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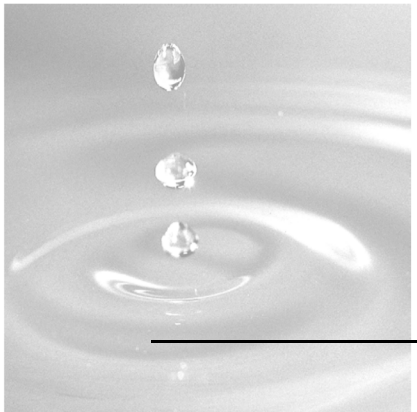
Study to Evaluate Future Alternatives for the Lake Elsinore Aeration and Mixing System

Lake Elsinore, California

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Acknowledgments

Elsinore Valley Municipal Water District, the City of Lake Elsinore, and the County of Riverside are pleased to have developed this Study to Evaluate Future Alternatives for the Lake Elsinore Aeration and Mixing System. Many factors make it uniquely challenging to manage water quality in Lake Elsinore. The technical analysis developed in this report required an expert team of scientists and engineers to assess the condition of the existing LEAMS, develop and implement a robust laboratory study, analyze extensive scientific data from over 25 years on Lake Elsinore, develop new project engineering concepts, evaluate management alternatives based on hydrodynamic modeling and the laboratory study results, and rank options based on economic and non-economic factors using the oxygenation alternative. We understand the great importance of the conclusions and recommendations of this study to set the stage for design and construction of a large project to offset excess external nutrient loads and improve water quality within Lake Elsinore. The information presented in this report and conclusions and recommendations were developed through the collaboration of the entire project team including:

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Acronyms and Abbreviations

AEM3D	three-dimensional Aquatic Ecosystem Model
AF	acre-feet
AFY	acre-feet per year
BIG	Blue in Green
BMPs	best management practices
CDFs	cumulative distribution functions
CEQA	California Environmental Quality Act
CLMs	Certified Lake Managers
CND	coupled nitrification – denitrification
DO	dissolved oxygen
EVMWD	Elsinore Valley Municipal Water District
FWS	Free surface wetlands
HFT	hydronucleation flotation technology
HLR	hydraulic loading rate
HRT	hydraulic residence time
HRU	hydrologic response unit
IRWM	Integrated Regional Water Management
LEAMS	Lake Elsinore Aeration and Mixing System
LECL	Lake Elsinore and Canyon Lake
LEMP	Lake Elsinore Management Project
LESJWA	Lake Elsinore and San Jacinto Watersheds Authority
LOX	liquid oxygen
MGD	million gallons per day
msl	mean sea level
N&P	nitrogen and phosphorus
NB	nanobubble
NPDES	National Polluant Discharge Elimination System
O&M	operation and maintenance
ORP	oxidation reduction potential
OST	Oxygen Saturation Technology
PACE	Pacific Advanced Civil Engineering, Inc.
PLOAD	Pollutant Load Estimator Model
PSA	Pressure Swing Absorption
RO	reverse osmosis
SCAG	Southern California Association of Governments
SDT	secchi depth transparency
SJR	San Jacinto River
SOD	sediment oxygen demand
SP	Speece cone
SRP	soluble reactive phosphorus

SWI	sediment water interface
TDS	total dissolved solids
TKN	total kjeldahl nitrogen
TMDL	Total Maximum Daily Load
TN	total nitrogen
TP	total phosphorus
USEPA	United State Environmental Protection Agency
VSA	Vacuum swing absorption
WOD	Water oxygen demand
WSP	WSP USA Environnent & Infrastructure, Inc.
WWTP	wastewater treatment plant
ZMS	zeolite molecular sieves

Executive Summary

Project Background

The Lake Elsinore Aeration and Mixing System (LEAMS) was constructed in 2007 as a joint project developed by Lake Elsinore and San Jacinto Watersheds Authority (LESJWA) and co-sponsored by EVMWD, the City of Lake Elsinore and Riverside County to reduce internal nutrient cycling from lake bottom sediments. LEAMS is designed to push oxygen-depleted water at the bottom toward the surface where it is re-aerated naturally by wind action or through algal photosynthesis and then returned to the lake bottom. Higher DO concentrations at the sediment surface reduce the internal load of nutrients.

In 2004, a nutrient total maximum daily load (TMDL) for Lake Elsinore was developed assuming LEAMS would be constructed and operated to achieve at least a 35% reduction in internal phosphorus load, as supported by Dr. Michael Anderson's 2001 laboratory experiments on sediment cores (Anderson 2001). This assumption in the 2004 TMDL required all responsible parties to participate in LEAMS. Thus, operation of LEAMS was included in watershed management plans developed by parties responsible for compliance with TMDL allocations, including the Comprehensive Nutrient Reduction Plan (CNRP) for Riverside County MS4 permittees and the Agriculture Nutrient Management Plan (AgNMP) for agricultural operators in the San Jacinto River watershed.

A license agreement was developed allowing LEAMS operators (EVMWD, City of Lake Elsinore, and County of Riverside) to sell nutrient reduction offset credits to other stakeholders (e.g., watershed cities, agricultural operators, Caltrans). Through 2024, operational costs for LEAMS continue to be shared by the Operators and other watershed stakeholders. In 2020, Dr. Alex Horne and Dr. Michael Anderson drafted a white paper which reviewed historical data for DO, temperature, and other water quality parameters to assess the effectiveness of LEAMS since 2007. The paper showed that LEAMS performance may be declining and rehab or replacement with a different nutrient reduction option is now warranted.

Concurrent to this evaluation of in-lake treatment, the TMDL Task Force is collaborating with the Santa Ana Regional Water Quality Control Board on a revised TMDL (LESJWA 2024) that will update the 2004 regulation with new information and science and extend the period of compliance by 20 years for entities to demonstrate required nutrient load reductions to meet allocations. The revised TMDL provides time for planning, design, construction, and several years of operation of new or enhanced in-lake water quality treatment projects. The program of implementation within the current draft of the revised TMDLs contains multiple new tasks to be implemented following the effective date, including *Task 5 to "Evaluate In-Lake Water Quality Control Options to Maintain Intended Uses in Lake Elsinore."*

This study satisfies the requirement of Task 5 of the revised TMDL program of implementation and evaluates a wide range of whole lake in-lake treatment alternatives to improve water quality in the long term. In the near-term, as per its NPDES Permit, EVMWD must continue to operate its existing aeration system (LEAMS), which assists in nutrient load reductions within the lake to offset excess loads in reclaimed water discharges. MS4s permittees must also continue to implement the CNRP to meet their NPDES Permit requirement associated with the LECL nutrient TMDL. This study also included a

Condition Assessment of the existing LEAMS (see Appendix D), which found that the existing LEAMS system has sufficient remaining life in the near term to continue to operate and provide vertical mixing of higher DO water in the surface to the lake bottom.

Study Objectives

This study seeks to create an implementable recommendation for future long-term in-lake water quality treatment for Lake Elsinore to reduce internal nutrient loads to levels needed to offset all external nutrient load that exceeds allocations (or allowable load) in the 2024 draft TMDL revision (LESJWA 2024). Several key steps were important to support the overall project objective including:

- Screening analysis of a wide range of possible alternatives for whole lake treatment in Lake Elsinore.
- Sediment nutrient and oxygen demand study to determine the appropriate amount of DO delivery needed for the lake bottom to meet the sediment oxygen demand (SOD) and to estimate potential internal nutrient load reductions from project implementation.
- Hydrodynamic modeling of Lake Elsinore to evaluate mixing in the Lake and assess the most effective strategy to distribute DO to maximize coverage of the lake bottom.
- Condition Assessment of the existing LEAMS to determine its remaining life.
- Project concept engineering for viable in-lake treatment alternatives, including lifecycle cost analysis.
- Evaluation of project options based on economic and non-economic factors.

Nutrients Load Reduction Target

Sources of external nutrient load to Lake Elsinore include EVMWD reclaimed water discharge and watershed runoff. Section 1 includes detailed summaries of external nutrient sources as well as the adopted ‘wet lake management strategy’ which involves the use of recycled water to maintain lake levels in Lake Elsinore. Target reduction of internal nutrient load needed to offset all excess external nutrient loads was determined based on the recently completed draft Technical Report for Revision to Lake Elsinore and Canyon Lake TMDL (LESJWA, 2024). A simple equation shows how estimated existing loads and allocations in the revised TMDL are used to determine load reduction goals for in-lake treatment, as follows:

Load Reduction Goal = Existing External Load – Allocated External Load

The 2024 TMDL revision includes interim milestones (to be achieved 20 years after the effective date) and final allocations (to be achieved 30 years after the effective date). Table ES-1 provides the target internal load reductions needed to offset all excess external nutrient load to achieve both interim milestones and final allocations (see Section 2 for detailed analysis).

Table ES-1. Estimation of In-Lake Offset Alternatives Load Reduction Goals to Meet Interim Milestones and Final Allocations in the Proposed Revised TMDL

Source	Required Reduction Goal (Interim)		Required Reduction Goal (Final)	
	TP (kg/yr)	TN (kg/yr)	TP (kg/yr)	TN (kg/yr)
Recycled Water (at 7.5 MGD) (1)	2,183	40,365	3,842	42,852
Local Lake Elsinore (Zone 1) (2)	205	1,316	517	1,783
Canyon Lake Overflow to Lake Elsinore (Zones 2-6) (2)	1,149	7,597	2,385	9,450
Additional Overflow from Mystic Lake (Zones 7-9) (2)	88	232	188	383
Total	**3,625**	**49,510**	**6,932**	**54,468**

1) EVMWD recycled water loads are based on 7.5 MGD flow rate, and interim/final discharge concentrations of 0.32/O.16 mg/L TP and 0.92/0.68 mg/L TN concentrations, respectively.
2) Delineation of subwatershed zones is shown in Figure 2-2.

Screening of Alternatives

Management approaches to improve water quality in freshwater lakes are diverse and include actions that 1) reduce internal nutrient load from lake bottom sediments to overlying water, 2) remove nutrients or algae from the water column, 3) manage food webs, or 4) control hydrology. The goal of this study is to identify and evaluate options to achieve nutrient load reduction goals prescribed in the 2024 revised TMDL (presented in Table ES-1 above).

A screening analysis was conducted for each of the 17 in-lake restoration methods documented by Dr Alex Horne and Dr Michael Anderson in a "Review of the Two Current Mixing Systems in Lake Elsinore with Recommendations for Improving Water Quality" (Horne and Anderson 2022). The 17 alternatives are also listed in Table 3-1 of this report. Oxygenation of Lake Elsinore is recommended as the primary in-lake treatment alternative because it is the only technically and economically feasible, long-term, whole lake water quality treatment alternative to directly address internal load of both TP and TN from lake bottom sediment by maintaining over 2 mg/L DO most of the time in the lake bottom.

Additional details of other rejected alternatives (e.g., dredging) and rationale for non-viability are provided in Table 3-1 and Section 3.1. This study, however, includes a more in-depth analysis of two other alternatives:

1. Algae biomass harvesting (see Section 3.1.1) and
2. Wetland treatment (see Section 3.1.2)

These alternatives could be considered in the future, if needed, to provide supplemental nitrogen reduction through an adaptive management approach.

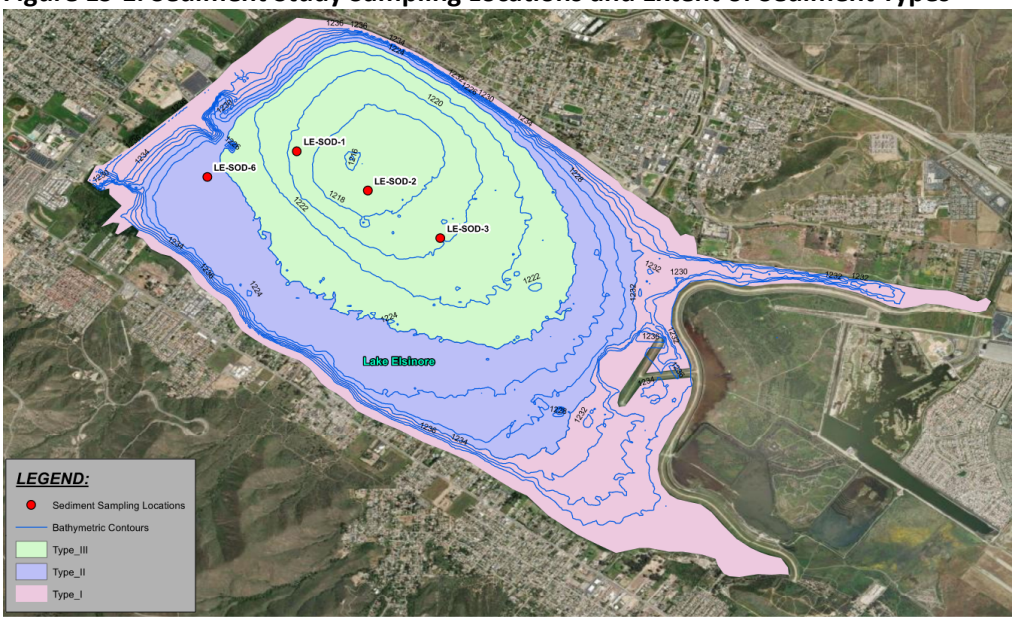
Sediment Oxygen Demand & Nutrient Release Study

Oxygenation reduces nutrient load from lake bottom sediment to the overlying water column. Two objectives of this study conducted in July 2024 are to:

1. Quantify sediment oxygen demand (SOD) to support sizing criteria for oxygenation system design, and
2. Conduct core-flux experiments to measure a reduced rate of nutrient release (or flux) under oxic (>2mg/L DO) relative to anoxic (<2 mg/L DO) conditions to support estimates of nutrients load reduction that could be achieved with oxygenation.

Figure ES-1 shows the location of sediment sample sites, which followed a previous demonstration that more than 95 percent of both total phosphorus (TP) and total nitrogen (TN) sediment flux occurs from Type II and III sediments over the deeper ~2,000 acres of lake bottom area (Anderson, 2001).

Figure ES-1. Sediment Study Sampling Locations and Extent of Sediment Types



SOD Test Results

SOD is the rate of oxygen consumed by decomposing organic matter in lake bottom sediments. The oxygenation system for Lake Elsinore should be sized to deliver enough DO to the lake bottom to meet the worst-case SOD conditions, during the summer season. To estimate SOD, DO as measured over five days from a total of 12 cores within an enclosed, temperature controlled chamber (four sites with three replicates per site). A sharp decline in DO was measured in the overlying water within all sediment core experiments within the first few days of the experiment (Figure ES-2). Results showed the following:

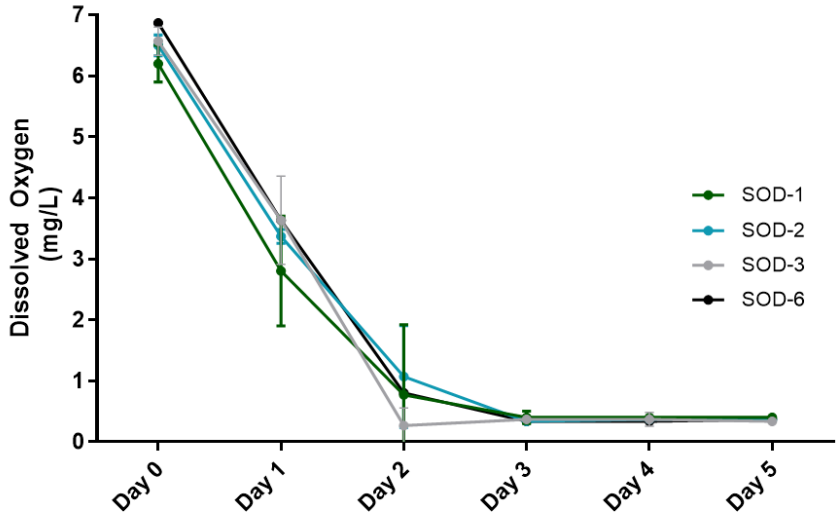
DO decline attributable to sediment over five-day period = 3.2 mg/day

The above is an average of four sediment sites excluding water oxygen demand (WOD), see Section 3.2.2 for detailed calculations. The SOD was then converted to an areal loss rate and extrapolated over the lake bottom to estimate SOD, as follows:

3.2 mg/day = areal SOD of 0.84 g/m^2/day or, daily lakewide SOD of ~14,900 lbs/day.

This value can be used for sizing oxygenation systems to provide sufficient DO to maintain oxic conditions in the lake bottom during most days of the year.

Figure ES-2. Reduction of DO in Water Overlying Sediment Cores from all Sites



Nutrients (TP, TN) Flux Reduction Test Results

The nutrient release rate (referred to as flux in mg/m^2/day) from bottom sediments to the overlying water column was measured by collecting subsamples of overlying water from 12 oxic cores (four sites with three replicates per site) and 12 anoxic cores (four sites with three replicates per site). The reduction from anoxic to oxic conditions represents the potential effectiveness of an oxygenation system (Table ES-2).

Table ES-2. Summary of Nutrient Flux Rates Measured in Sediment Study (see Appendix A for detail)

Nutrient Flux (mg/m^2/day)[1]	Type II Sediment (Site 6)			Type III Sediment (Sites 1,2,3)		
	Anoxic	Oxic	Difference (%)	Anoxic	Oxic	Difference (%)
TP	11.8	2.5	9.3 (79%)	14.4	8.1	6.3 (44%)
TN	96	49	48 (50%)	157	97	60 (38%)

1) Reported fluxes are average of 3 replicate cores based on changes in overlying water during Days 0-5 of the core-flux experiment

The nutrient flux results are based on core samples collected on a single day in July 2024. Oxygenation can only serve to reduce internal loading from sediment when the lake would otherwise experience

anoxia in the lake bottom. Nutrients released from sediments are different in different months of the year because of different areas of anoxic zones. Estimation of "*annual*" lake-wide nutrient loads required extrapolation analysis with seasonal adjustments for the following factors:

1. Temporal frequency of anoxic lake bottom,
2. Spatial extent of anoxic conditions in different months, and
3. Lake bottom water temperature variation (applicable to TN extrapolation only)

Using these adjustment factors, the monthly release of nutrients with and without oxygenation was estimated (See Table 3-3 for details) and summed up to provide annual nutrient reductions, as follows:

> **Annual nutrients load reduction (anoxic minus oxic) is estimated to provide 10,668 kg/yr TP and 64,163 kg/yr TN reduction.**

Based on this result from the July 2024 sediment nutrient core-flux experiments, TP &TN offsets needed to meet the interim milestones and final allocations in the proposed revised TMDL could be achieved by maintaining oxic conditions in the lake bottom year-round (Table ES-3). The estimated internal load reductions for TP and TN with oxygenation exceeds the reduction targets, thus a multi-agency offset program involving oxygenation is recommended to serve as the primary form of in-lake treatment for Lake Elsinore to meet both interim milestones and final allocations in the revised TMDL.

Table ES-3. Estimated Annual Internal Nutrient Load Reduction Provided by Oxygenation System in Lake Elsinore as Compared to Required Target Reduction

Summary of Offsets	TP (kg/yr)	TN (kg/yr)
EVMWD's Load Reduction Target [1]	3,842	42,852
Other's Load Reduction Target [1]	3,090	11,616
Total Load Reduction Target [1]	6,932	54,468
Oxygenation Nutrient Reduction Capacity [2]	10,668	64,163
% of Target Met	154%	118%

1) Values based on 2024 public draft of the proposed TMDL revision (LESJWA, 2024)
2) Basis for estimate from core-flux experiment conducted in July 2024 (see Appendix A) and extrapolation analysis (see Section 3.2.1)

Conceptual Engineering of Oxygenation System Components & Options

Various types of facilities/steps that must be included in any oxygenation project include:

- ***Oxygen Supply*** – Oxygen can be supplied via on-site generation or delivery of trucked liquid oxygen (LOX). Section 3.2.4.1 provides a summary of on-site generation equipment as well as details associated with the frequency of LOX deliveries and on-site storage tank sizing. There are pros and cons of either onsite generation or LOX delivery even though the costs of the two choices are comparable. LOX deliveries by vendors require large onsite storage tanks which can

be a public safety and aesthetic concern by the neighbors, but this alternative provides much reduced O&M demands as compared to the onsite generators. Selection of the preferred choice will be made after further evaluation during the design phase.

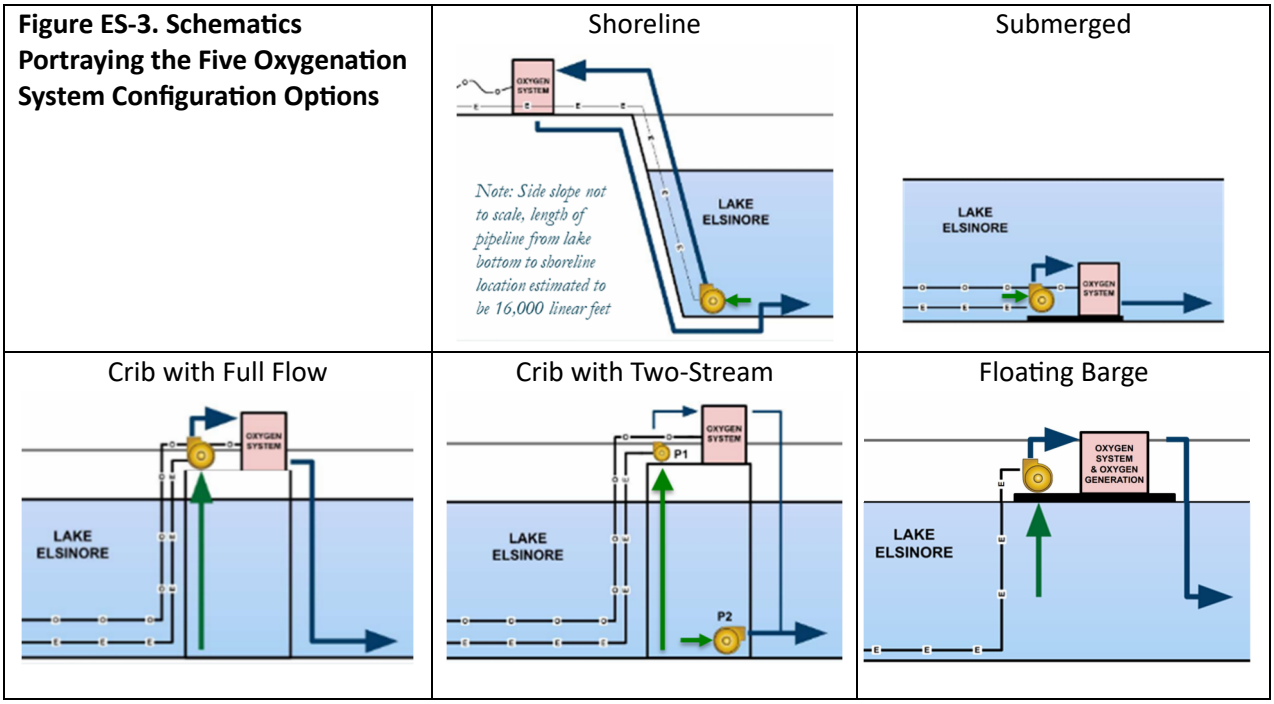
- ***Oxygen Dissolution Technology*** - Four vendors of oxygen dissolution technologies (to add oxygen gas into carrier water) were identified that could be implemented to deliver about 15,000 lbs/day of DO to Lake Elsinore. These include the following:

    1. Blue in Green (BIG, high-pressure system),
    2. Moleaer (nanobubbles, NB),
    3. Oxygen Saturation Technology (OST, modified Speece cone), and
    4. ECO2 (Speece cone, SP).

  For each of these technologies, between 2 to 12 units would be needed to deliver 15,000 lbs/day of DO. Other differences between the technologies relate to factors such as size, ability to be submerged, vessel pressure, O&M, and cost. Section 3.2.4.2 provides details and photos of the four technologies.

- ***Oxygenation System Configuration*** – An oxygenation project requires pumping of low DO water from the lake into a DO dissolution facility and then returning concentrated DO water to the lake bottom. Five options were identified for the location of the dissolution system, which impacts the pumping of water through the system, and delivery of energy and oxygen to the system. For each, schematics are provided to portray engineering concepts for pumping of water (blue lines with arrows), transmission of electrical (lines noted -E-) and oxygen gas (-O-) (Figure ES-3).

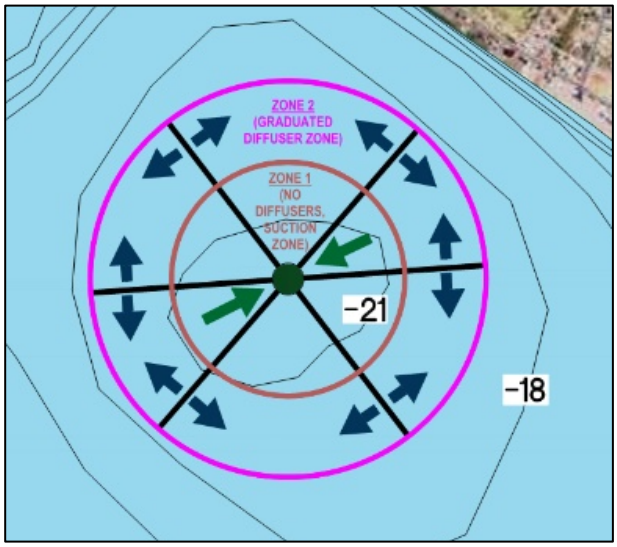
Figure ES-3. Schematics Portraying the Five Oxygenation System Configuration Options



- ***Distribution of Concentrated Oxygenated Water in Lake Bottom*** - (see Section 3.2.4.4 for details) Multiple options exist to deliver concentrated DO water from the oxygenation system to

the lake bottom. Ideally, the highly concentrated DO water would be delivered in a manner to remain close to the lake bottom (where it is needed) and spread laterally across the lake bottom. Two options were developed for this study, one involving slow diffusion to the lake bottom through a series of lines as shown in Figure ES-4, and the other involving jet delivery to the middle of the water column. Hydrodynamic modeling of these two options for distribution of oxygenated water was evaluated (see Appendix B for details). The hydrodynamic analysis showed that the lake experiences significant natural lateral mixing within the bottom. Thus, efficient lateral spreading of high DO water across the lake bottom can be achieved without the need for an extensive delivery system.

Figure ES-4. Oxygenation System at Deepest Zone of Lake Bottom showing Spoke Diffuser Concept



As many as 80 oxygenation permutations could be considered with varying combinations of generation or delivery (n=2; on-site or trucked LOX), dissolution (n=4; Moleaer, Speece cone, OST, or Blue-in-Green), system configuration (n=5; shoreline, submerged, platform full flow, platform 2-stream, or floating barge), and distribution (n=2; lake bottom spoke diffusers or mid-depth jet). For purposes of this study, five comprehensive options are identified that represent a wide range of approaches and preferred combinations of the above-mentioned components that would be most compatible for implementation, as follows:

1. ***Shoreline Option*** - Pump 60 MGD of water from the lake bottom to a shoreline location with onsite LOX storge and power. Dissolve LOX into carrier water via any of the four technologies described in Section 3.2.4.2, then distribute oxygenated water via six 2,000’ diffuser lines with perforations beginning 1,000’ from the suction zone (referred to as spoke delivery below, see Figure ES-4 above).
2. ***Submerged Option*** (Speece cone or similar dissolution method) Pump 60 MGD of water from the lake bottom into a submerged Speece cone or similar dissolution technology. Store LOX on the shoreline as well as convey power to the lake bottom dissolution system via underwater cables. Distribute oxygenated water via spoke delivery.

3. ***Crib with Full Flow Option*** - Pump 60 MGD of water from the lake bottom to a permanent platform above the lake level where an oxygenation system will be located. Store LOX on the shoreline and convey power to the platform dissolution system via underwater cables. Distribute oxygenated water via spoke delivery.
4. ***Crib with Two-Stream Flow Option*** - Pump two streams as follows: 9 MGD of water from the lake bottom to a permanent platform above the lake level where a high-pressure oxygenation system will be located. Store LOX on the shoreline and convey power to the platform dissolution system via underwater cables. The second stream involves pumping 90 MGD of water from the lake bottom to blend with the 9 MGD of supersaturated DO water as it comes down from platform. Distribute blended oxygenated water via spoke delivery.
5. ***Floating Barges Option*** - Pump 60 MGD of water from mid-depth to a network of six floating barges (treating 10 MGD each) where nano bubbles oxygenation systems will be located. On-site nano bubbles generators will be located on each barge. Convey power to the floating barges dissolution systema via underwater cables. Distribute oxygenated water at mid-depth via simple jet flow in pipeline underneath the barges. Option E is a scaled-up version of the current system involving 3 floating barges with Moleaer nanobubble technology.

Ranking of Oxygenation System Options

A multi-factor methodology for ranking of oxygenation options for Lake Elsinore treatment was developed to select the most preferred option. Meetings with stakeholders were held to collect input on the selection of evaluation criteria as well as criteria weights. The factors and weights considered in the ranking methodology are cost (30%), reliability (20%), regulatory requirements & environmental impacts (25%), Ease of Construction & O&M (10%), Constraints - Political, Social, Recreational, Stakeholder Acceptance (10%), and other benefits (5%). Detailed description of each criterion is provided in Section 4-2. The capital, O&M and life cycle costs of all the five system options are summarized in Table ES-4. For Options 1, 2 and 3, the costs are averaged over the multiple dissolution technologies applicable to the respective Option.

Table ES-4. Summary of Capital, O&M, and Lifecycle Costs of Oxygenation System Options for Lake Elsinore Treatment

Option #	System Option (Dissolution Technology)	Capital ($)	O&M ($/yr)	Lifecycle ($/25yrs)[1]
1	LOX, shoreline, spoke (SP, NB, OST, BIG)	$19,733,333	$2,550,000	$82,769,333
2	LOX, submerged, spoke (SP, OST)	$9,550,000	$1,650,000	$50,338,000
3	LOX, platform full-flow, spoke (NB, SP, OST)	$15,000,000	$2,100,000	$66,912,000
4	LOX, platform 2-stream, spoke (BIG)	$10,500,000	$1,750,000	$53,760,000
5	PSA, platform full-flow, Jet (NB)	$10,500,000	$1,620,000	$50,546,400

1) Sum of capital (2024 dollars) and annual O&M with 3 percent annual escalation over the next 25 years. Averaged over the compatible dissolution technologies. See Appendix C for detailed costs breakdown. Key for compatible vendors: SP = ECO2 Speece cone, NB = Moleaer nanobubbles, OST = Clarity Resources Group Oxygen Saturation Technology, BIG = Blue–in-Green

For each option, members of the expert team (including Dr. Alex Horne, Dr. Michael Anderson, six GEI limnology experts, and two PACE engineering experts) assigned scores independently based on the following scale***: 1 - Least Preferred to 5 – Most Preferred***. Following the independent scoring, all expert team members convened to discuss the results and address differing perspectives, particularly where there were significant differences among the independent rankings. After resolution of significant differences, the independent scores were averaged for each option and evaluation criteria to compute a single multi-factor weighted total score (See Table ES-5).

Table ES-5. Weighted Multi-Factor Scoring of Five Oxygenation System Options by the Expert Team

Option #	System Option (Dissolution Technology)	Cost	Reliability	Ease of Construction and O&M	Regulatory Compliance, Environmental	Social, Political, Recreational Constraints	Sustainability/ Other Benefits	Multi-Factor Weighted Score
		30%	20%	10%	25%	10%	5%	
1	LOX, shoreline, spoke (SP, NB, OST, BIG)	1.0	4.3	3.4	4.3	4.4	2.9	**3.1**
2	LOX, submerged, spoke (SP, OST)	5.0	4.1	3.6	4.0	3.6	3.5	**4.2**
3	LOX, platform full-flow, spoke (NB, SP, OST)	3.0	3.1	2.7	2.8	2.9	2.8	**2.9**
4	LOX, platform 2-stream, spoke (BIG)	4.6	3.9	3.1	4.0	3.4	3.3	**4.0**
5	PSA, platform full-flow, Jet (NB)	5.0	1.9	3.6	3.0	2.8	2.6	**3.4**

Key for compatible vendors: SP = ECO2 Speece cone, NB = Moleaer nanobubbles, OST = Clarity Resources Group Oxygen Saturation Technology, BIG = Blue–in-Green

Recommendations

Key Recommendation - This study recommends a primary in-lake treatment alternative involving an oxygenation system with a capacity to deliver 15,000 lbs/day of DO to the lake bottom. Because the existing aeration system (LEAMS) is unable to provide adequate DO in Lake bottom most of the year, an oxygenation system provides a logical replacement of existing LEAMS to more effectively reduce the flux of nutrients from lake bottom sediments. With persistent maintenance of oxic conditions in the lake bottom, oxygenation is projected to provide the internal nutrient load reduction needed to meet the offset demands for both TP and TN from all external sources to meet interim milestones and final allocations in the revised TMDL.

Specific Recommendation for Oxygenation System – The recommendation below is provided to design, construct, demonstrate effectiveness, and consider supplemental controls for an oxygenation project in Lake Elsinore. Out of the five assessed Options (Table ES-5), the highest ranked are the following:

- Option 2 - A submerged system (e.g., Speece cone) at 60 MGD capacity – Score 4.2

- Option 4 - a crib with two streams (9 MGD into a high-pressure dissolution on a crib above the water and 90 MGD of dilution carrier water) - Score 4.0.

Selection of the most preferred one of these two project concepts requires more detailed evaluation of the manufacturers' drawings of the systems & detailed assessment of capital and O&M cost and implementation feasibility. This Task and assessment are recommended to be completed as part of the predesign effort.

Other Recommendations

- Continuous measurement of DO in the lake bottom will be important to assess whether the project is achieving the goal of a persistent oxic condition in the bottom waters of Lake Elsinore. DO sondes could be installed at multiple permanent locations anchored to the lake bottom and a QAPP be developed to maximize data quality and allow for lake bottom DO data to be used in NPDES compliance offset demonstrations. Installation of such equipment must incorporate anti-fouling techniques (Delgado et. al., 2021).
- Estimated O&M cost in Table 4-2 amounts to ~$1.6 million/yr based on assumed full time operation of the oxygenation system. During design, smart controls should be incorporated into the oxygenation system that use data from in-situ sondes on the lake bottom to optimize DO deliveries. Given that anoxic conditions occur approximately 50% of the time annually over Type II and III sediments, the operation of the oxygenation system could be reduced by half with optimized control.
- Prior to the construction of oxygenation, the existing LEAMS system has sufficient remaining life to continue to operate and provide vertical mixing of higher DO water in the surface to the lake bottom. The Task Force may consider coordination with the Regional Board staff to allow for reduced operation of LEAMS during summer periods when data show DO conditions in the lake bottom are maintained at levels greater than 2 mg/L DO because of current ongoing addition of 5,600 lbs/day of DO via nanobubbles from three floating barges on the lake.
- An adaptive management approach is prescribed in the program of implementation for the revised TMDL with several studies to be conducted by all entities responsible for implementation of Lake Elsinore TMDL. Adaptive management requires the TMDL Task Force to continue coordination on a process of iterative project planning, implementation, and effectiveness demonstration. A roadmap is provided in the Phase II implementation program (LESJWA, 2024). Sediment nutrient studies will be conducted every five years (TMDL Task 12) providing new information to support updated demonstrations of effectiveness of in-lake project(s) after implementation. In addition, within the next 5 years, TMDL Task 8 of the Phase II program of implementation involves a study to evaluate cyanobacteria in Lake Elsinore after implementation of the preferred in-lake project(s) for Lake Elsinore. Based on the results of these studies, during Phase III, if needed, adaptive management may involve implementing secondary in-lake treatment to supplement oxygenation such as chemical addition for TP sequestration and wetland treatment or algae biomass removal for TN removal.

1. Introduction

1.1. Reason for Study

This study seeks to create an implementable recommendation for future long-term in-lake water quality improvement for Lake Elsinore to meet the allocations and numeric targets in the 2024 draft Total Maximum Daily Load (TMDL) revision. Once effective, the 2024 TMDL revision would replace the existing 2004 TMDL, and contain lower nutrient load allocations for external sources, thereby requiring more reduction than under the current TMDL. The 2024 TMDL revision also improved the scientific linkage analysis between external nutrient loads and in-lake water quality, and in so doing, created in-lake numeric targets as cumulative distribution functions (CDFs) to account for the spatial and temporal variability of water quality response once allocations have been achieved. Key elements of the 2024 draft TMDL revision will be introduced throughout this document as it pertains to implementation planning and unique challenges that Lake Elsinore presents to stakeholders. A detailed description of the proposed regulation and scientific basis for the 2024 draft TMDL revision is provided in the TMDL Technical Report.

The existing 2004 TMDL and associated National Pollutant Discharge Elimination System (NPDES) permits allow for the use of in-lake treatment controls to achieve internal nutrient load reduction sufficient to offset excess nutrient loads in external inflows. The Lake Elsinore Aeration and Mixing System (LEAMS) is currently operated to generate internal nutrient load reductions to offset excess external nutrient loads. Excess nutrient loads include watershed runoff and recycled water additions by Elsinore Valley Municipal Water District (EVMWD) to maintain lake levels. This Study was conducted for two key reasons:

- A key task to be completed within one year of the effective date of the 2024 draft TMDL revision is to "*Evaluate In-Lake Projects to Improve Water Quality in Lake Elsinore",* referred to as Task 5 hereafter. Task 5 requires the current LEAMS operators, namely the Elsinore Valley Municipal Water District, City of Lake Elsinore, and County of Riverside to implement Task 5 within one year of the TMDL effective date. As of the completion of this report, the TMDL is within the public review period and would not become effective until adoption by the Regional Board and subsequent U.S. Environmental Protection Agency (USEPA) approval. Thus, the study is being delivered earlier than required by the revised TMDL.
- To comply with the existing 2004 TMDL, LEAMS is operated to offset excess nutrient loads to Lake Elsinore. Nutrient reduction credits are estimated by comparing monthly nutrient concentrations for a baseline pre-project period of 2002 – 2006 with the monitoring data collected in the past year. Reports have shown a reduced concentration of total phosphorus (TP) and total nitrogen (TN) in offset demonstrations reports in 2012, 2015, 2018, and 2019, 2021, and 2022. In 2020 and 2023, reductions in TP concentrations relative to the baseline period were observed but TN concentrations were higher than the baseline period. The reason for higher nitrogen concentrations in 2020 relative to the 2002-2006 baseline could be attributed to other temporally varying factors that influence nutrient concentrations within Lake Elsinore, such as hydrology, presence of burned hillsides, changes to Canyon Lake overflow, water level, and TDS. To better understand the effectiveness and longevity of LEAMS, a white paper was created by

Dr. Alex Horne and Dr. Michael Anderson drawing upon their long-term work on Lake Elsinore and nationally recognized expertise in limnology and lake management. The general conclusion of this assessment was that an alternative in-lake water quality control project should be considered to supplement or replace LEAMS. A list of 17 lake water quality project types was presented and several recommendations were developed for further investigation.

The revised TMDL linkage analysis shows that even when all external load allocations are met to achieve conditions representative of a complete return of the San Jacinto River (SJR) watershed to a reference watershed condition, algae blooms are likely to occur, although at a reduced frequency and magnitude relatively to current conditions. As noted above, the primary objective for in-lake treatment is to reduce internal nutrient loads to levels needed to offset all excess external load from EVMWD reclaimed water discharge and watershed runoff. However, this evaluation of option(s) for in-lake treatment also considers the extent to which projects may achieve conditions that allow for even greater protection of recreational use than needed to meet the revised TMDL allocations.

1.2. Recent Work involving in-lake treatment in Lake Elsinore

This Study builds upon the work developed in Horne and Anderson (2022) as well as several other recent planning efforts, including Prop1 funded pilot study, City of Lake Elsinore Lake Management Plan, and the technical analysis to support a draft 2024 TMDL revision. Each of these planning efforts are described briefly below and referenced throughout the remainder of the study report:

- Review of the Two Current Mixing Systems in Lake Elsinore with Recommendations for Improving Water Quality (Horne and Anderson 2022). This study provides a comprehensive review of DO conditions in Lake Elsinore during periods with operation of the LEAMS and concludes that the current aeration system has a limited ability to achieve levels of dissolved oxygen (DO) in the lake bottom needed to maximize nutrient flux reduction benefits. Alternative in-lake treatment options are described, and several recommendations are provided for further evaluation.
- State of California Department of Water Resources Integrated Regional Water Management (IRWM) Implementation Prop 1 Grant. The City of Lake Elsinore conducted a study to evaluate potential in-lake treatment alternatives for Lake Elsinore. A series of mesocosms were created around the Launch Pointe dock and pilot scale testing was performed for several technologies including algaecide, bacteria addition, nanobubbles, and algae biomass removal. Overall, all technologies had poor performance with the test occurring during a severe algae bloom, highlighting the difficulty any technology will have to improve water quality lake wide. A summary of the study results is available www.sawpa.gov/wp-content/uploads/2022/09/LE-Algal-Pilot-Study_092322.pdf.
- City of Lake Elsinore Lake Management Plan. Lake management activities have been initiated by the City of Lake Elsinore with the objective to provide immediate water quality improvement needed to make the lake safe for recreational use, including as needed application of algaecides, a nanobubble pilot to deliver ~600 lbs/day DO, two partial scale nanobubble barges to each deliver 2,500 lbs/day DO, and potential lanthanum addition for lake bottom sediment nutrient sequestration.

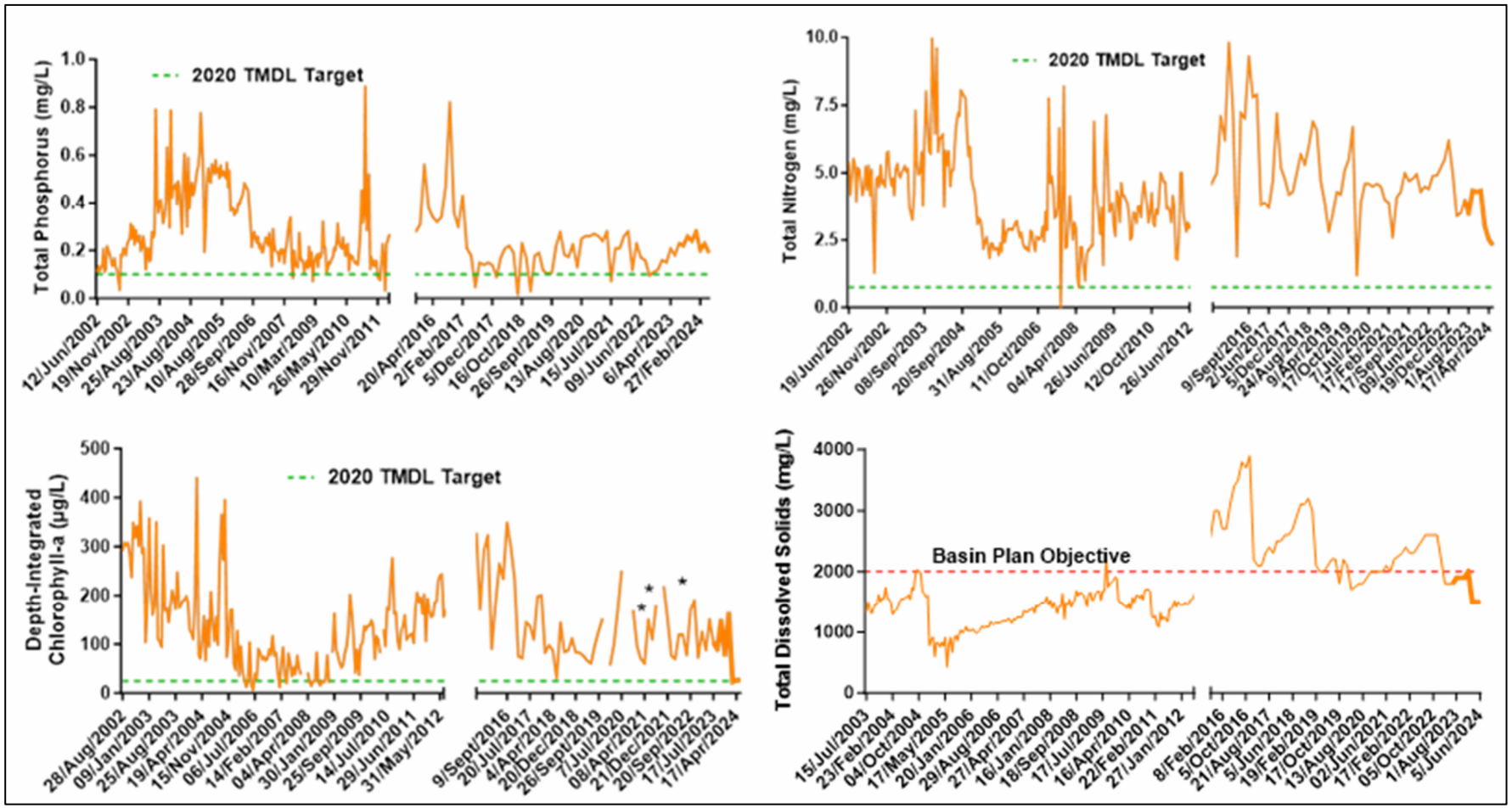
- Technical Report to Support Revision of the Lake Elsinore and Canyon Lake (LECL) Nutrient TMDL (LESJWA, 2024). Details of the scientific basis for a revised TMDL for Lake Elsinore that provides specific reductions of external nutrient loads to be achieved to meet allocations and guidelines for the use of in-lake treatment to offset excess external loads in compliance demonstration. The TMDL revision includes a detailed set of implementation requirements, including a task to evaluate in-lake treatment options for Lake Elsinore (this study), and subsequent task to implement the recommended option(s) to begin within 18 months of the effective date of the revised TMDL.
- Annual nutrients offset demonstration reports for the existing LEAMS (most recent 2023 report by Stillwater Sciences 2024), which compare current year nutrient monitoring data with a baseline, pre-LEAMS condition (2002-2006). Results have shown lower concentrations of soluble reactive phosphorus (SRP) in all years and ammonia in most years when comparing monitoring data before and after LEAMS become fully operational. In the most recent report, a key finding after in-depth review of DO pre and post LEAMS suggests that "providing a higher, more reliable DO source for bottom waters compared to the current aeration system will more consistently result in N and P offsets".

1.3. Current Water Quality

There are three routine monitoring programs that currently collect samples from Lake Elsinore for analytical chemistry to assess nutrients, TDS, chlorophyll-a, and cyanotoxins, including 1) TMDL compliance monitoring program (8 sample events/yr), 2) LEAMS offset demonstration led by EVMWD (14 sample events/yr), and 3) shoreline cyanotoxin sampling at recreational beaches (5 sample events/yr). Vertical profiles of temperature, DO, pH, and conductivity are collected during sample events as well as a measurement for secchi depth transparency (SDT). Lastly, EVMWD maintains vertically profiling sondes that measure temperature, pH, turbidity, oxidation reduction potential (ORP), DO, and conductivity on an hourly basis from various depths in the lakes.

Based on each sampling program, long-term patterns in concentration of nutrients, chlorophyll-a, and TDS are presented in Figure 1-1. A period of missing data from 2012 – 2015 was associated with a Task Force decision to focus resources in this period on implementation of the alum addition program in Canyon Lake and multi-agency participation in operation of LEAMS with support from the Regional Board. Nutrient concentrations (most notably TP) in the lake have declined with the current program of implementation (Figure 1-1).

Figure 1-1. Historical nutrient concentrations, chlorophyll-a, and TDS in Lake Elsinore (Reference - Draft 2024 TMDL Technical Report)



Reductions of lake nutrient concentrations have not reached in-lake numeric targets of the 2004 TMDL as shown in Table 1-1. This is despite demonstrations by the Task Force showing that allocations for external sources of nutrients in the 2004 TMDL have been achieved. Several factors contribute to the disconnect in the 2004 TMDL linkage analysis between external source inflows and in-lake water quality, including the use of a static lake water quality model, error in computation of flow-weighted average runoff used to determine lake model inflows, and underestimation of nutrient loads from undeveloped areas. Lastly, data analysis of in-lake water quality has shown algae growth in Lake Elsinore to be driven more so by other environmental factors (e.g., water level and TDS) than nutrient concentrations (Stillwater Sciences, 2024; Horne and Anderson, 2022).

Table 1-1. Average Annual Water Quality Data from Lake Elsinore (2016-2023) Compared to 2004 TMDL Targets

Lake	Parameter	2004 TMDL Target	Average (2016-2023)
Lake Elsinore	TP (mg/L)	0.10	0.23
	TN (mg/L)	1.0	5.2
	Chl-*a* (ug/L)	25	159

The draft 2024 TMDL revision by LESJWA (2024) utilizes flow and water quality data collected since 2004 to support new watershed and in-lake models so that when 10-year average annual allocations are achieved through nutrient load reduction, there will be more confidence that in-lake numeric targets will be achieved. A more detailed discussion of the source assessment and linkage analysis is provided in the Revised LECL TMDL Technical Report. If approved, the revised TMDL would 1) reduce allocations for external sources (i.e., requiring larger reductions) and 2) represent in-lake numeric targets as cumulative distribution functions (CDFs) allowing for natural variability in hydrology and environmental factors when assessing the effectiveness of implementation programs on in-lake water quality responses. This study is focused on the former and provides projections of N and P load reductions that could be achieved within Lake Elsinore to offset existing nutrient load that is in excess of allocations in the revised TMDL. Following implementation of in-lake treatment, Task 6 in the Phase II program of implementation prescribed in LESJWA (2024), another study as part of Phase II program of implementation will assess the ability of the project(s) to meet intended use, especially considering risk to swimmers from harmful algae blooms, which is the objective of Task 7 of the Phase II program of implementation.

Measurement of DO in Lake Elsinore is used to assess two key conditions, 1) anoxia in the lake bottom that can lead to increased internal load from lake bottom sediment caused by changing biochemistry, and 2) conditions needed to support healthy fishery throughout the water column. For the former, increasing DO in the lake bottom and the spatial and temporal extent of anoxia at the sediment-water interface (SWI) can reduce internal nutrient load. This process is the driving force behind lake management alternatives involving aeration or oxygenation (see Section 3.2 for further detail). For the latter, DO of greater than 5 mg/L is needed to fully sustain sport fish populations. When the entire water column drops significantly below 5 mg/L for an extended period of time, Lake Elsinore experiences fish kills. In recent years, low DO throughout the water column has been measured periodically and has been linked to fish kills. For this study, it is assumed that projects designed to achieve oxic conditions at the SWI year-round (i.e., oxygenation) would be sufficient to meet in-lake numeric targets for DO (expressed as a CDF in the draft revised TMDL Technical Report). Most likely DO conditions would be far better than

the numeric target thereby proving conditions protective of WARM aquatic life uses with greater frequency than would naturally occur.

1.4. Wet Lake Management Strategy

Lake Elsinore is a large (~3,000 acres after levee construction), relatively shallow lake (~ 30 feet at its deepest part) located in an area with a hot dry climate (< 12 inches rain/year). Each year nearly four billion gallons of water evaporate causing the lake level in Lake Elsinore to drop by about 4 feet. Average precipitation is not sufficient to make up for such losses and during prolonged droughts Lake Elsinore had sometimes dried up completely (Figure 1-2). As water in the lake evaporates, residual salt concentrations slowly increase and, at times, exceed the salinity of ocean water. High salinity concentrations are toxic to most freshwater organisms. When Lake Elsinore experienced historical extended drought conditions and dried up, all beneficial uses in Lake Elsinore, including warm freshwater aquatic habitat and recreational resources, ceased to exist.

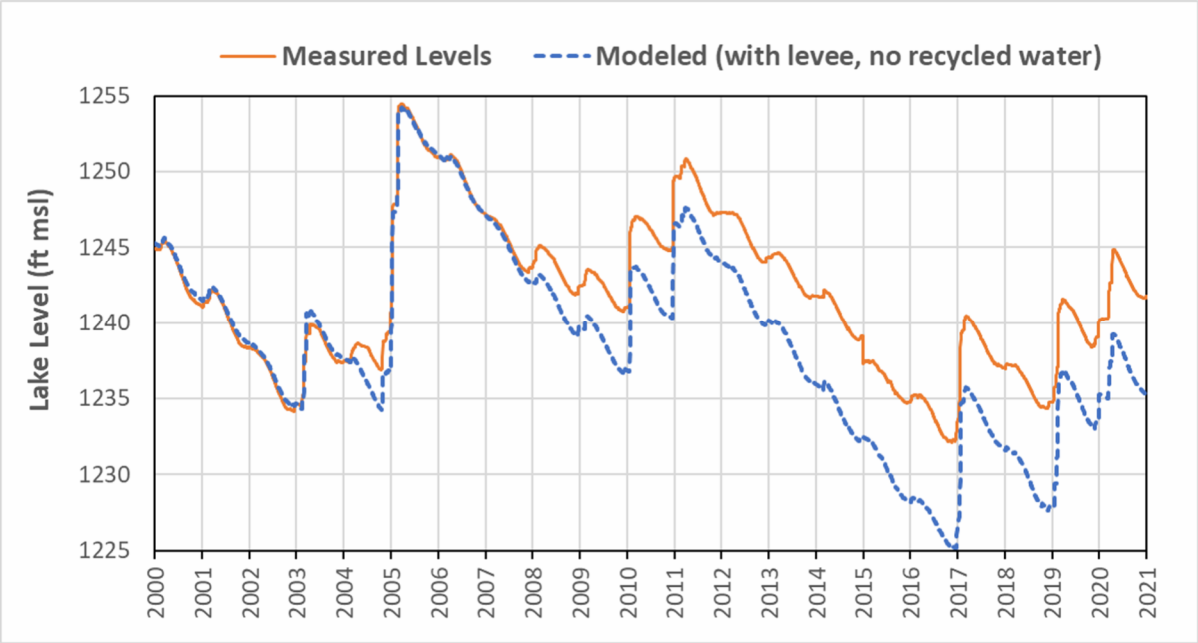
Figure 1-2. Mostly Evaporated Lake Elsinore circa 1956



To address water level and associated water quality concerns in Lake Elsinore, and to better maintain beneficial uses in Lake Elsinore, two key projects have been implemented over its history including:

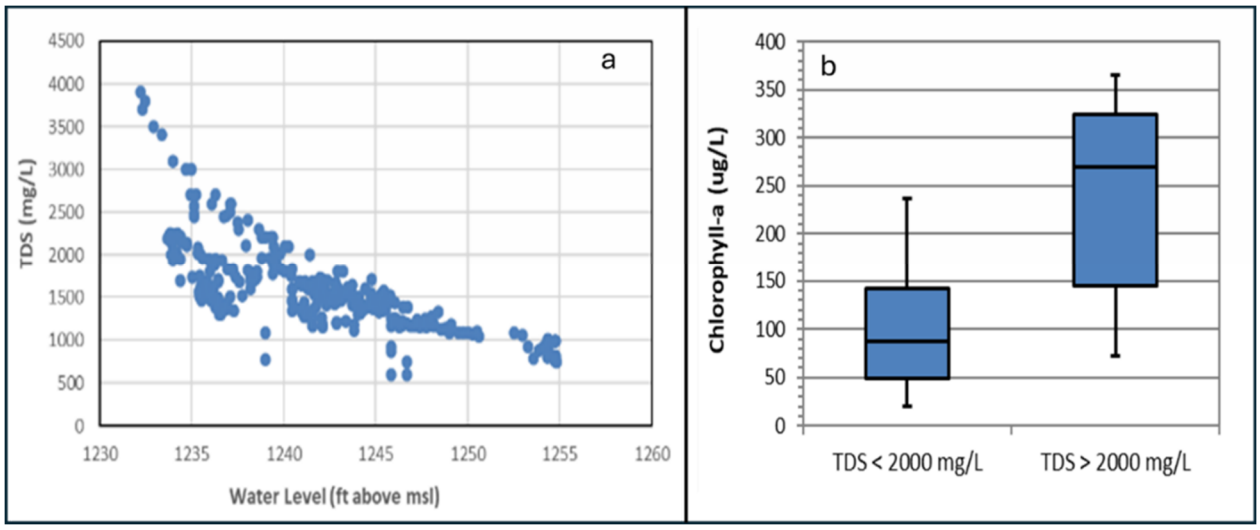
- Implementation of the Lake Elsinore Management Project (LEMP) to construct a levee that separated the main lake from the back basin, permanently reducing the lake size from approximately 6,000 acres to 3,000 acres and realigning the lake inlet channel to bring in natural runoff from the San Jacinto River watershed when Canyon Lake overflows.
- Addition of recycled water (beginning in 2002) by EVMWD to maintain water levels. Recycled water has effectively prevented desiccation of the lakebed that would have naturally occurred as recently as 2016 during extreme drought conditions (Figure 1-3). EVMWD (per an agreement with the City of Lake Elsinore) provides an average of 5,500-acre feet (AF) of recycled water to the lake each year. However, supplemental recycled water inputs are suspended if they will cause the lake to exceed an elevation of 1,247 feet, a condition that occurred in February of 2024 for the first time since recycled water additions began.

Figure 1-3. Lake Elsinore Measured Water Level Versus Simulated Water Level for Scenario with No Recycled Water Addition



The wet lake management strategy brings additional complexity to the evaluation of long-term in-lake water quality treatment options. Supplementing lake water with recycled water brings nutrients that must be reduced with offset programs to meet the revised TMDL allocations. In addition, long-term supplementation of Lake Elsinore with recycled water will have a cumulative impact (over 99 years simulation period from 1916-2015) of increased total dissolved solids by ~900 mg/L (Anderson 2015). TDS at high concentrations is a stressor for freshwater aquatic life, including zooplankton communities that graze upon algae and can mitigate the duration and magnitude of algae blooms (Figure 1-4).

Figure 1-4. Relationship Between TDS (mg/L) and Lake Elevation (ft above mean sea level [msl]) in Lake Elsinore and TDS (mg/L) and Chlorophyll-a (µg/L) (2000-2020)



This evaluation of a whole lake treatment strategy for Lake Elsinore involves a holistic understanding of the unique challenges to managing water quantity and quality in Lake Elsinore such as hydrologic variability, lack of overflow/flushing, external nutrient loading, impact of fire in watershed, prolonged blooms dominated by blue-green algae, dynamic salinity condition and impact upon food webs, and repeated cycling of nutrients between the lake bottom and water column. Given these complexities, this evaluation of in-lake water quality treatment option(s) involves multiple subject matter experts, including lead scientists and engineers that have guided work within Lake Elsinore over the past 25 years.

2. Nutrient Reduction Goals

Lake Elsinore in-lake treatment will reduce internal nutrient loads thereby offsetting reductions that are not achieved in external inflows. This evaluation study considers whole lake treatment options that provide sufficient potential to reduce internal sources of N and P that could be needed collectively for dischargers of recycled water, local watershed runoff, and overflows from Canyon Lake. This section describes estimates of existing loads (Section 2.1), allocations (Section 2.2), and reductions needed to achieve allocations (Section 2.3). A simple equation shows how load reduction goals are determined as follows:

Load Reduction Goal = Existing External Load – Allocated External Load

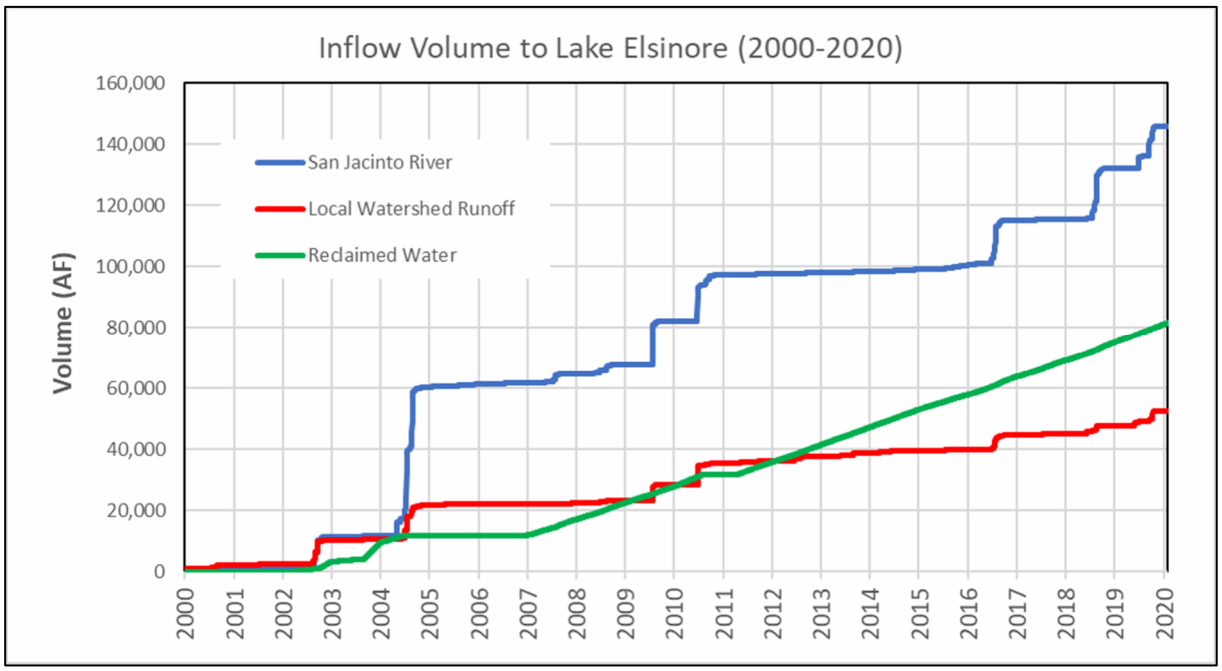
2.1. Assessment of Existing External Loads

External nutrient loads are discharged into Lake Elsinore from outside of the lake basin and include recycled water, watershed runoff, and Canyon Lake overflows. Long-term average loading of nutrients from these sources was quantified to support development of the scientific basis for the revised TMDL. A brief summary of the methods used to estimate nutrient loads from each of the key sources follows:

Supplemental Recycled Water – Since 2002, EVMWD has added over 80,000 AF of supplemental recycled water to Lake Elsinore for lake level stabilization (green line in Figure 2-1). This supplemental water addition effectively prevented the complete desiccation in 2016 following extended drought conditions (see Figure 1-2 above). The use of recycled water to maintain Lake water elevations creates an additional external source of nutrient loads in excess of reference conditions. Table 2-1 presents annual volumes and estimated TP and TN loads of recycled water discharged to Lake Elsinore. The estimated nutrient load is based on measured nutrient concentrations (2013-2022 average of 0.53 mg/L TP and 4.82 mg/L TN) and a projected increased rate of treated effluent from 5.5 MGD (based on recent metering) up to 7.5 MGD with future population growth of 7.5 MGD in the EVMWD service area.

Watershed Runoff from Local Watershed – A static model of average annual watershed runoff and nutrient loads was developed using a spreadsheet comparable to USEPA's Pollutant Loading Estimator (PLOAD) model. Runoff estimates and nutrient loading were computed for hydrologic response units or HRUs (i.e., unique combinations of jurisdiction, subwatershed zone, and land use). In the case of Lake Elsinore, model results are only used to characterize the local watershed, identified as Zone 1 in Figure 2-2. Inflows to Lake Elsinore associated with watershed runoff in Zones 2-9 all come through Canyon Lake and estimated based on measured data as is discussed in the following section. Key model parameters to estimate zone 1 watershed runoff nutrient loading include percent imperviousness (for runoff volume) and land use category (for nutrient concentration). Recently updated land use mapping (SCAG 2022) was employed to parameterize the model HRUs. Assumptions for land use based nutrient washoff concentrations are based on locally collected data where available and literature values as needed. Calibration of runoff coefficients as a function of imperviousness and landuse based nutrient washoff concentrations fit measured runoff volumes and load at downstream co-located USGS gauges and water quality monitoring sites for the two major inflows to Canyon Lake (limited data exists for tributaries in the zone 1 subwatershed). Estimated runoff volume for 2000-2024 is plotted in Figure 2-1 (red line) and average annual nutrient load presented in Table 2-1.

Figure 2-1. Cumulative Inflow to Lake Elsinore from the San Jacinto River, Local Runoff and Recycled Water for the Calibration Period 2000-2014



Canyon Lake Overflow – Flow gauge records and co-located water quality monitoring provides data to compute mass emission in overflow events from Canyon Lake to Lake Elsinore for the past 20 years. USGS flow gauge (San Jacinto River near Elsinore Station 11070500) measures discharge that is comprised of overflows from Canyon Lake with the exception of a small drainage area just downstream of Railroad Canyon Dam. Analysis of data from this gauge was conducted to develop an estimate of annual average overflow volumes from Canyon Lake to Lake Elsinore of ~ 6,400 AFY based on the period from 2000 – 2022 (average of blue bars in Figure 2-3). The relative contribution of Canyon Lake overflows was determined to be 55 percent based on cumulative volume from 2000-2024 (blue line in Figure 2-1 above).

The LECL annual monitoring program determines nutrient loading in overflows in each year of the program as the sum of measured events, plus average concentrations applied to any overflow volume that is not sampled in that same year. An example is provided in the 2022-23 annual monitoring program report (LESJWA, 2023). Average estimated loads over the full period of record (including zeros for dry years with no overflow) are included in Table 2-1.

