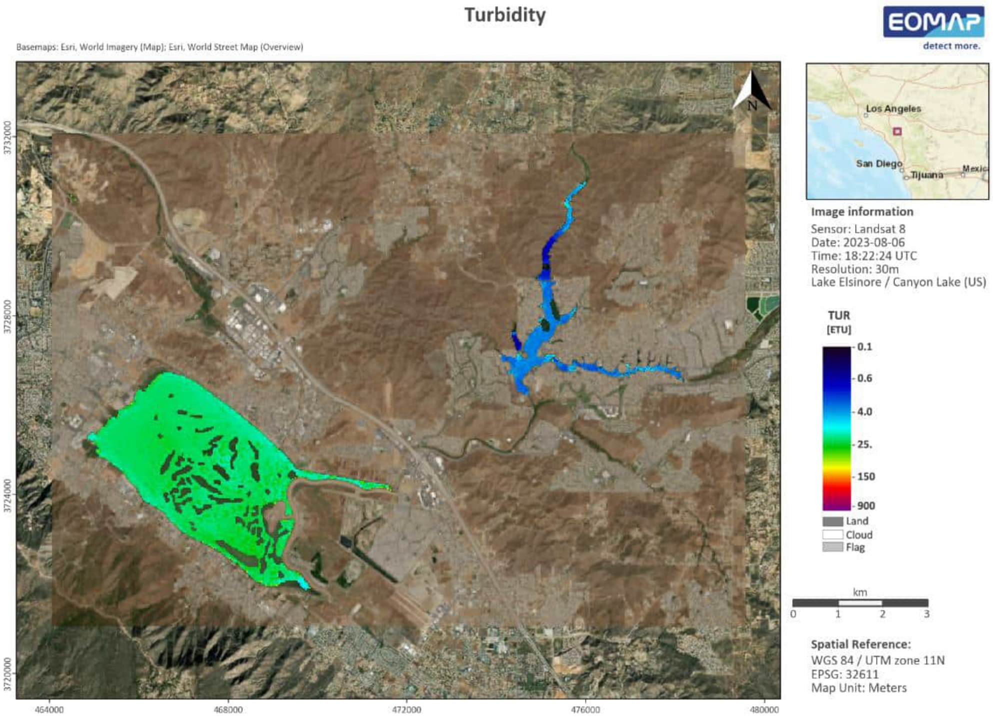


Figure 2: Turbidity product from 2023-08-06

3.2. Chlorophyll-a (CHL)

Chlorophyll-a (CHL) retrieval is based on the derived information of in-water organic absorption, in-water turbidity and spectral characteristics of each water body. Chlorophyll-a in [µg/l], is provided as a measure linearly related to the pigment-specific absorption at 440nm, with 1 µg/l Chl equal to 0.035 1/m pigment absorption. Phaeophytin and further pigments cannot be discriminated methodologically with the spectral resolution provided by Landsat 8/Sentinel-2 and similar sensors and is therefore included in this product. The pigment-related absorption is always smaller than the absorption of organic components (SOA). For clear water conditions (low chlorophyll/total suspended solids), the specific absorption chlorophyll increases significantly (Bricaud et al. 1995[9]). Chlorophyll values can vary over 4 magnitudes, for marine waters or clear lakes typical concentrations between 0.01 and 10 µg/l, while for eutrophic lakes concentrations can reach 100 µg/l and more. The chlorophyll products are typically reliable within a range of 10 – 50 % in comparison to in situ measures (Broszeit 2015[10]), which are typically based on one of three different methods, which include photometric, fluorescence and HPLC approaches and their subcategories. The Chlorophyll-a product from 2023-08-06 is shown in Figure 3.

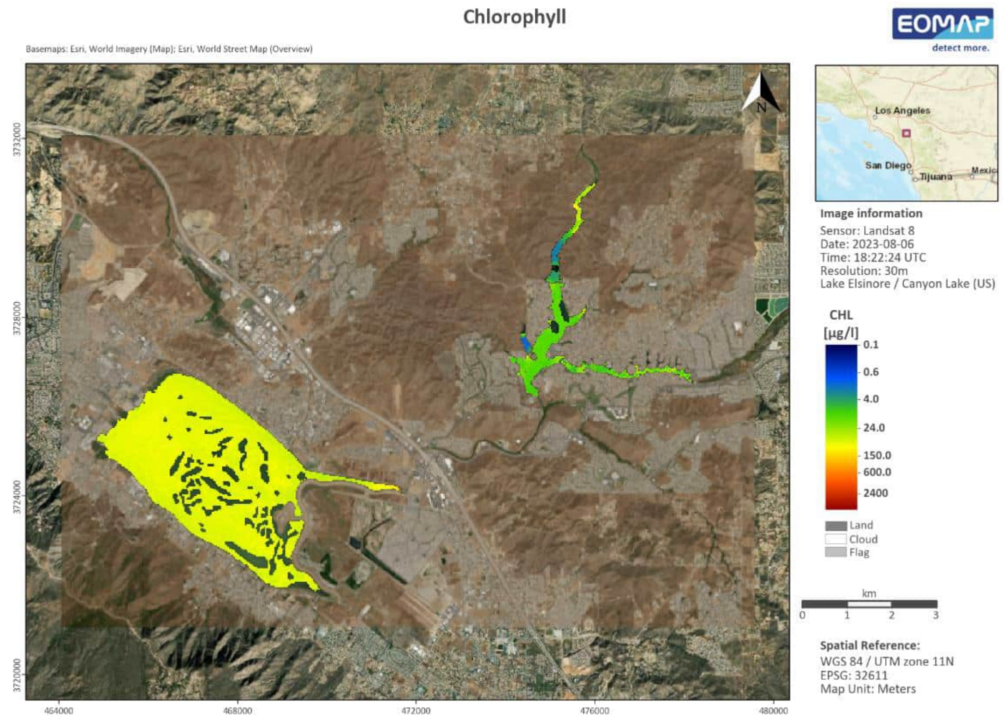


Figure 3: Chlorophyll-a product from 2023-08-06

---

[9] Bricaud, A., Babin, M., Morel, A., Claustre, H. (1995): Variability in the chlorophyll-specific absorption coefficients of natural phytoplankton: Analysis and parametrization. Journal of Geophysical Research Atmospheres, 100(C7):13,321-13,332

[10] Broszeit, A., 2015. Assessing long-term inland water quality using satellite imagery: A Feasibility and validation study of different lake types. MSc Thesis, Julius-Maximilian-University Würzburg, 96p

3.3. Harmful Algae Bloom Indicator (HAB)

The **Harmful Algae Bloom Indicator** (HAB) refers to the presence of cyanobacteria. It is sensitive to the appearance of cyanobacteria-related pigments, i.e. phycocyanin and phycoerythrin. Both pigments show absorption features in green wavelengths from 500 nm to approx. 640 nm; phycoerythrin shows its absorption maximum at 540-570 nm, phycocyanin at 610-620 (Colyer et al. 2005). Most satellite sensors support the identification of this feature with only two bands, i.e. one in the green wavelength region (e.g. L7 and L8 at 530 – 590 nm) and in the red wavelength region at approx. 640 – 670 nm. The used standard parameterisation of phytoplankton absorption in MIP as described above, however, does not account phycocyanin and phycoerythrin absorption in the retrieval process. The modelled phytoplankton absorption therefore lacks the absorption features of these pigments. Nonetheless, if these pigments are present in the water a slight spectral mismatch between modelled water leaving reflectance ($R_{modelled}$) and satellite derived reflectance ($R_{satellite}$) occurs. The algorithm then compares the slope of $R_{modelled}$ and $R_{satellite}$ between the green and red band ($\delta R = R_{green} - R_{red}$) in order to classify pixels with regard to phycocyanin and phycoerythrin occurrence, i.e. harmful algae bloom probability. The HAB indicator from 2023-08-06 is shown in Figure 4.

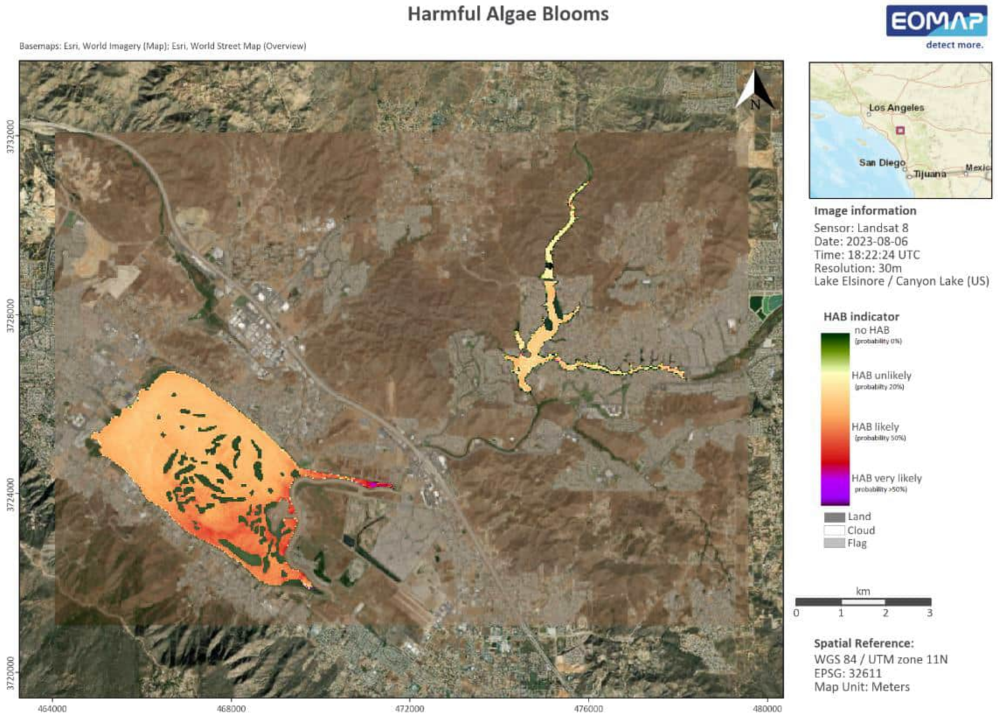


Figure 4: Harmful Algae Bloom Indicator product from 2023-08-06

3.4. True color composite (RGB)

RGB composite images represent the area of interest in true colour or false colour modes by combining predefined bands, depending on the sensor in use.

4. Quality Control and Flagging

As a standard output of the processing, an accuracy or quality indicator is calculated for each retrieved parameter and for each detected water pixel. This measure comprises a comprehensive range of factors that can impact the derived product quality, including:

- the geometry between sun, target, and sensor,
- the estimated sun glint probability,
- the retrieved aerosol optical depth,
- residuals of the measured and modelled sensor radiance and subsurface reflectance,
- the comparison of retrieved water species concentrations to extreme values as defined in the configuration files,
- pixels affected by cloud shadow and
- shallow water areas.

Threshold values define distinct values when a parameter is assumed to influence the quality. All parameters are integrated into one remaining quality parameter, allowing both an improved flagging and a quality weighting of pixels, that can later be merged into integrated 3rd level products.

The quality information is part of each standard geodata delivery and is visualized by two different 8bit GeoTIFFs:

- QUT - Total Quality, quantifying the overall quality of each pixel from low to high. Only valid water pixels - excluding land, cloud or flagged pixels - are represented in QUT indicator (Figure 5).
- QUC – EOMAP Quality coding (Figure 6), revealing the processor's internal quality check, split into the defined indicators (e.g. sunglint, shallow water risk, etc.). These are classified into 'no quality concerns', 'quality risk and 'bad quality' (flag). Note that 'quality risk' pixels are marked as such but not flagged.

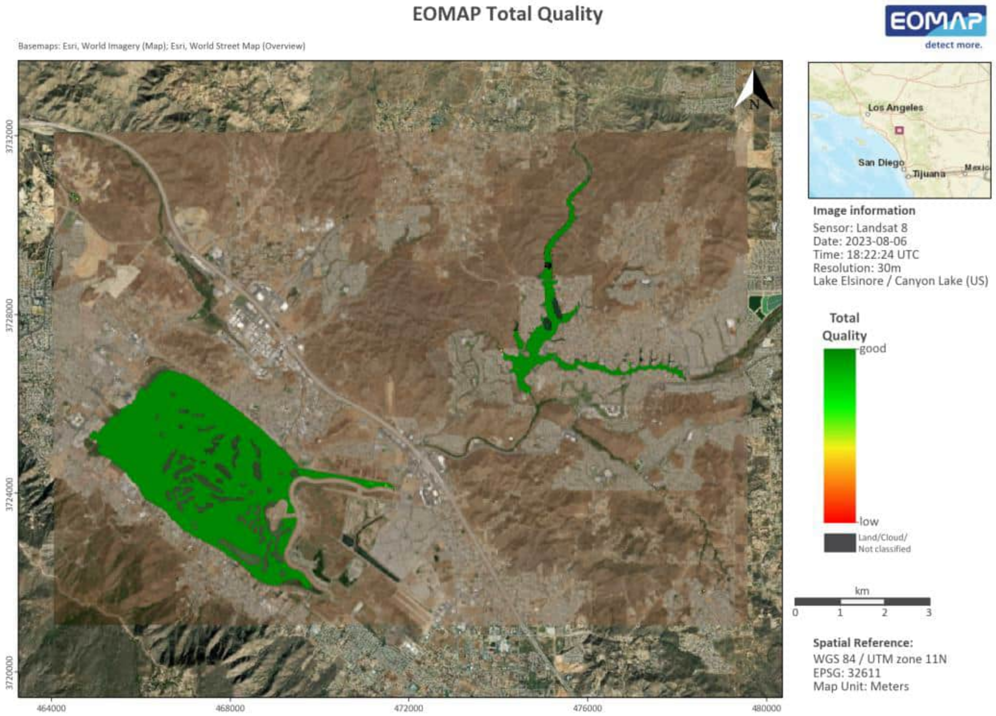


Figure 5: QUT product from 2023-08-06

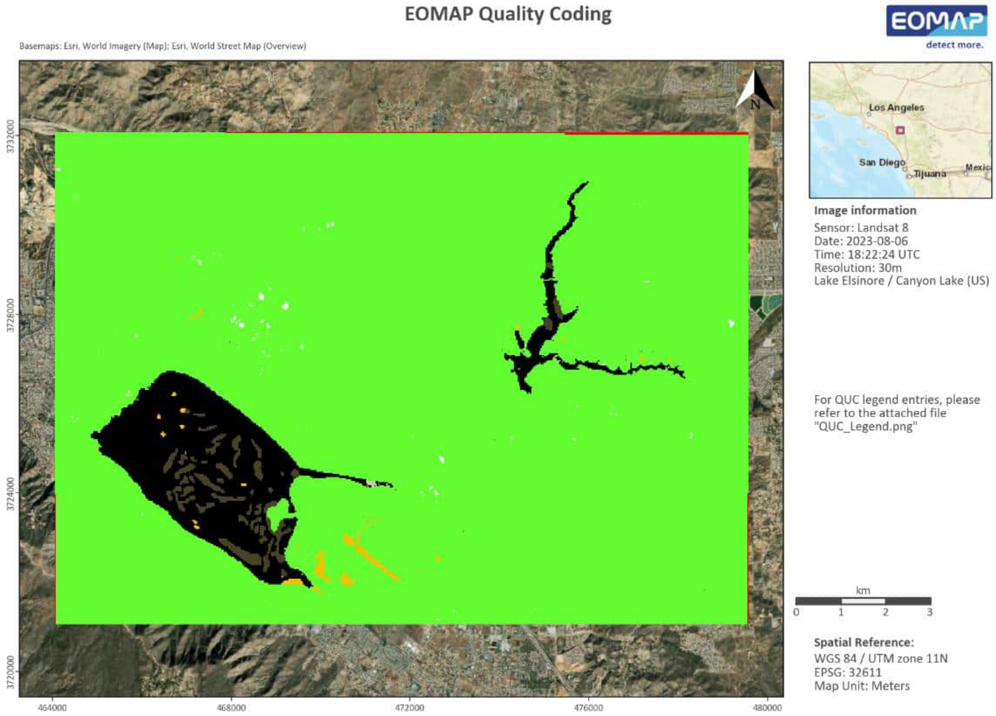
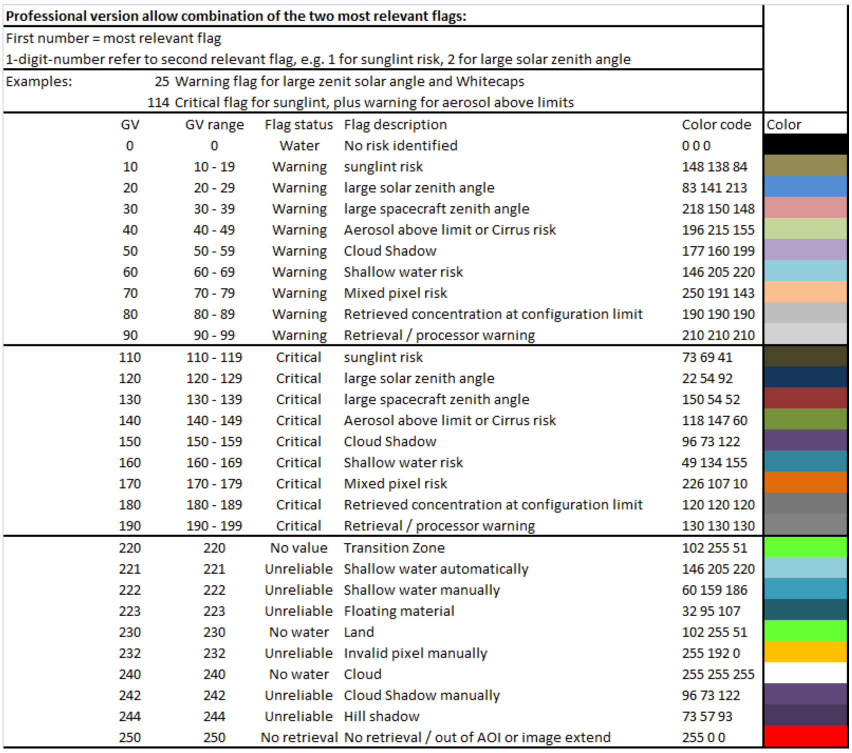


Figure 6: QUC product from 2023-08-06

The QUC file indicates the main quality influencing parameter using a specific EOMAP quality coding classification scheme with corresponding grey values (GV), shown in Figure 7.



Professional version allow combination of the two most relevant flags:

First number = most relevant flag

1-digit-number refer to second relevant flag, e.g. 1 for sunglint risk, 2 for large solar zenith angle

Examples: 25 Warning flag for large zenit solar angle and Whitecaps
114 Critical flag for sunglint, plus warning for aerosol above limits

GV	GV range	Flag status	Flag description	Color code	Color
0	0	Water	No risk identified	0 0 0	⬛
10	10 - 19	Warning	sunglint risk	148 138 84	🟫
20	20 - 29	Warning	large solar zenith angle	83 141 213	🟦
30	30 - 39	Warning	large spacecraft zenith angle	218 150 148	🟥
40	40 - 49	Warning	Aerosol above limit or Cirrus risk	196 215 155	🟩
50	50 - 59	Warning	Cloud Shadow	177 160 199	🟪
60	60 - 69	Warning	Shallow water risk	146 205 220	🟦
70	70 - 79	Warning	Mixed pixel risk	250 191 143	🟧
80	80 - 89	Warning	Retrieved concentration at configuration limit	190 190 190	▨
90	90 - 99	Warning	Retrieval / processor warning	210 210 210	▨
110	110 - 119	Critical	sunglint risk	73 69 41	🟫
120	120 - 129	Critical	large solar zenith angle	22 54 92	🟦
130	130 - 139	Critical	large spacecraft zenith angle	150 54 52	🟥
140	140 - 149	Critical	Aerosol above limit or Cirrus risk	118 147 60	🟩
150	150 - 159	Critical	Cloud Shadow	96 73 122	🟪
160	160 - 169	Critical	Shallow water risk	49 134 155	🟦
170	170 - 179	Critical	Mixed pixel risk	226 107 10	🟧
180	180 - 189	Critical	Retrieved concentration at configuration limit	120 120 120	▨
190	190 - 199	Critical	Retrieval / processor warning	130 130 130	▨
220	220	No value	Transition Zone	102 255 51	🟩
221	221	Unreliable	Shallow water automatically	146 205 220	🟦
222	222	Unreliable	Shallow water manually	60 159 186	🟦
223	223	Unreliable	Floating material	32 95 107	🟦
230	230	No water	Land	102 255 51	🟩
232	232	Unreliable	Invalid pixel manually	255 192 0	🟨
240	240	No water	Cloud	255 255 255	⬜
242	242	Unreliable	Cloud Shadow manually	96 73 122	🟪
244	244	Unreliable	Hill shadow	73 57 93	🟪
250	250	No retrieval	No retrieval / out of AOI or image extend	255 0 0	🟥

Figure 7: EOMAP QUC quality coding

EOMAP's water quality products are accompanied by the processor's internal quality control mechanisms QUT and QUC, resulting in pixel flagging in case of unreliable values. Moreover, a manual quality check and - if required - additional masking is applied to each product.

As an example, cloud shadow effects typically occur in the vicinity of clouds, resulting in unrealistically low water parameter values. In order to detect and flag these areas, EOMAP has developed a specific algorithm based on geometric models, considering the sun angle and sensor viewing geometry, the retrieved aerosol properties, the height of the clouds, an analysis of the blue channel radiances and a statistical anomaly detection of the water species concentrations. When applying this cloud shadow detection algorithm, approx. 85% of the cloud shadows are detected and masked. Remaining cloud shadows are manually flagged and can be identified in the QUC file by GV 242.

Due to the spatial extent of single pixels (Sentinel-2: 10*10m, Landsat 8/9: 30*30m), it is likely that spectral mixing of signals from land and water can affect the pixels along the edge of the water body, leading to unreliable retrieval of water parameter values. Such pixels are labelled with the quality flag 'transition zone'. EOMAP uses a high-resolution land-water-mask database to determine the land-water-boundary, which is then filtered to create a transition zone that is automatically flagged during processing. In the 8bit water constituent products the transition zone is marked by GV 251, whereas in the QUC product it is 220.

5. Data Format

The water quality data are delivered as 32bit real value GeoTIFFs as well as 8bit scaled and colored GeoTIFFs for easier visualization. These colors are only a suggestion a corresponding to EOMAPs standard except for the HAB visualization, which has been changed according to a client-specific request. In addition, KMZ- as well as XYZ-files are delivered as per client request.

6. Data Sources

EOMAP uses the following the AWS data hub (https://registry.opendata.aws/index.html) to access and download satellite raw data from different sensors.

- Landsat 8/9: https://registry.opendata.aws/usgs-landsat/index.html
- Sentinel-2: https://registry.opendata.aws/sentinel-2/

EOMAP
Schlosshof 4
82229 Seefeld
Germany
+49 (0)8152 99861 10
info@eomap.com
www.eomap.com

Delivery report

Water Quality Monitoring: Lake Elsinore & Canyon Lake

Date: 2024-02-01
Version: 31

Clients: Wood Plc.
Reference: 2370_Delivery_EOMAP2WoodPlc

EOMAP GmbH & Co.KG,
Schlosshof 4, 82229 Seefeld
Germany

Authors:	Email	Phone
Hendrik Bernert	bernert@eomap.de	+49 8152 99861 14
Minha Sultan	sultan@eomap.de	+49 8152 99861 14

CONTENT

1. Service Provision Report

Contractor Details	Service Provider Details
Wood Environment & Infrastructure Solutions, Inc.	EOMAP GmbH & Co. KG
9210 Sky Park Court, Suite 200	Schlosshof 4, 82229 Seefeld, Germany
San Diego, CA 92123, USA	
Point of Contact	**Point of Contact**
John D. Rudolph	Hendrik Bernert
john.rudolph@woodplc.com	bernert@eomap.de, +49 (0)8152 9986114

Contractor PO / Reference number	
Contractor project title	
Service Provider reference number	2370
Date of delivery	2024-02-01
Version	31

1.1. List of all delivered scenes

Sensor	Time of record
Sentinel-2	2023-09-20 18:45:01 UTC

1.2. Content

Product	Abbreviation	Yes/No
Total Absorption	ABS	☐
Aerosol Optical Thickness	AOT	☐
Yellow Substances	CDM	☐
Chlorophyll-a	CHL	☒
Ratio of Absorption and Scattering	DIV	☐
Harmful Algae Bloom Indicator	HAB	☒
Diffuse Attenuation Coefficient	KDC	☐
Quality Coding	QUC	☒
Total Quality	QUT	☒
True Color/False Color Composite	RGB	☒
Remote Sensing Reflectance	RRS	☐
Secchi Disc Depth	SDD	☐
Sum of Inorganic Absorption	SIA	☐
Sum if Organic Absorption	SOA	☐
Surface Temperature	SST	☐
Turbidity	TUR	☒
Trophic State Index (Chlorophyll)	TSC	☐
Total Suspended Matter	TSM	☐
Light Penetration Depth	Z90	☐
Water Body Extent	WEX	☐

1.3. List of delivered files (one product example)

File name	File format	Content
2370_Delivery_EOMAP2WoodPlc_Vs31_20240201.pdf	PDF	Delivery Report
CHL_us-california_11smt_EOMAP_20230920_184501_SENT2_m0010.tif	GeoTIFF	Product raster file, 8bit scaled and coloured
CHL_us-california_11smt_EOMAP_20230920_184501_SENT2_m0010_32bit.tif	GeoTIFF	Product raster file, 32bit real values
CHL_us-california_11smt_EOMAP_20230920_184501_SENT2_m0010_32bit_wgs84.txt	ASCII	Product text file, real values
CHL_us-california_11smt_EOMAP_20230920_184501_SENT2_m0010.kmz	KMZ	GoogleEarth overlay
CHL_us-california_11smt_EOMAP_20230920_184501_SENT2_m0010.xml	XML	Metadata
CHL_us-california_11smt_EOMAP_20230920_184501_SENT2_m0010_overview.pdf	PDF	Overview PDF, metadata and quicklook

1.4. File naming

[Product abbreviation]_[Country code]-[Area]_EOMAP_[Date of satellite image recording]_[Time of satellite image recording]_[sensor code]_[spatial resolution]_[optional]

With

[Product abbreviation]	see list of product abbreviations
[Country code]	Country ID following ISO 3166 ALPHA-2 standards
[Area]	name of city/region or other relevant area characterization
[Date of satellite image rec.]	Satellite image date used for the analysis in YYMMDD (YY= Year, MM = Month, DD = Date) in UTC
[Time of satellite image rec.]	Satellite image date used for the analysis in HHMMSS (HH= Hours, MM = Minute, SS = Seconds) in UTC time
[sensor code]	Sensor in use
[spatial resolution]	Spatial resolution/grid spacing in meters
[optional]	is an optional parameter which can is used to support the intuitive use of the data, such as ‘metadata’ or ‘XYZQ’ for metadata files and ASCII XYZQ files.

1.5. Notes (e.g. technical issues, exceptional conditions, etc.)

- None

Data Analyst	QA/QC
Hendrik Bernert	
Hendrik Bernert	Minha Sultan

2. Methodology: Modular Inversion and Processing System (MIP)

For the retrieval of satellite-derived water quality data, the physics-based Modular Inversion and Processing System (MIP), developed by EOMAP, has been applied to the satellite imagery. This sensor-independent approach includes all the relevant processing steps to guarantee a robust, standardised and operational retrieval of water quality parameters from various satellite data sources. The advantage of physics-based methods is that they do not require a priori information about the study area and can therefore be applied independently of satellite type and study area.

MIP imbeds sensor-independent algorithms and processing modules to derive consistent water quality parameters for multiple scales through a number of different satellite sensors. The algorithms take all relevant environmental impacts into account and do so for each individual measurement and pixel according to the current state-of-the-art, including:

a. water, land, cloud identification
b. estimation and correction of atmosphere and aerosol impacts[1] [2]
c. correction altitude level impacts[3]
d. correction of adjacency impact (light scattering into the water signal from adjacent land surfaces)[4]
e. correction[5] or flagging[6] of sunglitter impact
f. retrieval of in-water absorption and scattering as physical measures[7]
g. accounting for varying spectral slopes of specific inherent optical properties[8]
h. provision of uncertainty measures and flagging procedures
i. accounting for the full bidirectional effects in the atmosphere, at the water-atmosphere boundary layers and in-water, using a fully coupled radiative transfer model
j. application of procedures to minimize errors, resulting from the coupled interaction of light between atmosphere, water surface and in-water on the signal, through coupled inversion procedures

The different workflow steps from satellite raw imagery import to value-added water quality retrieval are displayed in Figure 1.

---

[1] Heege, T., Kiselev, V., Wettle, M., Hung N.N. (2014): Operational multi-sensor monitoring of turbidity for the entire Mekong Delta . Int. J. Remote Sensing, Special Issues Remote Sensing of the Mekong, Vol. 35 (8), pp. 2910-2926

[2] Richter, R., Heege, T., Kiselev, V., Schläpfer, D. (2014): Correction of ozone influence on TOA radiance. Int. J. of Remote Sensing. Vol. 35(23), pp. 8044-8056, doi: 10.1080/01431161.2014.978041

[3] Heege, T., Fischer, J. (2004): Mapping of water constituents in Lake Constance using multispectral airborne scanner data and a physically based processing scheme. Can. J. Remote Sensing, Vol. 30, No. 1, pp. 77-86

[4] Kiselev, V., Bulgarelli, B. and Heege, T., (2015). Sensor independent adjacency correction algorithm for coastal and inland water systems. Remote Sensing of Environment, 157: 85-95. , ISSN 0034-4257, http://dx.doi.org/10.1016/j.rse.2014.07.025

[5] Heege, T. & Fischer, J. (2000): Sun glitter correction in remote sensing imaging spectrometry. SPIE Ocean Optics XV Conference, Monaco, Oct. 16-20.

[6] EU FP7-Projekt GLASS: WP4 Validation report (29.2.2016): www.glass-project.eu/assets/Deliverables/GLaSS-D4.2.pdf

[7] Bumberger J., Heege T., Klinger P., et al. (2017): Towards a Harmonized Validation Procedure for Inland Water Optical Remote Sensing Data using Inherent Optical Properties, Rem. Sens. 2017(9), 21p, submitted 28 Feb. 2017

[8] Heege T., Schenk K., Klinger P., Broszeit A., Wenzel J., Kiselev V. (2015): Monitoring status and trends of water quality in inland waters using earth observation technologies. Proceedings “Water Quality in Europe: Challenges and Best Practice” UNESCO-IHP European Regional Consultation Workshop, Koblenz, Germany, Dec 2015, p. 1-4

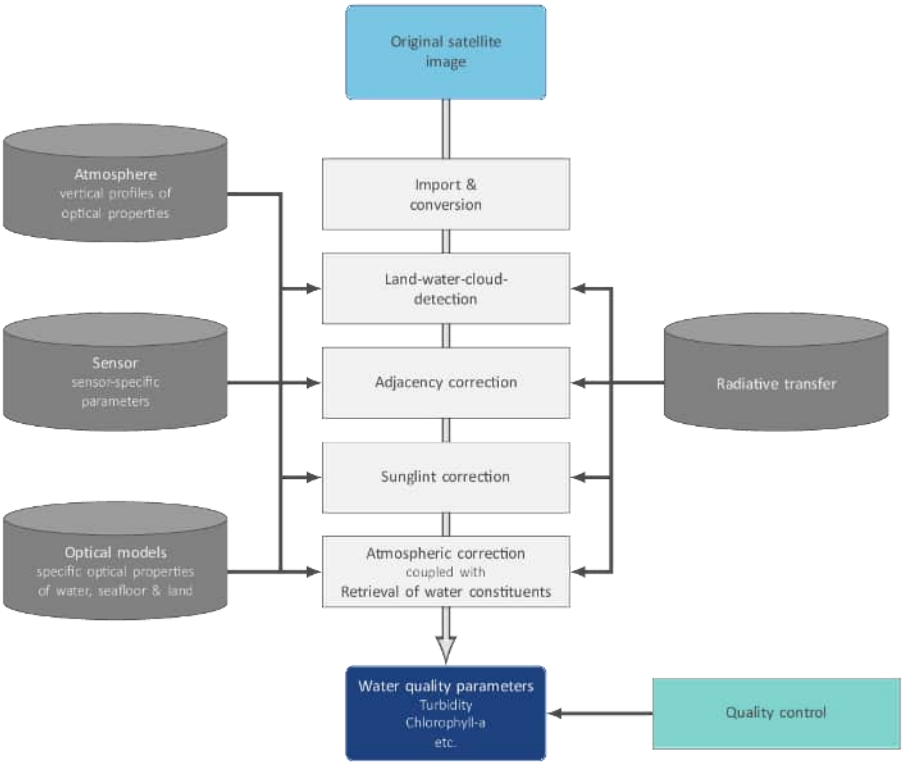


Figure 1: EOMAP's physics-based workflow to derive satellite-based water quality

MIP is the most established, sensor-independent and operational aquatic remote sensing processing system for the full range of high, medium and low-resolution satellite sensors. Fully-automated water monitoring processors are installed in satellite ground segments worldwide (Europe, Australia, Asia and America), to ensure fast and efficient access to a wide range of satellite data. The data processing and orchestration software, the EOMAP Workflow System (EWS) allows for continuous, daily production.

3. Products

3.1. Turbidity (TUR)

Turbidity (TUR) is a key parameter of water quality and is linearly related to the backward scattering of light of organic and inorganic particles in water. Turbidity is also linearly related to Total Suspended Matter (TSM) at low to moderate turbidity values. The measurement unit is Nephelometric Turbidity Unit (NTU). Satellite-derived turbidity is determined by the backward scattering of light between 450 to 800nm, which is physically retrieved using satellite data. The standard relation of EOMAP concentrations to inherent optical properties is defined as 1 NTU = 0.0118 1/m backward scattering at 550nm, or 1 NTU = 0.619 1/m total scattering at 550nm for an assumed ratio bb/b = 0.019. The linear relation between turbidity and suspended matter/solids in low to moderate concentrations is in most cases a regional constant, but can vary with particle size distribution. Note that the geometrical properties of an in-situ measurement device, and the wavelength in use, may differ in comparison to the satellite product. For example, the standard FTU determination, a measure of turbidity similar to NTU, is based on the measurement of light scattered within a 90° angle from a beam directed at the water sample. Alongside temporal differences in satellite and in situ measurements, different sampling depths and the measurement location, this needs to be considered when comparing and interpreting satellite derived vs. in situ measured turbidity values. The Turbidity product from 2023-09-20 is shown in Figure 2.

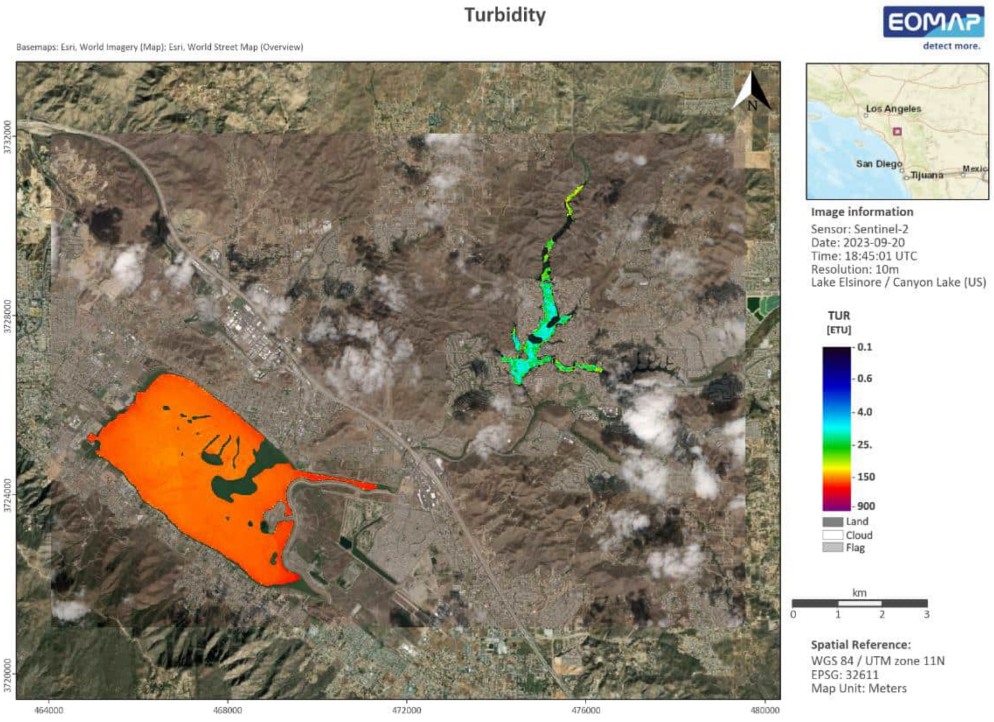


Figure 2: Turbidity product from 2023-09-20

3.2. Chlorophyll-a (CHL)

Chlorophyll-a (CHL) retrieval is based on the derived information of in-water organic absorption, in-water turbidity and spectral characteristics of each water body. Chlorophyll-a in [µg/l], is provided as a measure linearly related to the pigment-specific absorption at 440nm, with 1 µg/l Chl equal to 0.035 1/m pigment absorption. Phaeophytin and further pigments cannot be discriminated methodologically with the spectral resolution provided by Landsat 8/Sentinel-2 and similar sensors and is therefore included in this product. The pigment-related absorption is always smaller than the absorption of organic components (SOA). For clear water conditions (low chlorophyll/total suspended solids), the specific absorption chlorophyll increases significantly (Bricaud et al. 1995[9]). Chlorophyll values can vary over 4 magnitudes, for marine waters or clear lakes typical concentrations between 0.01 and 10 µg/l, while for eutrophic lakes concentrations can reach 100 µg/l and more. The chlorophyll products are typically reliable within a range of 10 – 50 % in comparison to in situ measures (Broszeit 2015[10]), which are typically based on one of three different methods, which include photometric, fluorescence and HPLC approaches and their subcategories. The Chlorophyll-a product from 2023-09-20 is shown in Figure 3.