Figure 2-2. Location of Lake Elsinore in the SJR Watershed. Subwatershed Delineation for Key Tributaries (Schematic in top right provides a representation of watershed runoff routing)

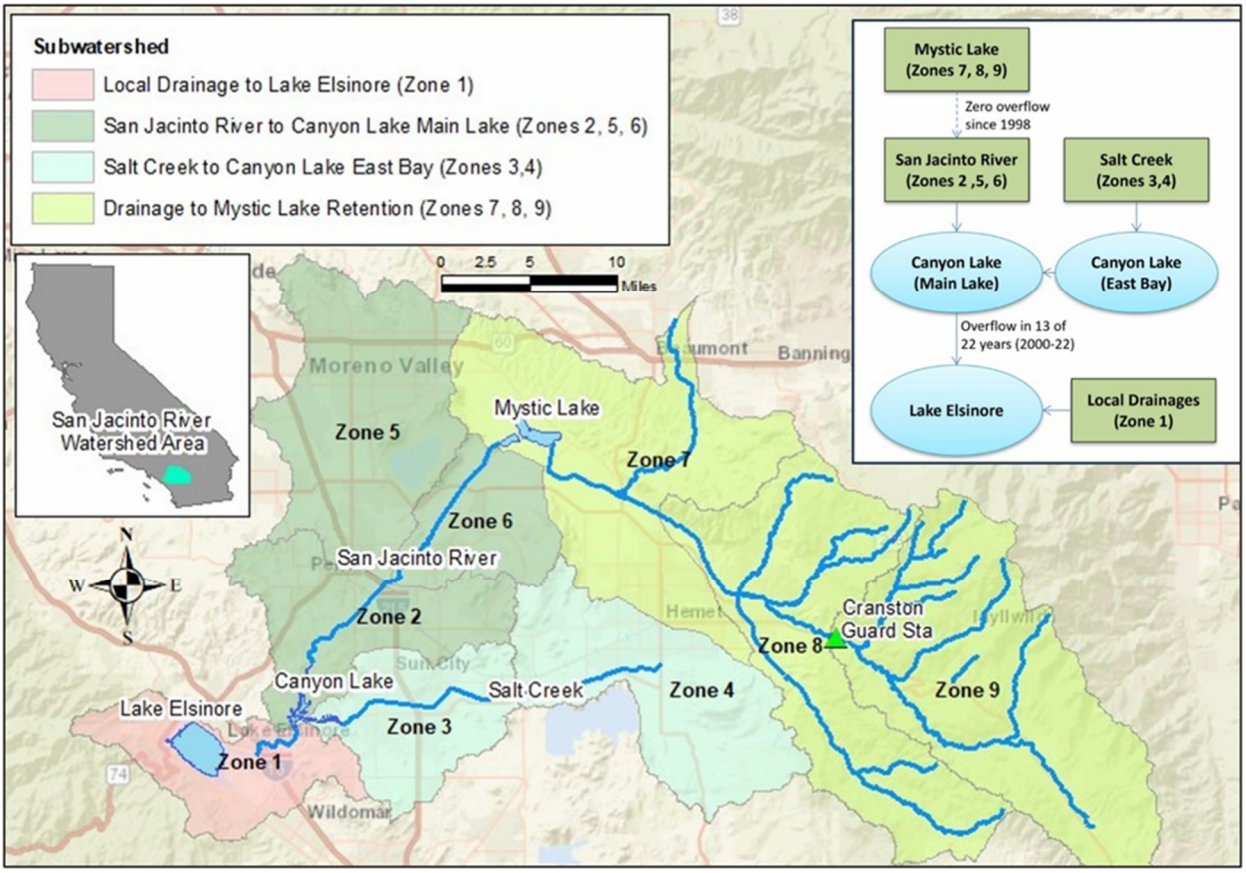
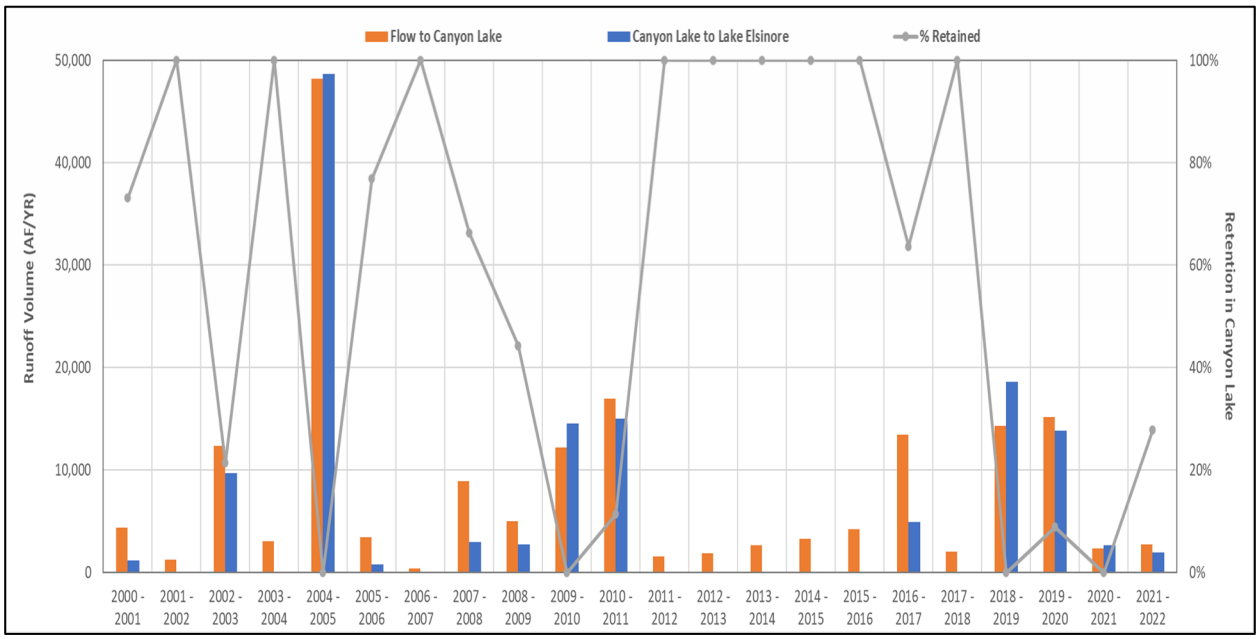


Figure 2-3. Annual Runoff Volume and Retention into Canyon Lake and Overflow to Lake Elsinore



Mystic Lake Overflow - Overflows from Canyon Lake to Lake Elsinore measured over the 2000 – 2024 period have occurred without any measured outflow from a 384 mi^2 upper watershed (zone 7-9 in Figure 2-2 above) that flows into Mystic Lake. Analysis for the TMDL revision estimated that 4 percent of runoff from this upper watershed may overflow Mystic Lake and thereby flow to Canyon Lake and Lake Elsinore downstream. Thus, the TMDL revision includes hydrologic analysis to estimate long-term average annual overflow volume from Mystic Lake to estimated average annual source load and allocations for Lake Elsinore (see Section 4.1.2.5 of the TMDL Technical Report for detail of this analysis).

Table 2-1. Estimate of Average Annual Loads to Lake Elsinore

Source	Volume Inflow (AFY)	TP (kg/yr)	TN (kg/yr)
Recycled Water (at 7.5 MGD) [1]	8,402	5,500	49,900
Local Lake Elsinore (Zone 1) [2]	1,578	828	3,107
Canyon Lake Overflow to Lake Elsinore (Zones 2-6) [3]	6,363	3,620	14,701
Additional Overflow from Mystic Lake (Zones 7-9) [4]	510	289	811
Total	16,853	10,237	68,519

[1] Population growth and expansion of the recycled water discharge to Lake Elsinore is anticipated to increase to 7.5 MGD prior to 2030
[2] Based on PLOAD simulation results for zone 1 subwatershed for average annual rainfall over 1948-2022
[3] Not modeled results, basis is the period of record for mass emission sampling (2000-2022)
[4] Estimated annual average (including zero years) overflows from Mystic Lake based on 105 year analysis with most recent overflow occurring in 1998

2.2. Allocations to External Loads in Draft TMDL Revision

Allocations for external sources of flow and nutrient loads to Lake Elsinore are determined based on a reference watershed. For external nutrient sources including supplemental water and watershed runoff, allocations are determined from nutrient concentrations in wet weather runoff from a reference watershed ($C_{reference}$). Due to the benefits realized with increased lake volume, current volumes (V_{annual}) of runoff and supplemental recycled water additions are accounted for in the estimation of allocations as follows: **Allocation = V_{annual}* $C_{reference}$**. Allocations for external load to Lake Elsinore were computed for each of the following sources:

- Addition of supplemental recycled water to maintain lake levels.
- Watershed runoff from the local Lake Elsinore watershed downstream of Canyon Lake
- Overflows from Canyon Lake to Lake Elsinore, including Mystic Lake overflow.

Allocations for external loads were developed based on an assumption that a reference watershed is best represented as having nutrient concentrations in runoff at the 25th percentile of all wet weather grab samples collected from the San Jacinto River at the Cranston Guard Station (TP: 0.16 mg/L and TN: 0.68 mg/L). The revised TMDLs include an interim milestone nutrient load to demonstrate progress toward meeting the allocations based on the median of all wet weather grab samples from the same dataset (TP: 0.32 mg/L and TN: 0.92 mg/L). Allocations are simply determined as the product of the average annual volumes reported in Table 2-1 above with nutrient concentrations at the interim and final concentrations used to support the TMDL revision (Table 2-2).

Table 2-2. Allocations for Watershed Runoff in Lake Elsinore Nutrient TMDLs

Source	Volume Inflow (AFY)	Interim Milestone[1]		Final Allocation[1]	
		TP (kg/yr)	TN (kg/yr)	TP (kg/yr)	TN (kg/yr)
Recycled Water (at 7.5 MGD)	8,402	3,317	9,535	1,658	7,048
Local Lake Elsinore (Zone 1)	1,578	623	1,791	311	1,324
Canyon Lake Overflow to Lake Elsinore (Zones 2-6)	6,259	2,471	7,104	1,235	5,251
Additional Overflow from Mystic Lake (Zones 7-9)	510	201	579	101	428
Total	16,749	6,612	19,009	3,305	14,051

1) Interim milestones are to be achieved within 20 years of the effective date of the revised TMDL and coincide with the Phase II Implementation Plan, final allocations are to be achieved within 30 years of the effective date of the TMDL and coincide with the Phase III Implementation Plan (LESJWA 2024)

Additional scientific study will be conducted to assess wet weather nutrient concentrations in watershed runoff from multiple reference watersheds in the region to support a potential future TMDL revision (see Task 11 of the Phase II program of implementation in Section 7.2.2.2 of the TMDL Technical Report [LESJWA, 2024]). For this reason, stakeholders will use an adaptive implementation approach for in-lake water quality projects to accommodate potential updates to target reductions. Thus, the ability for potential in-lake treatment alternatives to reduce internal loads and thereby offset excess external loads will be characterized for both interim milestones and final allocations.

2.3. Nutrient Load Reduction Goals for In-Lake Treatment

The difference between existing load and the allocation represents the reduction in TP and TN loads that must be achieved to meet allocations for external sources to Lake Elsinore. Table 2-3 provides the reductions needed to meet the interim milestones and Table 2-4 provides the reductions needed to meet the final allocations. The target reduction in this evaluation of alternatives is set to the sum of all reductions needed amounting to 3,625 kg/yr TP and 49,510 kg/yr TN for the interim milestone and 6,932 kg/yr TP and 54,468 kg/yr TN for the final allocations.

Over time, reductions in external nutrient loads to Lake Elsinore will occur with projects to meet the Canyon Lake TMDLs, continued deployment of watershed BMPs, and optimization of WWTP operations. These reductions are not quantified or assumed in the calculation of reductions needed in Tables 2-3 and 2-4. Thus, an implicit safety factor is incorporated into the targets for this study by assuming the full estimated reduction for all external sources (recycled water, watershed runoff, and Canyon Lake overflow) would be needed to be satisfied through offsets.

Table 2-3. Estimation of In-Lake Offset Alternatives Load Reduction Goals to Meet Interim Milestones in the Proposed Revised TMDL

Source	Avg. Annual Load to Lake Elsinore		Interim Milestone (Allowed) Load to Lake Elsinore		Required Reduction Goal (Interim)	
	TP (kg/yr)	TN (kg/yr)	TP (kg/yr)	TN (kg/yr)	TP (kg/yr)	TN (kg/yr)
Recycled Water (at 7.5 MGD)	5,500	49,900	3,317	9,535	2,183	40,365
Local Lake Elsinore (Zone 1)	828	3,107	623	1,791	205	1,316
Canyon Lake Overflow to Lake Elsinore (Zones 2-6)	3,620	14,701	2,471	7,104	1,149	7,597
Additional Overflow from Mystic Lake (Zones 7-9)	289	811	201	579	88	232
Total	10,237	68,519	6,612	19,009	**3,625**	**49,510**

Table 2-4. Estimation of In-Lake Offset Alternatives Load Reduction Goals to Meet Final Allocations in the Proposed Revised TMDL

Source	Avg. Annual Load to Lake Elsinore		Interim Milestone (Allowed) Load to Lake Elsinore		Required Reduction Goal (Interim)	
	TP (kg/yr)	TN (kg/yr)	TP (kg/yr)	TN (kg/yr)	TP (kg/yr)	TN (kg/yr)
Recycled Water (at 7.5 MGD)	5,500	49,900	1,658	7,048	3,842	42,852
Local Lake Elsinore (Zone 1)	828	3,107	311	1,324	517	1,783
Canyon Lake Overflow to Lake Elsinore (Zones 2-6)	3,620	14,701	1,235	5,251	2,385	9,450
Additional Overflow from Mystic Lake (Zones 7-9)	289	811	101	428	188	383
Total	10,237	68,519	3,305	14,051	**6,932**	**54,468**

3. Analysis of Future Alternatives for Lake Elsinore Aeration and Mixing System

Management approaches to improve water quality in freshwater lakes are diverse and include actions that 1) reduce internal load from lake bottom sediments to overlying water, 2) remove nutrients or algae from the water column, 3) manage food webs, or 4) control hydrology. The goal of this study is to identify and evaluate options to achieve nutrient load reduction goals prescribed in the 2024 revised TMDL presented in Tables 2-3 and 2-4 above. Many in-lake water quality management approaches are available to lake managers, but few of these were determined to have potential for long-term whole lake treatment in Lake Elsinore. Section 3.1 presents a screening analysis that was used to identify options that may be feasible for Lake Elsinore and short-list the ones to be analyzed in greater depth. Oxygenation was determined to be the only technically and economically feasible, long-term, whole lake water quality treatment alternative for Lake Elsinore. Further analyses of sub-options within the oxygenation alternative included development of project concept engineering, modeling of water quality effectiveness, cost estimation, and investigation of potential constraints (see Section 3.2).

An adaptive management approach is prescribed in the program of implementation for the revised TMDL. Over time, target load reduction will be refined and effectiveness of constructed in-lake treatment will be demonstratable at the whole lake scale. At this time, oxygenation provides a logical replacement of LEAMS to more effectively reduce the flux of nutrients from lake bottom sediments. Other alternatives such as algae biomass removal or wetland treatment pose significant challenges with regards to permitting and interagency coordination, but preliminary concepts are presented herein for consideration, as needed, during a next phase of in-lake treatment project implementation.

3.1. Screening of Alternatives

3.1.1. Screening of 17 In-Lake Option

Screening analysis was completed for each of the 17 in-lake restoration methods documented by Dr Alex Horne and Dr Michael Anderson in a “Review of the Two Current Mixing Systems in Lake Elsinore with Recommendations for Improving Water Quality” (Horne and Anderson 2022). The list of alternatives and findings from screening analysis are reported in Table 3-1. For each method, fatal flaws are associated with issues of scalability, cost, and hydrology as follows:

- Scale – Lake Elsinore is the largest natural lake in southern CA at 3000 acres with an average storage capacity of ~50,000 AF. Many projects designed for smaller lakes or ponds when scaled to whole Lake Elsinore treatment may be infeasible.
- Cost - In some cases, an option when technically scaled up to provide whole lake treatment, makes costs so high as to be economically infeasible.
- Hydrology – Lake Elsinore experiences extreme lake level fluctuation in its natural condition and has not overflowed to Temescal Creek in over 30 years. This condition makes some options that rely upon abundant water and stable lake levels to be infeasible.

Table 3-1. Screening of Alternatives for In-lake Treatment in Lake Elsinore (list of 17 alternatives modified from Horne and Anderson 2022)

Alternative	Conclusion	Basis of Conclusion
1. Dredging top 1 meter of 2000 acres of lake bottom sediment ~ 10 million CY	Nonviable, economic	Cost estimate ~ $1.5 billion in 2024 dollars [1]
2. Lake level stabilization	Ongoing as part of wet lake management strategy	Continuation of recycled water additions is needed to maintain lake levels. TMDL revisions developed to accommodate wet lake management strategy
3. Destratification / Aeration (e.g., existing LEAMS system)	Continue operation of the existing system until the recommended oxygenation system is completed [2]	Condition assessment of the existing system showed that near-term operation of LEAMS can be continued to provide a portion of needed DO from surface to portions of the lake bottom (see Appendix D)
4. Macrophyte harvesting	Not Applicable	No significant macrophyte growth
5. Wetland treatment	Consider in a later phase	See Section 3.1.3 for analysis
6. Algae harvesting	Pilot, consider for future application when technology is fully demonstrated at scale	Analysis of AECOM's hydronucleation floatation technology (HFT) showed that 15, 1-MGD units could provide target nutrient load reduction. Largest current application of HFT is 3 MGD in Southampton, NY. Local long-term biosolids handling and disposal would need piloting.
7. Hypolimnetic withdrawal	Nonviable, hydrologic	Involves a loss of water in a lake that is already receiving supplemental water for lake level stabilization
8. Dilution with reverse osmosis water	Nonviable, economic	Lifecycle cost for advanced WWTF estimated to be ~ $250 million based on analysis of EVMWD indirect potable reuse project[3]. Product water to be used for new supply and would offset cost of other sources of potable water.
9. Sediment sealing (e.g., liners)	Nonviable, scale	Small scale applications only
10. Herbicides	Nonviable, scale	Not a long-term whole lake option, may use in areas of greater recreational use to augment whole lake treatment. Does not address targets of TP, TN, & DO.
11. Oxygenation	Viable	See Section 3.2 for in-depth analysis
12. Shading	Nonviable, scale	Small scale applications only
13. Sediment sealing (chemical)	Viable, intermittent use	Small scale applications only
14. Beneficial bacteria addition	Nonviable, scale	Limited effectiveness for blue-greens
15. Fishery management	The existing program maintains low carp population and associated nutrient load from bioturbation	Continue program to 1) add game fish to predate upon zooplanktivores, and 2) remove benthivorous species (e.g., carp) that cause bioturbation of nutrient rich bottom sediment into water column
16. Biomanipulation	Nonviable, hydrologic	Aquatic macrophyte plant growth difficult with large lake level fluctuation
17. Sonication	Nonviable, scale	Small scale applications only

1) Estimate for dredging of 1 meter of sediment from 2,000 acres of Lake Elsinore bottom. Basis of cost from escalating removal cost from 2008 Machado Lake ($31/CY in 2024) and landfill cost from Canyon Lake ($114/CY in 2024) dredge projects
2) Operation of LEAMS is recommended in the near term (< 5 years) until a new project can be constructed to continue to provide benefits demonstrated annually and to support a healthy fishery
3) Cost estimated from treatment plant elements only (see Table 4-5) as reported in the Indirect Potable Reuse Feasibility Study (EVMWD, 2017) escalated to 2024 dollars

Most of the 17 alternative in-lake treatments were eliminated for various reasons and therefore not evaluated further in this study. Determinations of non-viability were made for 2 alternatives based on economic feasibility (dredging and dilution with RO), 6 alternatives based on scalability (physical and chemical sediment sealing, bacteria addition, herbicides, shading, and sonication), and 2 alternatives based on hydrologic factors (hypolimnetic withdrawal and biomanipulation). Three alternatives were determined to be already implemented through ongoing programs and continuation of these programs is already planned at least in the short-term (existing LEAMS, lake level stabilization with recycled water, and fishery management). Lastly, the macrophyte harvesting alternative was determined to be not applicable because of the limited extent of macrophytes in Lake Elsinore.

While oxygenation was identified as the primary and most viable option to meet nutrient offset requirements, the remaining two alternatives were identified as potentially useful supplemental methods to oxygenation, if needed at some point in the future: 1) algae biomass harvesting and 2) wetland treatment. Both options would require long-term pilot testing before they can be implemented at full-scale. Information on these two options is presented below.

3.1.2. Algae Harvesting Alternative

Close consideration was given to an innovative approach to implement algae harvesting using a shoreline based hydronucleation flotation technology (HFT). Removal of algae biomass would be effective at permanently removing both phosphorus and nitrogen from Lake Elsinore, a benefit that most other options do not provide. A bench scale experiment of the technology with Lake Elsinore water showed effective removal of 42 and 53 percent of influent N and P, respectively (WSP, 2023). Despite showing some promise, this technology was not selected for further evaluation for two primary reasons as follows:

- Scalability – Successful applications of the HFT algae harvesting technology have been limited to less than 3 MGD (each unit treats 1 MGD). To achieve the nutrient load reductions needed to meet future TMDL allocations, a system of 10-15 MGD would be needed ideally pulling algae rich water from various near surface locations around the lake. This would be the largest application of the HFT technology to date.
- Solids Handling – Operation of an algae harvesting project for Lake Elsinore will require a reliable long-term solution for algal float solids handling. The original vision for this technology involved reuse of the harvested biomass to produce biofuels. No such viable option was presented by proponents of algae harvesting. Thus, disposal of algae biosolids was suggested for consideration and meetings were held with CR&R waste haulers to discuss potential partnership for a holistic solution for Lake Elsinore that could find other uses for extracted solid waste (e.g., compost). CR&R indicated that they need further testing and assessment to determine if the algal float solids will be compatible with their digesters and that accepting such solids will be economically beneficial to their operations. The approximate 3% solids content (i.e., 97% water) of float solids was indicated as unacceptable for the digesters that operate with high solids content.

  Solids handling for a potential full-scale project applicable to Lake Elsinore will require consistency in the source to minimize variability in long-term operation. To date, the consistency of algae solid waste from HFT applications has not been demonstrated. This issue could be addressed through pilot testing over a full year and advancement of agreements with solids handling entity.

Over time, these issues of scalability and solids handling could be addressed and make a whole lake algae harvesting option viable for Lake Elsinore. Through adaptive implementation, this technology should be revisited in latter phases of TMDL implementation.

3.1.3. Wetland Treatment Alternative

Wetlands are effective natural treatment systems for removal of nutrients from water when designed, constructed and managed correctly. Most examples of treatment wetlands are used to manage wastewater effluents, but a few southern California examples of large-scale wetland systems have been demonstrated to be successful at treating surface waters such as the Prado and Mill Creek wetland systems. Examples of large-scale treatment wetlands for recirculated lake water were also identified and reviewed to consider this alternative including Lake Apopka in Florida and Grand Lake St Mary's in Ohio.

Preliminary analysis of nutrient reductions and costs for a potential 75-acre wetland in the Back Basin were developed to support the screening analysis. A 75-acre recirculating wetland was estimated to be capable of removing ~22,000 kg/yr of TN from Lake Elsinore. This estimate was based on a conservative mass removal rate of 72 g/m2/year. This estimate was derived from literature, including summaries in the textbook *Treatment Wetlands, 2nd Ed. by Robert Kadlec and Scott Wallace (2009)* and performance data published for two large-scale treatment wetland systems in Southern California, including one in Prado (294-acres) and one in San Jacinto (24-acres).

To estimate an optimal recirculation rate through the 75-acre wetland, detention time was considered. Optimal detention time for nutrient removal is typically on the order of 1 week. For example, Prado and San Jacinto treatment wetlands detention times ranged between 2-14 days, based on several years of performance data. A recirculation rate of 5 MGD would achieve a 5-day detention time in the Back Basin if the wetland were constructed to have an average water depth of 1-foot. The capital cost estimated for a 75-acre recirculating wetland treatment system in the Back Basin is $15,500,000. This is a planning level cost and assumes a 20% mark-up for taxes, bonding, overhead, insurance and taxes and a 20% contingency (more detail is shown in Appendix C). The O&M cost is estimated to be ~$350,000/yr and is roughly divided evenly between pumping energy for the recirculation and maintenance of the wetland. These costs were derived from conceptual design elements of the system and capital costs from similar systems from the literature.

At this time, wetland treatment is not recommended for further evaluation based on several key findings:

- Back Basin Site Limitations – The Back Basin poses significant challenges with regards to permitting and interagency coordination. Currently, the Back Basin serves as a mitigation area and is a combination of upland and wetland areas. Limitations were set by the original agreement for the Back Basin area between the City of Lake Elsinore and Regional Board, to set aside wetlands to mitigate for the impacts of building the flood protection levee back in the 1980s. In addition, no new fill is allowed in the Back Basin area.

  More recently, the mixed land use Summerly development project was constructed within the City of Lake Elsinore in the vicinity of the Bask Basin. Stormwater runoff from this urban development area is captured in a 71 acre detention basin with sufficient storage capacity for a

50 year storm event (~400 AF) over the watershed. Since there is no natural outflow, the stored stormwater is pumped from the detention basin into the existing Back Basin wetland area between storm events to provide sufficient storage capacity over the course of the wet season. A project to pump recirculating lake water into the same Back Basin area would involve additional complexity and could exacerbate operational challenges that were encountered in the 2024-25 wet season. There is currently no detailed, accurate survey data for much of the Back Basin. Therefore, it is difficult to estimate the impacts of high and low Lake Elsinore water levels on the overall water balance with a recirculating system.

- Nutrient Removal – The estimated TN load reduction of 22,000 kg/yr reported above is less than the amount needed to be offset (~54,000 kg/yr), thus a wetland treatment project would only be useful as a supplement to another TN reduction strategy. Moreover, there is little to no effectiveness of wetland treatment to reduce TP, which is the limiting nutrient for algal productivity in Lake Elsinore.

3.2. Detailed Analysis of Oxygenation Options

Oxygenation project options involve delivery of DO to the lake in a way that creates oxic conditions at the SWI. Releases of both N and P from enriched lake bottom sediment to the overlying water column are suppressed when oxic conditions (>2 mg/L DO) are maintained at the SWI through different biogeochemical processes. Key questions that were addressed in the analysis of oxygenation project options include:

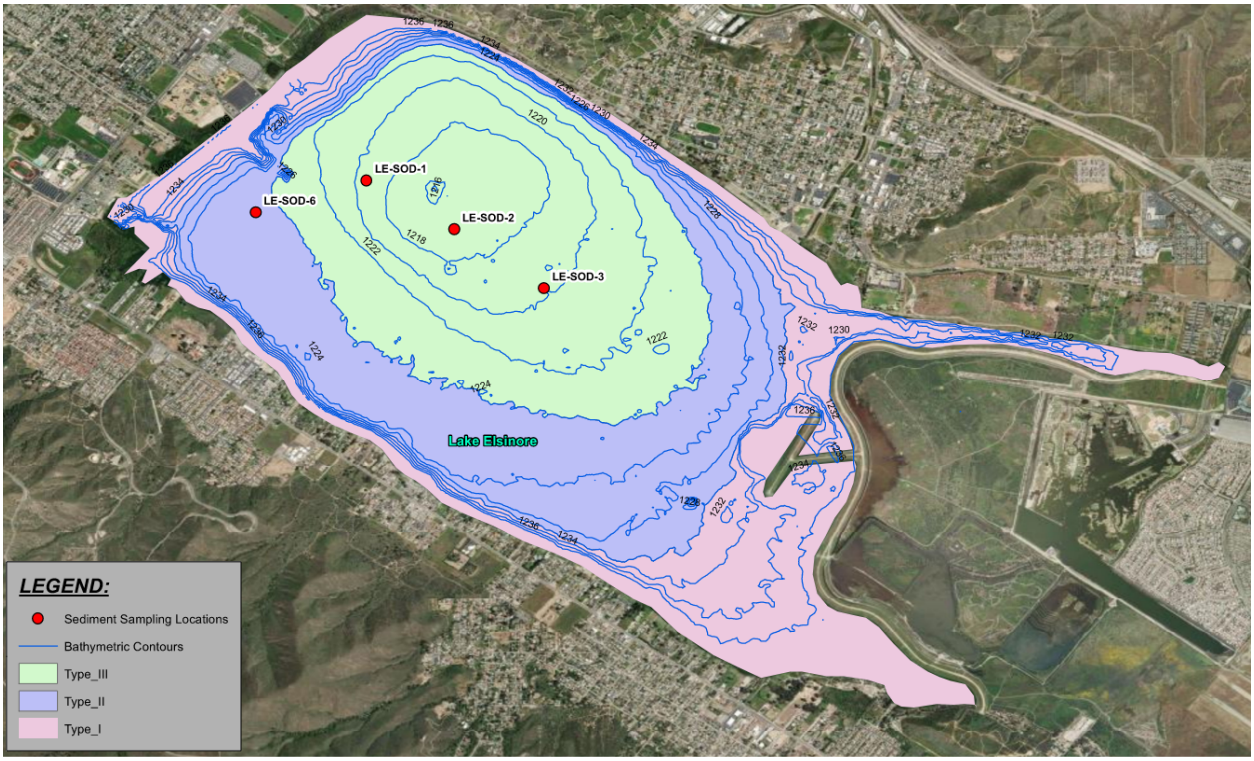
- How does oxygenation work to suppress releases of N and P from the lake bottom to overlying water column? What is the annual nutrient load reduction that could be realized through maintenance of oxic conditions at the SWI year-round? See Section 3.2.1
- How much DO would be needed to meet the sediment oxygen demand (SOD) in season of greatest enrichment? See Section 3.2.2
- What delivery system for carrier water will be most effective to maintain oxic conditions at the SWI year-round? See Section 3.2.3
- What are the range of engineering options to dissolve liquid oxygen into carrier water and deliver DO carrier water to the lake bottom at the scale needed for whole lake treatment? See Section 3.2.4
- What is the range of capital and operation and maintenance (O&M) cost for different oxygenation project options? See Section 3.2.5
- What are the pros and cons of different oxygenation project options with regard to other non-economic factors, including reliability, regulatory requirements / environmental impacts, ease of construction and O&M, social / political / recreation opportunities and constraints, and sustainability? See Section 3.2.6

3.2.1. Potential Nutrient Load Reduction

Oxygenation project options work to maintain oxic conditions (>2 mg/L) in the lake bottom and thereby suppress the release of nutrients at higher flux rates (measured as mg/m^2/day) associated with anoxic

conditions. Different biogeochemical reactions are responsible for suppression of flux rates for N and P with oxic conditions at the SWI, as described in the following sections. A sediment nutrient flux experiment was conducted in July 2024 to estimate the difference in N and P release under oxic and anoxic conditions (see Appendix A for details). Sediment was collected from three sites to represent the deepest zones of Lake Elsinore (referred to as Type III sediment) and one site to represent a transition zone at about 3 meters above the minimum depth at the deep hole (referred to as Type II sediment). The location of sediment samples and extent of Type II and III sediments are shown in Figure 3-1.

Figure 3-1. Sediment Study Sampling Locations and Extent of Sediment Types



Phosphorus: Oxic conditions in the top layer of lake bottom sediment prevent microbial reduction of iron bound forms of P causing decreases in phosphate and ferrous iron to surrounding porewater, and overlying water column by diffusive exchange. Many studies have shown that under anoxic conditions, release rates of soluble P are higher than the same sediment maintained in an oxic condition (Sondegaard et al., 2003; Anderson, 2001; Bostrom et al., 1988; Nurnberg, 1988). Presence of metals (iron, aluminum, calcium) in lake bottom sediment provides natural sorption capacity for P released with organic matter decomposition. The potential P suppression that can be achieved with maintaining oxic conditions at the SWI is limited by the chemical composition of lake bottom sediment, which impacts the amount of porewater P that can be bound as metal oxides. Even under oxic conditions, organic matter decomposition presents a source of SRP to the sediment porewater and overlying water column through diffusive exchange or physical resuspension (WRF, 2015). The sediment nutrient flux experiment provided estimates of P release under oxic and anoxic conditions. The study found an average reduction in flux of TP of 79 and 44 percent for Type II and III sediment cores, respectively (Table 3-2).

Table 3-2. Summary of Nutrient Flux Rates Measured in Sediment Study (see Appendix A for detail)

Nutrient Flux ($mg/m^2/day$)[1]	Type II Sediment (Site 6)			Type III Sediment (Sites 1,2,3)		
	Anoxic	Oxic	Difference	Anoxic	Oxic	Difference
TP	11.8	2.5	9.3	14.4	8.1	6.3
TN	96	49	48	157	97	60

1) Reported fluxes are average across 3 replicate cores based on changes in overlying water during Days 0-5 of the core-flux experiment

In addition to core-flux experimentation, laboratory analysis of sediment chemistry composition from four sites in the lake bottom showed that iron bound P was about half of the total releasable P in the lake bottom sediments (ranging from 40 to 46 percent). Thus, the capacity for P from decomposed organic matter to be sorbed to iron or other metal oxides is less than typically found in studies for other regions although core-flux measurement nevertheless demonstrates capacity of oxygenation to achieve significant reductions. A more detailed presentation of sediment chemistry analysis is presented in Appendix A.

Nitrogen: Reductions in nitrogen associated with oxygenation are complex and associated with two key processes; 1) aerobic bacteria with higher rates of ammonia assimilation and 2) nitrification of ammonia that allows for coupled nitrification – denitrification (CND) processes to be initiated. Core-flux experiments have demonstrated a rise in ammonia flux from sediment to the overlying water column in anoxic conditions and suggest that hypolimnetic oxygenation could reduce ammonia flux to the water column (Beutel, 2006). The sediment nutrient flux experiment conducted in July 2024 on Lake Elsinore provided estimates of N release under oxic and anoxic conditions. The study found a reduction in TN flux of 50 and 38 percent for Type II and III sediment cores, respectively (Table 3-2).

Estimation of Annual Load Suppression

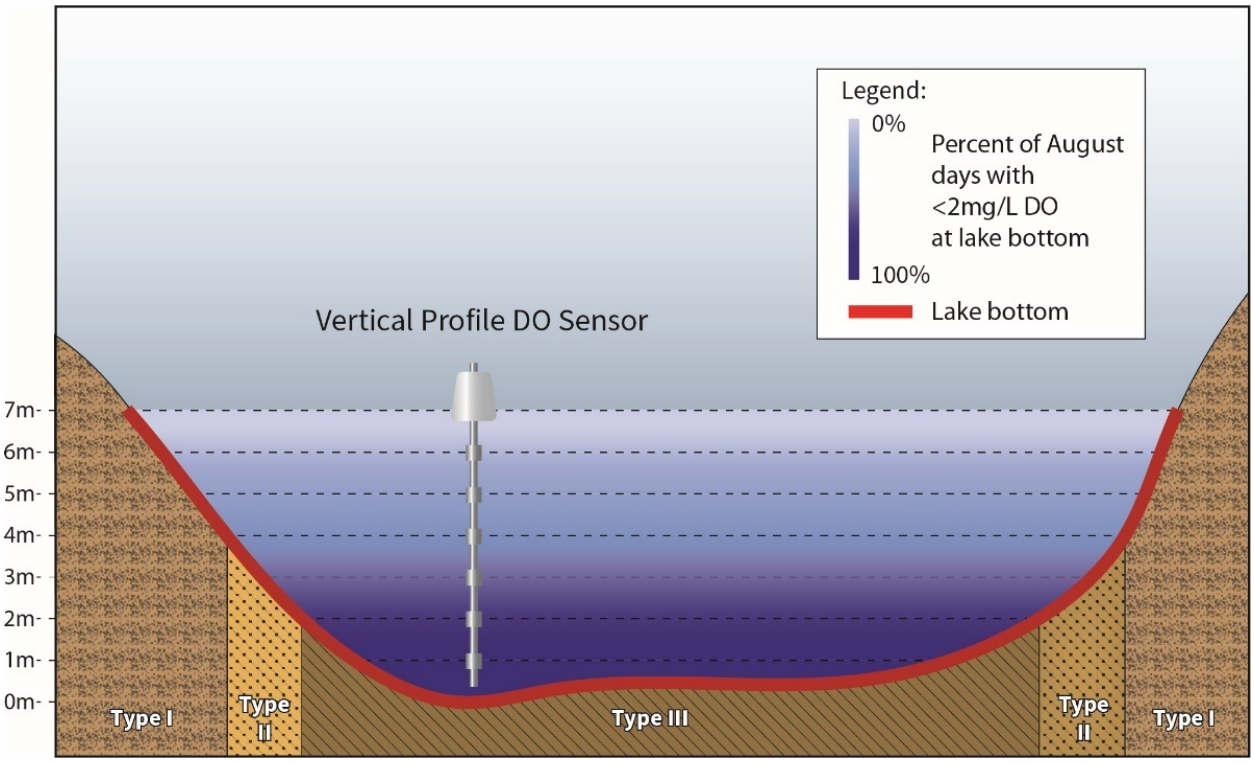
The differences measured in flux rate between oxic and anoxic cores presented in Table 3-2 above were used to estimate the reduction in nutrient flux from the lake bottom over the course of an entire year. Several important factors are necessary to extrapolate results from core-flux experiments based on sediment samples collected from four sites on a single July day to estimate annual load reduction including the 1) temporal frequency and 2) spatial extent of anoxic conditions in the baseline condition, and 3) lake bottom water temperature. In its current condition, Lake Elsinore experiences both anoxic and oxic conditions in the lake bottom. Near the surface of the lake, reaeration and algal photosynthesis create high DO concentrations. Mixing of lake water from the surface to deeper zones occurs via wind energy and is enhanced by operation of the existing aeration and mixing system. Lake Elsinore's shallow depth and hypereutrophic condition contribute to its polymictic regime, experiencing multiple stratification and de-stratification events year-round. High SOD in the lake bottom causes anoxia at the SWI to occur during days with lower mixing energy. On such days, nutrient load suppression from oxygenation would causes a shift from baseline anoxic condition to post-project oxic conditions.

In polymictic lakes, temporal patterns of anoxia at the SWI are difficult to model, therefore this study involved detailed analysis of measured data from hourly recording sondes to define a baseline frequency and spatial extent of anoxia. Such an analysis is not commonly undertaken in estimation of reduced

sediment nutrient flux from potential oxygenation system implementation because most applications of this technology involve deeper, dimictic lakes (e.g., like Canyon Lake). Dimictic lakes experience a single period of thermal stratification per year, which creates persistent anoxic conditions following hypolimnetic oxygen depletion throughout the period of stratification allowing for simplifying assumptions to estimate the number of days when internal load would be suppressed relative to a baseline condition.

For Lake Elsinore, analysis of hourly measurements of DO vertical profiles at two EVMWD in-situ sondes was undertaken in this study to estimate the frequency and spatial extent of anoxia in a baseline condition. Measured data from 2011-2024 were first reviewed for quality to remove data outside of expected ranges and assess whether sensors match handheld probe measured DO concentration during field visits. In total, quality checked DO profile data was compiled for 3,422 days of the 4,634 days between July 2011 and March 2024 (~74 percent of days with usable DO profiles). Measured vertical DO profiles were assumed to represent lake-wide conditions laterally as portrayed in Figure 3-2. DO profiles were converted from depth below the lake surface to depth above the lake bottom to allow for long term analysis of conditions in the lake bottom.

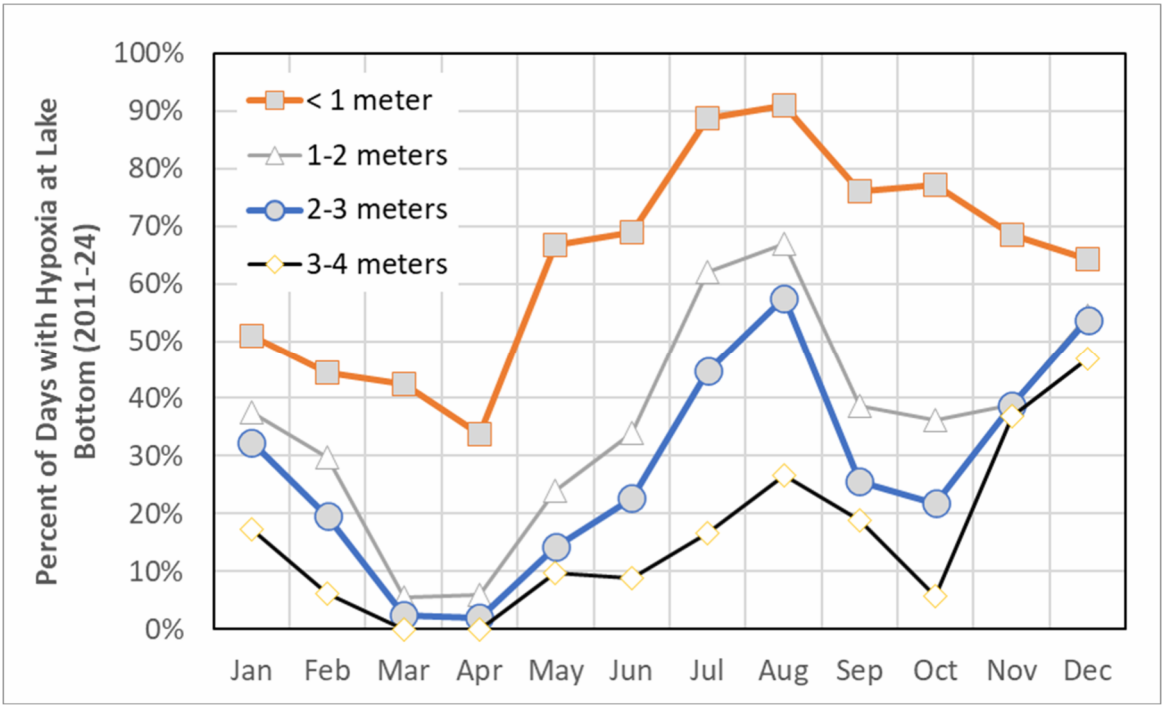
Figure 3-2. Extrapolation of Vertical DO Profiles Lake-Wide



Analysis showed the average frequency of days in each month of the year when DO in the bottom 1 meter of the lake dropped below 2 mg/L ranged from a low of 34 percent of April days to a high of 91 percent of August days (Figure 3-3). This same analysis of measurements at 1-2 meters, 2-3 meters, and 3-4 meters from the deep hole bottom showed generally lower frequency of anoxia with increasing distance from the deepest zone. The frequency of anoxia at the lake bottom overlying the Type II sediment zone was approximated from measured DO at 2-4 meters above the lake bottom at the location of the EVMWD sondes as portrayed in Figure 3-2. Less frequent anoxic conditions were

observed at heights of 3-4 m above the lake bottom overlying Type II sediment (Figure 3-3). Interestingly, a high frequency of anoxic conditions (40-50 percent of days) was measured above both Type II and III sediments in November and December, which is consistent with recent conclusions from LEAMS offset demonstrations that resulted in a decision by EVMWD to extend the period of operation (Stillwater, 2024).

Figure 3-3. Average Monthly Frequency of Anoxic Conditions (DO <2 mg/L) at heights above the deepest Lake Bottom in Zone of Type II and III Sediments



Bathymetry of the lake bottom provides the spatial extent of lake bottom at 1 meter interval depths (Figure 3-4). DO sonde data collected at corresponding 1 meter interval depths is used to estimate the spatial extent of anoxia daily and can be multiplied by the frequency of days in each month when DO < 2 mg/L to get a frequency weighted average (accounting for zero anoxia days) monthly area of anoxia across the lake bottom at the four depth intervals shown the Figure 3-3 above. For example, if a vertical profile of DO indicates less than 2 mg/L for all depths below 3 meters, then the area of anoxia for that day was 1,996 acres. On days with no readings below 2 mg/L, the area of anoxia is zero. The monthly frequency-weighted anoxic area overlying Type II and III sediments is shown in Figure 3-5.

Figure 3-4. Lake Elsinore Bathymetry

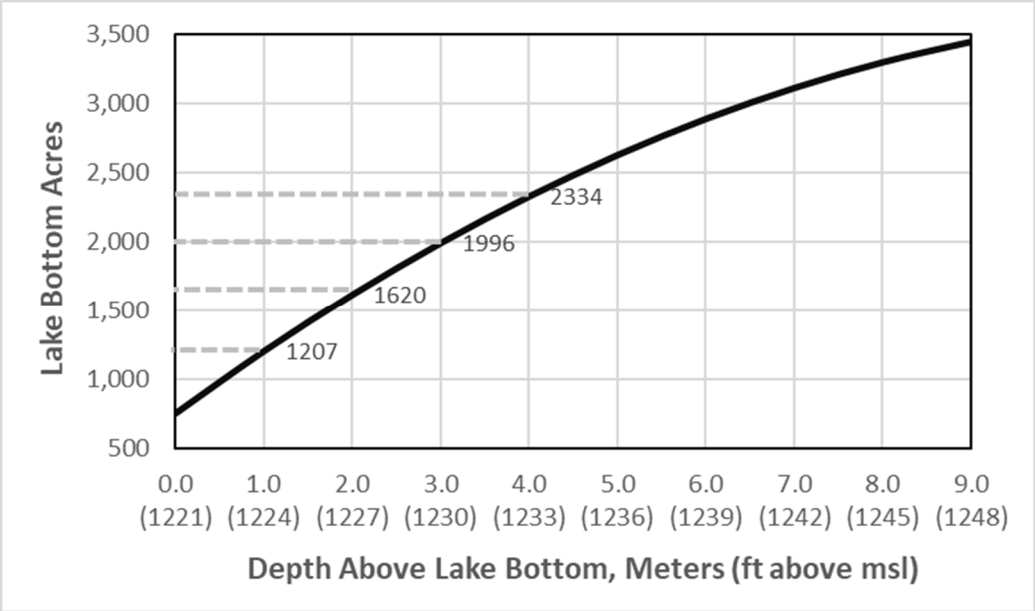
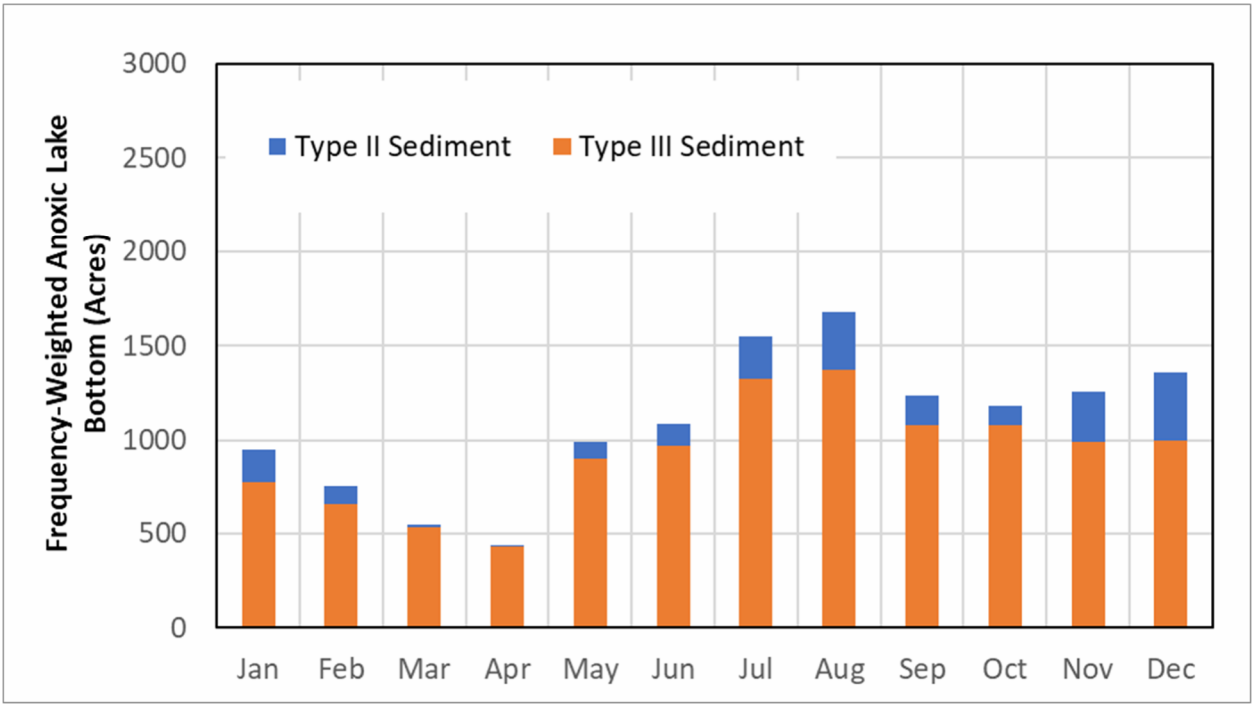


Figure 3-5. Average Monthly Frequency of Anoxic Conditions at the Lake Bottom in Zone of Type II and III Sediments



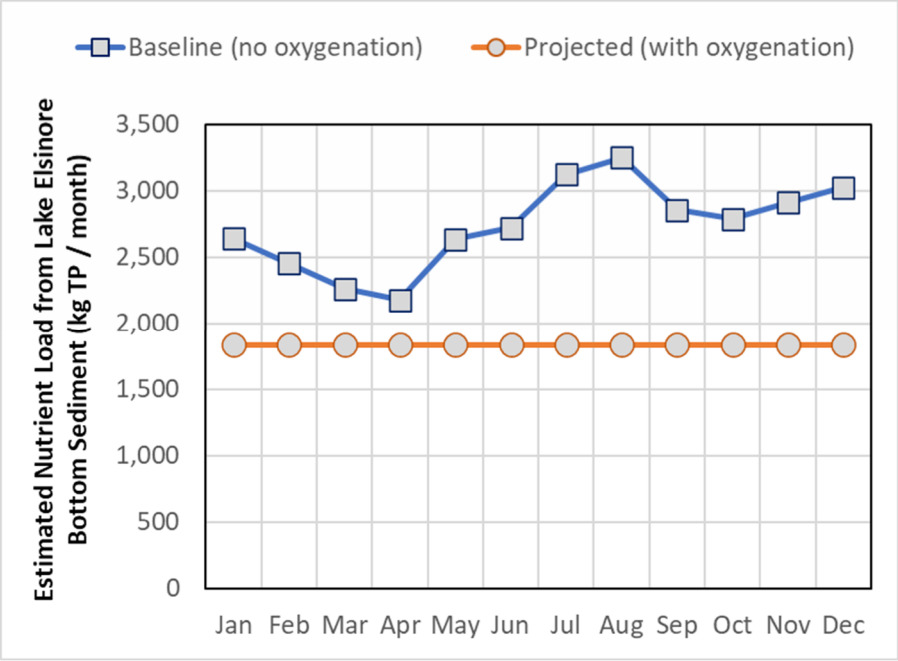
To support extrapolation of July 2024 core flux experiments over the entire year, the frequency weighted anoxic area was parsed into anoxic area over Type II and III sediments. This allowed for use of different estimates of flux rates by sediment type. The annual internal load (IL, kg/yr) for TP is calculated as follows:

$$IL_{TP} = \left[\sum_{s,m}(F_{aa}) * AA * D * CF\right] + \left[\sum_{s,m}(F_{oa}) * (TA - AA) * D * CF\right]$$

where F_{aa} is the anoxic flux rate and F_{oa} is the oxic flux rate as mg/m^2/day, AA is the frequency weighted anoxic acres for sediment type (s) month (m), TA is the total acres of lake bottom by sediment type (Type II - 713 acres, Type III - 1,620 acres), D is the number of days in month (m), and CF is a unit conversion factor of 0.004047. Prior core-flux measurements found little variation in phosphorus flux with temperature (Anderson, 2001), so incorporation of a temperature term was not included.

Results show that average annual TP load from sediment in the baseline condition amounts to ~32,800 kg/yr with a range of monthly variability driven by the frequency of anoxia (Figure 3-6). For example, higher flux is estimated for an average August because of more frequent and extensive anoxia. For a post-project condition, lower oxic flux rates are assumed to be maintained year-round, thereby eliminating monthly variability associated with anoxia. The annual average TP load for the post-project condition is estimated to be ~22,100 kg/yr (when AA = 0 in the equation for IL_{TP} above). Thus, the annual reduction of TP load from sediment nutrient flux that may be achieved with maintaining greater than 2 mg/L DO year-round in the lake bottom, is projected to be ~ 10,700 kg/yr TP. Results of this analysis on a monthly basis are reported in Table 3-3.

Figure 3-6. Estimated TP Load from Bottom Sediment Flux for Baseline and Post-Project Conditions



An additional factor to adjust for temperature is needed to extrapolate reductions in TN from July 2024 cores to annual load reductions. Anderson 2001 core-flux experiments were conducted during different seasons and estimated ammonia flux rates were computed with overlying water maintained at temperatures measured in the field ranging from 12-25 degrees C. Unlike phosphorus, earlier core-flux experiments (Anderson, 2001) showed water temperature to be an important property influencing for ammonia flux from the lake bottom sediment, which is consistent with findings from other similar

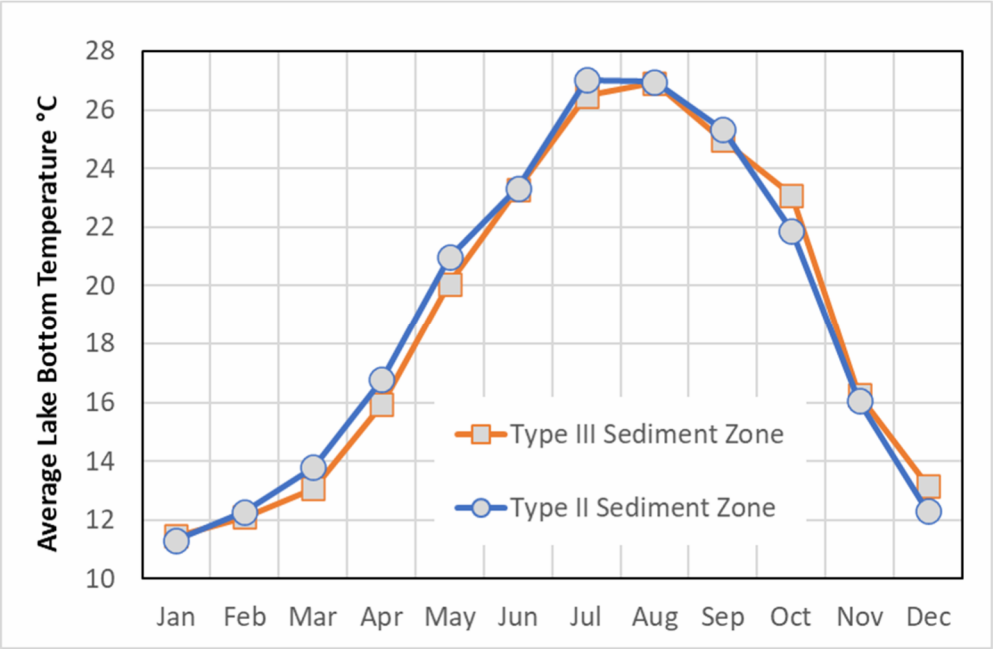
studies (Beutel 2006).[1] Core-flux experiments conducted in July 2024 involved a condition when lake bottom water temperature was 26 degrees C and incubations in lab were maintained at 25°C.
A temperature adjustment was considered for extrapolation of ammonia flux rates over the year. Lake bottom water temperature varies greatly in Lake Elsinore as shown in Figure 3-7. A simple temperature correction factor was estimated comparing flux rates from Anderson 2001 cores maintained at 12°C (yielding 20.8 mg/m^2/day NH4-N) and 25°C (yielding 94.7 mg/m^2/day NH4-N). Based on these cores, a monthly temperature adjustment factor (TF_m) was estimated as follows:

$$TF_m = 1 - [(25 - T_b) * 0.06] \qquad (1)$$

where T_b is the lake bottom water temperature in a given month (m). The annual internal load TN is calculated as follows:

$$IL_{TN} = \left[\sum_{s,m}(F_{aa}) * AA * TF * D * CF\right] + \left[\sum_{s,m}(F_{oa}) * (TA - AA) * TF * D * CF\right]$$

Figure 3-7. Average of Monthly Temperature of Water in Bottom of Lake Elsinore (based on 2011-2024 sonde data)



Results show that average annual TN load from sediment in the baseline condition amounts to ~242,600 kg/yr with a range of monthly variability driven by the frequency of anoxia and temperature (Figure 3-8). For a post-project condition, lower oxic flux rates are assumed to be maintained year-round but with temperature adjustment. The annual average TN load for the post-project condition is estimated to be ~178,400 kg/yr (when AA = 0 in the equation for IL_{TN} above). Thus, the annual reduction of TN load from

[1] Beutel, M. (2006). Inhibition of ammonia release from anoxic profundal sediments in lakes using hypolimnetic oxygenation, *Ecological Engineering,* v28 (3), 271-279.

sediment nutrient flux that may be achieved with maintaining greater than 2 mg/L DO year-round in the lake bottom, is projected to be ~ 64,200 kg/yr TN. Results of this analysis are reported in Table 3-3.

Figure 3-8. Estimated TN Load from Bottom Sediment Flux for Baseline and Post-Project Conditions

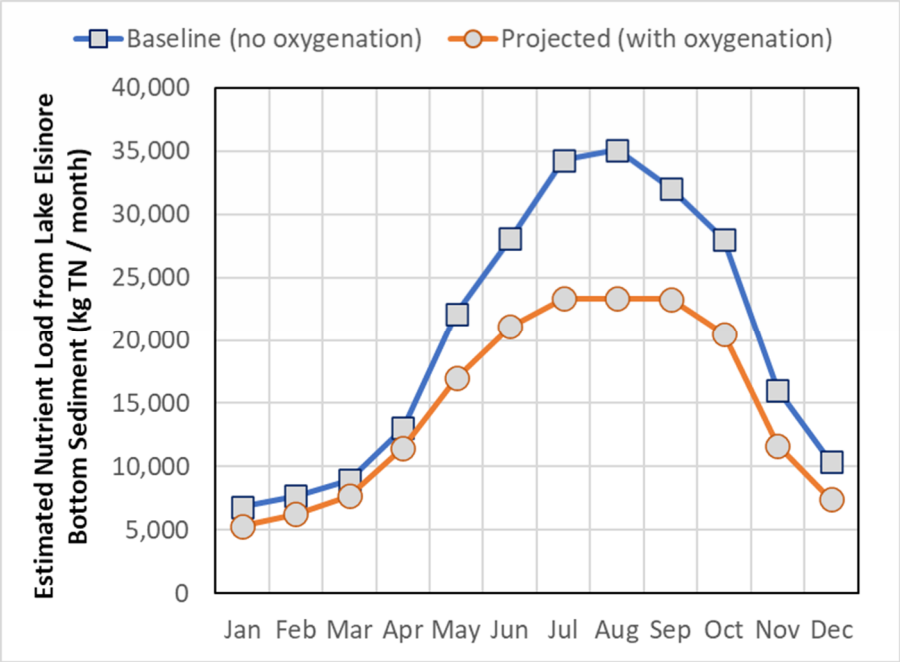


Table 3-3. Estimation of Annual Nutrient Load Reduction that may be Achieved with Oxygenation

Month	Type II Sediment (Site 6)			Type III Sediment (Sites 1,2,3)			TP Reduction (kg/yr)	TN Reduction (kg/yr)
	Anoxic Acres[1]	Lake Bottom Temp C	Temp Adjustment for N Flux	Anoxic Acres[1]	Lake Bottom Temp C	Temperature Adjustment for N Flux		
Jan	180	11.3	0.22	769	11.5	0.23	792	1,515
Feb	94	12.3	0.28	659	12.1	0.27	610	1,428
Mar	9	13.8	0.36	536	13.1	0.32	420	1,275
Apr	7	16.8	0.53	431	15.9	0.48	338	1,544
May	86	21.0	0.77	905	20.1	0.72	790	5,121
Jun	115	23.3	0.91	972	23.3	0.90	874	6,994
Jul	225	27.0	1.00	1327	26.5	1.00	1,269	10,952
Aug	306	27.0	1.00	1374	26.9	1.00	1,396	11,754
Sep	160	25.3	1.00	1079	25.0	1.00	1,006	8,755
Oct	101	21.9	0.82	1081	23.1	0.89	941	7,497
Nov	271	16.1	0.49	987	16.3	0.50	1,060	4,373
Dec	361	12.3	0.28	1000	13.2	0.33	1,172	2,955
Annual Total (kg/yr)							**10,668**	**64,163**

1) Frequency-weighted to account for days with and without DO < 2 mg/L. TP and TN load reduction is estimated based on the difference between anoxic and oxic flus rates. Anoxic acres for the baseline (no oxygenation) condition are based on historical vertical DO profile data. Anoxic acres assumed to be zero in the post-project condition

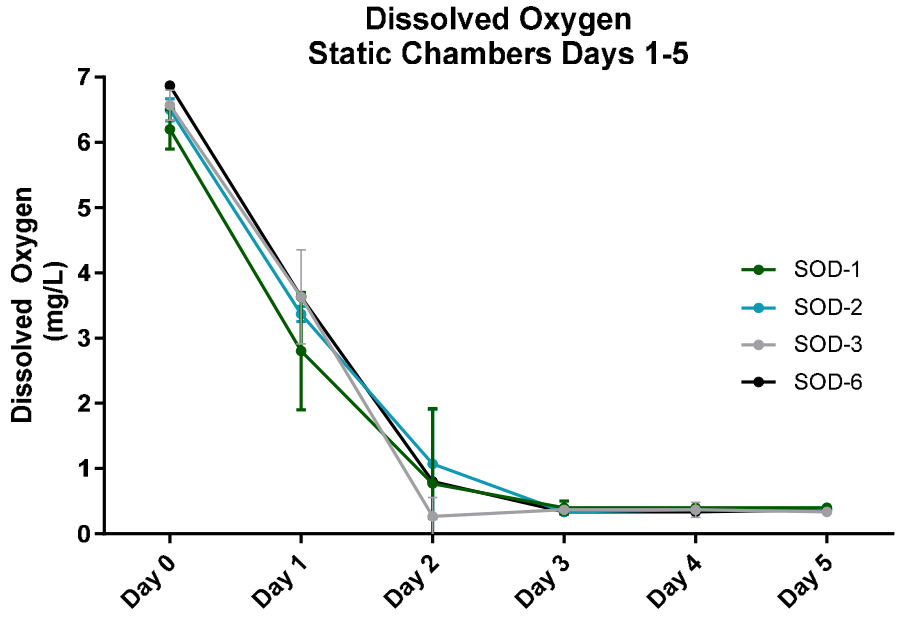
Lastly, this approach to estimating the frequency and spatial extent of anoxia is conservative because estimation of annual load suppression is based on measured DO during periods of enhanced mixing energy provided by the operation of LEAMS. The actual increased frequency of oxic condition relative to a no project option is unknown but would include more days per year that shift from anoxic to oxic as a result of oxygenation.

3.2.2. Estimation of Sediment Oxygen Demand

Addition of DO into Lake Elsinore can reduce the frequency of anoxic conditions in the lake bottom from current levels (see Figure 3-3 above) to near zero, thereby achieving reduced nutrient flux from sediment to the lake over the course of the year. DO is consumed within lake bottom sediments as a result of respiration of benthic organisms and chemical oxidation, both primarily associated with organic matter decomposition. The sediment oxygen demand (SOD) is the rate of oxygen consumption by lake bottom sediments. Additions of DO to a lake bottom in amounts equal of greater than the SOD has been shown to create a surplus of DO and prevents anoxic condition to form at the SWI (Horne, Beutel, Speece, loads of other citations). Thus, an oxygenation system for Lake Elsinore should be sized to deliver enough DO to the lake bottom to meet the SOD and thereby achieve the nutrient load reductions described in Section 3.2.1 above.

SOD in lake bottom sediment varies both spatially, highest in deeper zones where fine grained particles and organic matter tends to settle, and temporally, highest in the summer season with warmer temperatures and faster growth and decay of phytoplankton. Thus, oxygenation systems should be designed to deliver DO at rates representative of a worst case condition, from highly organic sediment during the summer season. The amount of DO that would be needed to achieve this shift in lake bottom DO conditions for such a worst case condition was estimated through experimentation with sediment cores (see Appendix A for detailed discussion of the study design and comprehensive set of results). The sediment study was evaluated by collecting sediment samples from multiple sites with highly organic composition during the summer season. A sharp decline in DO was measured in the overlying water within all sediment core experiments (Figure 3-9).

Figure 3-9. Reduction of DO in Water Overlying Sediment Cores from all Sites



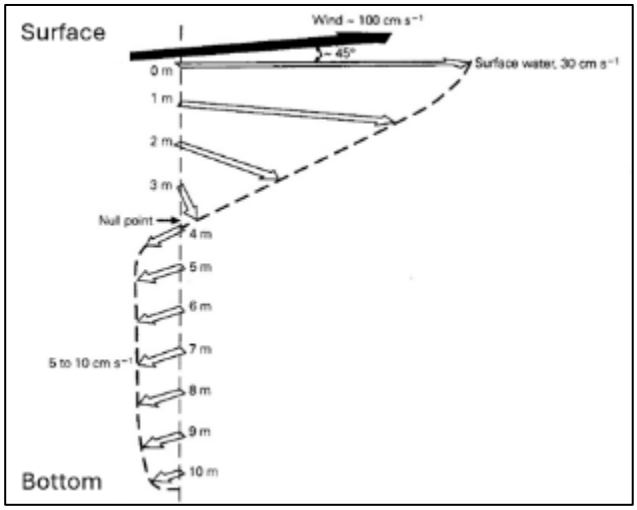
The slope of the best fit linear regression of DO mass (mg/L DO concentration multiplied by 1.4 liter volume of overlying water) and time across the four experimental cores was found to decline by 4.8 mg per day. This reduction is attributable to a combination of SOD and oxygen demand within the overlying water, referred to as water oxygen demand (WOD). A separate experimental core that contained no sediment in the bottom was included in the experiment to estimate the WOD. DO in this core declined at a rate of 1.2 mg/day. Estimated SOD was 3.2 mg/day averaged over the four sediment sites after exclusion of the WOD. This converts to an area SOD of 0.84 g/m^2/day (0.0032 grams per day / 0.0038 m^2 core surface area), which is consistent with previous estimates (Anderson, 2001; Beutel, 2000). Extrapolation of a SOD rate of 0.84 g/m^2/day over the extent of Type II and III sediments (~2000 acres), provides a daily lakewide SOD of **~14,900 lbs/day**. This value was used to develop engineering concepts for oxygenation sufficient to maintain oxic conditions in the lake bottom during most days of the year. A more detailed presentation of the DO core results and calculations is provided in Appendix A.

3.2.3. Hydrodynamic Analysis of Oxygenation in Lake Elsinore

Oxygenation is only effective if the oxygen rich carrier water is able to spread across the lake bottom where it can serve to impact chemical and biological processes occurring at the SWI. Vertical mixing could limit the effectiveness of oxygenation by moving DO carrier water away from the lake bottom before it is able to spread laterally. Mixing of water within the lake is primarily driven by wind, but temperature also impacts vertical migration based on varying water density. Eckman spirals involve currents generated within the lake bottom with wind driven waves at the surface as portrayed in Figure 3-10. Water depth is a key variable in determining the extent that winds at the surface influence deeper water, and whether thermal stratification is maintained. In the case of Lake Elsinore, the large surface area and relatively shallow depth creates a polymictic status involving many periods of thermal stratification and de-stratification over the course of a typical year. Thus, there is greater potential for vertical mixing in Lake Elsinore and as such, hydrodynamics is a key consideration in oxygenation system

design. Conversely, in deeper dimictic lakes, oxygenations systems have been designed with simple delivery systems and lower risk of losing DO rich water by returning the carrier water within the seasonally stratified zone.

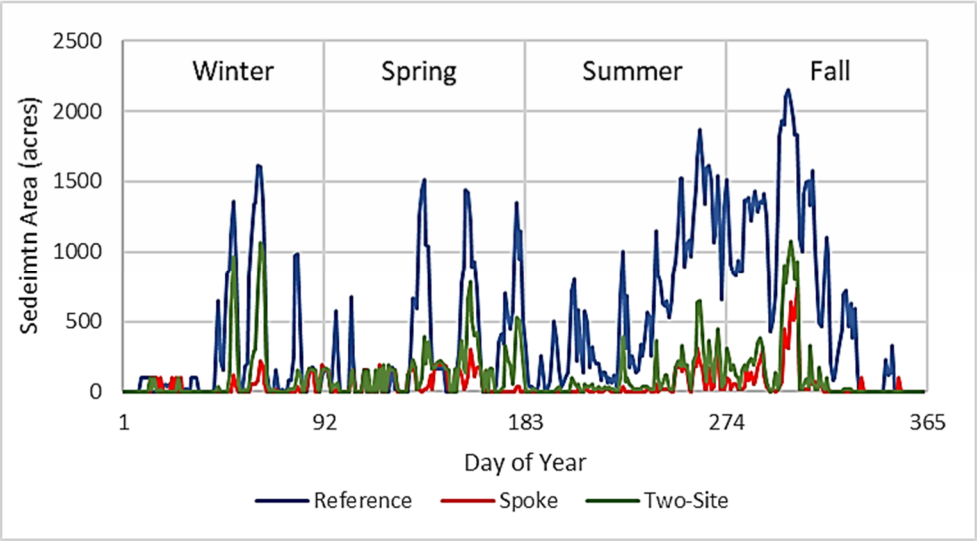
Figure 3-10. Conceptual Diagram of Eckman Spiral to Show Deep Water Mixing Triggered by Wind Driven Mixing at the Lake Surface (Horne and Goldman, 1994).



To support the evaluation of oxygenation options, an existing Lake Elsinore application of the three dimensional Aquatic Ecosystem Model (AEM3D) was parameterized to simulate mixing for a year with assumed starting lake level of 1240' and meteorological parameters of a hot, dry hydrologic year (2016) for both a baseline (no LEAMS and no oxygenation) and with varying oxygenation delivery systems (8 spokes with many small diffusers spreading carrier water 1 meter from deepest lake bottom delivering ~1,900 lb/day within each spoke or two jet injections at mid-depth at about 7,500 lbs/day each). Appendix B provides a more detailed description of the model application, including comparisons between measured and modeled velocities over a small calibration period in August 2001.

One key finding from the hydrodynamic analysis is that the lake experiences significant mixing laterally within the bottom, likely associated with Eckman spirals, as shown by measured data in August 2001 that indicated lateral velocities 1 meter from the lake bottom of ~ 5cm/sec. Longer simulations applying AEM3D show efficient lateral spreading of high DO water across the lake bottom without the need for an extensive delivery system. With the addition of 15,000 lbs/day, the areal extent of anoxia at the SWI is effectively reduced from baseline (reference) extent to less than 100 acres during any day over the one-year simulation period (Figure 3-11). Thus, with implementation of an oxygenation system, the model predicted greater than 90 percent reduction in the current annual average areal extent (~1,100 acres) of lake bottom anoxia.

Figure 3-11. Comparison of AEM3D Simulation Results for No Project (Reference) and with Oxygenation Scenarios based on 2016 Meteorological Year with a 1240' Starting Water Level (see Appendix B for more detail).



Two options for oxygen delivery were evaluated using AEM3D, a spoke system of 8 diffuser lines and a jet system at two locations overlying Type II sediment. Delivery of carrier water at a slower rate spread over many diffuser holes was shown to provide more effective maintenance of oxic conditions at the SWI than the two site jet carrier water delivery method; however, both methods result in substantial reduction in the frequency weighted areal extent of anoxia relative to current conditions.

3.2.4. Engineering Concepts for Oxygenation in Lake Elsinore

It will be challenging to generate, dissolve, and deliver large quantities of oxygen, 15,000 - 20,000 lbs per day, to the bottom waters contained within the very thin and wide hypolimnion layer of Lake Elsinore. The overall diameter to depth ratio is on the order of 500:1. Thus, the horizontal application of oxygen equipment and infrastructure, and the oxygen application itself, needs careful consideration to minimize cost and maximize the spread of the oxygen without oversaturation and loss to the atmosphere.
A well-organized site design will reduce the quantity of infrastructure to be built, have long lasting effective equipment operation, and allow optimal maintenance access. The following sections provide sub-options for the various types of facilities that must be included in any oxygenation project including:

- Generation or Delivery (see section 3.2.4.1)
- Dissolution (see Section 3.2.4.2)
- System Configuration (see Section 3.2.4.3)
- Distribution (see Section 3.2.4.4)

3.2.4.1. Oxygen Generation or Delivery

The first component to an oxygenation option involves procurement of oxygen itself. Two options exist: on-site generation or delivery from a supplier. These options are described below.

Option A – Delivery of Trucked Liquid Oxygen

Lake Elsinore is located within 40 miles of east Los Angeles where large scale cryogenic liquid oxygen (LOX) is generated, filled into trucks, and transported to sites such as Lake Elsinore for reasonable cost. The liquid oxygen would be delivered weekly to a designated site on the shoreline of the lake, where it would be offloaded into structural steel storage tanks. From the shoreline storage tanks, small evaporators and regulators will lower the pressure and convert the liquid oxygen to gaseous oxygen without icing. Examples of the onsite LOX storage systems are shown in Figure 3-12.

Figure 3-12. Examples of LOX Storage Systems



(a) Example 1 – Vertical Tank



(b) Example 2 – Horizontal Tanks

The gaseous oxygen would then be applied to the lake water through engineered delivery systems. The cost for LOX is competitive with onsite generation alternatives, and there are little to no onsite maintenance requirements for the owner. Disadvantages to LOX delivery are lack of supply control, scheduling hassle, and potentially higher cost of operation.

Option B – Onsite Generation with Several Small Generators

Oxygen generation is common for multiple industries including manufacturing and medicine. Small scale Pressure Swing Absorption (PSA) oxygen generation systems are mass produced, reliable, and cost competitive for effective oxygen generation. PSA units are available to generate 50-500 lbs/day of oxygen. PSA technology requires a large amount of pressurized air. The air compression needed for the potentially dozens of PSA generators could be supplied with fewer air compressor units. Examples of PSA systems are provided in Figure 3-13.

Figure 3-13. Examples of PSA Units



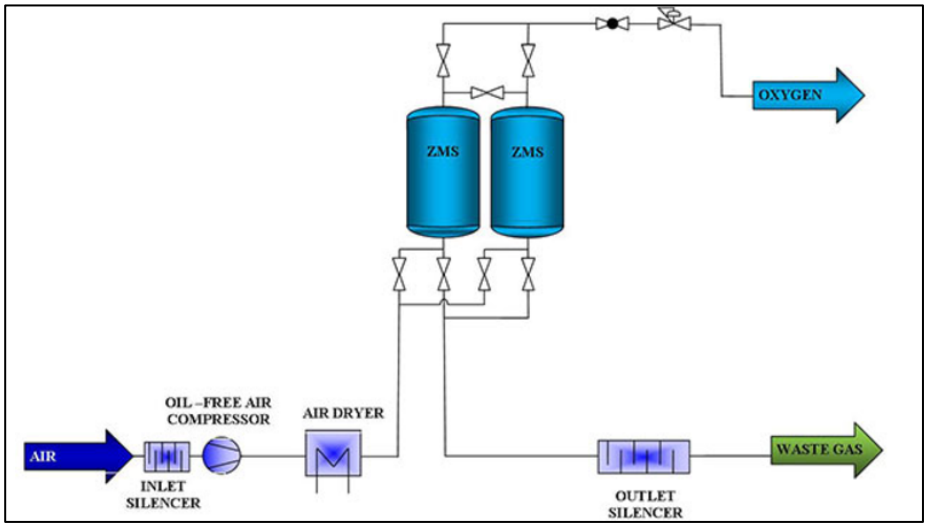
(a) Example 1 - Generon



(b) Example 2 – Atlas Copco

In this technology, air, containing 80% nitrogen and 20% oxygen, is compressed and the nitrogen is sieved out of the air to create >90% oxygen ready for use in the lake. These systems typically utilize zeolite molecular sieves (ZMS) due to their ability to trap larger nitrogen particles while allowing smaller oxygen particles to pass through. A typical schematic of this process is shown in Figure 3-14.

Figure 3-14. Schematic Diagram of PSA Process



If 15,000 lbs/day of combined DO delivery is required, a minimum of 30 of these small-scale oxygen generation units would be needed. The high quantity of required units may require excessive maintenance. The location of these generators could be on the shoreline or located on top of the lake itself near the application of oxygen, using either floating platforms or a fixed structural crib structure located within the lake. If the generators are located on top of the lake, electrical power would need to

be run to the platforms. The generators need replacement of the sieve filter media periodically, generally about after two years of service.

Larger scale onsite oxygen generation is available using two or more other types of technology. Vacuum swing absorption (VSA) sieve filters out the nitrogen without pressurizing the air, and oxygen can be generated with a much lower electrical demand. A typical schematic of the VSA process and an example of the system are shown in Figure 3-15.

Figure 3-15. Schematic and Example of VSA System



(a) Schematic (b) Example – PCI

VSA systems are not as reliable as PSA technology, and the large scale requires robust construction to avoid vibration damage over time. New cryogenic technology from Asia is available to cool air into liquids nitrogen and oxygen, where separation can easily occur. This technology is expensive to ship and there are few USA installations or customer support available to easily use this technology. The shipping cost for the tall cryogenic towers is high. Due to the potential low reliability and high cost of VSA onsite generation systems, they are not considered further.

3.2.4.2. Oxygen Dissolution Method

Many technologies are available to add oxygen gas into water, and four are identified that could be implemented at the scale needed to deliver as much as 15,000 lbs/day of dissolved oxygen to Lake Elsinore. For each of these technologies, 2-12 units would be needed to deliver the DO needed to meet the SOD at the bottom of Lake Elsinore. Other differences between the technologies are related to factors such as size, ability to be submerged, vessel pressure, O&M, and cost. The following sections describe each of the dissolution vendors considered in the study.

Dissolution Vendor A: Blue In Green

Blue In Green (BIG) consists of a cylindrical stainless steel high-pressure vessel (6-10 ft diameter, 10-12 ft tall) that is designed to contain half water (on the bottom) and half gas (on the top). An example of the system and its installation is shown in Figure 3-16.

Figure 3-16. Example of BIG System



The gas from the top half dissolves into the water due to pressurization of the vessel. The incoming water sprays through the upper half of the gas portion of the vessel to optimize dissolution physics. Thus, this system is a water through gas spray approach under pressure. A saturated water solution exits the bottom of the vessel through a back pressure valve and enters the desired reservoir or stream requiring increase in oxygen. A schematic of the BIG system is provided in Figure 3-17.

Figure 3-17. Schematic of BIG System



The pressure of the vessel can be >200 psig (15 atm), which is capable of dissolving 500 mg/L of oxygen in perfect conditions. The system is inefficient in general due to the need to pressurize and depressurize with large pressure swings. No hydraulic energy recovery is provided on the outlet of the vessel. For the

full mass of oxygen needed, a high-pressure system would not be reasonable unless a side stream delivery approach is employed. The BIG system cannot be submerged; thus, it needs to be located either on the shoreline or upon a platform on the lake. Two BIG units could supply enough oxygen for the entire project.

Dissolution Vendor B – Moleaer

Moleaer provides an oxygen dissolution system that provides a 'pipe within a pipe' reactor direct oxygen transfer approach. An example of shown in Figure 3-18.

Figure 3-18. Example of Moleaer System



High water flowrates pass through the outer part of the pipe reactor (12-24 inches' diameter) toward the pipe interior edges, and the center contains a small porous tube that diffuses out the gas into the passing water. This pipe within a pipe reactor comes in various configurations, sizes, lengths, and can operate at various pressures. Generally, the system operates at lower pressure, about two atm in order to save energy, and allows the oxygen generator to operate at lower pressure. Because the transfer of gas occurs through diffusion and dispersion within the pipe within the pipe reactor, the transfer efficiency is lower. The lower transfer efficiency is reportedly intentional such that the exiting water will contain nanobubbles which may have other effects in the reservoir or stream. The Moleaer reactor can potentially be submerged, but it is most appropriate to be located above the water on a floating platform for access as the reactor requires cleaning of the interior pipe over time. Potentially six dual-Moleaer units (twelve total units) could supply oxygen required for the entire project.

Dissolution Vendor C – OST

OST consists of two or three narrow plastic vertical towers (48-54" diameter) where water is passed up and down in series with gaseous oxygen injected into the first column tower. The towers are designed to be fully filled with water at all times, and a gas release valve is provided to off gas any leftover gas from the top of the towers. Thus, this system is a gas through water spray approach under pressure (a modification of the Speece Cone). Saturated solution water exits the bottom of the last tower and

enters the desired reservoir or stream requiring an increase in oxygen. Examples of the OST systems are provided in Figure 3-19.

Figure 3-19. Examples of OST System



Generally, the system operates at lower pressure, about two atm in order to save energy and optimize dissolution of oxygen. The system is generally designed to dissolve about 40-80 mg/L of oxygen. The OST system can be submerged which enables retention of pressure to save energy compared to pumping above the water surface, and there is little to no maintenance on the reactor towers during normal operation. Six OST units could supply oxygen required for the entire project.

Dissolution Vendor D – Speece Cone

The Speece Cone is the most reliable and well demonstrated oxygen delivery technology that has been in use at multiple locations for a long time. The Speece Cone consists of a 20-25’ high by 8-12’ diameter stainless V-shaped cone where water is passed down with gaseous oxygen injected into the top of the cone. The cone is designed to be fully filled with water at all times, and a gas release valve is provided to off gas any leftover gas from the top of the cone. Examples of the installation are provided in Figure 3-20.

Figure 3-20. Examples of Speece Cone Installations



(a) Upper Oso Reservoir Installation



(b) Camanche Reservoir Installation



(c) Savannah Harbor Installation



(d) Wolf Creek Reservoir Installation

The cone is less efficient at transferring oxygen compared to the multiple chamber OST system, and about 65-75% transfer efficiency can be expected. This system is a gas through water spray approach under pressure. Saturated solution water exits the bottom of the last tower and enters the desired reservoir or stream requiring an increase in oxygen. Generally, the system operates at lower pressure, about two atm in order to save energy and optimize dissolution of oxygen. The system is generally designed to dissolve about 40-80 mg/L of oxygen. The Speece Cone system can be submerged which enables retention of pressure to save energy compared to pumping above the water surface, and there is little to no maintenance on the reactor towers during normal operation. Potentially two to four Speece Cone units could supply oxygen required for the entire project.

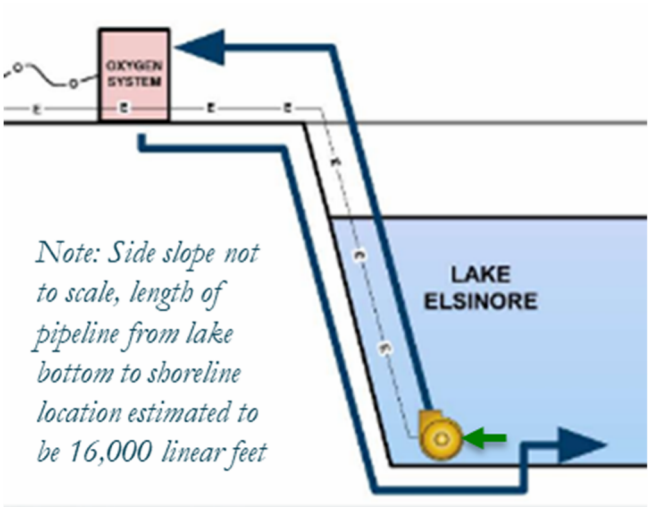
3.2.4.3. Oxygenation System Configuration

An oxygenation project requires pumping of low DO water from the lake into a dissolution facility and then returning that high DO water to the lake bottom. Several options were identified for the location of the dissolution system, which impacts the pumping of water through the system, and delivery of energy and oxygen to the system. Five options were identified and described in the following sections. For each, schematics are provided to portray engineering concepts for pumping water (blue lines with arrows), transmission of electrical (lines noted --E--) and oxygen gas (--O--).

Configuration Method A – Shoreline Delivery

The existing Grande Avenue and Lakeshore Driver aeration mixing compressor stations are located on the shoreline above the lake's high-high water level. Similarly, the proposed oxygen delivery system could be located on the shoreline(s) including at these two locations. A schematic of the system is shown in Figure 3-21.

Figure 3-21. Schematic of Shoreline Delivery



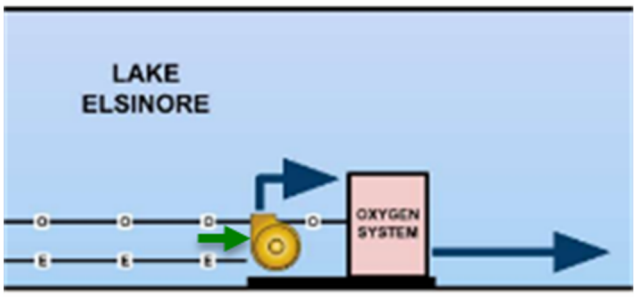
The accessibility of the equipment on a shoreline would be most ideal, with direct access to the dissolution equipment with minimal electrical and gas piping runs required at the bottom of the lake. The challenge with the shoreline solution is two-fold: a) all of the water requiring oxygenation will need to be lifted from the hydraulic profile of the lake up to the shoreline location from the bottom, which compared to other delivery options increases electrical demand (1,100 horsepower pumps) to operate the system by nearly 50% (depending on the lake level), and b) large diameter transmission pipes are required to move large quantities of water from the bottom of the lake to the shoreline, be oxygenated, and then transmitted back to the bottom of the lake. These additional transmission pipes increase the cost of this alternative prohibitively.

Delivery Method B – Submerged Delivery

Because the lake water requiring oxygenation needs transport pumps that pull water from underwater regardless of the type of delivery method, Method B has the advantage of co-locating the dissolution equipment with the pumping equipment underwater next to the transport pumps. It is common for

oxygen dissolution equipment to be located underwater adjacent to the submerged pumping equipment. A schematic of Delivery Method B is provided in Figure 3-22.

Figure 3-22. Schematic of Submerged Delivery



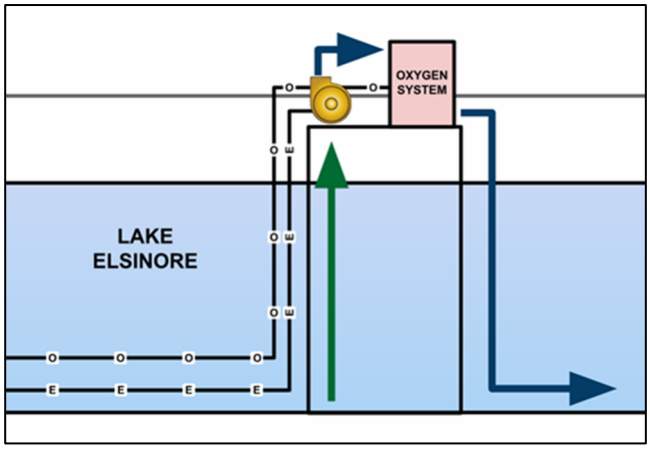
For example, the Upper Oso Reservoir in nearby Mission Viejo, California uses this submerged delivery approach with the transport pumps and the oxygen dissolution equipment (Speece Cone in the case of the Upper Oso Project) on a skid secured to the bottom of the reservoir. Locating the dissolution equipment underwater improves the efficiency of the operation because there is no wasted energy to move water to a higher hydraulic elevation. The estimated pump horsepower is 550, which is approximately half of the Delivery Method A horsepower requirements. The pressure inside the dissolution vessel will be inherently higher because the system is located at a lower elevation, underwater in this case.

The challenges with this approach are three-fold: a) it is challenging to access all system components underwater including the oxygen gas connection, pumping equipment with specialized submerged flow/pressure sensors, and the dissolution system itself, b) the system has a tendency to float if the dissolution vessel accidentally has gas accumulation and the bottom anchors are not secured completely, and c) there is a navigation hazard because the top of the underwater system maybe close to the air/water interface where boats could crash into the top of the system.

Delivery Method C – Platform Delivery Full Stream

Locating the oxygenation equipment out in the lake, nearer to the oxygen transport pumping equipment, is advantageous. This method includes raising the equipment out of the water to an above lake platform. A schematic of Delivery Method C is provided in Figure 3-23. All of the water to be delivered (full stream) is pumped to the platform for oxygen dissolution at low pressure.

Figure 3-23. Schematic of Platform Delivery Full Stream



The platform allows visual line of sight for boat navigation hazard reduction and importantly provides dry access for inspection and maintenance of the equipment. The platform configuration involves a structural crib setup which is a concrete tower with equipment located on top at a fixed location. An example of the crib setup is provided in Figure 3-22 below.

Figure 3-24. Examples of Crib Structures (Exterior)





The crib installation is more expensive compared to a floating system (see Delivery Method E), it also provides two advantages: a) a fixed system allows drawing water from the very bottom of the lake where the water is most dense and return water can be located to the same lower elevation for optimized bottom water discharge to coat the sediment-water interface, and b) very large high efficiency turbine pumps may be used which transport water at 85% efficiency compared to other pumping systems on a floating platform configuration which are 65-75% efficient.

The structural crib system also has the significant drawback of requiring water to be lifted to a high elevation, resulting in increased electrical demand similar to the shoreline delivery method (Method A). However, since the pumps are located on a structure in the lake and do not require long transfer pipes, the estimated horsepower is lower than Method A but higher than Method B.

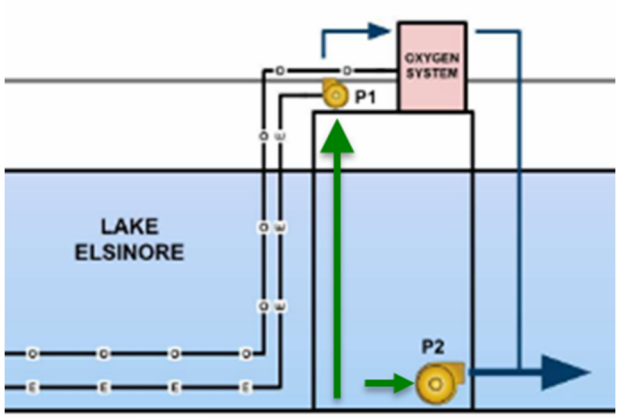
Delivery Method D – Two Stream Carrier Water Approach (Submerged and Platform Hybrid)

To consider achieving the advantages of a submerged installation in Delivery Method B (i.e., reduction in operating pressure and electricity demand), and a platform installation in Delivery Method C (i.e., better visual inspection capability and optimized maintenance access), a hybrid solution was developed. In this hybrid solution (Delivery Method D) there will be two separate pumped water streams, as follows:

1. Main carrier water stream needed to move large quantities of water at oxygen saturation will be provided completely underwater with minimal hydraulic force addition required. This will be about 85-90% of the total flow.
2. Oxygen dissolution would then occur with a small side-stream consisting of 10-15% of the total carrier water flow required. The 10-15% side stream would be pumped up to the platform at high pressure for oxygen dissolution purposes before it combines back into the 85-90% carrier water stream at low pressure.

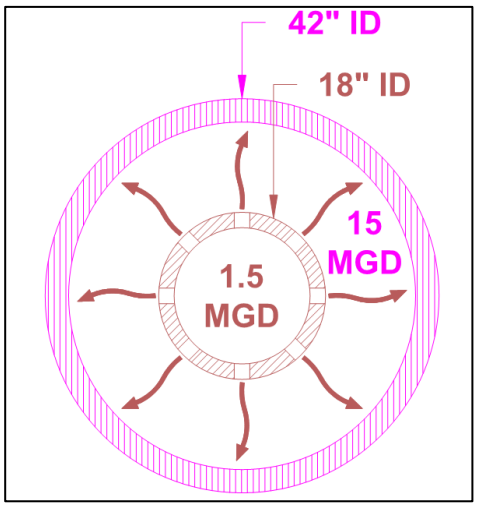
A schematic of this approach is provided in Figure 3-25.

Figure 3-25. Schematic of Two Stream Carrier Water Approach



The mixing of the two streams requires a liquid to liquid transfer through a new custom designed pipe within a pipe manifold. It would be similar to the standard Moleaer approach of a pipe within a pipe, however, in this case the interior pipe would be diffusing high oxygen content water (~225 mg/L DO) in the liquid form. A diagrammatic example of this custom designed pipe is provided in Figure 3-26.

Figure 3-26. Mixing of Supersaturated DO Stream (inside pipe) from Top of Crib into Carrier Water (outside pipe) Prior to Spoke Delivery



The platform design in this hybrid approach is feasible to be floating, there are few advantages in this method of using a floating platform compared to a fixed structural crib platform. In a structural crib installation, the carrier water can be drawn from the bottom and discharged to the bottom and no additional pressure would be required for the carrier water to be lifted to the higher crib elevation compared to the floating platform installation.

Since Delivery Method D is more involved than the rest of the delivery methods, a preliminary plan was created to facilitate the understanding of the two-stream carrier water approach. The plan view is provided in Figure 3-27. In addition to the plan view, two sections were created and are provided in Figure 3-28.

It is estimated that the carrier water pumps will require 150 horsepower. Only the side stream requires a higher lift to a higher elevation of a fixed crib. The side stream pumps are roughly estimated to require 470 horsepower, bringing the total horsepower required for Delivery Method D to 620. This power requirement is lower than both Delivery Method A and C, and only slightly greater than Delivery Method B.

Figure 3-27. Plan View Drawing of Two Stream Carrier Water Crib/Spoke System for Example with Blue in Green Dissolution Unit (options may also involve OST or Speece cone). Green flow arrows show the intake locations and the blue flow arrows show the discharge locations (Flow rates are preliminary estimates for a 15,000 lb/day delivery)

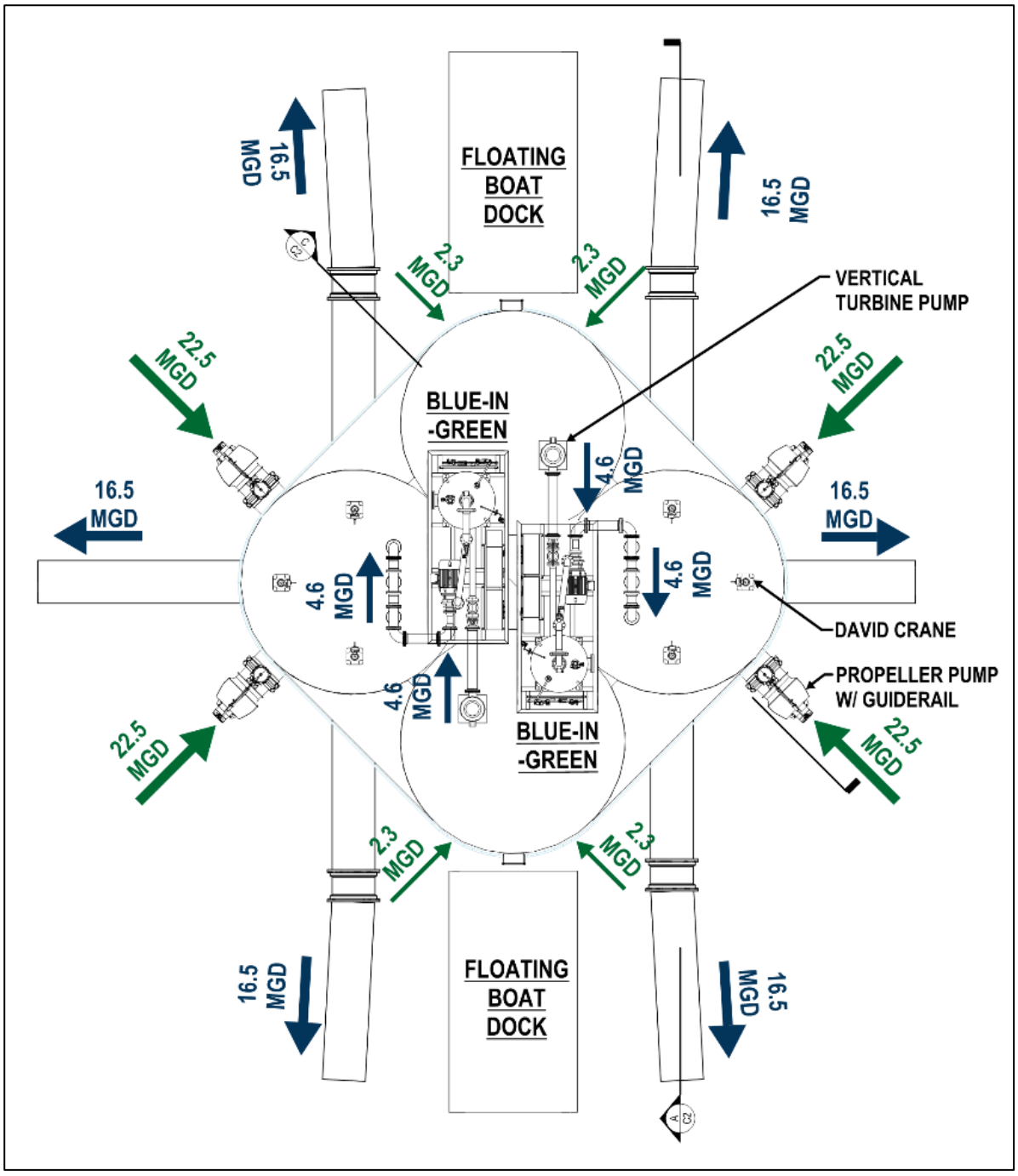
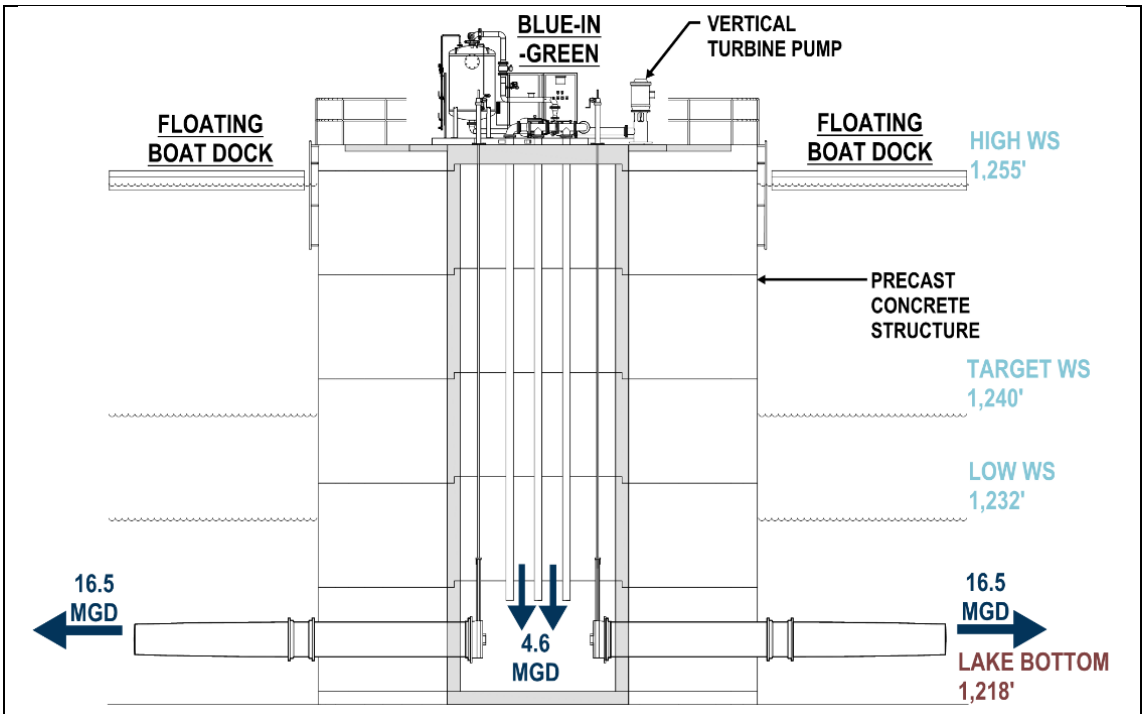
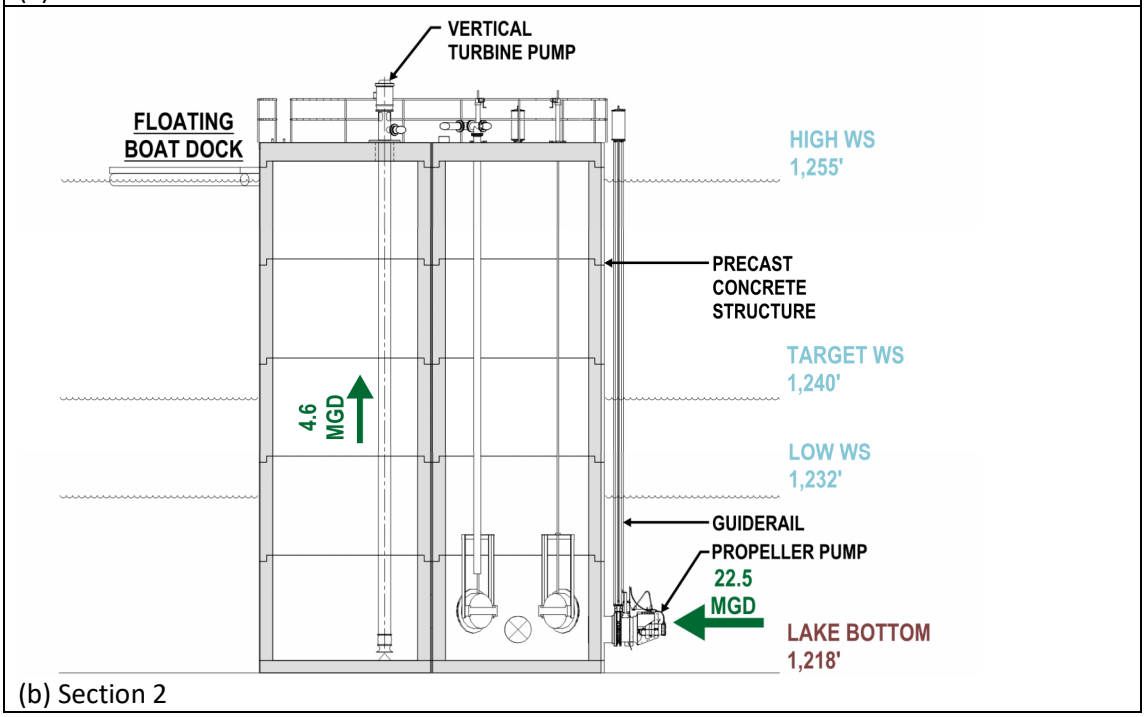


Figure 3-28. Preliminary Sections of Crib/Spoke System for Example with Blue in Green Dissolution Unit (options may also involve OST or Speece cone). Green flow arrows show the intake locations and the blue flow arrows show the discharge locations (Flow rates are preliminary estimates for a 15,000 lb/day delivery)



(a) Section 1

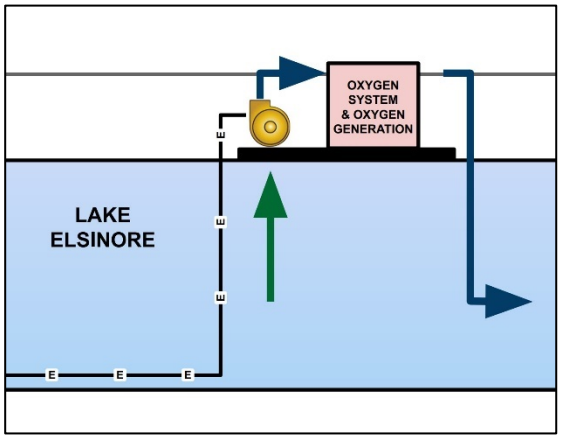


(b) Section 2

Delivery Method E – Floating Barge

Locating the oxygenation equipment on a series of floating barges in the lake is an approach that can be implemented with on-site generation, thereby only a power supply to connect to the platform. The City of Lake Elsinore has deployed three floating barges in the lake over the past year that are currently being operated to deliver a total of 5,600 lbs/day (1 barge at 600 lbs/day and 2 barges each at 2,500 lbs/day). A schematic of Delivery Method E is provided in Figure 3-29. The floating barge allows visual line of sight for boat navigation hazard reduction and importantly provides dry access for inspection and maintenance of the equipment. The floating barge system is less costly to construct and has been proven to be implementable within a short timeframe.

Figure 3-29. Schematic of Floating Barge Configuration Approach



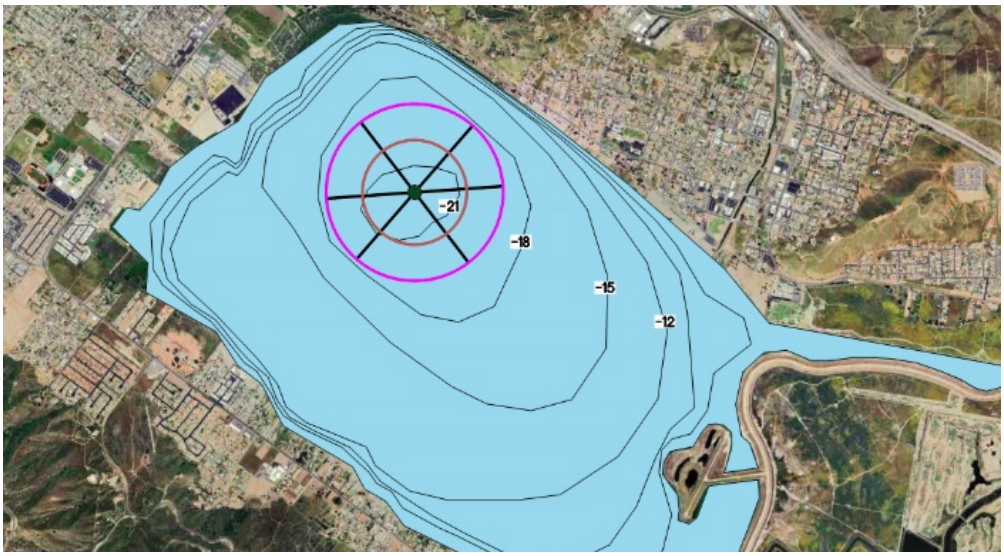
3.2.4.4. Distribution of Oxygenated Water

Multiple options exist to deliver high DO water from the oxygenation system to the lake. Ideally, the high DO water would be delivered in a manner to remain close to the SWI and spread laterally across the lake bottom. Two options were developed for this study, one involving slow diffusion to the lake bottom through a series of lines and the other involving jet delivery to the middle of the water column. Hydrodynamic modeling of these two options for distribution of oxygenated water was evaluated to estimate the benefit associated with a more extensive spoke distribution system (Appendix B). The following sections describe the two options considered in this study.

Option A – One Unit Located in Center, Bottom Suction/Discharge

This option consists of a single central pumping hub in the coldest, darkest, deepest location in the center of the deep zone of the lake. The approximate location of this location is highlighted by the magenta circle in Figure 3-30.

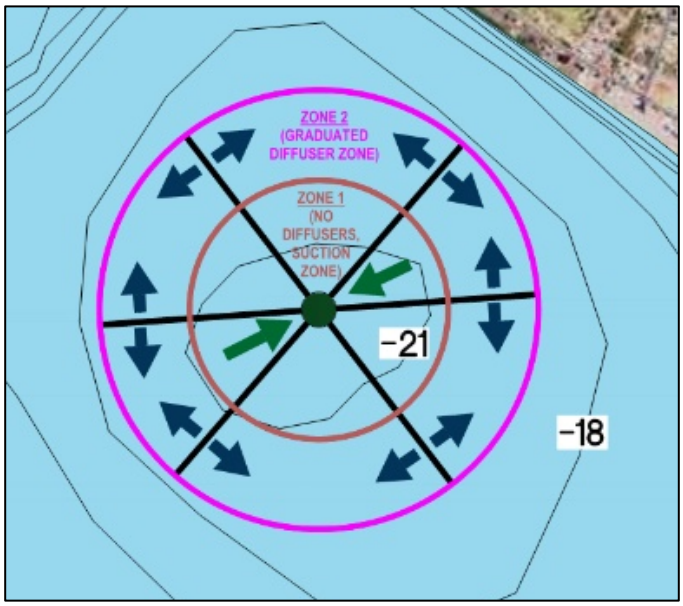
Figure 3-30. Location of Oxygenation System at Deepest Zone of Lake Bottom



The pumping needs to either be sitting on the bottom of the lake or hung from a fixed structural crib to get to this desired depth. This dense water comes from the bottom and contains the lowest oxygen content and highest pressure. It is standard practice to use this water source in an oxygenation project because the greatest gain in oxygen can be achieved. More importantly when this dense water is oxygenated and returned to the lake it will remain on the bottom if any stratification exists.

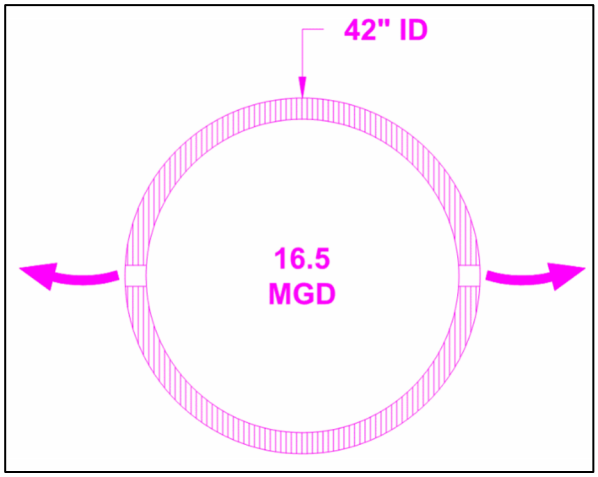
In this option it is envisioned that the suction to the center system hub location would occur from an interior circle around the hub (area inside brown circle in Figure 3-31. That suction would draw in low oxygen dense water. The discharge of the highly oxygenated water ideally would then be discharged beyond the distance of the suction piping diameter (doughnut shaped area between magenta and brown circle in Figure 3-31).

Figure 3-31. Example of "Spoke" System



The distribution piping of the spoke will have no perforation that exists within Zone 1 (a.k.a. suction zone) and consist of graduated perforations within doughnut shaped Zone 2 (a.k.a. graduated diffuser zone), as shown in Figure 3-32.

Figure 3-32. Graduated Perforated Pipe for Delivery of Oxygenated Water at the Lake Bottom



By incorporating graduated perforations, smaller to larger holes as you move farther from the central hub, this will allow for even distribution of water throughout the lake bottom. This method of drawing low oxygen, high density water, and discharging high oxygen, high density water will optimize the spread of the water without oversaturation and loss of oxygen to the atmosphere from oversaturation. Oversaturation can be caused by a) the localized over accumulation of high dissolved oxygen levels from the proposed dissolution system, or b) discharged water rising to the surface and entering lower-density water, where reduced pressure causes dissolved oxygen to come out of solution.

The hub and discharge spoke configuration layout would require long suction (aligned vertically) and longer discharge piping (to form the spokes laterally across the lake bottom) constructed with corrosion resistant plastic materials. The plastic piping would need to be anchored down to avoid buoyancy of the installed piping systems.

Option B – Multiple Units Located Nearer Shore, Mid Depth Suction/Discharge

This option involves deploying multiple (up to four) floating platform systems throughout the lake. In this configuration, the water is drawn from the middle of water column underneath the platform, sent through the oxygen dissolution system, and delivered underneath the platform in two laterally aligned jets in opposite directions (Figure 3-33). In this configuration, there could be some short-circuiting because the suction and discharge points are close to each other. This approach relies on consistent and adequate horizontal and vertical mixing currents to distribute dissolved oxygen throughout the water column. To be effective, water from mid water column must be able to mix into cooler, denser water at the lake bottom. In the case of nanobubble dissolution technology, random Brownian motion of the neutrally buoyant nanobubbles is a likely mechanism to aid in the dispersion of DO into the lake, and potentially facilitate vertical mixing to lower zones of cooler, denser water. The degree that nanobubbles are able to achieve measurable enhancements to natural hydrodynamics at the scale of 15,000 lbs/day into a large shallow lake like Lake Elsinore has not been demonstrated.

In February of 2024, the City of Lake Elsinore installed a pilot project to deliver 600 lbs/day of DO in the form of nanobubbles using Moleaer diffusers. At that time, the pilot was the largest nanobubble application in a freshwater lake in the United States. However, the small scale of this pilot makes it difficult to fully assess its impact. The Phase 2 Pilot was completed in October 2024 and includes two 2,500 lbs/day floating platform systems. Future analysis of the Phase 2 Pilot aims to evaluate several key factors, including oxygen transfer efficiency, the ability to prevent short-circuiting, the effectiveness of driving mid-depth high-oxygen water down to the bottom, and the capacity to retain dissolved oxygen in the liquid phase.

Figure 3-33. Photo of Floating Barge Nanobubble Pilot for 600 Lbs/Day DO



3.2.5. Summary of Oxygenation Options in Lake Elsinore

As many as 80 oxygenation permutations could be considered with varying combinations of generation or delivery (n=2; on-site or trucked LOX), dissolution (n=4; Moleaer, Speece cone, OST, or Blue-in-Green), system configuration (n=5; shoreline, submerged, platform full flow, platform 2-stream, or floating barge), and distribution (n=2; lake bottom spoke diffusers or mid-depth jet). For purposes of this study, five comprehensive options were identified to represent a wide range of approaches and to favor combinations of the above-mentioned components that would be most compatible for implementation. The five options are summarized below:

1. Pumping 60 MGD of water from the lake bottom to a shoreline location with onsite LOX storge and power. Dissolution of LOX into carrier water via any of the four technologies described in Section 3.2.4.2, distribution of oxygenated water via six 2,000’ diffuser lines with perforations beginning 1,000’ from the suction zone.
2. Pumping 60 MGD of water from the lake bottom into a submerged Speece cone or similar dissolution technology. LOX stored on the shoreline as well as power would be conveyed to the lake bottom dissolution system via underwater cables. Distribution of oxygenated water via six 2,000’ diffuser lines with perforations beginning 1,000’ from the suction zone.
3. Pumping 60 MGD of water from the lake bottom to a permanent platform above the lake level where an oxygenation system will be located. LOX stored on the shoreline as well as power would be conveyed to the platform dissolution system via underwater cables. Distribution of oxygenated water via six 2,000’ diffuser lines with perforations beginning 1,000’ from the suction zone.

4. Pumping of two streams as follows: 9 MGD of water from the lake bottom to a permanent platform above the lake level where a high-pressure oxygenation system will be located. LOX stored on the shoreline as well as power would be conveyed to the platform dissolution system via underwater cables. The second stream would involve pumping of 90 MGD of water from the lake bottom to mix with the 9 MGD of supersaturated DO water as it come down from platform, the blended oxygenated water would be distributed via six 2,000’ diffuser lines with perforations beginning 1,000’ from the suction zone.
5. Pumping 60 MGD of water from mid-depth to a network of six floating barges (treating 10 MGD each) where oxygenation systems will be located. On-site generators will be located on each barge. Power would be conveyed to the floating barge dissolution systema via underwater cables. Distribution of oxygenated water will occur mid-depth via simple jet flow in pipeline underneath the barges. Option E is a scaled-up version of the current system involving 2 floating barges with Moleaer nanobubble technology.

Section 4 provides a summary of the evaluation of these five options and the basis for recommendations in Section 5.

4. Ranking of Oxygenation Options

4.1. Introduction

Multiple options were identified to implement an oxygenation project in Lake Elsinore. For purposes of this study, five comprehensive oxygenation options were identified to represent a wide range of approaches. The five options are summarized in Section 3.2.5 above including project concept engineering, modeling of water quality effectiveness, cost estimation, and investigation of potential constraints. A multi-factor methodology for ranking of oxygenation options for Lake Elsinore treatment was developed to select the most preferred option. The following sections present evaluation criteria and rubric (Section 4.2) with resulting scores and ranking of the oxygenation sub-options (Section 4.3).

4.2. Evaluation Criteria, Weights, and Scoring Rubric

A collaborative process was completed to create an objective approach to evaluate oxygenation options to facilitate multi-factor scoring and ranking. Meetings with stakeholders were held to collect input on the selection of criteria as well as criteria weights. A technical memorandum with the ranking methodology was provided to the TMDL Task Force for review and comments. Based on the consensus, a description of the parameters and weight factors is as follows.

- ***Cost* (30%)** – to estimate capital cost, detailed take-off construction cost estimates were developed based on engineering concept plans developed for each project concept. Facilities include pumps, pipelines, oxygenation systems, storage vessels, package treatment plants, earthwork, and vegetation planting. Capital cost estimates include an additional 40 percent for permitting, design, construction management, legal and administrative fees and contingency. Estimation of O&M costs account- for materials (e.g., liquid oxygen, lanthanum, etc.), power and labor. Lifecycle costs ($/25yr) are determined as the sum of capital cost based on 2024 dollars and annual O&M over 25 years with escalation of 3 percent per year. In all cases, O&M costs comprise most of the lifecycle cost.
- ***Reliability (20%)*** – All of the oxygenation options were developed to deliver 15,000 lbs/day of DO to Lake Elsinore, the estimated SOD in the lake. The reliability factor involves the level of certainty that an option will achieve oxic conditions in the lake bottom. For example, options that deliver DO closer to the lake bottom are more effective than options that use a jet distribution in the middle of the water column. Previous applications of an oxygenation option at a similar scale to Lake Elsinore were also used to assess the reliability of an option.
- ***Regulatory Requirements & Environmental Impacts (25%)*** - Any project selected for construction of in-lake treatment of Lake Elsinore will require regulatory approvals. Environmental impacts associated with each option will vary depending upon the nature of activities during construction, location of facilities, and range of environmental disturbances. Projects would be subject to State and Federal regulations such as Clean Water Act 401/404, CA Fish and Game Code, Endangered Species Act, CEQA, and other local agencies. Any project that involves pumping lake water will need to address the impacts of entrainment of fish and other biota.

- ***Ease of Construction & O&M (10%)*** – Whole Lake treatment of Lake Elsinore will not be simple, but some project options may offer relatively more manageable construction activity or long-term O&M demand than others. For example, improved access to an oxygenation system housed on top of a raised crib would allow for more frequent and less complex O&M activities. Constructability must account for the extent of underwater work, the number of units, length of pipelines, and other components specific to each option. Challenges associated with long-term O&M must consider future availability of materials and energy, management of waste streams involving other entities, impacts of climate change, and infrastructure longevity.
- ***Constraints - Political, Social, Recreational, Stakeholder Acceptance (10%)*** – Lake improvement projects can create many concerns and potential impacts to recreation on the lake, aesthetics of the Lake and surrounding shoreline. Project will have differing impacts to noise, traffic, recreational access, and community aesthetics.
- ***Other Benefits (5%)*** – Other benefits are in addition to meeting the target nutrient load reductions. This criterion provides preference for any option that may provide additional social or environmental benefits.

For each option, the expert team assigned scores based on the following scale: 1 - Least Preferred to 5 – Most Preferred. The following section presents the results of the expert team evaluation as well as discussion of the specific considerations that supported scoring of options against the six different evaluation criteria. Scoring for each oxygenation option against each evaluation criteria were used to compute a weighted multi-factor total score as follows:

$$Multi - Criteria\ Weighted\ Score = \sum_{1}^{6} R_i * W_i$$

where R_i is the rating for criteria *i* and W_i is the weight factor for criteria *i*.

4.3. Results of Multi-Factor Evaluation of Oxygenation Options

The expert team held multiple meetings over the course of the study to discuss oxygenation as an alternative for Lake Elsinore as well as the many options to implement an oxygenation system. Following the consensus on evaluation criteria and assigned weights, the expert team generated four independently evaluated ratings by 1) Dr. Alex Horne, 2) Dr. Michael Anderson, 3) collective scoring of six GEI limnology experts, and 4) collective scoring of Pace engineering team. Following the independent scoring, all expert team members convened to discuss the results and address differing perspectives, particularly in cases where there were significant differences among the independent rankings. Once resolved, the independent scores were averaged for each option and evaluation criteria to create a single set of scores representative of the entire expert team (Table 4-1).

Table 4-1. Results of Weighted Multi-Factor Scoring of Five Oxygenation Options by the Expert Team

ID	Option	Cost	Reliability	Ease of Construction and O&M	Regulatory Compliance, Environmental	Social, Political, Recreational Constraints	Sustainability/ Other Benefits	Multi-Factor Weighted Score
		30%	20%	10%	25%	10%	5%	
1	LOX, shoreline, spoke (SP, NB, OST, BIG)	1.0	4.3	3.4	4.3	4.4	2.9	**3.1**
2	LOX, submerged, spoke (SP, OST)	5.0	4.1	3.6	4.0	3.6	3.5	**4.2**
3	LOX, platform full-flow, spoke (NB, SP, OST)	3.0	3.1	2.7	2.8	2.9	2.8	**2.9**
4	LOX, platform 2-stream, spoke (BIG)	4.6	3.9	3.1	4.0	3.4	3.3	**4.0**
5	PSA, platform full-flow, Jet (NB)	5.0	1.9	3.6	3.0	2.8	2.6	**3.4**

Key for compatible vendors: SP = ECO2 Speece cone, NB = Moleaer nanobubbles, OST = Clarity Resources Group Oxygen Saturation Technology, BIG = Blue–in-Green

4.3.1. Cost

Ratings for the cost factor were normalized based on the range of estimated lifecycle cost, whereby the lowest cost received a score of 5 and the highest cost received a score of 1 and all other costs were scaled proportionally. A summary of capital, annual O&M, and 25-year lifecycle costs for each of the five oxygenation options is provided in Table 4-2.

Table 4-2. Summary of Capital, O&M, and Lifecycle Costs for Whole Lake Oxygenation Options in Lake Elsinore (see Appendix C for detail)

ID	Option	Capital ($)	O&M ($/yr)	Lifecycle ($/25yrs)[1]
1	LOX, shoreline, spoke (SP, NB, OST, BIG)	$19,733,333	$2,550,000	$82,769,333
2	LOX, submerged, spoke (SP, OST)	$9,550,000	$1,650,000	$50,338,000
3	LOX, platform full-flow, spoke (NB, SP, OST)	$15,000,000	$2,100,000	$66,912,000
4	LOX, platform 2-stream, spoke (BIG)	$10,500,000	$1,750,000	$53,760,000
5	PSA, platform full-flow, Jet (NB)	$10,500,000	$1,620,000	$50,546,400

1) Sum of capital (2024 dollars) and annual O&M with 3 percent annual escalation over the next 25 years. Averaged over the compatible dissolution technologies
Key for compatible vendors: SP = ECO2 Speece cone, NB = Moleaer nanobubbles, OST = Clarity Resources Group Oxygen Saturation Technology, BIG = Blue–in-Green

On average, the shoreline approach has the highest capital and O&M cost, resulting in a lifecycle cost of over $80 million. The high cost is attributed to the large quantity of transmission pipe required to transfer water from the deep zone to the shoreline and back. Three options had similar capital cost estimated to be ~$10 million (2, 4, and 5). These options involved less transmission piping for carrier water upstream for the oxygenation systems compared with the shoreline system. For Option 3, the combination of a concrete crib platform as well as larger pumps and oxygenation system capacity cause this option to have higher capital cost than 2, 4, and 5. Option 4 operates at a higher pressure, requiring less pumping through the oxygen dissolution systems, which drives the cost down.

For all of the options involving LOX, estimated cost for oxygen, delivery and on-site storage is $700,000/yr. This is based on an estimate for leasing a LOX storage system and receiving weekly or bi-weekly deliveries, depending on the storage capacity. Two potential suppliers for onsite storage and delivery to Lake Elsinore are Westair and Airgas, both located near Los Angeles. The majority of the differences in O&M cost for each option is associated with power. For the four evaluated options involving LOX, power requirements in order of lowest to highest were as follows: Option 2 < option 4 < option 3 < option 1.

4.3.2. Reliability

The expert panel highlighted several pros and cons of the various options that served as the basis for assigning scores for reliability to each option, including:

- Options that involve distribution of DO close to the lake bottom and at velocities that minimize turbulence (options 1-4) were shown to more effectively maintain high DO conditions in the lake bottom than a mid-depth jet delivery (option 5) based on hydrodynamic simulation modeling comparing DO at the lake bottom for scenarios involving either spoke diffusers at the lake bottom to jet delivery at mid-depth in the water column (See Appendix B).
- Options with a proven track record of successful installation in other large freshwater lakes are limited to submerged or shoreline Speece cones (options 1 and 2). Conversely, options 3 and 4 involving the construction of a concrete crib in the lake were considered innovative with no examples implemented elsewhere on a similar scale. These options could provide other advantages over proven options based on other evaluation criteria, such as the pumping energy cost savings provided with the 2-stream configuration with high pressure dissolution (option 4). Lastly, option 5 is currently being implemented on Lake Elsinore to deliver about one third of the estimated DO need to meet SOD and it may be practical to scale up with additional floating barges.

4.3.3. Regulatory Requirements & Environmental Impacts

With regard to oxygenation, a key area of concern for all of the options involves entrainment of fish and other biota with pumping of lake water. The ability to design intakes to mitigate potential impacts from entrainment may vary between project options. For example, suction from the lake bottom (options 1-4) may entrain less biota than a configuration involving mid-depth suction (option 5) because aquatic life tends to be more abundant higher in the water column in Lake Elsinore.

4.3.4. Ease of Construction & O&M

Whole lake treatment of Lake Elsinore will not be simple, but some project options may offer relatively simpler construction activities or more manageable O&M demand than others. The expert team developed ratings for each of the options based on experience with other oxygenation systems and general knowledge of lake management. Highlights from this evaluation are provided below:

- Ease of construction scores were higher for configuration options that do not require underwater activities (options 1 and 5). Options 3 and 4 require the construction of a concrete crib in the lake and scored low for ease of construction.
- The submerged configuration (option 2) would require underwater O&M although infrequent (once every five years based on 25 years of operation at Comanche Reservoir). However, the smaller OST technology used in this configuration can be disconnected from anchors and floated to the surface for maintenance. O&M for the other four options would occur above water on the shoreline (option 1), on top of a concrete crib (options 3 and 4), or a floating barge (option 5).
- The system complexity and number of parts impacts the level of effort with regard to O&M activities. On-site oxygen generation on six floating barges (option 5) will be needed for ~30 PSA units. Similarly, option 5 will involve a total of 12 nanobubble diffusers, each with routine O&M involving use of chemical cleaners across the six barges.
- For the submerged configuration (option 2), previous instances of the Speece Cone system floating to the surface have occurred (e.g., Upper Oso Reservoir) when dissolution vessel accidentally has gas accumulate and the bottom anchors are not secured adequately. If selected, the risk of a floating Speece Cone must be addressed with conservative factors in the design.
- Challenges associated with long-term O&M must consider future availability of materials such as LOX. The availability and cost of LOX is a potential concern for options 1-4. The ability to modify a system to use on-site oxygen generation is more feasible in options above the water (option 1, 3, and 4).
- With regard to energy consumption, the most efficient systems require less pumping head such as the submerged configuration (option 2). The two-stream configuration limits the volume of water pumped from the lake bottom to the surface by using high pressure dissolution on a smaller stream of water pumped from the lake bottom (option 4).

4.3.5. Constraints (Political, Social, Recreational, Stakeholder Acceptance)

Lake improvement projects can create many concerns and potential impacts to recreation on the lake and aesthetics of the lake and surrounding shoreline. Project will have differing impacts to noise, traffic, recreational access, and community aesthetics. For example, oxygenation systems with a large crib would impede boat traffic within the high-speed zone. Similarly, submerged oxygenation could create an underwater hazard to boaters when the top of infrastructure is close to the water surface and would also require above water impediments to boating traffic. In the case of the floating barge (option 5), as many as six floating barges would be located throughout the lake. Noise impacts may be minimal for all options based on recent experience with the floating barges located close to the shoreline. Lastly, there may be some public perception of safety risk associated with high pressure oxygenation located in the center of the lake on a concrete crib (option 4).

4.3.6. Other Benefits

Other benefits are in addition to meeting the target nutrient load reductions. This criterion provides preference to any option that may provide additional social or environmental benefits. Examples of other benefits include 1) carbon sequestration, 2) diverse animal habitats, and 3) environmental education opportunities. The expert team found few differences between the oxygenation options with regards to other benefits. Minor differences in ratings were primarily associated with energy use for pumping.

5. Conclusions and Recommendations

5.1. Conclusions

This study serves to implement Task 5 of the Phase II program of implementation in the 2024 draft TMDL revision (LESJWA 2024), namely to "*Evaluate In-Lake Projects to Improve Water Quality in Lake Elsinore".* Elements of the study involved assessment of the current LEAMS, testing of Lake Elsinore sediment oxygen demand and flux of nutrients release from sediment, identification of alternatives for in-lake treatment, scientific analysis to analyze nutrient load reduction with oxygenation (the only viable whole lake treatment alternative), and evaluation and ranking of options based on engineering concepts for oxygenation based on economic and multiple non-economic factors. Key conclusions are summarized below.

Existing LEAMS Condition - Replacement of existing LEAMS with a different alternative system is needed to achieve target DO condition in the lake bottom. Horne and Anderson (2022) and recent EVMWD offset demonstrations by Stillwater Sciences (2024) have shown that LEAMS is not effectively maintaining oxic condition in the bottom waters of Lake Elsinore, and nitrogen offsets provided are inadequate to meet the NPDES permit requirement for the Regional Water Reclamation Facility effluent discharge to the Lake. Based on a detailed condition assessment (see Appendix D), the existing LEAMS has sufficient useful remaining life to continue operation until a replacement project is constructed.

Sediment Oxygen Demand & Nutrient Flux Results – Sediment nutrient core-flux and SOD experiments were conducted in July 2024 to estimate nutrient flux rate from sediments under both oxic and anoxic conditions and the SOD of the sediments.

The sediment nutrient study estimated a SOD of 0.84 $g/m^2/day$ based on condition in July 2024 with limited variability across 4 sites evaluated (see Appendix A). This summertime value was used to estimate that up to **~15,000 lbs/day of DO** would be needed to be delivered to the lake bottom to maintain oxic conditions. In practice, less DO would be needed in cooler months.

The rate of release of TP and TN was reduced in all replicate cores under oxic conditions relative to anoxic conditions. The difference in average values from replicate cores of Type II and III sediments for oxic and anoxic treatments are reported in Table 5-1. These differences in flux serve as the basis for estimation of the annual internal load reduction that may be achieved with oxygenation.

Annual Internal Load Reduction – An analysis of anoxic and oxic flux rates for TP and TN (as $mg/m^2/day$) was conducted to compare baseline (no oxygenation) with a post-project condition that assumed DO is maintained above 2 mg/L in the lake bottom year-round. In the baseline (no oxygenation) condition, naturally occurring spatial extent and temporal frequency of daily minimum DO in the lake bottom were used to allocate either oxic or anoxic flux rates in extrapolation over space and time. In the post-project condition, oxic flux rates are assumed to be achieved in lake bottom year-round.

Table 5-1. Difference in Nutrient Flux Rates between Oxic and Anoxic Cores with Type II and Type III Sediment from Lake Elsinore

Nutrient	Treatment	Type II (Site 6)	Type III (Average of Sites 1-3)
TP	Oxic as mg/m^2/day	2.5	8.1
	Anoxic as mg/m^2/day	11.8	14.4
	Difference as mg/m^2/day (%)	9.3 (79%)	6.3 (44%)
TN	Oxic as mg/m^2/day	96	157
	Anoxic as mg/m^2/day	49	97
	Difference as mg/m^2/day (%)	48 (50%)	60 (38%)

1) Site locations and areal extents of lake bottom sediment types are shown in Figure 3-1.

The estimated annual internal load reduction achieved with maintenance of oxic (>2 mg/L DO) conditions at the lake bottom year-round, relative to the baseline condition, is **~10,700 kg/yr for TP (48 percent of current load) and ~64,100 kg/yr for TN (35 percent of current load).** Section 3.2.1 presents a detailed analysis of hourly measurements of historical vertical profiles of DO that were used to parameterize the baseline condition.

Future Alternatives Screening and Selection - Many in-lake water quality management approaches are available to lake managers, but few of these were determined to have potential for long-term whole lake treatment in Lake Elsinore. A screening analysis of 17 in-lake treatment alternatives found that **oxygenation is the only viable alternative because of its ability to address offsets of both TN and TP, maintain over 2 mg/L DO in the lake bottom and to serve as a logical replacement of existing LEAMS**. Of the remaining 16 in-lake alternatives, 14 had fatal flaws or were deemed not viable for a variety of reasons (see Table 3.1). Geographic, climatic, size and biological characteristics of Lake Elsinore limit the viability of most in-lake water quality treatment alternatives.

While wetland treatment is not considered feasible at this point due to its lower effectiveness in removing TP and multiple implementation challenges, it is identified as a potential alternative for supplemental TN reduction in a later phase, if needed. In future, the algae harvesting alternative could also be a potential alternative if handling/disposal of algae float solids and the application of technology with a system large enough for application to Lake Elsinore are well demonstrated (See Section 3.1.2 for details).

Nutrients Load Reduction Provided by Oxygenation - The collective load reduction needed to meet the final allocations in the revised TMDL for all external sources to Lake Elsinore is 6,932 kg/yr TP and 54,468 kg/yr TN. The estimated internal load reductions for TP and TN with oxygenation exceed these reduction targets, thus a multi-agency offset program involving oxygenation is recommended to serve as the primary form of in-lake treatment for Lake Elsinore to meet both interim milestones and final allocations in the revised TMDL (Table 5-2).

Table 5-2. Estimated Annual Internal Nutrient Load Reduction with Oxygenation in Lake Elsinore as Compared to Target Reduction

Summary of Offsets	TP (kg/yr)	TN (kg/yr)
EVMWD's Load Reduction Target [1]	3,842	42,852
Other's Load Reduction Target [1]	3,090	11,616
Total Load Reduction Target [1]	6,932	54,468
Oxygenation Nutrient Reduction Capacity [2]	10,668	64,163
% of Target Met	154%	118%

1) Values based on 2024 public draft of the proposed TMDL revision (LESJWA, 2024)

2) Basis for estimate from core-flux experiment conducted in July 2024 (see Appendix A) and extrapolation analysis (see Section 3.2.1)

Key Oxygenation System Components

- **Oxygen Supply** – Oxygen can be supplied via on-site generation or delivery of trucked liquid oxygen (LOX). (See Section 3.2.4.1 for details).
- **Oxygen Dissolution Technology** - Four vendors of oxygen dissolution technologies to add oxygen gas into carrier water are:
  - Blue in Green (BIG, high pressure system),
  - Moleaer (nanobubbles, NB),
  - Oxygen Saturation Technology (OST, modified Speece cone), and
  - ECO2 (Speece cone, SP).

  For each of these technologies, between 2 to 12 units would be needed to deliver 15,000 lbs/day of DO into Lake Elsinore. For other differences such as size, ability to be submerged, vessel pressure, O&M, and cost etc. see Section 3.2.4.2 for details and photos.

- **Oxygenation System Configuration – An oxygenation project requires pumping of low DO water from** the lake into a DO dissolution facility and then returning concentrated DO water to the lake bottom. The following five schemes or configurations are considered for the oxygenation system. Details and photos are presented in the Executive Summary (Figure ES-3) and Section 3.2.4.3.
  - Shoreline - LOX, 60 MGD pumped to shoreline oxygenation system, spoke distribution *(Moleaer, Speece, OST, Blue in Green).*
  - Submerged – LOX, submerged system with 60 MGD, spoke distribution *(Speece, OST)*
  - Crib, single stream - LOX, concrete crib, 60 MGD, spoke distribution *(Moleaer, Speece, OST)*
  - Crib, 2-stream – LOX, concrete crib, 9 MGD through high-pressure system on concrete crib, 90 MGD mixing water at lake bottom, spoke distribution *(Speece, OST, Blue in Green)*

- Floating barge – onsite oxygen/nanobubbles generation, floating barge, 60 MGD, jet distribution mid depth *(Moleaer)*

- **Distribution of Concentrated Oxygenated Water in Lake Bottom** - (See Section 3.2.4.4 for details and photos) Ideally, the highly concentrated DO water would be delivered in a manner to remain close to the lake bottom (where it is needed) and spread laterally across the lake bottom. The two distribution options developed for this study are:

  1) Slow diffusion to the lake bottom through a series of lines and diffusers
  2) Jet delivery to the middle of the water column.

  Hydrodynamic modeling of these two options for distribution of oxygenated water (see Appendix B for details) showed that the lake experiences significant natural lateral mixing within the bottom. Thus, efficient lateral spreading of high DO water across the lake bottom can be achieved without the need for an extensive delivery system.

Evaluation & Ranking of Five Oxygenation System Configurations

The five system configurations were ranked based on criteria including cost, reliability, regulatory requirement and environmental impacts, ease of construction and O&M, constraints (political, social, recreational), and other benefits (social, environmental) using a scale 1 (Worst) to 5 (Best) (See details in Table 4.1). Based on ranking by multiple experts in the project team the **Oxygenation configurations 2 and 4 are ranked the highest with scores 4.2 and 4.0 respectively.**

Cost of Preferred Oxygenation Configurations – The Capital, O&M and Life Cycle costs of the preferred configurations 2 and 4 are presented in Table 5-3. Detailed costs of all configurations are presented in Table 4-2 and Appendix C.

Table 5-3. Capital, O&M, and Lifecycle Costs of Preferred System Configurations for Oxygenation of Lake Elsinore

Option #	System Option (Dissolution Technology)	Capital ($)	O&M ($/yr)	Lifecycle ($/25yrs)[1]
2	LOX, submerged, spoke (SP, OST)	$9,550,000	$1,650,000	$50,338,000
4	LOX, platform 2-stream, spoke (BIG)	$10,500,000	$1,750,000	$53,760,000

1) Sum of capital (2024 dollars) and annual O&M with 3 percent annual escalation over the next 25 years. Averaged over the compatible dissolution technologies
Key for compatible vendors: SP = ECO2 Speece cone, OST = Clarity Resources Group Oxygen Saturation Technology, BIG = Blue–in-Green

The recommendations of this Study are presented in the following section.

5.2. Recommendations

This study recommends a primary in-lake treatment alternative involving oxygenation with a system capacity to deliver 15,000 lbs/day of DO to Lake Elsinore bottom. Oxygenation provides a logical replacement of existing LEAMS to more effectively reduce the flux of nutrients from lake bottom

sediments. With persistent maintenance of oxic conditions in the lake bottom, oxygenation is projected to provide the internal nutrient load reduction needed to meet the demand for offsets for all external sources to meet interim milestones and final allocations in the revised TMDL. Several specific recommendations are provided below to design, construct, demonstrate effectiveness, and consider supplemental controls for an oxygenation project in Lake Elsinore.