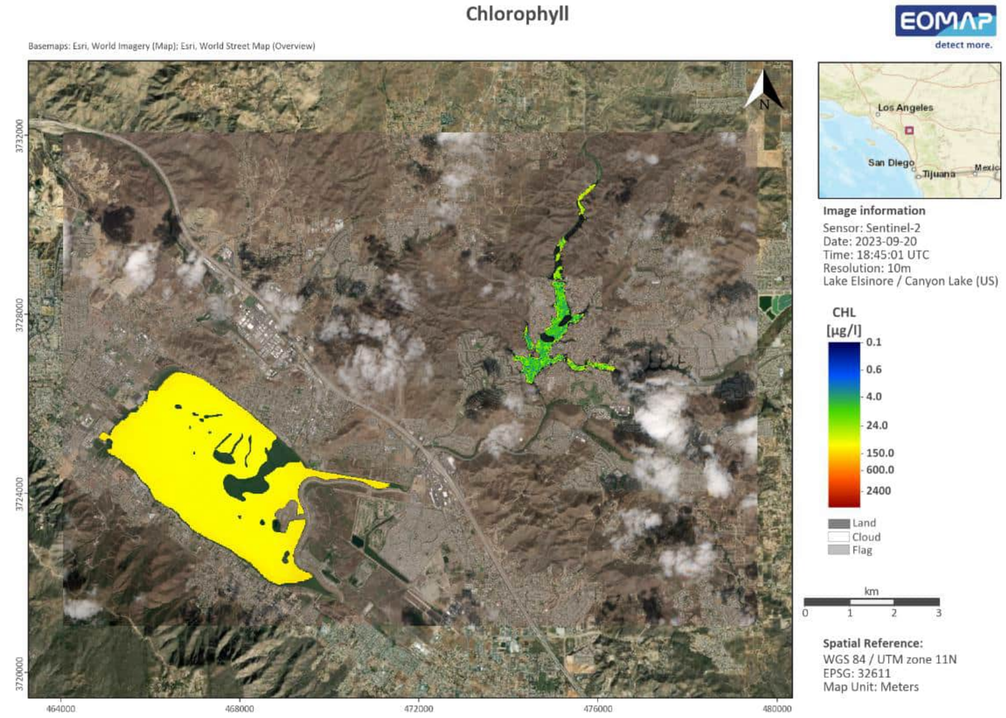


Figure 3: Chlorophyll-a product from 2023-09-20

---

[9] Bricaud, A., Babin, M., Morel, A., Claustre, H. (1995): Variability in the chlorophyll-specific absorption coefficients of natural phytoplankton: Analysis and parametrization. Journal of Geophysical Research Atmospheres, 100(C7):13,321-13,332

[10] Broszeit, A., 2015. Assessing long-term inland water quality using satellite imagery: A Feasibility and validation study of different lake types. MSc Thesis, Julius-Maximilian-University Würzburg, 96p

3.3. Harmful Algae Bloom Indicator (HAB)

The **Harmful Algae Bloom Indicator** (HAB) refers to the presence of cyanobacteria. It is sensitive to the appearance of cyanobacteria-related pigments, i.e. phycocyanin and phycoerythrin. Both pigments show absorption features in green wavelengths from 500 nm to approx. 640 nm; phycoerythrin shows its absorption maximum at 540-570 nm, phycocyanin at 610-620 (Colyer et al. 2005). Most satellite sensors support the identification of this feature with only two bands, i.e. one in the green wavelength region (e.g. L7 and L8 at 530 – 590 nm) and in the red wavelength region at approx. 640 – 670 nm. The used standard parameterisation of phytoplankton absorption in MIP as described above, however, does not account phycocyanin and phycoerythrin absorption in the retrieval process. The modelled phytoplankton absorption therefore lacks the absorption features of these pigments. Nonetheless, if these pigments are present in the water a slight spectral mismatch between modelled water leaving reflectance ($R_{modelled}$) and satellite derived reflectance ($R_{satellite}$) occurs. The algorithm then compares the slope of $R_{modelled}$ and $R_{satellite}$ between the green and red band ($\delta R = R_{green} - R_{red}$) in order to classify pixels with regard to phycocyanin and phycoerythrin occurrence, i.e. harmful algae bloom probability. The HAB indicator from 2023-09-20 is shown in Figure 4.

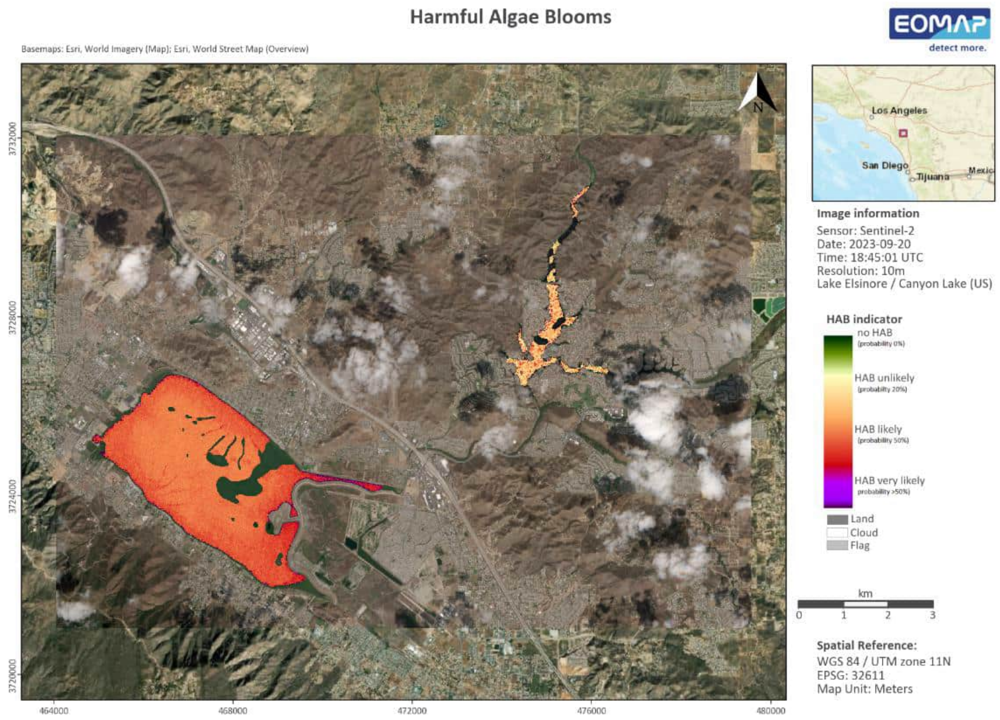


Figure 4: Harmful Algae Bloom Indicator product from 2023-09-20

3.4. True color composite (RGB)

RGB composite images represent the area of interest in true colour or false colour modes by combining predefined bands, depending on the sensor in use.

4. Quality Control and Flagging

As a standard output of the processing, an accuracy or quality indicator is calculated for each retrieved parameter and for each detected water pixel. This measure comprises a comprehensive range of factors that can impact the derived product quality, including:

- the geometry between sun, target, and sensor,
- the estimated sun glint probability,
- the retrieved aerosol optical depth,
- residuals of the measured and modelled sensor radiance and subsurface reflectance,
- the comparison of retrieved water species concentrations to extreme values as defined in the configuration files,
- pixels affected by cloud shadow and
- shallow water areas.

Threshold values define distinct values when a parameter is assumed to influence the quality. All parameters are integrated into one remaining quality parameter, allowing both an improved flagging and a quality weighting of pixels, that can later be merged into integrated 3rd level products.

The quality information is part of each standard geodata delivery and is visualized by two different 8bit GeoTIFFs:

- QUT - Total Quality, quantifying the overall quality of each pixel from low to high. Only valid water pixels - excluding land, cloud or flagged pixels - are represented in QUT indicator (Figure 5).
- QUC – EOMAP Quality coding (Figure 6), revealing the processor's internal quality check, split into the defined indicators (e.g. sunglint, shallow water risk, etc.). These are classified into 'no quality concerns', 'quality risk and 'bad quality' (flag). Note that 'quality risk' pixels are marked as such but not flagged.

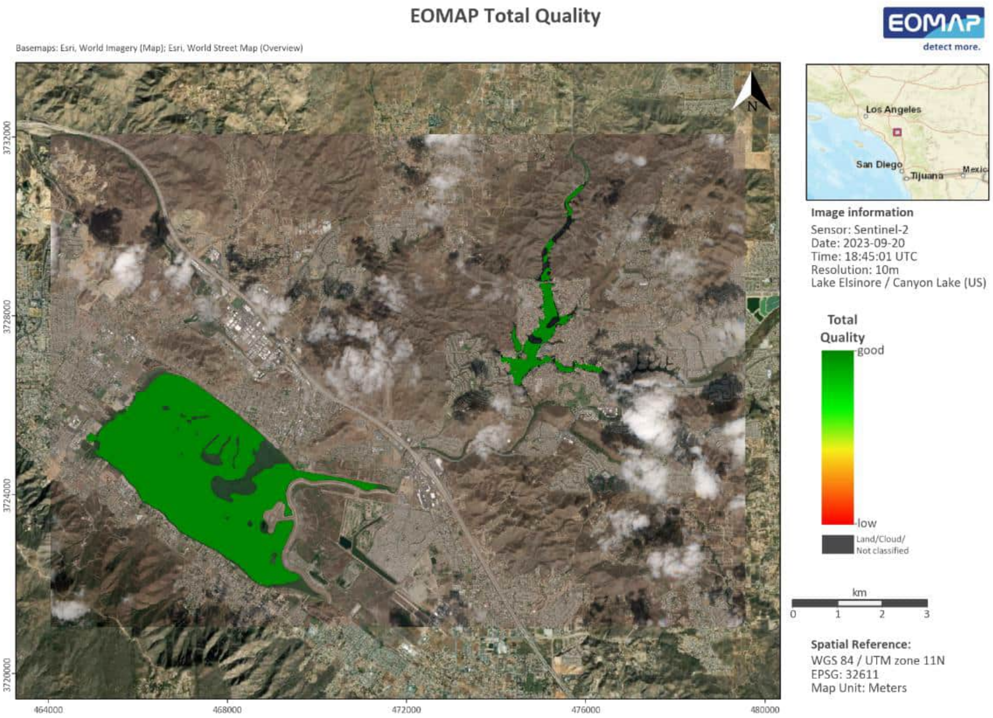


Figure 5: QUT product from 2023-09-20

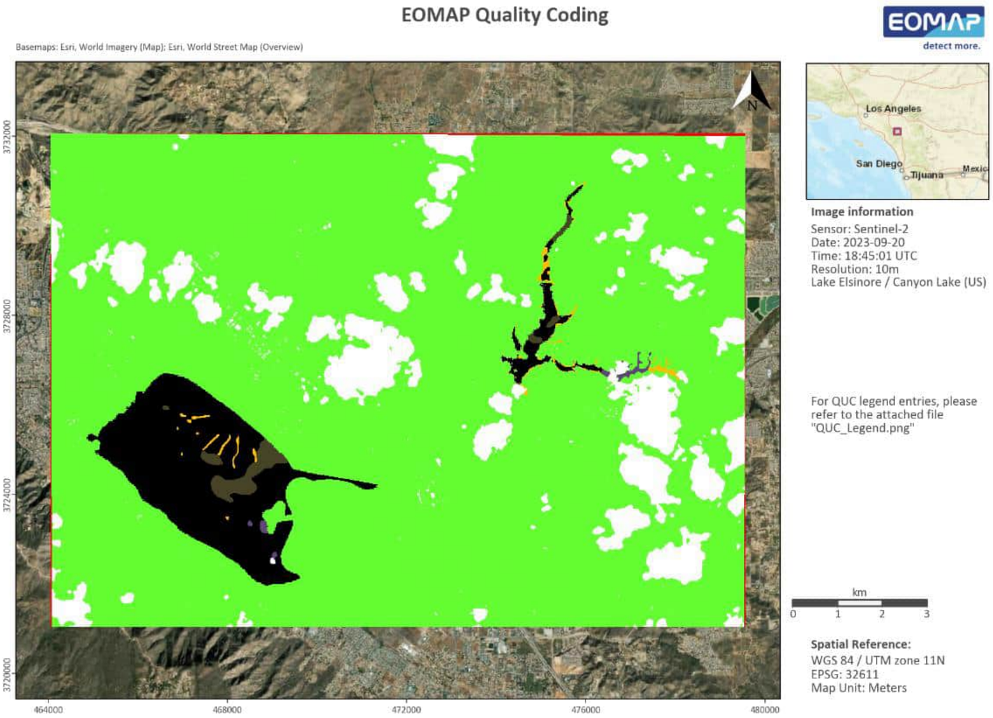
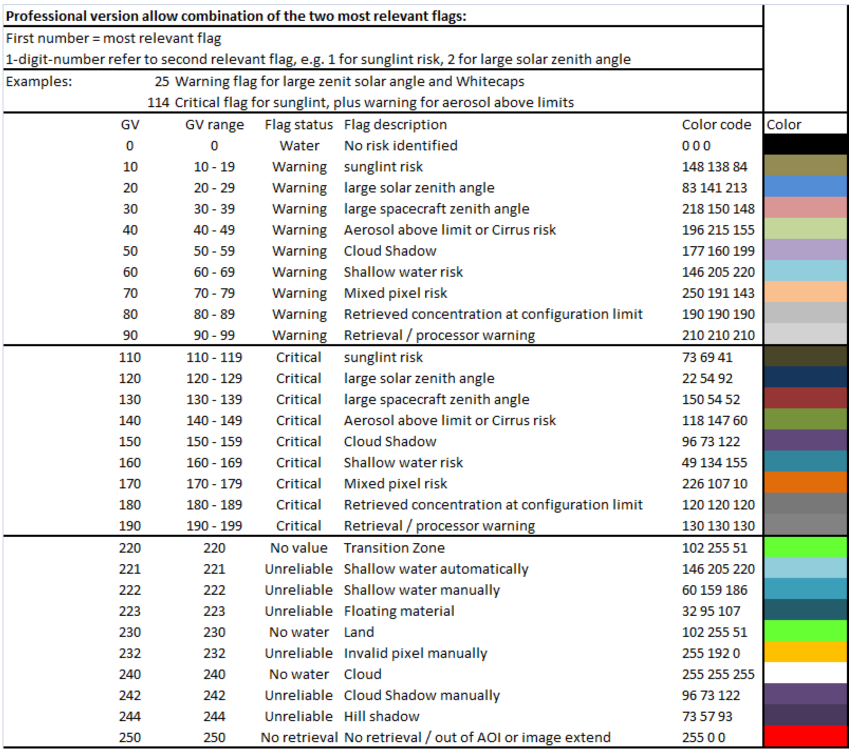


Figure 6: QUC product from 2023-09-20

The QUC file indicates the main quality influencing parameter using a specific EOMAP quality coding classification scheme with corresponding grey values (GV), shown in Figure 7.



Professional version allow combination of the two most relevant flags:

First number = most relevant flag
1-digit-number refer to second relevant flag, e.g. 1 for sunglint risk, 2 for large solar zenith angle

Examples: 25 Warning flag for large zenit solar angle and Whitecaps
114 Critical flag for sunglint, plus warning for aerosol above limits

GV	GV range	Flag status	Flag description	Color code	Color
0	0	Water	No risk identified	0 0 0	⬛
10	10 - 19	Warning	sunglint risk	148 138 84	🟫
20	20 - 29	Warning	large solar zenith angle	83 141 213	🟦
30	30 - 39	Warning	large spacecraft zenith angle	218 150 148	🟥
40	40 - 49	Warning	Aerosol above limit or Cirrus risk	196 215 155	🟩
50	50 - 59	Warning	Cloud Shadow	177 160 199	🟪
60	60 - 69	Warning	Shallow water risk	146 205 220	🟦
70	70 - 79	Warning	Mixed pixel risk	250 191 143	🟧
80	80 - 89	Warning	Retrieved concentration at configuration limit	190 190 190	◼
90	90 - 99	Warning	Retrieval / processor warning	210 210 210	◼
110	110 - 119	Critical	sunglint risk	73 69 41	🟫
120	120 - 129	Critical	large solar zenith angle	22 54 92	🟦
130	130 - 139	Critical	large spacecraft zenith angle	150 54 52	🟥
140	140 - 149	Critical	Aerosol above limit or Cirrus risk	118 147 60	🟩
150	150 - 159	Critical	Cloud Shadow	96 73 122	🟪
160	160 - 169	Critical	Shallow water risk	49 134 155	🟦
170	170 - 179	Critical	Mixed pixel risk	226 107 10	🟧
180	180 - 189	Critical	Retrieved concentration at configuration limit	120 120 120	◼
190	190 - 199	Critical	Retrieval / processor warning	130 130 130	◼
220	220	No value	Transition Zone	102 255 51	🟩
221	221	Unreliable	Shallow water automatically	146 205 220	🟦
222	222	Unreliable	Shallow water manually	60 159 186	🟦
223	223	Unreliable	Floating material	32 95 107	🟦
230	230	No water	Land	102 255 51	🟩
232	232	Unreliable	Invalid pixel manually	255 192 0	🟨
240	240	No water	Cloud	255 255 255	⬜
242	242	Unreliable	Cloud Shadow manually	96 73 122	🟪
244	244	Unreliable	Hill shadow	73 57 93	🟪
250	250	No retrieval	No retrieval / out of AOI or image extend	255 0 0	🟥

Figure 7: EOMAP QUC quality coding

EOMAP's water quality products are accompanied by the processor's internal quality control mechanisms QUT and QUC, resulting in pixel flagging in case of unreliable values. Moreover, a manual quality check and - if required - additional masking is applied to each product.
As an example, cloud shadow effects typically occur in the vicinity of clouds, resulting in unrealistically low water parameter values. In order to detect and flag these areas, EOMAP has developed a specific algorithm based on geometric models, considering the sun angle and sensor viewing geometry, the retrieved aerosol properties, the height of the clouds, an analysis of the blue channel radiances and a statistical anomaly detection of the water species concentrations. When applying this cloud shadow detection algorithm, approx. 85% of the cloud shadows are detected and masked. Remaining cloud shadows are manually flagged and can be identified in the QUC file by GV 242.
Due to the spatial extent of single pixels (Sentinel-2: 10*10m, Landsat 8/9: 30*30m), it is likely that spectral mixing of signals from land and water can affect the pixels along the edge of the water body, leading to unreliable retrieval of water parameter values. Such pixels are labelled with the quality flag 'transition zone'. EOMAP uses a high-resolution land-water-mask database to determine the land-water-boundary, which is then filtered to create a transition zone that is automatically flagged during processing. In the 8bit water constituent products the transition zone is marked by GV 251, whereas in the QUC product it is 220.

5. Data Format

The water quality data are delivered as 32bit real value GeoTIFFs as well as 8bit scaled and colored GeoTIFFs for easier visualization. These colors are only a suggestion a corresponding to EOMAPs standard except for the HAB visualization, which has been changed according to a client-specific request. In addition, KMZ- as well as XYZ-files are delivered as per client request.

6. Data Sources

EOMAP uses the following the AWS data hub (https://registry.opendata.aws/index.html) to access and download satellite raw data from different sensors.

- Landsat 8/9: https://registry.opendata.aws/usgs-landsat/index.html
- Sentinel-2: https://registry.opendata.aws/sentinel-2/

Disclaimer: This document contains confidential information that is intended only for the use by EOMAP's Client. It is not for public circulation or publication or to be used by any third party without the express permission of either the Client or EOMAP GmbH & Co. KG. The concepts and information contained in this document are the property of EOMAP GmbH & Co. KG. Use or copying of this document in whole or in part without the written permission of EOMAP GmbH & Co. KG constitutes an infringement of copyright.

While the findings presented in this report are based on information that EOMAP GmbH & Co. KG considers reliable un-less stated otherwise, the accuracy and completeness of source information cannot be guaranteed. Furthermore, the information compiled in this report addresses the specific needs of the client, so may not address the needs of third par-ties using this report for their own purposes. Thus, EOMAP GmbH & Co. KG and its employees accept no liability for any losses or damage for any action taken or not taken on the basis of any part of the contents of this report. Those acting on information provided in this report do so entirely at their own risk.

EOMAP
Schlosshof 4
82229 Seefeld
Germany
+49 (0)8152 99861 10
info@eomap.com
www.eomap.com

Delivery report

Water Quality Monitoring: Lake Elsinore & Canyon Lake

Date: 2024-01-30
Version: 29

Clients: Wood Plc.
Reference: 2370_Delivery_EOMAP2WoodPlc

EOMAP GmbH & Co.KG,
Schlosshof 4, 82229 Seefeld
Germany

Authors:	Email	Phone
Hendrik Bernert	bernert@eomap.de	+49 8152 99861 14
Minha Sultan	sultan@eomap.de	+49 8152 99861 14

CONTENT

1. Service Provision Report

Contractor Details	Service Provider Details
Wood Environment & Infrastructure Solutions, Inc.	EOMAP GmbH & Co. KG
9210 Sky Park Court, Suite 200	Schlosshof 4, 82229 Seefeld, Germany
San Diego, CA 92123, USA	
Point of Contact	**Point of Contact**
John D. Rudolph	Hendrik Bernert
john.rudolph@woodplc.com	bernert@eomap.de, +49 (0)8152 9986114

Contractor PO / Reference number	
Contractor project title	
Service Provider reference number	2370
Date of delivery	2024-01-30
Version	29

1.1. List of all delivered scenes

Sensor	Time of record
Sentinel-2	2023-10-10 18:44:58 UTC

1.2. Content

Product	Abbreviation	Yes/No
Total Absorption	ABS	☐
Aerosol Optical Thickness	AOT	☐
Yellow Substances	CDM	☐
Chlorophyll-a	CHL	☒
Ratio of Absorption and Scattering	DIV	☐
Harmful Algae Bloom Indicator	HAB	☒
Diffuse Attenuation Coefficient	KDC	☐
Quality Coding	QUC	☒
Total Quality	QUT	☒
True Color/False Color Composite	RGB	☒
Remote Sensing Reflectance	RRS	☐
Secchi Disc Depth	SDD	☐
Sum of Inorganic Absorption	SIA	☐
Sum if Organic Absorption	SOA	☐
Surface Temperature	SST	☐
Turbidity	TUR	☒
Trophic State Index (Chlorophyll)	TSC	☐
Total Suspended Matter	TSM	☐
Light Penetration Depth	Z90	☐
Water Body Extent	WEX	☐

1.3. List of delivered files (one product example)

File name	File format	Content
2370_Delivery_EOMAP2WoodPlc_Vs29_20240130.pdf	PDF	Delivery Report
CHL_us-california_11smt_EOMAP_20231010_184458_SENT2_m0010.tif	GeoTIFF	Product raster file, 8bit scaled and coloured
CHL_us-california_11smt_EOMAP_20231010_184458_SENT2_m0010_32bit.tif	GeoTIFF	Product raster file, 32bit real values
CHL_us-california_11smt_EOMAP_20231010_184458_SENT2_m0010_32bit_wgs84.txt	ASCII	Product text file, real values
CHL_us-california_11smt_EOMAP_20231010_184458_SENT2_m0010.kmz	KMZ	GoogleEarth overlay
CHL_us-california_11smt_EOMAP_20231010_184458_SENT2_m0010.xml	XML	Metadata
CHL_us-california_11smt_EOMAP_20231010_184458_SENT2_m0010_overview.pdf	PDF	Overview PDF, metadata and quicklook

1.4. File naming

[Product abbreviation]_[Country code]-[Area]_EOMAP_[Date of satellite image recording]_[Time of satellite image recording]_[sensor code]_[spatial resolution]_[optional]

With

[Product abbreviation]	see list of product abbreviations
[Country code]	Country ID following ISO 3166 ALPHA-2 standards
[Area]	name of city/region or other relevant area characterization
[Date of satellite image rec.]	Satellite image date used for the analysis in YYMMDD (YY= Year, MM = Month, DD = Date) in UTC
[Time of satellite image rec.]	Satellite image date used for the analysis in HHMMSS (HH= Hours, MM = Minute, SS = Seconds) in UTC time
[sensor code]	Sensor in use
[spatial resolution]	Spatial resolution/grid spacing in meters
[optional]	is an optional parameter which can is used to support the intuitive use of the data, such as 'metadata' or 'XYZQ' for metadata files and ASCII XYZQ files.

1.5. Notes (e.g. technical issues, exceptional conditions, etc.)

- None

Data Analyst

Hendrik Bernert

Hendrik Bernert

QA/QC

Minha Sultan

2. Methodology: Modular Inversion and Processing System (MIP)

For the retrieval of satellite-derived water quality data, the physics-based Modular Inversion and Processing System (MIP), developed by EOMAP, has been applied to the satellite imagery. This sensor-independent approach includes all the relevant processing steps to guarantee a robust, standardised and operational retrieval of water quality parameters from various satellite data sources. The advantage of physics-based methods is that they do not require a priori information about the study area and can therefore be applied independently of satellite type and study area.

MIP imbeds sensor-independent algorithms and processing modules to derive consistent water quality parameters for multiple scales through a number of different satellite sensors. The algorithms take all relevant environmental impacts into account and do so for each individual measurement and pixel according to the current state-of-the-art, including:

a. water, land, cloud identification
b. estimation and correction of atmosphere and aerosol impacts[1] [2]
c. correction altitude level impacts[3]
d. correction of adjacency impact (light scattering into the water signal from adjacent land surfaces)[4]
e. correction[5] or flagging[6] of sunglitter impact
f. retrieval of in-water absorption and scattering as physical measures[7]
g. accounting for varying spectral slopes of specific inherent optical properties[8]
h. provision of uncertainty measures and flagging procedures
i. accounting for the full bidirectional effects in the atmosphere, at the water-atmosphere boundary layers and in-water, using a fully coupled radiative transfer model
j. application of procedures to minimize errors, resulting from the coupled interaction of light between atmosphere, water surface and in-water on the signal, through coupled inversion procedures

The different workflow steps from satellite raw imagery import to value-added water quality retrieval are displayed in Figure 1.

---

[1] Heege, T., Kiselev, V., Wettle, M., Hung N.N. (2014): Operational multi-sensor monitoring of turbidity for the entire Mekong Delta . Int. J. Remote Sensing, Special Issues Remote Sensing of the Mekong, Vol. 35 (8), pp. 2910-2926

[2] Richter, R., Heege, T., Kiselev, V., Schläpfer, D. (2014): Correction of ozone influence on TOA radiance. Int. J. of Remote Sensing. Vol. 35(23), pp. 8044-8056, doi: 10.1080/01431161.2014.978041

[3] Heege, T., Fischer, J. (2004): Mapping of water constituents in Lake Constance using multispectral airborne scanner data and a physically based processing scheme. Can. J. Remote Sensing, Vol. 30, No. 1, pp. 77-86

[4] Kiselev, V., Bulgarelli, B. and Heege, T., (2015). Sensor independent adjacency correction algorithm for coastal and inland water systems. Remote Sensing of Environment, 157: 85-95. , ISSN 0034-4257, http://dx.doi.org/10.1016/j.rse.2014.07.025

[5] Heege, T. & Fischer, J. (2000): Sun glitter correction in remote sensing imaging spectrometry. SPIE Ocean Optics XV Conference, Monaco, Oct. 16-20.

[6] EU FP7-Projekt GLASS: WP4 Validation report (29.2.2016): www.glass-project.eu/assets/Deliverables/GLaSS-D4.2.pdf

[7] Bumberger J., Heege T., Klinger P., et al. (2017): Towards a Harmonized Validation Procedure for Inland Water Optical Remote Sensing Data using Inherent Optical Properties, Rem. Sens. 2017(9), 21p, submitted 28 Feb. 2017

[8] Heege T., Schenk K., Klinger P., Broszeit A., Wenzel J., Kiselev V. (2015): Monitoring status and trends of water quality in inland waters using earth observation technologies. Proceedings “Water Quality in Europe: Challenges and Best Practice” UNESCO-IHP European Regional Consultation Workshop, Koblenz, Germany, Dec 2015, p. 1-4

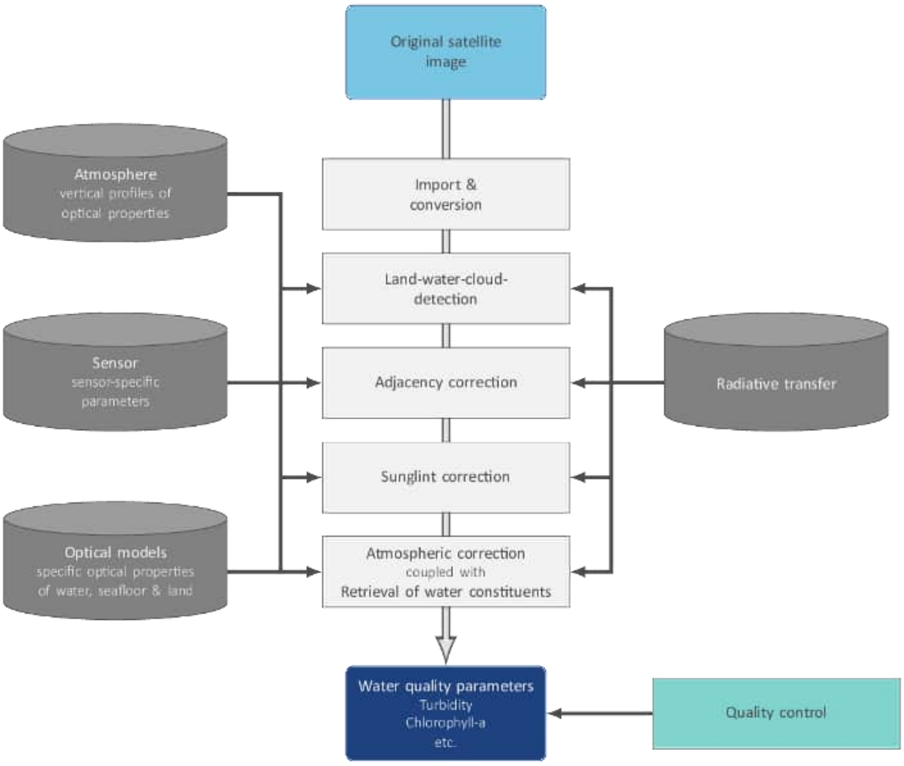


Figure 1: EOMAP's physics-based workflow to derive satellite-based water quality

MIP is the most established, sensor-independent and operational aquatic remote sensing processing system for the full range of high, medium and low-resolution satellite sensors. Fully-automated water monitoring processors are installed in satellite ground segments worldwide (Europe, Australia, Asia and America), to ensure fast and efficient access to a wide range of satellite data. The data processing and orchestration software, the EOMAP Workflow System (EWS) allows for continuous, daily production.

3. Products

3.1. Turbidity (TUR)

Turbidity (TUR) is a key parameter of water quality and is linearly related to the backward scattering of light of organic and inorganic particles in water. Turbidity is also linearly related to Total Suspended Matter (TSM) at low to moderate turbidity values. The measurement unit is Nephelometric Turbidity Unit (NTU). Satellite-derived turbidity is determined by the backward scattering of light between 450 to 800nm, which is physically retrieved using satellite data. The standard relation of EOMAP concentrations to inherent optical properties is defined as 1 NTU = 0.0118 1/m backward scattering at 550nm, or 1 NTU = 0.619 1/m total scattering at 550nm for an assumed ratio bb/b = 0.019. The linear relation between turbidity and suspended matter/solids in low to moderate concentrations is in most cases a regional constant, but can vary with particle size distribution. Note that the geometrical properties of an in-situ measurement device, and the wavelength in use, may differ in comparison to the satellite product. For example, the standard FTU determination, a measure of turbidity similar to NTU, is based on the measurement of light scattered within a 90° angle from a beam directed at the water sample. Alongside temporal differences in satellite and in situ measurements, different sampling depths and the measurement location, this needs to be considered when comparing and interpreting satellite derived vs. in situ measured turbidity values. The Turbidity product from 2023-10-10 is shown in Figure 2.

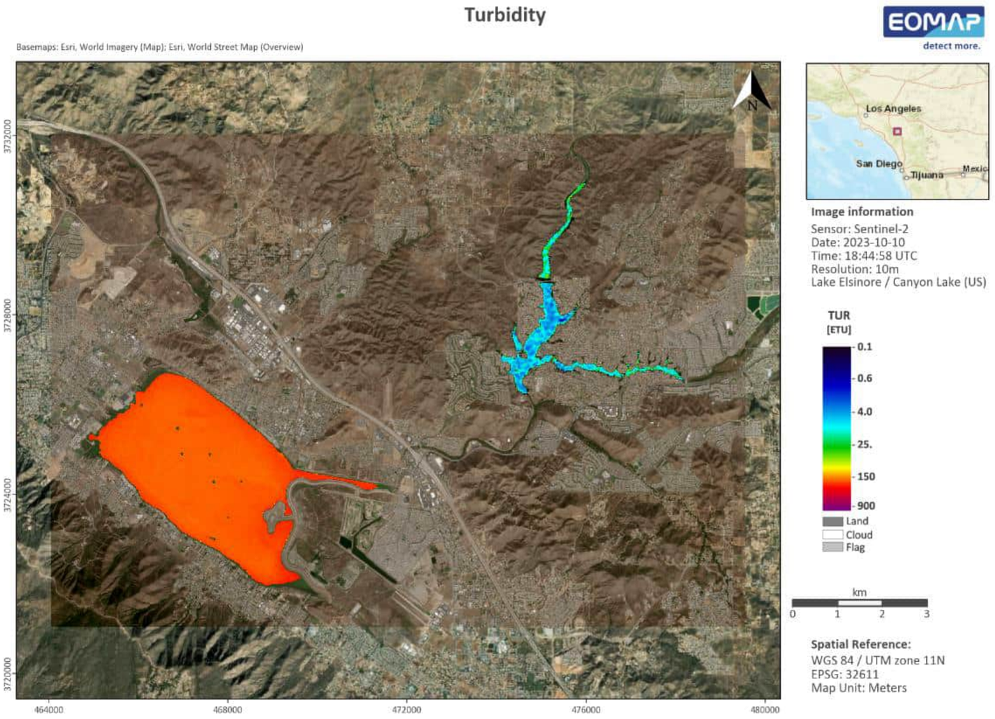


Figure 2: Turbidity product from 2023-10-10

3.2. Chlorophyll-a (CHL)

Chlorophyll-a (CHL) retrieval is based on the derived information of in-water organic absorption, in-water turbidity and spectral characteristics of each water body. Chlorophyll-a in [µg/l], is provided as a measure linearly related to the pigment-specific absorption at 440nm, with 1 µg/l Chl equal to 0.035 1/m pigment absorption. Phaeophytin and further pigments cannot be discriminated methodologically with the spectral resolution provided by Landsat 8/Sentinel-2 and similar sensors and is therefore included in this product. The pigment-related absorption is always smaller than the absorption of organic components (SOA). For clear water conditions (low chlorophyll/total suspended solids), the specific absorption chlorophyll increases significantly (Bricaud et al. 1995[9]). Chlorophyll values can vary over 4 magnitudes, for marine waters or clear lakes typical concentrations between 0.01 and 10 µg/l, while for eutrophic lakes concentrations can reach 100 µg/l and more. The chlorophyll products are typically reliable within a range of 10 – 50 % in comparison to in situ measures (Broszeit 2015[10]), which are typically based on one of three different methods, which include photometric, fluorescence and HPLC approaches and their subcategories. The Chlorophyll-a product from 2023-10-10 is shown in Figure 3.