- As concluded in Section 5-1, Option 2, a submerged system (e.g., Speece cone) at 60 MGD capacity, and Option 4, a crib with two streams (9 MGD into a high-pressure dissolution on a crib above the water and 90 MGD of dilution carrier water)are the preferred configurations. A selection of one of these two project concepts should be made during the preliminary design phase after more detailed engineering analysis of the systems & detailed assessment of capital and O&M cost and implementation feasibility.
- The results of the sediment nutrient core-flux experiments provide an estimated annual nutrient load reduction assuming DO condition are maintained above 2 mg/L relative to a baseline condition of areal extent and frequency of anoxia. These load reductions may be assumed to be achieved in the future by demonstrating that effective oxygenation maintains DO conditions at the lake bottom above 2 mg/L year-round. Continuous measurement of DO in the lake bottom will be important to assess whether the project is achieving the goal of a persistent oxic condition in the bottom waters of Lake Elsinore. DO sondes could be installed at multiple permanent locations anchored to the lake bottom and a QAPP be developed to maximize data quality and allow for lake bottom DO data to be used in NPDES compliance offset demonstrations. Installation of such equipment must incorporate anti-fouling techniques (Delgado et. al., 2021). Analysis of nutrient and other water quality parameters would continue to be collected to support general TMDL compliance monitoring.
- Estimated O&M cost in Table 4-2 amounts to ~$1.6 million/yr based on assumed full time operation of the oxygenation system. During design, smart controls should be incorporated into the oxygenation system that use data from in-situ sondes on the lake bottom to optimize DO deliveries. Given that anoxic conditions occur approximately 50% of the time annually over Type II and III sediments, the operation of the oxygenation system could be reduced by half with optimized control.
- Prior to the construction of oxygenation, the existing LEAMS system has sufficient remaining life to continue to operate and provide vertical mixing of higher DO water in the surface to the lake bottom. The Task Force may consider coordination with the Regional Board staff to allow for reduced operation of LEAMS during summer periods when data show DO conditions in the lake bottom are maintained at levels greater than 2 mg/L DO because of current ongoing addition of 5,600 lbs/day of DO via nanobubbles from three floating barges on the lake.
- An adaptive management approach is prescribed in the program of implementation for the revised TMDL with several studies to be conducted by all entities responsible for implementation of the Lake Elsinore TMDL. Adaptive management requires the TMDL Task Force to continue coordination on the process of iterative project planning, implementation, and effectiveness demonstration. A roadmap is provided in the Phase II implementation program (LESJWA, 2024). Sediment nutrient studies will be conducted every five years (Task 12) providing new information to support updated demonstrations of effectiveness of in-lake project(s) after implementation.

In addition, within the next 5 years, Task 8 of the Phase II program of implementation involves a study to evaluate cyanobacteria in Lake Elsinore after implementation of the preferred in-lake project(s) for Lake Elsinore. Based on the results of these studies, during Phase III, adaptive management may involve implementing secondary in-lake treatment to supplement oxygenation such as chemical addition for TP sequestration and wetland treatment or algae biomass removal for TN removal.

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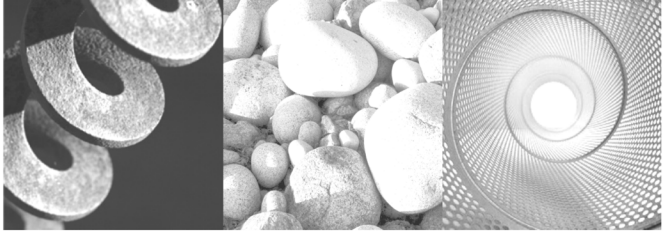
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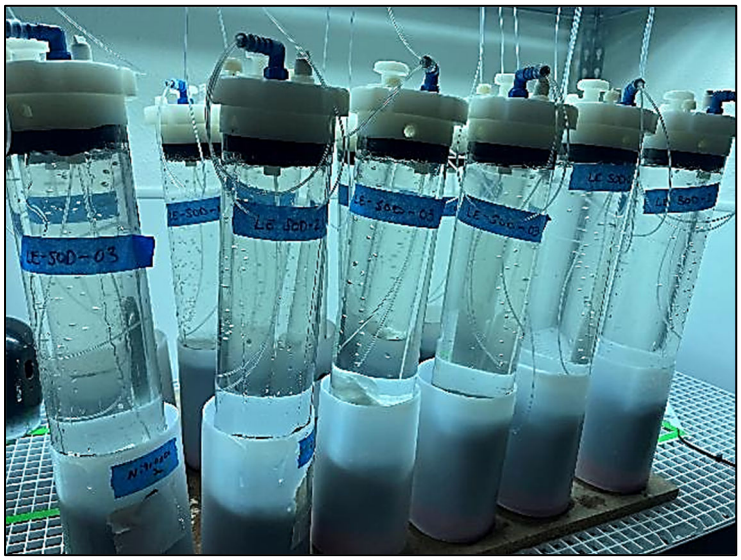
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Appendix A Results of the July 2024 Lake Bottom Sediment Oxygen Demand Study







Lake Elsinore Sediment Oxygen Demand and Nutrient Flux Study

FINAL REPORT

Lake Elsinore, California

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March 12, 2025
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1. Introduction

1.1 Background

Lake Elsinore, located in the southwest corner of Riverside County, Southern California, is a large terminal, polymictic lake known for its historical water quality issues. These include chronic cyanobacterial blooms, low dissolved oxygen (DO), high nutrient loads, and occasional fish kills. Consequently, in 1994, the California Regional Water Quality Control Board, Santa Ana Region (RWQCB), listed it on the Clean Water Act Section 303(d) list of impaired waterbodies. Current impairments identified by the RWQCB include excessive levels of nutrients, organic enrichment, and low DO.

Due to its shallow nature, with a maximum depth of 23 feet and a surface area of 3,000 acres, combined with its location in a mild semi-arid climate with hot, dry summers, the lake experiences significant evaporation. This results in an annual water loss of approximately 14,000 acre-feet, equivalent to about 4 to 4.5 feet of lake elevation. To address this water loss, improve water quality, and enhance recreational opportunities, the Elsinore Valley Municipal Water District (EVMWD) has been permitted by the RWQCB to discharge up to 7.5 million gallons per day (MGD) of recycled water into the lake.

Wastewater treatment by EVMWD removes over 80% of nitrogen (N) and phosphorus (P) from this water through tertiary treatment before discharge. EVMWD's NPDES permit allows for operation of in-lake projects to reduce internal nutrient load from the lake bottom sediments (about 75% of the long-term average nutrient load in the lake) to offset the remaining nutrient load in effluent discharge that exceeds NPDES permit limits. In 2010, as part of the Proposition 13 (Costa-Machado Water Act of 2000) Water Bond, a Lake Elsinore Aeration and Mixing System (LEAMS) was installed in Lake Elsinore to reduce internal nutrient load from lake bottom sediment and offset nitrogen and phosphorus load from recycled water in excess of NPDES permit limits.

Organic-rich sediments at the lake bottom consume oxygen through chemical and biological processes, creating a low DO or anoxic layer at the sediment water interface (SWI). This environment promotes flux of bioavailable nutrients from the sediments into the water column. LEAMS aims to increase DO near the SWI to reduce this nutrient flux by mixing the water column to circulate bottom water (low DO) to the surface and surface water (higher DO) to the bottom. Different biogeochemical processes occur to increase flux of phosphorus or nitrogen under anoxia. Given that both nutrients are addressed in the 2004 Total Maximum Daily Loads (TMDL), current EVMWD NPDES permit, and proposed TMDL revision, an updated core-flux experiment was developed to understand current sediment flux rates for both phosphorus and nitrogen.

Previous core-flux experiments showed that maintaining an oxygenated SWI in Lake Elsinore could reduce flux of phosphorus from the lake bottom by 30 percent (Anderson 2001). This reduction is more than enough to offset all phosphorus load in excess of EVMWD's permit limits and generates

surplus credits, which have been made available to offset excess phosphorus load from watershed runoff sources through multi-agency participation in LEAMS operation. Reductions in nitrogen in these same experiments was less significant (9 percent), thus only phosphorus reduction was assumed with the operation of LEAMS in the 2004 TMDL.

Post-project, routine effectiveness demonstrations were required by the Regional Board to show ongoing performance of LEAMS in 2012, 2015, 2018, 2019, 2020, 2021, 2022, and 2023. These demonstrations validated the pre-project estimates of phosphorus load reduction and showed significant nitrogen load reduction was achieved as a result of LEAMS operation. Until 2020, demonstrations of nitrogen load reduction were sufficient to offset all external loads (from EVMWD effluent and watershed runoff). In 2020, 2022, and 2023 annual effectiveness demonstrations showed insufficient reduction of the nitrogen load from lake bottom sediment. Recent reports attribute the lack of nitrogen load reduction to inefficiency in LEAMS operation to maintain oxic conditions at the SWI (Stillwater Sciences 2023). A more in-depth analysis by Horne and Anderson (2022) indicates that LEAMS has aged and is now less effective at delivering oxygenated surface waters to the bottom.

New data is needed to determine and confirm the potential annual load reduction in both phosphorus and nitrogen that could be achieved with effective, persistent, oxygenation of the SWI in Lake Elsinore. This report summarizes the results of a sediment oxygen demand (SOD) and nutrient flux study for Lake Elsinore. The findings will inform decisions about replacing LEAMS and guide the technical team in determining the appropriate method and magnitude of oxygen delivery needed for the lake bottom to effectively reduce internal sediment nutrient flux load. Lastly, the core-flux experiments will provide data needed to determine whether a project to maintain oxic conditions at the SWI, alone, will provide sufficient internal load reduction needed to offset excess external phosphorus and nitrogen loads based on anticipated allocations in the revised Lake Elsinore TMDL, which will also drive changes in subsequent NPDES permit updates (LESWA, 2024).

2. Methods

The project conducted laboratory experiments on intact sediment cores collected from multiple sites within Lake Elsinore. Two concurrent objectives were achieved through this study using the same cores: 1) quantification of sediment oxygen demand (SOD), and 2) evaluation of nutrient flux from sediments under both oxic and anoxic conditions. For the former, the study aimed to determine the oxygen consumption rate of Lake Elsinore sediments, providing necessary data to design a system for delivering oxygen to the lake bottom to achieve target dissolved oxygen (DO) conditions at the SWI. For the latter, the study design facilitated quantitative estimates of phosphorus and nitrogen flux reduction from the lake bottom sediments upon achieving oxic conditions at the SWI.

2.1 Sediment Collection

Selection of sites to collect sediment cores for experimentation in the summer of 2024 followed a previous study by Anderson (2001) which found the lake bottom sediment characteristics clustered into three general classes, as shown in **Figure 2-1** and summarized below:

- Type I (22% of the lake bottom): shallow water, coarse-textured and low in organic Carbon (C), total N and porewater nutrient concentrations.
- Type II (22% of the lake bottom): transitional sediment with a moderate organic content.
- Type III (53% of the lake bottom): finely textured, highly organic sediment found in the deepest water, having high organic C, total N, and porewater nutrient concentrations.
- Other (3% of the lake bottom): one sample did not conform to the classification scheme (i.e., high organic C, but low concentrations of porewater nutrients).

Anderson (2001) revealed that Type II and III sediments, rich in organic nutrients, were responsible for more than 95 percent of both phosphorus and nitrogen internal sediment flux load in Lake Elsinore. Consequently, this study in the summer of 2024 aimed to collect Type II and III lake sediment cores for SOD and nutrient flux experiments. First, an exploratory sediment collection effort was conducted on June 21, 2024, where sediment was collected from ten (10) locations around the lake, previously identified by Anderson (2001) as containing Type II and III sediments. Generally, the sediments at these locations were relatively homogeneous, showing no significant differences in consistency, color, odor, or organic nature, and largely matched Anderson's descriptions. However, an exception was found in the northwest corner of the lake, previously described as containing Type II transitional sediment. The sediment collected here during the June 2024 effort was much darker, had a stronger sulfide odor, and resembled Type III sediment more closely. This area is near the mouth of Leach Canyon Flood Control Channel, which discharges into the lake. Following the Holy Fire in the hills west of Lake Elsinore, the winter rains of 2019 caused significant sediment debris flow from the burn area into the lake via this channel, forming a large sediment debris delta. It is highly likely that the observed differences in the exploratory sediments

from this area are due to this event. Based on the exploratory sampling effort, sediments for the SOD study were collected on July 25-26, 2024, from four (4) locations as shown in **Figure 2-2** and **Table 2-1**.

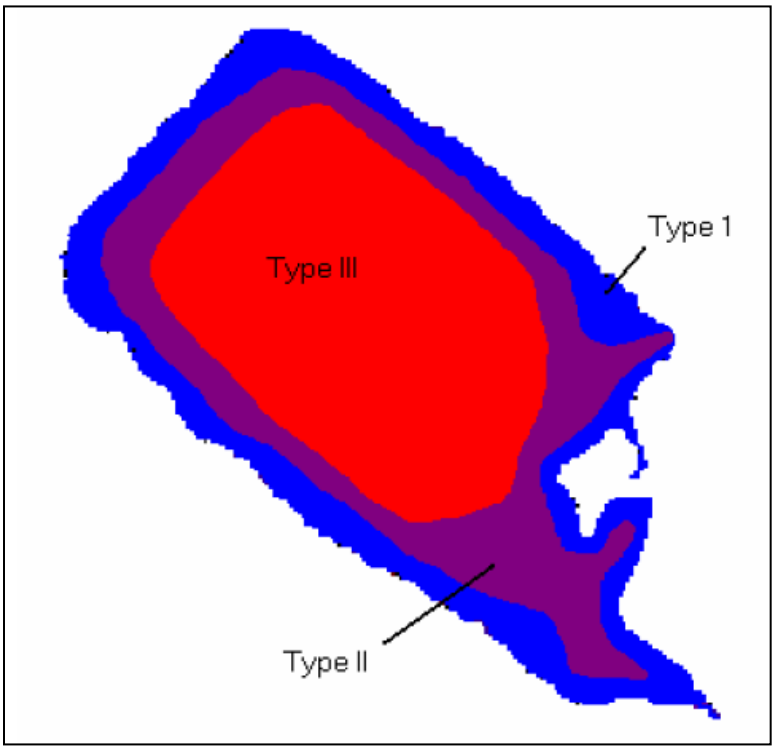


Figure 2-1. Location of Type I, II, III Sediments from Anderson (2001)

Intact surface sediments were collected using a 35-centimeter (cm) x 31-cm (0.1-m^2) Van Veen grab sampler. The VanVeen grab sampler was slowly lowered to the sediment surface to avoid the potential for over-penetration and to ensure collection of minimally disturbed sediment with an intact sediment-water interface. Once contact with the bottom occurred, the grab trigger was released, and the grab sampler was slowly brought to the surface. Once at the surface the grab sample was inspected for acceptability. An acceptable grab sample was characterized by an even surface with minimal disturbance, little or no leakage of overlying water, and a penetration depth of at least 10-cm with at least 70% of the surface intact. Grabs not meeting these criteria were discarded and noted as a failed attempt. Once a successful grab was retrieved, the sample was photographed and noted for physical characteristics, including percent surface intact, penetration depth, sediment composition, color, and associated odors. Intact cores were then subsampled from the Van Veen grab by slowly and carefully inserting a 7-cm diameter x 36-cm long (1.4-liter volume) clear Lucite tube into the sediment to a depth of 10-cm. The bottom of the core was then sealed with a cap gasket and carefully secured with electrical tape. A total of nine intact cores were collected from multiple Van Veen sediment grabs at each site, with the latitude/longitude of each sampling location recorded.

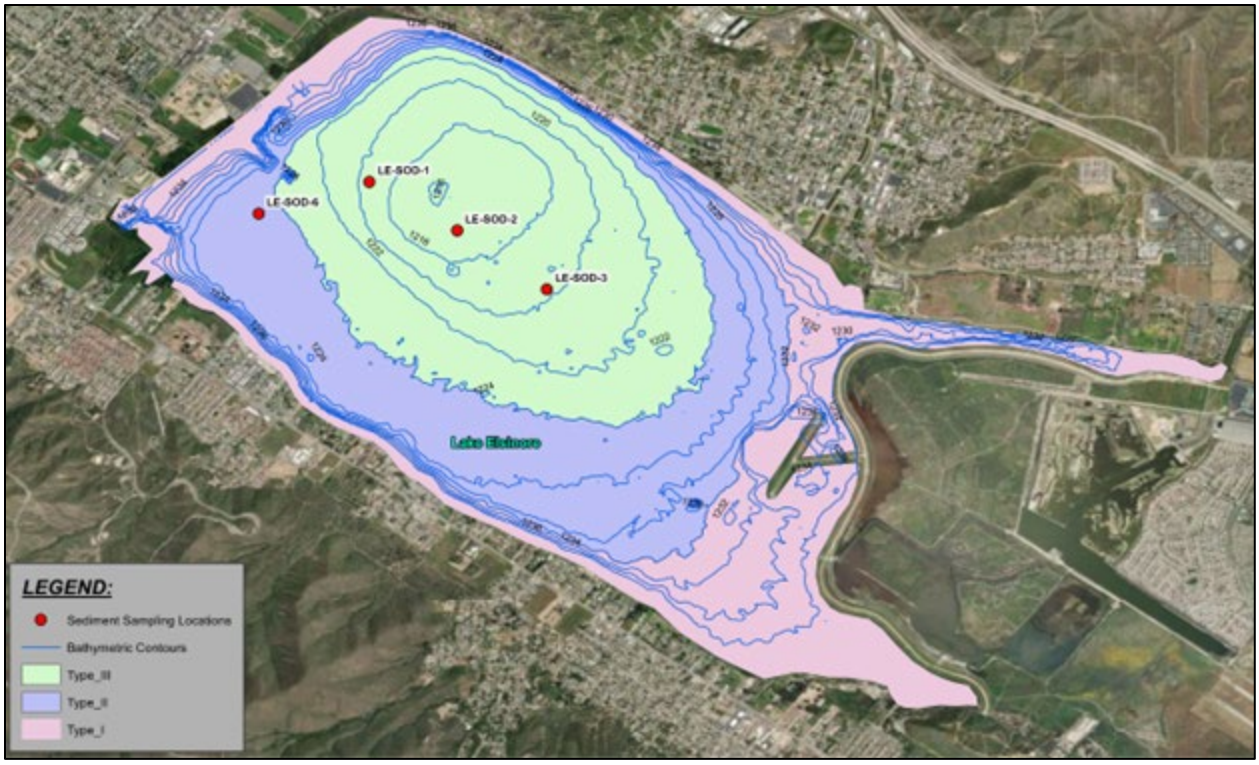


Figure 2-2. Sediment Sampling Locations for the SOD Nutrient Flux Study

Table 2-1. Sediment Sampling Locations for the SOD Nutrient Flux Study

Site ID	Latitude	Longitude	Lake Bottom Elevation (ft)	Sediment Type
LE-SOD-1	33.66910	-117.36172	1228	III
LE-SOD-2	33.66584	-117.35585	1227	III
LE-SOD-3	33.66190	-117.34984	1228	III
LE-SOD-6	33.66696	-117.36915	1230	II

Using a Van Dorn sampler, lake water was collected at a depth of 0.5 meters (m) above the sediment surface at each location. This water was then passed through a 1.2-micron (µm) filter to remove any debris and algae and then used to slowly and carefully top off each core ensuring little to no disturbance of the sediment-water interface. The top of the core was then sealed with a cap gasket and secured with electrical tape. Approximately 20 additional gallons of 1.2-µm filtered water was collected at the same depth of 0.5-m above the sediment surface into food-grade polypropylene bags. This water was transported to the laboratory for use as fresh replacement water overlying the SOD core incubations, and to measure the oxygen demand of the water alone without the sediment influence. The intact cores and additional lake water were stored on ice in a cooler while being transferred to the laboratory for testing.

Additional sediment was also collected with the Van Veen grab sampler at each location to evaluate bulk baseline physical and chemical characteristics as outlined in **Table 2-2**. Sediment samples (top 10-cm of each acceptable grab) were placed into a clean, food-grade Teflon bag and homogenized before being subsampled into multiple amber glass sample jars using a clean, stainless-steel spoon. Once at the laboratory, all intact sediment cores, filtered lake water, and bulk sediment were held at 4 degrees Celsius (°C) prior to the initiation of the SOD incubations and/or delivery to the analytical laboratory.

Table 2-2. Analyses and Methods for Whole Sediment and Porewater Collected

Analyte	Matrix	Method	Reporting Limit
Percent Solids	Whole Sediment	SM 2540 B	0.1%
Particle Size Distribution	Whole Sediment	SM 2560 D	0.1 %
Total Organic Carbon	Whole Sediment	EPA 9060	0.01 % DW
Total Inorganic Carbon	Whole Sediment	EPA 9060	0.01 % DW
Total Kjeldahl Nitrogen	Whole Sediment	EPA 351.3	5 mg/dry kg
Nitrite+Nitrate	Whole Sediment	SM 4500-P E	0.05 mg/dry kg
Total Nitrogen	Whole Sediment	EPA 9060	0.01 % dry weight
Total Phosphorus	Whole Sediment	EPA 6020	0.05 µg/dry g
Soluble Reactive Phosphorus	Porewater	EPA 300.0	0.01 mg/kg
Inorganic Phosphorus	Whole Sediment	EPA 6020	0.05 mg/kg
Labile Phosphorus	Whole Sediment	Bostom et al. (1988), Hupfer et al. (1995), Spears et al. (2007)	1 mg/kg
Aluminum-Bound Phosphorus	Whole Sediment	Psenner et al. (1984, 1988), Bostrom et al. (1988), Hupfer et al. (1995), Lukkari et al. (2007), Spears et al. (2007)	1 mg/kg
Iron-Bound Phosphorus	Whole Sediment	Psenner et al. (1984, 1988), Bostrom et al. (1988), Hupfer et al. (1995), Lukkari et al. (2007), Spears et al. (2007)	1 mg/kg
Total Iron	Whole Sediment	EPA 6020	5 µg/dry g
Iron (II)	Whole Sediment	Lukkari et al. (2007)	0.03 mg/dry kg
Total Ammonia	Whole Sediment	SM 4500-NH3 D	0.03 mg/dry kg
Total Ammonia	Porewater	SM 4500-NH3 D	0.03 mg/L
Total Sulfide	Whole Sediment	Plumb, 1981 and TERL	0.4 mg/kg

DW — Dry Weight; SM – Standard Method

2.2 Field Water Quality Measurements

Prior to the start of the sediment collection, water quality profiles were recorded at each sediment collection location at 1-m depth increments using a YSI ProDSS multimeter. The parameters measured included temperature, pH, specific conductivity (SpCond), DO, oxidation reduction potential (ORP), and turbidity. This information provided measures of water quality at the time of the sediment collection and also a baseline measure for the SOD and nutrient flux study.

2.3 Laboratory Sediment Incubations

On July 29, one day prior to the initiation of the SOD incubations, the intact cores were placed within a temperature-controlled environmental room in the dark at 25°C and allowed to equilibrate overnight. Intact cores were randomized within each treatment to minimize any variability associated with slight temperature variations within the room. On July 30 the morning of test initiation, the overlying lake water within each of the 36 cores was carefully siphoned off to within a few millimeters of the sediment surface, ensuring that the soft upper flocculant sediment layer was not disturbed. Filtered lake water collected at the time of sediment collection was warmed to 25°C, aerated to DO saturation, then slowly and carefully added to top off each incubation chamber with minimal to no headspace. The sediment chambers were then allowed to sit for two hours to allow suspended material to settle out of the water column. Initial overlying water quality parameters of temperature, DO, pH, specific conductivity (SpCond), and oxygen reduction potential (ORP) were recorded in the filtered lake water prior to adding to the individual cores. In addition, an aliquot of filtered lake water was collected as an initial Time 0 sample for total phosphorus, total nitrogen, ammonia as NH_4, SRP, and total and soluble iron (**Table 2-3**). Each chamber was then sealed using a cap with a small one-way port used to allow air to escape in the core chambers outlined below.

The sediment cores were then subjected to simultaneous incubation under three distinct treatments:

Treatment 1: Static, No-Aeration - primary source for SOD data

Treatment 2: Nitrogen Gas Bubbled - primary source of the nutrient flux data representing anoxic SWI conditions

Treatment 3: Ambient Air Aeration - control representing oxic SWI conditions

Table 2-3. Analytes Measured in Incubation Chamber Overlying Water

Analyte	Method	MDL
Ammonia as NH_4	Hach Ammonia TNT831 Plus Vial Test Kit	1-12 mg/L
Soluble Reactive Phosphorus (SRP)	EPA 300.0	0.002 mg/L
Total Phosphorus	EPA 200.8	0.016 mg/L
Total Nitrogen	SM 5310 B-N Module	0.28 mg/L
Total Iron	EPA 200.8	1.13 µg/L
Dissolved Iron	EPA 200.8	1.13 µg/L

MDL – Method Detection Limit; SM – Standard Method

Immediately before test initiation, all replicate cores were gently aerated with ambient air until fully saturated, ensuring identical conditions in all replicates at the beginning of the experiment. Three replicates of each site sediment were then taken off aeration (Treatment 1) and remained in this condition for the duration of the testing period. Three replicates of each site sediment were bubbled with nitrogen gas (Treatment 2) to strip dissolved oxygen from the overlying water maintaining an anoxic environment while also gently mixing the water column. The final three replicates of each site continued to be aerated with ambient air (Treatment 3) to maintain elevated DO in the overlying water while also gently mixing the water column. Treatments 2 (anoxic) and 3 (oxic) were bubbled continuously until the DO concentration in Treatment 2 dropped below 1.0 mg/L, at which time bubbling of both treatments was discontinued. The overlying water in Treatments 2 and 3 was briefly sparged multiple times daily as needed with nitrogen or ambient air respectively to maintain DO treatment conditions and to gently mix the water column within the core. Care was taken to not disturb the sediment surface when sparging. The cores were held under these conditions for 5 days.

At the end of the 5-day treatment period the conditions for Treatments 2 and 3 were swapped and allowed to run an additional 5 days, so that cores being held under aerated oxic conditions were now bubbled with nitrogen to purge/maintain a low DO and vice versa. It was determined that 5 days would be sufficient time for the chambers to reach equilibrium conditions based on a pilot SOD study performed with Lake Elsinore sediments in January 2024 and prior SOD studies by Beutel (2003, 2006). Switching the DO regime after 5 days of the study provided an assessment of nutrient flux under two conditions:

- Typical stratified conditions during late summer months (bottom water anoxic) transitioning into more frequently destratified conditions in late fall/winter (elevated dissolved oxygen in bottom water)
- Typical destratified conditions in winter (elevated dissolved oxygen in bottom water) transitioning into more frequently stratified conditions in late spring/summer (bottom water anoxic).

Measurements of DO in the overlying water were recorded hourly for the first 6 hours within each replicate, followed by measurements at the 8, 12, and 24-hour marks, and once daily thereafter. During the first day leading up to the 24-hour mark, DO readings were recorded at the surface, mid-column, and within 1 cm of the sediment surface. Measuring water quality at multiple depths within each chamber documented any micro-stratification that might have occurred, which we had observed in prior core studies. This approach also ensured that cores receiving aeration were being properly mixed. If measurements in any aerated replicate indicated a stratification of DO anytime during the study period, the aeration was immediately increased to compensate, and the DO was rechecked within 2 hours to verify lack of stratification.

Water quality measurements of pH, SpCond, and temperature were recorded once daily at the midpoint of the water column. The water quality probe was rinsed with deionized water between replicate readings to prevent cross-contamination. Prior to the start of each day, the YSI ProDSS meter was calibrated by laboratory staff using new calibration standards. Daily visual observations of the sediment surface within each replicate were also made to document changes in color and/or bacterial mat growth. Photographs were taken if any changes were noted in the incubation chambers.

Beginning Day 6 when the oxic (ambient air aeration) and anoxic (nitrogen aeration) treatments were switched, more frequent measurements of DO were again recorded as previously described in these two treatments for the first 24 hours after the switch. These readings were taken only at the midpoint of the water column as no vertical stratification was observed in either the oxic or anoxic treatment cores during the initial 24-hour measurement period. Water quality measurements of pH, SpCond, and temperature were again recorded once daily at the midpoint of the water column. Additionally, since the static, non-aerated cores were primarily used to determine the SOD of site sediments, and the DO in these replicates had come to equilibrium by Day 3 (with measurements ranging from 0.3 to 0.5 mg/L from Days 3 to 5), water quality readings were not recorded for these replicates from Days 6 to 10.

Analytical chemistry subsamples for total nitrogen, total phosphorus, SRP, ammonia as NH_4 and total and soluble iron were collected at test initiation in water prior to placement in the replicates (referred to as day zero sample), and once daily throughout the duration of the study from each test chamber. Subsamples were collected from each chamber using a plastic pipette for total nitrogen, total phosphorus, ammonia as NH_4, and total iron and deposited directly into lab-supplied pre-cleaned containers. Subsamples for SRP and dissolved iron were collected from each chamber with a plastic syringe, then pushed through a 0.45-micron nylon disc filter into lab-supplied pre-cleaned containers.

In order to isolate effects of SOD, the combined impact of biological oxygen demand (BOD) and chemical oxygen demand (COD) of the overlying lake water alone (i.e., water oxygen demand (WOD)) was also measured. This was performed by concurrently incubating lake water alone (without underlying sediment) within five replicate 500-milliliter (ml) opaque High-Density Polyethylene (HDPE) bottles. After the HDPE bottles were filled, all were aerated to DO saturation. The DO concentration in each bottle was then recorded, tightly capped, and placed next to the sediment incubation chambers. The DO concentration was then measured in one bottle each day for

a period of 5 days. This data was used to correct for DO being consumed within the water column alone to be subtracted from total oxygen loss in sediment incubation chambers to estimate SOD.

2.4 SOD and Nutrient Flux Calculations

A zero-order model was chosen to estimate SOD from temporal trend of dissolved oxygen measurements in the static, non-aerated cores. SOD was estimated as the slope of the best fit line for DO concentrations against time. SOD was then converted to a flux ($mg/m^2/day$) by multiplying the slope by the volume of the test chamber overlying water and dividing that product by the area of the test chamber sediment surface (38 cm^2 or 0.0038 m^2).

Zero-Order Model Equation

$$SOD = (m * V)/A$$

Where, SOD = the sediment oxygen demand in $mg/m^2/day$, m = the slope of the best fit line for DO concentrations over time, V = the volume of the overlying water (liters), and A = the area of the sediment surface (m^2).

The calculation of nutrient and iron flux rates from the sediment into the overlying water were performed by determining the slope of the best-fit line over time using the least squares method, as in Beutel (2006). This was adjusted for the mass removed during overlying water subsampling and divided by the sediment surface area of the chamber.

Nutrient Flux Rate

$$NF = m/A;$$

$$M_i = (C_i * V) - (C_i * V_{sub}) + (C_0 * V_{rep})$$

Where, NF = the nutrient/iron flux rate in $mg/m^2/day$, m = the slope of the best fit line of nutrient mass (M_i) over time, accounting for daily adjustments from the mass removed during water subsampling. Mass removed during subsampling ($C_i * V_{sub}$) was based on concentration in the core on day i (C_i) multiplied by the volume of water removed for sampling (V_{sub}) and mass added with replenishment water ($C_0 * V_{rep}$) based on concentration in Day zero replenishment water (C_0) multiplied by the volume of water added to replenish core (V_{rep}), and A = the area of the sediment surface (m^2). The volume of water removed for subsampling was roughly equal to the replenishment volume and had minimal influence on the estimate of nutrient flux, amounting to 50mL per day, or ~4% of the total water volume of the core.

2.5 Data Recording

All field and laboratory data were recorded on project-specific data sheets. The field components of the study consisted of water quality profile data sheets as well as sediment station occupation and characterization forms. These forms contained site descriptions and weather conditions, GPS location, as well as observed parameters for all sediment samples collected. Laboratory data sheets contained water quality measurements for the duration of the study, as well as a daily Quality Assurance/ Quality Control (QA/QC) checklist to ensure all tasks were completed.

3. Results

3.1 Whole Sediment and Porewater Chemistry

Whole sediment chemistry and porewater results are presented in **Tables 3-1** and **3-2**.

Two types of sediment as described in Anderson (2001) were targeted for collection in this study: Type II and Type III sediments. Analytical results for sediments collected generally matched the characteristics described by Anderson, with results for Sites LE-SOD-1, LE-SOD-2, and LE-SOD-3 falling within the higher concentration ranges of organic matter, total phosphorus, porewater ammonia, and porewater SRP representative of Type III sediment. Site LE-SOD-6 generally matched Type II sediment characteristics with lower concentrations of these same analytes.

Total phosphorus results in Type II and III whole sediment were within the range reported in Anderson (2010), while total nitrogen results in Type II and III whole sediment were above nitrogen levels obtained by Dr. Anderson. Of the three Type III sediments collected, only LE-SOD-3 exhibited a total ammonia porewater concentration similar to that observed in the 2010 Anderson study. Concentrations of ammonia in porewater from Sites LE-SOD-1 and LE-SOD-2 were above those found in the Anderson 2010 study, while the concentration of total ammonia in porewater from Site LE-SOD-6 Type II sediment was within the range obtained by Anderson.

Total iron results in Type II and III whole sediment were within the range reported in Boudreau (2015) for Lake Elsinore sediments collected within the top 10 cm. The ratio of iron to total phosphorus (Fe:P) is one measure for the potential phosphorus sequestration that may occur with oxic conditions at the SWI. Oxygenation impacts the release of iron bound phosphorus, whereby under oxic conditions, iron Fe(III) binds with P, effectively sequestering it in the sediment. Therefore, when more P is iron bound, the benefit of oxygenation could be far greater. Results from the 2024 sediment study estimated Fe:P ratios ranging from 29 to 91 (Table 3-1). A previous study by Boudreau (2015) estimated Fe:P ratios near Sites LE-SOD-2 and LE-SOD-3 of 34, similar to current findings for those two sites. An Fe:P ratio above 15 suggests good phosphorus binding capacity under oxic conditions, where iron exists as Fe(III) (Jensen et al.1992).

Despite the high Fe:P ratios in Lake Elsinore sediment, a relatively low proportion of iron-bound phosphorus relative to total mobile phosphorus (sum of labile P, iron-bound P, organic P, and metal oxide P fractions) was observed at the four sites sampled for this study (range of 40 to 46%). Boudreau (2015) also found similar ratios of iron-bound phosphorus to mobile phosphorus in Lake Elsinore (approximately 40% in all samples collected). High sulfide concentrations, especially as observed at Sites LE-SOD-1 and LE-SOD-2, can inhibit phosphorus binding capacity by forming iron disulfide (FeS_2) under anoxic conditions, which are common near the sediment surface in Lake Elsinore. Under anoxic conditions, not only is phosphorus released when Fe(III) is reduced to Fe(II), but FeS_2 formation locks up iron, preventing it from binding to phosphorus. Anderson

(2001) identified elevated sulfide concentrations (up to 50 mg/L) in the sediment porewater of Lake Elsinore via peeper studies. He observed that the sediment geochemistry of Lake Elsinore is predominantly characterized by strongly reducing conditions, facilitating the formation of FeS_2. Furthermore, the upper 10-cm of sediment was found to be a zone of intense sulfate reduction, as evidenced by high sulfide concentrations throughout much of the year. This elevated sulfide concentration inhibits Fe(II) levels in the porewater through the formation of FeS_2. Consequently, high rates of sulfate reduction limit the formation of iron(III) oxyhydroxide in the sediments, thereby diminishing iron's role in controlling phosphorus solubility. In a subsequent study conducted in 2010, Anderson determined that approximately 84% of the iron speciation in Lake Elsinore sediment was present in reduced sulfidic forms.

Anderson (2003) found that Canyon Lake, situated just upstream from Lake Elsinore, had sediments with total iron concentrations ranging from 10,500 to 53,000 mg/kg (mean 31,000 mg/kg, n=23), which is within the current range observed in Lake Elsinore. Boudreau (2015) found that 87% of total mobile phosphorus in Canyon Lake bottom sediment is within iron-bound pool. This is significantly higher than the 40-46% proportion observed in Lake Elsinore (Table 3-1). The disparity in iron-bound phosphorus in bottom sediments between the two lakes may be attributed to the high organic matter content in Lake Elsinore. As a terminal lake acting as a sink, and with high algal productivity and algal detritus, Lake Elsinore supports extensive microbial decomposition reactions, leading to elevated sulfide concentrations. These sulfides can bind with iron thereby limiting the sediment iron-phosphorus binding ability.

It is likely that the high organic matter in Lake Elsinore leading to increased sulfide production, create a unique benthic environment in Lake Elsinore with low sediment-phosphorus sequestering capacity. Thus, the magnitude of potential reduction in phosphorus flux with oxygenation is limited by the sediment geochemical composition. Supplemental additions of chemical binders (aluminum, lanthanum, calcium) may be used to supplement oxygenation in the event that reductions are not sufficient to offset all excess external load in the future.

Table 3-1. Whole Sediment Chemistry Results

Analyte	LE-SOD-1	LE-SOD-2	LE-SOD-3	LE-SOD-6	Anderson (2010)		Boudreau (2015)
					Type II	Type III	
Physical Characteristics (%)							
Solids	13	10	11	26	NR	NR	NR
Total Organic Matter Content	20	25	25	12	NR	NR	NR
Total Organic Carbon	5.9	7.1	7.4	3.5	2.4	6.3	5.8
% Fines (Silt+Clay)	80	72	75	81	55.1	98.3	NR
Clay (<0.0039 mm)	8	7	9	5	13.2	52.3	NR
Silt (0.0039 to <0.0625 mm)	72	65	66	76	41.9	46.0	NR
Sand (0.0625 to <2.0 mm)	20	28	25	19	44.9	1.7	NR
Granule (2.0 to 4.0 mm)	ND	ND	ND	ND	0	0	NR
Phosphorus Fractionation (mg/kg DW)							
Total Phosphorus	980	1076	1092	791	841	785	1250
Organic Phosphorous	152	185	159	108	156	191	NR
Inorganic Phosphorus	828	891	933	683	685	594	NR
Stable Phosphorous	352	336	394	402	NR	NR	NR
Residual Phosphorous	325	397	411	182	NR	NR	NR
Labile Phosphorus	ND (<3.9)	ND (<5.0)	ND (<4.5)	ND (<1.9)	NR	NR	NR
Releasable (Mobile) Phosphorus	205	222	176	133	NR	NR	NR
Aluminum-Bound Phosphorus	57	60	58	45	NR	NR	160
Iron-Bound Phosphorus	94	99	70	54	NR	NR	75
Nitrogen and Sulfides							
Total Nitrogen (mg/kg DW)	9400	12400	20000	18300	3000	5200	6000
Ammonia as N (mg/kg DW)	413	401	272	78	NR	NR	NR
Total Sulfides (mg/kg DW)	892	870	567	418	NR	NR	NR
TN:TP Mass Ratio	10	12	18	23	NR	NR	NR
Iron Fractionation (mg/kg DW)							
Ferrous Fe (II)	ND (< 5)	ND (< 5)	ND (< 5)	ND (< 5)	NR	NR	NR
Reducible Fe (III)	327	428	241	251	NR	NR	NR
Metal Oxide Fe (III)	454	359	320	440	NR	NR	NR
Total Fe	88900	30700	37300	45900	NR	NR	55000
Fe:TP Ratio	91	29	34	58	NR	NR	34

ND – not detected; DW — dry weight; NR – not reported
Note: The absence of labile-phosphorus and Fe(II) observed in the sediment may be an artifact of the sampling method. Exposure to oxygen during sample collection has the potential to oxidize Fe(II) to Fe(III) and labile-phosphorus to iron-bound phosphorus. Since the sediments were collected during an anoxic period in late July, it is likely that some concentration of labile-phosphorus and Fe(II) was present at the time of collection

Table 3-2. Sediment Porewater Chemistry Results

Analyte (mg/L)	LE-SOD-1	LE-SOD-2	LE-SOD-3	LE-SOD-6	Anderson (2010) Type II	Anderson (2010) Type III
Dissolved Orthophosphate as P	3.71	3.67	4.16	2.81	4.5	5.7
Ammonia as N	20.4	26.6	17.8	14.4	12.7	16.3

3.2 Sediment Oxygen Demand

This section focuses specifically on DO as it relates to SOD. A suite of other supporting water quality parameters including temperature, pH, and conductivity was measured daily in each of the replicate cores. A summary of these results can be found in Attachment A-1.

Measured WOD in lake water from samples collected near the bottom immediately prior to sediment sample collection (Day zero sample used for core overlying water) was 0.86 mg/L/day (**Figure 3-1**). This WOD value is similar to that found in Lake Elsinore in previous studies by Beutel (2000) at 0.80-0.94 mg/L/day and Anderson (2001) at 0.50-1.8 mg/L/day.

Oxygen depletion curves in Treatment 1 cores (static, non-aerated) were consistent among all four site sediments, with all sites exhibiting a similar decrease in overlying water DO as shown in **Figure 3-2.** Within the first 12 hours, the mean overlying water DO concentration for each site declined by 40 to 47%, from an initial concentration of 8.5 mg/L to between 4.5 and 5.1 mg/L, and during the following 12 hours decreased an additional 27 to 38%. Daily DO measurements were discontinued in the static, non-aerated cores after Day 5, as the overlying water DO had reached an equilibrium point of <1.0 mg/L, and the primary purpose of these cores was to determine SOD rather than nutrient flux rate. The DO concentration in the static, non-aerated cores was checked twice during the Day 6 to 10 period, both times measuring <1.0 mg/L in all replicates.

The SOD experiments performed for this study were conducted under static, quiescent conditions with no continuous, active mixing of the overlying water. In Lake Elsinore, dynamic variables impact conditions within the lake bottom. The most notable difference between the quiescent experimental chamber and large lake involves dynamic currents at the lake bottom. Water velocities near the sediment were measured to reach 3-4 cm/sec routinely over a two-week period (Anderson, unpublished 2001 data). Beutel (2003) and Nakamura et al. (1994) showed movement of water near the SWI within sediment oxygen demand SOD experimental cores can disturb the diffusive boundary layer allowing for more efficient diffusion of DO from overlying water into the sediment, thereby increasing the SOD 2 to 4 times. While no continuous mixing equipment was used during this SOD study, daily water quality measurements with probes inserted into each test chamber acted to mix the water column to some degree and most likely disturbed the diffusive boundary in these "static" cores. The effects of mixing within the overlying water of SOD cores may approximate

environmental conditions found in Lake Elsinore as a result of natural hydrodynamics and aeration in Lake Elsinore which cause vertical mixing to bring water with higher DO to the lake bottom.

Area estimates of WOD-corrected SOD were consistent among the four site sediments, ranging from 0.81 to 0.86 g/m^2/day of DO loss attributable to lake bottom sediment, with a mean of 0.84 g/m^2/day (**Figure 3-3**). These values are comparable to Lake Elsinore SOD estimates in previous studies by Beutel (2000) of 0.92-1.8 g/m^2/day and Anderson (2010) of 0.93 g/m^2/day, as well as a 2003 Beutel study which found 0.43-0.80 g/m^2/day in two other hypereutrophic lakes within California. Extrapolating the mean SOD rate (0.84 g/m^2/day) to the bottom area in Lake Elsinore encompassing Type II and Type III sediments (approximately 2000 acres) would equate to ~14,900 pounds (lbs) of oxygen per day consumed by sediments.

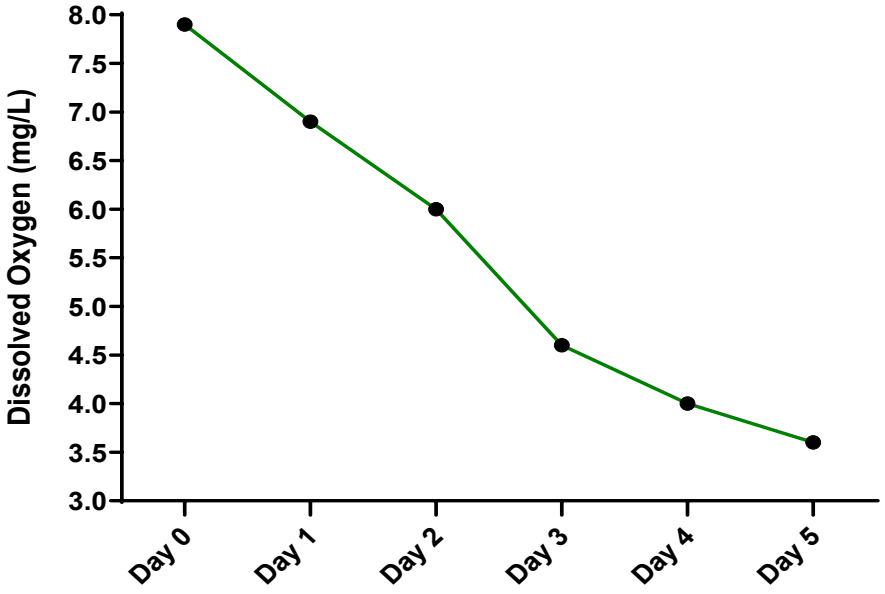


Figure 3-1. Dissolved Oxygen Consumption Over Time in Lake Water for Derivation of Overlying Water Oxygen Demand (WOD)

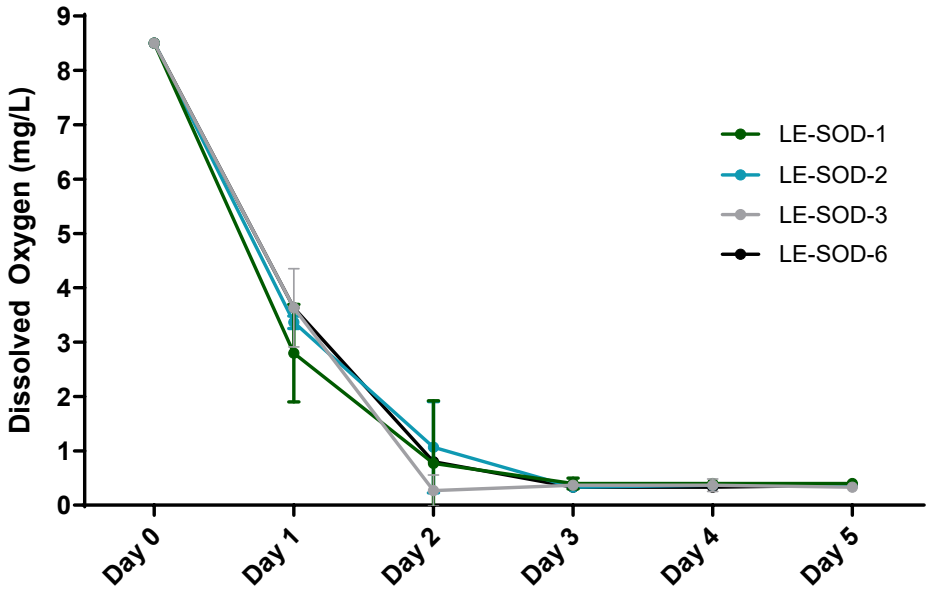


Figure 3-2. Dissolved Oxygen Concentrations Over Time in the Intact Sediment Core Study for the Static, Non-Aerated Treatment for Derivation of Sediment Oxygen Demand (Mean±1 standard deviation (SD), n=3)

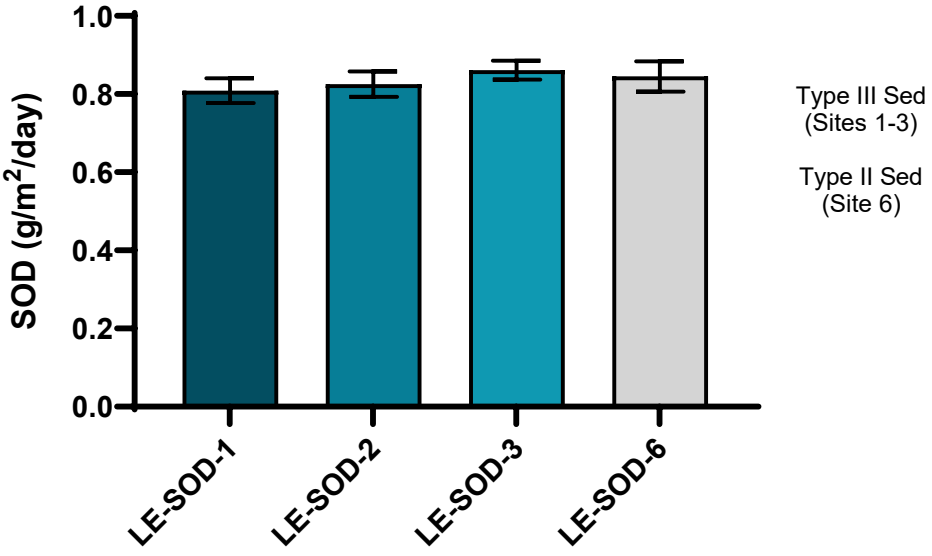


Figure 3-3. Calculated Sediment Oxygen Demand (g/m^2/day) for Site Sediments Corrected for WOD (Mean ±1 SD, n=3)

3.3 Sediment Nutrient Flux to Overlying Water

3.3.1 Concentration of Dissolved Oxygen and Nutrients in Overlying Water

Dissolved oxygen concentrations in the experimental cores were successfully maintained at prescribed study design conditions (**Figure 3-4**). Between days 5 and 6, the DO treatment of cores was switched, as indicated by changes in the color and marker shape for line plots of the same set of cores. The same plotting approach was employed for creating time series line plots of nutrient concentrations, with a transition in DO treatment between days 5 and 6.

During the Day 0-5 oxic treatment phase, DO levels ranged from 7.0-8.5 mg/L across all sites through Hour 12, but exhibited a decrease between the 12-hour and 24-hour mark to approximately 6.0 mg/L, then remained between 6.0-7.0 mg/L for the remainder of the Day 0-5 treatment period. This decrease in DO in the oxic treatment between the 12-hour and 24-hour mark coincided with the fastest rate of decline in the static, non-aerated cores, suggesting this decrease in the oxic cores may have been the result of an increased oxygen demand during this period. Despite this, the DO in the oxic treatment remained high enough to maintain sufficient oxygen levels in the chambers for the oxic/anoxic purposes of the study. During the Day 0-5 anoxic treatment phase, DO levels in the cores bubbled with nitrogen decreased to <1.0 mg/L within 2 hours for all sites and remained there for the duration of the Day 0-5 period. During the first 5-day period, all sites exhibited increased overlying water concentrations for all nutrients measured (TP, SRP, TN, NH_4) under anoxic conditions (black line with square markers) relative to that observed in the oxic (blue line with circle markers) cores (**Figures 3-5 to 3-8**).

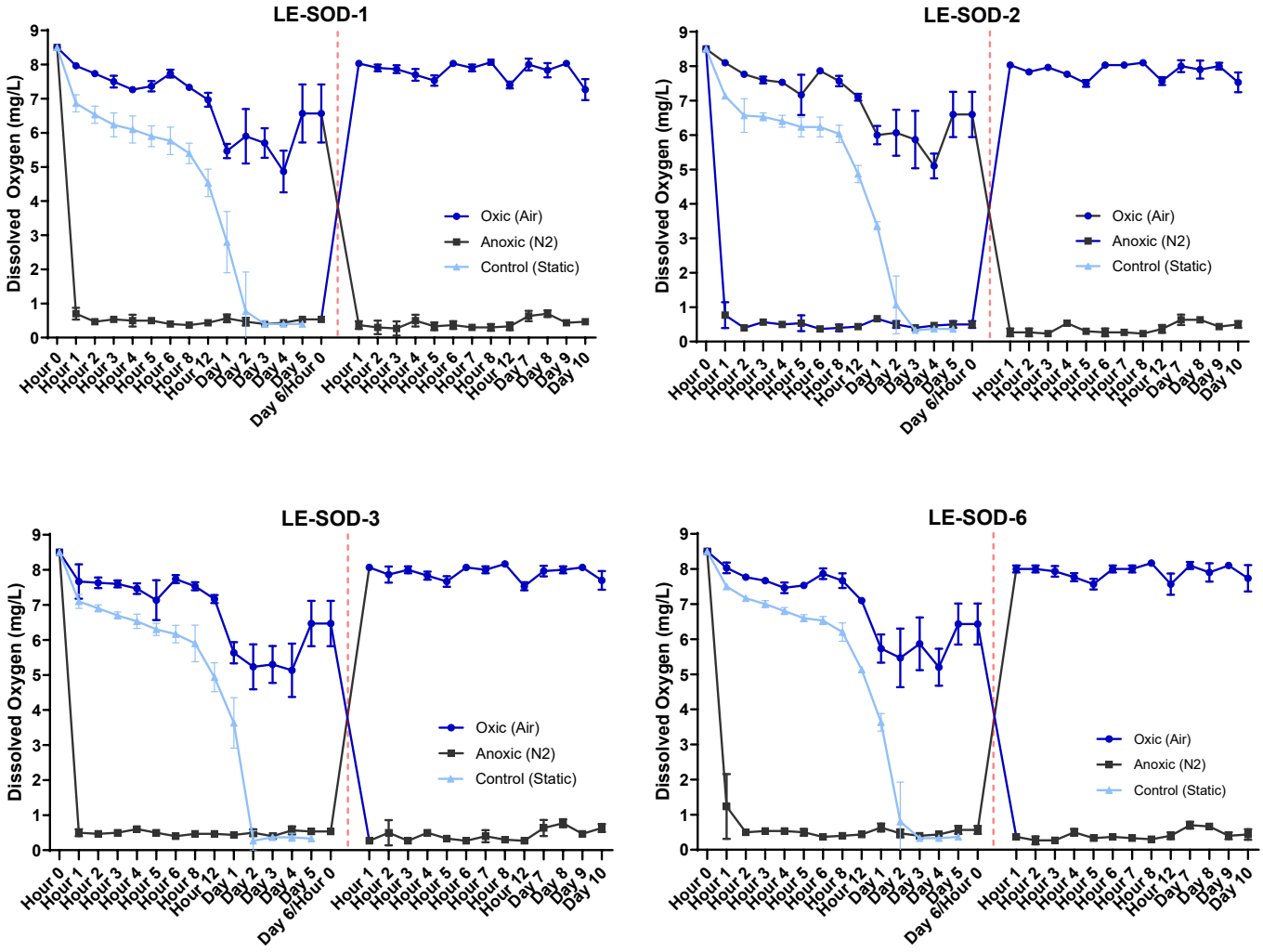


Figure 3-4. Dissolved Oxygen Concentrations During the 10-Day Nutrient Flux Study (Mean ±1 SD, n=3).

The dotted red line indicates the time between Day 5 and Day 6 when the anoxic (N2) and oxic (Air) treatments were switched within the replicate cores.

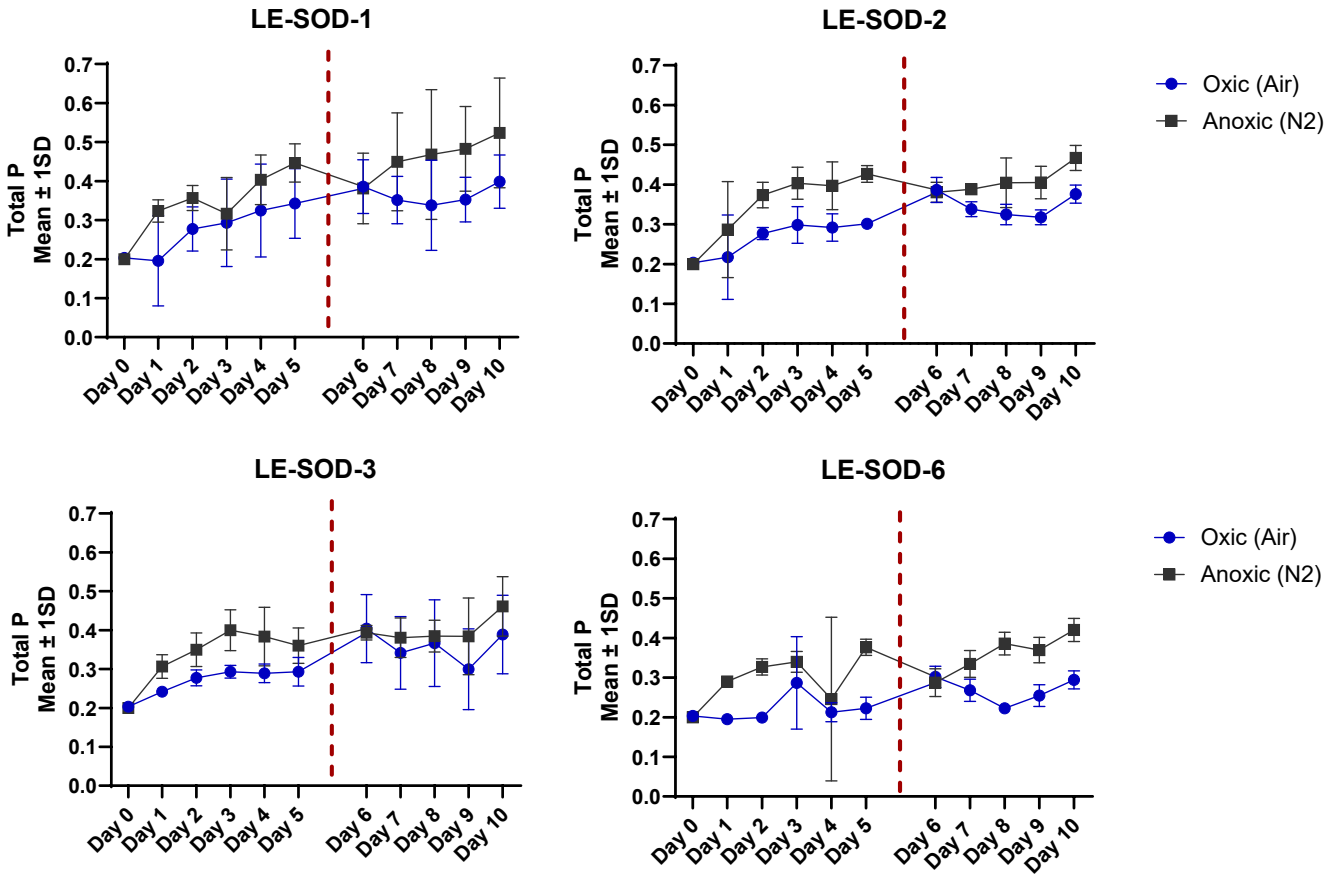


Figure 3-5. Concentrations of Total Phosphorus (mg/L) in Overlying Water During the 10-Day Nutrient Flux Study (Mean ±1 SD, n=3).

Dotted red line indicates the time between Days 5 and 6 when the anoxic (N2) and oxic (Air) treatments were switched within the replicate cores. Each line changes color and symbol to match treatment condition at the time the data was collected.

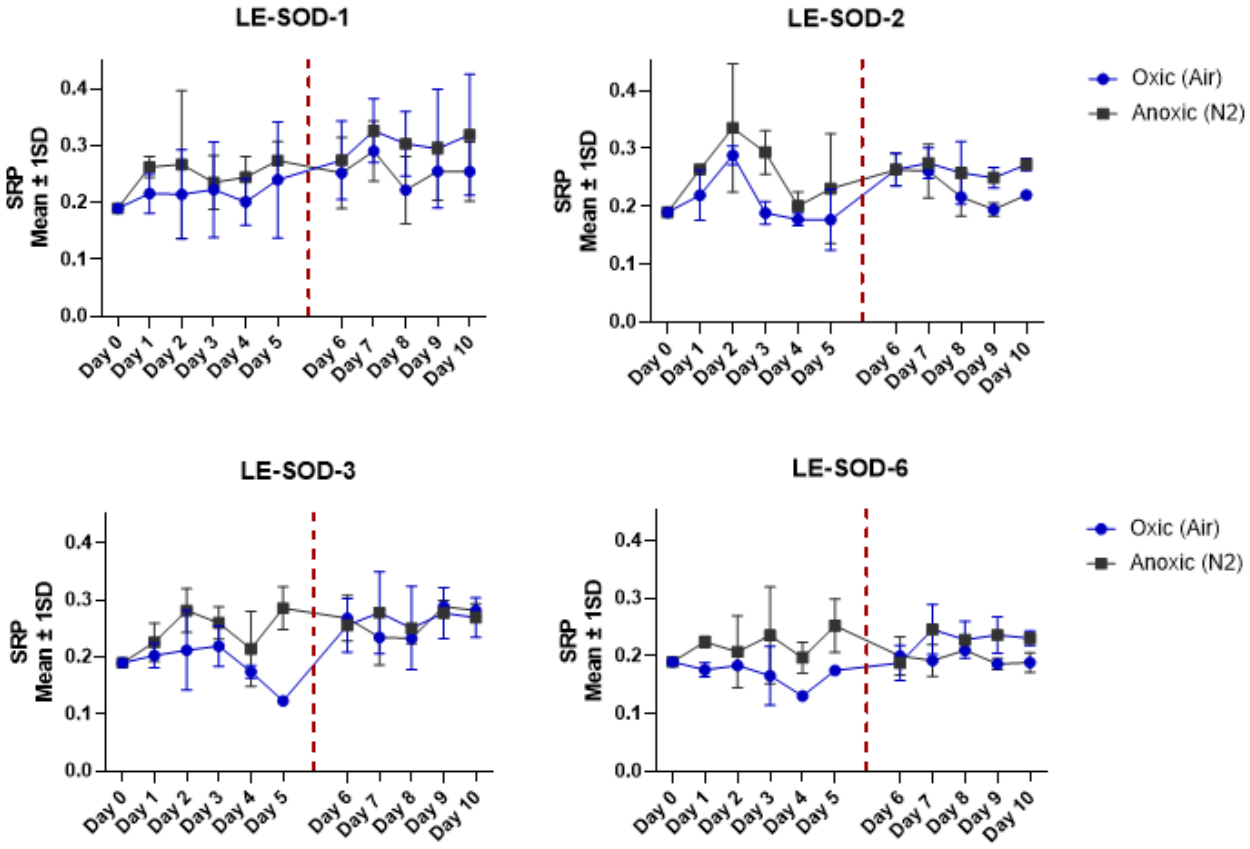


Figure 3-6. Concentrations of Soluble Reactive Phosphorus (mg/L) in Overlying Water During the 10-Day Nutrient Flux Study (Mean ±1 SD, n=3).

Dotted red line indicates the time between Days 5 and 6 when the anoxic (N2) and oxic (Air) treatments were switched within the replicate cores. Each line changes color and symbol to match treatment condition at the time the data was collected.

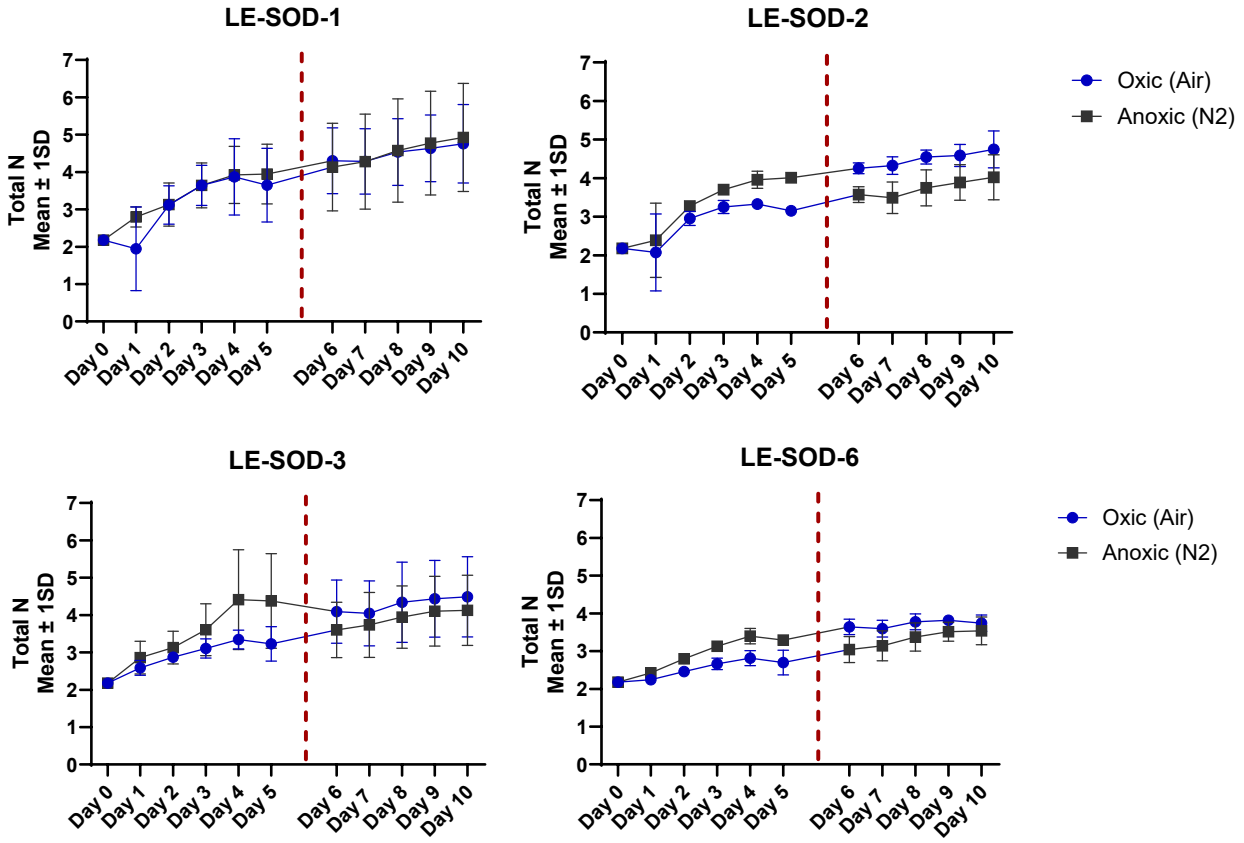


Figure 3-7. Concentrations of Total Nitrogen (mg/L) in Overlying Water During the 10-Day Nutrient Flux Study (Mean ±1 SD, n=3).

Dotted red line indicates the time between Days 5 and 6 when the anoxic (N2) and oxic (Air) treatments were switched within the replicate cores. Each line changes color and symbol to match treatment condition at the time at the time the data was collected.