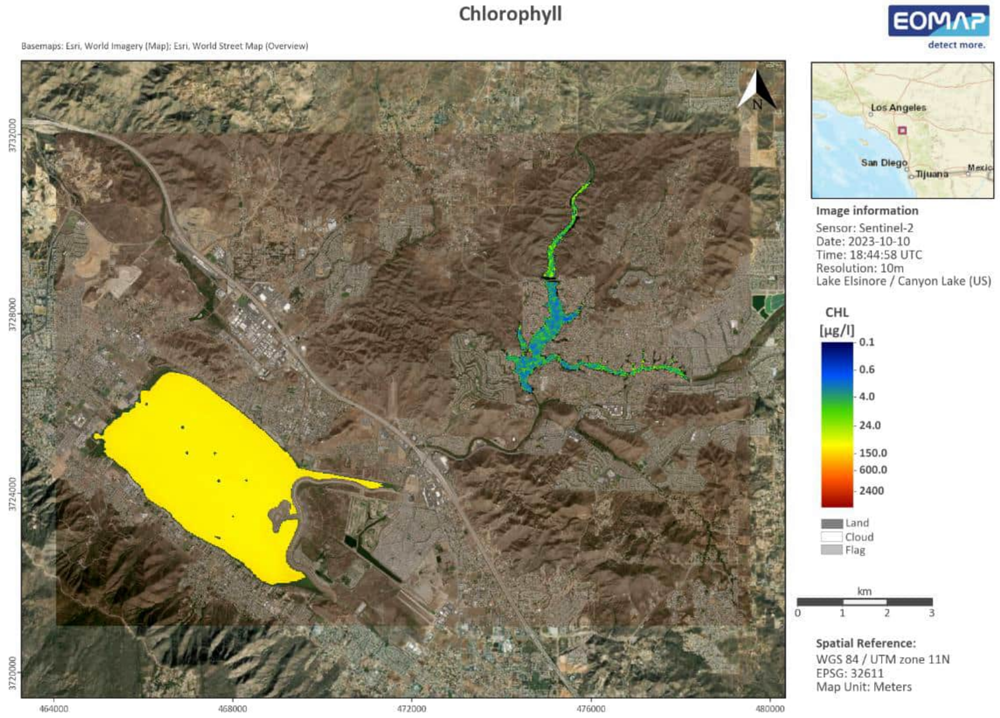


Figure 3: Chlorophyll-a product from 2023-10-10

---

[9] Bricaud, A., Babin, M., Morel, A., Claustre, H. (1995): Variability in the chlorophyll-specific absorption coefficients of natural phytoplankton: Analysis and parametrization. Journal of Geophysical Research Atmospheres, 100(C7):13,321-13,332

[10] Broszeit, A., 2015. Assessing long-term inland water quality using satellite imagery: A Feasibility and validation study of different lake types. MSc Thesis, Julius-Maximilian-University Würzburg, 96p

3.3. Harmful Algae Bloom Indicator (HAB)

The **Harmful Algae Bloom Indicator** (HAB) refers to the presence of cyanobacteria. It is sensitive to the appearance of cyanobacteria-related pigments, i.e. phycocyanin and phycoerythrin. Both pigments show absorption features in green wavelengths from 500 nm to approx. 640 nm; phycoerythrin shows its absorption maximum at 540-570 nm, phycocyanin at 610-620 (Colyer et al. 2005). Most satellite sensors support the identification of this feature with only two bands, i.e. one in the green wavelength region (e.g. L7 and L8 at 530 – 590 nm) and in the red wavelength region at approx. 640 – 670 nm. The used standard parameterisation of phytoplankton absorption in MIP as described above, however, does not account phycocyanin and phycoerythrin absorption in the retrieval process. The modelled phytoplankton absorption therefore lacks the absorption features of these pigments. Nonetheless, if these pigments are present in the water a slight spectral mismatch between modelled water leaving reflectance ($R_{modelled}$) and satellite derived reflectance ($R_{satellite}$) occurs. The algorithm then compares the slope of $R_{modelled}$ and $R_{satellite}$ between the green and red band ($\delta R = R_{green} - R_{red}$) in order to classify pixels with regard to phycocyanin and phycoerythrin occurrence, i.e. harmful algae bloom probability. The HAB indicator from 2023-10-10 is shown in Figure 4.

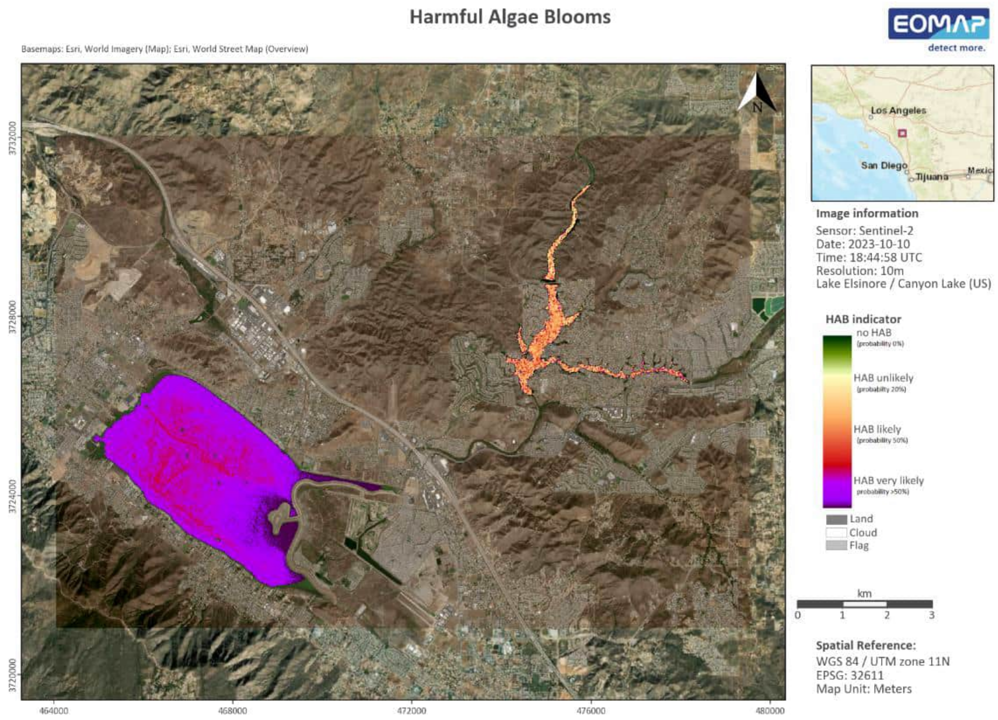


Figure 4: Harmful Algae Bloom Indicator product from 2023-10-10

3.4. True color composite (RGB)

RGB composite images represent the area of interest in true colour or false colour modes by combining predefined bands, depending on the sensor in use.

4. Quality Control and Flagging

As a standard output of the processing, an accuracy or quality indicator is calculated for each retrieved parameter and for each detected water pixel. This measure comprises a comprehensive range of factors that can impact the derived product quality, including:

- the geometry between sun, target, and sensor,
- the estimated sun glint probability,
- the retrieved aerosol optical depth,
- residuals of the measured and modelled sensor radiance and subsurface reflectance,
- the comparison of retrieved water species concentrations to extreme values as defined in the configuration files,
- pixels affected by cloud shadow and
- shallow water areas.

Threshold values define distinct values when a parameter is assumed to influence the quality. All parameters are integrated into one remaining quality parameter, allowing both an improved flagging and a quality weighting of pixels, that can later be merged into integrated 3rd level products.

The quality information is part of each standard geodata delivery and is visualized by two different 8bit GeoTIFFs:

- QUT - Total Quality, quantifying the overall quality of each pixel from low to high. Only valid water pixels - excluding land, cloud or flagged pixels - are represented in QUT indicator (Figure 5).
- QUC – EOMAP Quality coding (Figure 6), revealing the processor's internal quality check, split into the defined indicators (e.g. sunglint, shallow water risk, etc.). These are classified into 'no quality concerns', 'quality risk and 'bad quality' (flag). Note that 'quality risk' pixels are marked as such but not flagged.

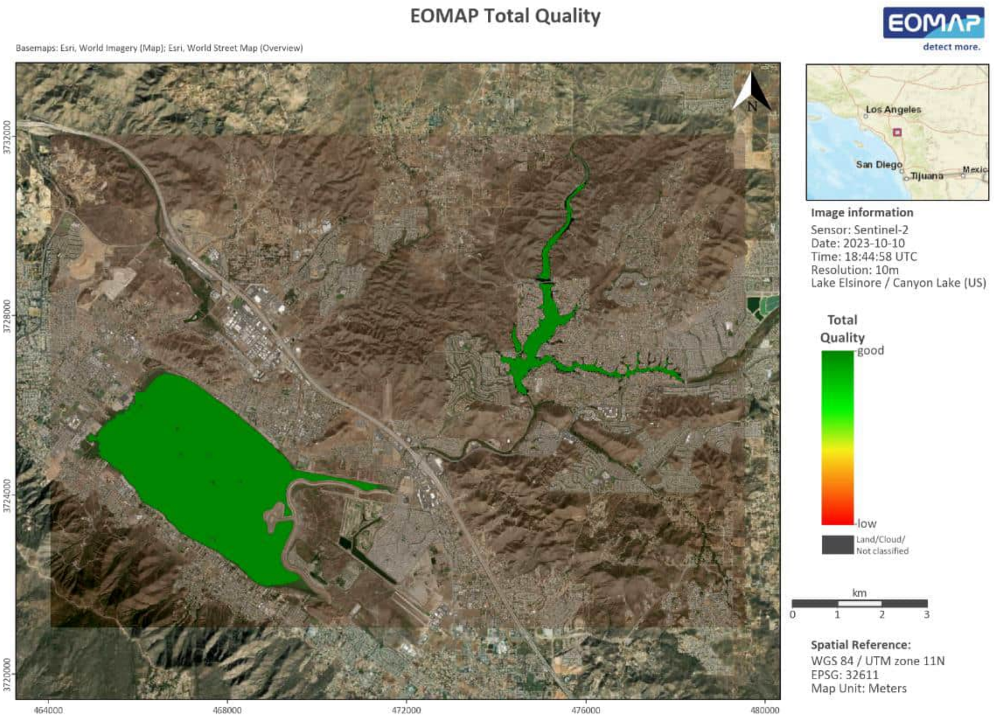


Figure 5: QUT product from 2023-10-10

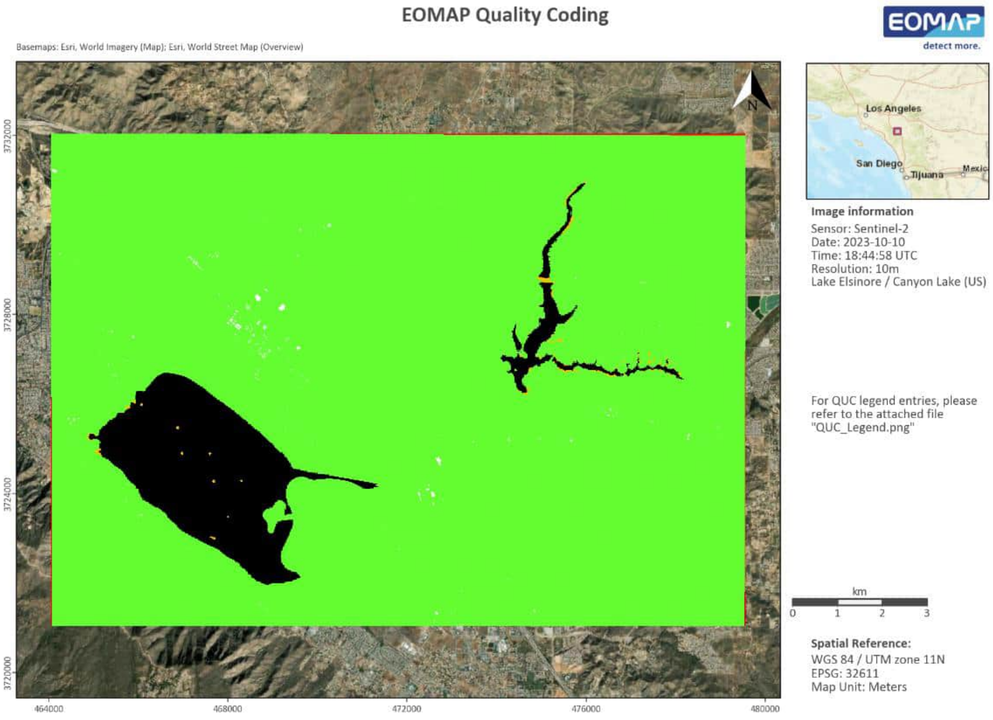
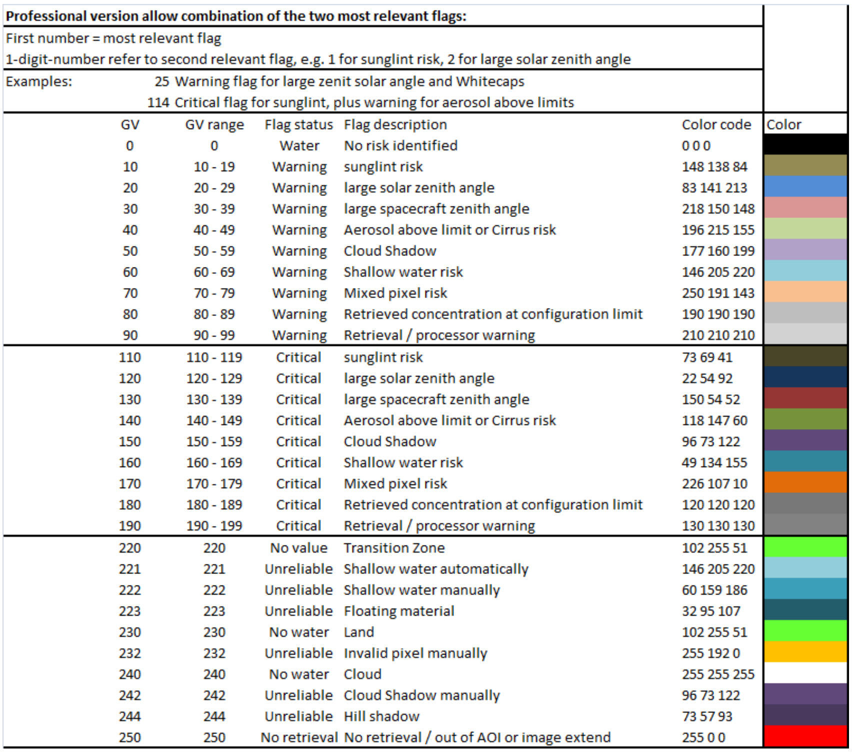


Figure 6: QUC product from 2023-10-10

The QUC file indicates the main quality influencing parameter using a specific EOMAP quality coding classification scheme with corresponding grey values (GV), shown in
Figure 7.



Professional version allow combination of the two most relevant flags:

First number = most relevant flag
1-digit-number refer to second relevant flag, e.g. 1 for sunglint risk, 2 for large solar zenith angle

Examples:
25 Warning flag for large zenit solar angle and Whitecaps
114 Critical flag for sunglint, plus warning for aerosol above limits

GV	GV range	Flag status	Flag description	Color code	Color
0	0	Water	No risk identified	0 0 0	■
10	10 - 19	Warning	sunglint risk	148 138 84	■
20	20 - 29	Warning	large solar zenith angle	83 141 213	■
30	30 - 39	Warning	large spacecraft zenith angle	218 150 148	■
40	40 - 49	Warning	Aerosol above limit or Cirrus risk	196 215 155	■
50	50 - 59	Warning	Cloud Shadow	177 160 199	■
60	60 - 69	Warning	Shallow water risk	146 205 220	■
70	70 - 79	Warning	Mixed pixel risk	250 191 143	■
80	80 - 89	Warning	Retrieved concentration at configuration limit	190 190 190	■
90	90 - 99	Warning	Retrieval / processor warning	210 210 210	■
110	110 - 119	Critical	sunglint risk	73 69 41	■
120	120 - 129	Critical	large solar zenith angle	22 54 92	■
130	130 - 139	Critical	large spacecraft zenith angle	150 54 52	■
140	140 - 149	Critical	Aerosol above limit or Cirrus risk	118 147 60	■
150	150 - 159	Critical	Cloud Shadow	96 73 122	■
160	160 - 169	Critical	Shallow water risk	49 134 155	■
170	170 - 179	Critical	Mixed pixel risk	226 107 10	■
180	180 - 189	Critical	Retrieved concentration at configuration limit	120 120 120	■
190	190 - 199	Critical	Retrieval / processor warning	130 130 130	■
220	220	No value	Transition Zone	102 255 51	■
221	221	Unreliable	Shallow water automatically	146 205 220	■
222	222	Unreliable	Shallow water manually	60 159 186	■
223	223	Unreliable	Floating material	32 95 107	■
230	230	No water	Land	102 255 51	■
232	232	Unreliable	Invalid pixel manually	255 192 0	■
240	240	No water	Cloud	255 255 255	□
242	242	Unreliable	Cloud Shadow manually	96 73 122	■
244	244	Unreliable	Hill shadow	73 57 93	■
250	250	No retrieval	No retrieval / out of AOI or image extend	255 0 0	■

Figure 7: EOMAP QUC quality coding

EOMAP's water quality products are accompanied by the processor's internal quality control mechanisms QUT and QUC, resulting in pixel flagging in case of unreliable values. Moreover, a manual quality check and - if required - additional masking is applied to each product.
As an example, cloud shadow effects typically occur in the vicinity of clouds, resulting in unrealistically low water parameter values. In order to detect and flag these areas, EOMAP has developed a specific algorithm based on geometric models, considering the sun angle and sensor viewing geometry, the retrieved aerosol properties, the height of the clouds, an analysis of the blue channel radiances and a statistical anomaly detection of the water species concentrations. When applying this cloud shadow detection algorithm, approx. 85% of the cloud shadows are detected and masked. Remaining cloud shadows are manually flagged and can be identified in the QUC file by GV 242.
Due to the spatial extent of single pixels (Sentinel-2: 10*10m, Landsat 8/9: 30*30m), it is likely that spectral mixing of signals from land and water can affect the pixels along the edge of the water body, leading to unreliable retrieval of water parameter values. Such pixels are labelled with the quality flag 'transition zone'. EOMAP uses a high-resolution land-water-mask database to determine the land-water-boundary, which is then filtered to create a transition zone that is automatically flagged during processing. In the 8bit water constituent products the transition zone is marked by GV 251, whereas in the QUC product it is 220.

5. Data Format

The water quality data are delivered as 32bit real value GeoTIFFs as well as 8bit scaled and colored GeoTIFFs for easier visualization. These colors are only a suggestion a corresponding to EOMAPs standard except for the HAB visualization, which has been changed according to a client-specific request. In addition, KMZ- as well as XYZ-files are delivered as per client request.

6. Data Sources

EOMAP uses the following the AWS data hub (https://registry.opendata.aws/index.html) to access and download satellite raw data from different sensors.

- Landsat 8/9: https://registry.opendata.aws/usgs-landsat/index.html
- Sentinel-2: https://registry.opendata.aws/sentinel-2/

Disclaimer: This document contains confidential information that is intended only for the use by EOMAP's Client. It is not for public circulation or publication or to be used by any third party without the express permission of either the Client or EOMAP GmbH & Co. KG. The concepts and information contained in this document are the property of EOMAP GmbH & Co. KG. Use or copying of this document in whole or in part without the written permission of EOMAP GmbH & Co. KG constitutes an infringement of copyright.

While the findings presented in this report are based on information that EOMAP GmbH & Co. KG considers reliable un-less stated otherwise, the accuracy and completeness of source information cannot be guaranteed. Furthermore, the information compiled in this report addresses the specific needs of the client, so may not address the needs of third par-ties using this report for their own purposes. Thus, EOMAP GmbH & Co. KG and its employees accept no liability for any losses or damage for any action taken or not taken on the basis of any part of the contents of this report. Those acting on information provided in this report do so entirely at their own risk.

EOMAP
Schlosshof 4
82229 Seefeld
Germany
+49 (0)8152 99861 10
info@eomap.com
www.eomap.com

Delivery report

Water Quality Monitoring: Lake Elsinore & Canyon Lake

Date: 2024-01-30
Version: 30

Clients: Wood Plc.
Reference: 2370_Delivery_EOMAP2WoodPlc

EOMAP GmbH & Co.KG,
Schlosshof 4, 82229 Seefeld
Germany

Authors:	Email	Phone
Hendrik Bernert	bernert@eomap.de	+49 8152 99861 14
Minha Sultan	sultan@eomap.de	+49 8152 99861 14

CONTENT

1. Service Provision Report

Contractor Details	Service Provider Details
Wood Environment & Infrastructure Solutions, Inc.	EOMAP GmbH & Co. KG
9210 Sky Park Court, Suite 200	Schlosshof 4, 82229 Seefeld, Germany
San Diego, CA 92123, USA	
Point of Contact	**Point of Contact**
John D. Rudolph	Hendrik Bernert
john.rudolph@woodplc.com	bernert@eomap.de, +49 (0)8152 9986114

Contractor PO / Reference number	
Contractor project title	
Service Provider reference number	2370
Date of delivery	2024-01-30
Version	30

1.1. List of all delivered scenes

Sensor	Time of record
Sentinel-2	2023-12-09 18:44:54 UTC

1.2. Content

Product	Abbreviation	Yes/No
Total Absorption	ABS	☐
Aerosol Optical Thickness	AOT	☐
Yellow Substances	CDM	☐
Chlorophyll-a	CHL	☒
Ratio of Absorption and Scattering	DIV	☐
Harmful Algae Bloom Indicator	HAB	☒
Diffuse Attenuation Coefficient	KDC	☐
Quality Coding	QUC	☒
Total Quality	QUT	☒
True Color/False Color Composite	RGB	☒
Remote Sensing Reflectance	RRS	☐
Secchi Disc Depth	SDD	☐
Sum of Inorganic Absorption	SIA	☐
Sum if Organic Absorption	SOA	☐
Surface Temperature	SST	☐
Turbidity	TUR	☒
Trophic State Index (Chlorophyll)	TSC	☐
Total Suspended Matter	TSM	☐
Light Penetration Depth	Z90	☐
Water Body Extent	WEX	☐

1.3. List of delivered files (one product example)

File name	File format	Content
2370_Delivery_EOMAP2WoodPlc_Vs30_20240130.pdf	PDF	Delivery Report
CHL_us-california_11smt_EOMAP_20231209_184454_SENT2_m0010.tif	GeoTIFF	Product raster file, 8bit scaled and coloured
CHL_us-california_11smt_EOMAP_20231209_184454_SENT2_m0010_32bit.tif	GeoTIFF	Product raster file, 32bit real values
CHL_us-california_11smt_EOMAP_20231209_184454_SENT2_m0010_32bit_wgs84.txt	ASCII	Product text file, real values
CHL_us-california_11smt_EOMAP_20231209_184454_SENT2_m0010.kmz	KMZ	GoogleEarth overlay
CHL_us-california_11smt_EOMAP_20231209_184454_SENT2_m0010.xml	XML	Metadata
CHL_us-california_11smt_EOMAP_20231209_184454_SENT2_m0010_overview.pdf	PDF	Overview PDF, metadata and quicklook

1.4. File naming

[Product abbreviation]_[Country code]-[Area]_EOMAP_[Date of satellite image recording]_[Time of satellite image recording]_[sensor code]_[spatial resolution]_[optional]

With

[Product abbreviation]	see list of product abbreviations
[Country code]	Country ID following ISO 3166 ALPHA-2 standards
[Area]	name of city/region or other relevant area characterization
[Date of satellite image rec.]	Satellite image date used for the analysis in YYMMDD (YY= Year, MM = Month, DD = Date) in UTC
[Time of satellite image rec.]	Satellite image date used for the analysis in HHMMSS (HH= Hours, MM = Minute, SS = Seconds) in UTC time
[sensor code]	Sensor in use
[spatial resolution]	Spatial resolution/grid spacing in meters
[optional]	is an optional parameter which can is used to support the intuitive use of the data, such as 'metadata' or 'XYZQ' for metadata files and ASCII XYZQ files.

1.5. Notes (e.g. technical issues, exceptional conditions, etc.)

- None

Data Analyst

Hendrik Bernert

Hendrik Bernert

QA/QC

Minha Sultan

2. Methodology: Modular Inversion and Processing System (MIP)

For the retrieval of satellite-derived water quality data, the physics-based Modular Inversion and Processing System (MIP), developed by EOMAP, has been applied to the satellite imagery. This sensor-independent approach includes all the relevant processing steps to guarantee a robust, standardised and operational retrieval of water quality parameters from various satellite data sources. The advantage of physics-based methods is that they do not require a priori information about the study area and can therefore be applied independently of satellite type and study area.

MIP imbeds sensor-independent algorithms and processing modules to derive consistent water quality parameters for multiple scales through a number of different satellite sensors. The algorithms take all relevant environmental impacts into account and do so for each individual measurement and pixel according to the current state-of-the-art, including:

a. water, land, cloud identification
b. estimation and correction of atmosphere and aerosol impacts[1] [2]
c. correction altitude level impacts[3]
d. correction of adjacency impact (light scattering into the water signal from adjacent land surfaces)[4]
e. correction[5] or flagging[6] of sunglitter impact
f. retrieval of in-water absorption and scattering as physical measures[7]
g. accounting for varying spectral slopes of specific inherent optical properties[8]
h. provision of uncertainty measures and flagging procedures
i. accounting for the full bidirectional effects in the atmosphere, at the water-atmosphere boundary layers and in-water, using a fully coupled radiative transfer model
j. application of procedures to minimize errors, resulting from the coupled interaction of light between atmosphere, water surface and in-water on the signal, through coupled inversion procedures

The different workflow steps from satellite raw imagery import to value-added water quality retrieval are displayed in Figure 1.

---

[1] Heege, T., Kiselev, V., Wettle, M., Hung N.N. (2014): Operational multi-sensor monitoring of turbidity for the entire Mekong Delta . Int. J. Remote Sensing, Special Issues Remote Sensing of the Mekong, Vol. 35 (8), pp. 2910-2926

[2] Richter, R., Heege, T., Kiselev, V., Schläpfer, D. (2014): Correction of ozone influence on TOA radiance. Int. J. of Remote Sensing. Vol. 35(23), pp. 8044-8056, doi: 10.1080/01431161.2014.978041

[3] Heege, T., Fischer, J. (2004): Mapping of water constituents in Lake Constance using multispectral airborne scanner data and a physically based processing scheme. Can. J. Remote Sensing, Vol. 30, No. 1, pp. 77-86

[4] Kiselev, V., Bulgarelli, B. and Heege, T., (2015). Sensor independent adjacency correction algorithm for coastal and inland water systems. Remote Sensing of Environment, 157: 85-95. , ISSN 0034-4257, http://dx.doi.org/10.1016/j.rse.2014.07.025

[5] Heege, T. & Fischer, J. (2000): Sun glitter correction in remote sensing imaging spectrometry. SPIE Ocean Optics XV Conference, Monaco, Oct. 16-20.

[6] EU FP7-Projekt GLASS: WP4 Validation report (29.2.2016): www.glass-project.eu/assets/Deliverables/GLaSS-D4.2.pdf

[7] Bumberger J., Heege T., Klinger P., et al. (2017): Towards a Harmonized Validation Procedure for Inland Water Optical Remote Sensing Data using Inherent Optical Properties, Rem. Sens. 2017(9), 21p, submitted 28 Feb. 2017

[8] Heege T., Schenk K., Klinger P., Broszeit A., Wenzel J., Kiselev V. (2015): Monitoring status and trends of water quality in inland waters using earth observation technologies. Proceedings "Water Quality in Europe: Challenges and Best Practice" UNESCO-IHP European Regional Consultation Workshop, Koblenz, Germany, Dec 2015, p. 1-4

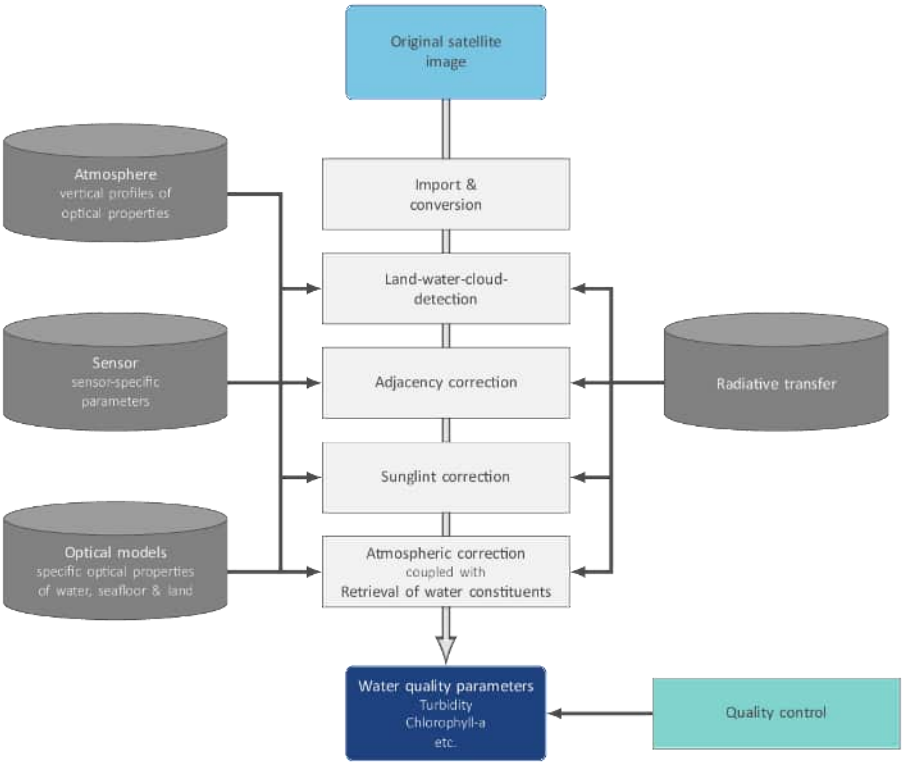


Figure 1: EOMAP's physics-based workflow to derive satellite-based water quality

MIP is the most established, sensor-independent and operational aquatic remote sensing processing system for the full range of high, medium and low-resolution satellite sensors. Fully-automated water monitoring processors are installed in satellite ground segments worldwide (Europe, Australia, Asia and America), to ensure fast and efficient access to a wide range of satellite data. The data processing and orchestration software, the EOMAP Workflow System (EWS) allows for continuous, daily production.

3. Products

3.1. Turbidity (TUR)

Turbidity (TUR) is a key parameter of water quality and is linearly related to the backward scattering of light of organic and inorganic particles in water. Turbidity is also linearly related to Total Suspended Matter (TSM) at low to moderate turbidity values. The measurement unit is Nephelometric Turbidity Unit (NTU). Satellite-derived turbidity is determined by the backward scattering of light between 450 to 800nm, which is physically retrieved using satellite data. The standard relation of EOMAP concentrations to inherent optical properties is defined as 1 NTU = 0.0118 1/m backward scattering at 550nm, or 1 NTU = 0.619 1/m total scattering at 550nm for an assumed ratio bb/b = 0.019. The linear relation between turbidity and suspended matter/solids in low to moderate concentrations is in most cases a regional constant, but can vary with particle size distribution. Note that the geometrical properties of an in-situ measurement device, and the wavelength in use, may differ in comparison to the satellite product. For example, the standard FTU determination, a measure of turbidity similar to NTU, is based on the measurement of light scattered within a 90° angle from a beam directed at the water sample. Alongside temporal differences in satellite and in situ measurements, different sampling depths and the measurement location, this needs to be considered when comparing and interpreting satellite derived vs. in situ measured turbidity values. The Turbidity product from 2023-12-09 is shown in Figure 2.

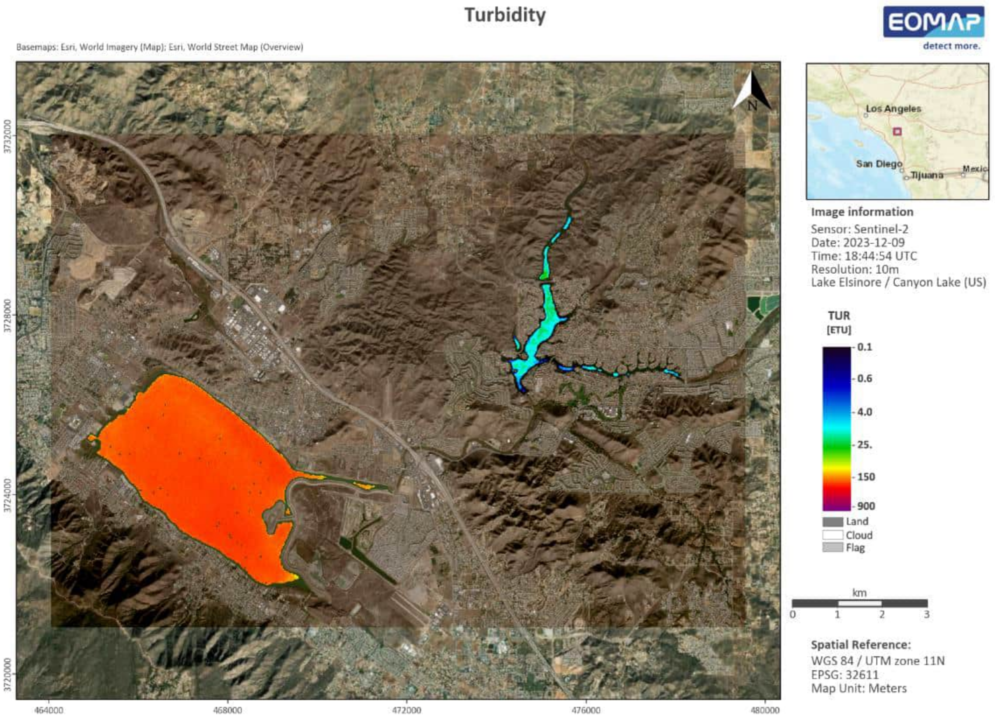


Figure 2: Turbidity product from 2023-12-09

3.2. Chlorophyll-a (CHL)

Chlorophyll-a (CHL) retrieval is based on the derived information of in-water organic absorption, in-water turbidity and spectral characteristics of each water body. Chlorophyll-a in [µg/l], is provided as a measure linearly related to the pigment-specific absorption at 440nm, with 1 µg/l Chl equal to 0.035 1/m pigment absorption. Phaeophytin and further pigments cannot be discriminated methodologically with the spectral resolution provided by Landsat 8/Sentinel-2 and similar sensors and is therefore included in this product. The pigment-related absorption is always smaller than the absorption of organic components (SOA). For clear water conditions (low chlorophyll/total suspended solids), the specific absorption chlorophyll increases significantly (Bricaud et al. 1995[9]). Chlorophyll values can vary over 4 magnitudes, for marine waters or clear lakes typical concentrations between 0.01 and 10 µg/l, while for eutrophic lakes concentrations can reach 100 µg/l and more. The chlorophyll products are typically reliable within a range of 10 – 50 % in comparison to in situ measures (Broszeit 2015[10]), which are typically based on one of three different methods, which include photometric, fluorescence and HPLC approaches and their subcategories. The Chlorophyll-a product from 2023-12-09 is shown in Figure 3.