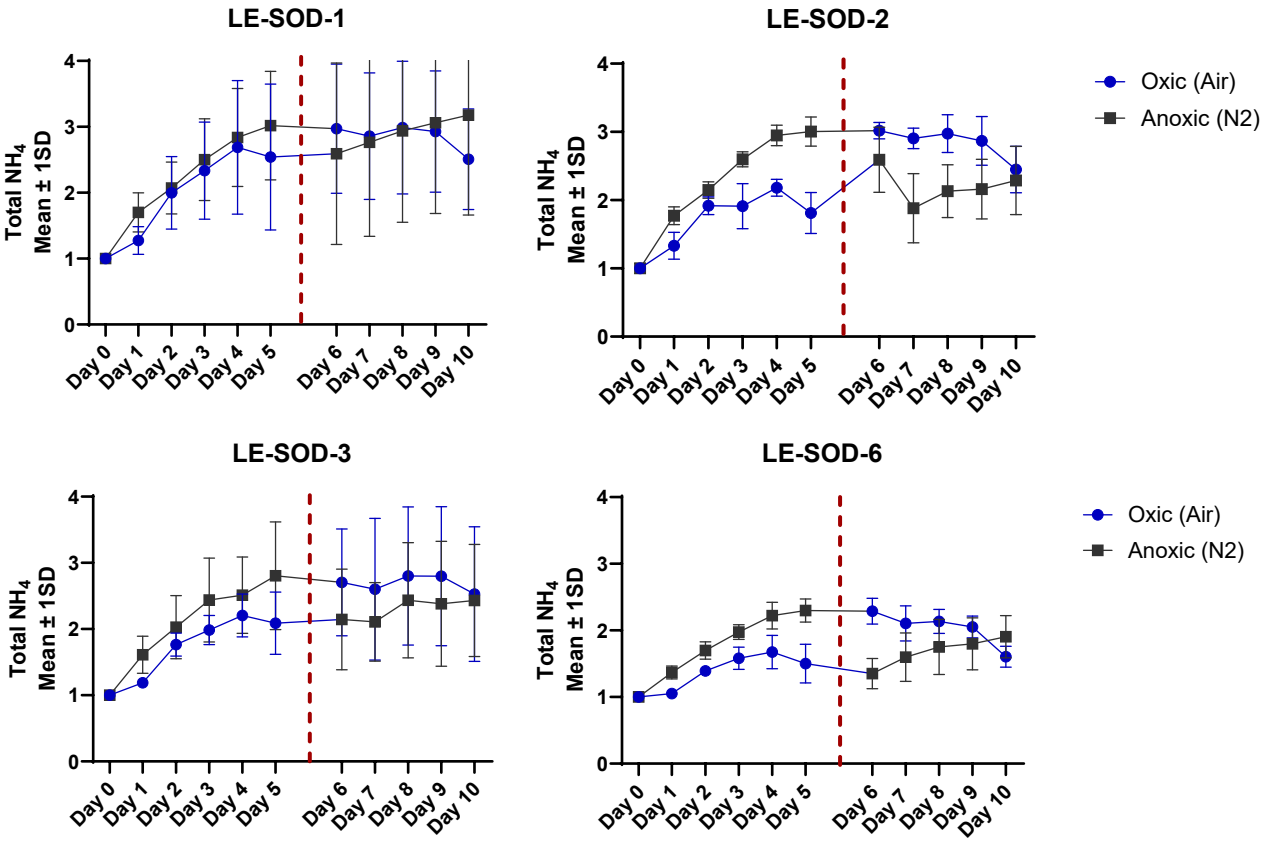


Figure 3-8. Concentrations of Total Ammonia (mg/L) in Overlying Water During the 10-Day Nutrient Flux Study (Mean ±1 SD, n=3).

Dotted red line indicates the time between Days 5 and 6 when the anoxic (N2) and oxic (Air) treatments were switched within the replicate cores. Each line changes color and symbol to match treatment condition at the time at the time the data was collected.

3.3.2 Nutrient Flux Results Day 0-5

Nutrient flux was determined by evaluating the cumulative nutrient mass in each core over time accounting for mass removed during water subsampling (see Section 2.4 above for calculation methodology). **Table 3-3** and **Figure 3-9** provide a summary of calculated average nutrient flux (TP, SRP, TN, NH_4) under different DO treatments for Type II and III sediments during the initial 5-day period. Under oxic conditions, the mean flux rate of TP, TN, and NH_4 in both Type II and III sediments was less than that exhibited in anoxic cores. For SRP, the mean flux rate of SRP in three of the four sediments held under oxic conditions was negative, indicating that the sediment acted as a sink for SRP, with the elevated oxygen facilitating the movement of SRP from water into the sediment. Site LE-SOD-1 which had a positive flux under oxic conditions, still exhibited approximately 30% less flux than the same sediment under anoxic conditions. Conversely, anoxic cores of both sediment types exhibited a positive flux mean.

The large difference observed between SRP and TP flux rates departs from the conceptual model whereby most phosphorus flux from lake bottom sediment is in soluble form. One potential explanation could involve an unintended uptake of SRP by phytoplankton within the overlying water column, which would be captured with TP analysis. This could have occurred despite the experimental design that sought to prevent phytoplankton growth within the cores by filtering the overlying water prior to experimentation. Therefore, results for phosphorus flux to support projections of load reduction from oxygenation were based on TP measurements.

3.3.3 Nutrient Flux Results Days 6-10

When moving from anoxic to oxic conditions at Day 6, TP and SRP concentrations in the overlying water decreased in all four sites (**Figures 3-5** and **3-6** above). Conversely, cores that moved from oxic conditions to anoxic conditions exhibited an initial large increase in overlying water concentration followed by a gradual increase through Day 10. Across all four sediments tested, a larger flux of TP and SRP was observed under anoxic conditions during the first 5-days, and upon reoxygenation at Day 6, the TP and SRP flux slowed or reversed to sediment uptake (**Figure 3-10**). While TP uptake by the sediments was not observed in the Type II sediment when switching from anoxic to oxic conditions, a much lower magnitude of TP release was exhibited under Day 6-10 oxic conditions.

Table 3-3. Mean Nutrient Flux Rates under Day 0-5 Oxic and Anoxic Condition (mg/m²/d)

Site ID	Treatment	Total Phosphorus	Soluble Reactive Phosphorus	Total Nitrogen	Total Ammonia
LE-SOD-1	Oxic	10.2 (±4.0)	2.34 (±5.8)	127 (±8.5)	90.1 (±15.3)
	Anoxic	15.4 (±1.7)	3.65 (±1.1)	139 (±52.1)	159 (±42.9)
	Absolute Difference	5.18	1.30	11.4	69.2
LE-SOD-2	Oxic	7.64 (±2.0)	-2.80 (±5.0)	78.8 (±2.7)	79.2 (±30.7)
	Anoxic	16.1 (±1.6)	-0.32 (±5.6)	156 (±15.9)	160 (±15.0)
	Absolute Difference	8.51	2.48	77.2	80.4
LE-SOD-3	Oxic	6.61 (±2.2)	-1.84 (±2.3)	84.4 (±34.1)	102 (±35.3)
	Anoxic	11.5 (±5.8)	2.79 (±4.0)	176 (±104)	140 (±54.1)
	Absolute Difference	4.93	4.62	91.2	37.5
LE-SOD-6	Oxic	2.54 (±2.6)	-2.26 (±3.4)	48.5 (±26.5)	57.1 (±24.0)
	Anoxic	11.8 (±1.6)	2.83 (±3.7)	96.3 (±11.9)	109 (±13.0)
	Absolute Difference	**9.28**	5.09	**47.7**	51.8
Average Flux Oxic Type III Sediment (Sites 1-3)		8.14	-0.76	96.9	90.4
Average Flux Anoxic Type III Sediment (Sites 1-3)		14.4	2.04	157	156
Average Absolute Flux Difference Type III Sediment (Sites 1-3)		**6.26**	2.80	**60.1**	65.6

Notes:
1) Means are of three replicates per site/treatment combination. Values in parenthesis are ±1SD.
2) A positive rate indicates an increase in the overlying water concentration over time. A negative rate indicates a decrease in the overlying water concentration over time.
3) Site LE-SOD-6 represents Type II sediment.

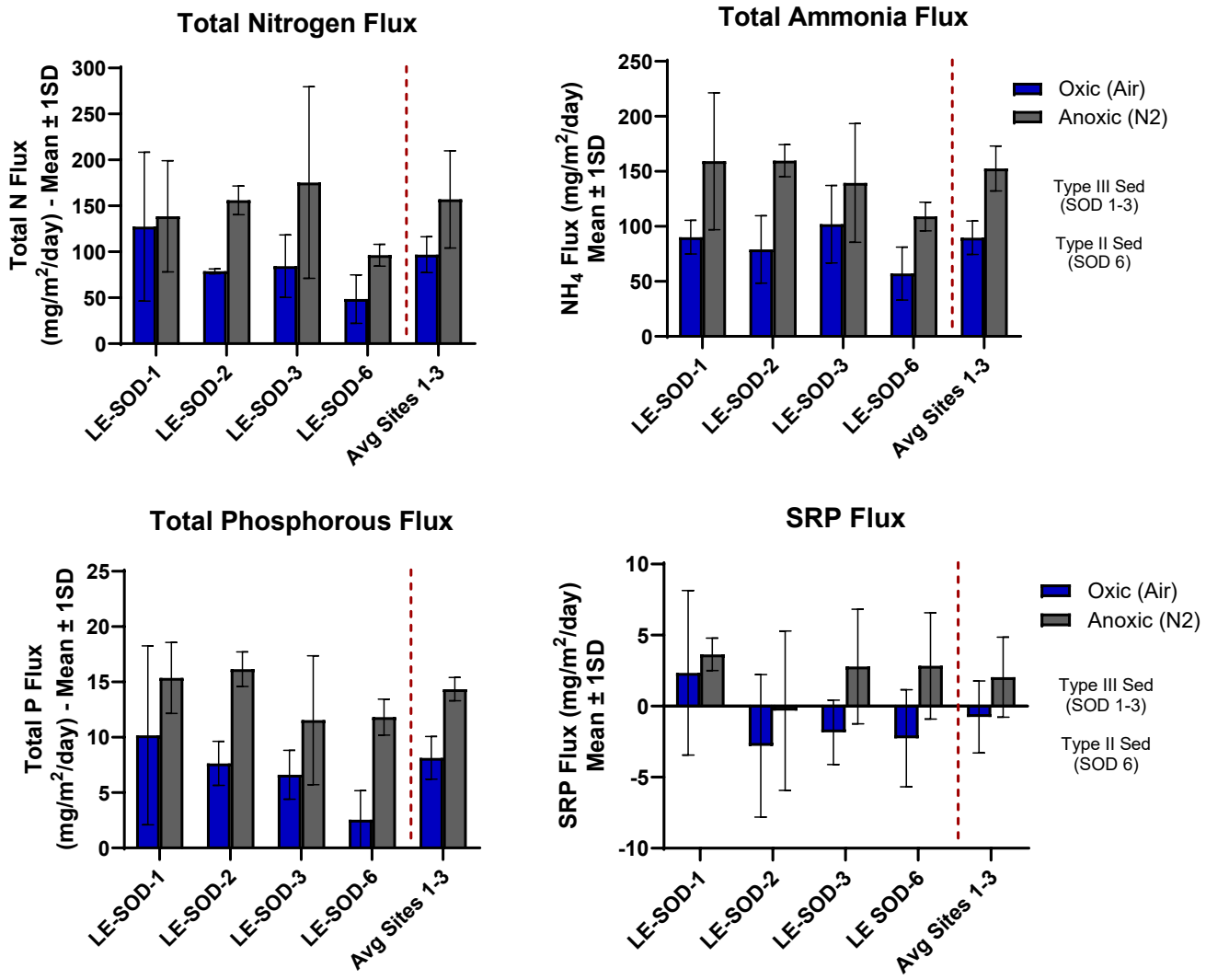


Figure 3-9. Day 0-5 Mass Flux of Total Nitrogen, Total Ammonia, Total Phosphorus, and Soluble Reactive Phosphorus (mg/m^2/day) from Sediment (Mean ±1 SD, n=3).

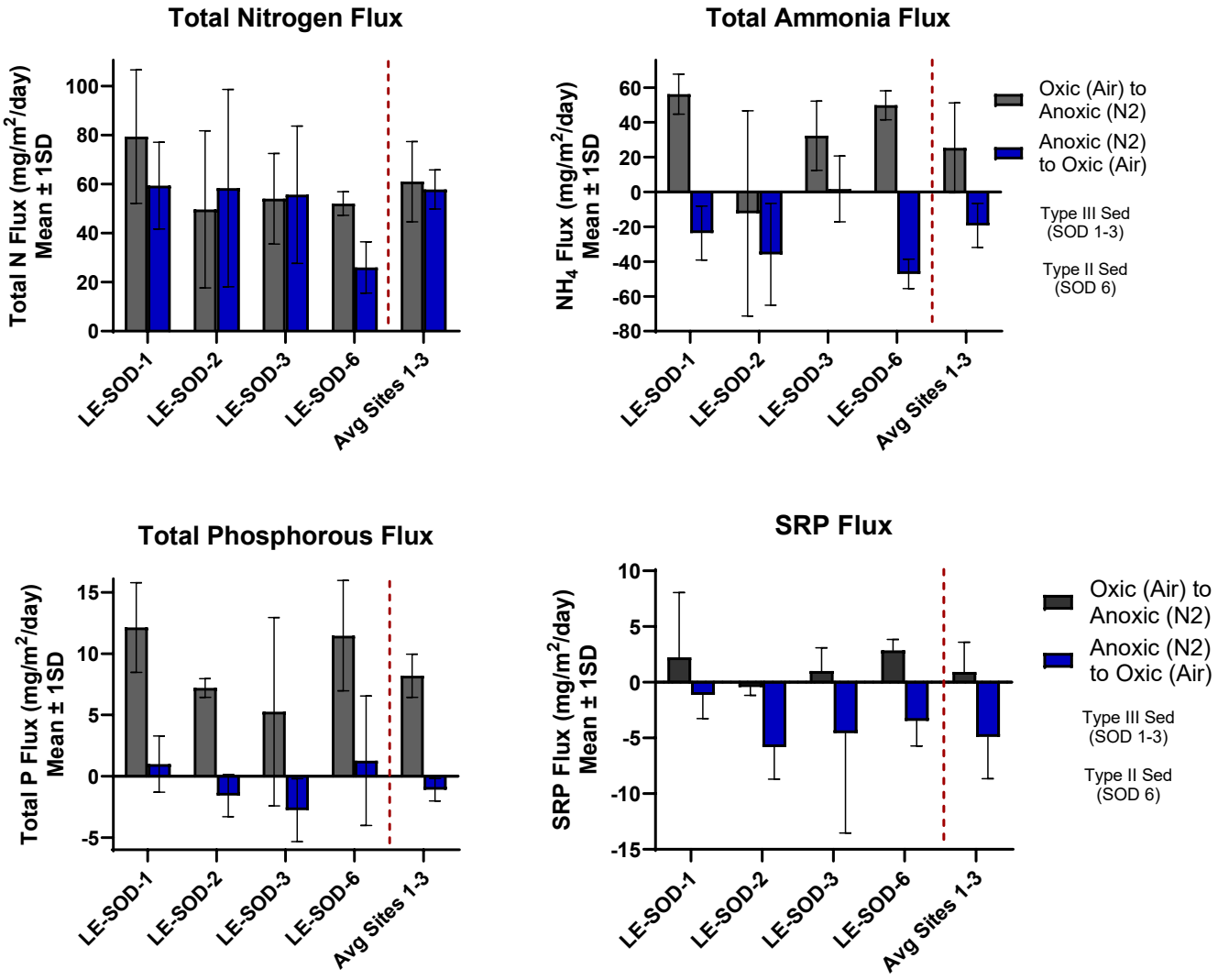


Figure 3-10 Day 6-10 Mass Flux of Total Nitrogen, Total Ammonia, Total Phosphorus, and Soluble Reactive Phosphorus (mg/m^2/day) from Sediment (Mean ±1 SD, n=3) after Switch of Oxic/Anoxic Treatments

"Oxic (Air) to Anoxic (N2)" grey bars represent cores that were held under oxic conditions during Days 0-5 and switched to anoxic conditions Days 6-10. "Anoxic (N2) to Oxic (Air)" blue bars represent cores that were held under anoxic conditions during Days 0-5 and switched to oxic conditions Days 6-10

During Days 0-5, the total phosphorus response did not show a correlation with any site-specific whole sediment or porewater characteristic. However, after switching treatments on Day 6, TP flux exhibited a positive correlation with metal oxide Fe(III) concentrations and Fe:P ratios in the whole sediment (**Figure 3-11**). These correlations are expected when transitioning from oxic to anoxic

conditions, as Fe(III) oxides bind phosphorus in sediments. Similarly, a high Fe:P ratio indicates a greater capacity for phosphorus binding during oxic conditions, but also phosphorus release under anoxic conditions. Lastly, a positive correlation was also present for these two parameters for cores transitioning from anoxic to oxic conditions during the Day 6-10 testing period. Under oxic conditions one would expect a negative correlation for these, in that as metal oxide Fe(III) concentrations and Fe:P ratios increase, total phosphorus flux would decrease.

The decomposition of organic matter in the sediment can produce reducing conditions locally, even within an overall oxic environment. This localized reduction can lead to the release of phosphorus from iron oxides. So, while oxic conditions were maintained in the overlying water, anoxia is expected to occur deeper within the sediment core (as evidenced by a changing in color between the top 2 mm and the remainder of the underlying core – see photo of aerated oxic replicate core in **Figure 3-12**). Thus, more iron rich sediment may have higher concentrations of iron-bound SRP deeper within the core and relatively higher flux (~1 $mg/m^2/day$) to the overlying water; although still significantly lower than cores under anoxic conditions (~12 $mg/m^2/day$).

Studies have found that many factors can influence the penetration of oxygen into the sediments including its SOD, diffusion coefficients in the sediment, surface roughness, bacterial mats, and water movement across the sediment surface (Nakamura & Stefan 1994, Moore et al.,1996). However, it is thought that DO concentration in the overlying water may be one of the biggest influences on its penetration (Revsbeck et al. 1980, Rasmussen & Jørgensen 1992, Rysgaard et al. 1994). Beutel (2001) reported that ammonia continued to flux out of sediments even in aerated chambers with 2.5 to 5.0 mg/L DO concentrations in the overlying water. He attributed this to lack of sufficient DO penetration into the sediment. Similarly, Gächter and Wehrli (1998) report that the surface of profundal sediments in a Swiss lake remained anoxic even though overlaying water generally contained DO above 4 mg/L. As a result, sediment continued to release orthophosphate (Gächter &Wehrli, 1998) and ammonia (Mengis et al., 1997) to overlying water.

Similar conditions in Lake Elsinore sediments may exist where decomposition of organic matter in the sediment produces reducing conditions which dominate the subsurface sediment allowing for iron to continually release SRP even though the overlying water is oxygenated. It would then follow that sediments containing higher concentrations of iron would be able to release more iron-bound SRP from the subsurface layers. Furthermore, reducing conditions favor the formation of FeS_2 once SRP has been released, preventing the further bonding of iron to phosphorus.

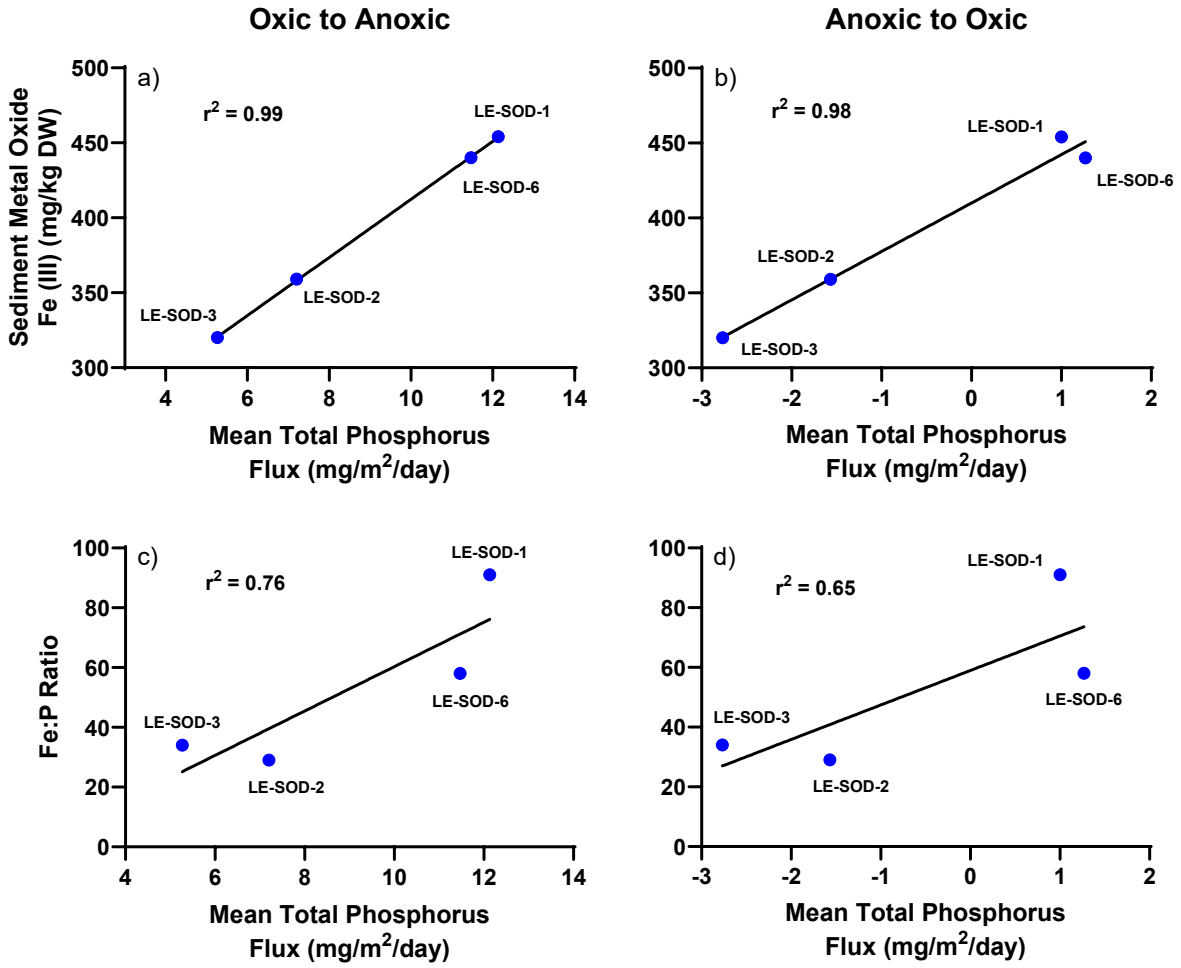


Figure 3-11. Linear Regression of Day 6-10 Total Phosphorus Mass Flux vs. Sediment Metal Oxide Fe(III) Concentration and Sediment Fe:P Ratio under Anoxic and Oxic Conditions

Each dot on the plots represents the average value for the 4 different sediments.
"Oxic to Anoxic" column represents cores that were held under oxic conditions during Days 0-5 and switched to anoxic conditions Days 6-10.
"Anoxic to Oxic" column represents cores that were held under anoxic conditions during Days 0-5 and switched to oxic conditions Days 6-10.



Figure 3-12. Photo of the Sediment Water Interface within an Aerated, High Dissolved Oxygen Core Chamber Showing Thin Tan Oxygenated Sediment Layer on Surface and Dark Anoxic Layer Beneath.

Total nitrogen concentrations continued their increasing trend over time under both oxic and anoxic conditions after treatments were switched at Day 6 (**Figures 3-7 and 3-10**). While total nitrogen flux rates during the Day 6-10 exposure period after switching treatments were still positive under both treatment regimes, they were lower than Day 0-5 at only 61 mg/m^2/day for anoxic conditions (157 mg/m^2/day during Days 0-5), and 58 mg/m^2/day for oxic conditions (115 mg/m^2/day during Days 0-5 oxic treatment). The chamber experiments do not account for natural lake processes including particulate nutrient replenishment settling to the lake bottom, thus flux of nutrients from sediment cores will ultimately be reduced to zero once an equilibrium condition is achieved. This is the reason that flux rates from Days 0-5 will serve as the basis for estimating potential flux reductions with oxygenation.

While the rate of ammonia flux was higher under anoxic conditions during the first five days of the testing period, an increase in overlying water ammonia concentration was observed for both oxic and anoxic conditions. However, at the end of the Day 0-5 oxic treatment period there appeared to be a slight drop in overlying water ammonia concentration at all sites, while concentrations in the anoxic treatment continued to increase (**Figure 3-8**). When the oxic cores for each site were then switched to anoxic conditions on Day 6, the rate of ammonia flux began to increase again.

Conversely, while the ammonia flux under anoxic conditions exhibited a continual increase throughout the Day 0-5 period, when those cores were switched to oxic conditions, ammonia concentrations in the overlying water began to decrease perhaps indicating nitrification of ammonia being converted to nitrate. This can be seen when evaluating flux across the Day 6-10 period (**Figure 3-10**) in which cores switched from anoxic to oxic conditions exhibited negative ammonia flux rate, while those switched from oxic to anoxic conditions generally exhibited a positive flux rate (enhanced release of ammonia from the sediment).

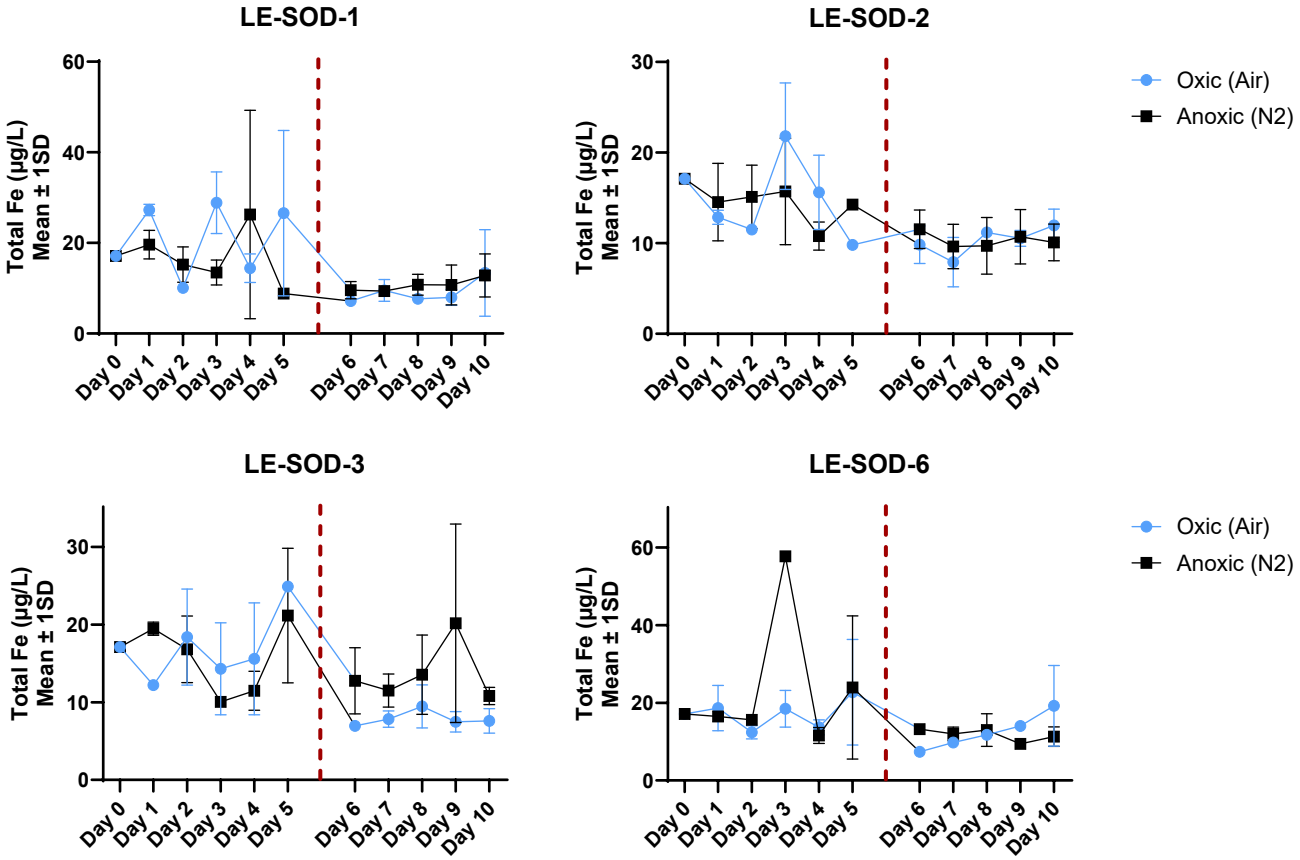
The difference in flux rate between anoxic and oxic conditions in both sediment types during the Day 6-10 period was less for TN than for TP. It is likely that during the last portion of the Day 0-5 oxic phase and during Days 6-10 reoxygenation after initial anoxic conditions, NH_4 was being converted to nitrite and nitrate through nitrification, thus explaining the reduction in NH_4 under oxic conditions, but relatively steady increase in TN throughout the 10-day study period in both treatments. Although nitrite and nitrate levels were not measured in the overlying water for this study, other research has shown that with adequate oxygen levels in the overlying water and at the SWI, ammonia accumulation in the overlying water can be halted or reversed, accompanied by an increase in nitrate (Beutel 2001, Graetz et al. 1973, Höhener and Gächter 1994, Rysgaard et al. 1994). These studies, which were longer in duration than the current study (over 20 days), also observed a subsequent decrease in nitrate concentration in the overlying water due to denitrification.

Numerous studies have reported a correlation between water column DO concentration, nitrate levels, and denitrification rates (Seitzinger 1988, Höhener and Gächter 1993, Rysgaard et al. 1994). It is likely that denitrification occurred primarily in the sediments rather than in the oxygenated water column of the experimental chambers (Vincent & Downes 1981, Seitzinger 1988), because denitrification occurs primarily in anoxic environments. This coupled nitrification-denitrification process is facilitated by facultative anaerobic bacteria in the deeper anoxic sediment which would have reduced nitrate (NO_3^-) to nitrogen gas (N_2) and an overall reduction in total nitrogen in the system. Given the short duration of this study, it is unlikely that we would have observed this full nitrogen cycle occurring, but it is likely that this process would be occurring in the lake given sufficient oxygen present at the SWI.

3.3 Iron Flux to Overlying Water

There were few discernible patterns in total or dissolved iron concentrations in the overlying water (Figures 3-13 and 3-14) or in flux rates among sediments or treatments (Figures 3-15 to 3-16). A general negative flux (sediment uptake) of total iron from Type III sediments under anoxic conditions was observed during the initial 5-day period, particularly at Site LE SOD-1, which had the highest whole sediment iron concentration and the greatest negative flux under anoxic conditions. These Day 0-5 results are contrary to expectations, as iron is typically more likely to flux out of the sediment under anoxic conditions. In the absence of oxygen, iron (III) oxides in the sediment are reduced to soluble iron (II), which can then diffuse into the overlying water. Conversely, under oxic conditions, iron tends to remain in the sediment as insoluble iron (III) oxide,

which can bind phosphorus and thereby reduce its flux into the water column. When oxic and anoxic treatments were switched at Day 6, again no clear pattern emerged for total iron flux. Both treatments showed a positive dissolved iron flux after Day 6, however the flux rate was lower under oxic conditions relative to anoxic conditions (Figure 3-16). In the case of this experiment for Lake Elsinore, anoxic conditions generally did not result in a significant gradient across the sediment-water interface to cause increased iron flux to the overlying water column. Elevated sulfide concentrations in the sediments may have caused an atypical iron response. Under anoxic conditions, sulfide could have combined with iron to form FeS_2, preventing the typical release of



iron. This aligns with the larger negative total iron flux observed at Site LE-SOD-1 during the initial 5-day period, as this site had the highest sulfide whole sediment concentration.

Figure 3-13. Concentrations of Total Iron (µg/L) in Overlying Water During the 10-Day Nutrient Flux Study (Mean ±1 SD, n=3).

Dotted red line indicates the time between Days 5 and 6 when the anoxic (N2) and oxic (Air) treatments were switched within the replicate cores. Each line changes color and symbol to match treatment condition at the time at the time the data was collected.

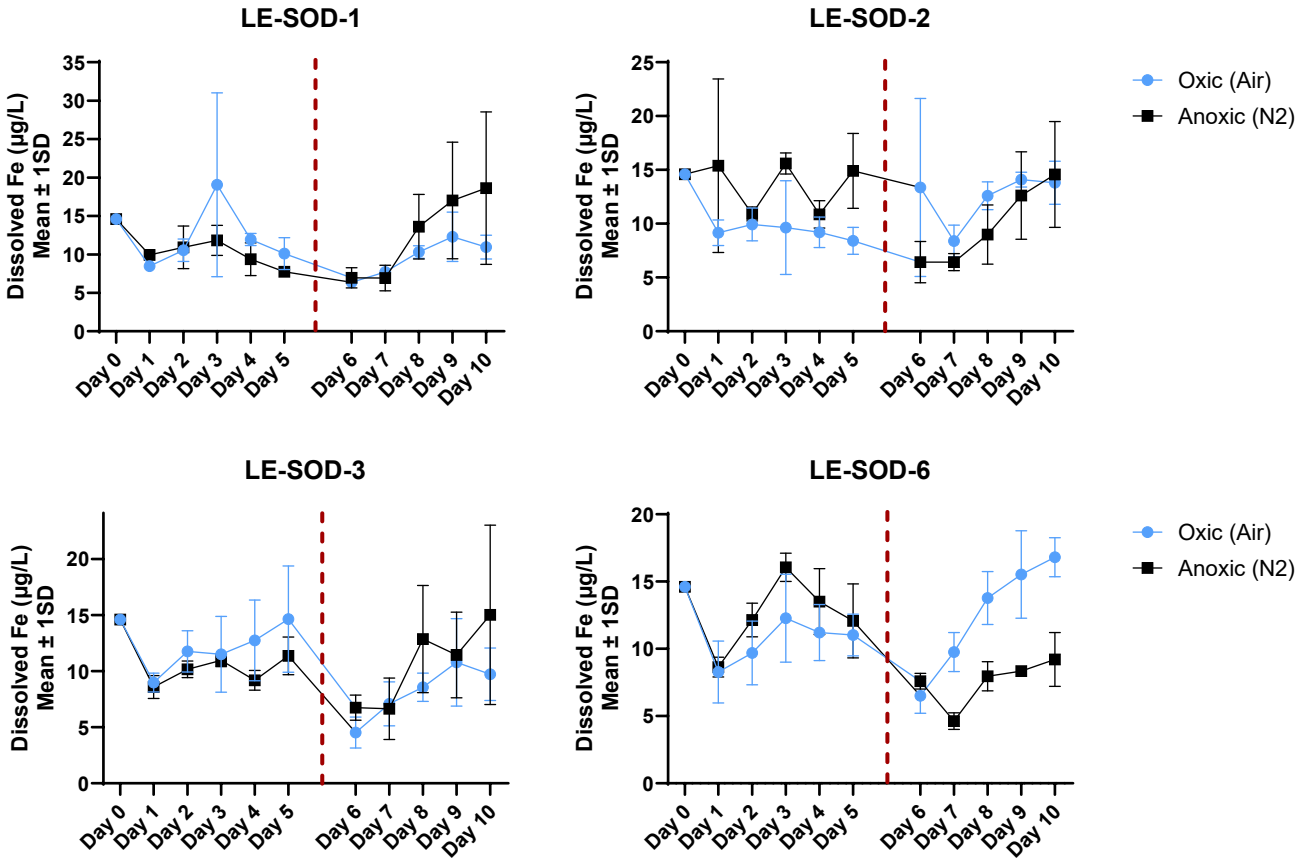


Figure 3-14. Concentrations of Dissolved Iron (µg/L) in Overlying Water During the 10-Day Nutrient Flux Study (Mean ±1 SD, n=3).

Dotted red line indicates the time between Days 5 and 6 when the anoxic (N2) and oxic (Air) treatments were switched within the replicate cores. Each line changes color and symbol to match treatment condition at the time at the time the data was collected.

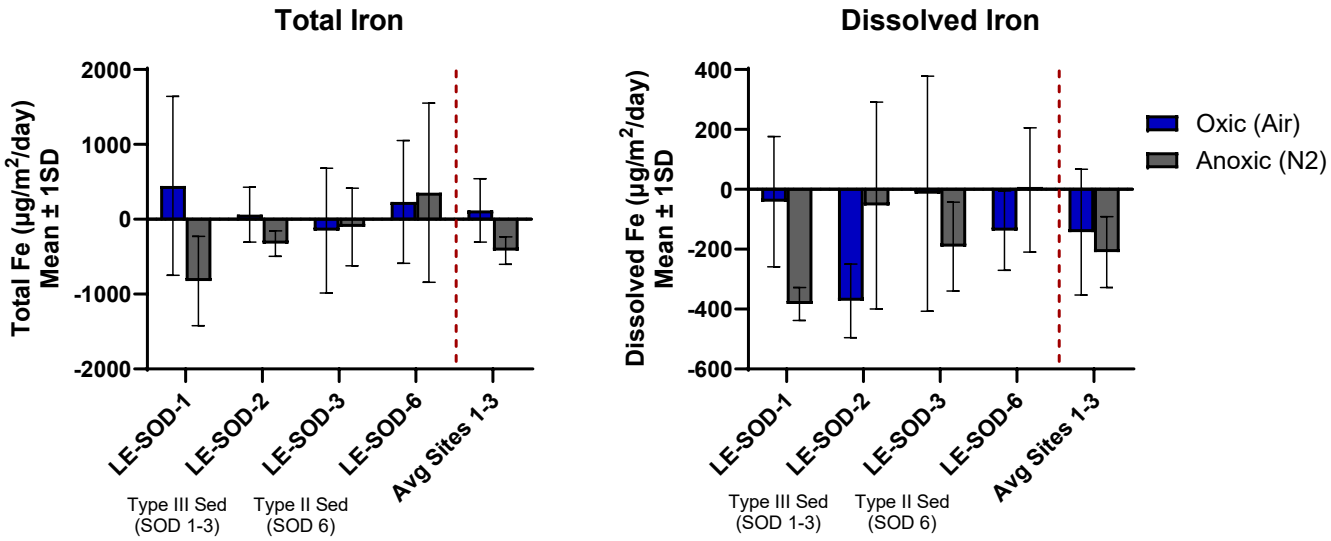


Figure 3-15. Day 0-5 Mass Flux of Total and Dissolved Iron (µg/m2/day) from Sediment (Mean ±1 SD, n=3).

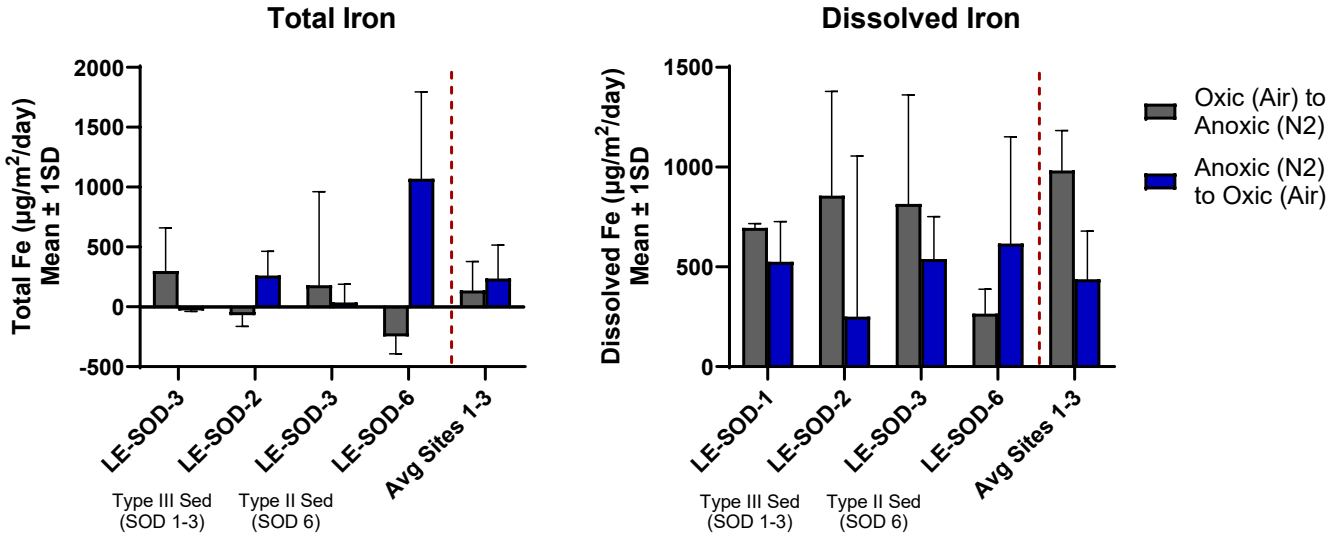


Figure 3-16. Day 6-10 Mass Flux of Total and Dissolved Iron (µg/m^2/day) from Sediment (Mean ±1 SD, n=3).

3.4 Quality Assurance

All reported analytical data met internal QA/QC objectives. However, the initial dataset for overlying water phosphorus, nitrogen, and in particular total and dissolved iron showed abnormally large within-treatment replicate variability, leading to a request for lab reanalysis of some batches. Most variability was resolved upon reanalysis, but some replicate data were excluded for total nitrogen (n=2), total phosphorus (n=3), SRP (n=6), total iron (n=10), and dissolved iron (n=5) if identified as statistical outliers using Grubbs's Test (1969).

Additionally, some total nitrogen (n=2), total phosphorus (n=2), and SRP (n=1) replicate samples were damaged while being stored frozen and were not able to be recovered.

4. Conclusions

The experimental laboratory results from this study suggest that increasing the dissolved oxygen at the SWI and thereby reducing anoxic conditions in Lake Elsinore will inhibit nutrient release from the sediment. The amount of DO addition that would be needed to achieve a persistent oxic condition was also estimated to provide design criteria for engineering concepts.

Sediment Oxygen Demand

The study found that both Type II and III sediments tested exhibited similar rates of oxygen consumption with a mean WOD-corrected SOD rate of 0.84 g/m^2/day. This rate is within the range of that reported in previous Lake Elsinore SOD studies performed under quiescent conditions of 0.92-1.8 g/m^2/day (Beutel 2000) and 0.93 g/m^2/day (Anderson 2010). Other studies have also reported comparable quiescent SOD rates between 0.2-1.2 g/m^2/day for eutrophic lakes (Hutchinson 1957, Edberg and Hofsten 1973, Brewer et al. 1977, Mathias and Barica 1980, Belanger 1981, Beutel 2003, Beutel 2007). Extrapolating the mean SOD rate (0.84 g/m2/day) to the bottom area in Lake Elsinore encompassing Type II and Type III sediments (approximately 2000 acres) would equate to ~14,900 pounds (lbs) of oxygen per day consumed by sediments.

There is uncertainty in extrapolation of laboratory experiments to the entire lake bottom. Continuous measurement of DO in the lake bottom will be important to assess whether the project is achieving the goal of a persistent oxic condition in the bottom waters of Lake Elsinore. This data could be used to adapt the oxygenation in the future to either increase, decrease, or optimize timing of oxygen deliveries to Lake Elsinore.

Nutrient Flux Rate

Relative to sediments held under anoxic conditions, Lake Elsinore sediments that are well oxygenated exhibited a reduction in nutrient flux rate (Table 4-1). While generally exhibiting a lower magnitude flux rate (with the exception of SRP, **Table 3-3**), Type II sediment displayed a larger percent reduction in nutrient flux when moving from anoxic to oxic conditions.

Table 4-1. Percent (%) Reduction in Nutrient Flux from Sediments Held Under Oxic Conditions Relative to those Under Anoxic Conditions.

Sediment Type	Total Phosphorus	Soluble Reactive Phosphorus	Total Nitrogen	Total Ammonia
II	78.6	179.9	49.5	47.5
III	43.5	137.3	38.3	42.1

The study design included numerous replicate cores to enhance confidence in the findings. Table 3-3 provides a tabular summary of these replicate cores. For the primary parameters used to estimate

nutrient load reduction achievable through oxygenation (TP and TN), the standard deviations of the three replicates within each site and DO treatment combination were lower than the differences in mean flux rates between DO treatments. This suggests that the observed differences in mean flux rates are statistically significant and not due to random variation, thereby providing substantial confidence in the estimated reductions in nutrient flux that could be achieved with oxygenation.

5. References

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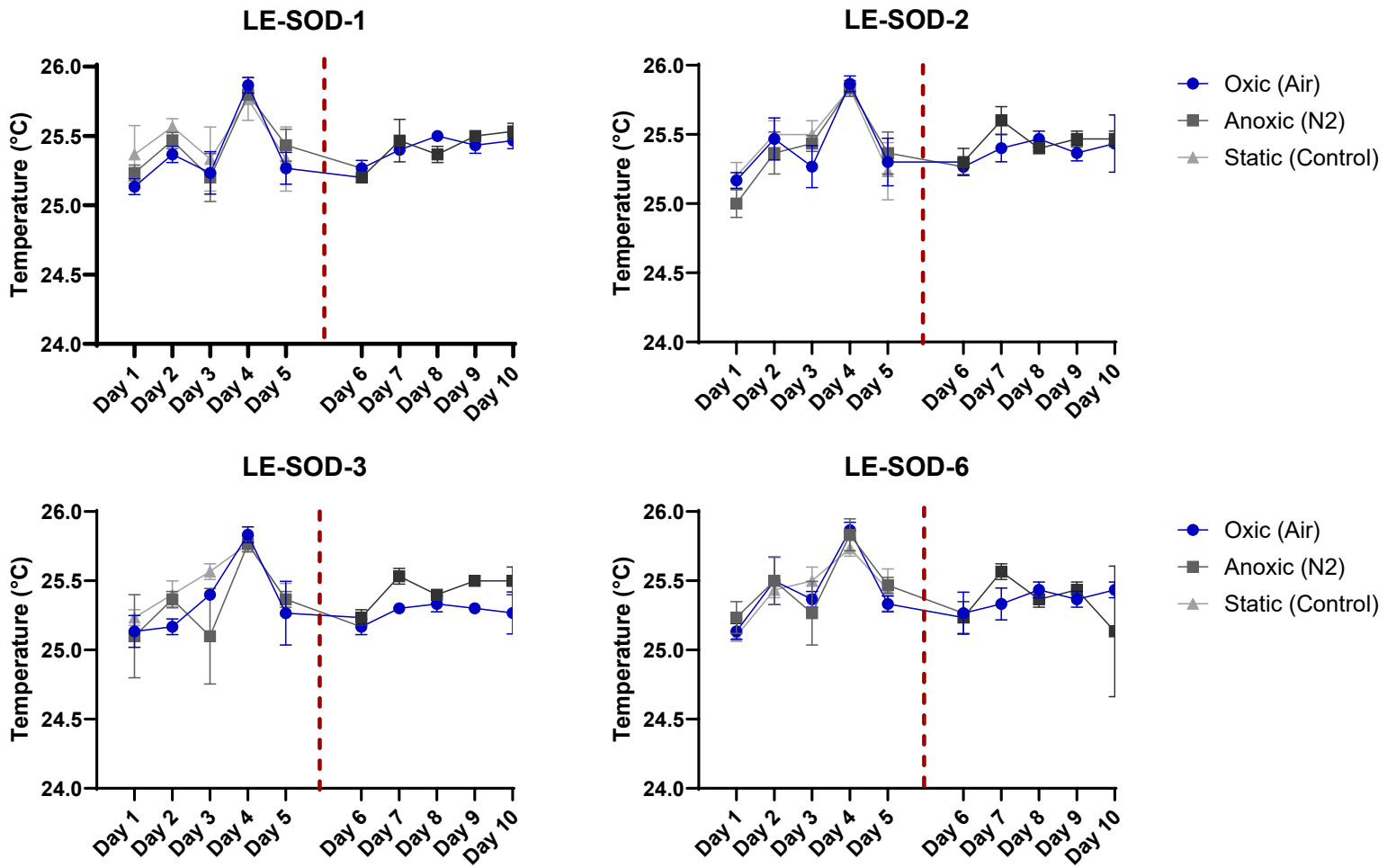
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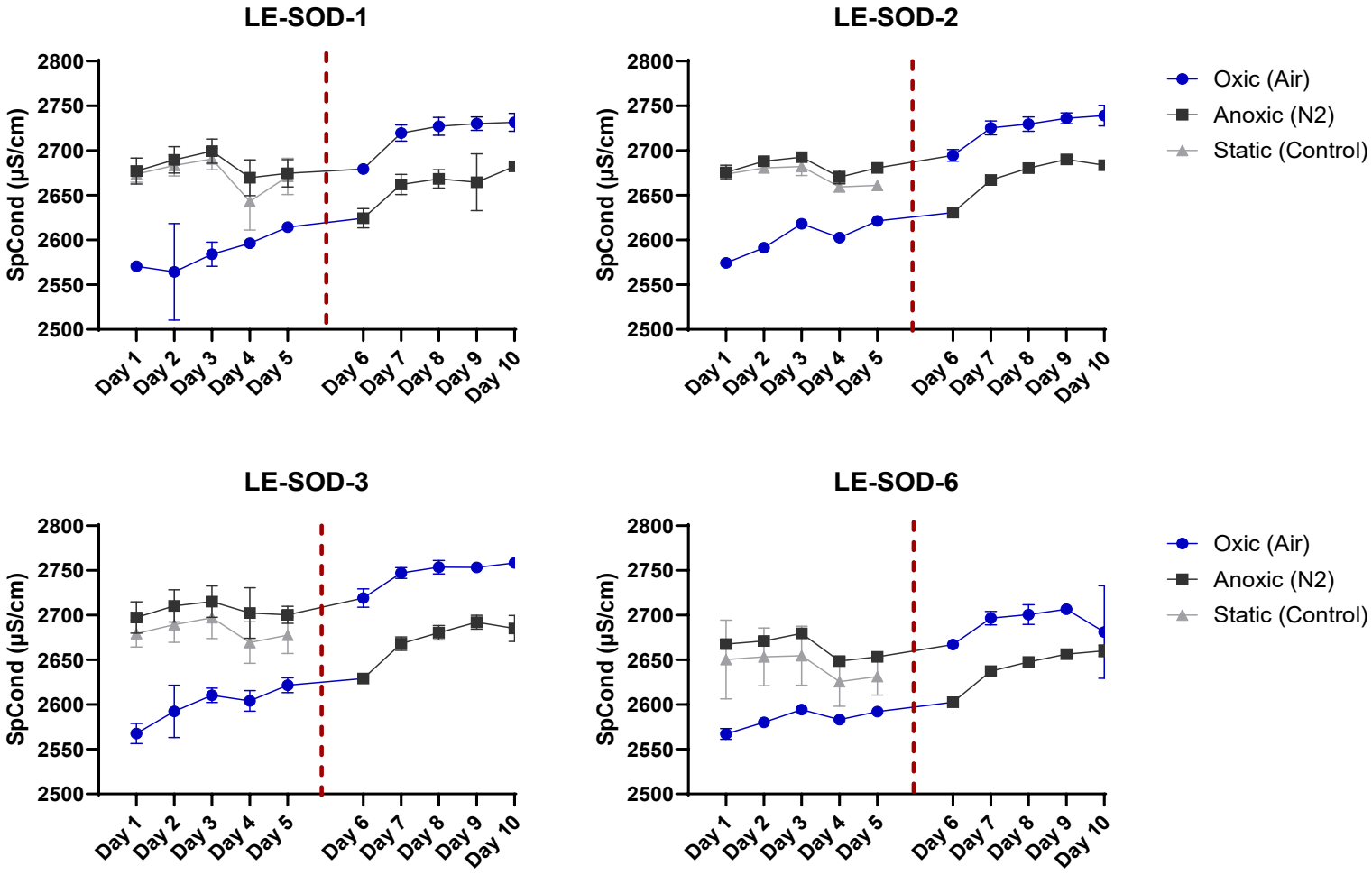
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Attachment A-1 Water Quality Parameter Measurements within Experimental Cores – Temperature, Specific Conductivity, and pH



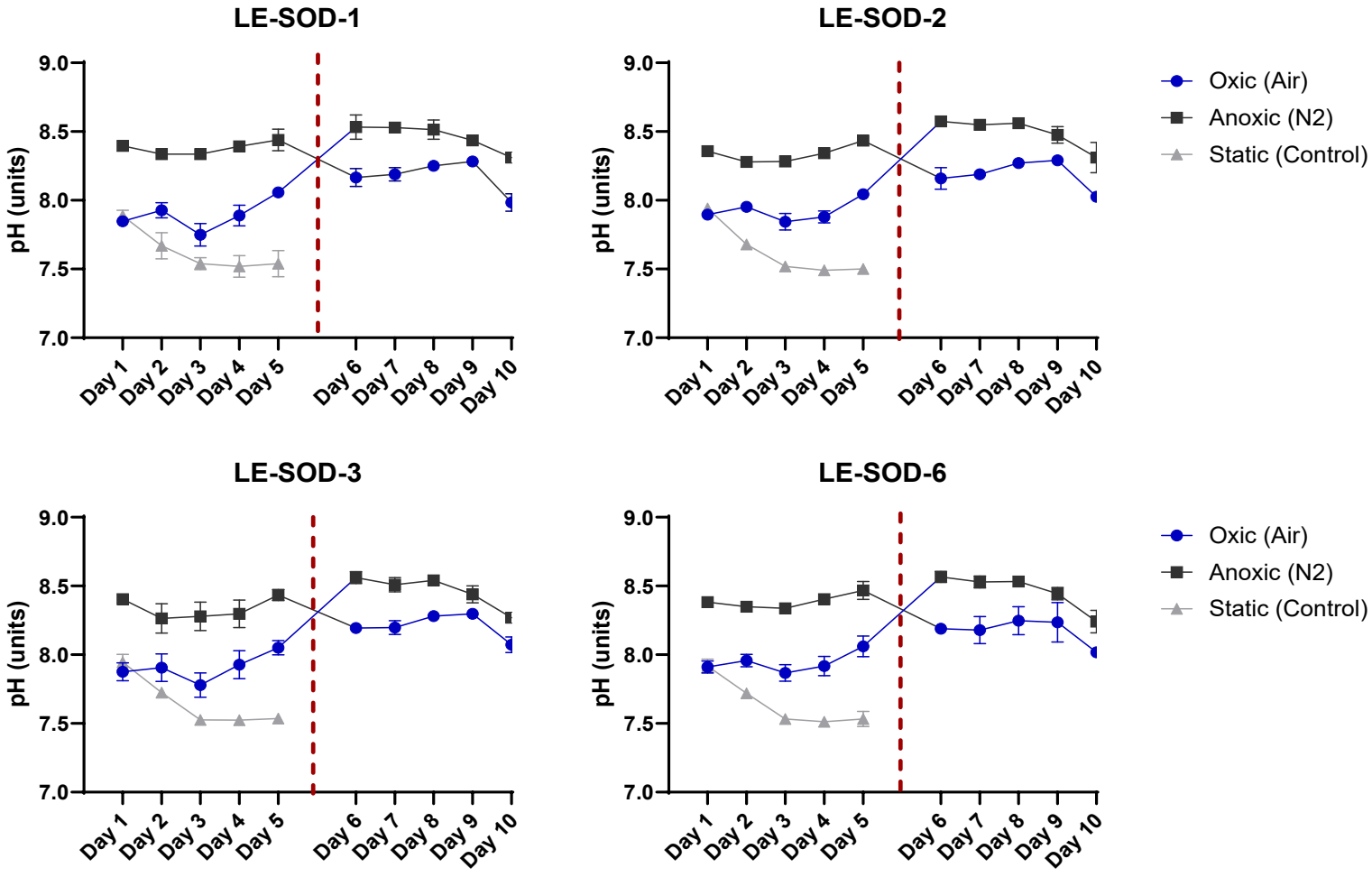
Attachment Figure A-1. Experimental Core Chamber Temperatures Across the Entire 10-Day Test Period

The dotted red line indicates the time between Day 5 and Day 6 when the anoxic (N2) and oxic (Air) treatments were switched within the replicate cores.



Attachment Figure A-2. Experimental Core Chamber Specific Conductivity Across the Entire 10-Day Test Period

The dotted red line indicates the time between Day 5 and Day 6 when the anoxic (N2) and oxic (Air) treatments were switched within the replicate cores.



Attachment Figure A-3. Experimental Core Chamber pH Values Across the Entire 10-Day Test Period

The dotted red line indicates the time between Day 5 and Day 6 when the anoxic (N2) and oxic (Air) treatments were switched within the replicate cores.

Attachment A-2 Lab Chemistry Analytical Reports

PHYSIS
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December 02, 2024

John D. Rudolph
WSP USA
9177 Sky Park Court
San Diego, CA 92123-

Project Name: GEI EVMWD SOD Study Project # US0024915.6871
Physis Project ID: 2407005-001

Dear John,

Enclosed are the analytical results for samples submitted to PHYSIS Environmental Laboratories, Inc. (PHYSIS) on 8/2/2024. A total of 109 samples were received for analysis in accordance with the attached chain of custody (COC). Per the COC, the samples were analyzed for:

Conventionals
Total Phosphorus by SM 4500-P E
Total Nitrogen by SM 5310 B-N Module
Dissolved Orthophosphate as P by EPA 300.0
Elements
Total Phosphorus by EPA 200.8
Total & Dissolved Iron (Fe) by EPA 200.8

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

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ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PROJECT SAMPLE LIST

WSP USA — PHYSIS Project ID: 2407005-001

GEI EVMWD SOD Study Project # US0024915.6871 — Total Samples: 1E

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
121633	Day 0-1		7/30/2024	7:15	Samplewater	Not Specified
121634	Day 1-1		7/31/2024	10:55	Samplewater	Not Specified
121635	Day 1-2		7/31/2024	10:55	Samplewater	Not Specified
121636	Day 1-3		7/31/2024	10:55	Samplewater	Not Specified
121637	Day 1-4		7/31/2024	10:55	Samplewater	Not Specified
121638	Day 1-5		7/31/2024	10:55	Samplewater	Not Specified
121639	Day 1-6		7/31/2024	10:55	Samplewater	Not Specified
121640	Day 1-7		7/31/2024	10:55	Samplewater	Not Specified
121641	Day 1-8		7/31/2024	10:55	Samplewater	Not Specified
121642	Day 1-9		7/31/2024	10:55	Samplewater	Not Specified
121643	Day 1-10		7/31/2024	10:55	Samplewater	Not Specified
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121646	Day 1-13		7/31/2024	10:55	Samplewater	Not Specified
121647	Day 1-14		7/31/2024	10:55	Samplewater	Not Specified
121648	Day 1-15		7/31/2024	10:55	Samplewater	Not Specified
121649	Day 1-16		7/31/2024	10:55	Samplewater	Not Specified
121650	Day 1-17		7/31/2024	10:55	Samplewater	Not Specified
121651	Day 1-18		7/31/2024	10:55	Samplewater	Not Specified
121652	Day 1-19		7/31/2024	10:55	Samplewater	Not Specified
121653	Day 1-20		7/31/2024	10:55	Samplewater	Not Specified
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121655	Day 1-22		7/31/2024	10:55	Samplewater	Not Specified
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121667	Day 1-34		7/31/2024	10:55	Samplewater	Not Specified

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Innovative Solutions for Nature

WSP USA

PHYSIS Project ID: 2407005-001

GEI EVMWD SOD Study Project # US0024915.6871

Total Samples: 1E

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
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121672	Day 2-3		8/1/2024	11:00	Samplewater	Not Specified
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121682	Day 2-13		8/1/2024	11:00	Samplewater	Not Specified
121683	Day 2-14		8/1/2024	11:00	Samplewater	Not Specified
121684	Day 2-15		8/1/2024	11:00	Samplewater	Not Specified
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121704	Day 2-35		8/1/2024	11:00	Samplewater	Not Specified

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WSP USA

PHYSIS Project ID: 2407005-001

GEI EVMWD SOD Study Project # US0024915.6871

Total Samples: 1E

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
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121741	Day 3-36		8/2/2024	10:45	Samplewater	Not Specified

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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

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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

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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.

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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

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ANALYTICAL REPORT

PHYSIS
TERRA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-001
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121633-R1 Day 0-1			**Matrix: Samplewater**				**Sampled: 30-Jul-24 7:15**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.19	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.18	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.203	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24
Sample ID: 121634-R1 Day 1-1			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.238	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.31	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.284	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24
Sample ID: 121635-R1 Day 1-2			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.207	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.81	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.233	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24
Sample ID: 121636-R1 Day 1-3			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.267	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.98	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.375	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24
Sample ID: 121637-R1 Day 1-4			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.196	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.62	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.272	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121638-R1 Day 1-5			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.163	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.24	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.195	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24
Sample ID: 121639-R1 Day 1-6			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.252	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.84	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.344	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24
Sample ID: 121640-R1 Day 1-7			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.191	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.5	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.286	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24
Sample ID: 121641-R1 Day 1-8			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.188	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.43	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.296	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24
Sample ID: 121642-R1 Day 1-9			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.257	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.86	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.341	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121643-R1 Day 1-10			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.241	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.78	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.333	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24
Sample ID: 121644-R1 Day 1-11			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.179	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.43	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.245	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24
Sample ID: 121645-R1 Day 1-12			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.255	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.81	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.296	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24
Sample ID: 121646-R1 Day 1-13			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.188	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Phosphorus	EPA 200.8	mg/L	0.394	1	0.016	0.05	Total		E-33116	16-Oct-24	16-Oct-24
Sample ID: 121647-R1 Day 1-14			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.242	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.83	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.316	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24
Sample ID: 121648-R1 Day 1-15			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.27	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.68	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.285	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121649-R1 Day 1-16			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.217	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.45	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.295	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24
Sample ID: 121650-R1 Day 1-17			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.204	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.62	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.288	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24
Sample ID: 121651-R1 Day 1-18			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.271	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.91	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.331	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24
Sample ID: 121652-R1 Day 1-19			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.269	1	0.002	0.005	NA		C-83038	27-Aug-24	27-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.81	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.354	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24
Sample ID: 121653-R1 Day 1-20			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.281	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.05	2	0.28	0.6	NA		O-28126	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.342	1	0.016	0.02	NA		C-82142	20-Aug-24	22-Aug-24

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PHYSIS Project ID: 2407005-001
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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121654-R1 Day 1-21			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.263	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.83	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.336	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24
Sample ID: 121655-R1 Day 1-22			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.177	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.25	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.195	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24
Sample ID: 121656-R1 Day 1-23			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.221	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.36	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.281	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24
Sample ID: 121657-R1 Day 1-24			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.225	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.53	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.284	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24
Sample ID: 121658-R1 Day 1-25			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.187	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.35	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.222	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121659-R1 Day 1-26			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.274	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.81	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.309	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24
Sample ID: 121660-R1 Day 1-27			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.254	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.56	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.292	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24
Sample ID: 121661-R1 Day 1-28			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.21	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.48	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.239	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24
Sample ID: 121662-R1 Day 1-29			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.254	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	1.28	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.15	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24
Sample ID: 121663-R1 Day 1-30			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.256	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.02	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.343	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121664-R1 Day 1-31			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.193	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	0.918	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.0939	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24
Sample ID: 121665-R1 Day 1-32			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.222	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.52	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.248	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24
Sample ID: 121666-R1 Day 1-33			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.244	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.51	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.292	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24
Sample ID: 121667-R1 Day 1-34			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.207	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	0.677	5	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.069	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24
Sample ID: 121668-R1 Day 1-35			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.235	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.46	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.286	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-001
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121669-R1 Day 1-36			**Matrix: Samplewater**					**Sampled: 31-Jul-24 10:55**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.21	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.49	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.282	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24
Sample ID: 121670-R1 Day 2-1			**Matrix: Samplewater**					**Sampled: 01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.265	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.44	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.373	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24
Sample ID: 121671-R1 Day 2-2			**Matrix: Samplewater**					**Sampled: 01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.273	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.96	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.295	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24
Sample ID: 121672-R1 Day 2-3			**Matrix: Samplewater**					**Sampled: 01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.462	1	0.002	0.005	NA		C-83039	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.28	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.412	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24
Sample ID: 121673-R1 Day 2-4			**Matrix: Samplewater**					**Sampled: 01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.3	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.94	2	0.28	0.6	NA		O-28127	27-Aug-24	28-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.28	1	0.016	0.02	NA		C-82143	20-Aug-24	22-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121674-R1 Day 2-5			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.181	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.43	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.208	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24
Sample ID: 121675-R1 Day 2-6			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.325	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.32	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.383	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24
Sample ID: 121676-R1 Day 2-7			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.223	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.84	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.27	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24
Sample ID: 121677-R1 Day 2-8			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.254	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.63	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.299	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24
Sample ID: 121678-R1 Day 2-9			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.296	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.09	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.335	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121679-R1 Day 2-10			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.293	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.83	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.337	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24
Sample ID: 121680-R1 Day 2-11			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.227	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.75	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.255	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24
Sample ID: 121681-R1 Day 2-12			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.305	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.68	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.337	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24
Sample ID: 121682-R1 Day 2-13			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.184	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.36	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.188	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24
Sample ID: 121683-R1 Day 2-14			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.31	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.26	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.365	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121684-R1 Day 2-15			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.277	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.14	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.29	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24
Sample ID: 121685-R1 Day 2-16			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.237	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.82	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.317	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24
Sample ID: 121686-R1 Day 2-17			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.28	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.29	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.307	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24
Sample ID: 121687-R1 Day 2-18			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.293	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.35	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.348	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24
Sample ID: 121688-R1 Day 2-19			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.282	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.27	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.338	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121689-R1 Day 2-20			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.341	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.65	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.374	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24
Sample ID: 121690-R1 Day 2-21			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.343	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.23	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.381	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24
Sample ID: 121691-R1 Day 2-22			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.186	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.59	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.201	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24
Sample ID: 121692-R1 Day 2-23			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.249	1	0.002	0.005	NA		C-83040	28-Aug-24	28-Aug-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.71	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.306	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24
Sample ID: 121693-R1 Day 2-24			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.186	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.65	2	0.28	0.6	NA		O-28128	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.278	1	0.016	0.02	NA		C-82194	22-Aug-24	23-Aug-24

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Conventionals

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Sample ID: 121694-R1 Day 2-25			**Matrix: Samplewater**					**Sampled: 01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.168	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.67	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.224	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24
Sample ID: 121695-R1 Day 2-26			**Matrix: Samplewater**					**Sampled: 01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.234	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.1	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.339	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24
Sample ID: 121696-R1 Day 2-27			**Matrix: Samplewater**					**Sampled: 01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	ND	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.62	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.291	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24
Sample ID: 121697-R1 Day 2-28			**Matrix: Samplewater**					**Sampled: 01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.157	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.68	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.281	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24
Sample ID: 121698-R1 Day 2-29			**Matrix: Samplewater**					**Sampled: 01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.252	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.2	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.355	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121699-R1 Day 2-30			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.217	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.33	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.376	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24
Sample ID: 121700-R1 Day 2-31			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	ND	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.78	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.26	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24
Sample ID: 121701-R1 Day 2-32			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.136	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.91	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.282	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24
Sample ID: 121702-R1 Day 2-33			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.117	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.51	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.315	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24
Sample ID: 121703-R1 Day 2-34			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.171	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.01	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.271	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-001
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121704-R1 Day 2-35			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.135	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.87	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.35	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24
Sample ID: 121705-R1 Day 2-36			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.174	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.89	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.312	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24
Sample ID: 121706-R1 Day 3-1			**Matrix: Samplewater**				**Sampled: 02-Aug-24 10:45**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.275	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.25	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.441	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24
Sample ID: 121707-R1 Day 3-2			**Matrix: Samplewater**				**Sampled: 02-Aug-24 10:45**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.241	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.2	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.309	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24
Sample ID: 121708-R1 Day 3-3			**Matrix: Samplewater**				**Sampled: 02-Aug-24 10:45**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.25	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.77	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.442	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24
Sample ID: 121709-R1 Day 3-4			**Matrix: Samplewater**				**Sampled: 02-Aug-24 10:45**			**Received: 02-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.208	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Phosphorus	EPA 200.8	mg/L	0.446	1	0.016	0.05	Total		E-33116	16-Oct-24	16-Oct-24

PHYSIS
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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121710-R1 Day 3-5			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.13	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.77	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.224	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24
Sample ID: 121711-R1 Day 3-6			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.277	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.7	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.419	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24
Sample ID: 121712-R1 Day 3-7			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.205	1	0.002	0.005	NA		C-83041	12-Sep-24	12-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.2	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.323	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24
Sample ID: 121713-R1 Day 3-8			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.227	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.87	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.342	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24
Sample ID: 121714-R1 Day 3-9			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.299	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.54	2	0.28	0.6	NA		O-28129	28-Aug-24	29-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.387	1	0.016	0.02	NA		C-82147	22-Aug-24	23-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121715-R1 Day 3-10			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.297	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.15	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.361	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24
Sample ID: 121716-R1 Day 3-11			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.178	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.81	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.276	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24
Sample ID: 121717-R1 Day 3-12			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.304	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.26	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.406	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24
Sample ID: 121718-R1 Day 3-13			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.202	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.48	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.215	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24
Sample ID: 121719-R1 Day 3-14			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.251	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.51	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.387	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121720-R1 Day 3-15			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.169	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.37	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.331	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24
Sample ID: 121721-R1 Day 3-16			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.304	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.05	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.364	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24
Sample ID: 121722-R1 Day 3-17			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.22	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.34	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.341	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24
Sample ID: 121723-R1 Day 3-18			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.318	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.77	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.41	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24
Sample ID: 121724-R1 Day 3-19			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.331	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.29	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.363	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121725-R1 Day 3-20			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.271	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.28	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.214	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24
Sample ID: 121726-R1 Day 3-21			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.182	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.56	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.384	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24
Sample ID: 121727-R1 Day 3-22			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	ND	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.73	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.421	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24
Sample ID: 121728-R1 Day 3-23			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.142	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.15	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.306	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24
Sample ID: 121729-R1 Day 3-24			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.143	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.64	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.284	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121730-R1 Day 3-25			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.136	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.36	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.182	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24
Sample ID: 121731-R1 Day 3-26			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.139	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.46	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.355	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24
Sample ID: 121732-R1 Day 3-27			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.155	1	0.002	0.005	NA		C-83042	13-Sep-24	13-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.92	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.306	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24
Sample ID: 121733-R1 Day 3-28			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.245	1	0.002	0.005	NA		C-83043	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.89	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.275	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24
Sample ID: 121734-R1 Day 3-29			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.312	1	0.002	0.005	NA		C-83043	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.57	2	0.28	0.6	NA		O-28130	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.364	1	0.016	0.02	NA		C-82148	22-Aug-24	24-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121735-R1 Day 3-30			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.253	1	0.002	0.005	NA		C-83043	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.66	2	0.28	0.6	NA		O-28131	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.391	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24
Sample ID: 121736-R1 Day 3-31			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.189	1	0.002	0.005	NA		C-83043	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.13	2	0.28	0.6	NA		O-28131	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.266	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24
Sample ID: 121737-R1 Day 3-32			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.239	1	0.002	0.005	NA		C-83043	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.3	2	0.28	0.6	NA		O-28131	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.294	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24
Sample ID: 121738-R1 Day 3-33			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.254	1	0.002	0.005	NA		C-83043	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.09	2	0.28	0.6	NA		O-28131	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.359	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24
Sample ID: 121739-R1 Day 3-34			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.229	1	0.002	0.005	NA		C-83043	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.31	2	0.28	0.6	NA		O-28131	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.292	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
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Innovative Solutions for Nature

PHYSIS Project ID: 2407005-001
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121740-R1 Day 3-35			**Matrix: Samplewater**				**Sampled: 02-Aug-24 10:45**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.261	1	0.002	0.005	NA		C-83043	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.18	2	0.28	0.6	NA		O-28131	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.346	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24
Sample ID: 121741-R1 Day 3-36			**Matrix: Samplewater**				**Sampled: 02-Aug-24 10:45**			**Received:**	**02-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.256	1	0.002	0.005	NA		C-83043	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.22	2	0.28	0.6	NA		O-28131	29-Aug-24	30-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.326	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24

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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121633-R1	**Day 0-1**			**Matrix: Samplewater**				**Sampled:**	**30-Jul-24 7:15**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	17.1	1	1.13	5.65	Total		E-33095	16-Sep-24	18-Sep-24
Iron (Fe)		EPA 200.8	µg/L	14.6	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24
Sample ID: 121634-R1	**Day 1-1**			**Matrix: Samplewater**				**Sampled:**	**31-Jul-24 10:55**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	19.3	1	1.13	5.65	Total		E-33095	16-Sep-24	18-Sep-24
Iron (Fe)		EPA 200.8	µg/L	48.3	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24
Sample ID: 121635-R1	**Day 1-2**			**Matrix: Samplewater**				**Sampled:**	**31-Jul-24 10:55**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.2	1	1.13	5.65	Total		E-33095	16-Sep-24	18-Sep-24
Iron (Fe)		EPA 200.8	µg/L	8.88	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24
Sample ID: 121636-R1	**Day 1-3**			**Matrix: Samplewater**				**Sampled:**	**31-Jul-24 10:55**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	19.4	1	1.13	5.65	Total		E-33095	16-Sep-24	18-Sep-24
Iron (Fe)		EPA 200.8	µg/L	35.2	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24
Sample ID: 121637-R1	**Day 1-4**			**Matrix: Samplewater**				**Sampled:**	**31-Jul-24 10:55**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.3	1	1.13	5.65	Total		E-33095	16-Sep-24	18-Sep-24
Iron (Fe)		EPA 200.8	µg/L	9.84	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24
Sample ID: 121638-R1	**Day 1-5**			**Matrix: Samplewater**				**Sampled:**	**31-Jul-24 10:55**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	14.5	1	1.13	5.65	Total		E-33095	16-Sep-24	18-Sep-24
Iron (Fe)		EPA 200.8	µg/L	6.65	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24
Sample ID: 121639-R1	**Day 1-6**			**Matrix: Samplewater**				**Sampled:**	**31-Jul-24 10:55**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	20.4	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)		EPA 200.8	µg/L	7.87	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24

PHYSIS
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Elements

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121640-R1 Day 1-7			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	46.9	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	9.91	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24
Sample ID: 121641-R1 Day 1-8			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	18.7	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	9.31	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24
Sample ID: 121642-R1 Day 1-9			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	99.2	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	7.38	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24
Sample ID: 121643-R1 Day 1-10			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	11.3	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	10	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24
Sample ID: 121644-R1 Day 1-11			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	62.9	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	8.21	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24
Sample ID: 121645-R1 Day 1-12			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	367	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	32.7	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24
Sample ID: 121646-R1 Day 1-13			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	659	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	33.1	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24

PHYSIS
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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121647-R1	**Day 1-14**			**Matrix: Samplewater**				**Sampled:**	**31-Jul-24 10:55**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.1	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)		EPA 200.8	µg/L	8.05	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24
Sample ID: 121648-R1	**Day 1-15**			**Matrix: Samplewater**				**Sampled:**	**31-Jul-24 10:55**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	13.4	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)		EPA 200.8	µg/L	8.29	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24
Sample ID: 121649-R1	**Day 1-16**			**Matrix: Samplewater**				**Sampled:**	**31-Jul-24 10:55**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	17.3	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)		EPA 200.8	µg/L	8.12	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24
Sample ID: 121650-R1	**Day 1-17**			**Matrix: Samplewater**				**Sampled:**	**31-Jul-24 10:55**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)		EPA 200.8	µg/L	14	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24
Sample ID: 121651-R1	**Day 1-18**			**Matrix: Samplewater**				**Sampled:**	**31-Jul-24 10:55**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.8	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)		EPA 200.8	µg/L	21.1	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24
Sample ID: 121652-R1	**Day 1-19**			**Matrix: Samplewater**				**Sampled:**	**31-Jul-24 10:55**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	48	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)		EPA 200.8	µg/L	11.1	1	1.13	5.65	Dissolved		E-33095	16-Sep-24	18-Sep-24
Sample ID: 121653-R1	**Day 1-20**			**Matrix: Samplewater**				**Sampled:**	**31-Jul-24 10:55**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	17.4	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.2	1	1.13	5.65	Dissolved		E-33096	16-Sep-24	19-Sep-24

PHYSIS
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PHYSIS Project ID: 2407005-001
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Elements

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121654-R1 Day 1-21			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	21.9	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	9.43	1	1.13	5.65	Dissolved		E-33096	16-Sep-24	19-Sep-24
Sample ID: 121655-R1 Day 1-22			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	22.8	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	9.91	1	1.13	5.65	Dissolved		E-33096	16-Sep-24	19-Sep-24
Sample ID: 121656-R1 Day 1-23			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	15.7	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	9.18	1	1.13	5.65	Dissolved		E-33096	16-Sep-24	19-Sep-24
Sample ID: 121657-R1 Day 1-24			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	108	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	35.3	1	1.13	5.65	Dissolved		E-33096	16-Sep-24	19-Sep-24
Sample ID: 121658-R1 Day 1-25			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	28.2	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	8.75	1	1.13	5.65	Dissolved		E-33096	16-Sep-24	19-Sep-24
Sample ID: 121659-R1 Day 1-26			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	22.9	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	54.9	1	1.13	5.65	Dissolved		E-33096	16-Sep-24	19-Sep-24
Sample ID: 121660-R1 Day 1-27			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	74.9	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	9.49	1	1.13	5.65	Dissolved		E-33096	16-Sep-24	19-Sep-24

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Elements

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121661-R1 Day 1-28			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	101	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	207	1	1.13	5.65	Dissolved		E-33096	16-Sep-24	19-Sep-24
Sample ID: 121662-R1 Day 1-29			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	11.4	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	9.69	1	1.13	5.65	Dissolved		E-33096	16-Sep-24	19-Sep-24
Sample ID: 121663-R1 Day 1-30			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	1080	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	1440	1	1.13	5.65	Dissolved		E-33096	16-Sep-24	19-Sep-24
Sample ID: 121664-R1 Day 1-31			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	488	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	645	1	1.13	5.65	Dissolved		E-33096	16-Sep-24	19-Sep-24
Sample ID: 121665-R1 Day 1-32			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	96	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	9.87	1	1.13	5.65	Dissolved		E-33096	16-Sep-24	19-Sep-24
Sample ID: 121666-R1 Day 1-33			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	81.8	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	10.2	1	1.13	5.65	Dissolved		E-33096	16-Sep-24	19-Sep-24
Sample ID: 121667-R1 Day 1-34			**Matrix: Samplewater**				**Sampled: 31-Jul-24 10:55**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	26.4	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)	EPA 200.8	µg/L	8.18	1	1.13	5.65	Dissolved		E-33096	16-Sep-24	19-Sep-24

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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121668-R1	**Day 1-35**			**Matrix: Samplewater**				**Sampled:**	**31-Jul-24 10:55**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	248	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)		EPA 200.8	µg/L	438	1	1.13	5.65	Dissolved		E-33096	16-Sep-24	19-Sep-24
Sample ID: 121669-R1	**Day 1-36**			**Matrix: Samplewater**				**Sampled:**	**31-Jul-24 10:55**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	113	1	1.13	5.65	Total		E-33095	16-Sep-24	19-Sep-24
Iron (Fe)		EPA 200.8	µg/L	405	1	1.13	5.65	Dissolved		E-33096	16-Sep-24	19-Sep-24
Sample ID: 121670-R1	**Day 2-1**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	18.6	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.2	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24
Sample ID: 121671-R1	**Day 2-2**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	20.6	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	13.9	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24
Sample ID: 121672-R1	**Day 2-3**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	15.8	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.2	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24
Sample ID: 121673-R1	**Day 2-4**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.7	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	8.18	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24
Sample ID: 121674-R1	**Day 2-5**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.4	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	8.63	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-001
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121675-R1	**Day 2-6**			**Matrix: Samplewater**					**Sampled:**	**01-Aug-24 11:00**	**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.9	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	9.4	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24
Sample ID: 121676-R1	**Day 2-7**			**Matrix: Samplewater**					**Sampled:**	**01-Aug-24 11:00**	**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	14.2	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	13.2	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24
Sample ID: 121677-R1	**Day 2-8**			**Matrix: Samplewater**					**Sampled:**	**01-Aug-24 11:00**	**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	19.9	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.9	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24
Sample ID: 121678-R1	**Day 2-9**			**Matrix: Samplewater**					**Sampled:**	**01-Aug-24 11:00**	**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	7.75	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24
Sample ID: 121679-R1	**Day 2-10**			**Matrix: Samplewater**					**Sampled:**	**01-Aug-24 11:00**	**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	14.7	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	9.85	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24
Sample ID: 121680-R1	**Day 2-11**			**Matrix: Samplewater**					**Sampled:**	**01-Aug-24 11:00**	**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.4	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.7	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24
Sample ID: 121681-R1	**Day 2-12**			**Matrix: Samplewater**					**Sampled:**	**01-Aug-24 11:00**	**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.95	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	8.91	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24

PHYSIS
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PHYSIS Project ID: 2407005-001
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121682-R1 Day 2-13			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	13.4	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)	EPA 200.8	µg/L	12.4	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24
Sample ID: 121683-R1 Day 2-14			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	8.8	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)	EPA 200.8	µg/L	8.02	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24
Sample ID: 121684-R1 Day 2-15			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	11.5	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)	EPA 200.8	µg/L	11	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24
Sample ID: 121685-R1 Day 2-16			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	14.8	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)	EPA 200.8	µg/L	12.3	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24
Sample ID: 121686-R1 Day 2-17			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	9.14	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)	EPA 200.8	µg/L	9.73	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24
Sample ID: 121687-R1 Day 2-18			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	11.3	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)	EPA 200.8	µg/L	11.5	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24
Sample ID: 121688-R1 Day 2-19			**Matrix: Samplewater**				**Sampled: 01-Aug-24 11:00**			**Received: 02-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	17.5	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)	EPA 200.8	µg/L	20.2	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24

PHYSIS
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PHYSIS Project ID: 2407005-001
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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121689-R1	**Day 2-20**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	15.8	1	1.13	5.65	Total		E-33097	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	7.94	1	1.13	5.65	Dissolved		E-33097	18-Sep-24	20-Sep-24
Sample ID: 121690-R1	**Day 2-21**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11	1	1.13	5.65	Total		E-33098	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	11.5	1	1.13	5.65	Dissolved		E-33098	18-Sep-24	20-Sep-24
Sample ID: 121691-R1	**Day 2-22**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	13.3	1	1.13	5.65	Total		E-33098	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	8.02	1	1.13	5.65	Dissolved		E-33098	18-Sep-24	20-Sep-24
Sample ID: 121692-R1	**Day 2-23**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	152	1	1.13	5.65	Total		E-33098	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	13.3	1	1.13	5.65	Dissolved		E-33098	18-Sep-24	20-Sep-24
Sample ID: 121693-R1	**Day 2-24**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.5	1	1.13	5.65	Total		E-33098	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	12.1	1	1.13	5.65	Dissolved		E-33098	18-Sep-24	20-Sep-24
Sample ID: 121694-R1	**Day 2-25**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.8	1	1.13	5.65	Total		E-33098	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	11	1	1.13	5.65	Dissolved		E-33098	18-Sep-24	20-Sep-24
Sample ID: 121695-R1	**Day 2-26**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.1	1	1.13	5.65	Total		E-33098	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.1	1	1.13	5.65	Dissolved		E-33098	18-Sep-24	20-Sep-24

PHYSIS
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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121696-R1	**Day 2-27**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.9	1	1.13	5.65	Total		E-33098	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	12.1	1	1.13	5.65	Dissolved		E-33098	18-Sep-24	20-Sep-24
Sample ID: 121697-R1	**Day 2-28**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	64.9	1	1.13	5.65	Total		E-33098	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	25.6	1	1.13	5.65	Dissolved		E-33098	18-Sep-24	20-Sep-24
Sample ID: 121698-R1	**Day 2-29**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	18.2	1	1.13	5.65	Total		E-33098	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	11	1	1.13	5.65	Dissolved		E-33098	18-Sep-24	20-Sep-24
Sample ID: 121699-R1	**Day 2-30**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	19.2	1	1.13	5.65	Total		E-33098	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	11.3	1	1.13	5.65	Dissolved		E-33098	18-Sep-24	20-Sep-24
Sample ID: 121700-R1	**Day 2-31**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.3	1	1.13	5.65	Total		E-33098	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.6	1	1.13	5.65	Dissolved		E-33098	18-Sep-24	20-Sep-24
Sample ID: 121701-R1	**Day 2-32**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	23.2	1	1.13	5.65	Total		E-33098	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.7	1	1.13	5.65	Dissolved		E-33098	18-Sep-24	20-Sep-24
Sample ID: 121702-R1	**Day 2-33**			**Matrix: Samplewater**				**Sampled:**	**01-Aug-24 11:00**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	18.8	1	1.13	5.65	Total		E-33098	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	13.4	1	1.13	5.65	Dissolved		E-33098	18-Sep-24	20-Sep-24

PHYSIS
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Innovative Solutions for Nature

PHYSIS Project ID: 2407005-001
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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121703-R1	**Day 2-34**			**Matrix: Samplewater**					**Sampled:**	**01-Aug-24 11:00**	**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.4	1	1.13	5.65	Total		E-33098	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	11.7	1	1.13	5.65	Dissolved		E-33098	18-Sep-24	20-Sep-24
Sample ID: 121704-R1	**Day 2-35**			**Matrix: Samplewater**					**Sampled:**	**01-Aug-24 11:00**	**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	16.4	1	1.13	5.65	Total		E-33098	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.8	1	1.13	5.65	Dissolved		E-33098	18-Sep-24	20-Sep-24
Sample ID: 121705-R1	**Day 2-36**			**Matrix: Samplewater**					**Sampled:**	**01-Aug-24 11:00**	**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	20.8	1	1.13	5.65	Total		E-33098	18-Sep-24	20-Sep-24
Iron (Fe)		EPA 200.8	µg/L	13.3	1	1.13	5.65	Dissolved		E-33098	18-Sep-24	20-Sep-24
Sample ID: 121706-R1	**Day 3-1**			**Matrix: Samplewater**					**Sampled:**	**02-Aug-24 10:45**	**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.2	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.5	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24
Sample ID: 121707-R1	**Day 3-2**			**Matrix: Samplewater**					**Sampled:**	**02-Aug-24 10:45**	**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	21.1	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	15.4	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24
Sample ID: 121708-R1	**Day 3-3**			**Matrix: Samplewater**					**Sampled:**	**02-Aug-24 10:45**	**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.5	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	14.5	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24
Sample ID: 121709-R1	**Day 3-4**			**Matrix: Samplewater**					**Sampled:**	**02-Aug-24 10:45**	**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	15.3	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	8.9	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24

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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121710-R1	**Day 3-5**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	102	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	9.84	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24
Sample ID: 121711-R1	**Day 3-6**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	36.1	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.8	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24
Sample ID: 121712-R1	**Day 3-7**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	31.9	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	13.3	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24
Sample ID: 121713-R1	**Day 3-8**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.85	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	11.6	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24
Sample ID: 121714-R1	**Day 3-9**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.3	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	14.9	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24
Sample ID: 121715-R1	**Day 3-10**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	32.1	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	53.7	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24
Sample ID: 121716-R1	**Day 3-11**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.5	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	9.38	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24

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Elements

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121717-R1 Day 3-12			**Matrix: Samplewater**				**Sampled: 02-Aug-24 10:45**			**Received:**	**02-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	25.1	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)	EPA 200.8	µg/L	31.7	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24
Sample ID: 121718-R1 Day 3-13			**Matrix: Samplewater**				**Sampled: 02-Aug-24 10:45**			**Received:**	**02-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	21.8	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)	EPA 200.8	µg/L	16	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24
Sample ID: 121719-R1 Day 3-14			**Matrix: Samplewater**				**Sampled: 02-Aug-24 10:45**			**Received:**	**02-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	8.01	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)	EPA 200.8	µg/L	9.21	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24
Sample ID: 121720-R1 Day 3-15			**Matrix: Samplewater**				**Sampled: 02-Aug-24 10:45**			**Received:**	**02-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	26.8	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)	EPA 200.8	µg/L	14.3	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24
Sample ID: 121721-R1 Day 3-16			**Matrix: Samplewater**				**Sampled: 02-Aug-24 10:45**			**Received:**	**02-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	57.7	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)	EPA 200.8	µg/L	15.3	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24
Sample ID: 121722-R1 Day 3-17			**Matrix: Samplewater**				**Sampled: 02-Aug-24 10:45**			**Received:**	**02-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	17.7	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)	EPA 200.8	µg/L	14.5	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24
Sample ID: 121723-R1 Day 3-18			**Matrix: Samplewater**				**Sampled: 02-Aug-24 10:45**			**Received:**	**02-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	14.5	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)	EPA 200.8	µg/L	15.9	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-001
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121724-R1	**Day 3-19**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	14.5	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	22	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24
Sample ID: 121725-R1	**Day 3-20**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	16.4	1	1.13	5.65	Total		E-33099	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.6	1	1.13	5.65	Dissolved		E-33099	18-Sep-24	21-Sep-24
Sample ID: 121726-R1	**Day 3-21**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	13.1	1	1.13	5.65	Total		E-33100	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.8	1	1.13	5.65	Dissolved		E-33100	18-Sep-24	21-Sep-24
Sample ID: 121727-R1	**Day 3-22**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	15.1	1	1.13	5.65	Total		E-33100	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	11	1	1.13	5.65	Dissolved		E-33100	18-Sep-24	21-Sep-24
Sample ID: 121728-R1	**Day 3-23**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	128	1	1.13	5.65	Total		E-33100	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	16.8	1	1.13	5.65	Dissolved		E-33100	18-Sep-24	21-Sep-24
Sample ID: 121729-R1	**Day 3-24**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	14.8	1	1.13	5.65	Total		E-33100	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	15.3	1	1.13	5.65	Dissolved		E-33100	18-Sep-24	21-Sep-24
Sample ID: 121730-R1	**Day 3-25**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	24.8	1	1.13	5.65	Total		E-33100	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	7.94	1	1.13	5.65	Dissolved		E-33100	18-Sep-24	21-Sep-24

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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121731-R1	**Day 3-26**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	19.3	1	1.13	5.65	Total		E-33100	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	15.2	1	1.13	5.65	Dissolved		E-33100	18-Sep-24	21-Sep-24
Sample ID: 121732-R1	**Day 3-27**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	24.1	1	1.13	5.65	Total		E-33100	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	19.9	1	1.13	5.65	Dissolved		E-33100	18-Sep-24	21-Sep-24
Sample ID: 121733-R1	**Day 3-28**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	29.5	1	1.13	5.65	Total		E-33100	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	25.1	1	1.13	5.65	Dissolved		E-33100	18-Sep-24	21-Sep-24
Sample ID: 121734-R1	**Day 3-29**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	22.1	1	1.13	5.65	Total		E-33100	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	16.4	1	1.13	5.65	Dissolved		E-33100	18-Sep-24	21-Sep-24
Sample ID: 121735-R1	**Day 3-30**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	112	1	1.13	5.65	Total		E-33100	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	14.3	1	1.13	5.65	Dissolved		E-33100	18-Sep-24	21-Sep-24
Sample ID: 121736-R1	**Day 3-31**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	23.3	1	1.13	5.65	Total		E-33100	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	5.69	1	1.13	5.65	Dissolved		E-33100	18-Sep-24	23-Sep-24
Sample ID: 121737-R1	**Day 3-32**			**Matrix: Samplewater**				**Sampled:**	**02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.3	1	1.13	5.65	Total		E-33100	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	9.71	1	1.13	5.65	Dissolved		E-33100	18-Sep-24	21-Sep-24

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PHYSIS Project ID: 2407005-001
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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121738-R1	**Day 3-33**			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.9	1	1.13	5.65	Total		E-33100	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	14.1	1	1.13	5.65	Dissolved		E-33100	18-Sep-24	21-Sep-24
Sample ID: 121739-R1	**Day 3-34**			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	36.7	1	1.13	5.65	Total		E-33100	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	17.6	1	1.13	5.65	Dissolved		E-33100	18-Sep-24	21-Sep-24
Sample ID: 121740-R1	**Day 3-35**			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	128	1	1.13	5.65	Total		E-33100	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	48	1	1.13	5.65	Dissolved		E-33100	18-Sep-24	21-Sep-24
Sample ID: 121741-R1	**Day 3-36**			**Matrix: Samplewater**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	41	1	1.13	5.65	Total		E-33100	18-Sep-24	21-Sep-24
Iron (Fe)		EPA 200.8	µg/L	14.3	1	1.13	5.65	Dissolved		E-33100	18-Sep-24	21-Sep-24

QUALITY CONTROL REPORT

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Attachment A-2

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PHYSIS Project ID: 2407005-001
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Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

QUALITY CONTROL REPORT

SAMPLE ID		BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS		QA CODE
Dissolved Orthophosphate as P		**Method: EPA 300.0**					**Fraction: NA**				**Prepared: 27-Aug-24**			**Analyzed: 27-Aug-24**		
121627-B1	QAQC Procedural Blank	C-83038	ND	1	0.002	0.005	mg/L									
121627-BS1	QAQC Procedural Blank	C-83038	1.97	1	0.002	0.005	mg/L	2	0	99	90 - 110%	PASS				
121627-BS2	QAQC Procedural Blank	C-83038	2.1	1	0.002	0.005	mg/L	2	0	105	90 - 110%	PASS	7	30	PASS	
121628-B1	QAQC Procedural Blank	C-83039	ND	1	0.002	0.005	mg/L									
121628-BS1	QAQC Procedural Blank	C-83039	2.15	1	0.002	0.005	mg/L	2	0	108	90 - 110%	PASS				
121628-BS2	QAQC Procedural Blank	C-83039	2.01	1	0.002	0.005	mg/L	2	0	100	90 - 110%	PASS	8	30	PASS	
121629-B1	QAQC Procedural Blank	C-83040	ND	1	0.002	0.005	mg/L									
121629-BS1	QAQC Procedural Blank	C-83040	2.03	1	0.002	0.005	mg/L	2	0	101	90 - 110%	PASS				
121629-BS2	QAQC Procedural Blank	C-83040	2.09	1	0.002	0.005	mg/L	2	0	104	90 - 110%	PASS	2	30	PASS	
121630-B1	QAQC Procedural Blank	C-83041	ND	1	0.002	0.005	mg/L									
121630-BS1	QAQC Procedural Blank	C-83041	1.8	1	0.002	0.005	mg/L	2	0	90	90 - 110%	PASS				
121630-BS2	QAQC Procedural Blank	C-83041	1.89	1	0.002	0.005	mg/L	2	0	94	90 - 110%	PASS	4	30	PASS	
121631-B1	QAQC Procedural Blank	C-83042	ND	1	0.002	0.005	mg/L									
121631-BS1	QAQC Procedural Blank	C-83042	1.77	1	0.002	0.005	mg/L	2	0	88	90 - 110%	FAIL				R
121631-BS2	QAQC Procedural Blank	C-83042	2.08	1	0.002	0.005	mg/L	2	0	104	90 - 110%	PASS	17	30	PASS	
121632-B1	QAQC Procedural Blank	C-83043	ND	1	0.002	0.005	mg/L									
121632-BS1	QAQC Procedural Blank	C-83043	2.17	1	0.002	0.005	mg/L	2	0	109	90 - 110%	PASS				
121632-BS2	QAQC Procedural Blank	C-83043	2.07	1	0.002	0.005	mg/L	2	0	103	90 - 110%	PASS	4	30	PASS	
Total Nitrogen		**Method: SM 5310 B-N Module**					**Fraction: NA**				**Prepared: 26-Aug-24**			**Analyzed: 27-Aug-24**		
121627-B1	QAQC Procedural Blank	O-28126	ND	1	0.28	0.6	mg/L									
121627-BS1	QAQC Procedural Blank	O-28126	10.2	1	0.28	0.6	mg/L	10	0	102	70 - 130%	PASS				
121627-BS2	QAQC Procedural Blank	O-28126	9.35	1	0.28	0.6	mg/L	10	0	94	70 - 130%	PASS	8	30	PASS	

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Conventionals

QUALITY CONTROL REPORT

SAMPLE ID		BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS	QA CODE
121628-B1	QAQC Procedural Blank	O-28127	ND	1	0.28	0.6	mg/L								
121628-BS1	QAQC Procedural Blank	O-28127	10.1	1	0.28	0.6	mg/L	10	0	101	70 - 130%	PASS			
121628-BS2	QAQC Procedural Blank	O-28127	10.1	1	0.28	0.6	mg/L	10	0	101	70 - 130%	PASS	0	30 PASS	
121629-B1	QAQC Procedural Blank	O-28128	ND	1	0.28	0.6	mg/L								
121629-BS1	QAQC Procedural Blank	O-28128	10.3	1	0.28	0.6	mg/L	10	0	103	70 - 130%	PASS			
121629-BS2	QAQC Procedural Blank	O-28128	10.1	1	0.28	0.6	mg/L	10	0	101	70 - 130%	PASS	2	30 PASS	
121630-B1	QAQC Procedural Blank	O-28129	ND	1	0.28	0.6	mg/L								
121630-BS1	QAQC Procedural Blank	O-28129	10.6	1	0.28	0.6	mg/L	10	0	106	70 - 130%	PASS			
121630-BS2	QAQC Procedural Blank	O-28129	10.3	1	0.28	0.6	mg/L	10	0	103	70 - 130%	PASS	3	30 PASS	
121631-B1	QAQC Procedural Blank	O-28130	ND	1	0.28	0.6	mg/L								
121631-BS1	QAQC Procedural Blank	O-28130	10.4	1	0.28	0.6	mg/L	10	0	104	70 - 130%	PASS			
121631-BS2	QAQC Procedural Blank	O-28130	10.2	1	0.28	0.6	mg/L	10	0	102	70 - 130%	PASS	2	30 PASS	
121632-B1	QAQC Procedural Blank	O-28131	ND	1	0.28	0.6	mg/L								
121632-BS1	QAQC Procedural Blank	O-28131	10.6	1	0.28	0.6	mg/L	10	0	106	70 - 130%	PASS			
121632-BS2	QAQC Procedural Blank	O-28131	10	1	0.28	0.6	mg/L	10	0	100	70 - 130%	PASS	6	30 PASS	
Total Phosphorus		**Method: EPA 200.8**				**Fraction: Tot**				**Prepared: 10-Oct-24**				**Analyzed: 16-Oct-24**	
121627-B1	QAQC Procedural Blank	E-33116	ND	1	0.016	0.05	mg/L								
121627-BS1	QAQC Procedural Blank	E-33116	19.7	1	0.016	0.05	mg/L	20	0	99	70 - 130%	PASS			
121627-BS2	QAQC Procedural Blank	E-33116	20.1	1	0.016	0.05	mg/L	20	0	100	70 - 130%	PASS	2	30 PASS	
Total Phosphorus		**Method: SM 4500-P E**				**Fraction: NA**				**Prepared: 20-Aug-24**				**Analyzed: 22-Aug-24**	
121627-B1	QAQC Procedural Blank	C-82142	ND	1	0.016	0.05	mg/L								
121627-BS1	QAQC Procedural Blank	C-82142	0.333	1	0.016	0.05	mg/L	0.3	0	111	70 - 130%	PASS			
121627-BS2	QAQC Procedural Blank	C-82142	0.327	1	0.016	0.05	mg/L	0.3	0	109	70 - 130%	PASS	2	30 PASS	

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QUALITY CONTROL REPORT

SAMPLE ID		BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS	QA CODE
121628-B1	QAQC Procedural Blank	C-82143	ND	1	0.016	0.02	mg/L								
121628-BS1	QAQC Procedural Blank	C-82143	0.333	1	0.016	0.02	mg/L	0.3	0	111	73 - 131%	PASS			
121628-BS2	QAQC Procedural Blank	C-82143	0.327	1	0.016	0.02	mg/L	0.3	0	109	73 - 131%	PASS	2	30	PASS
121629-B1	QAQC Procedural Blank	C-82147	ND	1	0.016	0.02	mg/L								
121629-BS1	QAQC Procedural Blank	C-82147	0.323	1	0.016	0.02	mg/L	0.3	0	108	73 - 131%	PASS			
121629-BS2	QAQC Procedural Blank	C-82147	0.328	1	0.016	0.02	mg/L	0.3	0	109	73 - 131%	PASS	1	30	PASS
121630-B1	QAQC Procedural Blank	C-82148	ND	1	0.016	0.05	mg/L								
121630-BS1	QAQC Procedural Blank	C-82148	0.335	1	0.016	0.05	mg/L	0.3	0	112	70 - 130%	PASS			
121630-BS2	QAQC Procedural Blank	C-82148	0.336	1	0.016	0.05	mg/L	0.3	0	112	70 - 130%	PASS	0	30	PASS
121631-B1	QAQC Procedural Blank	C-82149	ND	1	0.016	0.02	mg/L								
121631-BS1	QAQC Procedural Blank	C-82149	0.31	1	0.016	0.02	mg/L	0.3	0	103	73 - 131%	PASS			
121631-BS2	QAQC Procedural Blank	C-82149	0.317	1	0.016	0.02	mg/L	0.3	0	106	73 - 131%	PASS	3	30	PASS
121632-B1	QAQC Procedural Blank	C-82194	ND	1	0.016	0.02	mg/L								
121632-BS1	QAQC Procedural Blank	C-82194	0.322	1	0.016	0.02	mg/L	0.3	0	107	73 - 131%	PASS			
121632-BS2	QAQC Procedural Blank	C-82194	0.33	1	0.016	0.02	mg/L	0.3	0	110	73 - 131%	PASS	3	30	PASS

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Elements

QUALITY CONTROL REPORT

ANALYTE	FRACTION	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS		QA CODEc
Sample ID: 121627-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33095		Prepared: 16-Sep-24					Analyzed: 19-Sep-24		
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L									
Sample ID: 121627-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33095		Prepared: 16-Sep-24					Analyzed: 19-Sep-24		
Iron (Fe)	Total	932	1	1.13	5.65	µg/L	1000	0	93	85 - 115%	PASS				
Sample ID: 121627-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33095		Prepared: 16-Sep-24					Analyzed: 19-Sep-24		
Iron (Fe)	Total	978	1	1.13	5.65	µg/L	1000	0	98	85 - 115%	PASS	5	30	PASS	
Sample ID: 121628-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33096		Prepared: 16-Sep-24					Analyzed: 19-Sep-24		
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L									
Sample ID: 121628-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33096		Prepared: 16-Sep-24					Analyzed: 19-Sep-24		
Iron (Fe)	Total	981	1	1.13	5.65	µg/L	1000	0	98	85 - 115%	PASS				
Sample ID: 121628-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33096		Prepared: 16-Sep-24					Analyzed: 19-Sep-24		
Iron (Fe)	Total	982	1	1.13	5.65	µg/L	1000	0	98	85 - 115%	PASS	0	30	PASS	
Sample ID: 121629-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33097		Prepared: 18-Sep-24					Analyzed: 20-Sep-24		
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L									
Sample ID: 121629-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33097		Prepared: 18-Sep-24					Analyzed: 20-Sep-24		
Iron (Fe)	Total	1050	1	1.13	5.65	µg/L	1000	0	105	85 - 115%	PASS				

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-001
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

QUALITY CONTROL REPORT

ANALYTE	FRACTION	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS	QA CODEc
Sample ID: 121629-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**			**Received:**			
		Method: EPA 200.8				Batch ID: E-33097		Prepared: 18-Sep-24			Analyzed: 20-Sep-24			
Iron (Fe)	Total	957	1	1.13	5.65	µg/L	1000	0	96	85 - 115%	PASS	9	30	PASS
Sample ID: 121630-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**			**Received:**			
		Method: EPA 200.8				Batch ID: E-33098		Prepared: 18-Sep-24			Analyzed: 20-Sep-24			
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L								
Sample ID: 121630-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**			**Received:**			
		Method: EPA 200.8				Batch ID: E-33098		Prepared: 18-Sep-24			Analyzed: 20-Sep-24			
Iron (Fe)	Total	1050	1	1.13	5.65	µg/L	1000	0	105	85 - 115%	PASS			
Sample ID: 121630-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**			**Received:**			
		Method: EPA 200.8				Batch ID: E-33098		Prepared: 18-Sep-24			Analyzed: 20-Sep-24			
Iron (Fe)	Total	987	1	1.13	5.65	µg/L	1000	0	99	85 - 115%	PASS	6	30	PASS
Sample ID: 121631-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**			**Received:**			
		Method: EPA 200.8				Batch ID: E-33099		Prepared: 18-Sep-24			Analyzed: 21-Sep-24			
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L								
Sample ID: 121631-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**			**Received:**			
		Method: EPA 200.8				Batch ID: E-33099		Prepared: 18-Sep-24			Analyzed: 21-Sep-24			
Iron (Fe)	Total	970	1	1.13	5.65	µg/L	1000	0	97	85 - 115%	PASS			
Sample ID: 121631-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**			**Received:**			
		Method: EPA 200.8				Batch ID: E-33099		Prepared: 18-Sep-24			Analyzed: 21-Sep-24			
Iron (Fe)	Total	959	1	1.13	5.65	µg/L	1000	0	96	85 - 115%	PASS	1	30	PASS
Sample ID: 121632-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**			**Received:**			
		Method: EPA 200.8				Batch ID: E-33100		Prepared: 18-Sep-24			Analyzed: 23-Sep-24			
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L								

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-001
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

QUALITY CONTROL REPORT

ANALYTE	FRACTION	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS		QA CODEc
Sample ID: 121632-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33100		Prepared: 18-Sep-24					Analyzed: 23-Sep-24		
Iron (Fe)	Total	919	1	1.13	5.65	µg/L	1000	0	92	85 - 115%	PASS				
Sample ID: 121632-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33100		Prepared: 18-Sep-24					Analyzed: 23-Sep-24		
Iron (Fe)	Total	914	1	1.13	5.65	µg/L	1000	0	91	85 - 115%	PASS	1	30	PASS	

Attachment A-2

CHAIN OF CUSTODY

PHASE
TERRA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus													
Day 0-1		7/30/2024	0715	3			x				x	x	x														
Day 1-1		7/31/2024	1055	3			x				x	x	x														
Day 1-2		7/31/2024	1055	3			x				x	x	x														
Day 1-3		7/31/2024	1055	3			x				x	x	x														
Day 1-4		7/31/2024	1055	3			x				x	x	x														
Day 1-5		7/31/2024	1055	3			x				x	x	x														
Day 1-6		7/31/2024	1055	3			x				x	x	x														
Day 1-7		7/31/2024	1055	3			x				x	x	x														
Day 1-8		7/31/2024	1055	3			x				x	x	x														
Day 1-9		7/31/2024	1055	3			x				x	x	x														

Samplers Signature	**Date** 8/2/24	**Time** 1245
Relinquished By:	**Date** 8/2/24	**Time** 1300
Received By:	**Date** 8/2/24	**Time** 1:00
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date** 8/2/24	**Time** 1640

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ___/___/___
Temperature (°C): ____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses															
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus												
Day 1-10		7/31/2024	1055	3			x				x	x	x													
Day 1-11		7/31/2024	1055	3			x				x	x	x													
Day 1-12		7/31/2024	1055	3			x				x	x	x													
Day 1-13		7/31/2024	1055	3			x				x	x	x													
Day 1-14		7/31/2024	1055	3			x				x	x	x													
Day 1-15		7/31/2024	1055	3			x				x	x	x													
Day 1-16		7/31/2024	1055	3			x				x	x	x													
Day 1-17		7/31/2024	1055	3			x				x	x	x													
Day 1-18		7/31/2024	1055	3			x				x	x	x													
Day 1-19		7/31/2024	1055	3			x				x	x	x													

Samplers Signature	**Date** 8/2/24	**Time** 1245
Relinquished By:	**Date** 8/2/24	**Time** 1300
Received By:	**Date** 8/2/24	**Time** 1:00
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date** 8/2/24	**Time** 1640

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 Page: 1 of 1

Project Manager: John Rudolph	phone: 858-243-8158	Bill To: John Rudolph	Report To: John Rudolph
Project Name: GEI EVMWD SOD Study		Company: WSP USA	Company: WSP USA
Proj# US0024915.6871		Address: 9177 Sky Park Court, San Diego, CA 92123	Email: john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		Lab Use	
QC Level:	TAT:	Preservatives	

Sample Data					Matrix						Analyses																
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus													
Day 1-20		7/31/2024	1055	3			x				x	x	x														
Day 1-21		7/31/2024	1055	3			x				x	x	x														
Day 1-22		7/31/2024	1055	3			x				x	x	x														
Day 1-23		7/31/2024	1055	3			x				x	x	x														
Day 1-24		7/31/2024	1055	3			x				x	x	x														
Day 1-25		7/31/2024	1055	3			x				x	x	x														
Day 1-26		7/31/2024	1055	3			x				x	x	x														
Day 1-27		7/31/2024	1055	3			x				x	x	x														
Day 1-28		7/31/2024	1055	3			x				x	x	x														
Day 1-29		7/31/2024	1055	3			x				x	x	x														

Samplers Signature	Date 8/2/24	Time 1245
Relinquished By:	Date 8/2/24	Time 1300
Received By:	Date 8/2/24	Time 1:00
Relinquished By:	Date	Time
Received By (LAB):	Date 8/2/24	Time 1640

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 Page: 1 of 1

Project Manager: John Rudolph	phone: 858-243-8158	Bill To: John Rudolph	Report To: John Rudolph
Project Name: GEI EVMWD SOD Study		Company: WSP USA	Company: WSP USA
Proj# US0024915.6871		Address: 9177 Sky Park Court, San Diego, CA 92123	Email: john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		Lab Use	
QC Level:	TAT:	Preservatives	

Sample Data					Matrix						Analyses															
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus												
Day 1-30		7/31/2024	1055	3			x				x	x	x													
Day 1-31		7/31/2024	1055	3			x				x	x	x													
Day 1-32		7/31/2024	1055	3			x				x	x	x													
Day 1-33		7/31/2024	1055	3			x				x	x	x													
Day 1-34		7/31/2024	1055	3			x				x	x	x													
Day 1-35		7/31/2024	1055	3			x				x	x	x													
Day 1-36		7/31/2024	1055	3			x				x	x	x													

Samplers Signature		Date 8/2/24	Time 1245
Relinquished By:		Date 8/2/24	Time 1300
Received By:	Jerry Mendoza	Date 8/2/24	Time 1:00
Relinquished By:		Date	Time
Received By (LAB):		Date 8/2/24	Time 1640

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court, San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses															
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus												
Day 2-1		8/1/2024	1100	3			x				x	x	x													
Day 2-2		8/1/2024	1100	3			x				x	x	x													
Day 2-3		8/1/2024	1100	3			x				x	x	x													
Day 2-4		8/1/2024	1100	3			x				x	x	x													
Day 2-5		8/1/2024	1100	3			x				x	x	x													
Day 2-6		8/1/2024	1100	3			x				x	x	x													
Day 2-7		8/1/2024	1100	3			x				x	x	x													
Day 2-8		8/1/2024	1100	3			x				x	x	x													
Day 2-9		8/1/2024	1100	3			x				x	x	x													
Day 2-10		8/1/2024	1100	3			x				x	x	x													

Samplers Signature		**Date** 8/2/24	**Time** 1245
Relinquished By:		**Date** 8/2/24	**Time** 1300
Received By:		**Date** 8/2/24	**Time** 1:00
Relinquished By:		**Date**	**Time**
Received By (LAB):		**Date** 8/2/24	**Time** 1640

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court, San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus													
Day 2-11		8/1/2024	1100	3			x				x	x	x														
Day 2-12		8/1/2024	1100	3			x				x	x	x														
Day 2-13		8/1/2024	1100	3			x				x	x	x														
Day 2-14		8/1/2024	1100	3			x				x	x	x														
Day 2-15		8/1/2024	1100	3			x				x	x	x														
Day 2-16		8/1/2024	1100	3			x				x	x	x														
Day 2-17		8/1/2024	1100	3			x				x	x	x														
Day 2-18		8/1/2024	1100	3			x				x	x	x														
Day 2-19		8/1/2024	1100	3			x				x	x	x														
Day 2-20		8/1/2024	1100	3			x				x	x	x														

Samplers Signature	**Date** 8/2/24	**Time** 1245
Relinquished By:	**Date** 8/2/24	**Time** 1300
Received By:	**Date** 8/2/24	**Time** 1:00
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date** 8/2/24	**Time** 1640

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court, San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus													
Day 2-21		8/1/2024	1100	3			x				x	x	x														
Day 2-22		8/1/2024	1100	3			x				x	x	x														
Day 2-23		8/1/2024	1100	3			x				x	x	x														
Day 2-24		8/1/2024	1100	3			x				x	x	x														
Day 2-25		8/1/2024	1100	3			x				x	x	x														
Day 2-26		8/1/2024	1100	3			x				x	x	x														
Day 2-27		8/1/2024	1100	3			x				x	x	x														
Day 2-28		8/1/2024	1100	3			x				x	x	x														
Day 2-29		8/1/2024	1100	3			x				x	x	x														
Day 2-30		8/1/2024	1100	3			x				x	x	x														

Samplers Signature	**Date** 8/2/24	**Time** 1245
Relinquished By:	**Date** 8/2/24	**Time** 1300
Received By:	**Date** 8/2/24	**Time** 1:00
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date** 8/2/24	**Time** 1640

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	phone: 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court, San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses															
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus												
Day 2-31		8/1/2024	1100	3			x				x	x	x													
Day 2-32		8/1/2024	1100	3			x				x	x	x													
Day 2-33		8/1/2024	1100	3			x				x	x	x													
Day 2-34		8/1/2024	1100	3			x				x	x	x													
Day 2-35		8/1/2024	1100	3			x				x	x	x													
Day 2-36		8/1/2024	1100	3			x				x	x	x													

Samplers Signature	**Date** 8/1/24	**Time** 1245
Relinquished By:	**Date** 8/2/24	**Time** 1300
Received By:	**Date** 8/2/24	**Time** 1:00
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date** 8/2/24	**Time** 1040

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus													
Day 3-1		8/2/2024	1045	3			x				x	x	x														
Day 3-2		8/2/2024	1045	3			x				x	x	x														
Day 3-3		8/2/2024	1045	3			x				x	x	x														
Day 3-4		8/2/2024	1045	3			x				x	x	x														
Day 3-5		8/2/2024	1045	3			x				x	x	x														
Day 3-6		8/2/2024	1045	3			x				x	x	x														
Day 3-7		8/2/2024	1045	3			x				x	x	x														
Day 3-8		8/2/2024	1045	3			x				x	x	x														
Day 3-9		8/2/2024	1045	3			x				x	x	x														
Day 3-10		8/2/2024	1045	3			x				x	x	x														

Samplers Signature		**Date** 8/2/24	**Time** 1245
Relinquished By:		**Date** 8/2/24	**Time** 1300
Received By:		**Date** 8/2/24	**Time** 1:00
Relinquished By:		**Date**	**Time**
Received By (LAB):		**Date** 8/2/24	**Time** 1600

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court, San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus													
Day 3-11		8/2/2024	1045	3			x				x	x	x														
Day 3-12		8/2/2024	1045	3			x				x	x	x														
Day 3-13		8/2/2024	1045	3			x				x	x	x														
Day 3-14		8/2/2024	1045	3			x				x	x	x														
Day 3-15		8/2/2024	1045	3			x				x	x	x														
Day 3-16		8/2/2024	1045	3			x				x	x	x														
Day 3-17		8/2/2024	1045																								
Day 3-18		8/2/2024	1045																								
Day 3-19		8/2/2024	1045																								
Day 3-20		8/2/2024	1045																								

Samplers Signature		**Date** 8/2/24	**Time** 1245
Relinquished By:		**Date** 8/2/24	**Time** 1300
Received By:		**Date** 8/2/24	**Time** 1:00
Relinquished By:		**Date**	**Time**
Received By (LAB):		**Date** 8/2/24	**Time** 1640

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 Page: 1 of 1

Project Manager: John Rudolph	phone: 858-243-8158	Bill To: John Rudolph	Report To: John Rudolph
Project Name: GEI EVMWD SOD Study		Company: WSP USA	Company: WSP USA
Proj# US0024915.6871		Address: 9177 Sky Park Court, San Diego, CA 92123	Email: john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		Lab Use	
QC Level:	TAT:	Preservatives	

Sample Data					Matrix						Analyses															
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus												
Day 3-21		8/2/2024	1045	3			x				x	x	x													
Day 3-22		8/2/2024	1045	3			x				x	x	x													
Day 3-23		8/2/2024	1045	3			x				x	x	x													
Day 3-24		8/2/2024	1045	3			x				x	x	x													
Day 3-25		8/2/2024	1045	3			x				x	x	x													
Day 3-26		8/2/2024	1045	3			x				x	x	x													
Day 3-27		8/2/2024	1045																							
Day 3-28		8/2/2024	1045																							
Day 3-29		8/2/2024	1045																							
Day 3-30		8/2/2024	1045																							

Samplers Signature	Date 8/2/24	Time 1215
Relinquished By:	Date 8/2/24	Time 1300
Received By: Jerry Mendoza	Date 8/2/24	Time 1.00
Relinquished By:	Date	Time
Received By (LAB):	Date 8/2/24	Time 1640

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus													
Day 3-31		8/2/2024	1045	3			x				x	x	x														
Day 3-32		8/2/2024	1045	3			x				x	x	x														
Day 3-33		8/2/2024	1045	3			x				x	x	x														
Day 3-34		8/2/2024	1045	3			x				x	x	x														
Day 3-35		8/2/2024	1045	3			x				x	x	x														
Day 3-36		8/2/2024	1045	3			x				x	x	x														

Samplers Signature	**Date** 8/2/24	**Time** 1245
Relinquished By:	**Date** 8/2/24	**Time** 1300
Received By:	**Date** 8/2/24	**Time** 1:00pm
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date** 8/2/24	**Time** 1640

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

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Project Iteration ID: 2407005-001
Client Name: WSP USA
Project Name: GEI EVMWD SOD Study Project # US0024915.6871
COC Page Number: 13 of 13
Bottle Label Color: NA

Sample Receipt Summary

Receiving Info

1. Initials Received By: [signature]
2. Date Received: 3/2/24
3. Time Received: ~~1:45pm~~ 1:00pm
4. Client Name: WSP Jerry Mendoza
5. Courier Information: (Please circle)
   - Client
   - UPS
   - Area Fast
   - DRS
   - FedEx
   - GSO/GLS
   - Ontrac
   - PAMS
   - PHYSIS Driver:
     - i. Start Time: 9:45am
     - ii. End Time: 4:42pm
     - iii. Total Mileage: _____
     - iv. Number of Pickups: _____
6. Container Information: (Please put the # of containers or circle none)
   - 2 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): 4.9 Used I/R Thermometer # 1-2

Inspection Info

1. Initials Inspected By: [signature]

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

IR Wet Freezer #10

Notes:

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September 30, 2024

John D. Rudolph
WSP USA
9177 Sky Park Court
San Diego, CA 92123-

Project Name: GEI EVMWD SOD Study Project # US0024915.6871
Physis Project ID: 2407005-003

Dear John,

Enclosed are the analytical results for samples submitted to PHYSIS Environmental Laboratories, Inc. (PHYSIS) on 8/6/2024. A total of 72 samples were received for analysis in accordance with the attached chain of custody (COC). Per the COC, the samples were analyzed for:

Conventionals
Total Phosphorus by SM 4500-P E
Total Nitrogen by SM 5310 B-N Module
Dissolved Orthophosphate as P by EPA 300.0
Elements
Total & Dissolved Iron (Fe) by EPA 200.8

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

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PROJECT SAMPLE LIST

WSP USA

PHYSIS Project ID: 2407005-003

GEI EVMWD SOD Study Project # US0024915.6871

Total Samples: 72

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
121763	Day 4-1		8/3/2024	9:45	Samplewater	Not Specified
121764	Day 4-2		8/3/2024	9:45	Samplewater	Not Specified
121765	Day 4-3		8/3/2024	9:45	Samplewater	Not Specified
121766	Day 4-4		8/3/2024	9:45	Samplewater	Not Specified
121767	Day 4-5		8/3/2024	9:45	Samplewater	Not Specified
121768	Day 4-6		8/3/2024	9:45	Samplewater	Not Specified
121769	Day 4-7		8/3/2024	9:45	Samplewater	Not Specified
121770	Day 4-8		8/3/2024	9:45	Samplewater	Not Specified
121771	Day 4-9		8/3/2024	9:45	Samplewater	Not Specified
121772	Day 4-10		8/3/2024	9:45	Samplewater	Not Specified
121773	Day 4-11		8/3/2024	9:45	Samplewater	Not Specified
121774	Day 4-12		8/3/2024	9:45	Samplewater	Not Specified
121775	Day 4-13		8/3/2024	9:45	Samplewater	Not Specified
121776	Day 4-14		8/3/2024	9:45	Samplewater	Not Specified
121777	Day 4-15		8/3/2024	9:45	Samplewater	Not Specified
121778	Day 4-16		8/3/2024	9:45	Samplewater	Not Specified
121779	Day 4-17		8/3/2024	9:45	Samplewater	Not Specified
121780	Day 4-18		8/3/2024	9:45	Samplewater	Not Specified
121781	Day 4-19		8/3/2024	9:45	Samplewater	Not Specified
121782	Day 4-20		8/3/2024	9:45	Samplewater	Not Specified
121783	Day 4-21		8/3/2024	9:45	Samplewater	Not Specified
121784	Day 4-22		8/3/2024	9:45	Samplewater	Not Specified
121785	Day 4-23		8/3/2024	9:45	Samplewater	Not Specified
121786	Day 4-24		8/3/2024	9:45	Samplewater	Not Specified
121787	Day 4-25		8/3/2024	9:45	Samplewater	Not Specified
121788	Day 4-26		8/3/2024	9:45	Samplewater	Not Specified
121789	Day 4-27		8/3/2024	9:45	Samplewater	Not Specified
121790	Day 4-28		8/3/2024	9:45	Samplewater	Not Specified
121791	Day 4-29		8/3/2024	9:45	Samplewater	Not Specified
121792	Day 4-30		8/3/2024	9:45	Samplewater	Not Specified
121793	Day 4-31		8/3/2024	9:45	Samplewater	Not Specified
121794	Day 4-32		8/3/2024	9:45	Samplewater	Not Specified
121795	Day 4-33		8/3/2024	9:45	Samplewater	Not Specified
121796	Day 4-34		8/3/2024	9:45	Samplewater	Not Specified
121797	Day 4-35		8/3/2024	9:45	Samplewater	Not Specified

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WSP USA

PHYSIS Project ID: 2407005-003

GEI EVMWD SOD Study Project # US0024915.6871

Total Samples: 72

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
121798	Day 4-36		8/3/2024	9:45	Samplewater	Not Specified
121799	Day 5-1		8/4/2024	9:20	Samplewater	Not Specified
121800	Day 5-2		8/4/2024	9:20	Samplewater	Not Specified
121801	Day 5-3		8/4/2024	9:20	Samplewater	Not Specified
121802	Day 5-4		8/4/2024	9:20	Samplewater	Not Specified
121803	Day 5-5		8/4/2024	9:20	Samplewater	Not Specified
121804	Day 5-6		8/4/2024	9:20	Samplewater	Not Specified
121805	Day 5-7		8/4/2024	9:20	Samplewater	Not Specified
121806	Day 5-8		8/4/2024	9:20	Samplewater	Not Specified
121807	Day 5-9		8/4/2024	9:20	Samplewater	Not Specified
121808	Day 5-10		8/4/2024	9:20	Samplewater	Not Specified
121809	Day 5-11		8/4/2024	9:20	Samplewater	Not Specified
121810	Day 5-12		8/4/2024	9:20	Samplewater	Not Specified
121811	Day 5-13		8/4/2024	9:20	Samplewater	Not Specified
121812	Day 5-14		8/4/2024	9:20	Samplewater	Not Specified
121813	Day 5-15		8/4/2024	9:20	Samplewater	Not Specified
121814	Day 5-16		8/4/2024	9:20	Samplewater	Not Specified
121815	Day 5-17		8/4/2024	9:20	Samplewater	Not Specified
121816	Day 5-18		8/4/2024	9:20	Samplewater	Not Specified
121817	Day 5-19		8/4/2024	9:20	Samplewater	Not Specified
121818	Day 5-20		8/4/2024	9:20	Samplewater	Not Specified
121819	Day 5-21		8/4/2024	9:20	Samplewater	Not Specified
121820	Day 5-22		8/4/2024	9:20	Samplewater	Not Specified
121821	Day 5-23		8/4/2024	9:20	Samplewater	Not Specified
121822	Day 5-24		8/4/2024	9:20	Samplewater	Not Specified
121823	Day 5-25		8/4/2024	9:20	Samplewater	Not Specified
121824	Day 5-26		8/4/2024	9:20	Samplewater	Not Specified
121825	Day 5-27		8/4/2024	9:20	Samplewater	Not Specified
121826	Day 5-28		8/4/2024	9:20	Samplewater	Not Specified
121827	Day 5-29		8/4/2024	9:20	Samplewater	Not Specified
121828	Day 5-30		8/4/2024	9:20	Samplewater	Not Specified
121829	Day 5-31		8/4/2024	9:20	Samplewater	Not Specified
121830	Day 5-32		8/4/2024	9:20	Samplewater	Not Specified
121831	Day 5-33		8/4/2024	9:20	Samplewater	Not Specified
121832	Day 5-34		8/4/2024	9:20	Samplewater	Not Specified
121833	Day 5-35		8/4/2024	9:20	Samplewater	Not Specified
121834	Day 5-36		8/4/2024	9:20	Samplewater	Not Specified

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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

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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

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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.

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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

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PHYSIS
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Innovative Solutions for Nature

CASE NARRATIVE

QUALIFIER NOTES

In addition to the use of analyte specific Physis Qualifier Codes where applicable, the following were also noted.

SAMPLE LOSS

Sample Day 5-2 (PHYSIS SID 121800) was lost due to an instrument leak during sample uptake. There was no remaining sample and therefore Dissolved Orthophosphate as P results could not be reported.

ANALYTICAL REPORT

PHYSIS
TERRA AURA
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PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-003
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121763-R1 Day 4-1			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.278	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.61	2	0.28	0.6	NA		O-28131	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.468	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24
Sample ID: 121764-R1 Day 4-2			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.181	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.41	2	0.28	0.6	NA		O-28131	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.315	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24
Sample ID: 121765-R1 Day 4-3			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.226	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.03	2	0.28	0.6	NA		O-28131	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.455	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24
Sample ID: 121766-R1 Day 4-4			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.185	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.35	2	0.28	0.6	NA		O-28131	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.314	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24
Sample ID: 121767-R1 Day 4-5			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.132	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3	2	0.28	0.6	NA		O-28131	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.239	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24

PHYSIS
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PHYSIS Project ID: 2407005-003
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121768-R1 Day 4-6			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.219	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.64	2	0.28	0.6	NA		O-28131	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.347	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24
Sample ID: 121769-R1 Day 4-7			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.18	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.67	2	0.28	0.6	NA		O-28131	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.376	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24
Sample ID: 121770-R1 Day 4-8			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.146	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.99	2	0.28	0.6	NA		O-28131	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.329	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24
Sample ID: 121771-R1 Day 4-9			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.198	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.07	2	0.28	0.6	NA		O-28131	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.399	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24
Sample ID: 121772-R1 Day 4-10			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.199	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.63	2	0.28	0.6	NA		O-28131	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.324	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24

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PHYSIS Project ID: 2407005-003
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Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121773-R1 Day 4-11			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.161	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.07	2	0.28	0.6	NA		O-28131	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.268	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24
Sample ID: 121774-R1 Day 4-12			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.241	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.03	2	0.28	0.6	NA		O-28131	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.455	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24
Sample ID: 121775-R1 Day 4-13			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	ND	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.6	2	0.28	0.6	NA		O-28131	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.193	1	0.016	0.02	NA		C-82149	23-Aug-24	26-Aug-24
Sample ID: 121776-R1 Day 4-14			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.191	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.6	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.37	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24
Sample ID: 121777-R1 Day 4-15			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.165	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.37	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.31	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121778-R1 Day 4-16			**Matrix: Samplewater**				**Sampled: 03-Aug-24 9:45**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.197	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.32	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.346	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24
Sample ID: 121779-R1 Day 4-17			**Matrix: Samplewater**				**Sampled: 03-Aug-24 9:45**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.181	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.68	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.33	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24
Sample ID: 121780-R1 Day 4-18			**Matrix: Samplewater**				**Sampled: 03-Aug-24 9:45**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.177	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.14	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.394	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24
Sample ID: 121781-R1 Day 4-19			**Matrix: Samplewater**				**Sampled: 03-Aug-24 9:45**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.246	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.85	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.373	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24
Sample ID: 121782-R1 Day 4-20			**Matrix: Samplewater**				**Sampled: 03-Aug-24 9:45**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.247	1	0.002	0.005	NA		C-83044	16-Sep-24	16-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.7	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.438	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24

PHYSIS
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PHYSIS Project ID: 2407005-003
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121783-R1 Day 4-21			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.28	1	0.002	0.005	NA		C-83045	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.89	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.437	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24
Sample ID: 121784-R1 Day 4-22			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.129	1	0.002	0.005	NA		C-83045	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.84	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.206	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24
Sample ID: 121785-R1 Day 4-23			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.17	1	0.002	0.005	NA		C-83045	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.24	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	ND	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24
Sample ID: 121786-R1 Day 4-24			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.173	1	0.002	0.005	NA		C-83045	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.8	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.286	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24
Sample ID: 121787-R1 Day 4-25			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.159	1	0.002	0.005	NA		C-83045	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.12	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.222	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121788-R1 Day 4-26			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.194	1	0.002	0.005	NA		C-83045	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.54	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.319	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24
Sample ID: 121789-R1 Day 4-27			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.195	1	0.002	0.005	NA		C-83045	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.05	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.276	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24
Sample ID: 121790-R1 Day 4-28			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.16	1	0.002	0.005	NA		C-83045	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.95	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.265	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24
Sample ID: 121791-R1 Day 4-29			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.199	1	0.002	0.005	NA		C-83045	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.71	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.343	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24
Sample ID: 121792-R1 Day 4-30			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.264	1	0.002	0.005	NA		C-83045	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.88	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.363	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121793-R1 Day 4-31			**Matrix: Samplewater**				**Sampled: 03-Aug-24 9:45**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.183	1	0.002	0.005	NA		C-83045	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.27	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.252	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24
Sample ID: 121794-R1 Day 4-32			**Matrix: Samplewater**				**Sampled: 03-Aug-24 9:45**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.181	1	0.002	0.005	NA		C-83045	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.56	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.284	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24
Sample ID: 121795-R1 Day 4-33			**Matrix: Samplewater**				**Sampled: 03-Aug-24 9:45**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.207	1	0.002	0.005	NA		C-83045	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.17	2	0.28	0.6	NA		O-28132	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.33	1	0.016	0.02	NA		C-82152	26-Aug-24	27-Aug-24
Sample ID: 121796-R1 Day 4-34			**Matrix: Samplewater**				**Sampled: 03-Aug-24 9:45**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.204	1	0.002	0.005	NA		C-83045	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.46	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.296	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24
Sample ID: 121797-R1 Day 4-35			**Matrix: Samplewater**				**Sampled: 03-Aug-24 9:45**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.224	1	0.002	0.005	NA		C-83045	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.63	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.379	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-003
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121798-R1 Day 4-36			**Matrix: Samplewater**					**Sampled: 03-Aug-24 9:45**		**Received: 06-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.236	1	0.002	0.005	NA		C-83045	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.36	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.334	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24
Sample ID: 121799-R1 Day 5-1			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received: 06-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.259	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.8	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.414	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24
Sample ID: 121800-R1 Day 5-2			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received: 06-Aug-24**	
Total Nitrogen	SM 5310 B-N Module	mg/L	3.21	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.285	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24
Sample ID: 121801-R1 Day 5-3			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received: 06-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.281	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.1	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.451	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24
Sample ID: 121802-R1 Day 5-4			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received: 06-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.215	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.2	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.3	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24
Sample ID: 121803-R1 Day 5-5			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received: 06-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.175	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.93	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.249	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24

PHYSIS
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PHYSIS Project ID: 2407005-003
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121804-R1 Day 5-6			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.312	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.38	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.35	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24
Sample ID: 121805-R1 Day 5-7			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.203	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.61	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.34	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24
Sample ID: 121806-R1 Day 5-8			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	ND	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.95	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.319	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24
Sample ID: 121807-R1 Day 5-9			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.266	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.06	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.418	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24
Sample ID: 121808-R1 Day 5-10			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.219	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.36	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.364	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24

PHYSIS
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PHYSIS Project ID: 2407005-003
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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121809-R1 Day 5-11			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	ND	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.77	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.261	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24
Sample ID: 121810-R1 Day 5-12			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.355	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.78	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.441	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24
Sample ID: 121811-R1 Day 5-13			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	ND	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.32	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.193	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24
Sample ID: 121812-R1 Day 5-14			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.118	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.66	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.413	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24
Sample ID: 121813-R1 Day 5-15			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.117	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.11	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	ND	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24

PHYSIS
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PHYSIS Project ID: 2407005-003
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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121814-R1 Day 5-16			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.21	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.26	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.358	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24
Sample ID: 121815-R1 Day 5-17			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.227	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.71	2	0.28	0.6	NA		O-28133	30-Aug-24	31-Aug-24
Total Phosphorus	SM 4500-P E	mg/L	0.362	1	0.016	0.02	NA		C-82154	26-Aug-24	27-Aug-24
Sample ID: 121816-R1 Day 5-18			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.121	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.08	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.418	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24
Sample ID: 121817-R1 Day 5-19			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.298	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.83	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.422	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24
Sample ID: 121818-R1 Day 5-20			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.282	1	0.002	0.005	NA		C-83046	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.79	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.469	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24

PHYSIS
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PHYSIS Project ID: 2407005-003
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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121819-R1 Day 5-21			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.303	1	0.002	0.005	NA		C-83047	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.85	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.477	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24
Sample ID: 121820-R1 Day 5-22			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	ND	1	0.002	0.005	NA		C-83047	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.85	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.226	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24
Sample ID: 121821-R1 Day 5-23			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.246	1	0.002	0.005	NA		C-83047	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.19	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.369	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24
Sample ID: 121822-R1 Day 5-24			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	ND	1	0.002	0.005	NA		C-83047	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.81	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.309	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24
Sample ID: 121823-R1 Day 5-25			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.159	1	0.002	0.005	NA		C-83047	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.95	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.266	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121824-R1 Day 5-26			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.128	1	0.002	0.005	NA		C-83047	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.81	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.393	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24
Sample ID: 121825-R1 Day 5-27			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.113	1	0.002	0.005	NA		C-83047	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.17	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.337	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24
Sample ID: 121826-R1 Day 5-28			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	ND	1	0.002	0.005	NA		C-83047	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.92	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.321	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24
Sample ID: 121827-R1 Day 5-29			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.29	1	0.002	0.005	NA		C-83047	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.86	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.407	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24
Sample ID: 121828-R1 Day 5-30			**Matrix: Samplewater**					**Sampled: 04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.226	1	0.002	0.005	NA		C-83047	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.431	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121829-R1 Day 5-31			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.2	1	0.002	0.005	NA		C-83047	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.14	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.302	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24
Sample ID: 121830-R1 Day 5-32			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.123	1	0.002	0.005	NA		C-83047	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.7	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.333	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24
Sample ID: 121831-R1 Day 5-33			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.237	1	0.002	0.005	NA		C-83047	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.19	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.39	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24
Sample ID: 121832-R1 Day 5-34			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.207	1	0.002	0.005	NA		C-83047	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.21	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.321	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24
Sample ID: 121833-R1 Day 5-35			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.302	1	0.002	0.005	NA		C-83047	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.43	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.399	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24

PHYSIS
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PHYSIS Project ID: 2407005-003
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121834-R1 Day 5-36			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received: 06-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.228	1	0.002	0.005	NA		C-83047	17-Sep-24	17-Sep-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.24	2	0.28	0.6	NA		O-28134	31-Aug-24	01-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.357	1	0.016	0.02	NA		C-82155	26-Aug-24	27-Aug-24

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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121763-R1	**Day 4-1**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	13.4	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	9.42	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24
Sample ID: 121764-R1	**Day 4-2**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	23.8	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	14.2	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24
Sample ID: 121765-R1	**Day 4-3**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.9	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.7	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24
Sample ID: 121766-R1	**Day 4-4**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	16.5	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	54.5	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24
Sample ID: 121767-R1	**Day 4-5**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.6	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	9.24	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24
Sample ID: 121768-R1	**Day 4-6**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.6	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	8.22	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24
Sample ID: 121769-R1	**Day 4-7**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	17.1	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	25.5	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24

PHYSIS
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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121770-R1	**Day 4-8**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.4	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	9.93	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24
Sample ID: 121771-R1	**Day 4-9**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	11.4	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24
Sample ID: 121772-R1	**Day 4-10**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	16.5	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	19	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24
Sample ID: 121773-R1	**Day 4-11**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.3	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	8.65	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24
Sample ID: 121774-R1	**Day 4-12**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	13.2	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	11	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24
Sample ID: 121775-R1	**Day 4-13**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.5	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	13.4	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24
Sample ID: 121776-R1	**Day 4-14**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.75	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	6.16	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24