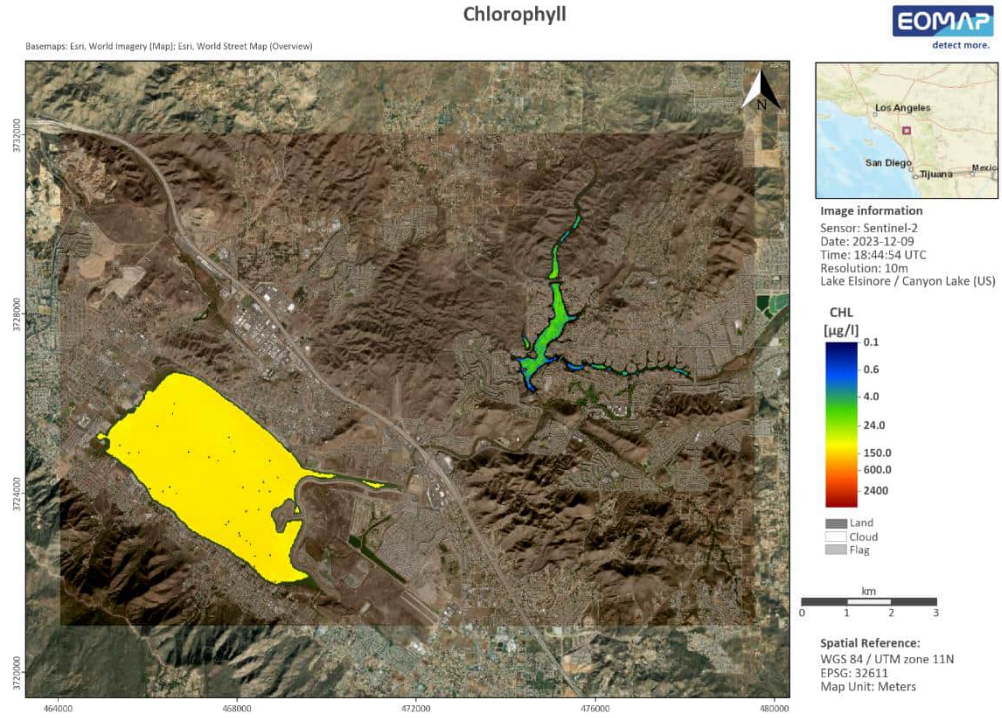


Figure 3: Chlorophyll-a product from 2023-12-09

---

[9] Bricaud, A., Babin, M., Morel, A., Claustre, H. (1995): Variability in the chlorophyll-specific absorption coefficients of natural phytoplankton: Analysis and parametrization. Journal of Geophysical Research Atmospheres, 100(C7):13,321-13,332

[10] Broszeit, A., 2015. Assessing long-term inland water quality using satellite imagery: A Feasibility and validation study of different lake types. MSc Thesis, Julius-Maximilian-University Würzburg, 96p

3.3. Harmful Algae Bloom Indicator (HAB)

The **Harmful Algae Bloom Indicator** (HAB) refers to the presence of cyanobacteria. It is sensitive to the appearance of cyanobacteria-related pigments, i.e. phycocyanin and phycoerythrin. Both pigments show absorption features in green wavelengths from 500 nm to approx. 640 nm; phycoerythrin shows its absorption maximum at 540-570 nm, phycocyanin at 610-620 (Colyer et al. 2005). Most satellite sensors support the identification of this feature with only two bands, i.e. one in the green wavelength region (e.g. L7 and L8 at 530 – 590 nm) and in the red wavelength region at approx. 640 – 670 nm. The used standard parameterisation of phytoplankton absorption in MIP as described above, however, does not account phycocyanin and phycoerythrin absorption in the retrieval process. The modelled phytoplankton absorption therefore lacks the absorption features of these pigments. Nonetheless, if these pigments are present in the water a slight spectral mismatch between modelled water leaving reflectance ($R_{modelled}$) and satellite derived reflectance ($R_{satellite}$) occurs. The algorithm then compares the slope of $R_{modelled}$ and $R_{satellite}$ between the green and red band ($\delta R = R_{green} - R_{red}$) in order to classify pixels with regard to phycocyanin and phycoerythrin occurrence, i.e. harmful algae bloom probability. The HAB indicator from 2023-12-09 is shown in Figure 4.

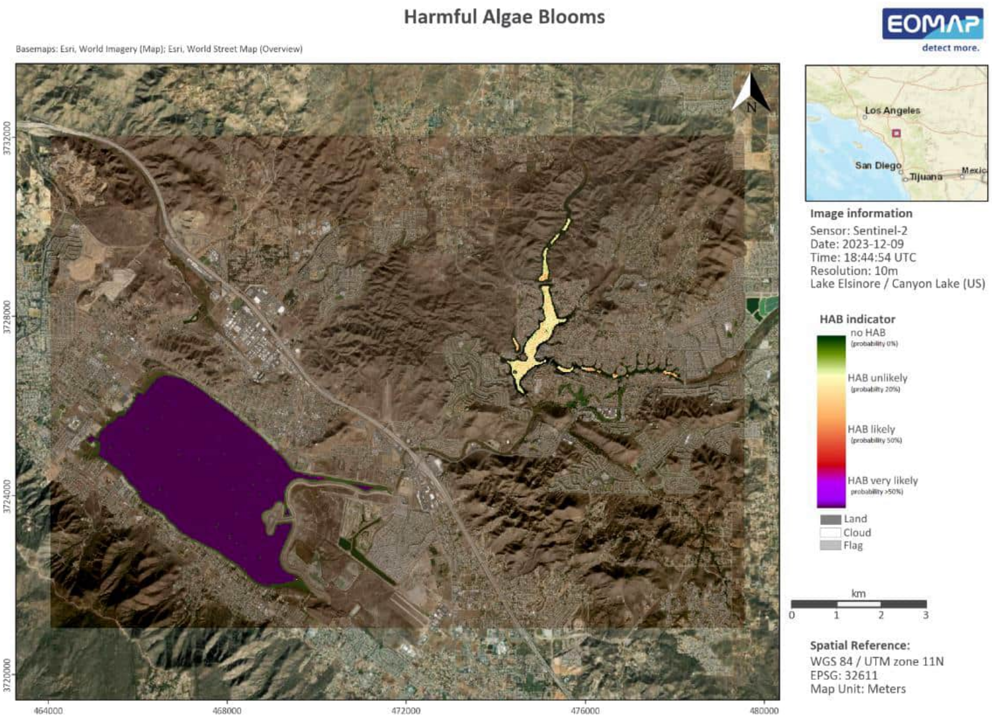


Figure 4: Harmful Algae Bloom Indicator product from 2023-12-09

3.4. True color composite (RGB)

RGB composite images represent the area of interest in true colour or false colour modes by combining predefined bands, depending on the sensor in use.

4. Quality Control and Flagging

As a standard output of the processing, an accuracy or quality indicator is calculated for each retrieved parameter and for each detected water pixel. This measure comprises a comprehensive range of factors that can impact the derived product quality, including:

- the geometry between sun, target, and sensor,
- the estimated sun glint probability,
- the retrieved aerosol optical depth,
- residuals of the measured and modelled sensor radiance and subsurface reflectance,
- the comparison of retrieved water species concentrations to extreme values as defined in the configuration files,
- pixels affected by cloud shadow and
- shallow water areas.

Threshold values define distinct values when a parameter is assumed to influence the quality. All parameters are integrated into one remaining quality parameter, allowing both an improved flagging and a quality weighting of pixels, that can later be merged into integrated 3rd level products.

The quality information is part of each standard geodata delivery and is visualized by two different 8bit GeoTIFFs:

- QUT - Total Quality, quantifying the overall quality of each pixel from low to high. Only valid water pixels - excluding land, cloud or flagged pixels - are represented in QUT indicator (Figure 5).
- QUC – EOMAP Quality coding (Figure 6), revealing the processor's internal quality check, split into the defined indicators (e.g. sunglint, shallow water risk, etc.). These are classified into 'no quality concerns', 'quality risk and 'bad quality' (flag). Note that 'quality risk' pixels are marked as such but not flagged.

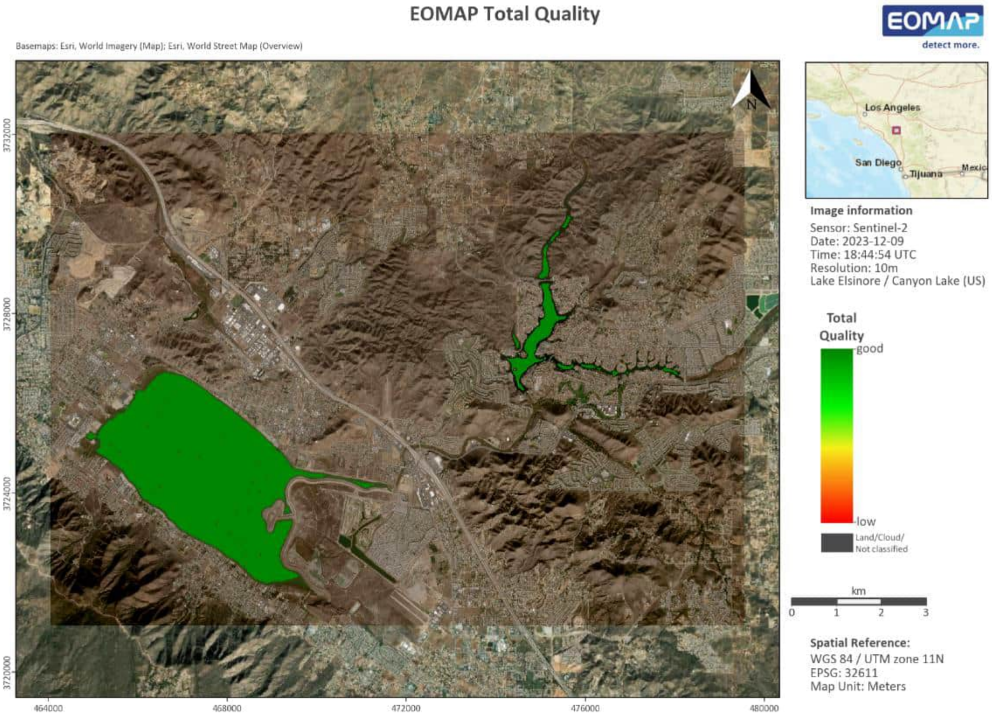


Figure 5: QUT product from 2023-12-09

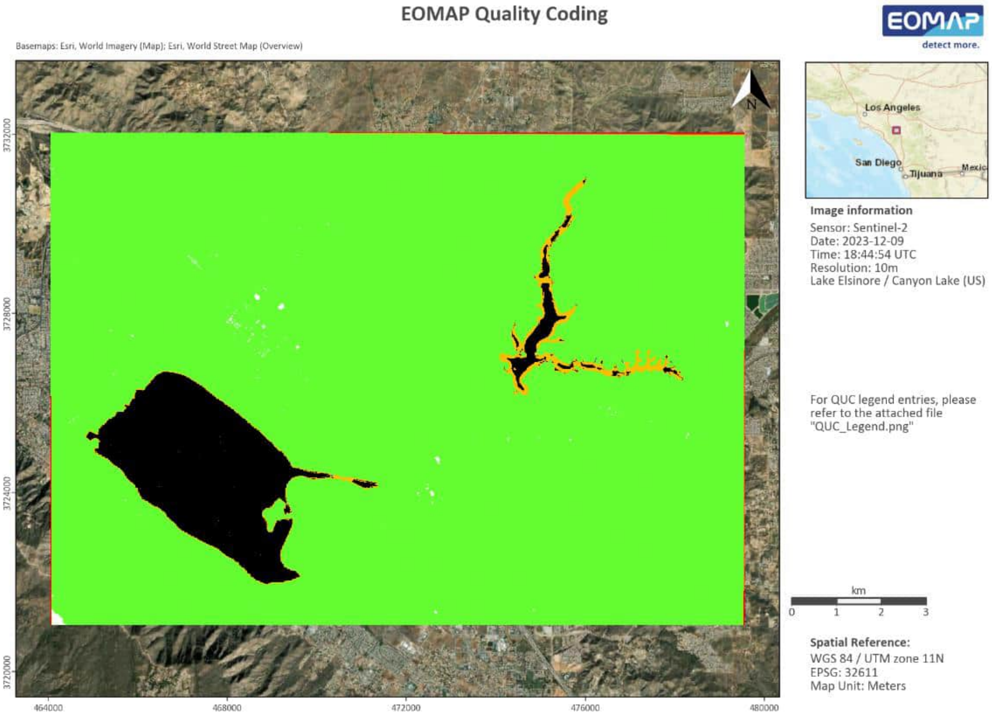
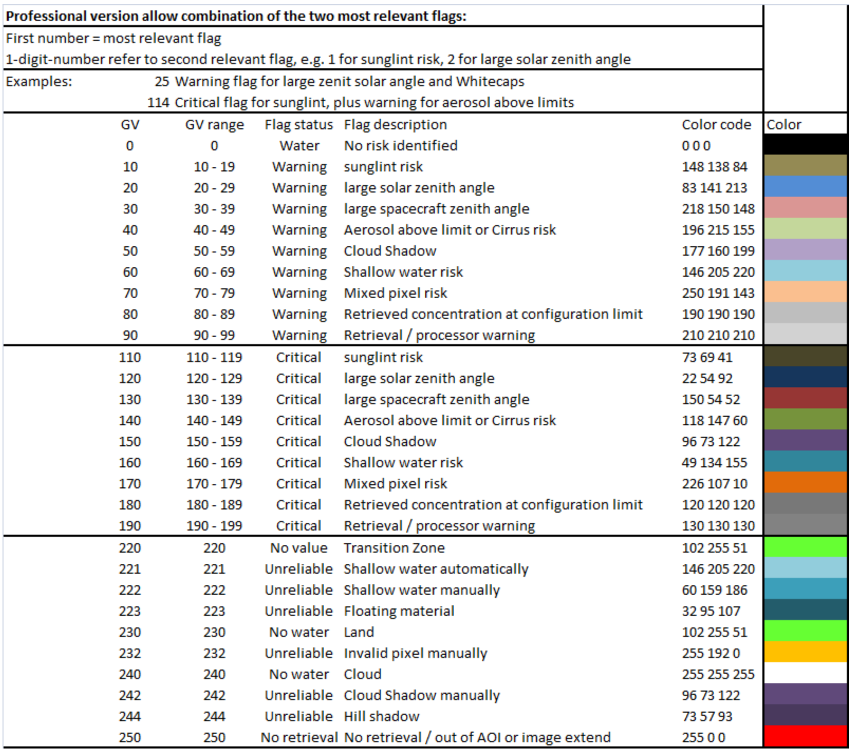


Figure 6: QUC product from 2023-12-09

The QUC file indicates the main quality influencing parameter using a specific EOMAP quality coding classification scheme with corresponding grey values (GV), shown in
Figure 7.



Professional version allow combination of the two most relevant flags:

First number = most relevant flag
1-digit-number refer to second relevant flag, e.g. 1 for sunglint risk, 2 for large solar zenith angle

Examples: 25 Warning flag for large zenit solar angle and Whitecaps
114 Critical flag for sunglint, plus warning for aerosol above limits

GV	GV range	Flag status	Flag description	Color code	Color
0	0	Water	No risk identified	0 0 0	⬛
10	10 - 19	Warning	sunglint risk	148 138 84	🟫
20	20 - 29	Warning	large solar zenith angle	83 141 213	🟦
30	30 - 39	Warning	large spacecraft zenith angle	218 150 148	🟥
40	40 - 49	Warning	Aerosol above limit or Cirrus risk	196 215 155	🟩
50	50 - 59	Warning	Cloud Shadow	177 160 199	🟪
60	60 - 69	Warning	Shallow water risk	146 205 220	🟦
70	70 - 79	Warning	Mixed pixel risk	250 191 143	🟧
80	80 - 89	Warning	Retrieved concentration at configuration limit	190 190 190	⬜
90	90 - 99	Warning	Retrieval / processor warning	210 210 210	⬜
110	110 - 119	Critical	sunglint risk	73 69 41	🟫
120	120 - 129	Critical	large solar zenith angle	22 54 92	🟦
130	130 - 139	Critical	large spacecraft zenith angle	150 54 52	🟥
140	140 - 149	Critical	Aerosol above limit or Cirrus risk	118 147 60	🟩
150	150 - 159	Critical	Cloud Shadow	96 73 122	🟪
160	160 - 169	Critical	Shallow water risk	49 134 155	🟦
170	170 - 179	Critical	Mixed pixel risk	226 107 10	🟧
180	180 - 189	Critical	Retrieved concentration at configuration limit	120 120 120	⬛
190	190 - 199	Critical	Retrieval / processor warning	130 130 130	⬛
220	220	No value	Transition Zone	102 255 51	🟩
221	221	Unreliable	Shallow water automatically	146 205 220	🟦
222	222	Unreliable	Shallow water manually	60 159 186	🟦
223	223	Unreliable	Floating material	32 95 107	🟦
230	230	No water	Land	102 255 51	🟩
232	232	Unreliable	Invalid pixel manually	255 192 0	🟨
240	240	No water	Cloud	255 255 255	⬜
242	242	Unreliable	Cloud Shadow manually	96 73 122	🟪
244	244	Unreliable	Hill shadow	73 57 93	🟪
250	250	No retrieval	No retrieval / out of AOI or image extend	255 0 0	🟥

Figure 7: EOMAP QUC quality coding

EOMAP's water quality products are accompanied by the processor's internal quality control mechanisms QUT and QUC, resulting in pixel flagging in case of unreliable values. Moreover, a manual quality check and - if required - additional masking is applied to each product.
As an example, cloud shadow effects typically occur in the vicinity of clouds, resulting in unrealistically low water parameter values. In order to detect and flag these areas, EOMAP has developed a specific algorithm based on geometric models, considering the sun angle and sensor viewing geometry, the retrieved aerosol properties, the height of the clouds, an analysis of the blue channel radiances and a statistical anomaly detection of the water species concentrations. When applying this cloud shadow detection algorithm, approx. 85% of the cloud shadows are detected and masked. Remaining cloud shadows are manually flagged and can be identified in the QUC file by GV 242.
Due to the spatial extent of single pixels (Sentinel-2: 10*10m, Landsat 8/9: 30*30m), it is likely that spectral mixing of signals from land and water can affect the pixels along the edge of the water body, leading to unreliable retrieval of water parameter values. Such pixels are labelled with the quality flag 'transition zone'. EOMAP uses a high-resolution land-water-mask database to determine the land-water-boundary, which is then filtered to create a transition zone that is automatically flagged during processing. In the 8bit water constituent products the transition zone is marked by GV 251, whereas in the QUC product it is 220.

5. Data Format

The water quality data are delivered as 32bit real value GeoTIFFs as well as 8bit scaled and colored GeoTIFFs for easier visualization. These colors are only a suggestion a corresponding to EOMAPs standard except for the HAB visualization, which has been changed according to a client-specific request. In addition, KMZ- as well as XYZ-files are delivered as per client request.

6. Data Sources

EOMAP uses the following the AWS data hub (https://registry.opendata.aws/index.html) to access and download satellite raw data from different sensors.

- Landsat 8/9: https://registry.opendata.aws/usgs-landsat/index.html
- Sentinel-2: https://registry.opendata.aws/sentinel-2/

EOMAP
Schlosshof 4
82229 Seefeld
Germany
+49 (0)8152 99861 10
info@eomap.com
www.eomap.com

Delivery report

Water Quality Monitoring: Lake Elsinore & Canyon Lake

Date: 2024-06-13
Version: 33

Clients: Wood Plc.
Reference: 2370_Delivery_EOMAP2WoodPlc

EOMAP GmbH & Co.KG,
Schlosshof 4, 82229 Seefeld
Germany

Authors:	Email	Phone
Hendrik Bernert	bernert@eomap.de	+49 8152 99861 14
Minha Sultan	sultan@eomap.de	+49 8152 99861 14

CONTENT

1. Service Provision Report

Contractor Details	Service Provider Details
Wood Environment & Infrastructure Solutions, Inc.	EOMAP GmbH & Co. KG
9210 Sky Park Court, Suite 200	Schlosshof 4, 82229 Seefeld, Germany
San Diego, CA 92123, USA	
Point of Contact	**Point of Contact**
John D. Rudolph	Hendrik Bernert
john.rudolph@woodplc.com	bernert@eomap.de, +49 (0)8152 9986114

Contractor PO / Reference number	
Contractor project title	
Service Provider reference number	2370
Date of delivery	2024-06-13
Version	33

1.1. List of all delivered scenes

Sensor	Time of record
Sentinel-2	2024-02-22 18:44:59 UTC

1.2. Content

Product	Abbreviation	Yes/No
Total Absorption	ABS	☐
Aerosol Optical Thickness	AOT	☐
Yellow Substances	CDM	☐
Chlorophyll-a	CHL	☒
Ratio of Absorption and Scattering	DIV	☐
Harmful Algae Bloom Indicator	HAB	☒
Diffuse Attenuation Coefficient	KDC	☐
Quality Coding	QUC	☒
Total Quality	QUT	☒
True Color/False Color Composite	RGB	☒
Remote Sensing Reflectance	RRS	☐
Secchi Disc Depth	SDD	☐
Sum of Inorganic Absorption	SIA	☐
Sum if Organic Absorption	SOA	☐
Surface Temperature	SST	☐
Turbidity	TUR	☒
Trophic State Index (Chlorophyll)	TSC	☐
Total Suspended Matter	TSM	☐
Light Penetration Depth	Z90	☐
Water Body Extent	WEX	☐

1.3. List of delivered files (one product example)

File name	File format	Content
2370_Delivery_EOMAP2WoodPlc_Vs33_20240613.pdf	PDF	Delivery Report
CHL_us-california_11smt_EOMAP_20240222_184459_SENT2_m0010.tif	GeoTIFF	Product raster file, 8bit scaled and coloured
CHL_us-california_11smt_EOMAP_20240222_184459_SENT2_m0010_32bit.tif	GeoTIFF	Product raster file, 32bit real values
CHL_us-california_11smt_EOMAP_20240222_184459_SENT2_m0010_32bit_wgs84.txt	ASCII	Product text file, real values
CHL_us-california_11smt_EOMAP_20240222_184459_SENT2_m0010.kmz	KMZ	GoogleEarth overlay
CHL_us-california_11smt_EOMAP_20240222_184459_SENT2_m0010.xml	XML	Metadata
CHL_us-california_11smt_EOMAP_20240222_184459_SENT2_m0010_overview.pdf	PDF	Overview PDF, metadata and quicklook

1.4. File naming

[Product abbreviation]_[Country code]-[Area]_EOMAP_[Date of satellite image recording]_[Time of satellite image recording]_[sensor code]_[spatial resolution]_[optional]

With

[Product abbreviation]	see list of product abbreviations
[Country code]	Country ID following ISO 3166 ALPHA-2 standards
[Area]	name of city/region or other relevant area characterization
[Date of satellite image rec.]	Satellite image date used for the analysis in YYMMDD (YY= Year, MM = Month, DD = Date) in UTC
[Time of satellite image rec.]	Satellite image date used for the analysis in HHMMSS (HH= Hours, MM = Minute, SS = Seconds) in UTC time
[sensor code]	Sensor in use
[spatial resolution]	Spatial resolution/grid spacing in meters
[optional]	is an optional parameter which can is used to support the intuitive use of the data, such as ‘metadata’ or ‘XYZQ’ for metadata files and ASCII XYZQ files.

1.5. Notes (e.g. technical issues, exceptional conditions, etc.)

- None

Data Analyst

Hendrik Bernert

Hendrik Bernert

QA/QC

Minha Sultan

2. Methodology: Modular Inversion and Processing System (MIP)

For the retrieval of satellite-derived water quality data, the physics-based Modular Inversion and Processing System (MIP), developed by EOMAP, has been applied to the satellite imagery. This sensor-independent approach includes all the relevant processing steps to guarantee a robust, standardised and operational retrieval of water quality parameters from various satellite data sources. The advantage of physics-based methods is that they do not require a priori information about the study area and can therefore be applied independently of satellite type and study area.

MIP imbeds sensor-independent algorithms and processing modules to derive consistent water quality parameters for multiple scales through a number of different satellite sensors. The algorithms take all relevant environmental impacts into account and do so for each individual measurement and pixel according to the current state-of-the-art, including:

a. water, land, cloud identification
b. estimation and correction of atmosphere and aerosol impacts[1] [2]
c. correction altitude level impacts[3]
d. correction of adjacency impact (light scattering into the water signal from adjacent land surfaces)[4]
e. correction[5] or flagging[6] of sunglitter impact
f. retrieval of in-water absorption and scattering as physical measures[7]
g. accounting for varying spectral slopes of specific inherent optical properties[8]
h. provision of uncertainty measures and flagging procedures
i. accounting for the full bidirectional effects in the atmosphere, at the water-atmosphere boundary layers and in-water, using a fully coupled radiative transfer model
j. application of procedures to minimize errors, resulting from the coupled interaction of light between atmosphere, water surface and in-water on the signal, through coupled inversion procedures

The different workflow steps from satellite raw imagery import to value-added water quality retrieval are displayed in Figure 1.

---

[1] Heege, T., Kiselev, V., Wettle, M., Hung N.N. (2014): Operational multi-sensor monitoring of turbidity for the entire Mekong Delta . Int. J. Remote Sensing, Special Issues Remote Sensing of the Mekong, Vol. 35 (8), pp. 2910-2926

[2] Richter, R., Heege, T., Kiselev, V., Schläpfer, D. (2014): Correction of ozone influence on TOA radiance. Int. J. of Remote Sensing. Vol. 35(23), pp. 8044-8056, doi: 10.1080/01431161.2014.978041

[3] Heege, T., Fischer, J. (2004): Mapping of water constituents in Lake Constance using multispectral airborne scanner data and a physically based processing scheme. Can. J. Remote Sensing, Vol. 30, No. 1, pp. 77-86

[4] Kiselev, V., Bulgarelli, B. and Heege, T., (2015). Sensor independent adjacency correction algorithm for coastal and inland water systems. Remote Sensing of Environment, 157: 85-95. , ISSN 0034-4257, http://dx.doi.org/10.1016/j.rse.2014.07.025

[5] Heege, T. & Fischer, J. (2000): Sun glitter correction in remote sensing imaging spectrometry. SPIE Ocean Optics XV Conference, Monaco, Oct. 16-20.

[6] EU FP7-Projekt GLASS: WP4 Validation report (29.2.2016): www.glass-project.eu/assets/Deliverables/GLaSS-D4.2.pdf

[7] Bumberger J., Heege T., Klinger P., et al. (2017): Towards a Harmonized Validation Procedure for Inland Water Optical Remote Sensing Data using Inherent Optical Properties, Rem. Sens. 2017(9), 21p, submitted 28 Feb. 2017

[8] Heege T., Schenk K., Klinger P., Broszeit A., Wenzel J., Kiselev V. (2015): Monitoring status and trends of water quality in inland waters using earth observation technologies. Proceedings “Water Quality in Europe: Challenges and Best Practice” UNESCO-IHP European Regional Consultation Workshop, Koblenz, Germany, Dec 2015, p. 1-4

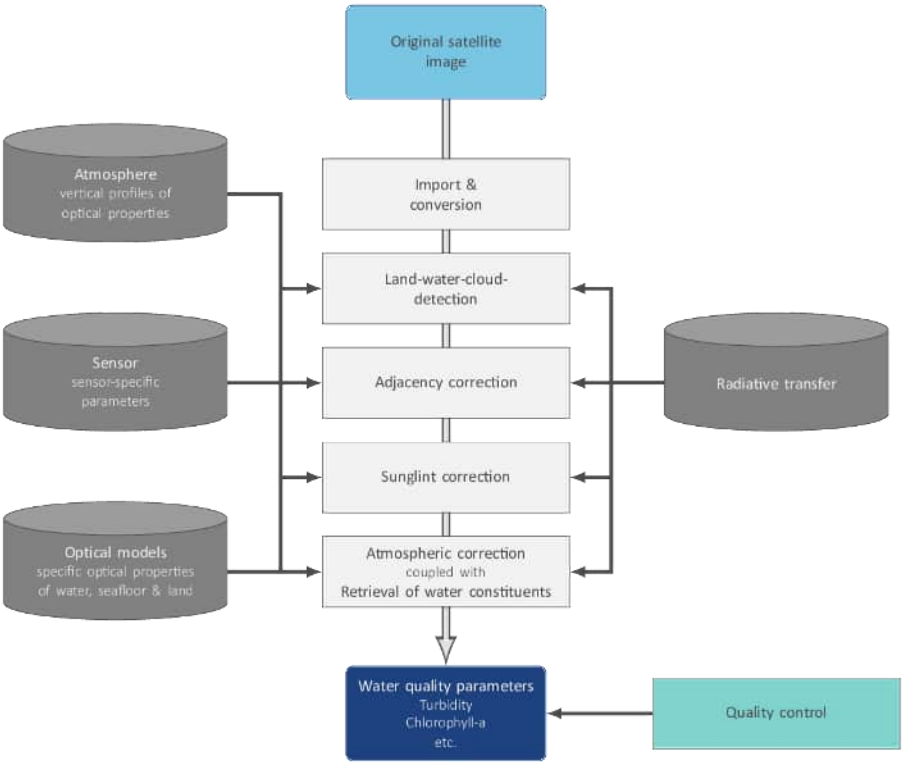


Figure 1: EOMAP's physics-based workflow to derive satellite-based water quality

MIP is the most established, sensor-independent and operational aquatic remote sensing processing system for the full range of high, medium and low-resolution satellite sensors. Fully-automated water monitoring processors are installed in satellite ground segments worldwide (Europe, Australia, Asia and America), to ensure fast and efficient access to a wide range of satellite data. The data processing and orchestration software, the EOMAP Workflow System (EWS) allows for continuous, daily production.

3. Products

3.1. Turbidity (TUR)

Turbidity (TUR) is a key parameter of water quality and is linearly related to the backward scattering of light of organic and inorganic particles in water. Turbidity is also linearly related to Total Suspended Matter (TSM) at low to moderate turbidity values. The measurement unit is Nephelometric Turbidity Unit (NTU). Satellite-derived turbidity is determined by the backward scattering of light between 450 to 800nm, which is physically retrieved using satellite data. The standard relation of EOMAP concentrations to inherent optical properties is defined as 1 NTU = 0.0118 1/m backward scattering at 550nm, or 1 NTU = 0.619 1/m total scattering at 550nm for an assumed ratio bb/b = 0.019. The linear relation between turbidity and suspended matter/solids in low to moderate concentrations is in most cases a regional constant, but can vary with particle size distribution. Note that the geometrical properties of an in-situ measurement device, and the wavelength in use, may differ in comparison to the satellite product. For example, the standard FTU determination, a measure of turbidity similar to NTU, is based on the measurement of light scattered within a 90° angle from a beam directed at the water sample. Alongside temporal differences in satellite and in situ measurements, different sampling depths and the measurement location, this needs to be considered when comparing and interpreting satellite derived vs. in situ measured turbidity values. The Turbidity product from 2024-02-22 is shown in Figure 2.

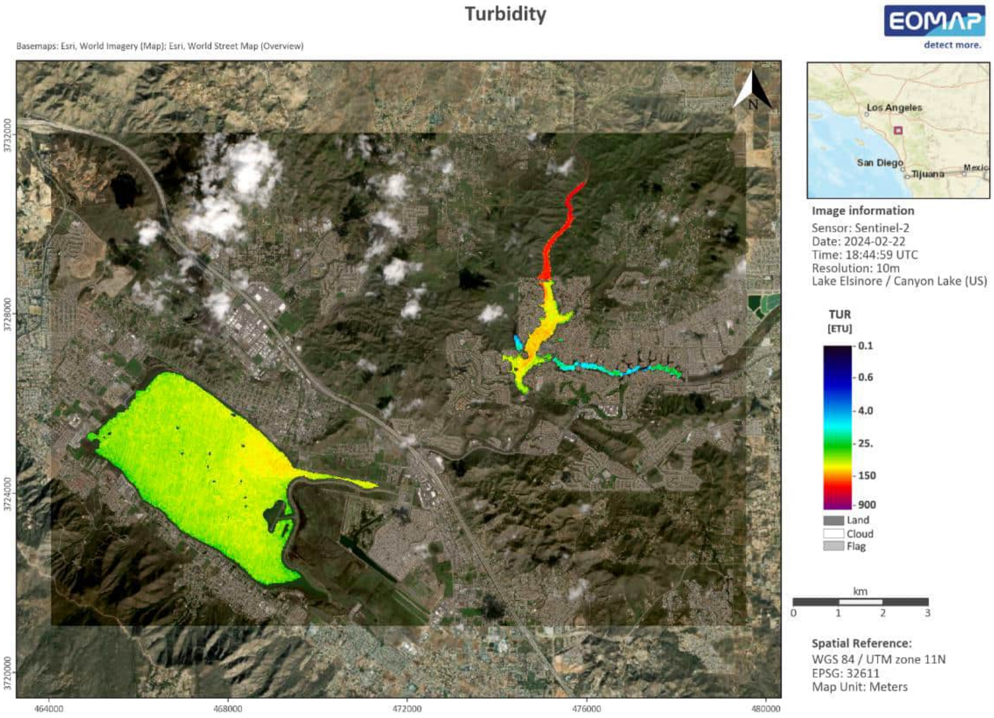


Figure 2: Turbidity product from 2024-02-22

3.2. Chlorophyll-a (CHL)

Chlorophyll-a (CHL) retrieval is based on the derived information of in-water organic absorption, in-water turbidity and spectral characteristics of each water body. Chlorophyll-a in [µg/l], is provided as a measure linearly related to the pigment-specific absorption at 440nm, with 1 µg/l Chl equal to 0.035 1/m pigment absorption. Phaeophytin and further pigments cannot be discriminated methodologically with the spectral resolution provided by Landsat 8/Sentinel-2 and similar sensors and is therefore included in this product. The pigment-related absorption is always smaller than the absorption of organic components (SOA). For clear water conditions (low chlorophyll/total suspended solids), the specific absorption chlorophyll increases significantly (Bricaud et al. 1995[9]). Chlorophyll values can vary over 4 magnitudes, for marine waters or clear lakes typical concentrations between 0.01 and 10 µg/l, while for eutrophic lakes concentrations can reach 100 µg/l and more. The chlorophyll products are typically reliable within a range of 10 – 50 % in comparison to in situ measures (Broszeit 2015[10]), which are typically based on one of three different methods, which include photometric, fluorescence and HPLC approaches and their subcategories. The Chlorophyll-a product from 2024-02-22 is shown in Figure 3.

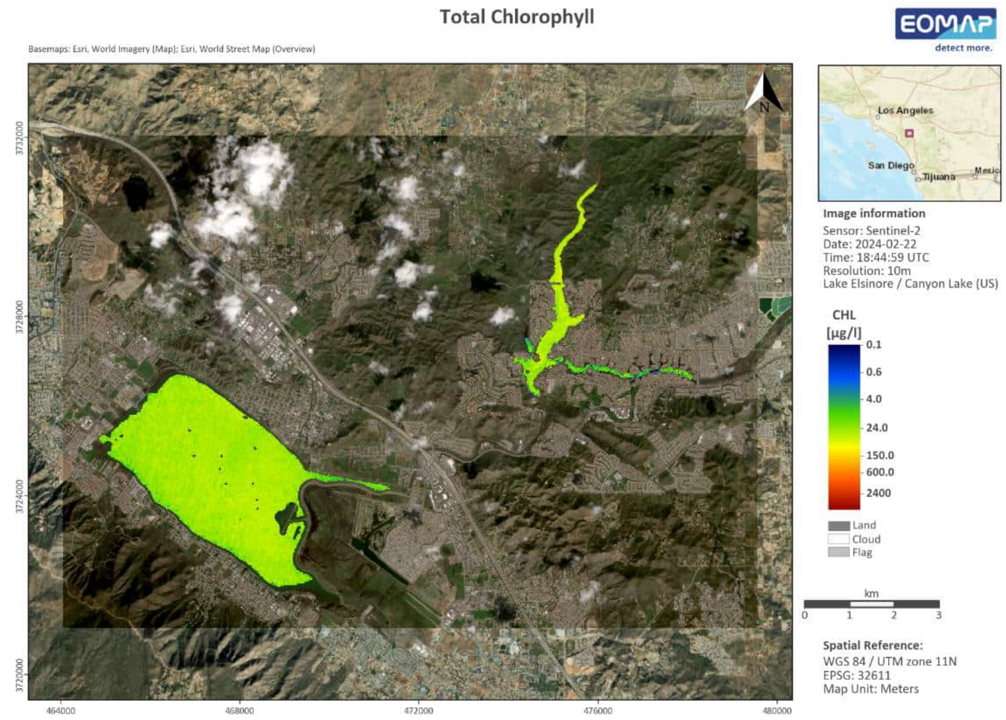


Figure 3: Chlorophyll-a product from 2024-02-22

---

[9] Bricaud, A., Babin, M., Morel, A., Claustre, H. (1995): Variability in the chlorophyll-specific absorption coefficients of natural phytoplankton: Analysis and parametrization. Journal of Geophysical Research Atmospheres, 100(C7):13,321-13,332

[10] Broszeit, A., 2015. Assessing long-term inland water quality using satellite imagery: A Feasibility and validation study of different lake types. MSc Thesis, Julius-Maximilian-University Würzburg, 96p

3.3. Harmful Algae Bloom Indicator (HAB)

The **Harmful Algae Bloom Indicator** (HAB) refers to the presence of cyanobacteria. It is sensitive to the appearance of cyanobacteria-related pigments, i.e. phycocyanin and phycoerythrin. Both pigments show absorption features in green wavelengths from 500 nm to approx. 640 nm; phycoerythrin shows its absorption maximum at 540-570 nm, phycocyanin at 610-620 (Colyer et al. 2005). Most satellite sensors support the identification of this feature with only two bands, i.e. one in the green wavelength region (e.g. L7 and L8 at 530 – 590 nm) and in the red wavelength region at approx. 640 – 670 nm. The used standard parameterisation of phytoplankton absorption in MIP as described above, however, does not account phycocyanin and phycoerythrin absorption in the retrieval process. The modelled phytoplankton absorption therefore lacks the absorption features of these pigments. Nonetheless, if these pigments are present in the water a slight spectral mismatch between modelled water leaving reflectance ($R_{modelled}$) and satellite derived reflectance ($R_{satellite}$) occurs. The algorithm then compares the slope of $R_{modelled}$ and $R_{satellite}$ between the green and red band ($\delta R = R_{green} - R_{red}$) in order to classify pixels with regard to phycocyanin and phycoerythrin occurrence, i.e. harmful algae bloom probability. The HAB indicator from 2024-02-22 is shown in Figure 4.

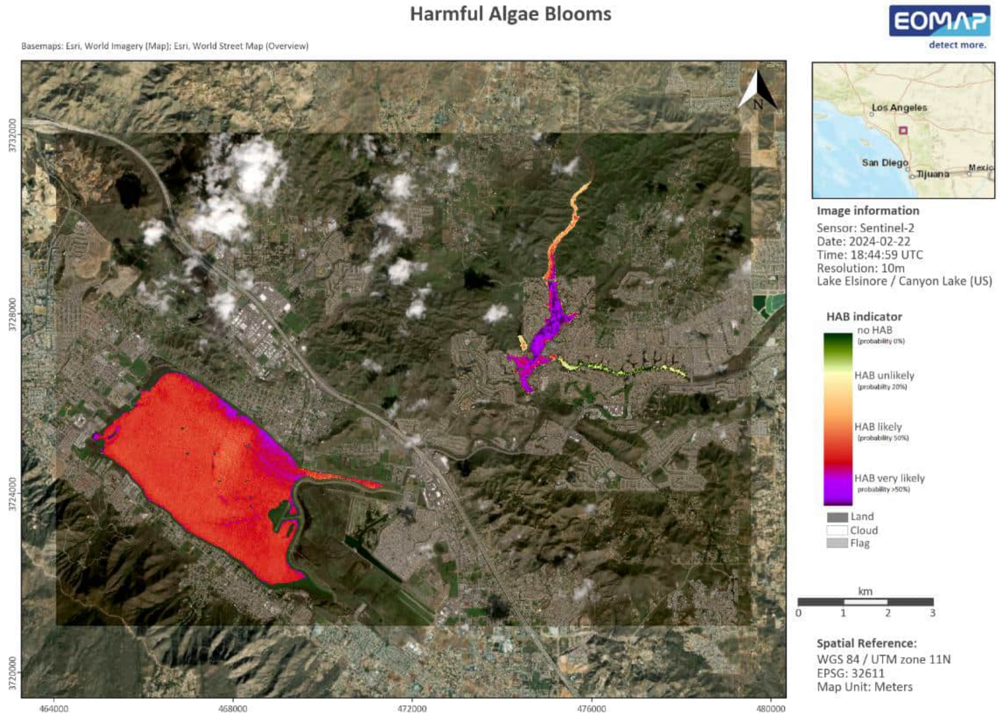


Figure 4: Harmful Algae Bloom Indicator product from 2024-02-22

3.4. True color composite (RGB)

RGB composite images represent the area of interest in true colour or false colour modes by combining predefined bands, depending on the sensor in use.

4. Quality Control and Flagging

As a standard output of the processing, an accuracy or quality indicator is calculated for each retrieved parameter and for each detected water pixel. This measure comprises a comprehensive range of factors that can impact the derived product quality, including:

- the geometry between sun, target, and sensor,
- the estimated sun glint probability,
- the retrieved aerosol optical depth,
- residuals of the measured and modelled sensor radiance and subsurface reflectance,
- the comparison of retrieved water species concentrations to extreme values as defined in the configuration files,
- pixels affected by cloud shadow and
- shallow water areas.

Threshold values define distinct values when a parameter is assumed to influence the quality. All parameters are integrated into one remaining quality parameter, allowing both an improved flagging and a quality weighting of pixels, that can later be merged into integrated 3rd level products.

The quality information is part of each standard geodata delivery and is visualized by two different 8bit GeoTIFFs:

- QUT - Total Quality, quantifying the overall quality of each pixel from low to high. Only valid water pixels - excluding land, cloud or flagged pixels - are represented in QUT indicator (Figure 5).
- QUC – EOMAP Quality coding (Figure 6), revealing the processor's internal quality check, split into the defined indicators (e.g. sunglint, shallow water risk, etc.). These are classified into 'no quality concerns', 'quality risk and 'bad quality' (flag). Note that 'quality risk' pixels are marked as such but not flagged.

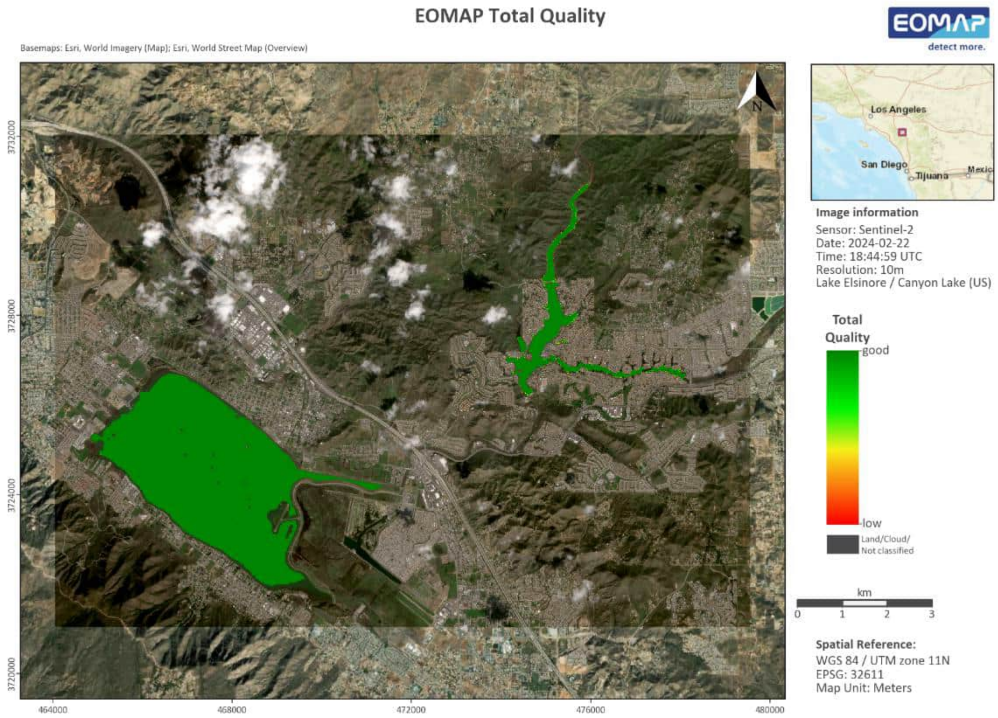


Figure 5: QUT product from 2024-02-22

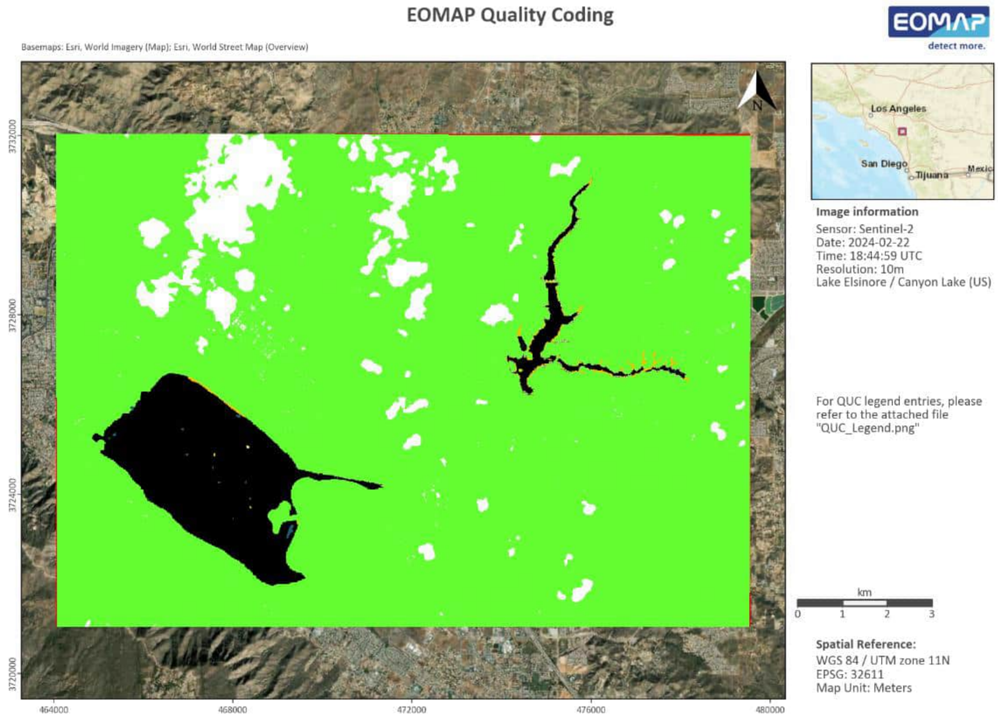
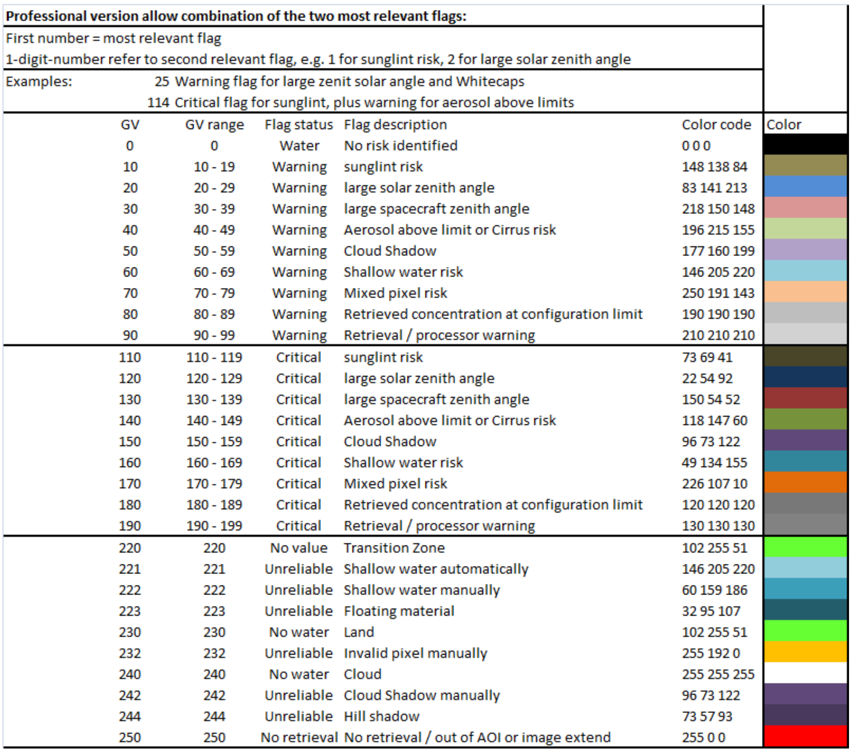


Figure 6: QUC product from 2024-02-22

The QUC file indicates the main quality influencing parameter using a specific EOMAP quality coding classification scheme with corresponding grey values (GV), shown in
Figure 7.



Professional version allow combination of the two most relevant flags:
First number = most relevant flag
1-digit-number refer to second relevant flag, e.g. 1 for sunglint risk, 2 for large solar zenith angle

Examples: 25 Warning flag for large zenit solar angle and Whitecaps
114 Critical flag for sunglint, plus warning for aerosol above limits

GV	GV range	Flag status	Flag description	Color code	Color
0	0	Water	No risk identified	0 0 0	⬛
10	10 - 19	Warning	sunglint risk	148 138 84	🟫
20	20 - 29	Warning	large solar zenith angle	83 141 213	🟦
30	30 - 39	Warning	large spacecraft zenith angle	218 150 148	🟥
40	40 - 49	Warning	Aerosol above limit or Cirrus risk	196 215 155	🟩
50	50 - 59	Warning	Cloud Shadow	177 160 199	🟪
60	60 - 69	Warning	Shallow water risk	146 205 220	🟦
70	70 - 79	Warning	Mixed pixel risk	250 191 143	🟧
80	80 - 89	Warning	Retrieved concentration at configuration limit	190 190 190	⬜
90	90 - 99	Warning	Retrieval / processor warning	210 210 210	⬜
110	110 - 119	Critical	sunglint risk	73 69 41	🟫
120	120 - 129	Critical	large solar zenith angle	22 54 92	🟦
130	130 - 139	Critical	large spacecraft zenith angle	150 54 52	🟥
140	140 - 149	Critical	Aerosol above limit or Cirrus risk	118 147 60	🟩
150	150 - 159	Critical	Cloud Shadow	96 73 122	🟪
160	160 - 169	Critical	Shallow water risk	49 134 155	🟦
170	170 - 179	Critical	Mixed pixel risk	226 107 10	🟧
180	180 - 189	Critical	Retrieved concentration at configuration limit	120 120 120	⬛
190	190 - 199	Critical	Retrieval / processor warning	130 130 130	⬛
220	220	No value	Transition Zone	102 255 51	🟩
221	221	Unreliable	Shallow water automatically	146 205 220	🟦
222	222	Unreliable	Shallow water manually	60 159 186	🟦
223	223	Unreliable	Floating material	32 95 107	🟦
230	230	No water	Land	102 255 51	🟩
232	232	Unreliable	Invalid pixel manually	255 192 0	🟨
240	240	No water	Cloud	255 255 255	⬜
242	242	Unreliable	Cloud Shadow manually	96 73 122	🟪
244	244	Unreliable	Hill shadow	73 57 93	🟪
250	250	No retrieval	No retrieval / out of AOI or image extend	255 0 0	🟥

Figure 7: EOMAP QUC quality coding

EOMAP's water quality products are accompanied by the processor's internal quality control mechanisms QUT and QUC, resulting in pixel flagging in case of unreliable values. Moreover, a manual quality check and - if required - additional masking is applied to each product.
As an example, cloud shadow effects typically occur in the vicinity of clouds, resulting in unrealistically low water parameter values. In order to detect and flag these areas, EOMAP has developed a specific algorithm based on geometric models, considering the sun angle and sensor viewing geometry, the retrieved aerosol properties, the height of the clouds, an analysis of the blue channel radiances and a statistical anomaly detection of the water species concentrations. When applying this cloud shadow detection algorithm, approx. 85% of the cloud shadows are detected and masked. Remaining cloud shadows are manually flagged and can be identified in the QUC file by GV 242.
Due to the spatial extent of single pixels (Sentinel-2: 10*10m, Landsat 8/9: 30*30m), it is likely that spectral mixing of signals from land and water can affect the pixels along the edge of the water body, leading to unreliable retrieval of water parameter values. Such pixels are labelled with the quality flag 'transition zone'. EOMAP uses a high-resolution land-water-mask database to determine the land-water-boundary, which is then filtered to create a transition zone that is automatically flagged during processing. In the 8bit water constituent products the transition zone is marked by GV 251, whereas in the QUC product it is 220.

5. Data Format

The water quality data are delivered as 32bit real value GeoTIFFs as well as 8bit scaled and colored GeoTIFFs for easier visualization. These colors are only a suggestion a corresponding to EOMAPs standard except for the HAB visualization, which has been changed according to a client-specific request. In addition, KMZ- as well as XYZ-files are delivered as per client request.

6. Data Sources

EOMAP uses the following the AWS data hub (https://registry.opendata.aws/index.html) to access and download satellite raw data from different sensors.

- Landsat 8/9: https://registry.opendata.aws/usgs-landsat/index.html
- Sentinel-2: https://registry.opendata.aws/sentinel-2/

Disclaimer: This document contains confidential information that is intended only for the use by EOMAP's Client. It is not for public circulation or publication or to be used by any third party without the express permission of either the Client or EOMAP GmbH & Co. KG. The concepts and information contained in this document are the property of EOMAP GmbH & Co. KG. Use or copying of this document in whole or in part without the written permission of EOMAP GmbH & Co. KG constitutes an infringement of copyright.

While the findings presented in this report are based on information that EOMAP GmbH & Co. KG considers reliable un-less stated otherwise, the accuracy and completeness of source information cannot be guaranteed. Furthermore, the information compiled in this report addresses the specific needs of the client, so may not address the needs of third par-ties using this report for their own purposes. Thus, EOMAP GmbH & Co. KG and its employees accept no liability for any losses or damage for any action taken or not taken on the basis of any part of the contents of this report. Those acting on information provided in this report do so entirely at their own risk.

EOMAP
Schlosshof 4
82229 Seefeld
Germany
+49 (0)8152 99861 10
info@eomap.com
www.eomap.com

Delivery report

Water Quality Monitoring: Lake Elsinore & Canyon Lake

Date: 2024-06-13
Version: 32

Clients: Wood Plc.
Reference: 2370_Delivery_EOMAP2WoodPlc

EOMAP GmbH & Co.KG,
Schlosshof 4, 82229 Seefeld
Germany

Authors:	Email	Phone
Hendrik Bernert	bernert@eomap.de	+49 8152 99861 14
Minha Sultan	sultan@eomap.de	+49 8152 99861 14

CONTENT

1. Service Provision Report

Contractor Details	Service Provider Details
Wood Environment & Infrastructure Solutions, Inc.	EOMAP GmbH & Co. KG
9210 Sky Park Court, Suite 200	Schlosshof 4, 82229 Seefeld, Germany
San Diego, CA 92123, USA	
Point of Contact	**Point of Contact**
John D. Rudolph	Hendrik Bernert
john.rudolph@woodplc.com	bernert@eomap.de, +49 (0)8152 9986114

Contractor PO / Reference number	
Contractor project title	
Service Provider reference number	2370
Date of delivery	2024-06-13
Version	32

1.1. List of all delivered scenes

Sensor	Time of record
Sentinel-2	2024-04-17 18:45:02 UTC

1.2. Content

Product	Abbreviation	Yes/No
Total Absorption	ABS	☐
Aerosol Optical Thickness	AOT	☐
Yellow Substances	CDM	☐
Chlorophyll-a	CHL	☒
Ratio of Absorption and Scattering	DIV	☐
Harmful Algae Bloom Indicator	HAB	☒
Diffuse Attenuation Coefficient	KDC	☐
Quality Coding	QUC	☒
Total Quality	QUT	☒
True Color/False Color Composite	RGB	☒
Remote Sensing Reflectance	RRS	☐
Secchi Disc Depth	SDD	☐
Sum of Inorganic Absorption	SIA	☐
Sum if Organic Absorption	SOA	☐
Surface Temperature	SST	☐
Turbidity	TUR	☒
Trophic State Index (Chlorophyll)	TSC	☐
Total Suspended Matter	TSM	☐
Light Penetration Depth	Z90	☐
Water Body Extent	WEX	☐

1.3. List of delivered files (one product example)

File name	File format	Content
2370_Delivery_EOMAP2WoodPlc_Vs32_20240613.pdf	PDF	Delivery Report
CHL_us-california_11smt_EOMAP_20240417_184502_SENT2_m0010.tif	GeoTIFF	Product raster file, 8bit scaled and coloured
CHL_us-california_11smt_EOMAP_20240417_184502_SENT2_m0010_32bit.tif	GeoTIFF	Product raster file, 32bit real values
CHL_us-california_11smt_EOMAP_20240417_184502_SENT2_m0010_32bit_wgs84.txt	ASCII	Product text file, real values
CHL_us-california_11smt_EOMAP_20240417_184502_SENT2_m0010.kmz	KMZ	GoogleEarth overlay
CHL_us-california_11smt_EOMAP_20240417_184502_SENT2_m0010.xml	XML	Metadata
CHL_us-california_11smt_EOMAP_20240417_184502_SENT2_m0010_overview.pdf	PDF	Overview PDF, metadata and quicklook

1.4. File naming

[Product abbreviation]_[Country code]-[Area]_EOMAP_[Date of satellite image recording]_[Time of satellite image recording]_[sensor code]_[spatial resolution]_[optional]

With

[Product abbreviation]	see list of product abbreviations
[Country code]	Country ID following ISO 3166 ALPHA-2 standards
[Area]	name of city/region or other relevant area characterization
[Date of satellite image rec.]	Satellite image date used for the analysis in YYMMDD (YY= Year, MM = Month, DD = Date) in UTC
[Time of satellite image rec.]	Satellite image date used for the analysis in HHMMSS (HH= Hours, MM = Minute, SS = Seconds) in UTC time
[sensor code]	Sensor in use
[spatial resolution]	Spatial resolution/grid spacing in meters
[optional]	is an optional parameter which can is used to support the intuitive use of the data, such as 'metadata' or 'XYZQ' for metadata files and ASCII XYZQ files.

1.5. Notes (e.g. technical issues, exceptional conditions, etc.)

- None

Data Analyst	QA/QC
Hendrik Bernert	
Hendrik Bernert	Minha Sultan

2. Methodology: Modular Inversion and Processing System (MIP)

For the retrieval of satellite-derived water quality data, the physics-based Modular Inversion and Processing System (MIP), developed by EOMAP, has been applied to the satellite imagery. This sensor-independent approach includes all the relevant processing steps to guarantee a robust, standardised and operational retrieval of water quality parameters from various satellite data sources. The advantage of physics-based methods is that they do not require a priori information about the study area and can therefore be applied independently of satellite type and study area.

MIP imbeds sensor-independent algorithms and processing modules to derive consistent water quality parameters for multiple scales through a number of different satellite sensors. The algorithms take all relevant environmental impacts into account and do so for each individual measurement and pixel according to the current state-of-the-art, including:

a. water, land, cloud identification
b. estimation and correction of atmosphere and aerosol impacts[1] [2]
c. correction altitude level impacts[3]
d. correction of adjacency impact (light scattering into the water signal from adjacent land surfaces)[4]
e. correction[5] or flagging[6] of sunglitter impact
f. retrieval of in-water absorption and scattering as physical measures[7]
g. accounting for varying spectral slopes of specific inherent optical properties[8]
h. provision of uncertainty measures and flagging procedures
i. accounting for the full bidirectional effects in the atmosphere, at the water-atmosphere boundary layers and in-water, using a fully coupled radiative transfer model
j. application of procedures to minimize errors, resulting from the coupled interaction of light between atmosphere, water surface and in-water on the signal, through coupled inversion procedures

The different workflow steps from satellite raw imagery import to value-added water quality retrieval are displayed in Figure 1.

---

[1] Heege, T., Kiselev, V., Wettle, M., Hung N.N. (2014): Operational multi-sensor monitoring of turbidity for the entire Mekong Delta . Int. J. Remote Sensing, Special Issues Remote Sensing of the Mekong, Vol. 35 (8), pp. 2910-2926

[2] Richter, R., Heege, T., Kiselev, V., Schläpfer, D. (2014): Correction of ozone influence on TOA radiance. Int. J. of Remote Sensing. Vol. 35(23), pp. 8044-8056, doi: 10.1080/01431161.2014.978041

[3] Heege, T., Fischer, J. (2004): Mapping of water constituents in Lake Constance using multispectral airborne scanner data and a physically based processing scheme. Can. J. Remote Sensing, Vol. 30, No. 1, pp. 77-86

[4] Kiselev, V., Bulgarelli, B. and Heege, T., (2015). Sensor independent adjacency correction algorithm for coastal and inland water systems. Remote Sensing of Environment, 157: 85-95. , ISSN 0034-4257, http://dx.doi.org/10.1016/j.rse.2014.07.025

[5] Heege, T. & Fischer, J. (2000): Sun glitter correction in remote sensing imaging spectrometry. SPIE Ocean Optics XV Conference, Monaco, Oct. 16-20.

[6] EU FP7-Projekt GLASS: WP4 Validation report (29.2.2016): www.glass-project.eu/assets/Deliverables/GLaSS-D4.2.pdf

[7] Bumberger J., Heege T., Klinger P., et al. (2017): Towards a Harmonized Validation Procedure for Inland Water Optical Remote Sensing Data using Inherent Optical Properties, Rem. Sens. 2017(9), 21p, submitted 28 Feb. 2017

[8] Heege T., Schenk K., Klinger P., Broszeit A., Wenzel J., Kiselev V. (2015): Monitoring status and trends of water quality in inland waters using earth observation technologies. Proceedings “Water Quality in Europe: Challenges and Best Practice” UNESCO-IHP European Regional Consultation Workshop, Koblenz, Germany, Dec 2015, p. 1-4

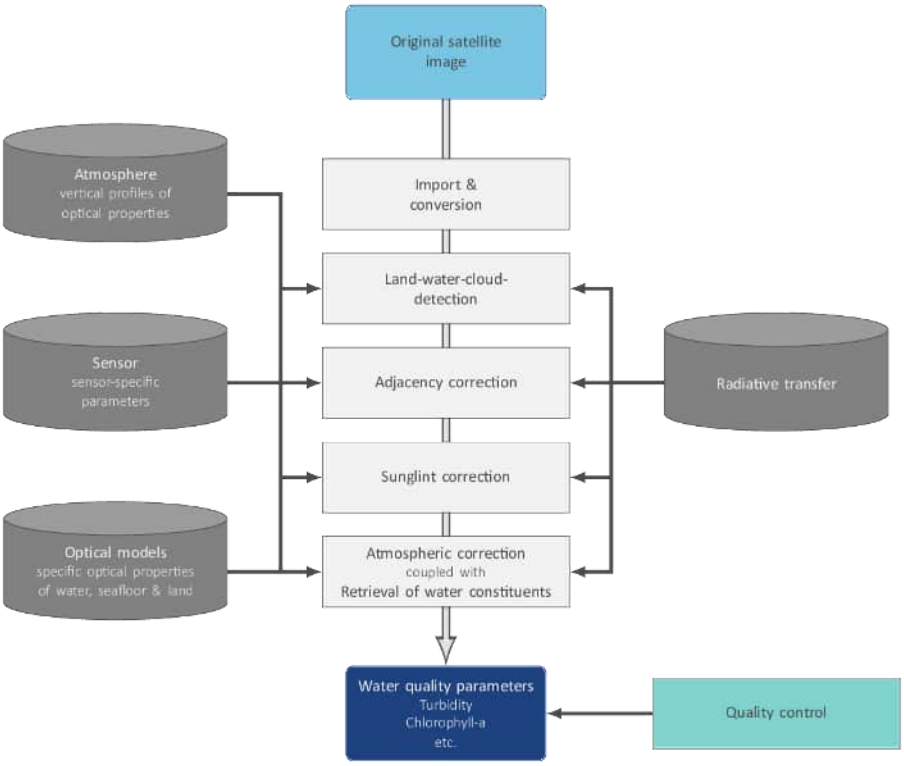


Figure 1: EOMAP's physics-based workflow to derive satellite-based water quality

MIP is the most established, sensor-independent and operational aquatic remote sensing processing system for the full range of high, medium and low-resolution satellite sensors. Fully-automated water monitoring processors are installed in satellite ground segments worldwide (Europe, Australia, Asia and America), to ensure fast and efficient access to a wide range of satellite data. The data processing and orchestration software, the EOMAP Workflow System (EWS) allows for continuous, daily production.

3. Products

3.1. Turbidity (TUR)

Turbidity (TUR) is a key parameter of water quality and is linearly related to the backward scattering of light of organic and inorganic particles in water. Turbidity is also linearly related to Total Suspended Matter (TSM) at low to moderate turbidity values. The measurement unit is Nephelometric Turbidity Unit (NTU). Satellite-derived turbidity is determined by the backward scattering of light between 450 to 800nm, which is physically retrieved using satellite data. The standard relation of EOMAP concentrations to inherent optical properties is defined as 1 NTU = 0.0118 1/m backward scattering at 550nm, or 1 NTU = 0.619 1/m total scattering at 550nm for an assumed ratio bb/b = 0.019. The linear relation between turbidity and suspended matter/solids in low to moderate concentrations is in most cases a regional constant, but can vary with particle size distribution. Note that the geometrical properties of an in-situ measurement device, and the wavelength in use, may differ in comparison to the satellite product. For example, the standard FTU determination, a measure of turbidity similar to NTU, is based on the measurement of light scattered within a 90° angle from a beam directed at the water sample. Alongside temporal differences in satellite and in situ measurements, different sampling depths and the measurement location, this needs to be considered when comparing and interpreting satellite derived vs. in situ measured turbidity values. The Turbidity product from 2024-04-17 is shown in Figure 2.

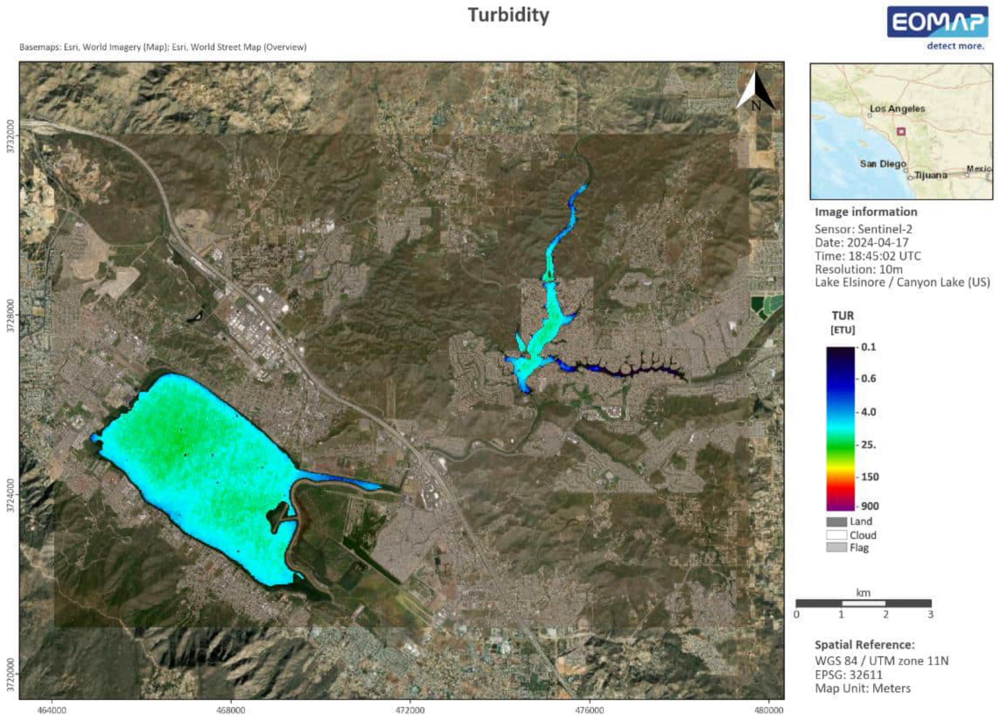


Figure 2: Turbidity product from 2024-04-17

3.2. Chlorophyll-a (CHL)

Chlorophyll-a (CHL) retrieval is based on the derived information of in-water organic absorption, in-water turbidity and spectral characteristics of each water body. Chlorophyll-a in [µg/l], is provided as a measure linearly related to the pigment-specific absorption at 440nm, with 1 µg/l Chl equal to 0.035 1/m pigment absorption. Phaeophytin and further pigments cannot be discriminated methodologically with the spectral resolution provided by Landsat 8/Sentinel-2 and similar sensors and is therefore included in this product. The pigment-related absorption is always smaller than the absorption of organic components (SOA). For clear water conditions (low chlorophyll/total suspended solids), the specific absorption chlorophyll increases significantly (Bricaud et al. 1995[9]). Chlorophyll values can vary over 4 magnitudes, for marine waters or clear lakes typical concentrations between 0.01 and 10 µg/l, while for eutrophic lakes concentrations can reach 100 µg/l and more. The chlorophyll products are typically reliable within a range of 10 – 50 % in comparison to in situ measures (Broszeit 2015[10]), which are typically based on one of three different methods, which include photometric, fluorescence and HPLC approaches and their subcategories. The Chlorophyll-a product from 2024-04-17 is shown in Figure 3.

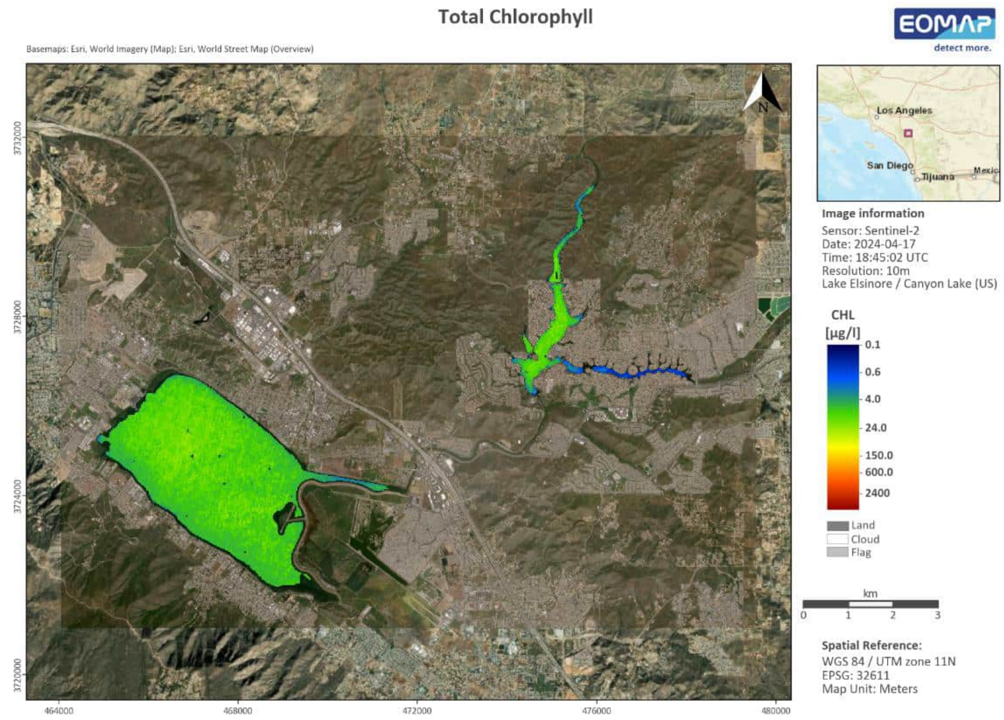


Figure 3: Chlorophyll-a product from 2024-04-17

---

[9] Bricaud, A., Babin, M., Morel, A., Claustre, H. (1995): Variability in the chlorophyll-specific absorption coefficients of natural phytoplankton: Analysis and parametrization. Journal of Geophysical Research Atmospheres, 100(C7):13,321-13,332

[10] Broszeit, A., 2015. Assessing long-term inland water quality using satellite imagery: A Feasibility and validation study of different lake types. MSc Thesis, Julius-Maximilian-University Würzburg, 96p

3.3. Harmful Algae Bloom Indicator (HAB)

The **Harmful Algae Bloom Indicator** (HAB) refers to the presence of cyanobacteria. It is sensitive to the appearance of cyanobacteria-related pigments, i.e. phycocyanin and phycoerythrin. Both pigments show absorption features in green wavelengths from 500 nm to approx. 640 nm; phycoerythrin shows its absorption maximum at 540-570 nm, phycocyanin at 610-620 (Colyer et al. 2005). Most satellite sensors support the identification of this feature with only two bands, i.e. one in the green wavelength region (e.g. L7 and L8 at 530 – 590 nm) and in the red wavelength region at approx. 640 – 670 nm. The used standard parameterisation of phytoplankton absorption in MIP as described above, however, does not account phycocyanin and phycoerythrin absorption in the retrieval process. The modelled phytoplankton absorption therefore lacks the absorption features of these pigments. Nonetheless, if these pigments are present in the water a slight spectral mismatch between modelled water leaving reflectance ($R_{modelled}$) and satellite derived reflectance ($R_{satellite}$) occurs. The algorithm then compares the slope of $R_{modelled}$ and $R_{satellite}$ between the green and red band ($\delta R = R_{green} - R_{red}$) in order to classify pixels with regard to phycocyanin and phycoerythrin occurrence, i.e. harmful algae bloom probability. The HAB indicator from 2024-04-17 is shown in Figure 4.