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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121777-R1	**Day 4-15**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.1	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	8.21	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24
Sample ID: 121778-R1	**Day 4-16**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.15	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.8	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24
Sample ID: 121779-R1	**Day 4-17**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.3	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	14.1	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24
Sample ID: 121780-R1	**Day 4-18**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.3	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	12.2	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24
Sample ID: 121781-R1	**Day 4-19**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	22.7	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	17.2	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24
Sample ID: 121782-R1	**Day 4-20**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.46	1	1.13	5.65	Total		E-33101	23-Sep-24	23-Sep-24
Iron (Fe)		EPA 200.8	µg/L	6.86	1	1.13	5.65	Dissolved		E-33101	23-Sep-24	23-Sep-24
Sample ID: 121783-R1	**Day 4-21**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	16.8	1	1.13	5.65	Total		E-33102	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.4	1	1.13	5.65	Dissolved		E-33102	23-Sep-24	23-Sep-24

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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121784-R1	**Day 4-22**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	15.9	1	1.13	5.65	Total		E-33102	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	11	1	1.13	5.65	Dissolved		E-33102	23-Sep-24	23-Sep-24
Sample ID: 121785-R1	**Day 4-23**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.6	1	1.13	5.65	Total		E-33102	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	14.1	1	1.13	5.65	Dissolved		E-33102	23-Sep-24	23-Sep-24
Sample ID: 121786-R1	**Day 4-24**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	22.5	1	1.13	5.65	Total		E-33102	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	17.8	1	1.13	5.65	Dissolved		E-33102	23-Sep-24	24-Sep-24
Sample ID: 121787-R1	**Day 4-25**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12	1	1.13	5.65	Total		E-33102	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	12.4	1	1.13	5.65	Dissolved		E-33102	23-Sep-24	24-Sep-24
Sample ID: 121788-R1	**Day 4-26**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.2	1	1.13	5.65	Total		E-33102	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	18.2	1	1.13	5.65	Dissolved		E-33102	23-Sep-24	24-Sep-24
Sample ID: 121789-R1	**Day 4-27**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	27	1	1.13	5.65	Total		E-33102	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	24	1	1.13	5.65	Dissolved		E-33102	23-Sep-24	24-Sep-24
Sample ID: 121790-R1	**Day 4-28**			**Matrix: Samplewater**				**Sampled:**	**03-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	43.9	1	1.13	5.65	Total		E-33102	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	38	1	1.13	5.65	Dissolved		E-33102	23-Sep-24	24-Sep-24

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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121791-R1	**Day 4-29**			**Matrix: Samplewater**					**Sampled:**	**03-Aug-24 9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.23	1	1.13	5.65	Total		E-33102	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	9.68	1	1.13	5.65	Dissolved		E-33102	23-Sep-24	24-Sep-24
Sample ID: 121792-R1	**Day 4-30**			**Matrix: Samplewater**					**Sampled:**	**03-Aug-24 9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	61	1	1.13	5.65	Total		E-33102	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	18.6	1	1.13	5.65	Dissolved		E-33102	23-Sep-24	24-Sep-24
Sample ID: 121793-R1	**Day 4-31**			**Matrix: Samplewater**					**Sampled:**	**03-Aug-24 9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	19.2	1	1.13	5.65	Total		E-33102	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.2	1	1.13	5.65	Dissolved		E-33102	23-Sep-24	24-Sep-24
Sample ID: 121794-R1	**Day 4-32**			**Matrix: Samplewater**					**Sampled:**	**03-Aug-24 9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.7	1	1.13	5.65	Total		E-33102	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	15.4	1	1.13	5.65	Dissolved		E-33102	23-Sep-24	24-Sep-24
Sample ID: 121795-R1	**Day 4-33**			**Matrix: Samplewater**					**Sampled:**	**03-Aug-24 9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	52.5	1	1.13	5.65	Total		E-33102	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.8	1	1.13	5.65	Dissolved		E-33102	23-Sep-24	24-Sep-24
Sample ID: 121796-R1	**Day 4-34**			**Matrix: Samplewater**					**Sampled:**	**03-Aug-24 9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	18	1	1.13	5.65	Total		E-33102	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	12.4	1	1.13	5.65	Dissolved		E-33102	23-Sep-24	24-Sep-24
Sample ID: 121797-R1	**Day 4-35**			**Matrix: Samplewater**					**Sampled:**	**03-Aug-24 9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.9	1	1.13	5.65	Total		E-33102	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	15.6	1	1.13	5.65	Dissolved		E-33102	23-Sep-24	24-Sep-24

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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121798-R1	**Day 4-36**			**Matrix: Samplewater**					**Sampled:**	**03-Aug-24 9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	31.1	1	1.13	5.65	Total		E-33102	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	21.1	1	1.13	5.65	Dissolved		E-33102	23-Sep-24	24-Sep-24
Sample ID: 121799-R1	**Day 5-1**			**Matrix: Samplewater**					**Sampled:**	**04-Aug-24 9:20**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	28.5	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.2	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24
Sample ID: 121800-R1	**Day 5-2**			**Matrix: Samplewater**					**Sampled:**	**04-Aug-24 9:20**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	24.9	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	18	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24
Sample ID: 121801-R1	**Day 5-3**			**Matrix: Samplewater**					**Sampled:**	**04-Aug-24 9:20**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	14	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	16	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24
Sample ID: 121802-R1	**Day 5-4**			**Matrix: Samplewater**					**Sampled:**	**04-Aug-24 9:20**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	128	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	9.79	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24
Sample ID: 121803-R1	**Day 5-5**			**Matrix: Samplewater**					**Sampled:**	**04-Aug-24 9:20**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	15.6	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	12.5	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24
Sample ID: 121804-R1	**Day 5-6**			**Matrix: Samplewater**					**Sampled:**	**04-Aug-24 9:20**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.6	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	13.3	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-003
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121805-R1	**Day 5-7**			**Matrix: Samplewater**				**Sampled:**	**04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	16.2	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	26.6	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24
Sample ID: 121806-R1	**Day 5-8**			**Matrix: Samplewater**				**Sampled:**	**04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	23.4	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	10.6	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24
Sample ID: 121807-R1	**Day 5-9**			**Matrix: Samplewater**				**Sampled:**	**04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	24.5	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	19	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24
Sample ID: 121808-R1	**Day 5-10**			**Matrix: Samplewater**				**Sampled:**	**04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	17	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	22.3	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24
Sample ID: 121809-R1	**Day 5-11**			**Matrix: Samplewater**				**Sampled:**	**04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	245	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	226	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24
Sample ID: 121810-R1	**Day 5-12**			**Matrix: Samplewater**				**Sampled:**	**04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	47.6	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	11.6	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24
Sample ID: 121811-R1	**Day 5-13**			**Matrix: Samplewater**				**Sampled:**	**04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	38.4	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	9.39	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24

PHYSIS
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PHYSIS Project ID: 2407005-003
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Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121812-R1 Day 5-14			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received: 06-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	32.5	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)	EPA 200.8	µg/L	6.53	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24
Sample ID: 121813-R1 Day 5-15			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received: 06-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	9.79	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)	EPA 200.8	µg/L	8.12	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24
Sample ID: 121814-R1 Day 5-16			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received: 06-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	44.8	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)	EPA 200.8	µg/L	11.4	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24
Sample ID: 121815-R1 Day 5-17			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received: 06-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	11.4	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)	EPA 200.8	µg/L	14.2	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24
Sample ID: 121816-R1 Day 5-18			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received: 06-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	62	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)	EPA 200.8	µg/L	11	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24
Sample ID: 121817-R1 Day 5-19			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received: 06-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	32.5	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)	EPA 200.8	µg/L	14.1	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24
Sample ID: 121818-R1 Day 5-20			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received: 06-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	54.7	1	1.13	5.65	Total		E-33103	23-Sep-24	24-Sep-24
Iron (Fe)	EPA 200.8	µg/L	7.89	1	1.13	5.65	Dissolved		E-33103	23-Sep-24	24-Sep-24

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PHYSIS Project ID: 2407005-003
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Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121819-R1	**Day 5-21**			**Matrix: Samplewater**					**Sampled:**	**04-Aug-24 9:20**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	205	1	1.13	5.65	Total		E-33104	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	7.87	1	1.13	5.65	Dissolved		E-33104	23-Sep-24	24-Sep-24
Sample ID: 121820-R1	**Day 5-22**			**Matrix: Samplewater**					**Sampled:**	**04-Aug-24 9:20**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	14.2	1	1.13	5.65	Total		E-33104	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	11.2	1	1.13	5.65	Dissolved		E-33104	23-Sep-24	24-Sep-24
Sample ID: 121821-R1	**Day 5-23**			**Matrix: Samplewater**					**Sampled:**	**04-Aug-24 9:20**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	17.2	1	1.13	5.65	Total		E-33104	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	15.1	1	1.13	5.65	Dissolved		E-33104	23-Sep-24	24-Sep-24
Sample ID: 121822-R1	**Day 5-24**			**Matrix: Samplewater**					**Sampled:**	**04-Aug-24 9:20**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	13.1	1	1.13	5.65	Total		E-33104	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	14.1	1	1.13	5.65	Dissolved		E-33104	23-Sep-24	24-Sep-24
Sample ID: 121823-R1	**Day 5-25**			**Matrix: Samplewater**					**Sampled:**	**04-Aug-24 9:20**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	17.1	1	1.13	5.65	Total		E-33104	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	8.64	1	1.13	5.65	Dissolved		E-33104	23-Sep-24	24-Sep-24
Sample ID: 121824-R1	**Day 5-26**			**Matrix: Samplewater**					**Sampled:**	**04-Aug-24 9:20**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.7	1	1.13	5.65	Total		E-33104	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	16	1	1.13	5.65	Dissolved		E-33104	23-Sep-24	24-Sep-24
Sample ID: 121825-R1	**Day 5-27**			**Matrix: Samplewater**					**Sampled:**	**04-Aug-24 9:20**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	32.6	1	1.13	5.65	Total		E-33104	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	48.9	1	1.13	5.65	Dissolved		E-33104	23-Sep-24	24-Sep-24

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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121826-R1	**Day 5-28**			**Matrix: Samplewater**				**Sampled:**	**04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	18.4	1	1.13	5.65	Total		E-33104	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	49.9	1	1.13	5.65	Dissolved		E-33104	23-Sep-24	24-Sep-24
Sample ID: 121827-R1	**Day 5-29**			**Matrix: Samplewater**				**Sampled:**	**04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	14.5	1	1.13	5.65	Total		E-33104	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	17.7	1	1.13	5.65	Dissolved		E-33104	23-Sep-24	24-Sep-24
Sample ID: 121828-R1	**Day 5-30**			**Matrix: Samplewater**				**Sampled:**	**04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	22.4	1	1.13	5.65	Total		E-33104	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	59.5	1	1.13	5.65	Dissolved		E-33104	23-Sep-24	24-Sep-24
Sample ID: 121829-R1	**Day 5-31**			**Matrix: Samplewater**				**Sampled:**	**04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	514	1	1.13	5.65	Total		E-33104	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	7.32	1	1.13	5.65	Dissolved		E-33104	23-Sep-24	24-Sep-24
Sample ID: 121830-R1	**Day 5-32**			**Matrix: Samplewater**				**Sampled:**	**04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	154	1	1.13	5.65	Total		E-33104	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	11.3	1	1.13	5.65	Dissolved		E-33104	23-Sep-24	24-Sep-24
Sample ID: 121831-R1	**Day 5-33**			**Matrix: Samplewater**				**Sampled:**	**04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.81	1	1.13	5.65	Total		E-33104	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	7.49	1	1.13	5.65	Dissolved		E-33104	23-Sep-24	24-Sep-24
Sample ID: 121832-R1	**Day 5-34**			**Matrix: Samplewater**				**Sampled:**	**04-Aug-24 9:20**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	15	1	1.13	5.65	Total		E-33104	23-Sep-24	24-Sep-24
Iron (Fe)		EPA 200.8	µg/L	49.8	1	1.13	5.65	Dissolved		E-33104	23-Sep-24	24-Sep-24

PHYSIS
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PHYSIS Project ID: 2407005-003
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Elements

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121833-R1 Day 5-35			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received: 06-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	9.78	1	1.13	5.65	Total		E-33104	23-Sep-24	24-Sep-24
Iron (Fe)	EPA 200.8	µg/L	9.71	1	1.13	5.65	Dissolved		E-33104	23-Sep-24	24-Sep-24
Sample ID: 121834-R1 Day 5-36			**Matrix: Samplewater**				**Sampled: 04-Aug-24 9:20**			**Received: 06-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	16.3	1	1.13	5.65	Total		E-33104	23-Sep-24	24-Sep-24
Iron (Fe)	EPA 200.8	µg/L	21.7	1	1.13	5.65	Dissolved		E-33104	23-Sep-24	24-Sep-24

QUALITY CONTROL REPORT

PHYSIS
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Attachment A-2

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-003
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

QUALITY CONTROL REPORT

SAMPLE ID		BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS	QA CODE
Dissolved Orthophosphate as P		**Method: EPA 300.0**					**Fraction: NA**				**Prepared: 16-Sep-24**			**Analyzed: 16-Sep-24**	
121755-B1	QAQC Procedural Blank	C-83044	ND	1	0.002	0.005	mg/L								
121755-BS1	QAQC Procedural Blank	C-83044	1.85	1	0.002	0.005	mg/L	2	0	93	90 - 110%	PASS			
121755-BS2	QAQC Procedural Blank	C-83044	1.92	1	0.002	0.005	mg/L	2	0	96	90 - 110%	PASS	4	30	PASS
121756-B1	QAQC Procedural Blank	C-83045	ND	1	0.002	0.005	mg/L								
121756-BS1	QAQC Procedural Blank	C-83045	1.93	1	0.002	0.005	mg/L	2	0	96	90 - 110%	PASS			
121756-BS2	QAQC Procedural Blank	C-83045	1.89	1	0.002	0.005	mg/L	2	0	94	90 - 110%	PASS	2	30	PASS
121757-B1	QAQC Procedural Blank	C-83046	ND	1	0.002	0.005	mg/L								
121757-BS1	QAQC Procedural Blank	C-83046	2.17	1	0.002	0.005	mg/L	2	0	109	90 - 110%	PASS			
121757-BS2	QAQC Procedural Blank	C-83046	2.13	1	0.002	0.005	mg/L	2	0	107	90 - 110%	PASS	1	30	PASS
121758-B1	QAQC Procedural Blank	C-83047	ND	1	0.002	0.005	mg/L								
121758-BS1	QAQC Procedural Blank	C-83047	1.9	1	0.002	0.005	mg/L	2	0	95	90 - 110%	PASS			
121758-BS2	QAQC Procedural Blank	C-83047	2.1	1	0.002	0.005	mg/L	2	0	105	90 - 110%	PASS	10	30	PASS
Total Nitrogen		**Method: SM 5310 B-N Module**					**Fraction: NA**				**Prepared: 30-Aug-24**			**Analyzed: 31-Aug-24**	
121755-B1	QAQC Procedural Blank	O-28131	ND	1	0.28	0.6	mg/L								
121755-BS1	QAQC Procedural Blank	O-28131	10.6	1	0.28	0.6	mg/L	10	0	106	70 - 130%	PASS			
121755-BS2	QAQC Procedural Blank	O-28131	10	1	0.28	0.6	mg/L	10	0	100	70 - 130%	PASS	6	30	PASS
121756-B1	QAQC Procedural Blank	O-28132	ND	1	0.28	0.6	mg/L								
121756-BS1	QAQC Procedural Blank	O-28132	10.4	1	0.28	0.6	mg/L	10	0	104	70 - 130%	PASS			
121756-BS2	QAQC Procedural Blank	O-28132	10	1	0.28	0.6	mg/L	10	0	100	70 - 130%	PASS	4	30	PASS
121757-B1	QAQC Procedural Blank	O-28133	ND	1	0.28	0.6	mg/L								
121757-BS1	QAQC Procedural Blank	O-28133	10.6	1	0.28	0.6	mg/L	10	0	106	70 - 130%	PASS			
121757-BS2	QAQC Procedural Blank	O-28133	10.7	1	0.28	0.6	mg/L	10	0	107	70 - 130%	PASS	1	30	PASS

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Conventionals

QUALITY CONTROL REPORT

SAMPLE ID		BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS	QA CODE
121758-B1	QAQC Procedural Blank	O-28134	ND	1	0.28	0.6	mg/L								
121758-BS1	QAQC Procedural Blank	O-28134	10.7	1	0.28	0.6	mg/L	10	0	107	70 - 130%	PASS			
121758-BS2	QAQC Procedural Blank	O-28134	10.1	1	0.28	0.6	mg/L	10	0	101	70 - 130%	PASS	6	30	PASS
Total Phosphorus		**Method: SM 4500-P E**					**Fraction: NA**				**Prepared: 23-Aug-24**			**Analyzed: 26-Aug-24**	
121755-B1	QAQC Procedural Blank	C-82149	ND	1	0.016	0.02	mg/L								
121755-BS1	QAQC Procedural Blank	C-82149	0.31	1	0.016	0.02	mg/L	0.3	0	103	73 - 131%	PASS			
121755-BS2	QAQC Procedural Blank	C-82149	0.317	1	0.016	0.02	mg/L	0.3	0	106	73 - 131%	PASS	3	30	PASS
121756-B1	QAQC Procedural Blank	C-82152	ND	1	0.016	0.02	mg/L								
121756-BS1	QAQC Procedural Blank	C-82152	0.294	1	0.016	0.02	mg/L	0.3	0	98	73 - 131%	PASS			
121756-BS2	QAQC Procedural Blank	C-82152	0.303	1	0.016	0.02	mg/L	0.3	0	101	73 - 131%	PASS	3	30	PASS
121757-B1	QAQC Procedural Blank	C-82154	ND	1	0.016	0.02	mg/L								
121757-BS1	QAQC Procedural Blank	C-82154	0.308	1	0.016	0.02	mg/L	0.3	0	103	73 - 131%	PASS			
121757-BS2	QAQC Procedural Blank	C-82154	0.302	1	0.016	0.02	mg/L	0.3	0	101	73 - 131%	PASS	2	30	PASS
121758-B1	QAQC Procedural Blank	C-82155	ND	1	0.016	0.02	mg/L								
121758-BS1	QAQC Procedural Blank	C-82155	0.317	1	0.016	0.02	mg/L	0.3	0	106	73 - 131%	PASS			
121758-BS2	QAQC Procedural Blank	C-82155	0.315	1	0.016	0.02	mg/L	0.3	0	105	73 - 131%	PASS	1	30	PASS

Attachment A-2

PHYSIS
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PHYSIS Project ID: 2407005-003
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

QUALITY CONTROL REPORT

ANALYTE	FRACTION	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS		QA CODEc
Sample ID: 121755-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33101		Prepared: 23-Sep-24					Analyzed: 23-Sep-24		
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L									
Sample ID: 121755-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33101		Prepared: 23-Sep-24					Analyzed: 23-Sep-24		
Iron (Fe)	Total	1060	1	1.13	5.65	µg/L	1000	0	106	85 - 115%	PASS				
Sample ID: 121755-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33101		Prepared: 23-Sep-24					Analyzed: 23-Sep-24		
Iron (Fe)	Total	982	1	1.13	5.65	µg/L	1000	0	98	85 - 115%	PASS	8	30	PASS	
Sample ID: 121756-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33102		Prepared: 23-Sep-24					Analyzed: 23-Sep-24		
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L									
Sample ID: 121756-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33102		Prepared: 23-Sep-24					Analyzed: 24-Sep-24		
Iron (Fe)	Total	961	1	1.13	5.65	µg/L	1000	0	96	85 - 115%	PASS				
Sample ID: 121756-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33102		Prepared: 23-Sep-24					Analyzed: 24-Sep-24		
Iron (Fe)	Total	1010	1	1.13	5.65	µg/L	1000	0	101	85 - 115%	PASS	5	30	PASS	
Sample ID: 121757-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33103		Prepared: 23-Sep-24					Analyzed: 24-Sep-24		
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L									
Sample ID: 121757-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33103		Prepared: 23-Sep-24					Analyzed: 24-Sep-24		
Iron (Fe)	Total	980	1	1.13	5.65	µg/L	1000	0	98	85 - 115%	PASS				

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-003
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

QUALITY CONTROL REPORT

ANALYTE	FRACTION	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS		QA CODEc
Sample ID: 121757-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33103		Prepared: 23-Sep-24					Analyzed: 24-Sep-24		
Iron (Fe)	Total	1020	1	1.13	5.65	µg/L	1000	0	102	85 - 115%	PASS	4	30	PASS	
Sample ID: 121758-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33104		Prepared: 23-Sep-24					Analyzed: 24-Sep-24		
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L									
Sample ID: 121758-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33104		Prepared: 23-Sep-24					Analyzed: 24-Sep-24		
Iron (Fe)	Total	998	1	1.13	5.65	µg/L	1000	0	100	85 - 115%	PASS				
Sample ID: 121758-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33104		Prepared: 23-Sep-24					Analyzed: 24-Sep-24		
Iron (Fe)	Total	980	1	1.13	5.65	µg/L	1000	0	98	85 - 115%	PASS	2	30	PASS	

Attachment A-2

CHAIN OF CUSTODY

PHASE
TERRA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court, San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus													
Day 4-1		8/3/2024	9:45	3			x				x	x	x														
Day 4-2		8/3/2024	9:45	3			x				x	x	x														
Day 4-3		8/3/2024	9:45	3			x				x	x	x														
Day 4-4		8/3/2024	9:45	3			x				x	x	x														
Day 4-5		8/3/2024	9:45	3			x				x	x	x														
Day 4-6		8/3/2024	9:45	3			x				x	x	x														
Day 4-7		8/3/2024	9:45	3			x				x	x	x														
Day 4-8		8/3/2024	9:45	3			x				x	x	x														
Day 4-9		8/3/2024	9:45	3			x				x	x	x														
Day 4-10		8/3/2024	9:45	3			x				x	x	x														

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/6/24	**Time** 1300
Received By:	**Date** 8/6/24	**Time** 1:00
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus													
Day 4-11		8/3/2024	9:45	3			x				x	x	x														
Day 4-12		8/3/2024	9:45	3			x				x	x	x														
Day 4-13		8/3/2024	9:45	3			x				x	x	x														
Day 4-14		8/3/2024	9:45	3			x				x	x	x														
Day 4-15		8/3/2024	9:45	3			x				x	x	x														
Day 4-16		8/3/2024	9:45	3			x				x	x	x														
Day 4-17		8/3/2024	9:45	3			x				x	x	x														
Day 4-18		8/3/2024	9:45	3			x				x	x	x														
Day 4-19		8/3/2024	9:45	3			x				x	x	x														
Day 4-20		8/3/2024	9:45	3			x				x	x	x														

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/6/24	**Time** 1300
Received By:	**Date** 8/6/24	**Time** 1:00
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	phone: 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																	
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus														
Day 4-21		8/3/2024	9:45	3			x				x	x	x															
Day 4-22		8/3/2024	9:45	3			x				x	x	x															
Day 4-23		8/3/2024	9:45	3			x				x	x	x															
Day 4-24		8/3/2024	9:45	3			x				x	x	x															
Day 4-25		8/3/2024	9:45	3			x				x	x	x															
Day 4-26		8/3/2024	9:45	3			x				x	x	x															
Day 4-27		8/3/2024	9:45	3			x				x	x	x															
Day 4-28		8/3/2024	9:45	3			x				x	x	x															
Day 4-29		8/3/2024	9:45	3			x				x	x	x															
Day 4-30		8/3/2024	9:45	3			x				x	x	x															

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/6/24	**Time** 1300
Received By:	**Date** 8/6/24	**Time** 1:00
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																	
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus														
Day 4-31		8/3/2024	9:45	3			x				x	x	x															
Day 4-32		8/3/2024	9:45	3			x				x	x	x															
Day 4-33		8/3/2024	9:45	3			x				x	x	x															
Day 4-34		8/3/2024	9:45	3			x				x	x	x															
Day 4-35		8/3/2024	9:45	3			x				x	x	x															
Day 4-36		8/3/2024	9:45	3			x				x	x	x															

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/6/24	**Time** 1300
Received By:	**Date** 8/6/24	**Time** 1:00
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																				
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus																	
Day 5-1		8/4/2024	9:20	3			x				x	x	x																	
Day 5-2		8/4/2024	9:20	3			x				x	x	x																	
Day 5-3		8/4/2024	9:20	3			x				x	x	x																	
Day 5-4		8/4/2024	9:20	3			x				x	x	x																	
Day 5-5		8/4/2024	9:20	3			x				x	x	x																	
Day 5-6		8/4/2024	9:20	3			x				x	x	x																	
Day 5-7		8/4/2024	9:20	3			x				x	x	x																	
Day 5-8		8/4/2024	9:20	3			x				x	x	x																	
Day 5-9		8/4/2024	9:20	3			x				x	x	x																	
Day 5-10		8/4/2024	9:20	3			x				x	x	x																	

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/6/24	**Time** 1300
Received By:	**Date** 8/6/24	**Time** 1:00
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court, San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus													
Day 5-11		8/4/2024	9:20	3			x				x	x	x														
Day 5-12		8/4/2024	9:20	3			x				x	x	x														
Day 5-13		8/4/2024	9:20	3			x				x	x	x														
Day 5-14		8/4/2024	9:20	3			x				x	x	x														
Day 5-15		8/4/2024	9:20	3			x				x	x	x														
Day 5-16		8/4/2024	9:20	3			x				x	x	x														
Day 5-17		8/4/2024	9:20	3			x				x	x	x														
Day 5-18		8/4/2024	9:20	3			x				x	x	x														
Day 5-19		8/4/2024	9:20	3			x				x	x	x														
Day 5-20		8/4/2024	9:20	3			x				x	x	x														

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/6/24	**Time** 1300
Received By:	**Date** 8/6/24	**Time** 1:00
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																	
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus														
Day 5-21		8/4/2024	9:20	3			x				x	x	x														
Day 5-22		8/4/2024	9:20	3			x				x	x	x														
Day 5-23		8/4/2024	9:20	3			x				x	x	x														
Day 5-24		8/4/2024	9:20	3			x				x	x	x														
Day 5-25		8/4/2024	9:20	3			x				x	x	x														
Day 5-26		8/4/2024	9:20	3			x				x	x	x														
Day 5-27		8/4/2024	9:20	3			x				x	x	x														
Day 5-28		8/4/2024	9:20	3			x				x	x	x														
Day 5-29		8/4/2024	9:20	3			x				x	x	x														
Day 5-30		8/4/2024	9:20	3			x				x	x	x														

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/6/24	**Time** 1300
Received By:	**Date** 8/6/24	**Time** 1:00
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses															
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus												
Day 5-31		8/4/2024	9:20	3			x				x	x	x													
Day 5-32		8/4/2024	9:20	3			x				x	x	x													
Day 5-33		8/4/2024	9:20	3			x				x	x	x													
Day 5-34		8/4/2024	9:20	3			x				x	x	x													
Day 5-35		8/4/2024	9:20	3			x				x	x	x													
Day 5-36		8/4/2024	9:20	3			x				x	x	x													

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/6/24	**Time** 1300
Received By:	**Date** 8/6/24	**Time** 1:00
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

wsp

Chain of Custody

Control Number:

Date: 8/2/24 Page: 1 of 1

Project Manager: John Rudolph	phone: 858-243-8158	Bill To: John Rudolph	Report To: John Rudolph
Project Name: GEI EVMWD SOD Study		Company: WSP USA	Company: WSP USA
Proj# US0024915.6871		Address: 9177 Sky Park Court San Diego, CA 92123	Email: john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		Lab Use	
QC Level:	TAT:	Preservatives	

Sample Data					Matrix						Analyses																
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus													
Day 6-1		8/5/2024	9:45	3			x				x	x	x														
Day 6-2		8/5/2024	9:45	3			x				x	x	x														
Day 6-3		8/5/2024	9:45	3			x				x	x	x														
Day 6-4		8/5/2024	9:45	3			x				x	x	x														
Day 6-5		8/5/2024	9:45	3			x				x	x	x														
Day 6-6		8/5/2024	9:45	3			x				x	x	x														
Day 6-7		8/5/2024	9:45	3			x				x	x	x														
Day 6-8		8/5/2024	9:45	3			x				x	x	x														
Day 6-9		8/5/2024	9:45	3			x				x	x	x														
Day 6-10		8/5/2024	9:45	3			x				x	x	x														

Samplers Signature	Date	Time
Relinquished By:	Date 8/6/24	Time 1300
Received By:	Date 8/6/24	Time 1:00
Relinquished By:	Date	Time
Received By (LAB):	Date	Time

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																	
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus														
Day 6-11		8/5/2024	9:45	3			x				x	x	x															
Day 6-12		8/5/2024	9:45	3			x				x	x	x															
Day 6-13		8/5/2024	9:45	3			x				x	x	x															
Day 6-14		8/5/2024	9:45	3			x				x	x	x															
Day 6-15		8/5/2024	9:45	3			x				x	x	x															
Day 6-16		8/5/2024	9:45	3			x				x	x	x															
Day 6-17		8/5/2024	9:45	3			x				x	x	x															
Day 6-18		8/5/2024	9:45	3			x				x	x	x															
Day 6-19		8/5/2024	9:45	3			x				x	x	x															
Day 6-20		8/5/2024	9:45	3			x				x	x	x															

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/6/24	**Time** 1300
Received By:	**Date** 8/6/24	**Time** 1:00
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)

Sampler's Name: John Rudolph

QC Level: **TAT:**

Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Matrix: Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Analyses: Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus
Day 6-21		8/5/2024	9:45	3			x				x	x	x
Day 6-22		8/5/2024	9:45	3			x				x	x	x
Day 6-23		8/5/2024	9:45	3			x				x	x	x
Day 6-24		8/5/2024	9:45	3			x				x	x	x
Day 6-25		8/5/2024	9:45	3			x				x	x	x
Day 6-26		8/5/2024	9:45	3			x				x	x	x
Day 6-27		8/5/2024	9:45	3			x				x	x	x
Day 6-28		8/5/2024	9:45	3			x				x	x	x
Day 6-29		8/5/2024	9:45	3			x				x	x	x
Day 6-30		8/5/2024	9:45	3			x				x	x	x

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/6/24	**Time** 1300
Received By:	**Date** 8/6/24	**Time** 1:00
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158
Project Name: GEI EVMWD SOD Study	
Proj# US0024915.6871	

Bill To:	John Rudolph
Company:	WSP USA
Address:	9177 Sky Park Court San Diego, CA 92123

Report To:	John Rudolph
Company:	WSP USA
Email:	john.rudolph@wsp.com (electronic copies only)

Sampler's Name:	John Rudolph
QC Level:	**TAT:**

Sample Data					Matrix						Analyses																	
Sample Station ID	**Client ID**	**Date Collected**	**Time Collected**	**# Containers**	**Soil/Sediment**	**Seawater**	**Freshwater**	**Algae**	**Filter**	**Benthic Macroinverts**	**Total Iron**	**Total Nitrogen, Total Phosphorus**	**Dissolved Iron, Ortho-Phosphorus**														
Day 6-31		8/5/2024	9:45	3			x				x	x	x														
Day 6-32		8/5/2024	9:45	3			x				x	x	x														
Day 6-33		8/5/2024	9:45	3			x				x	x	x														
Day 6-34		8/5/2024	9:45	3			x				x	x	x														
Day 6-35		8/5/2024	9:45	3			x				x	x	x														
Day 6-36		8/5/2024	9:45	3			x				x	x	x														

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/6/24	**Time** 1300
Received By:	**Date** 8/6/24	**Time** 1:00
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																	
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus														
Day 7-1		8/6/2024	10:45	3			x				x	x	x															
Day 7-2		8/6/2024	10:45	3			x				x	x	x															
Day 7-3		8/6/2024	10:45	3			x				x	x	x															
Day 7-4		8/6/2024	10:45	3			x				x	x	x															
Day 7-5		8/6/2024	10:45	3			x				x	x	x															
Day 7-6		8/6/2024	10:45	3			x				x	x	x															
Day 7-7		8/6/2024	10:45	3			x				x	x	x															
Day 7-8		8/6/2024	10:45	3			x				x	x	x															
Day 7-9		8/6/2024	10:45	3			x				x	x	x															
Day 7-10		8/6/2024	10:45	3			x				x	x	x															

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/6/24	**Time** 1300
Received By:	**Date** 8/6/24	**Time** 1.00
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																	
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus														
Day 7-11		8/6/2024	10:45	3			x				x	x	x															
Day 7-12		8/6/2024	10:45	3			x				x	x	x															
Day 7-13		8/6/2024	10:45	3			x				x	x	x															
Day 7-14		8/6/2024	10:45	3			x				x	x	x															
Day 7-15		8/6/2024	10:45	3			x				x	x	x															
Day 7-16		8/6/2024	10:45	3			x				x	x	x															
Day 7-17		8/6/2024	10:45	3							x	x	x															
Day 7-18		8/6/2024	10:45	3							x	x	x															
Day 7-19		8/6/2024	10:45	3							x	x	x															
Day 7-20		8/6/2024	10:45	3							x	x	x															

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/6/24	**Time** 1300
Received By:	**Date** 8/6/24	**Time** 1:00
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus													
Day 7-21		8/6/2024	10:45	3			x				x	x	x														
Day 7-22		8/6/2024	10:45	3			x				x	x	x														
Day 7-23		8/6/2024	10:45	3			x				x	x	x														
Day 7-24		8/6/2024	10:45	3			x				x	x	x														
Day 7-25		8/6/2024	10:45	3			x				x	x	x														
Day 7-26		8/6/2024	10:45	3			x				x	x	x														
Day 7-27		8/6/2024	10:45	3			x				x	x	x														
Day 7-28		8/6/2024	10:45	3			x				x	x	x														
Day 7-29		8/6/2024	10:45	3			x				x	x	x														
Day 7-30		8/6/2024	10:45	3			x				x	x	x														

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/6/24	**Time** 1300
Received By:	**Date** 8/6/24	**Time** 1:06
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																	
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus														
Day 7-31		8/6/2024	10:45	3			x				x	x	x															
Day 7-32		8/6/2024	10:45	3			x				x	x	x															
Day 7-33		8/6/2024	10:45	3			x				x	x	x															
Day 7-34		8/6/2024	10:45	3			x				x	x	x															
Day 7-35		8/6/2024	10:45	3			x				x	x	x															
Day 7-36		8/6/2024	10:45	3			x				x	x	x															

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/6/24	**Time** 1300
Received By:	**Date** 8/6/24	**Time** 1:00
Relinquished By:	**Date**	**Time**
Received By (LAB): PHYSIS	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

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: 2407005-003
Client Name: WSP USA
Project Name: GEI EVMWD SOD Study Project # US0024915.6871
COC Page Number: 17 of 17
Bottle Label Color: NA

Receiving Info

1. Initials Received By: SW
2. Date Received: 8/6/24
3. Time Received: 3:05
4. Client Name: WSP
5. Courier Information: (Please circle)
   - Client • UPS • Area Fast • DRS
   - FedEx • GSO/GLS • Ontrac • PAMS
   - PHYSIS Driver: Jerry Mendoza
     i. Start Time: 9:30am
     ii. End Time: 3:05 pm
     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): 1.4°C 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:

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

March 12, 2025

John D. Rudolph
GEI
5901 Priestly Drive
Suite 301
Carlsbad, CA 92008-

Project Name: GEI EVMWD SOD Study Project # US0024915.6871
Physis Project ID: 2407005-004

Dear John,

Enclosed are the analytical results for samples submitted to PHYSIS Environmental Laboratories, Inc. (PHYSIS) on 8/12/2024. A total of 180 samples were received for analysis in accordance with the attached chain of custody (COC). Per the COC, the samples were analyzed for:

Conventionals
Total Phosphorus by SM 4500-P E
Total Nitrogen by SM 5310 B-N Module
Dissolved Orthophosphate as P by EPA 300.0
Elements
Total & Dissolved Iron (Fe) by EPA 200.8

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

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PROJECT SAMPLE LIST

WSP USA

PHYSIS Project ID: 2407005-00

GEI EVMWD SOD Study Project # US0024915.6871

Total Samples: 2E

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
121835	Day 6-1		8/5/2024	9:45	Samplewater	Non Specific
121836	Day 6-2		8/5/2024	9:45	Samplewater	Non Specific
121837	Day 6-3		8/5/2024	9:45	Samplewater	Non Specific
121838	Day 6-4		8/5/2024	9:45	Samplewater	Non Specific
121839	Day 6-5		8/5/2024	9:45	Samplewater	Non Specific
121840	Day 6-6		8/5/2024	9:45	Samplewater	Non Specific
121841	Day 6-7		8/5/2024	9:45	Samplewater	Non Specific
121842	Day 6-8		8/5/2024	9:45	Samplewater	Non Specific
121843	Day 6-9		8/5/2024	9:45	Samplewater	Non Specific
121844	Day 6-10		8/5/2024	9:45	Samplewater	Non Specific
121845	Day 6-11		8/5/2024	9:45	Samplewater	Non Specific
121846	Day 6-12		8/5/2024	9:45	Samplewater	Non Specific
121847	Day 6-13		8/5/2024	9:45	Samplewater	Non Specific
121848	Day 6-14		8/5/2024	9:45	Samplewater	Non Specific
121849	Day 6-15		8/5/2024	9:45	Samplewater	Non Specific
121850	Day 6-16		8/5/2024	9:45	Samplewater	Non Specific
121851	Day 6-17		8/5/2024	9:45	Samplewater	Non Specific
121852	Day 6-18		8/5/2024	9:45	Samplewater	Non Specific
121853	Day 6-19		8/5/2024	9:45	Samplewater	Non Specific
121854	Day 6-20		8/5/2024	9:45	Samplewater	Non Specific
121855	Day 6-21		8/5/2024	9:45	Samplewater	Non Specific
121856	Day 6-22		8/5/2024	9:45	Samplewater	Non Specific
121857	Day 6-23		8/5/2024	9:45	Samplewater	Non Specific
121858	Day 6-24		8/5/2024	9:45	Samplewater	Non Specific
121859	Day 6-25		8/5/2024	9:45	Samplewater	Non Specific
121860	Day 6-26		8/5/2024	9:45	Samplewater	Non Specific
121861	Day 6-27		8/5/2024	9:45	Samplewater	Non Specific
121862	Day 6-28		8/5/2024	9:45	Samplewater	Non Specific
121863	Day 6-29		8/5/2024	9:45	Samplewater	Non Specific
121864	Day 6-30		8/5/2024	9:45	Samplewater	Non Specific
121865	Day 6-31		8/5/2024	9:45	Samplewater	Non Specific
121866	Day 6-32		8/5/2024	9:45	Samplewater	Non Specific
121867	Day 6-33		8/5/2024	9:45	Samplewater	Non Specific
121868	Day 6-34		8/5/2024	9:45	Samplewater	Non Specific
121869	Day 6-35		8/5/2024	9:45	Samplewater	Non Specific

1904 E. Wright Circle Anaheim, CA 92806 (714) 602-5320 fax (714) 602-5321 www.physislabs.com CA ELAP #2769

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

WSP USA

PHYSIS Project ID: 2407005-00

GEI EVMWD SOD Study Project # US0024915.6871

Total Samples: 2E

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
121870	Day 6-36		8/5/2024	9:45	Samplewater	Non Specific
121871	Day 7-1		8/6/2024	10:45	Samplewater	Non Specific
121872	Day 7-2		8/6/2024	10:45	Samplewater	Non Specific
121873	Day 7-3		8/6/2024	10:45	Samplewater	Non Specific
121874	Day 7-4		8/6/2024	10:45	Samplewater	Non Specific
121875	Day 7-5		8/6/2024	10:45	Samplewater	Non Specific
121876	Day 7-6		8/6/2024	10:45	Samplewater	Non Specific
121877	Day 7-7		8/6/2024	10:45	Samplewater	Non Specific
121878	Day 7-8		8/6/2024	10:45	Samplewater	Non Specific
121879	Day 7-9		8/6/2024	10:45	Samplewater	Non Specific
121880	Day 7-10		8/6/2024	10:45	Samplewater	Non Specific
121881	Day 7-11		8/6/2024	10:45	Samplewater	Non Specific
121882	Day 7-12		8/6/2024	10:45	Samplewater	Non Specific
121883	Day 7-13		8/6/2024	10:45	Samplewater	Non Specific
121884	Day 7-14		8/6/2024	10:45	Samplewater	Non Specific
121885	Day 7-15		8/6/2024	10:45	Samplewater	Non Specific
121886	Day 7-16		8/6/2024	10:45	Samplewater	Non Specific
121887	Day 7-17		8/6/2024	10:45	Samplewater	Non Specific
121888	Day 7-18		8/6/2024	10:45	Samplewater	Non Specific
121889	Day 7-19		8/6/2024	10:45	Samplewater	Non Specific
121890	Day 7-20		8/6/2024	10:45	Samplewater	Non Specific
121891	Day 7-21		8/6/2024	10:45	Samplewater	Non Specific
121892	Day 7-22		8/6/2024	10:45	Samplewater	Non Specific
121893	Day 7-23		8/6/2024	10:45	Samplewater	Non Specific
121894	Day 7-24		8/6/2024	10:45	Samplewater	Non Specific
121895	Day 7-25		8/6/2024	10:45	Samplewater	Non Specific
121896	Day 7-26		8/6/2024	10:45	Samplewater	Non Specific
121897	Day 7-27		8/6/2024	10:45	Samplewater	Non Specific
121898	Day 7-28		8/6/2024	10:45	Samplewater	Non Specific
121899	Day 7-29		8/6/2024	10:45	Samplewater	Non Specific
121900	Day 7-30		8/6/2024	10:45	Samplewater	Non Specific
121901	Day 7-31		8/6/2024	10:45	Samplewater	Non Specific
121902	Day 7-32		8/6/2024	10:45	Samplewater	Non Specific
121903	Day 7-33		8/6/2024	10:45	Samplewater	Non Specific
121904	Day 7-34		8/6/2024	10:45	Samplewater	Non Specific
121905	Day 7-35		8/6/2024	10:45	Samplewater	Non Specific
121906	Day 7-36		8/6/2024	10:45	Samplewater	Non Specific

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PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

WSP USA

PHYSIS Project ID: 2407005-00

GEI EVMWD SOD Study Project # US0024915.6871

Total Samples: 2E

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
122132	Day 8 - 1		8/7/2024	10:10	Freshwater	Non Specific
122133	Day 8 - 2		8/7/2024	10:10	Freshwater	Non Specific
122134	Day 8 - 3		8/7/2024	10:10	Freshwater	Non Specific
122135	Day 8 - 4		8/7/2024	10:10	Freshwater	Non Specific
122136	Day 8 - 5		8/7/2024	10:10	Freshwater	Non Specific
122137	Day 8 - 6		8/7/2024	10:10	Freshwater	Non Specific
122138	Day 8 - 7		8/7/2024	10:10	Freshwater	Non Specific
122139	Day 8 - 8		8/7/2024	10:10	Freshwater	Non Specific
122140	Day 8 - 9		8/7/2024	10:10	Freshwater	Non Specific
122141	Day 8 - 10		8/7/2024	10:10	Freshwater	Non Specific
122142	Day 8 - 11		8/7/2024	10:10	Freshwater	Non Specific
122143	Day 8 - 12		8/7/2024	10:10	Freshwater	Non Specific
122144	Day 8 - 13		8/7/2024	10:10	Freshwater	Non Specific
122145	Day 8 - 14		8/7/2024	10:10	Freshwater	Non Specific
122146	Day 8 - 15		8/7/2024	10:10	Freshwater	Non Specific
122147	Day 8 - 16		8/7/2024	10:10	Freshwater	Non Specific
122148	Day 8 - 17		8/7/2024	10:10	Freshwater	Non Specific
122149	Day 8 - 18		8/7/2024	10:10	Freshwater	Non Specific
122150	Day 8 - 19		8/7/2024	10:10	Freshwater	Non Specific
122151	Day 8 - 20		8/7/2024	10:10	Freshwater	Non Specific
122152	Day 8 - 21		8/7/2024	10:10	Freshwater	Non Specific
122153	Day 8 - 22		8/7/2024	10:10	Freshwater	Non Specific
122154	Day 8 - 23		8/7/2024	10:10	Freshwater	Non Specific
122155	Day 8 - 24		8/7/2024	10:10	Freshwater	Non Specific
122156	Day 8 - 25		8/7/2024	10:10	Freshwater	Non Specific
122157	Day 8 - 26		8/7/2024	10:10	Freshwater	Non Specific
122158	Day 8 - 27		8/7/2024	10:10	Freshwater	Non Specific
122159	Day 8 - 28		8/7/2024	10:10	Freshwater	Non Specific
122160	Day 8 - 29		8/7/2024	10:10	Freshwater	Non Specific
122161	Day 8 - 30		8/7/2024	10:10	Freshwater	Non Specific
122162	Day 8 - 31		8/7/2024	10:10	Freshwater	Non Specific
122163	Day 8 - 32		8/7/2024	10:10	Freshwater	Non Specific
122164	Day 8 - 33		8/7/2024	10:10	Freshwater	Non Specific
122165	Day 8 - 34		8/7/2024	10:10	Freshwater	Non Specific
122166	Day 8 - 35		8/7/2024	10:10	Freshwater	Non Specific
122167	Day 8 - 36		8/7/2024	10:10	Freshwater	Non Specific
122168	Day 9 - 1		8/8/2024	10:30	Freshwater	Non Specific

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Innovative Solutions for Nature

WSP USA

PHYSIS Project ID: 2407005-00

GEI EVMWD SOD Study Project # US0024915.6871

Total Samples: 2E

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
122169	Day 9 - 2		8/8/2024	10:30	Freshwater	Non Specific
122170	Day 9 - 3		8/8/2024	10:30	Freshwater	Non Specific
122171	Day 9 - 4		8/8/2024	10:30	Freshwater	Non Specific
122172	Day 9 - 5		8/8/2024	10:30	Freshwater	Non Specific
122173	Day 9 - 6		8/8/2024	10:30	Freshwater	Non Specific
122174	Day 9 - 7		8/8/2024	10:30	Freshwater	Non Specific
122175	Day 9 - 8		8/8/2024	10:30	Freshwater	Non Specific
122176	Day 9 - 9		8/8/2024	10:30	Freshwater	Non Specific
122177	Day 9 - 10		8/8/2024	10:30	Freshwater	Non Specific
122178	Day 9 - 11		8/8/2024	10:30	Freshwater	Non Specific
122179	Day 9 - 12		8/8/2024	10:30	Freshwater	Non Specific
122180	Day 9 - 13		8/8/2024	10:30	Freshwater	Non Specific
122181	Day 9 - 14		8/8/2024	10:30	Freshwater	Non Specific
122182	Day 9 - 15		8/8/2024	10:30	Freshwater	Non Specific
122183	Day 9 - 16		8/8/2024	10:30	Freshwater	Non Specific
122184	Day 9 - 17		8/8/2024	10:30	Freshwater	Non Specific
122185	Day 9 - 18		8/8/2024	10:30	Freshwater	Non Specific
122186	Day 9 - 19		8/8/2024	10:30	Freshwater	Non Specific
122187	Day 9 - 20		8/8/2024	10:30	Freshwater	Non Specific
122188	Day 9 - 21		8/8/2024	10:30	Freshwater	Non Specific
122189	Day 9 - 22		8/8/2024	10:30	Freshwater	Non Specific
122190	Day 9 - 23		8/8/2024	10:30	Freshwater	Non Specific
122191	Day 9 - 24		8/8/2024	10:30	Freshwater	Non Specific
122192	Day 9 - 25		8/8/2024	10:30	Freshwater	Non Specific
122193	Day 9 - 26		8/8/2024	10:30	Freshwater	Non Specific
122194	Day 9 - 27		8/8/2024	10:30	Freshwater	Non Specific
122195	Day 9 - 28		8/8/2024	10:30	Freshwater	Non Specific
122196	Day 9 - 29		8/8/2024	10:30	Freshwater	Non Specific
122197	Day 9 - 30		8/8/2024	10:30	Freshwater	Non Specific
122198	Day 9 - 31		8/8/2024	10:30	Freshwater	Non Specific
122199	Day 9 - 32		8/8/2024	10:30	Freshwater	Non Specific
122200	Day 9 - 33		8/8/2024	10:30	Freshwater	Non Specific
122201	Day 9 - 34		8/8/2024	10:30	Freshwater	Non Specific
122202	Day 9 - 35		8/8/2024	10:30	Freshwater	Non Specific
122203	Day 9 - 36		8/8/2024	10:30	Freshwater	Non Specific
122204	Day 10 - 1		8/9/2024	9:30	Freshwater	Non Specific
122205	Day 10 - 2		8/9/2024	9:30	Freshwater	Non Specific

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Innovative Solutions for Nature

WSP USA

PHYSIS Project ID: 2407005-00

GEI EVMWD SOD Study Project # US0024915.6871

Total Samples: 2E

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
122206	Day 10 - 3		8/9/2024	9:30	Freshwater	Non Specific
122207	Day 10 - 4		8/9/2024	9:30	Freshwater	Non Specific
122208	Day 10 - 5		8/9/2024	9:30	Freshwater	Non Specific
122209	Day 10 - 6		8/9/2024	9:30	Freshwater	Non Specific
122210	Day 10 - 7		8/9/2024	9:30	Freshwater	Non Specific
122211	Day 10 - 8		8/9/2024	9:30	Freshwater	Non Specific
122212	Day 10 - 9		8/9/2024	9:30	Freshwater	Non Specific
122213	Day 10 - 10		8/9/2024	9:30	Freshwater	Non Specific
122214	Day 10 - 11		8/9/2024	9:30	Freshwater	Non Specific
122215	Day 10 - 12		8/9/2024	9:30	Freshwater	Non Specific
122216	Day 10 - 13		8/9/2024	9:30	Freshwater	Non Specific
122217	Day 10 - 14		8/9/2024	9:30	Freshwater	Non Specific
122218	Day 10 - 15		8/9/2024	9:30	Freshwater	Non Specific
122219	Day 10 - 16		8/9/2024	9:30	Freshwater	Non Specific
122220	Day 10 - 17		8/9/2024	9:30	Freshwater	Non Specific
122221	Day 10 - 18		8/9/2024	9:30	Freshwater	Non Specific
122222	Day 10 - 19		8/9/2024	9:30	Freshwater	Non Specific
122223	Day 10 - 20		8/9/2024	9:30	Freshwater	Non Specific
122224	Day 10 - 21		8/9/2024	9:30	Freshwater	Non Specific
122225	Day 10 - 22		8/9/2024	9:30	Freshwater	Non Specific
122226	Day 10 - 23		8/9/2024	9:30	Freshwater	Non Specific
122227	Day 10 - 24		8/9/2024	9:30	Freshwater	Non Specific
122228	Day 10 - 25		8/9/2024	9:30	Freshwater	Non Specific
122229	Day 10 - 26		8/9/2024	9:30	Freshwater	Non Specific
122230	Day 10 - 27		8/9/2024	9:30	Freshwater	Non Specific
122231	Day 10 - 28		8/9/2024	9:30	Freshwater	Non Specific
122232	Day 10 - 29		8/9/2024	9:30	Freshwater	Non Specific
122233	Day 10 - 30		8/9/2024	9:30	Freshwater	Non Specific
122234	Day 10 - 31		8/9/2024	9:30	Freshwater	Non Specific
122235	Day 10 - 32		8/9/2024	9:30	Freshwater	Non Specific
122236	Day 10 - 33		8/9/2024	9:30	Freshwater	Non Specific
122237	Day 10 - 34		8/9/2024	9:30	Freshwater	Non Specific
122238	Day 10 - 35		8/9/2024	9:30	Freshwater	Non Specific
122239	Day 10 - 36		8/9/2024	9:30	Freshwater	Non Specific

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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

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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

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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.

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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

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ANALYTICAL REPORT

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PHYSIS
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ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121835-R1 Day 6-1			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.282	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.74	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.452	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24
Sample ID: 121836-R1 Day 6-2			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.267	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.41	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.372	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24
Sample ID: 121837-R1 Day 6-3			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.278	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.11	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.422	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24
Sample ID: 121838-R1 Day 6-4			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.282	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.65	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.392	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24
Sample ID: 121839-R1 Day 6-5			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.223	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.13	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.307	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24

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PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121840-R1 Day 6-6			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.299	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.4	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.457	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24
Sample ID: 121841-R1 Day 6-7			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.279	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.02	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.376	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24
Sample ID: 121842-R1 Day 6-8			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.223	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.13	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.302	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24
Sample ID: 121843-R1 Day 6-9			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.34	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.52	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.426	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24
Sample ID: 121844-R1 Day 6-10			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Total Nitrogen	SM 5310 B-N Module	mg/L	3.93	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.396	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24
Sample ID: 121845-R1 Day 6-11			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.204	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.98	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.404	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24

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Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121846-R1 Day 6-12			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.348	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.46	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.479	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24
Sample ID: 121847-R1 Day 6-13			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.172	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.66	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.308	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24
Sample ID: 121848-R1 Day 6-14			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.293	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.17	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.454	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24
Sample ID: 121849-R1 Day 6-15			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.279	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.34	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.398	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24
Sample ID: 121850-R1 Day 6-16			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.202	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.47	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	ND	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24

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ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121851-R1 Day 6-17			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.281	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.02	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.388	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24
Sample ID: 121852-R1 Day 6-18			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.231	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.26	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.363	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24
Sample ID: 121853-R1 Day 6-19			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.314	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.42	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.449	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24
Sample ID: 121854-R1 Day 6-20			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.31	1	0.002	0.005	NA		C-83068	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.25	1	0.28	0.6	NA		O-28140	28-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.455	1	0.016	0.02	NA		C-87046	02-Oct-24	03-Oct-24
Sample ID: 121855-R1 Day 6-21			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.261	1	0.002	0.005	NA		C-83069	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.15	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.386	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24

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Sample ID: 121856-R1 Day 6-22			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.169	1	0.002	0.005	NA		C-83069	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.34	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.246	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24
Sample ID: 121857-R1 Day 6-23			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.166	1	0.002	0.005	NA		C-83069	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.58	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.283	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24
Sample ID: 121858-R1 Day 6-24			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.189	1	0.002	0.005	NA		C-83069	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.19	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.323	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24
Sample ID: 121859-R1 Day 6-25			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.211	1	0.002	0.005	NA		C-83069	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.22	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.301	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24
Sample ID: 121860-R1 Day 6-26			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.308	1	0.002	0.005	NA		C-83069	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.37	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.402	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24

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Sample ID: 121861-R1 Day 6-27			**Matrix: Samplewater**				**Sampled: 05-Aug-24 9:45**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.234	1	0.002	0.005	NA		C-83069	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.57	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.33	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24
Sample ID: 121862-R1 Day 6-28			**Matrix: Samplewater**				**Sampled: 05-Aug-24 9:45**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.211	1	0.002	0.005	NA		C-83069	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.48	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.324	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24
Sample ID: 121863-R1 Day 6-29			**Matrix: Samplewater**				**Sampled: 05-Aug-24 9:45**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.281	1	0.002	0.005	NA		C-83069	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.39	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.374	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24
Sample ID: 121864-R1 Day 6-30			**Matrix: Samplewater**				**Sampled: 05-Aug-24 9:45**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.318	1	0.002	0.005	NA		C-83069	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.4	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.435	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24
Sample ID: 121865-R1 Day 6-31			**Matrix: Samplewater**				**Sampled: 05-Aug-24 9:45**			**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.231	1	0.002	0.005	NA		C-83069	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.73	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.352	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24

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Sample ID: 121866-R1 Day 6-32			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.296	1	0.002	0.005	NA		C-83069	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.42	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.405	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24
Sample ID: 121867-R1 Day 6-33			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.185	1	0.002	0.005	NA		C-83069	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.5	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.317	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24
Sample ID: 121868-R1 Day 6-34			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.265	1	0.002	0.005	NA		C-83069	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.72	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.363	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24
Sample ID: 121869-R1 Day 6-35			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.232	1	0.002	0.005	NA		C-83069	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.87	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.321	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24
Sample ID: 121870-R1 Day 6-36			**Matrix: Samplewater**					**Sampled: 05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.282	1	0.002	0.005	NA		C-83069	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.82	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.379	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24

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Sample ID: 121871-R1 Day 7-1			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.236	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.54	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.393	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24
Sample ID: 121872-R1 Day 7-2			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.287	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.43	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.383	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24
Sample ID: 121873-R1 Day 7-3			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.254	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.06	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.352	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24
Sample ID: 121874-R1 Day 7-4			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.255	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.66	1	0.28	0.6	NA		O-28141	30-Sep-24	30-Sep-24
Total Phosphorus	SM 4500-P E	mg/L	0.389	1	0.016	0.02	NA		C-87049	03-Oct-24	07-Oct-24
Sample ID: 121875-R1 Day 7-5			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.241	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.25	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.35	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24

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Sample ID: 121876-R1 Day 7-6			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.283	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.55	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.398	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24
Sample ID: 121877-R1 Day 7-7			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.269	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.16	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.353	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24
Sample ID: 121878-R1 Day 7-8			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.185	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.04	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.234	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24
Sample ID: 121879-R1 Day 7-9			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.314	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.81	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.445	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24
Sample ID: 121880-R1 Day 7-10			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.287	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.98	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.367	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24

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Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121881-R1 Day 7-11			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.202	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.06	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.328	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24
Sample ID: 121882-R1 Day 7-12			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.372	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.73	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.59	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24
Sample ID: 121883-R1 Day 7-13			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.206	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.7	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.296	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24
Sample ID: 121884-R1 Day 7-14			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.295	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.25	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.413	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24
Sample ID: 121885-R1 Day 7-15			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.265	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.02	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.389	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121886-R1 Day 7-16			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.182	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.51	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.24	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24
Sample ID: 121887-R1 Day 7-17			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.309	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.28	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.365	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24
Sample ID: 121888-R1 Day 7-18			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.219	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.49	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.317	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24
Sample ID: 121889-R1 Day 7-19			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.312	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.68	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.435	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24
Sample ID: 121890-R1 Day 7-20			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.315	1	0.002	0.005	NA		C-83070	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.22	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.395	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121891-R1 Day 7-21			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.328	1	0.002	0.005	NA		C-83071	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.14	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.378	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24
Sample ID: 121892-R1 Day 7-22			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.292	1	0.002	0.005	NA		C-83071	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.47	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.358	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24
Sample ID: 121893-R1 Day 7-23			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.171	1	0.002	0.005	NA		C-83071	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.42	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.268	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24
Sample ID: 121894-R1 Day 7-24			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.242	1	0.002	0.005	NA		C-83071	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.26	1	0.28	0.6	NA		O-28142	30-Sep-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.323	1	0.016	0.02	NA		C-87050	03-Oct-24	07-Oct-24
Sample ID: 121895-R1 Day 7-25			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.264	1	0.002	0.005	NA		C-83071	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.33	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.348	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121896-R1 Day 7-26			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.31	1	0.002	0.005	NA		C-83071	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.59	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.415	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24
Sample ID: 121897-R1 Day 7-27			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.284	1	0.002	0.005	NA		C-83071	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.84	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.359	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24
Sample ID: 121898-R1 Day 7-28			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.265	1	0.002	0.005	NA		C-83071	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.6	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.335	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24
Sample ID: 121899-R1 Day 7-29			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.311	1	0.002	0.005	NA		C-83071	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.42	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.345	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24
Sample ID: 121900-R1 Day 7-30			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.354	1	0.002	0.005	NA		C-83071	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.58	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.444	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121901-R1 Day 7-31			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.305	1	0.002	0.005	NA		C-83071	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.79	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.386	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24
Sample ID: 121902-R1 Day 7-32			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.344	1	0.002	0.005	NA		C-83071	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.72	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.43	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24
Sample ID: 121903-R1 Day 7-33			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.23	1	0.002	0.005	NA		C-83071	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.49	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.282	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24
Sample ID: 121904-R1 Day 7-34			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.343	1	0.002	0.005	NA		C-83071	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.78	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.411	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24
Sample ID: 121905-R1 Day 7-35			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.223	1	0.002	0.005	NA		C-83071	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.85	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.296	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24

PHYSIS
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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121906-R1 Day 7-36			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.274	1	0.002	0.005	NA		C-83071	10-Dec-24	10-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.84	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.395	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24
Sample ID: 122132-R1 Day 8 - 1			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.226	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.16	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.449	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24
Sample ID: 122133-R1 Day 8 - 2			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.235	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.72	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.412	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24
Sample ID: 122134-R1 Day 8 - 3			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.193	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.34	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.354	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24
Sample ID: 122135-R1 Day 8 - 4			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.228	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.01	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.462	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122136-R1 Day 8 - 5			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.23	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.43	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.408	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24
Sample ID: 122137-R1 Day 8 - 6			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.239	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.74	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.411	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24
Sample ID: 122138-R1 Day 8 - 7			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.273	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.37	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.385	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24
Sample ID: 122139-R1 Day 8 - 8			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	ND	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.13	1	0.28	0.6	NA		O-28143	01-Oct-24	01-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.24	1	0.016	0.02	NA		C-87052	07-Oct-24	08-Oct-24
Sample ID: 122140-R1 Day 8 - 9			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.236	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.31	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.45	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122141-R1 Day 8 - 10			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.256	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.19	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.39	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122142-R1 Day 8 - 11			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.187	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.24	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.338	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122143-R1 Day 8 - 12			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.367	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	6.16	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.66	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122144-R1 Day 8 - 13			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.195	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	2.98	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.353	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122145-R1 Day 8 - 14			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.232	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.42	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.441	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122146-R1 Day 8 - 15			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.321	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.21	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.413	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122147-R1 Day 8 - 16			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	ND	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.76	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.236	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122148-R1 Day 8 - 17			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.289	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.61	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.404	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122149-R1 Day 8 - 18			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	ND	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.66	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.307	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122150-R1 Day 8 - 19			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.232	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.04	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.476	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24

PHYSIS
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Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122151-R1 **Day 8 - 20**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.264	1	0.002	0.005	NA		C-83072	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.45	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.398	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122152-R1 **Day 8 - 21**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	ND	1	0.002	0.005	NA		C-83073	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.49	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.411	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122153-R1 **Day 8 - 22**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.259	1	0.002	0.005	NA		C-83073	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.72	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.396	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122154-R1 **Day 8 - 23**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	ND	1	0.002	0.005	NA		C-83073	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.58	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.216	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122155-R1 **Day 8 - 24**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.242	1	0.002	0.005	NA		C-83073	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.54	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.35	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24

PHYSIS
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PHYSIS Project ID: 2407005-004
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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122156-R1 Day 8 - 25			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.258	1	0.002	0.005	NA		C-83073	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.61	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.379	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122157-R1 Day 8 - 26			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.269	1	0.002	0.005	NA		C-83073	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.91	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.446	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122158-R1 Day 8 - 27			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.268	1	0.002	0.005	NA		C-83073	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.94	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.37	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122159-R1 Day 8 - 28			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.24	1	0.002	0.005	NA		C-83073	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.59	1	0.28	0.6	NA		O-28144	01-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.324	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122160-R1 Day 8 - 29			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.24	1	0.002	0.005	NA		C-83073	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.64	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.312	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122161-R1 Day 8 - 30			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.354	1	0.002	0.005	NA		C-83073	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.94	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.426	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122162-R1 Day 8 - 31			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.226	1	0.002	0.005	NA		C-83073	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.03	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.338	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122163-R1 Day 8 - 32			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.33	1	0.002	0.005	NA		C-83073	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.87	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.404	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122164-R1 Day 8 - 33			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.18	1	0.002	0.005	NA		C-83073	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.67	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.205	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122165-R1 Day 8 - 34			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.286	1	0.002	0.005	NA		C-83073	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.95	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.365	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24

PHYSIS
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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122166-R1 Day 8 - 35			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.21	1	0.002	0.005	NA		C-83073	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.216	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122167-R1 Day 8 - 36			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.21	1	0.002	0.005	NA		C-83073	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.02	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.337	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122168-R1 Day 9 - 1			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.296	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.17	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.373	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122169-R1 Day 9 - 2			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.297	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.92	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.368	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122170-R1 Day 9 - 3			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.196	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.34	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.301	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24

PHYSIS
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Innovative Solutions for Nature

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122171-R1 Day 9 - 4			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.23	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.11	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.36	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122172-R1 Day 9 - 5			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.251	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.58	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.347	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122173-R1 Day 9 - 6			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.281	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.88	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.345	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122174-R1 Day 9 - 7			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.257	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.57	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.334	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122175-R1 Day 9 - 8			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	ND	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.26	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.181	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24

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PHYSIS Project ID: 2407005-004
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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122176-R1 **Day 9 - 9**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.259	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.25	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.411	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122177-R1 **Day 9 - 10**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.271	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.2	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.341	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122178-R1 **Day 9 - 11**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.226	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.28	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.294	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122179-R1 **Day 9 - 12**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.413	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	6.36	1	0.28	0.6	NA		O-28145	02-Oct-24	02-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.601	1	0.016	0.02	NA		C-87067	24-Oct-24	28-Oct-24
Sample ID: 122180-R1 **Day 9 - 13**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.2	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.24	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.355	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122181-R1	**Day 9 - 14**		**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.3	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.66	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.447	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24
Sample ID: 122182-R1	**Day 9 - 15**		**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.264	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.36	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.44	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24
Sample ID: 122183-R1	**Day 9 - 16**		**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.193	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.81	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.253	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24
Sample ID: 122184-R1	**Day 9 - 17**		**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.249	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.59	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.395	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24
Sample ID: 122185-R1	**Day 9 - 18**		**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.183	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.9	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.314	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122186-R1 Day 9 - 19			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.284	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.78	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.45	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24
Sample ID: 122187-R1 Day 9 - 20			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.274	1	0.002	0.005	NA		C-83074	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.56	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.381	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24
Sample ID: 122188-R1 Day 9 - 21			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.294	1	0.002	0.005	NA		C-83075	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.57	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.39	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24
Sample ID: 122189-R1 Day 9 - 22			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.258	1	0.002	0.005	NA		C-83075	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.73	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.406	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24
Sample ID: 122190-R1 Day 9 - 23			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	ND	1	0.002	0.005	NA		C-83075	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.72	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.228	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122191-R1 Day 9 - 24			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.2	1	0.002	0.005	NA		C-83075	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.7	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.333	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24
Sample ID: 122192-R1 Day 9 - 25			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.216	1	0.002	0.005	NA		C-83075	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.79	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.388	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24
Sample ID: 122193-R1 Day 9 - 26			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.312	1	0.002	0.005	NA		C-83075	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.06	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.45	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24
Sample ID: 122194-R1 Day 9 - 27			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.226	1	0.002	0.005	NA		C-83075	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.04	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.377	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24
Sample ID: 122195-R1 Day 9 - 28			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.205	1	0.002	0.005	NA		C-83075	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.65	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.333	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122196-R1 Day 9 - 29			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.206	1	0.002	0.005	NA		C-83075	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.52	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.338	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24
Sample ID: 122197-R1 Day 9 - 30			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.273	1	0.002	0.005	NA		C-83075	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.93	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.385	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24
Sample ID: 122198-R1 Day 9 - 31			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.255	1	0.002	0.005	NA		C-83075	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.2	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.415	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24
Sample ID: 122199-R1 Day 9 - 32			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.308	1	0.002	0.005	NA		C-83075	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.12	1	0.28	0.6	NA		O-28146	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.49	1	0.016	0.02	NA		C-87069	24-Oct-24	28-Oct-24
Sample ID: 122200-R1 Day 9 - 33			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.197	1	0.002	0.005	NA		C-83075	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.78	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.286	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24