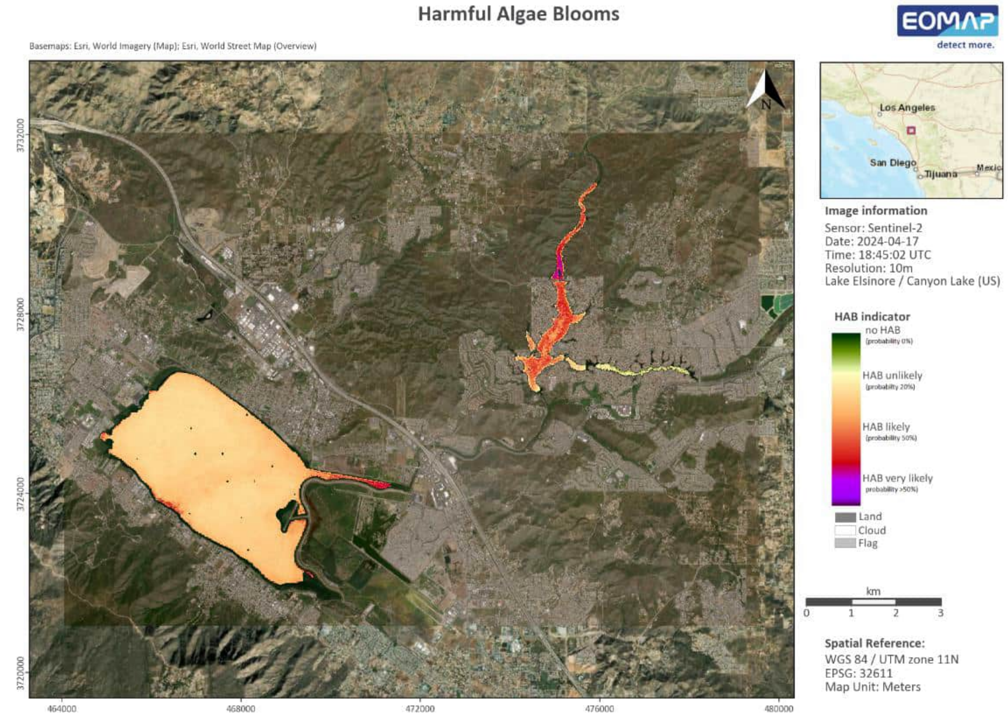


Figure 4: Harmful Algae Bloom Indicator product from 2024-04-17

3.4. True color composite (RGB)

RGB composite images represent the area of interest in true colour or false colour modes by combining predefined bands, depending on the sensor in use.

4. Quality Control and Flagging

As a standard output of the processing, an accuracy or quality indicator is calculated for each retrieved parameter and for each detected water pixel. This measure comprises a comprehensive range of factors that can impact the derived product quality, including:

- the geometry between sun, target, and sensor,
- the estimated sun glint probability,
- the retrieved aerosol optical depth,
- residuals of the measured and modelled sensor radiance and subsurface reflectance,
- the comparison of retrieved water species concentrations to extreme values as defined in the configuration files,
- pixels affected by cloud shadow and
- shallow water areas.

Threshold values define distinct values when a parameter is assumed to influence the quality. All parameters are integrated into one remaining quality parameter, allowing both an improved flagging and a quality weighting of pixels, that can later be merged into integrated 3rd level products.

The quality information is part of each standard geodata delivery and is visualized by two different 8bit GeoTIFFs:

- QUT - Total Quality, quantifying the overall quality of each pixel from low to high. Only valid water pixels - excluding land, cloud or flagged pixels - are represented in QUT indicator (Figure 5).
- QUC – EOMAP Quality coding (Figure 6), revealing the processor's internal quality check, split into the defined indicators (e.g. sunglint, shallow water risk, etc.). These are classified into 'no quality concerns', 'quality risk and 'bad quality' (flag). Note that 'quality risk' pixels are marked as such but not flagged.

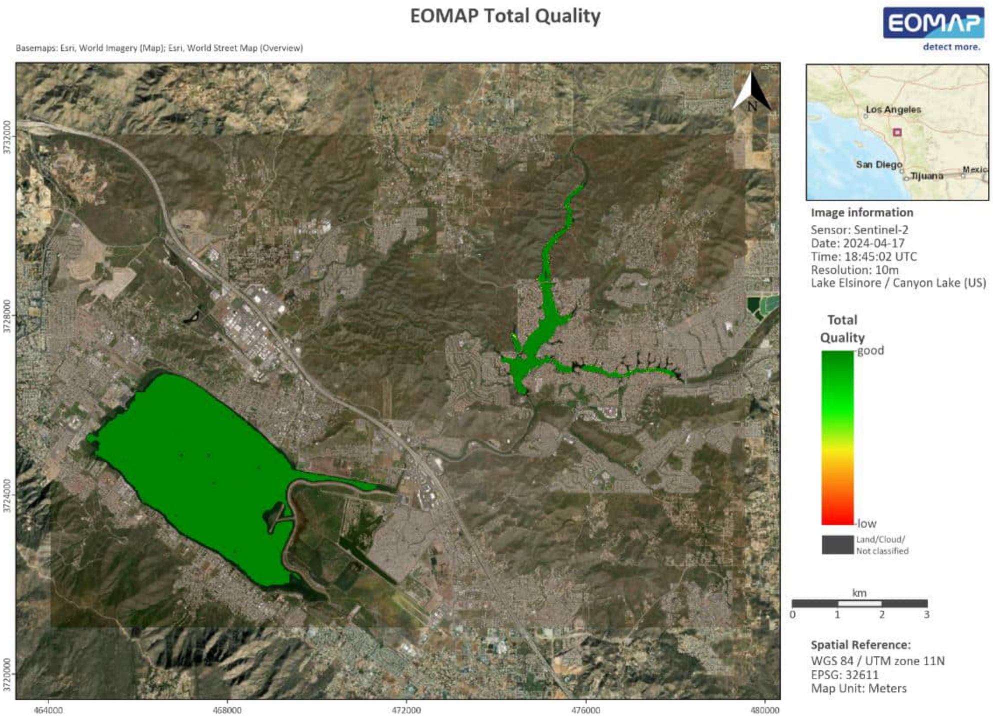


Figure 5: QUT product from 2024-04-17

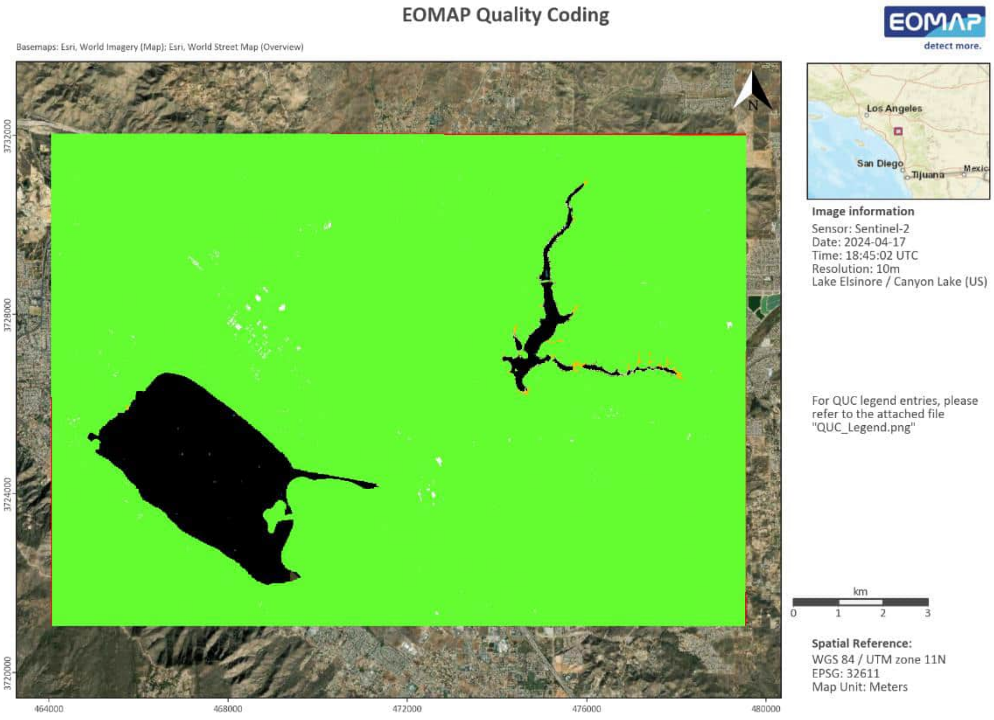
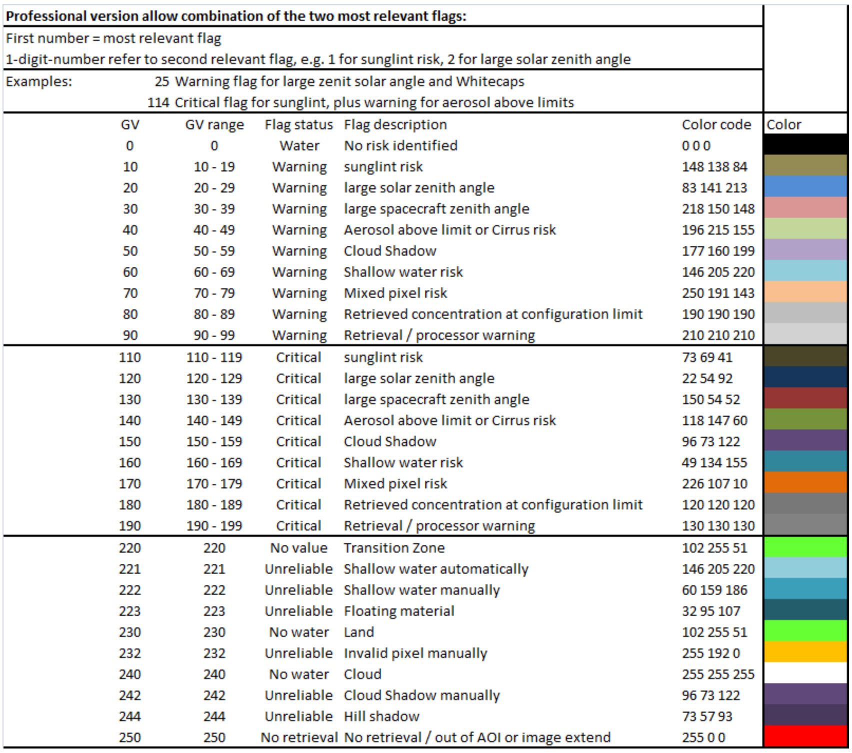


Figure 6: QUC product from 2024-04-17

The QUC file indicates the main quality influencing parameter using a specific EOMAP quality coding classification scheme with corresponding grey values (GV), shown in Figure 7.



Professional version allow combination of the two most relevant flags:

First number = most relevant flag
1-digit-number refer to second relevant flag, e.g. 1 for sunglint risk, 2 for large solar zenith angle

Examples: 25 Warning flag for large zenit solar angle and Whitecaps
114 Critical flag for sunglint, plus warning for aerosol above limits

GV	GV range	Flag status	Flag description	Color code	Color
0	0	Water	No risk identified	0 0 0	⬛
10	10 - 19	Warning	sunglint risk	148 138 84	🟫
20	20 - 29	Warning	large solar zenith angle	83 141 213	🟦
30	30 - 39	Warning	large spacecraft zenith angle	218 150 148	🟥
40	40 - 49	Warning	Aerosol above limit or Cirrus risk	196 215 155	🟩
50	50 - 59	Warning	Cloud Shadow	177 160 199	🟪
60	60 - 69	Warning	Shallow water risk	146 205 220	🟦
70	70 - 79	Warning	Mixed pixel risk	250 191 143	🟧
80	80 - 89	Warning	Retrieved concentration at configuration limit	190 190 190	⬜
90	90 - 99	Warning	Retrieval / processor warning	210 210 210	⬜
110	110 - 119	Critical	sunglint risk	73 69 41	🟫
120	120 - 129	Critical	large solar zenith angle	22 54 92	🟦
130	130 - 139	Critical	large spacecraft zenith angle	150 54 52	🟥
140	140 - 149	Critical	Aerosol above limit or Cirrus risk	118 147 60	🟩
150	150 - 159	Critical	Cloud Shadow	96 73 122	🟪
160	160 - 169	Critical	Shallow water risk	49 134 155	🟦
170	170 - 179	Critical	Mixed pixel risk	226 107 10	🟧
180	180 - 189	Critical	Retrieved concentration at configuration limit	120 120 120	⬛
190	190 - 199	Critical	Retrieval / processor warning	130 130 130	⬛
220	220	No value	Transition Zone	102 255 51	🟩
221	221	Unreliable	Shallow water automatically	146 205 220	🟦
222	222	Unreliable	Shallow water manually	60 159 186	🟦
223	223	Unreliable	Floating material	32 95 107	🟦
230	230	No water	Land	102 255 51	🟩
232	232	Unreliable	Invalid pixel manually	255 192 0	🟨
240	240	No water	Cloud	255 255 255	⬜
242	242	Unreliable	Cloud Shadow manually	96 73 122	🟪
244	244	Unreliable	Hill shadow	73 57 93	🟪
250	250	No retrieval	No retrieval / out of AOI or image extend	255 0 0	🟥

Figure 7: EOMAP QUC quality coding

EOMAP's water quality products are accompanied by the processor's internal quality control mechanisms QUT and QUC, resulting in pixel flagging in case of unreliable values. Moreover, a manual quality check and - if required - additional masking is applied to each product.
As an example, cloud shadow effects typically occur in the vicinity of clouds, resulting in unrealistically low water parameter values. In order to detect and flag these areas, EOMAP has developed a specific algorithm based on geometric models, considering the sun angle and sensor viewing geometry, the retrieved aerosol properties, the height of the clouds, an analysis of the blue channel radiances and a statistical anomaly detection of the water species concentrations. When applying this cloud shadow detection algorithm, approx. 85% of the cloud shadows are detected and masked. Remaining cloud shadows are manually flagged and can be identified in the QUC file by GV 242.
Due to the spatial extent of single pixels (Sentinel-2: 10*10m, Landsat 8/9: 30*30m), it is likely that spectral mixing of signals from land and water can affect the pixels along the edge of the water body, leading to unreliable retrieval of water parameter values. Such pixels are labelled with the quality flag 'transition zone'. EOMAP uses a high-resolution land-water-mask database to determine the land-water-boundary, which is then filtered to create a transition zone that is automatically flagged during processing. In the 8bit water constituent products the transition zone is marked by GV 251, whereas in the QUC product it is 220.

5. Data Format

The water quality data are delivered as 32bit real value GeoTIFFs as well as 8bit scaled and colored GeoTIFFs for easier visualization. These colors are only a suggestion a corresponding to EOMAPs standard except for the HAB visualization, which has been changed according to a client-specific request. In addition, KMZ- as well as XYZ-files are delivered as per client request.

6. Data Sources

EOMAP uses the following the AWS data hub (https://registry.opendata.aws/index.html) to access and download satellite raw data from different sensors.

- Landsat 8/9: https://registry.opendata.aws/usgs-landsat/index.html
- Sentinel-2: https://registry.opendata.aws/sentinel-2/

Disclaimer: This document contains confidential information that is intended only for the use by EOMAP’s Client. It is not for public circulation or publication or to be used by any third party without the express permission of either the Client or EOMAP GmbH & Co. KG. The concepts and information contained in this document are the property of EOMAP GmbH & Co. KG. Use or copying of this document in whole or in part without the written permission of EOMAP GmbH & Co. KG constitutes an infringement of copyright.

While the findings presented in this report are based on information that EOMAP GmbH & Co. KG considers reliable un-less stated otherwise, the accuracy and completeness of source information cannot be guaranteed. Furthermore, the information compiled in this report addresses the specific needs of the client, so may not address the needs of third par-ties using this report for their own purposes. Thus, EOMAP GmbH & Co. KG and its employees accept no liability for any losses or damage for any action taken or not taken on the basis of any part of the contents of this report. Those acting on information provided in this report do so entirely at their own risk.

EOMAP
Schlosshof 4
82229 Seefeld
Germany
+49 (0)8152 99861 10
info@eomap.com
www.eomap.com

Delivery report

Water Quality Monitoring: Lake Elsinore & Canyon Lake

Date: 2024-06-13
Version: 34

Clients: Wood Plc.
Reference: 2370_Delivery_EOMAP2WoodPlc

EOMAP GmbH & Co.KG,
Schlosshof 4, 82229 Seefeld
Germany

Authors:	Email	Phone
Hendrik Bernert	bernert@eomap.de	+49 8152 99861 14
Minha Sultan	sultan@eomap.de	+49 8152 99861 14

CONTENT

1. Service Provision Report

Contractor Details	Service Provider Details
Wood Environment & Infrastructure Solutions, Inc.	EOMAP GmbH & Co. KG
9210 Sky Park Court, Suite 200	Schlosshof 4, 82229 Seefeld, Germany
San Diego, CA 92123, USA	
Point of Contact	**Point of Contact**
John D. Rudolph	Hendrik Bernert
john.rudolph@woodplc.com	bernert@eomap.de, +49 (0)8152 9986114

Contractor PO / Reference number	
Contractor project title	
Service Provider reference number	2370
Date of delivery	2024-06-13
Version	34

1.1. List of all delivered scenes

Sensor	Time of record
Landsat-8	2024-06-05 18:21:38 UTC

1.2. Content

Product	Abbreviation	Yes/No
Total Absorption	ABS	☐
Aerosol Optical Thickness	AOT	☐
Yellow Substances	CDM	☐
Chlorophyll-a	CHL	☒
Ratio of Absorption and Scattering	DIV	☐
Harmful Algae Bloom Indicator	HAB	☒
Diffuse Attenuation Coefficient	KDC	☐
Quality Coding	QUC	☒
Total Quality	QUT	☒
True Color/False Color Composite	RGB	☒
Remote Sensing Reflectance	RRS	☐
Secchi Disc Depth	SDD	☐
Sum of Inorganic Absorption	SIA	☐
Sum if Organic Absorption	SOA	☐
Surface Temperature	SST	☐
Turbidity	TUR	☒
Trophic State Index (Chlorophyll)	TSC	☐
Total Suspended Matter	TSM	☐
Light Penetration Depth	Z90	☐
Water Body Extent	WEX	☐

1.3. List of delivered files (one product example)

File name	File format	Content
2370_Delivery_EOMAP2WoodPlc_Vs34_20240613.pdf	PDF	Delivery Report
CHL_us-california_040037_EOMAP_20240605_182138_LSAT8_m0030.tif	GeoTIFF	Product raster file, 8bit scaled and coloured
CHL_us-california_040037_EOMAP_20240605_182138_LSAT8_m0030_32bit.tif	GeoTIFF	Product raster file, 32bit real values
CHL_us-california_040037_EOMAP_20240605_182138_LSAT8_m0030_32bit_wgs84.txt	ASCII	Product text file, real values
CHL_us-california_040037_EOMAP_20240605_182138_LSAT8_m0030.kmz	KMZ	GoogleEarth overlay
CHL_us-california_040037_EOMAP_20240605_182138_LSAT8_m0030.xml	XML	Metadata
CHL_us-california_040037_EOMAP_20240605_182138_LSAT8_m0030_overview.pdf	PDF	Overview PDF, metadata and quicklook

1.4. File naming

[Product abbreviation]_[Country code]-[Area]_EOMAP_[Date of satellite image recording]_[Time of satellite image recording]_[sensor code]_[spatial resolution]_[optional]

With

[Product abbreviation]	see list of product abbreviations
[Country code]	Country ID following ISO 3166 ALPHA-2 standards
[Area]	name of city/region or other relevant area characterization
[Date of satellite image rec.]	Satellite image date used for the analysis in YYMMDD (YY= Year, MM = Month, DD = Date) in UTC
[Time of satellite image rec.]	Satellite image date used for the analysis in HHMMSS (HH= Hours, MM = Minute, SS = Seconds) in UTC time
[sensor code]	Sensor in use
[spatial resolution]	Spatial resolution/grid spacing in meters
[optional]	is an optional parameter which can is used to support the intuitive use of the data, such as 'metadata' or 'XYZQ' for metadata files and ASCII XYZQ files.

1.5. Notes (e.g. technical issues, exceptional conditions, etc.)

- None

Data Analyst

Hendrik Bernert

Hendrik Bernert

QA/QC

Minha Sultan

2. Methodology: Modular Inversion and Processing System (MIP)

For the retrieval of satellite-derived water quality data, the physics-based Modular Inversion and Processing System (MIP), developed by EOMAP, has been applied to the satellite imagery. This sensor-independent approach includes all the relevant processing steps to guarantee a robust, standardised and operational retrieval of water quality parameters from various satellite data sources. The advantage of physics-based methods is that they do not require a priori information about the study area and can therefore be applied independently of satellite type and study area.

MIP imbeds sensor-independent algorithms and processing modules to derive consistent water quality parameters for multiple scales through a number of different satellite sensors. The algorithms take all relevant environmental impacts into account and do so for each individual measurement and pixel according to the current state-of-the-art, including:

a. water, land, cloud identification
b. estimation and correction of atmosphere and aerosol impacts[1] [2]
c. correction altitude level impacts[3]
d. correction of adjacency impact (light scattering into the water signal from adjacent land surfaces)[4]
e. correction[5] or flagging[6] of sunglitter impact
f. retrieval of in-water absorption and scattering as physical measures[7]
g. accounting for varying spectral slopes of specific inherent optical properties[8]
h. provision of uncertainty measures and flagging procedures
i. accounting for the full bidirectional effects in the atmosphere, at the water-atmosphere boundary layers and in-water, using a fully coupled radiative transfer model
j. application of procedures to minimize errors, resulting from the coupled interaction of light between atmosphere, water surface and in-water on the signal, through coupled inversion procedures

The different workflow steps from satellite raw imagery import to value-added water quality retrieval are displayed in Figure 1.

---

[1] Heege, T., Kiselev, V., Wettle, M., Hung N.N. (2014): Operational multi-sensor monitoring of turbidity for the entire Mekong Delta . Int. J. Remote Sensing, Special Issues Remote Sensing of the Mekong, Vol. 35 (8), pp. 2910-2926

[2] Richter, R., Heege, T., Kiselev, V., Schläpfer, D. (2014): Correction of ozone influence on TOA radiance. Int. J. of Remote Sensing. Vol. 35(23), pp. 8044-8056, doi: 10.1080/01431161.2014.978041

[3] Heege, T., Fischer, J. (2004): Mapping of water constituents in Lake Constance using multispectral airborne scanner data and a physically based processing scheme. Can. J. Remote Sensing, Vol. 30, No. 1, pp. 77-86

[4] Kiselev, V., Bulgarelli, B. and Heege, T., (2015). Sensor independent adjacency correction algorithm for coastal and inland water systems. Remote Sensing of Environment, 157: 85-95. , ISSN 0034-4257, http://dx.doi.org/10.1016/j.rse.2014.07.025

[5] Heege, T. & Fischer, J. (2000): Sun glitter correction in remote sensing imaging spectrometry. SPIE Ocean Optics XV Conference, Monaco, Oct. 16-20.

[6] EU FP7-Projekt GLASS: WP4 Validation report (29.2.2016): www.glass-project.eu/assets/Deliverables/GLaSS-D4.2.pdf

[7] Bumberger J., Heege T., Klinger P., et al. (2017): Towards a Harmonized Validation Procedure for Inland Water Optical Remote Sensing Data using Inherent Optical Properties, Rem. Sens. 2017(9), 21p, submitted 28 Feb. 2017

[8] Heege T., Schenk K., Klinger P., Broszeit A., Wenzel J., Kiselev V. (2015): Monitoring status and trends of water quality in inland waters using earth observation technologies. Proceedings “Water Quality in Europe: Challenges and Best Practice” UNESCO-IHP European Regional Consultation Workshop, Koblenz, Germany, Dec 2015, p. 1-4

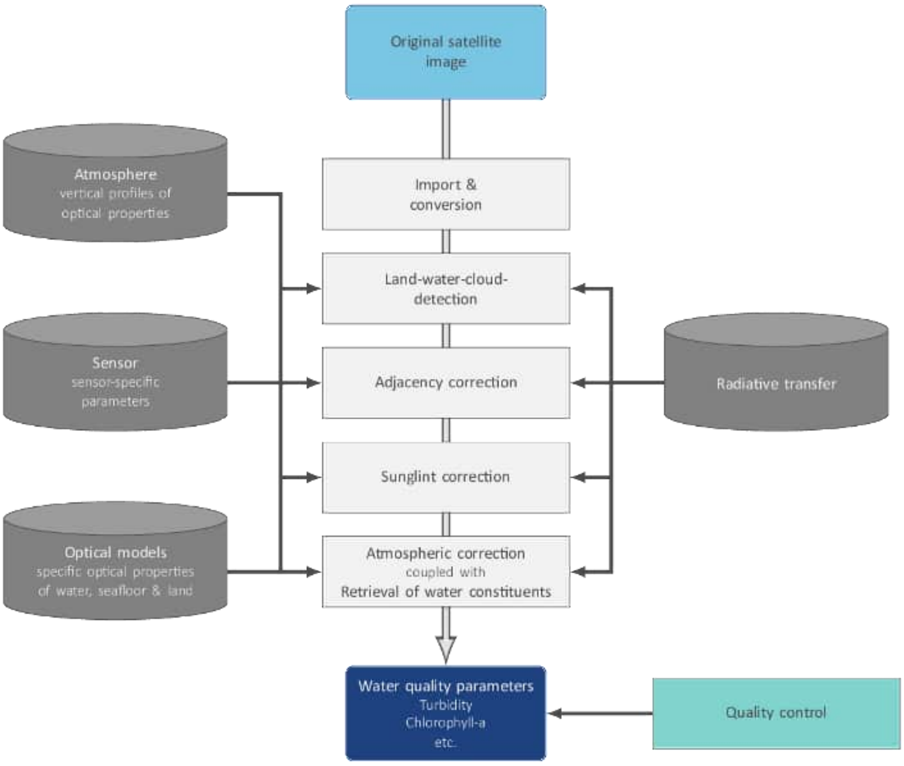


Figure 1: EOMAP's physics-based workflow to derive satellite-based water quality

MIP is the most established, sensor-independent and operational aquatic remote sensing processing system for the full range of high, medium and low-resolution satellite sensors. Fully-automated water monitoring processors are installed in satellite ground segments worldwide (Europe, Australia, Asia and America), to ensure fast and efficient access to a wide range of satellite data. The data processing and orchestration software, the EOMAP Workflow System (EWS) allows for continuous, daily production.

3. Products

3.1. Turbidity (TUR)

Turbidity (TUR) is a key parameter of water quality and is linearly related to the backward scattering of light of organic and inorganic particles in water. Turbidity is also linearly related to Total Suspended Matter (TSM) at low to moderate turbidity values. The measurement unit is Nephelometric Turbidity Unit (NTU). Satellite-derived turbidity is determined by the backward scattering of light between 450 to 800nm, which is physically retrieved using satellite data. The standard relation of EOMAP concentrations to inherent optical properties is defined as 1 NTU = 0.0118 1/m backward scattering at 550nm, or 1 NTU = 0.619 1/m total scattering at 550nm for an assumed ratio bb/b = 0.019. The linear relation between turbidity and suspended matter/solids in low to moderate concentrations is in most cases a regional constant, but can vary with particle size distribution. Note that the geometrical properties of an in-situ measurement device, and the wavelength in use, may differ in comparison to the satellite product. For example, the standard FTU determination, a measure of turbidity similar to NTU, is based on the measurement of light scattered within a 90° angle from a beam directed at the water sample. Alongside temporal differences in satellite and in situ measurements, different sampling depths and the measurement location, this needs to be considered when comparing and interpreting satellite derived vs. in situ measured turbidity values. The Turbidity product from 2024-06-05 is shown in Figure 2.

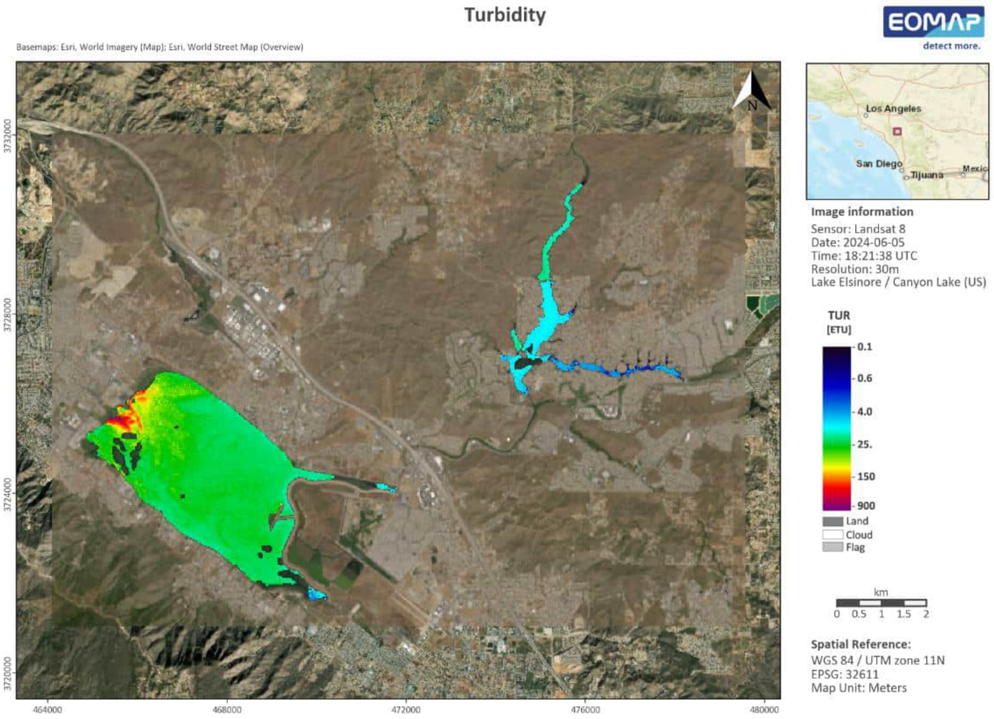


Figure 2: Turbidity product from 2024-06-05

3.2. Chlorophyll-a (CHL)

Chlorophyll-a (CHL) retrieval is based on the derived information of in-water organic absorption, in-water turbidity and spectral characteristics of each water body. Chlorophyll-a in [µg/l], is provided as a measure linearly related to the pigment-specific absorption at 440nm, with 1 µg/l Chl equal to 0.035 1/m pigment absorption. Phaeophytin and further pigments cannot be discriminated methodologically with the spectral resolution provided by Landsat 8/Sentinel-2 and similar sensors and is therefore included in this product. The pigment-related absorption is always smaller than the absorption of organic components (SOA). For clear water conditions (low chlorophyll/total suspended solids), the specific absorption chlorophyll increases significantly (Bricaud et al. 1995[9]). Chlorophyll values can vary over 4 magnitudes, for marine waters or clear lakes typical concentrations between 0.01 and 10 µg/l, while for eutrophic lakes concentrations can reach 100 µg/l and more. The chlorophyll products are typically reliable within a range of 10 – 50 % in comparison to in situ measures (Broszeit 2015[10]), which are typically based on one of three different methods, which include photometric, fluorescence and HPLC approaches and their subcategories. The Chlorophyll-a product from 2024-06-05 is shown in Figure 3.

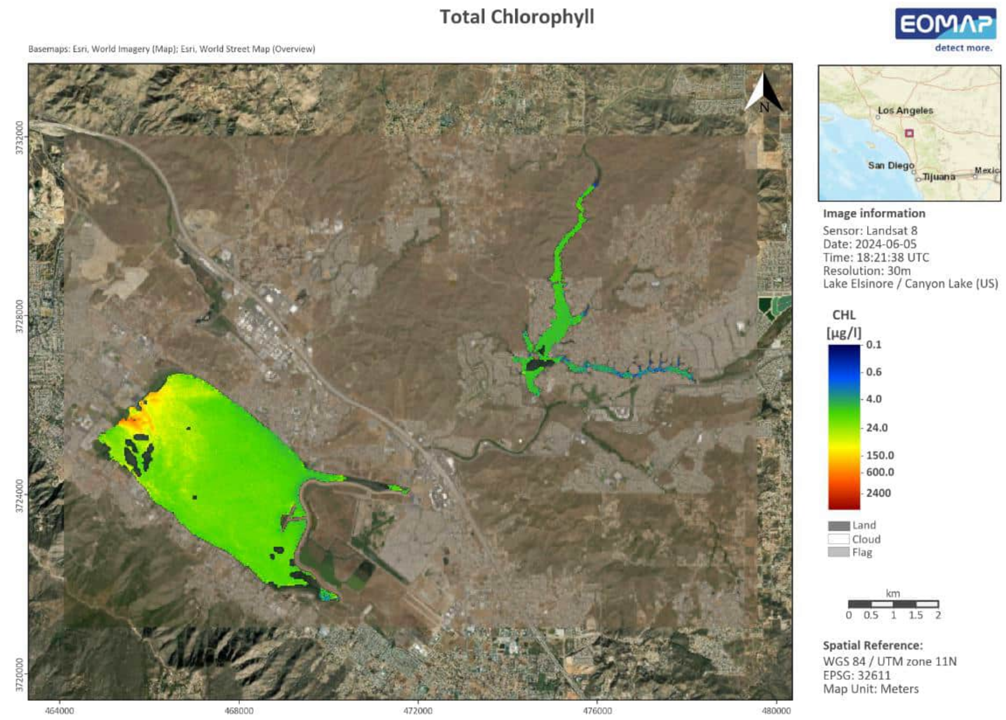


Figure 3: Chlorophyll-a product from 2024-06-05

---

[9] Bricaud, A., Babin, M., Morel, A., Claustre, H. (1995): Variability in the chlorophyll-specific absorption coefficients of natural phytoplankton: Analysis and parametrization. Journal of Geophysical Research Atmospheres, 100(C7):13,321-13,342

[10] Broszeit, A., 2015. Assessing long-term inland water quality using satellite imagery: A Feasibility and validation study of different lake types. MSc Thesis, Julius-Maximilian-University Würzburg, 96p

3.3. Harmful Algae Bloom Indicator (HAB)

The **Harmful Algae Bloom Indicator** (HAB) refers to the presence of cyanobacteria. It is sensitive to the appearance of cyanobacteria-related pigments, i.e. phycocyanin and phycoerythrin. Both pigments show absorption features in green wavelengths from 500 nm to approx. 640 nm; phycoerythrin shows its absorption maximum at 540-570 nm, phycocyanin at 610-620 (Colyer et al. 2005). Most satellite sensors support the identification of this feature with only two bands, i.e. one in the green wavelength region (e.g. L7 and L8 at 530 – 590 nm) and in the red wavelength region at approx. 640 – 670 nm. The used standard parameterisation of phytoplankton absorption in MIP as described above, however, does not account phycocyanin and phycoerythrin absorption in the retrieval process. The modelled phytoplankton absorption therefore lacks the absorption features of these pigments. Nonetheless, if these pigments are present in the water a slight spectral mismatch between modelled water leaving reflectance ($R_{modelled}$) and satellite derived reflectance ($R_{satellite}$) occurs. The algorithm then compares the slope of $R_{modelled}$ and $R_{satellite}$ between the green and red band ($\delta R = R_{green} - R_{red}$) in order to classify pixels with regard to phycocyanin and phycoerythrin occurrence, i.e. harmful algae bloom probability. The HAB indicator from 2024-06-05 is shown in Figure 4.

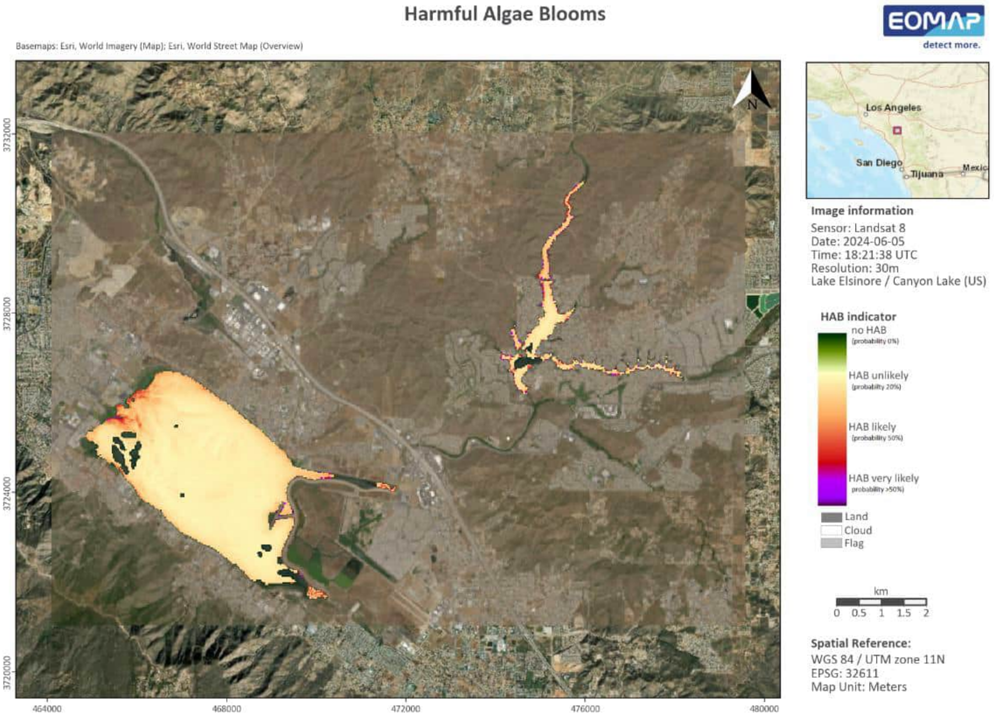


Figure 4: Harmful Algae Bloom Indicator product from 2024-06-05

3.4. True color composite (RGB)

RGB composite images represent the area of interest in true colour or false colour modes by combining predefined bands, depending on the sensor in use.

4. Quality Control and Flagging

As a standard output of the processing, an accuracy or quality indicator is calculated for each retrieved parameter and for each detected water pixel. This measure comprises a comprehensive range of factors that can impact the derived product quality, including:

- the geometry between sun, target, and sensor,
- the estimated sun glint probability,
- the retrieved aerosol optical depth,
- residuals of the measured and modelled sensor radiance and subsurface reflectance,
- the comparison of retrieved water species concentrations to extreme values as defined in the configuration files,
- pixels affected by cloud shadow and
- shallow water areas.

Threshold values define distinct values when a parameter is assumed to influence the quality. All parameters are integrated into one remaining quality parameter, allowing both an improved flagging and a quality weighting of pixels, that can later be merged into integrated 3rd level products.

The quality information is part of each standard geodata delivery and is visualized by two different 8bit GeoTIFFs:

- QUT - Total Quality, quantifying the overall quality of each pixel from low to high. Only valid water pixels - excluding land, cloud or flagged pixels - are represented in QUT indicator (Figure 5).
- QUC – EOMAP Quality coding (Figure 6), revealing the processor's internal quality check, split into the defined indicators (e.g. sunglint, shallow water risk, etc.). These are classified into 'no quality concerns', 'quality risk and 'bad quality' (flag). Note that 'quality risk' pixels are marked as such but not flagged.

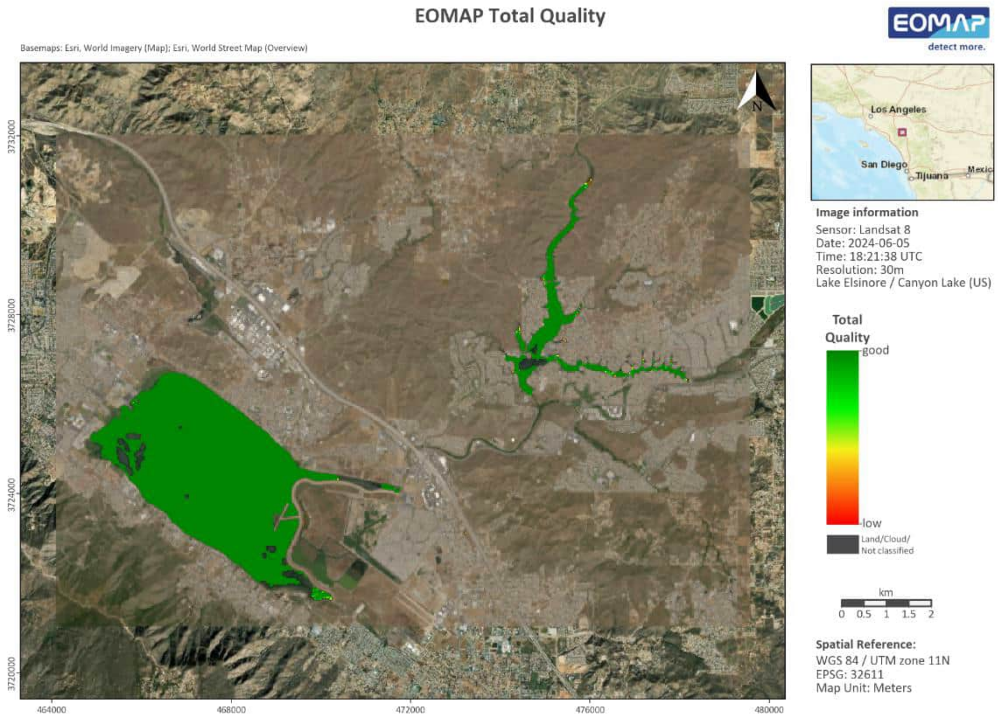


Figure 5: QUT product from 2024-06-05

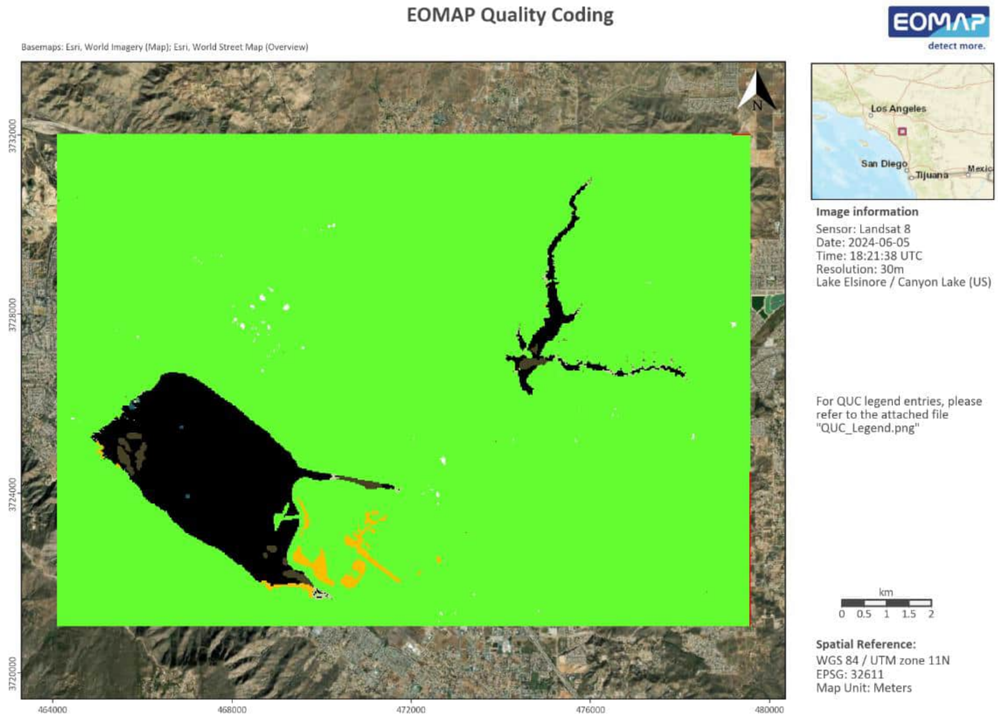
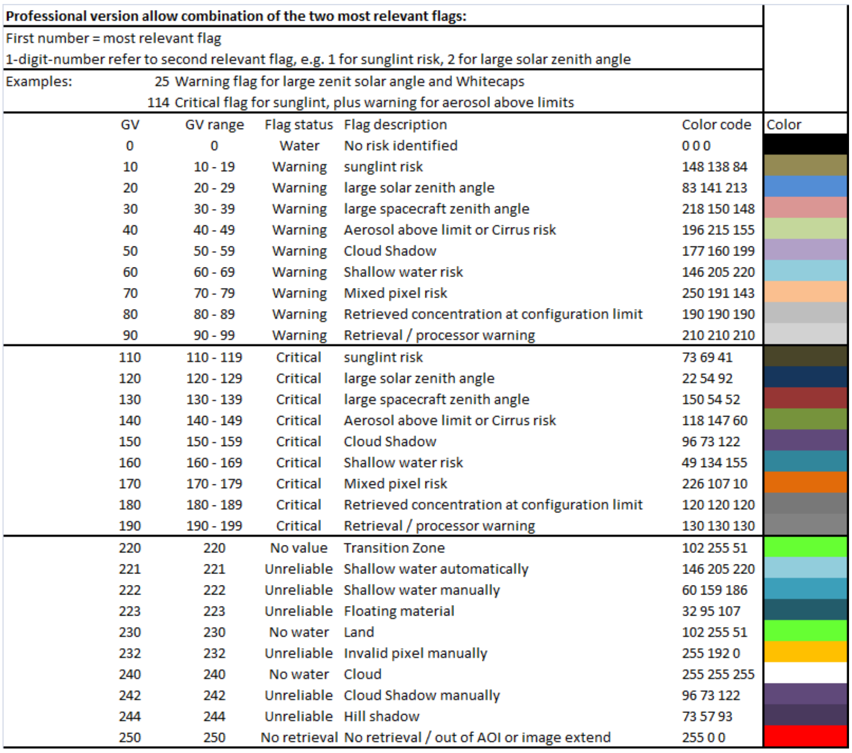


Figure 6: QUC product from 2024-06-05

The QUC file indicates the main quality influencing parameter using a specific EOMAP quality coding classification scheme with corresponding grey values (GV), shown in Figure 7.



Professional version allow combination of the two most relevant flags:

First number = most relevant flag
1-digit-number refer to second relevant flag, e.g. 1 for sunglint risk, 2 for large solar zenith angle

Examples: 25 Warning flag for large zenit solar angle and Whitecaps
114 Critical flag for sunglint, plus warning for aerosol above limits

GV	GV range	Flag status	Flag description	Color code	Color
0	0	Water	No risk identified	0 0 0	⬛
10	10 - 19	Warning	sunglint risk	148 138 84	🟫
20	20 - 29	Warning	large solar zenith angle	83 141 213	🟦
30	30 - 39	Warning	large spacecraft zenith angle	218 150 148	🟥
40	40 - 49	Warning	Aerosol above limit or Cirrus risk	196 215 155	🟩
50	50 - 59	Warning	Cloud Shadow	177 160 199	🟪
60	60 - 69	Warning	Shallow water risk	146 205 220	🟦
70	70 - 79	Warning	Mixed pixel risk	250 191 143	🟧
80	80 - 89	Warning	Retrieved concentration at configuration limit	190 190 190	⬜
90	90 - 99	Warning	Retrieval / processor warning	210 210 210	⬜
110	110 - 119	Critical	sunglint risk	73 69 41	🟫
120	120 - 129	Critical	large solar zenith angle	22 54 92	🟦
130	130 - 139	Critical	large spacecraft zenith angle	150 54 52	🟥
140	140 - 149	Critical	Aerosol above limit or Cirrus risk	118 147 60	🟩
150	150 - 159	Critical	Cloud Shadow	96 73 122	🟪
160	160 - 169	Critical	Shallow water risk	49 134 155	🟦
170	170 - 179	Critical	Mixed pixel risk	226 107 10	🟧
180	180 - 189	Critical	Retrieved concentration at configuration limit	120 120 120	⬛
190	190 - 199	Critical	Retrieval / processor warning	130 130 130	⬛
220	220	No value	Transition Zone	102 255 51	🟩
221	221	Unreliable	Shallow water automatically	146 205 220	🟦
222	222	Unreliable	Shallow water manually	60 159 186	🟦
223	223	Unreliable	Floating material	32 95 107	🟦
230	230	No water	Land	102 255 51	🟩
232	232	Unreliable	Invalid pixel manually	255 192 0	🟨
240	240	No water	Cloud	255 255 255	⬜
242	242	Unreliable	Cloud Shadow manually	96 73 122	🟪
244	244	Unreliable	Hill shadow	73 57 93	🟪
250	250	No retrieval	No retrieval / out of AOI or image extend	255 0 0	🟥

Figure 7: EOMAP QUC quality coding

EOMAP's water quality products are accompanied by the processor's internal quality control mechanisms QUT and QUC, resulting in pixel flagging in case of unreliable values. Moreover, a manual quality check and - if required - additional masking is applied to each product.

As an example, cloud shadow effects typically occur in the vicinity of clouds, resulting in unrealistically low water parameter values. In order to detect and flag these areas, EOMAP has developed a specific algorithm based on geometric models, considering the sun angle and sensor viewing geometry, the retrieved aerosol properties, the height of the clouds, an analysis of the blue channel radiances and a statistical anomaly detection of the water species concentrations. When applying this cloud shadow detection algorithm, approx. 85% of the cloud shadows are detected and masked. Remaining cloud shadows are manually flagged and can be identified in the QUC file by GV 242.

Due to the spatial extent of single pixels (Sentinel-2: 10*10m, Landsat 8/9: 30*30m), it is likely that spectral mixing of signals from land and water can affect the pixels along the edge of the water body, leading to unreliable retrieval of water parameter values. Such pixels are labelled with the quality flag 'transition zone'. EOMAP uses a high-resolution land-water-mask database to determine the land-water-boundary, which is then filtered to create a transition zone that is automatically flagged during processing. In the 8bit water constituent products the transition zone is marked by GV 251, whereas in the QUC product it is 220.

5. Data Format

The water quality data are delivered as 32bit real value GeoTIFFs as well as 8bit scaled and colored GeoTIFFs for easier visualization. These colors are only a suggestion a corresponding to EOMAPs standard except for the HAB visualization, which has been changed according to a client-specific request. In addition, KMZ- as well as XYZ-files are delivered as per client request.

6. Data Sources

EOMAP uses the following the AWS data hub (https://registry.opendata.aws/index.html) to access and download satellite raw data from different sensors.

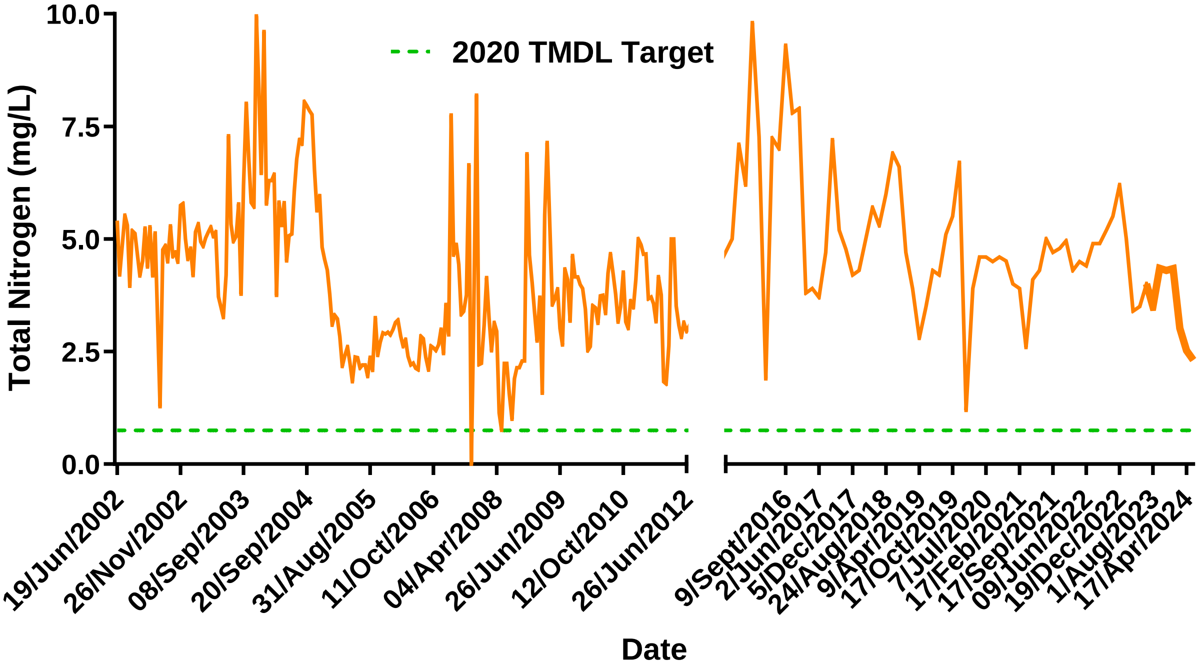
- Landsat 8/9: https://registry.opendata.aws/usgs-landsat/index.html
- Sentinel-2: https://registry.opendata.aws/sentinel-2/

EOMAP
Schlosshof 4
82229 Seefeld
Germany
+49 (0)8152 99861 10
info@eomap.com
www.eomap.com

APPENDIX E

CURRENT DATA IN HISTORICAL CONTEXT

Lake Elsinore – Historical Monitoring Results

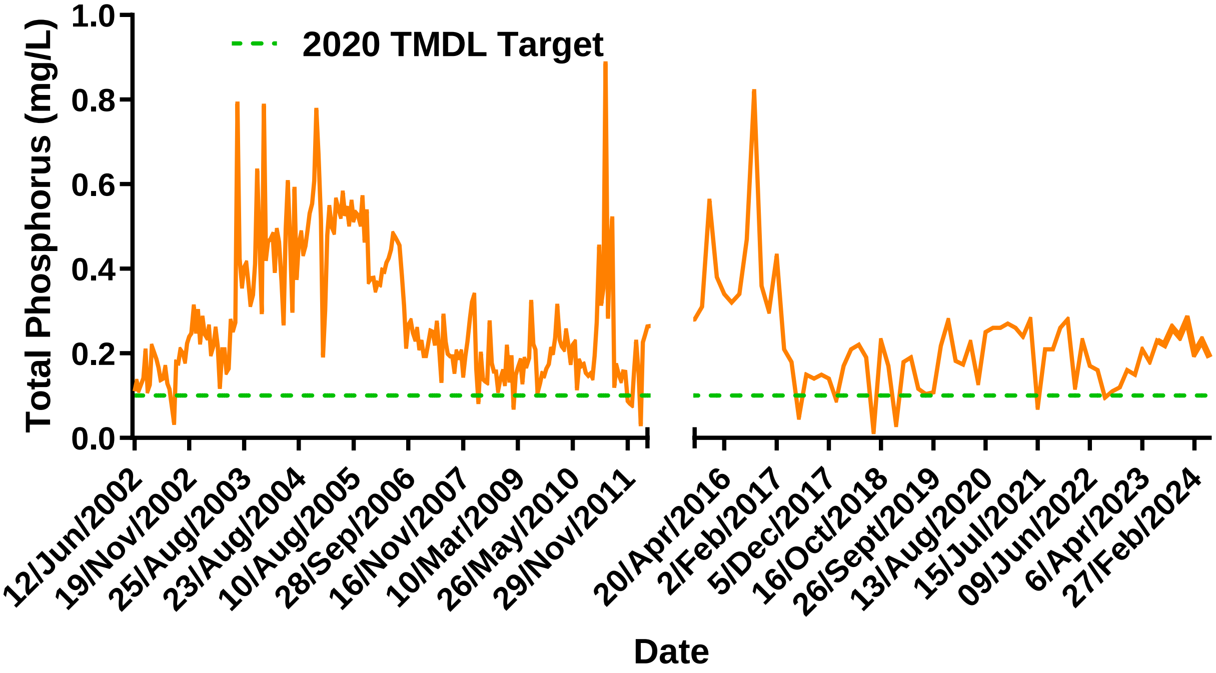


No data available from June 2012-July2015

TMDL target of 0.75 mg/L is annual average to be attained by 2020

Bold represents current monitoring year July 2023-June 2024

Lake Elsinore – Historical Monitoring Results (continued)

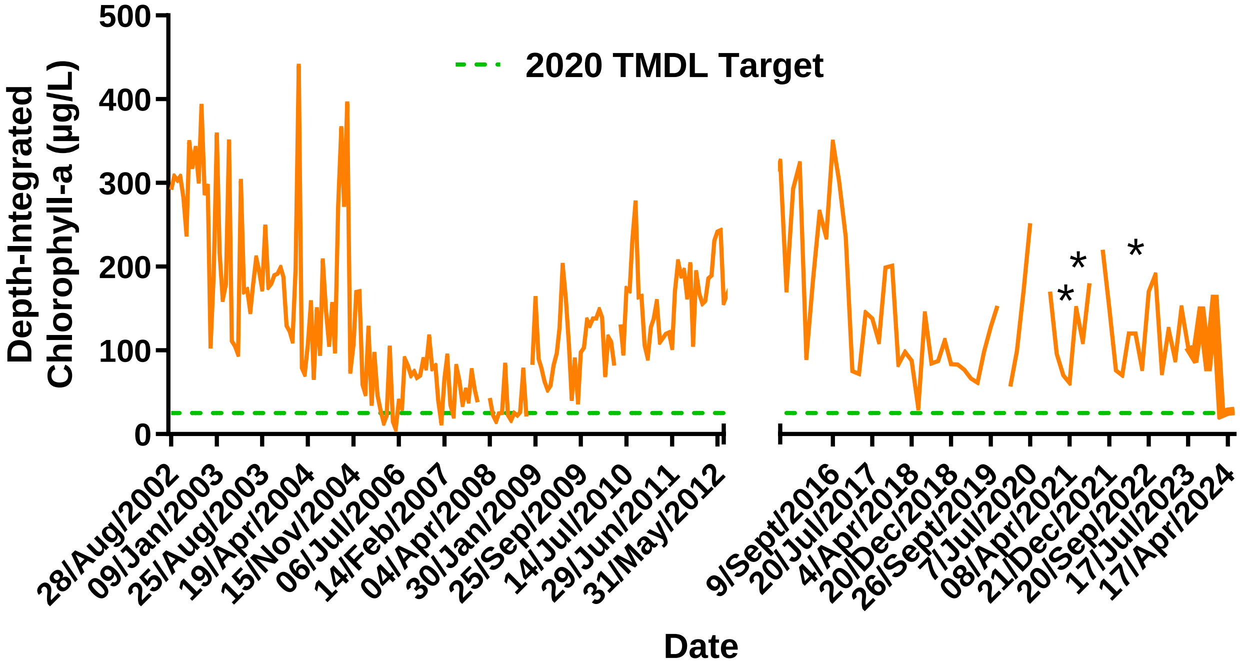


No data available from June 2012-July2015

TMDL target of 0.1 mg/L is annual average to be attained by 2020

Bold represents current monitoring year July 2023-June 2024

Lake Elsinore – Historical Monitoring Results (continued)

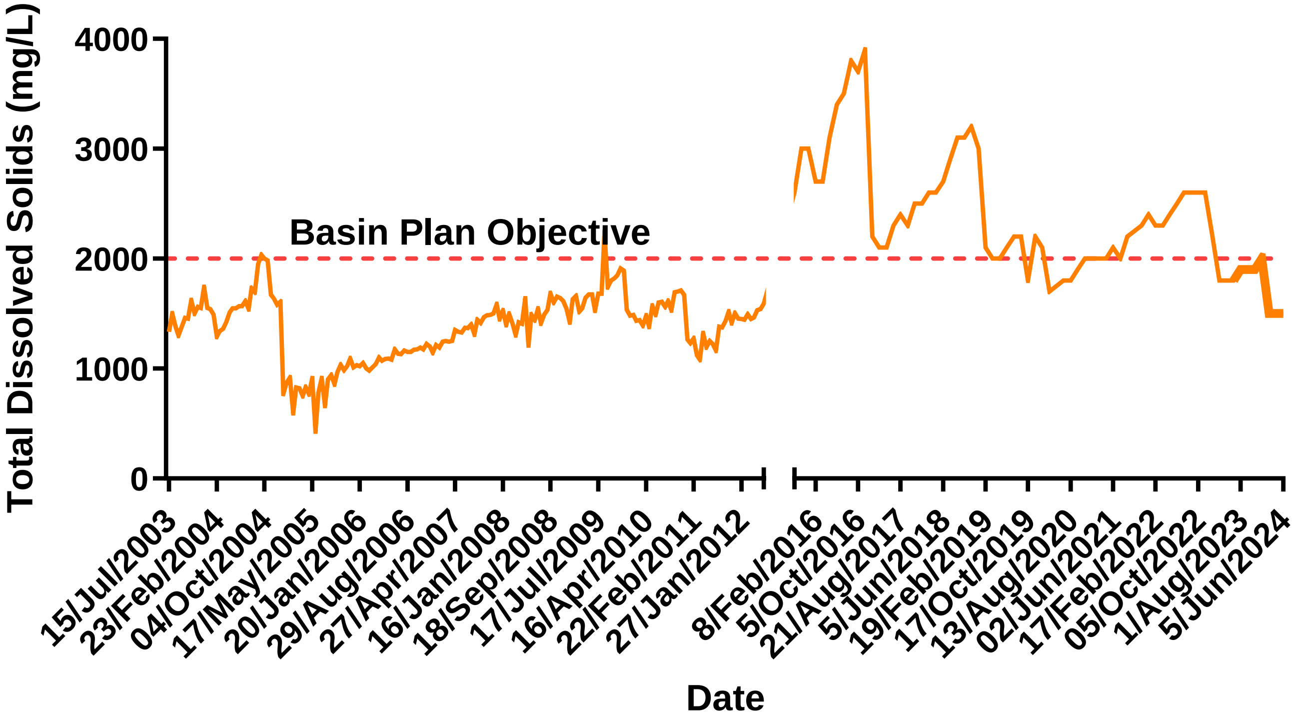


No data available from June 2012-July2015

TMDL target of 25 µg/L is summer average to be attained by 2020

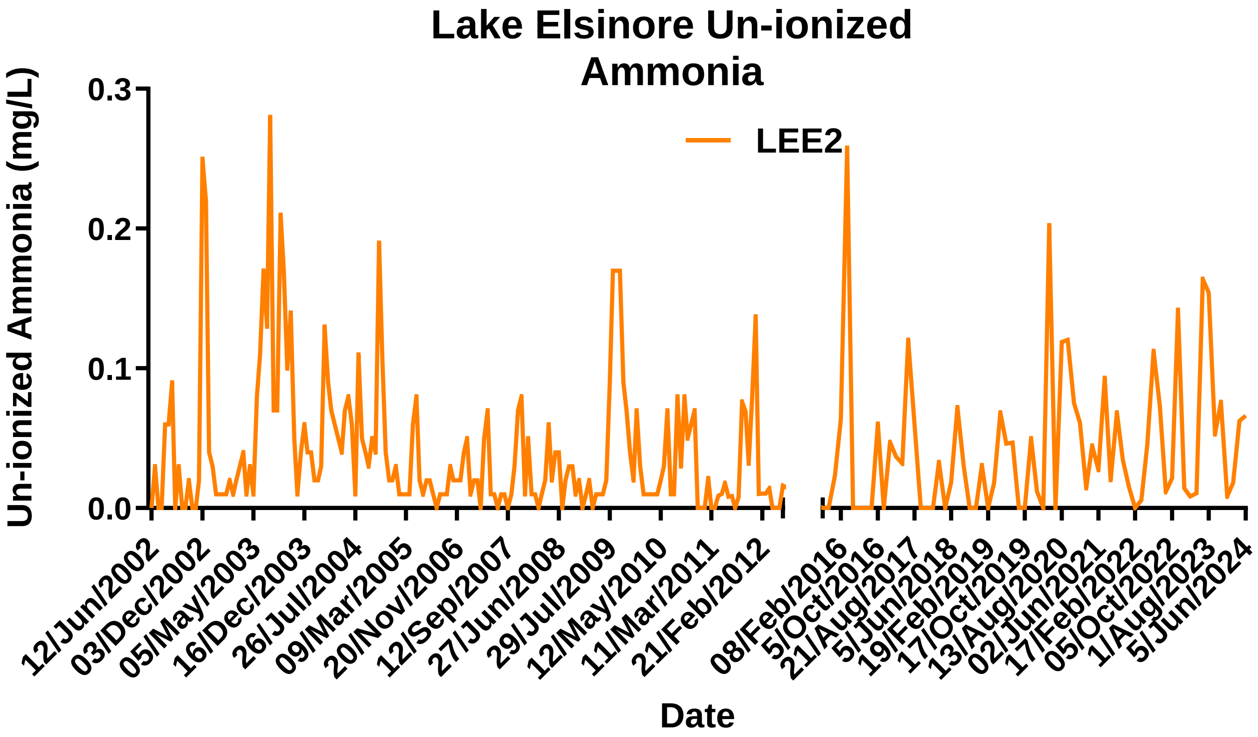
Bold represents current monitoring year July 2023- June 2024
***Not measured due to laboratory error. See report for details.**

Lake Elsinore – Historical Monitoring Results (continued)

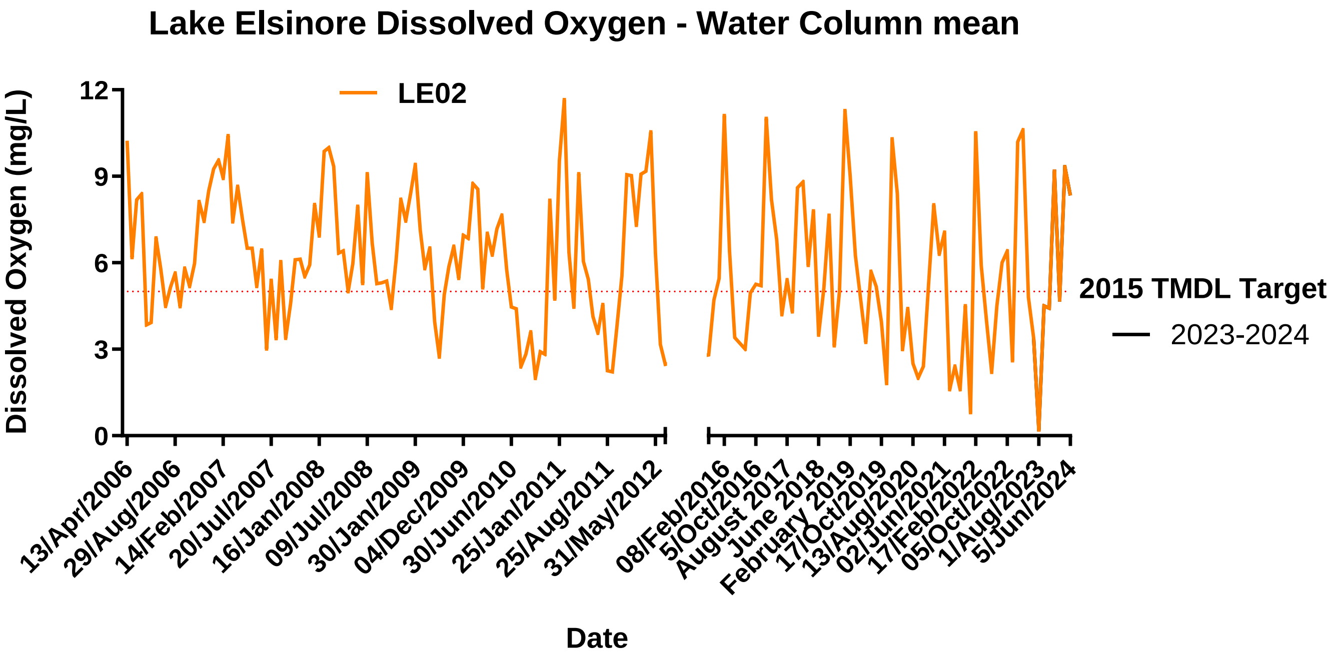


No data available from June 2012-July 2015

Bold represents current monitoring year July 2023-June 2024

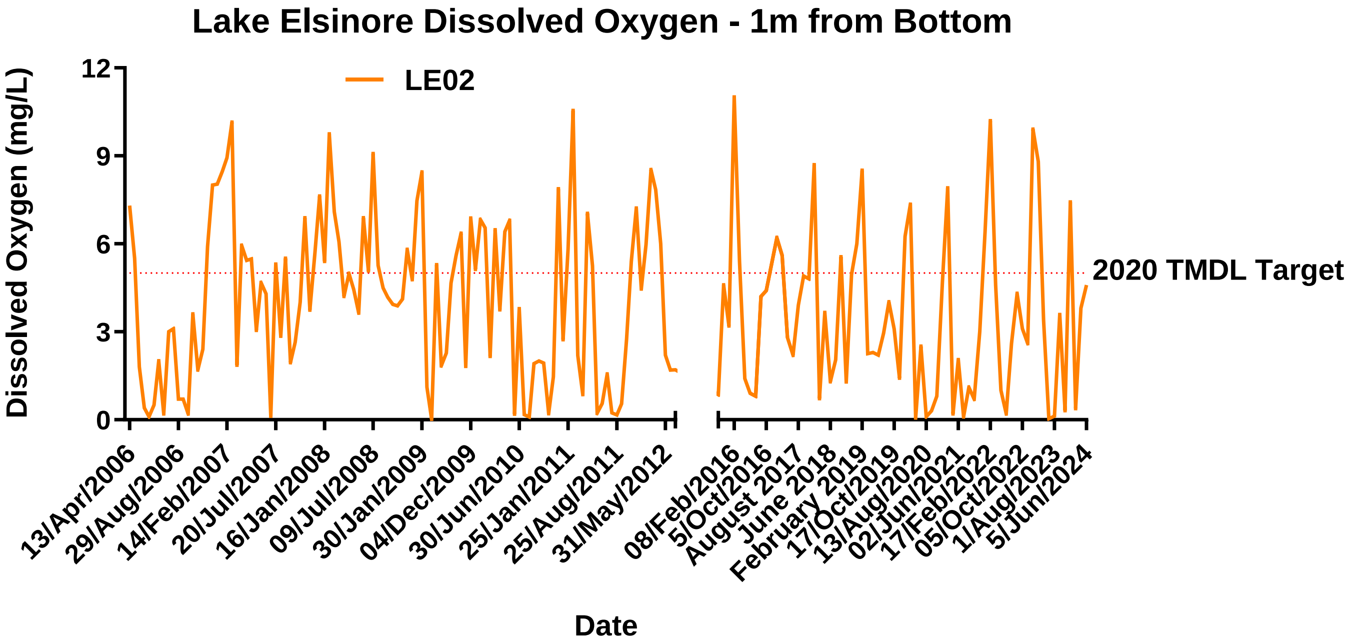


No data available from June 2012-July2015



No data available from June 2012-July2015

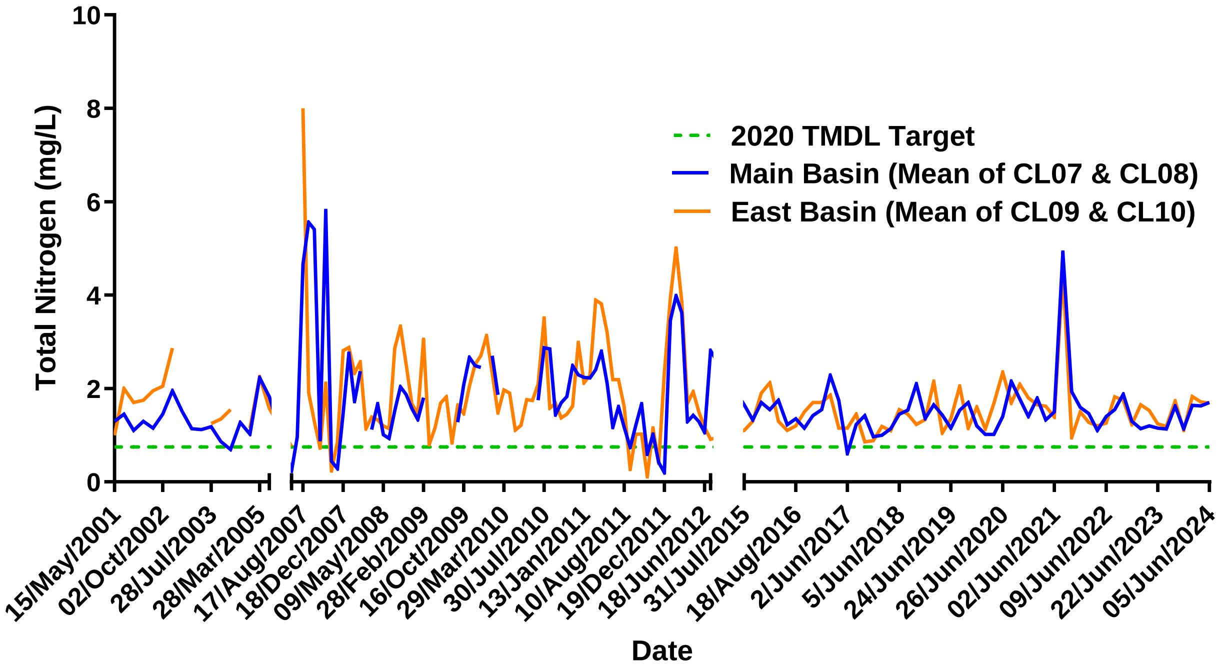
TMDL target of 5 mg/L is depth average to be attained by 2015



No data available from June 2012-July2015

TMDL target of 5 mg/L is 1m off lake bottom to be attained by 2020

Canyon Lake – Historical Monitoring Results

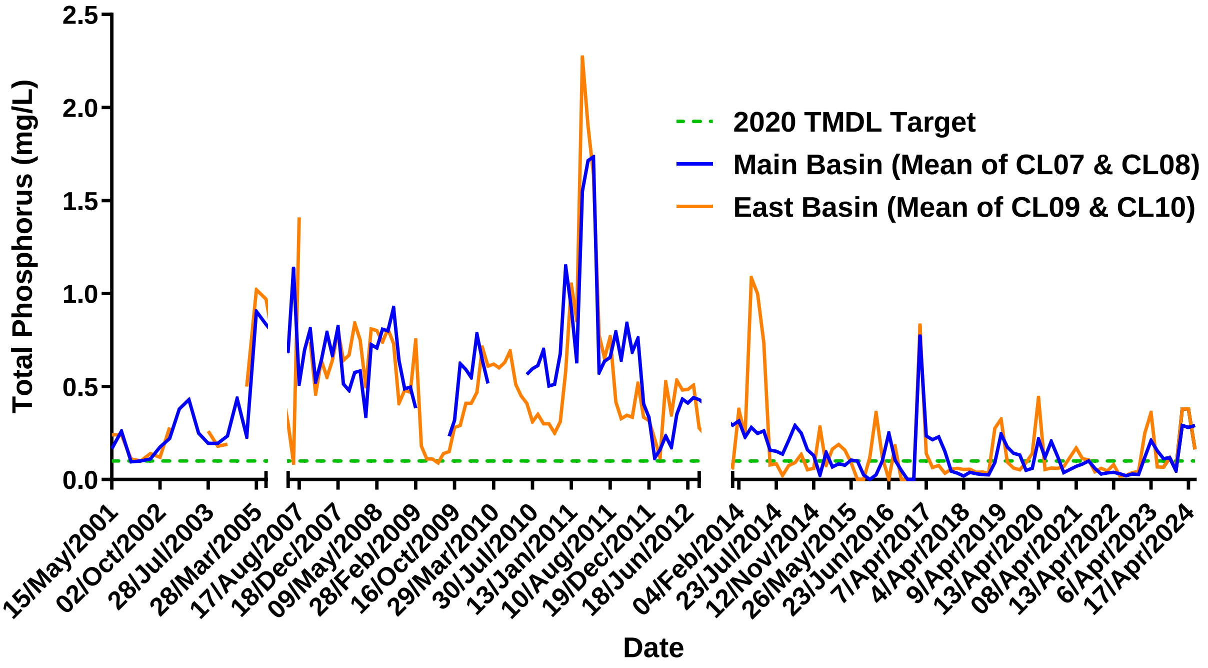


No data available from May 2005-July 2007; June 2012-July2015

TMDL target of 0.75 mg/L is annual average to be attained by 2020

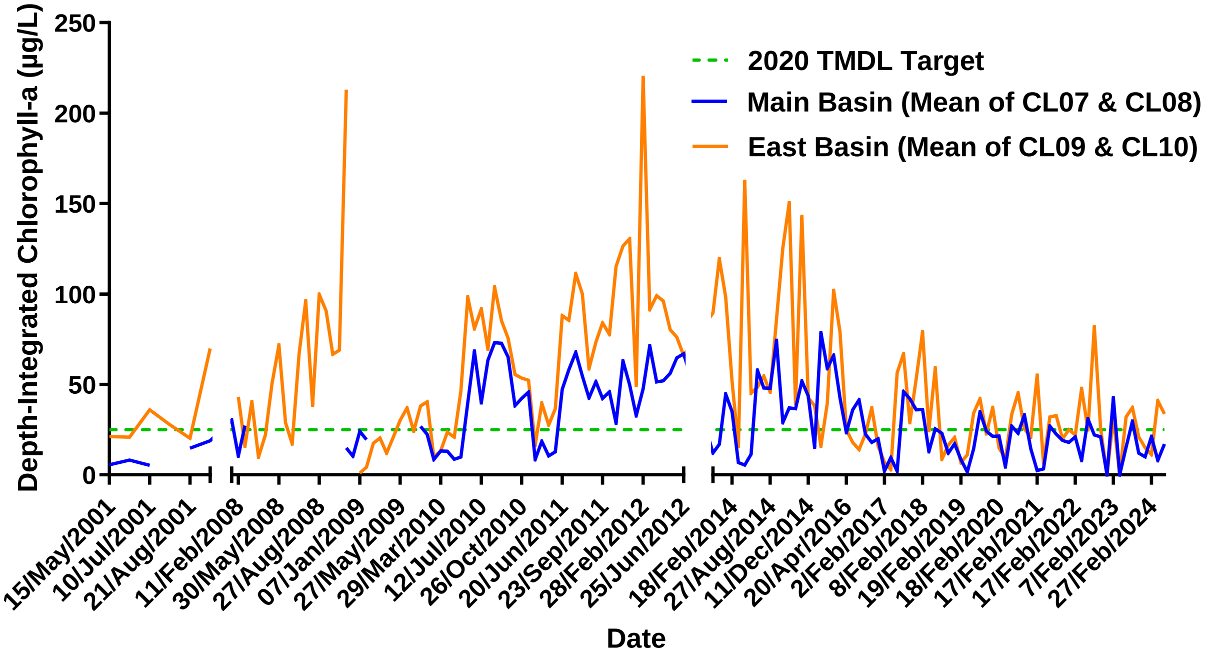
Bold represents current monitoring year July 2023-June 2024

Canyon Lake – Historical Monitoring Results (continued)



No data available from May 2005-July 2007; June 2012-Sept 2013
TMDL target of 0.1 mg/L is annual average to be attained by 2020
Bold represents current monitoring year July 2023-June 2024

Canyon Lake – Historical Monitoring Results (continued)

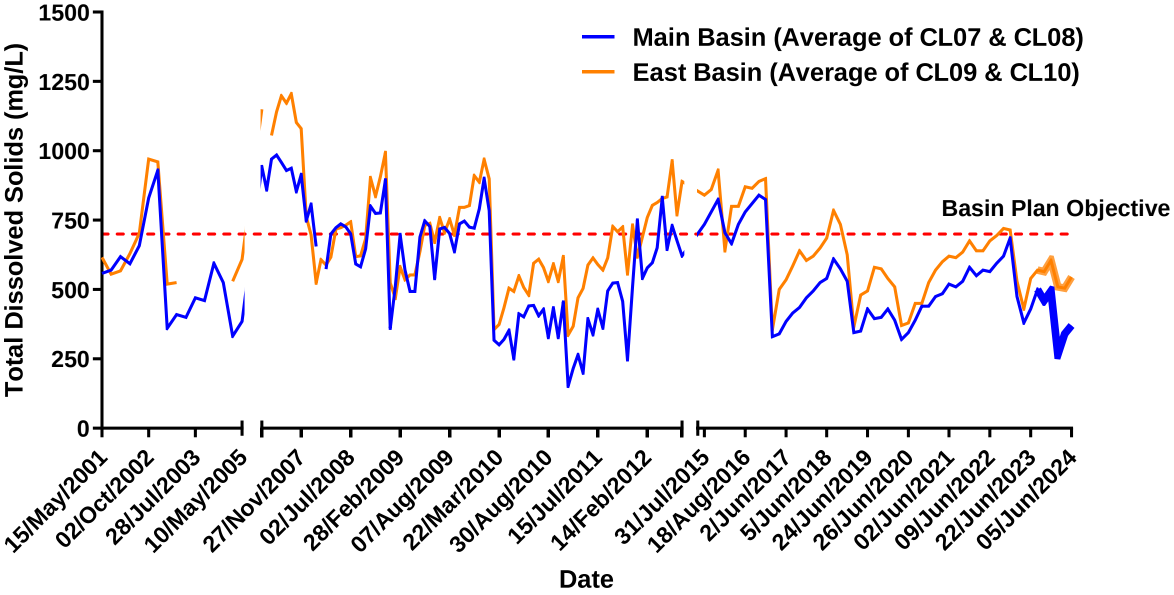


No data available from June 2012-July2015

2020 TMDL target of 25 µg/L is annual average to be attained by 2020

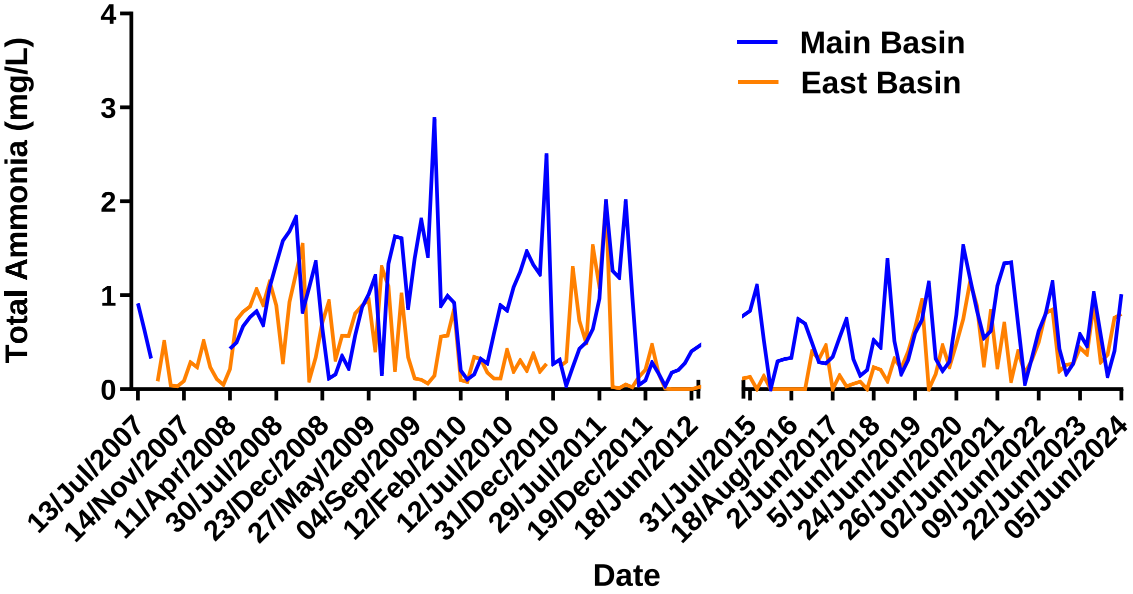
Bold represents current monitoring year July 2023-June 2024

Canyon Lake – Historical Monitoring Results (continued)

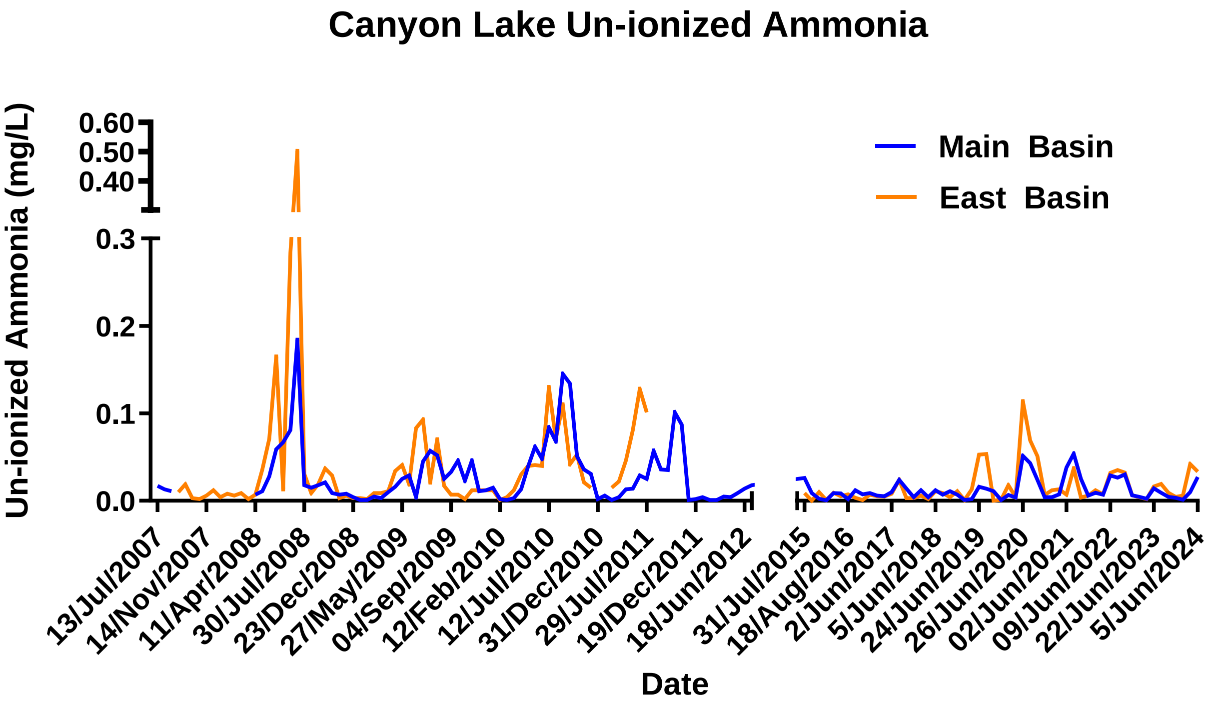


No data available from May 2005-July 2007; June 2012-July 2015

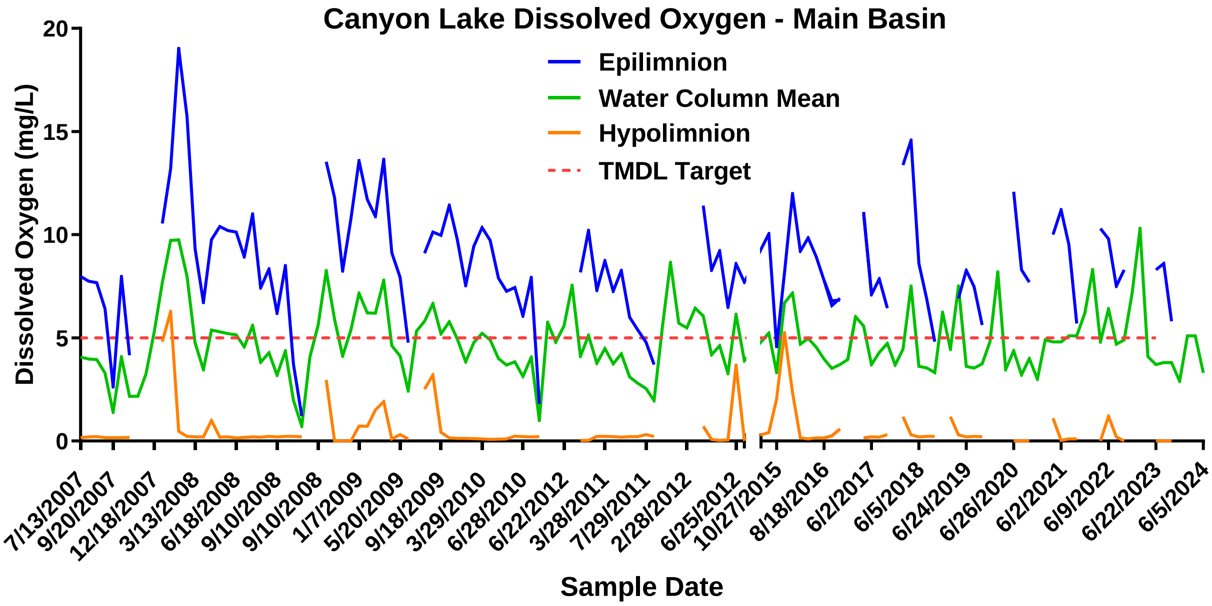
Bold represents current monitoring year July 2023-June 2024



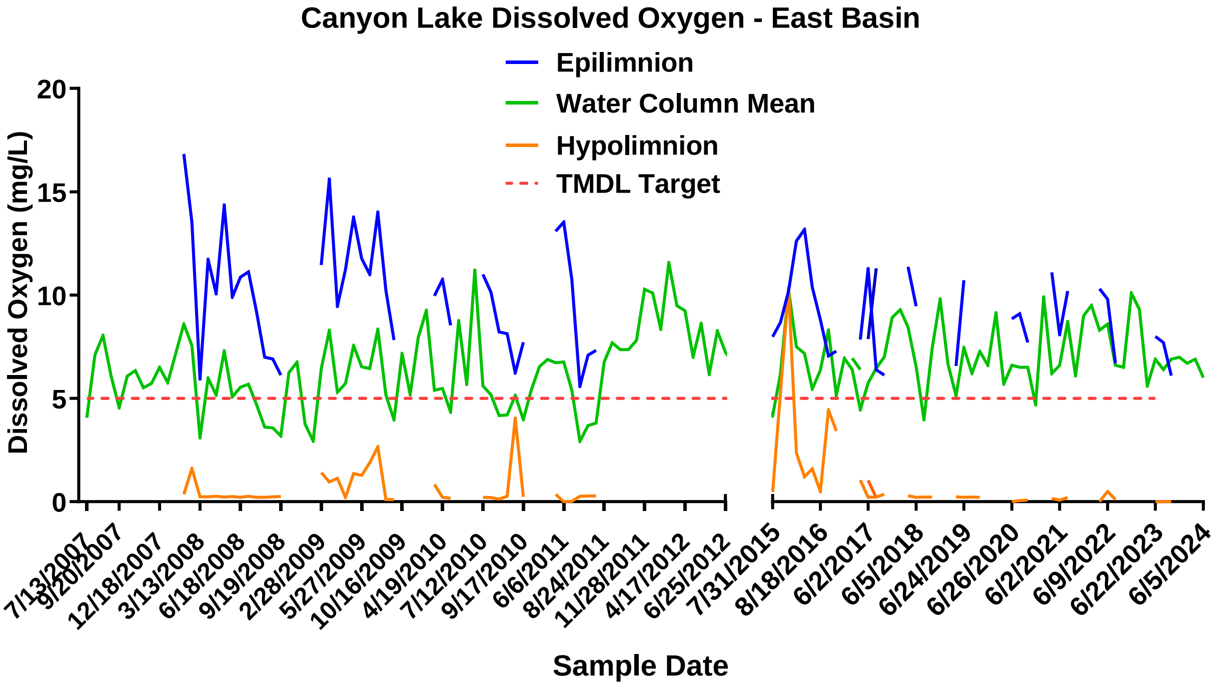
No data available from June 2012-July2015



No data available from June 2012-July2015



No data available from June 2012 - July 2015
Data represents average values of sites CL07 and CL08
TMDL 2015 target >5 mg/L in Epilimnion, 2020 target >5 mg/L in Hypolimnion



No data available from June 2012 - July 2015

Data represents average values of sites CL09 and CL10

TMDL 2015 target >5 mg/L in Epilimnion, 2020 target >5 mg/L in Hypolimnion

APPENDIX F

CANYON LAKE FISH DIE-OFF INVESTIGATION TECHNICAL MEMO

TECHNICAL MEMORANDUM

TO: Rachel Gray & Rick Whetsel, SAWPA

FROM: John Rudolph & Chris Stransky, WSP USA

SUBJECT: April 2024 Canyon Lake Fish Die Off

DATE: June 8, 2024

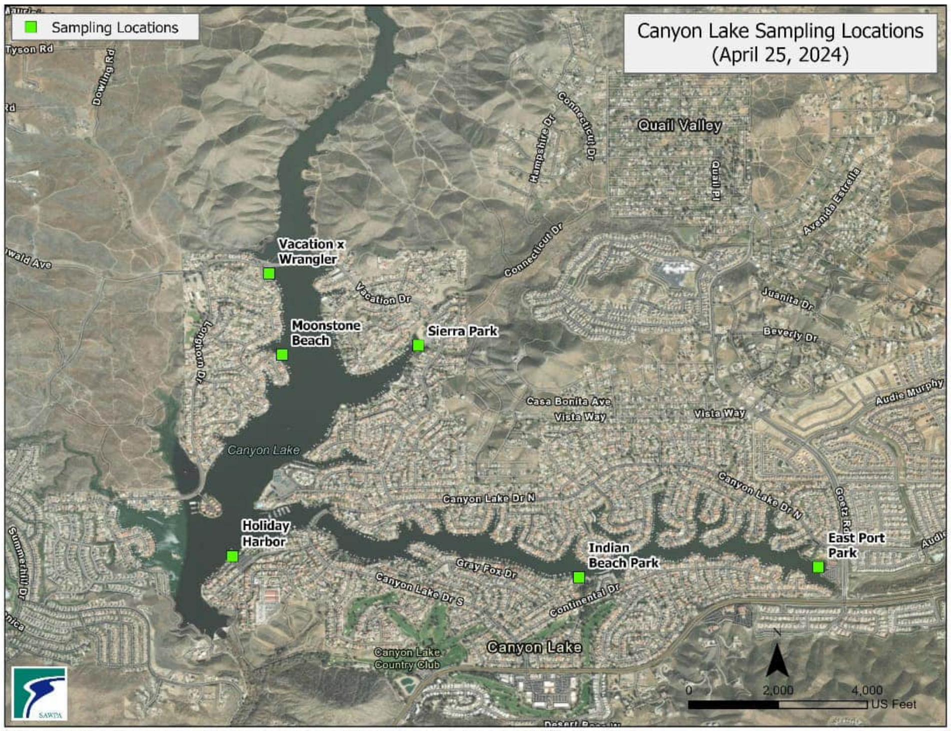
This memo has been prepared in response to a minor fish die off that occurred on Wednesday, April 24, 2024, consisting exclusively of shad that was observed in Canyon Lake following the Spring 2024 alum application (April 22 to 24, 2024). To investigate a potential cause of the fish die off, WSP mobilized field staff to visit the lake at the request of Lake Elsinore and San Jacinto Watersheds Authority (LESJWA) staff. During this visit, visual observations and photos were taken, a series of water quality readings were performed (pH, temperature, conductivity, and dissolved oxygen (DO)), and samples of water were collected to scan for algae species. Observations, water quality profiles, and sample collections were performed at six locations around the lake as shown in **Figure 1** consisting of four locations in the main body of the lake and two in the eastern arm:

- Main Body:
  - Northern Causeway (near corner of Old Wrangler Drive and Vacation Drive)
  - Sierra Park
  - Holiday Harbor
  - Moonstone Beach
- Eastern Arm:
  - East Port Park
  - Indian Beach

Water quality readings were recorded, and samples were collected at each site between 5:45 am and 8:17 am on April 25, 2024. At the time of the collection, the water column was turbid with a greenish brown tint suggesting an algal bloom was occurring in the lake. During the site visit a few dead shad were observed floating near Sierra Park in Bass Cove where previously reported.

Water quality readings, including pH, DO, temperature, and specific conductivity were recorded early in the morning to determine if there might have been an overnight decrease in DO below concentrations that can cause acute lethality to fish (approximately 2.0 milligrams per liter (mg/L) or less). When elevated concentrations of algae are present in the water column the lowest concentrations of DO will typically occur just before dawn; once the sun rises the algae start to photosynthesize producing oxygen as a byproduct, while at night they utilize respiration which consumes oxygen in the water. Low concentrations of DO as a result of algae respiration at night resulting in fish kills are well documented in the literature (https://en.wikipedia.org/wiki/Fish_kill) and has been observed as a cause for fish die offs in local lakes in southern California including nearby Lake Elsinore (EIP Associates, 2005[1]).

However, measured concentrations of DO in Canyon Lake on April 25th were all >7.0 mg/L within at least the top 2-meters among all 6 sites evaluated, which is well above the 2.0 mg/L threshold below which fish mortality may be observed. A fairly steep decline in DO was noted below a depth of 3-4 meters, in some cases dropping to near 0 mg/L. A comparison of DO water column profile concentrations from the previous two April monitoring events in 2022 and 2023 does appear to show depressed DO in April 2024 relative to these prior years. Because fish are mobile, they have the ability to find refuge in the top 2-meters of the water column where the DO was higher, suggesting that this parameter does not appear to be a primary cause based on the measurements taken several days after the fish kill. However, it is still possible that localized transient mixing of deeper low DO waters with surface waters prior to the follow up sampling may have resulted in brief periods of low DO throughout the water column to a degree that may have affected local fish at that time.



P:\Projects\Rick_Whetsel\CanyonLakeSamplingLocations\CanyonLakeSamplingLocations.aprx LoSamplingLocations SW-3278

Figure 1. Map of Sample Locations

---

[1] EIP Associates, 2005. Final Fisheries Management Plan for Lake Elsinore, Riverside County, California. Prepared for the Lake Elsinore & San Jacinto Watersheds Authority. Technical Report. August 2005.

Samples of water collected on April 25, 2024 were delivered to the WSP laboratory where a visual scan of algal species was performed on a microscope. Although the lake was turbid with a greenish brown tint, the concentration of algae species observed in the samples, along with a high diversity that included a number of diatoms, did not indicate a bloom condition typical of cyanobacteria often dominated by just one or two species. There were also no obvious signs of Golden Algae (*Prymnesium parvum*), another possible culprit that can cause sudden fish die-offs as a result of the potent neurotoxins this species can produce during a bloom condition[2]. Furthermore, if Golden Algae was the cause, other species of dead fish would likely have been observed rather than exclusively shad.

The concentration of ammonia is another potential cause of fish die offs in lakes with elevated organic content and anoxic sediments where it may be produced. Ammonia also becomes increasingly toxic to fish at elevated pH values above 8.0 when present at high enough concentrations. However, measured concentrations of total ammonia in the six samples collected on April 25, 2024 were all <1.0 mg/L, well below a level of potential concern at approximately 10 mg/L or more.

Aluminum (Al) is the primary active ingredient in alum that binds to and precipitates out phosphorous from the water column, thereby limiting this key nutrient as a source of food for algae. Aluminum at high enough concentrations can also be toxic to aquatic life. To assess whether alum may have resulted in elevated aluminum above a toxic threshold for fish, water samples were collected for analysis of total and dissolved aluminum at four of the locations visited on April 25, 2024 (Northern Causeway, Sierra Park, Holiday Harbor and East Port Park). Total and dissolved phosphorus were also analyzed in these samples to evaluate their relationship to aluminum. These samples were delivered to Weck Analytical for quantification.

A summary of analytical results is provided in **Table 1** showing concentrations of total aluminum ranging from 980 to 1,000 micrograms per liter (µg/L). Dissolved concentrations of aluminum represented greater than 85% of the total for all locations except East Port Park with 110 µg/L dissolved Al (just 11% of the total at this site). The surface pH of 7.7 was notably much lower at the East Pork Park location relative to the other sites ranging from 9.1 to 9.2. Aluminum is less soluble between pH values of approximately 6.0 and 8.0 which corroborates the low dissolved Al concentration at this site. The measured total concentrations were compared to the 2018 EPA water quality criteria for aluminum (which is site specific based on total aluminum concentration, and measured pH, dissolved organic carbon, and water hardness at the time of collection). None of the samples tested exceeded the acute criteria maximum concentration (CMC), but all exceeded the chronic criteria continuous concentration (CCC). The EPA acute threshold values are higher, and one would expect to see some survival impacts (i.e., fish die off) if these are exceeded. The EPA chronic threshold criteria is lower (more conservative), indicative of concentrations where impacts to survival or some other sublethal endpoint (e.g., reproduction, growth) might be observed if these concentrations are exceeded for an extended period of time. For toxicological

---

[2] https://hab.whoi.edu/impacts/impacts-golden-algae/

reference, the lowest genus mean acute value (GMAV) used for the derivation of the EPA acute water quality criterion for total Al is 3,880 µg/L based on smallmouth bass *Micropterus dolomieu*. The lowest genus mean chronic value (GMCV) of 564 µg/L total Al was derived from Atlantic Salmon, *Salmo salar*.[3]

Based on the measurements of aluminum in Canyon Lake on April 25, 2024, it is difficult to conclude whether the elevated concentrations related to the alum application may have been directly responsible for the fish die-off. The pre-alum water quality monitoring data collected on April 17, 2024 found total aluminum concentrations ranging from 41 to 75 ug/L across the four TMDL sites. So, while the total aluminum concentrations during the week of the fish die off were quite elevated relative to that typically observed during routine monitoring, this is not unexpected given that the samples were collected just one day after the alum was applied. The elevated pH of the lake (causing increased solubility of aluminum at values above 8.0), and calm conditions at the time of the alum application, may have also reduced the typical settling time. There have been prior samples collected in Canyon Lake with much higher aluminum concentrations (up to 6,300 ug/L) with no associated fish die off. However, these previous elevated concentrations were also observed soon after several large storm events, so likely the result of elemental aluminum associated with incoming sediment loads. While the aluminum concentrations measured following the recent fish die off were below the EPA acute CMC, 2 of the 3 samples were just slightly below it and were well above the CCC (Sierra Park and Northern Causeway). It is possible that at the time of application, the aluminum concentration could have exceeded the acute CMC for a short time in limited portions of the lake, resulting in a limited short-term fish die off.

Another key observation noted during the fish kill after alum application, and during the site visit performed thereafter, was the presence of floating scum/ mats in the eastern arm of the lake as shown in **Figure 2.** These mats were likely a result of the alum application reacting with suspended material in the water column from the numerous large storms during the recent prior wet season, elevated algal biomass, elevated pH, and high surface dissolved oxygen concentration in the water forming a flocculant organic material that rose to the surface. This did not have the appearance of a typical cyanobacterial surface scum. The flocculant was observed to dissipate within a few days following our site visit.

A subsequent visit to Canyon Lake was performed six days after the last alum application during the late afternoon on April 30, 2024. During this visit no dead shad were observed or surface scums. The dissolved oxygen was supersaturated at the surface on both the west and east side of the Canyon Lake Drive bridge. The water however was still turbid with a greenish brown tint at the time. What initially appeared to be a narrow white foam/scum in east Canyon Lake near the entrance of the San Jacinto River turned out to be a large gathering of willow seeds (**see Figure 3**). Algal species and densities in samples collected on April 30, 2024 looked similar to those collected on April 25, 2024 with no Golden Algae observed.

Finally, routine water quality monitoring of Canyon Lake in support of the TMDL was performed on June 5, 2024. No dead fish or other abnormal conditions were noted at the time of sampling.

---

[3] GMAV and GMCVs based on a pH of 7.0, hardness of 300 mg/L, and DOC of 1.0 mg/L.

Water quality profiles were also consistent with typical historical results showing a stratified lake with warmer temperatures and elevated DO near the surface. Analytical results for this event including aluminum are pending at the time of this technical memo.

Table 1. Aluminum Concentrations Observed in Canyon Lake Water Samples – April 25, 2024

Sites	Measured Total Aluminum (ug/L)	EPA Aluminum Acute (CMC) Threshold ug/L[a]	EPA Aluminum Chronic (CCC) Threshold ug/L[a]	Total Aluminum Exceeds CMC ?	Total Aluminum Exceeds CCC ?
East Port Park	980	1,700	730	NO	YES
Sierra Park	1000	1,100	680	NO	YES
Holiday Harbor	1000	1,900	920	NO	YES
Northern Causeway	1000	1,100	710	NO	YES

[a] Site-specific calculation based on measured pH, conductivity, and hardness, and estimated dissolved organic carbon (DOC) of 1.0 mg/L as a default value.

Figure 2. Surface scum observed in an East Canyon Lake arm on April 24, 2024

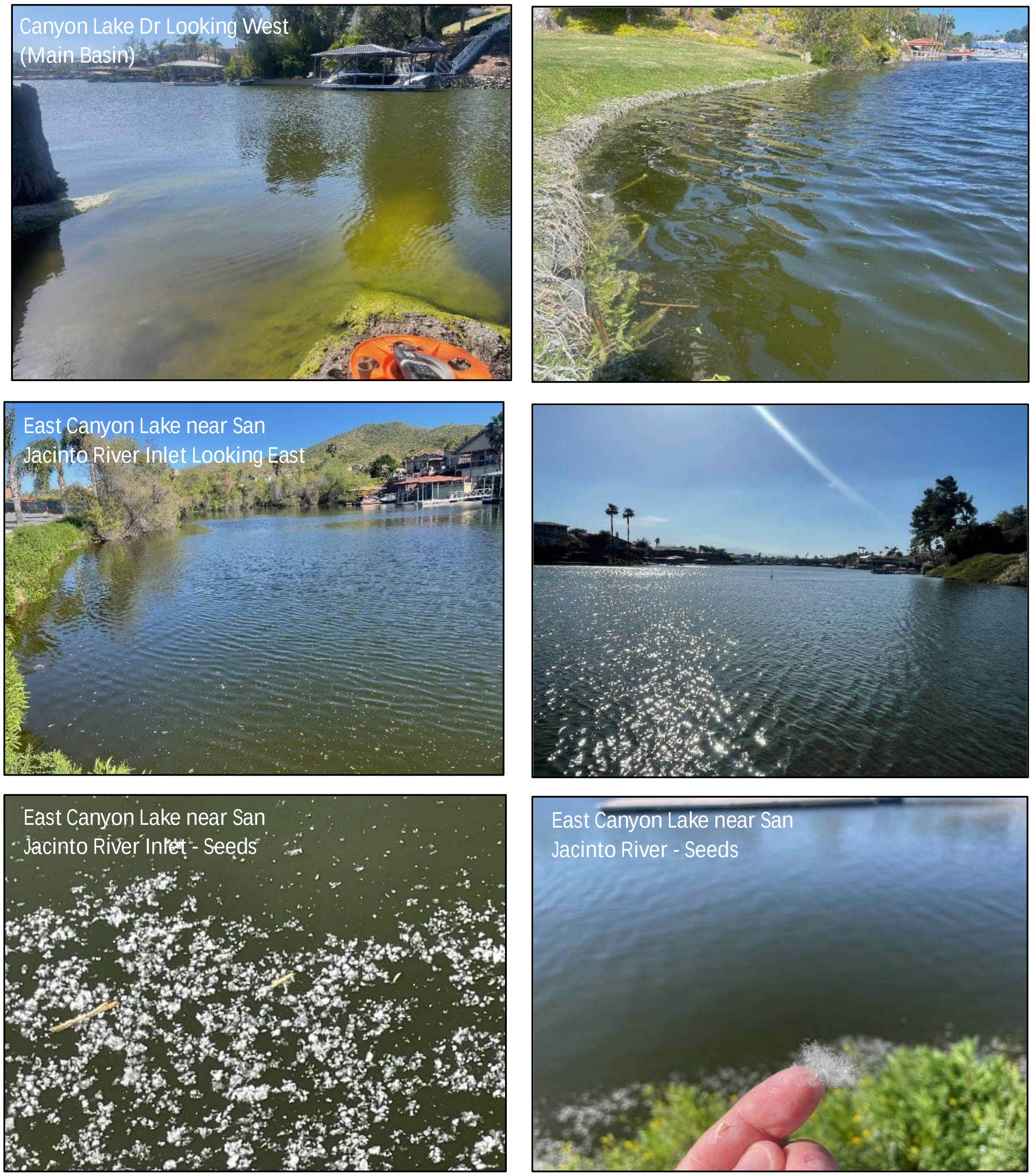


Figure 3. Photographs of Canyon Lake in the afternoon on April 30, 2024 (6 days after the last day of alum application)

Conclusion

Although a single definitive factor was not identified as a cause for the limited die off of shad observed in late April 2024, the coinciding timing shortly after the application of alum, observation of elevated pH and total aluminum, the rather abnormal observation of flocculent scum at some locations associated with dead fish, and the transient nature of the die off for just this one species, suggests that this alum application might be one of several possible causes. Additionally, surface concentrations of DO were elevated at the surface during the morning after the alum application, the low DO in the deeper waters may have also been a responsible factor, or co-factor, if this water might have mixed temporarily through the water column at some locations.

Thank you for your time and consideration. If you have questions, please contact John Rudolph (john.rudolph@wsp.com) or Chris Stransky (chris.stransky@wsp.com).

Sincerely,

John Rudolph
Senior Aquatic Scientist
WSP USA, San Diego