PHYSIS
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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122201-R1 Day 9 - 34			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.256	1	0.002	0.005	NA		C-83075	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.17	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.459	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122202-R1 Day 9 - 35			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.179	1	0.002	0.005	NA		C-83075	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.92	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.283	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122203-R1 Day 9 - 36			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.249	1	0.002	0.005	NA		C-83075	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.16	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.423	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122204-R1 Day 10 - 1			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.29	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.37	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.465	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122205-R1 Day 10 - 2			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.275	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.89	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.474	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122206-R1 **Day 10 - 3**			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.226	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.39	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.402	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122207-R1 **Day 10 - 4**			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.278	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.42	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.502	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122208-R1 **Day 10 - 5**			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.241	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.67	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.434	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122209-R1 **Day 10 - 6**			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.273	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.8	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.427	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122210-R1 **Day 10 - 7**			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.258	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.75	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.461	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122211-R1	**Day 10 - 8**		**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	ND	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.29	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.274	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122212-R1	**Day 10 - 9**		**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.276	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.37	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.518	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122213-R1	**Day 10 - 10**		**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.246	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.3	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.435	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122214-R1	**Day 10 - 11**		**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.232	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.33	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.379	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122215-R1	**Day 10 - 12**		**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.441	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	6.58	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.685	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122216-R1 Day 10 - 13			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.216	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.12	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.386	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122217-R1 Day 10 - 14			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.312	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.58	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.487	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122218-R1 Day 10 - 15			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.279	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.35	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.457	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122219-R1 Day 10 - 16			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.181	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.7	1	0.28	0.6	NA		O-28147	02-Oct-24	03-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.298	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122220-R1 Day 10 - 17			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.24	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.2	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.439	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24

PHYSIS
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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122221-R1	**Day 10 - 18**		**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.212	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.29	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.362	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122222-R1	**Day 10 - 19**		**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.295	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.88	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.447	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122223-R1	**Day 10 - 20**		**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.284	1	0.002	0.005	NA		C-83076	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.84	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.449	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122224-R1	**Day 10 - 21**		**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.286	1	0.002	0.005	NA		C-83077	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.69	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.426	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122225-R1	**Day 10 - 22**		**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.235	1	0.002	0.005	NA		C-83077	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.82	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.44	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122226-R1 Day 10 - 23			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.177	1	0.002	0.005	NA		C-83077	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.55	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.27	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122227-R1 Day 10 - 24			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.19	1	0.002	0.005	NA		C-83077	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.71	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.358	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122228-R1 Day 10 - 25			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.243	1	0.002	0.005	NA		C-83077	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.91	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.43	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122229-R1 Day 10 - 26			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.313	1	0.002	0.005	NA		C-83077	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.33	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.487	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122230-R1 Day 10 - 27			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.208	1	0.002	0.005	NA		C-83077	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.05	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.369	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122231-R1	**Day 10 - 28**		**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.234	1	0.002	0.005	NA		C-83077	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.89	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.382	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122232-R1	**Day 10 - 29**		**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.222	1	0.002	0.005	NA		C-83077	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.55	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.364	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122233-R1	**Day 10 - 30**		**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.32	1	0.002	0.005	NA		C-83077	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.1	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.53	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122234-R1	**Day 10 - 31**		**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.26	1	0.002	0.005	NA		C-83077	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.3	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.441	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122235-R1	**Day 10 - 32**		**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.3	1	0.002	0.005	NA		C-83077	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	5.16	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.53	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24

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Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122236-R1 Day 10 - 33			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.195	1	0.002	0.005	NA		C-83077	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.74	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.321	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122237-R1 Day 10 - 34			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.274	1	0.002	0.005	NA		C-83077	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.29	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.455	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122238-R1 Day 10 - 35			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.208	1	0.002	0.005	NA		C-83077	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	3.98	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.315	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24
Sample ID: 122239-R1 Day 10 - 36			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Dissolved Orthophosphate as P	EPA 300.0	mg/L	0.246	1	0.002	0.005	NA		C-83077	11-Dec-24	11-Dec-24
Total Nitrogen	SM 5310 B-N Module	mg/L	4.35	1	0.28	0.6	NA		O-28148	03-Oct-24	04-Oct-24
Total Phosphorus	SM 4500-P E	mg/L	0.462	1	0.016	0.02	NA		C-87070	25-Oct-24	28-Oct-24

PHYSIS
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PHYSIS Project ID: 2407005-004
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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121835-R1	**Day 6-1**			**Matrix: Samplewater**					**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.24	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	2.94	1	1.13	5.65	Dissolved	J	E-33142	17-Dec-24	18-Dec-24
Sample ID: 121836-R1	**Day 6-2**			**Matrix: Samplewater**					**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	17.7	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	7.13	1	1.13	5.65	Dissolved		E-33142	17-Dec-24	18-Dec-24
Sample ID: 121837-R1	**Day 6-3**			**Matrix: Samplewater**					**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.91	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	6.61	1	1.13	5.65	Dissolved		E-33142	17-Dec-24	18-Dec-24
Sample ID: 121838-R1	**Day 6-4**			**Matrix: Samplewater**					**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	13.9	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	8.64	1	1.13	5.65	Dissolved		E-33142	17-Dec-24	18-Dec-24
Sample ID: 121839-R1	**Day 6-5**			**Matrix: Samplewater**					**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	13.3	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	8.05	1	1.13	5.65	Dissolved		E-33142	17-Dec-24	18-Dec-24
Sample ID: 121840-R1	**Day 6-6**			**Matrix: Samplewater**					**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	6.39	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	5.39	1	1.13	5.65	Dissolved	J	E-33142	17-Dec-24	18-Dec-24
Sample ID: 121841-R1	**Day 6-7**			**Matrix: Samplewater**					**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.2	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	16	1	1.13	5.65	Dissolved		E-33142	17-Dec-24	18-Dec-24

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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121842-R1	**Day 6-8**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.23	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	5.25	1	1.13	5.65	Dissolved	J	E-33142	17-Dec-24	18-Dec-24
Sample ID: 121843-R1	**Day 6-9**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.7	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	16.7	1	1.13	5.65	Dissolved		E-33142	17-Dec-24	18-Dec-24
Sample ID: 121844-R1	**Day 6-10**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.4	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	14.4	1	1.13	5.65	Dissolved		E-33142	17-Dec-24	18-Dec-24
Sample ID: 121845-R1	**Day 6-11**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.4	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	5.47	1	1.13	5.65	Dissolved	J	E-33142	17-Dec-24	18-Dec-24
Sample ID: 121846-R1	**Day 6-12**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.95	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	8.11	1	1.13	5.65	Dissolved		E-33142	17-Dec-24	18-Dec-24
Sample ID: 121847-R1	**Day 6-13**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	14.2	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	7.79	1	1.13	5.65	Dissolved		E-33142	17-Dec-24	18-Dec-24
Sample ID: 121848-R1	**Day 6-14**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	5.74	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	11.5	1	1.13	5.65	Dissolved		E-33142	17-Dec-24	18-Dec-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121849-R1	**Day 6-15**			**Matrix: Samplewater**					**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.75	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	5.37	1	1.13	5.65	Dissolved	J	E-33142	17-Dec-24	18-Dec-24
Sample ID: 121850-R1	**Day 6-16**			**Matrix: Samplewater**					**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	6.54	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	7.32	1	1.13	5.65	Dissolved		E-33142	17-Dec-24	18-Dec-24
Sample ID: 121851-R1	**Day 6-17**			**Matrix: Samplewater**					**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.41	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	10.5	1	1.13	5.65	Dissolved		E-33142	17-Dec-24	18-Dec-24
Sample ID: 121852-R1	**Day 6-18**			**Matrix: Samplewater**					**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.9	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	10.9	1	1.13	5.65	Dissolved		E-33132	12-Dec-24	16-Dec-24
Sample ID: 121853-R1	**Day 6-19**			**Matrix: Samplewater**					**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.88	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	10.8	1	1.13	5.65	Dissolved		E-33142	17-Dec-24	18-Dec-24
Sample ID: 121854-R1	**Day 6-20**			**Matrix: Samplewater**					**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	6.9	1	1.13	5.65	Total		E-33132	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	6.74	1	1.13	5.65	Dissolved		E-33142	17-Dec-24	18-Dec-24
Sample ID: 121855-R1	**Day 6-21**			**Matrix: Samplewater**					**Sampled:**	**05-Aug-24**	**9:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.54	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	6.76	1	1.13	5.65	Dissolved		E-33143	17-Dec-24	18-Dec-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121856-R1	**Day 6-22**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.2	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	6.92	1	1.13	5.65	Dissolved		E-33143	17-Dec-24	18-Dec-24
Sample ID: 121857-R1	**Day 6-23**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.51	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	7.19	1	1.13	5.65	Dissolved		E-33143	17-Dec-24	18-Dec-24
Sample ID: 121858-R1	**Day 6-24**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.85	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	13.6	1	1.13	5.65	Dissolved		E-33143	17-Dec-24	18-Dec-24
Sample ID: 121859-R1	**Day 6-25**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.06	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	5.51	1	1.13	5.65	Dissolved	J	E-33143	17-Dec-24	18-Dec-24
Sample ID: 121860-R1	**Day 6-26**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.38	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	10.3	1	1.13	5.65	Dissolved		E-33143	17-Dec-24	18-Dec-24
Sample ID: 121861-R1	**Day 6-27**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.74	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	12.3	1	1.13	5.65	Dissolved		E-33143	17-Dec-24	18-Dec-24
Sample ID: 121862-R1	**Day 6-28**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	16.6	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	24.3	1	1.13	5.65	Dissolved		E-33143	17-Dec-24	18-Dec-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121863-R1	**Day 6-29**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.74	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	22.6	1	1.13	5.65	Dissolved		E-33143	17-Dec-24	18-Dec-24
Sample ID: 121864-R1	**Day 6-30**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.8	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	11.2	1	1.13	5.65	Dissolved		E-33143	17-Dec-24	18-Dec-24
Sample ID: 121865-R1	**Day 6-31**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	5.28	1	1.13	5.65	Dissolved	J	E-33143	17-Dec-24	18-Dec-24
Sample ID: 121866-R1	**Day 6-32**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.2	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	7.63	1	1.13	5.65	Dissolved		E-33143	17-Dec-24	18-Dec-24
Sample ID: 121867-R1	**Day 6-33**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.12	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	5.6	1	1.13	5.65	Dissolved	J	E-33143	17-Dec-24	18-Dec-24
Sample ID: 121868-R1	**Day 6-34**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.7	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	7.26	1	1.13	5.65	Dissolved		E-33143	17-Dec-24	18-Dec-24
Sample ID: 121869-R1	**Day 6-35**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.05	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	5.01	1	1.13	5.65	Dissolved	J	E-33143	17-Dec-24	18-Dec-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121870-R1	**Day 6-36**			**Matrix: Samplewater**				**Sampled:**	**05-Aug-24 9:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	13.1	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	19.8	1	1.13	5.65	Dissolved		E-33143	17-Dec-24	18-Dec-24
Sample ID: 121871-R1	**Day 7-1**			**Matrix: Samplewater**				**Sampled:**	**06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.86	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	9.28	1	1.13	5.65	Dissolved		E-33143	17-Dec-24	18-Dec-24
Sample ID: 121872-R1	**Day 7-2**			**Matrix: Samplewater**				**Sampled:**	**06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	13.9	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	5.79	1	1.13	5.65	Dissolved		E-33143	17-Dec-24	18-Dec-24
Sample ID: 121873-R1	**Day 7-3**			**Matrix: Samplewater**				**Sampled:**	**06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.3	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	7.5	1	1.13	5.65	Dissolved		E-33143	17-Dec-24	18-Dec-24
Sample ID: 121874-R1	**Day 7-4**			**Matrix: Samplewater**				**Sampled:**	**06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.9	1	1.13	5.65	Total		E-33133	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	6.58	1	1.13	5.65	Dissolved		E-33143	17-Dec-24	18-Dec-24
Sample ID: 121875-R1	**Day 7-5**			**Matrix: Samplewater**				**Sampled:**	**06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.5	1	1.13	5.65	Total		E-33134	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	3.91	1	1.13	5.65	Dissolved	J	E-33144	17-Dec-24	18-Dec-24
Sample ID: 121876-R1	**Day 7-6**			**Matrix: Samplewater**				**Sampled:**	**06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.86	1	1.13	5.65	Total		E-33134	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	5.52	1	1.13	5.65	Dissolved	J	E-33144	17-Dec-24	18-Dec-24

PHYSIS
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Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121877-R1	**Day 7-7**			**Matrix: Samplewater**					**Sampled:**	**06-Aug-24 10:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.4	1	1.13	5.65	Total		E-33134	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	12.6	1	1.13	5.65	Dissolved		E-33144	17-Dec-24	18-Dec-24
Sample ID: 121878-R1	**Day 7-8**			**Matrix: Samplewater**					**Sampled:**	**06-Aug-24 10:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	6.76	1	1.13	5.65	Total		E-33134	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	6.44	1	1.13	5.65	Dissolved		E-33144	17-Dec-24	18-Dec-24
Sample ID: 121879-R1	**Day 7-9**			**Matrix: Samplewater**					**Sampled:**	**06-Aug-24 10:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.19	1	1.13	5.65	Total		E-33134	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	7.97	1	1.13	5.65	Dissolved		E-33144	17-Dec-24	18-Dec-24
Sample ID: 121880-R1	**Day 7-10**			**Matrix: Samplewater**					**Sampled:**	**06-Aug-24 10:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.04	1	1.13	5.65	Total		E-33134	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	9.91	1	1.13	5.65	Dissolved		E-33144	17-Dec-24	18-Dec-24
Sample ID: 121881-R1	**Day 7-11**			**Matrix: Samplewater**					**Sampled:**	**06-Aug-24 10:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.76	1	1.13	5.65	Total		E-33134	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	4.44	1	1.13	5.65	Dissolved	J	E-33144	17-Dec-24	18-Dec-24
Sample ID: 121882-R1	**Day 7-12**			**Matrix: Samplewater**					**Sampled:**	**06-Aug-24 10:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.66	1	1.13	5.65	Total		E-33134	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	8.55	1	1.13	5.65	Dissolved		E-33144	17-Dec-24	18-Dec-24
Sample ID: 121883-R1	**Day 7-13**			**Matrix: Samplewater**					**Sampled:**	**06-Aug-24 10:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.6	1	1.13	5.65	Total		E-33134	12-Dec-24	16-Dec-24
Iron (Fe)		EPA 200.8	µg/L	4.93	1	1.13	5.65	Dissolved	J	E-33144	17-Dec-24	18-Dec-24

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PHYSIS Project ID: 2407005-004
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Elements

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121884-R1 Day 7-14			**Matrix: Samplewater**				**Sampled: 06-Aug-24 10:45**			**Received:**	**06-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	6.62	1	1.13	5.65	Total		E-33134	12-Dec-24	16-Dec-24
Iron (Fe)	EPA 200.8	µg/L	4.29	1	1.13	5.65	Dissolved	J	E-33144	17-Dec-24	18-Dec-24
Sample ID: 121885-R1 Day 7-15			**Matrix: Samplewater**				**Sampled: 06-Aug-24 10:45**			**Received:**	**06-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	6.78	1	1.13	5.65	Total		E-33134	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	5.57	1	1.13	5.65	Dissolved	J	E-33144	17-Dec-24	18-Dec-24
Sample ID: 121886-R1 Day 7-16			**Matrix: Samplewater**				**Sampled: 06-Aug-24 10:45**			**Received:**	**06-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	9.36	1	1.13	5.65	Total		E-33134	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	8.17	1	1.13	5.65	Dissolved		E-33144	17-Dec-24	18-Dec-24
Sample ID: 121887-R1 Day 7-17			**Matrix: Samplewater**				**Sampled: 06-Aug-24 10:45**			**Received:**	**06-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	6.59	1	1.13	5.65	Total		E-33134	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	8.93	1	1.13	5.65	Dissolved		E-33144	17-Dec-24	18-Dec-24
Sample ID: 121888-R1 Day 7-18			**Matrix: Samplewater**				**Sampled: 06-Aug-24 10:45**			**Received:**	**06-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	8.5	1	1.13	5.65	Total		E-33134	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	7.58	1	1.13	5.65	Dissolved		E-33144	17-Dec-24	18-Dec-24
Sample ID: 121889-R1 Day 7-19			**Matrix: Samplewater**				**Sampled: 06-Aug-24 10:45**			**Received:**	**06-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	9.78	1	1.13	5.65	Total		E-33134	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	8.37	1	1.13	5.65	Dissolved		E-33144	17-Dec-24	18-Dec-24
Sample ID: 121890-R1 Day 7-20			**Matrix: Samplewater**				**Sampled: 06-Aug-24 10:45**			**Received:**	**06-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	8.02	1	1.13	5.65	Total		E-33134	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	8.32	1	1.13	5.65	Dissolved		E-33144	17-Dec-24	18-Dec-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121891-R1	**Day 7-21**			**Matrix: Samplewater**					**Sampled:**	**06-Aug-24 10:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.3	1	1.13	5.65	Total		E-33134	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	7.29	1	1.13	5.65	Dissolved		E-33144	17-Dec-24	18-Dec-24
Sample ID: 121892-R1	**Day 7-22**			**Matrix: Samplewater**					**Sampled:**	**06-Aug-24 10:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	13.9	1	1.13	5.65	Total		E-33134	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	5.03	1	1.13	5.65	Dissolved	J	E-33144	17-Dec-24	18-Dec-24
Sample ID: 121893-R1	**Day 7-23**			**Matrix: Samplewater**					**Sampled:**	**06-Aug-24 10:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.5	1	1.13	5.65	Total		E-33134	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	10.1	1	1.13	5.65	Dissolved		E-33144	17-Dec-24	18-Dec-24
Sample ID: 121894-R1	**Day 7-24**			**Matrix: Samplewater**					**Sampled:**	**06-Aug-24 10:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.54	1	1.13	5.65	Total		E-33134	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	10.1	1	1.13	5.65	Dissolved		E-33144	17-Dec-24	18-Dec-24
Sample ID: 121895-R1	**Day 7-25**			**Matrix: Samplewater**					**Sampled:**	**06-Aug-24 10:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.2	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	5.18	1	1.13	5.65	Dissolved	J	E-33144	17-Dec-24	18-Dec-24
Sample ID: 121896-R1	**Day 7-26**			**Matrix: Samplewater**					**Sampled:**	**06-Aug-24 10:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.3	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	6.25	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	18-Dec-24
Sample ID: 121897-R1	**Day 7-27**			**Matrix: Samplewater**					**Sampled:**	**06-Aug-24 10:45**	**Received:**	**06-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.35	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	57.3	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	18-Dec-24

PHYSIS
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ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121898-R1 Day 7-28			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	22.3	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	18.4	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	18-Dec-24
Sample ID: 121899-R1 Day 7-29			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	4.94	1	1.13	5.65	Total	J	E-33135	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	10.1	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	18-Dec-24
Sample ID: 121900-R1 Day 7-30			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	14	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	8.99	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	19-Dec-24
Sample ID: 121901-R1 Day 7-31			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	11.2	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	7.13	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	19-Dec-24
Sample ID: 121902-R1 Day 7-32			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	10.9	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	9.71	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	19-Dec-24
Sample ID: 121903-R1 Day 7-33			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	8.19	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	7.55	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	19-Dec-24
Sample ID: 121904-R1 Day 7-34			**Matrix: Samplewater**					**Sampled: 06-Aug-24 10:45**		**Received:**	**06-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	10.3	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	7.02	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	19-Dec-24

PHYSIS
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PHYSIS Project ID: 2407005-004
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Elements

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121905-R1 Day 7-35			**Matrix: Samplewater**				**Sampled: 06-Aug-24 10:45**			**Received:**	**06-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	9.38	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	11	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	19-Dec-24
Sample ID: 121906-R1 Day 7-36			**Matrix: Samplewater**				**Sampled: 06-Aug-24 10:45**			**Received:**	**06-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	13.8	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	15.3	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	19-Dec-24
Sample ID: 122132-R1 Day 8 - 1			**Matrix: Freshwater**				**Sampled: 07-Aug-24 10:10**			**Received:**	**12-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	8.5	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	10	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	19-Dec-24
Sample ID: 122133-R1 Day 8 - 2			**Matrix: Freshwater**				**Sampled: 07-Aug-24 10:10**			**Received:**	**12-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	19.1	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	12.1	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	19-Dec-24
Sample ID: 122134-R1 Day 8 - 3			**Matrix: Freshwater**				**Sampled: 07-Aug-24 10:10**			**Received:**	**12-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	11.7	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	14.1	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	19-Dec-24
Sample ID: 122135-R1 Day 8 - 4			**Matrix: Freshwater**				**Sampled: 07-Aug-24 10:10**			**Received:**	**12-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	13.2	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	11.9	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	19-Dec-24
Sample ID: 122136-R1 Day 8 - 5			**Matrix: Freshwater**				**Sampled: 07-Aug-24 10:10**			**Received:**	**12-Aug-24**
Iron (Fe)	EPA 200.8	µg/L	11.5	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	7.03	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	19-Dec-24

PHYSIS
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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122137-R1	**Day 8 - 6**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.6	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	8.02	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	19-Dec-24
Sample ID: 122138-R1	**Day 8 - 7**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.9	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	17.3	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	19-Dec-24
Sample ID: 122139-R1	**Day 8 - 8**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.27	1	1.13	5.65	Total		E-33135	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	7.66	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	19-Dec-24
Sample ID: 122140-R1	**Day 8 - 9**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.38	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	11.5	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	19-Dec-24
Sample ID: 122141-R1	**Day 8 - 10**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.4	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	17.7	1	1.13	5.65	Dissolved		E-33145	17-Dec-24	19-Dec-24
Sample ID: 122142-R1	**Day 8 - 11**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.04	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	8.52	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24
Sample ID: 122143-R1	**Day 8 - 12**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.1	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	16.6	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24

PHYSIS
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Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122144-R1	**Day 8 - 13**			**Matrix: Freshwater**				**Sampled:**	**07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.71	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	9.15	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24
Sample ID: 122145-R1	**Day 8 - 14**			**Matrix: Freshwater**				**Sampled:**	**07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	4.45	1	1.13	5.65	Total	J	E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	13.3	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24
Sample ID: 122146-R1	**Day 8 - 15**			**Matrix: Freshwater**				**Sampled:**	**07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.12	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	6.43	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24
Sample ID: 122147-R1	**Day 8 - 16**			**Matrix: Freshwater**				**Sampled:**	**07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.7	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	14.7	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24
Sample ID: 122148-R1	**Day 8 - 17**			**Matrix: Freshwater**				**Sampled:**	**07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	6.74	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	11.7	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24
Sample ID: 122149-R1	**Day 8 - 18**			**Matrix: Freshwater**				**Sampled:**	**07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.8	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	11.9	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24
Sample ID: 122150-R1	**Day 8 - 19**			**Matrix: Freshwater**				**Sampled:**	**07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.4	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	8.73	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24

PHYSIS
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Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
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Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122151-R1	**Day 8 - 20**			**Matrix: Freshwater**				**Sampled:**	**07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	6.72	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	9.57	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24
Sample ID: 122152-R1	**Day 8 - 21**			**Matrix: Freshwater**				**Sampled:**	**07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.8	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	10.2	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24
Sample ID: 122153-R1	**Day 8 - 22**			**Matrix: Freshwater**				**Sampled:**	**07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	17.8	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	7.68	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24
Sample ID: 122154-R1	**Day 8 - 23**			**Matrix: Freshwater**				**Sampled:**	**07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.3	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	15.1	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24
Sample ID: 122155-R1	**Day 8 - 24**			**Matrix: Freshwater**				**Sampled:**	**07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	6.54	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	6.43	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24
Sample ID: 122156-R1	**Day 8 - 25**			**Matrix: Freshwater**				**Sampled:**	**07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.27	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	8.8	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24
Sample ID: 122157-R1	**Day 8 - 26**			**Matrix: Freshwater**				**Sampled:**	**07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.06	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	7.27	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24

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PHYSIS Project ID: 2407005-004
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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122158-R1	**Day 8 - 27**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.82	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	9.13	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24
Sample ID: 122159-R1	**Day 8 - 28**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	16.1	1	1.13	5.65	Total		E-33136	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	23.8	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24
Sample ID: 122160-R1	**Day 8 - 29**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.1	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	11.8	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24
Sample ID: 122161-R1	**Day 8 - 30**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.1	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	13.5	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24
Sample ID: 122162-R1	**Day 8 - 31**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.78	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	8.65	1	1.13	5.65	Dissolved		E-33146	17-Dec-24	19-Dec-24
Sample ID: 122163-R1	**Day 8 - 32**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.5	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	18	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24
Sample ID: 122164-R1	**Day 8 - 33**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.45	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	11.2	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122165-R1	**Day 8 - 34**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.9	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	15.4	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24
Sample ID: 122166-R1	**Day 8 - 35**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.2	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	11.5	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24
Sample ID: 122167-R1	**Day 8 - 36**			**Matrix: Freshwater**					**Sampled: 07-Aug-24 10:10**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.9	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	22.9	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24
Sample ID: 122168-R1	**Day 9 - 1**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.95	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	9.51	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24
Sample ID: 122169-R1	**Day 9 - 2**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	13.3	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	13.4	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24
Sample ID: 122170-R1	**Day 9 - 3**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.3	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	14.8	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24
Sample ID: 122171-R1	**Day 9 - 4**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	13.8	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	13.9	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122172-R1	**Day 9 - 5**			**Matrix: Freshwater**				**Sampled:**	**08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.96	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	8.11	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24
Sample ID: 122173-R1	**Day 9 - 6**			**Matrix: Freshwater**				**Sampled:**	**08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	6.4	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	15.2	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24
Sample ID: 122174-R1	**Day 9 - 7**			**Matrix: Freshwater**				**Sampled:**	**08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.53	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	17.9	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24
Sample ID: 122175-R1	**Day 9 - 8**			**Matrix: Freshwater**				**Sampled:**	**08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.12	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	7.69	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24
Sample ID: 122176-R1	**Day 9 - 9**			**Matrix: Freshwater**				**Sampled:**	**08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.63	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	10.8	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24
Sample ID: 122177-R1	**Day 9 - 10**			**Matrix: Freshwater**				**Sampled:**	**08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.74	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	14.3	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24
Sample ID: 122178-R1	**Day 9 - 11**			**Matrix: Freshwater**				**Sampled:**	**08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	34.9	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	7.04	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122179-R1	**Day 9 - 12**			**Matrix: Freshwater**				**Sampled:**	**08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.73	1	1.13	5.65	Total		E-33137	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	14.8	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24
Sample ID: 122180-R1	**Day 9 - 13**			**Matrix: Freshwater**				**Sampled:**	**08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.48	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	8.53	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24
Sample ID: 122181-R1	**Day 9 - 14**			**Matrix: Freshwater**				**Sampled:**	**08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	3.86	1	1.13	5.65	Total	J	E-33138	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	6.08	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24
Sample ID: 122182-R1	**Day 9 - 15**			**Matrix: Freshwater**				**Sampled:**	**08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.83	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	8.06	1	1.13	5.65	Dissolved		E-33147	17-Dec-24	19-Dec-24
Sample ID: 122183-R1	**Day 9 - 16**			**Matrix: Freshwater**				**Sampled:**	**08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.8	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	12.2	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24
Sample ID: 122184-R1	**Day 9 - 17**			**Matrix: Freshwater**				**Sampled:**	**08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	6.01	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	13.3	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24
Sample ID: 122185-R1	**Day 9 - 18**			**Matrix: Freshwater**				**Sampled:**	**08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.5	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	14.1	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122186-R1 **Day 9 - 19**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received: 12-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	22.5	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	13.1	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24
Sample ID: 122187-R1 **Day 9 - 20**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received: 12-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	7.14	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	16	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24
Sample ID: 122188-R1 **Day 9 - 21**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received: 12-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	10	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	10.5	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24
Sample ID: 122189-R1 **Day 9 - 22**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received: 12-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	9.79	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	8.37	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24
Sample ID: 122190-R1 **Day 9 - 23**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received: 12-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	15.1	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	18.7	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24
Sample ID: 122191-R1 **Day 9 - 24**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received: 12-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	8.69	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	6.89	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24
Sample ID: 122192-R1 **Day 9 - 25**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received: 12-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	8.61	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	10.8	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122193-R1	**Day 9 - 26**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	6.65	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	8.85	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24
Sample ID: 122194-R1	**Day 9 - 27**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.03	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	11.6	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24
Sample ID: 122195-R1	**Day 9 - 28**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	17.6	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	32.3	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24
Sample ID: 122196-R1	**Day 9 - 29**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.78	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	13.4	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24
Sample ID: 122197-R1	**Day 9 - 30**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	33	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	10.5	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24
Sample ID: 122198-R1	**Day 9 - 31**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.5	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	15.9	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24
Sample ID: 122199-R1	**Day 9 - 32**			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.3	1	1.13	5.65	Total		E-33138	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	13.9	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24

PHYSIS
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ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122200-R1 Day 9 - 33			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received: 12-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	6.76	1	1.13	5.65	Total		E-33139	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	10.4	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24
Sample ID: 122201-R1 Day 9 - 34			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received: 12-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	15.8	1	1.13	5.65	Total		E-33139	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	25.5	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24
Sample ID: 122202-R1 Day 9 - 35			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received: 12-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	14.2	1	1.13	5.65	Total		E-33139	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	15.7	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24
Sample ID: 122203-R1 Day 9 - 36			**Matrix: Freshwater**					**Sampled: 08-Aug-24 10:30**		**Received: 12-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	11.6	1	1.13	5.65	Total		E-33139	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	23.3	1	1.13	5.65	Dissolved		E-33148	17-Dec-24	19-Dec-24
Sample ID: 122204-R1 Day 10 - 1			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	9.4	1	1.13	5.65	Total		E-33139	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	12.4	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24
Sample ID: 122205-R1 Day 10 - 2			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	11.5	1	1.13	5.65	Total		E-33139	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	12.8	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24
Sample ID: 122206-R1 Day 10 - 3			**Matrix: Freshwater**					**Sampled: 09-Aug-24 9:30**		**Received: 12-Aug-24**	
Iron (Fe)	EPA 200.8	µg/L	10.6	1	1.13	5.65	Total		E-33139	12-Dec-24	17-Dec-24
Iron (Fe)	EPA 200.8	µg/L	13.3	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122207-R1	**Day 10 - 4**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	10.6	1	1.13	5.65	Total		E-33139	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	13.6	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24
Sample ID: 122208-R1	**Day 10 - 5**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.1	1	1.13	5.65	Total		E-33139	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	9.72	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24
Sample ID: 122209-R1	**Day 10 - 6**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	6.51	1	1.13	5.65	Total		E-33139	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	8.09	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24
Sample ID: 122210-R1	**Day 10 - 7**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.04	1	1.13	5.65	Total		E-33139	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	16.7	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24
Sample ID: 122211-R1	**Day 10 - 8**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	6.85	1	1.13	5.65	Total		E-33139	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	8.69	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24
Sample ID: 122212-R1	**Day 10 - 9**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	4.83	1	1.13	5.65	Total	J	E-33139	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	9.6	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24
Sample ID: 122213-R1	**Day 10 - 10**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.62	1	1.13	5.65	Total		E-33139	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	13.5	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24

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PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122214-R1	**Day 10 - 11**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.4	1	1.13	5.65	Total		E-33139	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	8.38	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24
Sample ID: 122215-R1	**Day 10 - 12**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.1	1	1.13	5.65	Total		E-33139	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	14.3	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24
Sample ID: 122216-R1	**Day 10 - 13**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	13.9	1	1.13	5.65	Total		E-33139	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	10.9	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24
Sample ID: 122217-R1	**Day 10 - 14**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	3.32	1	1.13	5.65	Total	J	E-33139	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	3.58	1	1.13	5.65	Dissolved	J	E-33149	17-Dec-24	19-Dec-24
Sample ID: 122218-R1	**Day 10 - 15**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.86	1	1.13	5.65	Total		E-33139	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	10.2	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24
Sample ID: 122219-R1	**Day 10 - 16**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	13.7	1	1.13	5.65	Total		E-33139	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	16.9	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24
Sample ID: 122220-R1	**Day 10 - 17**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	5.71	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	11.2	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24

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PHYSIS Project ID: 2407005-004
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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122221-R1	**Day 10 - 18**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	14	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	16	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24
Sample ID: 122222-R1	**Day 10 - 19**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	5.98	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	11.2	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24
Sample ID: 122223-R1	**Day 10 - 20**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	24.4	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	12.3	1	1.13	5.65	Dissolved		E-33149	17-Dec-24	19-Dec-24
Sample ID: 122224-R1	**Day 10 - 21**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.4	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	9.27	1	1.13	5.65	Dissolved		E-33150	17-Dec-24	19-Dec-24
Sample ID: 122225-R1	**Day 10 - 22**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.84	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	6.99	1	1.13	5.65	Dissolved		E-33150	17-Dec-24	19-Dec-24
Sample ID: 122226-R1	**Day 10 - 23**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	31.2	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	18.2	1	1.13	5.65	Dissolved		E-33150	17-Dec-24	19-Dec-24
Sample ID: 122227-R1	**Day 10 - 24**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.09	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	6.81	1	1.13	5.65	Dissolved		E-33150	17-Dec-24	19-Dec-24

PHYSIS
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PHYSIS Project ID: 2407005-004
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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122228-R1	**Day 10 - 25**			**Matrix: Freshwater**				**Sampled:**	**09-Aug-24**	**9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.15	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	11.6	1	1.13	5.65	Dissolved		E-33150	17-Dec-24	19-Dec-24
Sample ID: 122229-R1	**Day 10 - 26**			**Matrix: Freshwater**				**Sampled:**	**09-Aug-24**	**9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	5.16	1	1.13	5.65	Total	J	E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	7.36	1	1.13	5.65	Dissolved		E-33150	17-Dec-24	19-Dec-24
Sample ID: 122230-R1	**Day 10 - 27**			**Matrix: Freshwater**				**Sampled:**	**09-Aug-24**	**9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	8.55	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	9.11	1	1.13	5.65	Dissolved		E-33150	17-Dec-24	19-Dec-24
Sample ID: 122231-R1	**Day 10 - 28**			**Matrix: Freshwater**				**Sampled:**	**09-Aug-24**	**9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	15.5	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	18.5	1	1.13	5.65	Dissolved		E-33150	17-Dec-24	19-Dec-24
Sample ID: 122232-R1	**Day 10 - 29**			**Matrix: Freshwater**				**Sampled:**	**09-Aug-24**	**9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.3	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	12.1	1	1.13	5.65	Dissolved		E-33150	17-Dec-24	19-Dec-24
Sample ID: 122233-R1	**Day 10 - 30**			**Matrix: Freshwater**				**Sampled:**	**09-Aug-24**	**9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	6.92	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	9.6	1	1.13	5.65	Dissolved		E-33150	17-Dec-24	19-Dec-24
Sample ID: 122234-R1	**Day 10 - 31**			**Matrix: Freshwater**				**Sampled:**	**09-Aug-24**	**9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	11.8	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	19.9	1	1.13	5.65	Dissolved		E-33150	17-Dec-24	19-Dec-24

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Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
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Elements

ANALYTE		Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 122235-R1	**Day 10 - 32**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	9.51	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	23.9	1	1.13	5.65	Dissolved		E-33150	17-Dec-24	19-Dec-24
Sample ID: 122236-R1	**Day 10 - 33**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	7.36	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	11.3	1	1.13	5.65	Dissolved		E-33150	17-Dec-24	19-Dec-24
Sample ID: 122237-R1	**Day 10 - 34**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	18.2	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	30	1	1.13	5.65	Dissolved		E-33150	17-Dec-24	19-Dec-24
Sample ID: 122238-R1	**Day 10 - 35**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	12.8	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	15.3	1	1.13	5.65	Dissolved		E-33150	17-Dec-24	19-Dec-24
Sample ID: 122239-R1	**Day 10 - 36**			**Matrix: Freshwater**					**Sampled:**	**09-Aug-24 9:30**	**Received:**	**12-Aug-24**
Iron (Fe)		EPA 200.8	µg/L	23.3	1	1.13	5.65	Total		E-33140	12-Dec-24	17-Dec-24
Iron (Fe)		EPA 200.8	µg/L	16.1	1	1.13	5.65	Dissolved		E-33150	17-Dec-24	19-Dec-24

QUALITY CONTROL REPORT

PHYSIS
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ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

QUALITY CONTROL REPORT

SAMPLE ID		BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS		QA CODE
Dissolved Orthophosphate as P		**Method: EPA 300.0**					**Fraction: NA**				**Prepared: 10-Dec-24**			**Analyzed: 10-Dec-24**		
121759-B1	QAQC Procedural Blank	C-83068	ND	1	0.002	0.005	mg/L									
121759-BS1	QAQC Procedural Blank	C-83068	1.79	1	0.002	0.005	mg/L	2	0	89	90 - 110%	FAIL				R
121759-BS2	QAQC Procedural Blank	C-83068	1.83	1	0.002	0.005	mg/L	2	0	92	90 - 110%	PASS	2	30	PASS	
121760-B1	QAQC Procedural Blank	C-83069	ND	1	0.002	0.005	mg/L									
121760-BS1	QAQC Procedural Blank	C-83069	1.85	1	0.002	0.005	mg/L	2	0	93	90 - 110%	PASS				
121760-BS2	QAQC Procedural Blank	C-83069	1.9	1	0.002	0.005	mg/L	2	0	95	90 - 110%	PASS	3	30	PASS	
121761-B1	QAQC Procedural Blank	C-83070	ND	1	0.002	0.005	mg/L									
121761-BS1	QAQC Procedural Blank	C-83070	1.92	1	0.002	0.005	mg/L	2	0	96	90 - 110%	PASS				
121761-BS2	QAQC Procedural Blank	C-83070	1.85	1	0.002	0.005	mg/L	2	0	93	90 - 110%	PASS	4	30	PASS	
121762-B1	QAQC Procedural Blank	C-83071	ND	1	0.002	0.005	mg/L									
121762-BS1	QAQC Procedural Blank	C-83071	1.95	1	0.002	0.005	mg/L	2	0	98	90 - 110%	PASS				
121762-BS2	QAQC Procedural Blank	C-83071	1.9	1	0.002	0.005	mg/L	2	0	95	90 - 110%	PASS	3	30	PASS	
122131-B1	QAQC Procedural Blank	C-83072	ND	1	0.002	0.005	mg/L									
122131-BS1	QAQC Procedural Blank	C-83072	2.02	1	0.002	0.005	mg/L	2	0	101	90 - 110%	PASS				
122131-BS2	QAQC Procedural Blank	C-83072	1.9	1	0.002	0.005	mg/L	2	0	95	90 - 110%	PASS	6	30	PASS	
123548-B1	QAQC Procedural Blank	C-83073	ND	1	0.002	0.005	mg/L									
123548-BS1	QAQC Procedural Blank	C-83073	1.9	1	0.002	0.005	mg/L	2	0	95	90 - 110%	PASS				
123548-BS2	QAQC Procedural Blank	C-83073	1.89	1	0.002	0.005	mg/L	2	0	94	90 - 110%	PASS	1	30	PASS	
123549-B1	QAQC Procedural Blank	C-83074	ND	1	0.002	0.005	mg/L									
123549-BS1	QAQC Procedural Blank	C-83074	1.9	1	0.002	0.005	mg/L	2	0	95	90 - 110%	PASS				
123549-BS2	QAQC Procedural Blank	C-83074	1.91	1	0.002	0.005	mg/L	2	0	95	90 - 110%	PASS	1	30	PASS	

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Conventionals

QUALITY CONTROL REPORT

SAMPLE ID		BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS	QA CODE
123550-B1	QAQC Procedural Blank	C-83075	ND	1	0.002	0.005	mg/L								
123550-BS1	QAQC Procedural Blank	C-83075	1.99	1	0.002	0.005	mg/L	2	0	100	90 - 110%	PASS			
123550-BS2	QAQC Procedural Blank	C-83075	1.93	1	0.002	0.005	mg/L	2	0	96	90 - 110%	PASS	4	30 PASS	
123551-B1	QAQC Procedural Blank	C-83076	ND	1	0.002	0.005	mg/L								
123551-BS1	QAQC Procedural Blank	C-83076	1.97	1	0.002	0.005	mg/L	2	0	99	90 - 110%	PASS			
123551-BS2	QAQC Procedural Blank	C-83076	1.95	1	0.002	0.005	mg/L	2	0	98	90 - 110%	PASS	0	30 PASS	
23442-B1	QAQC Procedural Blank	C-83077	ND	1	0.002	0.005	mg/L								
23442-BS1	QAQC Procedural Blank	C-83077	1.96	1	0.002	0.005	mg/L	2	0	98	90 - 110%	PASS			
23442-BS2	QAQC Procedural Blank	C-83077	1.97	1	0.002	0.005	mg/L	2	0	99	90 - 110%	PASS	0	30 PASS	
Total Nitrogen		**Method: SM 5310 B-N Module**					**Fraction: NA**				**Prepared: 28-Sep-24**			**Analyzed: 30-Sep-24**	
121759-B1	QAQC Procedural Blank	O-28140	ND	1	0.28	0.6	mg/L								
121759-BS1	QAQC Procedural Blank	O-28140	10.2	1	0.28	0.6	mg/L	10	0	102	70 - 130%	PASS			
121759-BS2	QAQC Procedural Blank	O-28140	10	1	0.28	0.6	mg/L	10	0	100	70 - 130%	PASS	2	30 PASS	
121760-B1	QAQC Procedural Blank	O-28141	ND	1	0.28	0.6	mg/L								
121760-BS1	QAQC Procedural Blank	O-28141	10.2	1	0.28	0.6	mg/L	10	0	102	70 - 130%	PASS			
121760-BS2	QAQC Procedural Blank	O-28141	10.1	1	0.28	0.6	mg/L	10	0	101	70 - 130%	PASS	1	30 PASS	
121761-B1	QAQC Procedural Blank	O-28142	ND	1	0.28	0.6	mg/L								
121761-BS1	QAQC Procedural Blank	O-28142	10.3	1	0.28	0.6	mg/L	10	0	103	70 - 130%	PASS			
121761-BS2	QAQC Procedural Blank	O-28142	9.76	1	0.28	0.6	mg/L	10	0	98	70 - 130%	PASS	5	30 PASS	
121762-B1	QAQC Procedural Blank	O-28143	ND	1	0.28	0.6	mg/L								
121762-BS1	QAQC Procedural Blank	O-28143	10.3	1	0.28	0.6	mg/L	10	0	103	70 - 130%	PASS			
121762-BS2	QAQC Procedural Blank	O-28143	10.6	1	0.28	0.6	mg/L	10	0	106	70 - 130%	PASS	3	30 PASS	

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

QUALITY CONTROL REPORT

SAMPLE ID		BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS	QA CODE
122131-B1	QAQC Procedural Blank	O-28144	ND	1	0.28	0.6	mg/L								
122131-BS1	QAQC Procedural Blank	O-28144	10.6	1	0.28	0.6	mg/L	10	0	106	70 - 130%	PASS			
122131-BS2	QAQC Procedural Blank	O-28144	10.8	1	0.28	0.6	mg/L	10	0	108	70 - 130%	PASS	2	30	PASS
123548-B1	QAQC Procedural Blank	O-28145	ND	1	0.28	0.6	mg/L								
123548-BS1	QAQC Procedural Blank	O-28145	10.8	1	0.28	0.6	mg/L	10	0	108	70 - 130%	PASS			
123548-BS2	QAQC Procedural Blank	O-28145	9.91	1	0.28	0.6	mg/L	10	0	99	70 - 130%	PASS	9	30	PASS
123549-B1	QAQC Procedural Blank	O-28146	ND	1	0.28	0.6	mg/L								
123549-BS1	QAQC Procedural Blank	O-28146	10.8	1	0.28	0.6	mg/L	10	0	108	70 - 130%	PASS			
123549-BS2	QAQC Procedural Blank	O-28146	11.1	1	0.28	0.6	mg/L	10	0	111	70 - 130%	PASS	3	30	PASS
123550-B1	QAQC Procedural Blank	O-28147	ND	1	0.28	0.6	mg/L								
123550-BS1	QAQC Procedural Blank	O-28147	11.1	1	0.28	0.6	mg/L	10	0	111	70 - 130%	PASS			
123550-BS2	QAQC Procedural Blank	O-28147	10.9	1	0.28	0.6	mg/L	10	0	109	70 - 130%	PASS	2	30	PASS
123551-B1	QAQC Procedural Blank	O-28148	ND	1	0.28	0.6	mg/L								
123551-BS1	QAQC Procedural Blank	O-28148	11	1	0.28	0.6	mg/L	10	0	110	70 - 130%	PASS			
123551-BS2	QAQC Procedural Blank	O-28148	10.8	1	0.28	0.6	mg/L	10	0	108	70 - 130%	PASS	2	30	PASS
Total Phosphorus		**Method: SM 4500-P E**					**Fraction: NA**			**Prepared: 02-Oct-24**			**Analyzed: 03-Oct-24**		
121759-B1	QAQC Procedural Blank	C-87046	ND	1	0.016	0.02	mg/L								
121759-BS1	QAQC Procedural Blank	C-87046	0.319	1	0.016	0.02	mg/L	0.3	0	106	73 - 131%	PASS			
121759-BS2	QAQC Procedural Blank	C-87046	0.342	1	0.016	0.02	mg/L	0.3	0	114	73 - 131%	PASS	7	30	PASS
121760-B1	QAQC Procedural Blank	C-87049	ND	1	0.016	0.02	mg/L								
121760-BS1	QAQC Procedural Blank	C-87049	0.305	1	0.016	0.02	mg/L	0.3	0	102	73 - 131%	PASS			
121760-BS2	QAQC Procedural Blank	C-87049	0.301	1	0.016	0.02	mg/L	0.3	0	100	73 - 131%	PASS	2	30	PASS

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Conventionals

QUALITY CONTROL REPORT

SAMPLE ID		BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS	QA CODE
121761-B1	QAQC Procedural Blank	C-87050	ND	1	0.016	0.02	mg/L								
121761-BS1	QAQC Procedural Blank	C-87050	0.307	1	0.016	0.02	mg/L	0.3	0	102	73 - 131%	PASS			
121761-BS2	QAQC Procedural Blank	C-87050	0.329	1	0.016	0.02	mg/L	0.3	0	110	73 - 131%	PASS	8	30	PASS
121762-B1	QAQC Procedural Blank	C-87052	ND	1	0.016	0.02	mg/L								
121762-BS1	QAQC Procedural Blank	C-87052	0.298	1	0.016	0.02	mg/L	0.3	0	99	73 - 131%	PASS			
121762-BS2	QAQC Procedural Blank	C-87052	0.309	1	0.016	0.02	mg/L	0.3	0	103	73 - 131%	PASS	4	30	PASS
122131-B1	QAQC Procedural Blank	C-87067	ND	1	0.016	0.02	mg/L								
122131-BS1	QAQC Procedural Blank	C-87067	0.32	1	0.016	0.02	mg/L	0.3	0	107	73 - 131%	PASS			
122131-BS2	QAQC Procedural Blank	C-87067	0.324	1	0.016	0.02	mg/L	0.3	0	108	73 - 131%	PASS	1	30	PASS
123548-B1	QAQC Procedural Blank	C-87068	ND	1	0.016	0.02	mg/L								
123548-BS1	QAQC Procedural Blank	C-87068	0.32	1	0.016	0.02	mg/L	0.3	0	107	73 - 131%	PASS			
123548-BS2	QAQC Procedural Blank	C-87068	0.324	1	0.016	0.02	mg/L	0.3	0	108	73 - 131%	PASS	1	30	PASS
123549-B1	QAQC Procedural Blank	C-87069	ND	1	0.016	0.02	mg/L								
123549-BS1	QAQC Procedural Blank	C-87069	0.339	1	0.016	0.02	mg/L	0.3	0	113	73 - 131%	PASS			
123549-BS2	QAQC Procedural Blank	C-87069	0.326	1	0.016	0.02	mg/L	0.3	0	109	73 - 131%	PASS	4	30	PASS
123550-B1	QAQC Procedural Blank	C-87070	ND	1	0.016	0.02	mg/L								
123550-BS1	QAQC Procedural Blank	C-87070	0.34	1	0.016	0.02	mg/L	0.3	0	113	73 - 131%	PASS			
123550-BS2	QAQC Procedural Blank	C-87070	0.327	1	0.016	0.02	mg/L	0.3	0	109	73 - 131%	PASS	4	30	PASS
123551-B1	QAQC Procedural Blank	C-87071	ND	1	0.016	0.02	mg/L								
123551-BS1	QAQC Procedural Blank	C-87071	0.339	1	0.016	0.02	mg/L	0.3	0	113	73 - 131%	PASS			
123551-BS2	QAQC Procedural Blank	C-87071	0.328	1	0.016	0.02	mg/L	0.3	0	109	73 - 131%	PASS	4	30	PASS

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Elements

QUALITY CONTROL REPORT

ANALYTE	FRACTION	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS		QA CODEc
Sample ID: 121759-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**			**Received:**				
		Method: EPA 200.8				Batch ID: E-33132		Prepared: 12-Dec-24			Analyzed: 16-Dec-24				
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L									
		Method: EPA 200.8				Batch ID: E-33142		Prepared: 17-Dec-24			Analyzed: 18-Dec-24				
Iron (Fe)	Dissolved	ND	1	1.13	5.65	µg/L									
Sample ID: 121759-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**			**Received:**				
		Method: EPA 200.8				Batch ID: E-33132		Prepared: 12-Dec-24			Analyzed: 16-Dec-24				
Iron (Fe)	Total	943	1	1.13	5.65	µg/L	1000	0	94	85 - 115%	PASS				
		Method: EPA 200.8				Batch ID: E-33142		Prepared: 17-Dec-24			Analyzed: 18-Dec-24				
Iron (Fe)	Dissolved	908	1	1.13	5.65	µg/L	1000	0	91	85 - 115%	PASS				
Sample ID: 121759-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**			**Received:**				
		Method: EPA 200.8				Batch ID: E-33132		Prepared: 12-Dec-24			Analyzed: 16-Dec-24				
Iron (Fe)	Total	908	1	1.13	5.65	µg/L	1000	0	91	85 - 115%	PASS	3	30	PASS	
		Method: EPA 200.8				Batch ID: E-33142		Prepared: 17-Dec-24			Analyzed: 18-Dec-24				
Iron (Fe)	Dissolved	920	1	1.13	5.65	µg/L	1000	0	92	85 - 115%	PASS	1	30	PASS	
Sample ID: 121760-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**			**Received:**				
		Method: EPA 200.8				Batch ID: E-33133		Prepared: 12-Dec-24			Analyzed: 16-Dec-24				
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L									
		Method: EPA 200.8				Batch ID: E-33143		Prepared: 17-Dec-24			Analyzed: 18-Dec-24				
Iron (Fe)	Dissolved	ND	1	1.13	5.65	µg/L									
Sample ID: 121760-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**			**Received:**				
		Method: EPA 200.8				Batch ID: E-33133		Prepared: 12-Dec-24			Analyzed: 16-Dec-24				
Iron (Fe)	Total	904	1	1.13	5.65	µg/L	1000	0	90	85 - 115%	PASS				
		Method: EPA 200.8				Batch ID: E-33143		Prepared: 17-Dec-24			Analyzed: 18-Dec-24				
Iron (Fe)	Dissolved	871	1	1.13	5.65	µg/L	1000	0	87	85 - 115%	PASS				

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QUALITY CONTROL REPORT

ANALYTE	FRACTION	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS	QA CODEc
Sample ID: 121760-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**			**Received:**			
		Method: EPA 200.8				Batch ID: E-33133		Prepared: 12-Dec-24			Analyzed: 16-Dec-24			
Iron (Fe)	Total	888	1	1.13	5.65	µg/L	1000	0	89	85 - 115%	PASS	1	30 PASS	
		Method: EPA 200.8				Batch ID: E-33143		Prepared: 17-Dec-24			Analyzed: 18-Dec-24			
Iron (Fe)	Dissolved	885	1	1.13	5.65	µg/L	1000	0	88	85 - 115%	PASS	1	30 PASS	
Sample ID: 121761-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**			**Received:**			
		Method: EPA 200.8				Batch ID: E-33134		Prepared: 12-Dec-24			Analyzed: 16-Dec-24			
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L								
		Method: EPA 200.8				Batch ID: E-33144		Prepared: 17-Dec-24			Analyzed: 18-Dec-24			
Iron (Fe)	Dissolved	ND	1	1.13	5.65	µg/L								
Sample ID: 121761-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**			**Received:**			
		Method: EPA 200.8				Batch ID: E-33134		Prepared: 12-Dec-24			Analyzed: 17-Dec-24			
Iron (Fe)	Total	902	1	1.13	5.65	µg/L	1000	0	90	85 - 115%	PASS			
		Method: EPA 200.8				Batch ID: E-33144		Prepared: 17-Dec-24			Analyzed: 18-Dec-24			
Iron (Fe)	Dissolved	895	1	1.13	5.65	µg/L	1000	0	89	85 - 115%	PASS			
Sample ID: 121761-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**			**Received:**			
		Method: EPA 200.8				Batch ID: E-33134		Prepared: 12-Dec-24			Analyzed: 17-Dec-24			
Iron (Fe)	Total	909	1	1.13	5.65	µg/L	1000	0	91	85 - 115%	PASS	1	30 PASS	
		Method: EPA 200.8				Batch ID: E-33144		Prepared: 17-Dec-24			Analyzed: 18-Dec-24			
Iron (Fe)	Dissolved	893	1	1.13	5.65	µg/L	1000	0	89	85 - 115%	PASS	1	30 PASS	
Sample ID: 121762-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**			**Received:**			
		Method: EPA 200.8				Batch ID: E-33135		Prepared: 12-Dec-24			Analyzed: 17-Dec-24			
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L								
		Method: EPA 200.8				Batch ID: E-33145		Prepared: 17-Dec-24			Analyzed: 18-Dec-24			
Iron (Fe)	Dissolved	ND	1	1.13	5.65	µg/L								

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Elements

QUALITY CONTROL REPORT

ANALYTE	FRACTION	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS		QA CODEc
Sample ID: 121762-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33135		Prepared: 12-Dec-24					Analyzed: 17-Dec-24		
Iron (Fe)	Total	914	1	1.13	5.65	µg/L	1000	0	91	85 - 115%	PASS				
		Method: EPA 200.8				Batch ID: E-33145		Prepared: 17-Dec-24					Analyzed: 19-Dec-24		
Iron (Fe)	Dissolved	902	1	1.13	5.65	µg/L	1000	0	90	85 - 115%	PASS				
Sample ID: 121762-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33135		Prepared: 12-Dec-24					Analyzed: 17-Dec-24		
Iron (Fe)	Total	896	1	1.13	5.65	µg/L	1000	0	90	85 - 115%	PASS	1	30	PASS	
		Method: EPA 200.8				Batch ID: E-33145		Prepared: 17-Dec-24					Analyzed: 19-Dec-24		
Iron (Fe)	Dissolved	879	1	1.13	5.65	µg/L	1000	0	88	85 - 115%	PASS	2	30	PASS	
Sample ID: 122131-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33136		Prepared: 12-Dec-24					Analyzed: 17-Dec-24		
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L									
		Method: EPA 200.8				Batch ID: E-33146		Prepared: 17-Dec-24					Analyzed: 19-Dec-24		
Iron (Fe)	Dissolved	ND	1	1.13	5.65	µg/L									
Sample ID: 122131-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33136		Prepared: 12-Dec-24					Analyzed: 17-Dec-24		
Iron (Fe)	Total	915	1	1.13	5.65	µg/L	1000	0	92	85 - 115%	PASS				
		Method: EPA 200.8				Batch ID: E-33146		Prepared: 17-Dec-24					Analyzed: 19-Dec-24		
Iron (Fe)	Dissolved	908	1	1.13	5.65	µg/L	1000	0	91	85 - 115%	PASS				
Sample ID: 122131-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33136		Prepared: 12-Dec-24					Analyzed: 17-Dec-24		
Iron (Fe)	Total	891	1	1.13	5.65	µg/L	1000	0	89	85 - 115%	PASS	3	30	PASS	
		Method: EPA 200.8				Batch ID: E-33146		Prepared: 17-Dec-24					Analyzed: 19-Dec-24		
Iron (Fe)	Dissolved	890	1	1.13	5.65	µg/L	1000	0	89	85 - 115%	PASS	2	30	PASS	

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QUALITY CONTROL REPORT

ANALYTE	FRACTION	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS	PRECISION %	PRECISION LIMITS	QA CODEc
Sample ID: 123548-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**	**Sampled:**					**Received:**	
		Method: EPA 200.8				Batch ID: E-33137				Prepared: 12-Dec-24		Analyzed: 17-Dec-24	
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L							
		Method: EPA 200.8				Batch ID: E-33147				Prepared: 17-Dec-24		Analyzed: 19-Dec-24	
Iron (Fe)	Dissolved	ND	1	1.13	5.65	µg/L							
Sample ID: 123548-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**	**Sampled:**					**Received:**	
		Method: EPA 200.8				Batch ID: E-33137				Prepared: 12-Dec-24		Analyzed: 17-Dec-24	
Iron (Fe)	Total	928	1	1.13	5.65	µg/L	1000	0	93	85 - 115% PASS			
		Method: EPA 200.8				Batch ID: E-33147				Prepared: 17-Dec-24		Analyzed: 19-Dec-24	
Iron (Fe)	Dissolved	895	1	1.13	5.65	µg/L	1000	0	89	85 - 115% PASS			
Sample ID: 123548-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**	**Sampled:**					**Received:**	
		Method: EPA 200.8				Batch ID: E-33137				Prepared: 12-Dec-24		Analyzed: 17-Dec-24	
Iron (Fe)	Total	902	1	1.13	5.65	µg/L	1000	0	90	85 - 115% PASS	3	30 PASS	
		Method: EPA 200.8				Batch ID: E-33147				Prepared: 17-Dec-24		Analyzed: 19-Dec-24	
Iron (Fe)	Dissolved	925	1	1.13	5.65	µg/L	1000	0	93	85 - 115% PASS	2	30 PASS	
Sample ID: 123549-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**	**Sampled:**					**Received:**	
		Method: EPA 200.8				Batch ID: E-33138				Prepared: 12-Dec-24		Analyzed: 17-Dec-24	
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L							
		Method: EPA 200.8				Batch ID: E-33148				Prepared: 17-Dec-24		Analyzed: 19-Dec-24	
Iron (Fe)	Dissolved	ND	1	1.13	5.65	µg/L							
Sample ID: 123549-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**	**Sampled:**					**Received:**	
		Method: EPA 200.8				Batch ID: E-33138				Prepared: 12-Dec-24		Analyzed: 17-Dec-24	
Iron (Fe)	Total	903	1	1.13	5.65	µg/L	1000	0	90	85 - 115% PASS			
		Method: EPA 200.8				Batch ID: E-33148				Prepared: 17-Dec-24		Analyzed: 19-Dec-24	
Iron (Fe)	Dissolved	920	1	1.13	5.65	µg/L	1000	0	92	85 - 115% PASS			

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ANALYTE	FRACTION	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS		QA CODEc
Sample ID: 123549-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33138		Prepared: 12-Dec-24					Analyzed: 17-Dec-24		
Iron (Fe)	Total	903	1	1.13	5.65	µg/L	1000	0	90	85 - 115%	PASS	0	30	PASS	
		Method: EPA 200.8				Batch ID: E-33148		Prepared: 17-Dec-24					Analyzed: 19-Dec-24		
Iron (Fe)	Dissolved	921	1	1.13	5.65	µg/L	1000	0	92	85 - 115%	PASS	0	30	PASS	
Sample ID: 123550-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33139		Prepared: 12-Dec-24					Analyzed: 17-Dec-24		
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L									
		Method: EPA 200.8				Batch ID: E-33149		Prepared: 17-Dec-24					Analyzed: 19-Dec-24		
Iron (Fe)	Dissolved	ND	1	1.13	5.65	µg/L									
Sample ID: 123550-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33139		Prepared: 12-Dec-24					Analyzed: 17-Dec-24		
Iron (Fe)	Total	905	1	1.13	5.65	µg/L	1000	0	90	85 - 115%	PASS				
		Method: EPA 200.8				Batch ID: E-33149		Prepared: 17-Dec-24					Analyzed: 19-Dec-24		
Iron (Fe)	Dissolved	896	1	1.13	5.65	µg/L	1000	0	90	85 - 115%	PASS				
Sample ID: 123550-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33139		Prepared: 12-Dec-24					Analyzed: 17-Dec-24		
Iron (Fe)	Total	885	1	1.13	5.65	µg/L	1000	0	88	85 - 115%	PASS	2	30	PASS	
		Method: EPA 200.8				Batch ID: E-33149		Prepared: 17-Dec-24					Analyzed: 19-Dec-24		
Iron (Fe)	Dissolved	898	1	1.13	5.65	µg/L	1000	0	90	85 - 115%	PASS	0	30	PASS	
Sample ID: 123551-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 200.8				Batch ID: E-33140		Prepared: 12-Dec-24					Analyzed: 17-Dec-24		
Iron (Fe)	Total	ND	1	1.13	5.65	µg/L									
		Method: EPA 200.8				Batch ID: E-33150		Prepared: 17-Dec-24					Analyzed: 19-Dec-24		
Iron (Fe)	Dissolved	ND	1	1.13	5.65	µg/L									

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-004
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

QUALITY CONTROL REPORT

ANALYTE	FRACTION	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS		QA CODEc
Sample ID: 123551-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
	Method: EPA 200.8					Batch ID: E-33140		Prepared: 12-Dec-24					Analyzed: 17-Dec-24		
Iron (Fe)	Total	906	1	1.13	5.65	µg/L	1000	0	91	85 - 115%	PASS				
	Method: EPA 200.8					Batch ID: E-33150		Prepared: 17-Dec-24					Analyzed: 19-Dec-24		
Iron (Fe)	Dissolved	926	1	1.13	5.65	µg/L	1000	0	93	85 - 115%	PASS				
Sample ID: 123551-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
	Method: EPA 200.8					Batch ID: E-33140		Prepared: 12-Dec-24					Analyzed: 17-Dec-24		
Iron (Fe)	Total	877	1	1.13	5.65	µg/L	1000	0	88	85 - 115%	PASS	3	30	PASS	
	Method: EPA 200.8					Batch ID: E-33150		Prepared: 17-Dec-24					Analyzed: 19-Dec-24		
Iron (Fe)	Dissolved	914	1	1.13	5.65	µg/L	1000	0	91	85 - 115%	PASS	2	30	PASS	

Attachment A-2

CHAIN OF CUSTODY

PHASE
TERRA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses															
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus												
Day 8-1		8/7/2024	1010	3			x				x	x	x													
Day 8-2		8/7/2024	1010	3			x				x	x	x													
Day 8-3		8/7/2024	1010	3			x				x	x	x													
Day 8-4		8/7/2024	1010	3			x				x	x	x													
Day 8-5		8/7/2024	1010	3			x				x	x	x													
Day 8-6		8/7/2024	1010	3			x				x	x	x													
Day 8-7		8/7/2024	1010	3			x				x	x	x													
Day 8-8		8/7/2024	1010	3			x				x	x	x													
Day 8-9		8/7/2024	1010	3			x				x	x	x													
Day 8-10		8/7/2024	1010	3			x				x	x	x													

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/12/24	**Time**
Received By:	**Date** 8/12/24	**Time** 11:30
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court, San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus													
Day 8-11		8/7/2024	1010	3			x				x	x	x														
Day 8-12		8/7/2024	1010	3			x				x	x	x														
Day 8-13		8/7/2024	1010	3			x				x	x	x														
Day 8-14		8/7/2024	1010	3			x				x	x	x														
Day 8-15		8/7/2024	1010	3			x				x	x	x														
Day 8-16		8/7/2024	1010	3			x				x	x	x														
Day 8-17		8/7/2024	1010	3			x				x	x	x														
Day 8-18		8/7/2024	1010	3			x				x	x	x														
Day 8-19		8/7/2024	1010	3			x				x	x	x														
Day 8-20		8/7/2024	1010	3			x				x	x	x														

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/12/24	**Time**
Received By:	**Date** 8/12/24	**Time** 11:30
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 Page: 1 of 1

Project Manager: John Rudolph	phone: 858-243-8158	Bill To: John Rudolph	Report To: John Rudolph
Project Name: GEI EVMWD SOD Study		Company: WSP USA	Company: WSP USA
Proj# US0024915.6871		Address: 9177 Sky Park Court San Diego, CA 92123	Email: john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		Lab Use	
QC Level:	TAT:	Preservatives	

Sample Data					Matrix						Analyses																	
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus														
Day 8-21		8/7/2024	1010	3			x				x	x	x															
Day 8-22		8/7/2024	1010	3			x				x	x	x															
Day 8-23		8/7/2024	1010	3			x				x	x	x															
Day 8-24		8/7/2024	1010	3			x				x	x	x															
Day 8-25		8/7/2024	1010	3			x				x	x	x															
Day 8-26		8/7/2024	1010	3			x				x	x	x															
Day 8-27		8/7/2024	1010	3			x				x	x	x															
Day 8-28		8/7/2024	1010	3			x				x	x	x															
Day 8-29		8/7/2024	1010	3			x				x	x	x															
Day 8-30		8/7/2024	1010	3			x				x	x	x															

Samplers Signature	Date	Time
Relinquished By:	Date 8/12/24	Time
Received By:	Date 8/12/24	Time 11:30
Relinquished By:	Date	Time
Received By (LAB):	Date	Time

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus													
Day 8-31		8/7/2024	1010	3			x				x	x	x														
Day 8-32		8/7/2024	1010	3			x				x	x	x														
Day 8-33		8/7/2024	1010	3			x				x	x	x														
Day 8-34		8/7/2024	1010	3			x				x	x	x														
Day 8-35		8/7/2024	1010	3			x				x	x	x														
Day 8-36		8/7/2024	1010	3			x				x	x	x														

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/12/24	**Time**
Received By:	**Date** 8/12/24	**Time** 11:30
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158
Project Name: GEI EVMWD SOD Study	
Proj# US0024915.6871	

Bill To:	John Rudolph
Company:	WSP USA
Address:	9177 Sky Park Court San Diego, CA 92123

Report To:	John Rudolph
Company:	WSP USA
Email:	john.rudolph@wsp.com (electronic copies only)

Sampler's Name: John Rudolph

QC Level: **TAT:**

Sample Data					Matrix						Analyses																		
Lab Use																													
Preservatives																													
Sample Station ID	**Client ID**	**Date Collected**	**Time Collected**	**# Containers**	**Soil/Sediment**	**Seawater**	**Freshwater**	**Algae**	**Filter**	**Benthic Macroinverts**	**Total Iron**	**Total Nitrogen, Total Phosphorus**	**Dissolved Iron, Ortho-Phosphorus**																
Day 9-1		8/8/2024	1030	3			x				x	x	x																
Day 9-2		8/8/2024	1030	3			x				x	x	x																
Day 9-3		8/8/2024	1030	3			x				x	x	x																
Day 9-4		8/8/2024	1030	3			x				x	x	x																
Day 9-5		8/8/2024	1030	3			x				x	x	x																
Day 9-6		8/8/2024	1030	3			x				x	x	x																
Day 9-7		8/8/2024	1030	3			x				x	x	x																
Day 9-8		8/8/2024	1030	3			x				x	x	x																
Day 9-9		8/8/2024	1030	3			x				x	x	x																
Day 9-10		8/8/2024	1030	3			x				x	x	x																

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/12/24	**Time**
Received By:	**Date** 8/12/24	**Time** 11:30
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																			
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus																
Day 9-11		8/8/2024	1030	3			x				x	x	x																	
Day 9-12		8/8/2024	1030	3			x				x	x	x																	
Day 9-13		8/8/2024	1030	3			x				x	x	x																	
Day 9-14		8/8/2024	1030	3			x				x	x	x																	
Day 9-15		8/8/2024	1030	3			x				x	x	x																	
Day 9-16		8/8/2024	1030	3			x				x	x	x																	
Day 9-17		8/8/2024	1030	3			x				x	x	x																	
Day 9-18		8/8/2024	1030	3			x				x	x	x																	
Day 9-19		8/8/2024	1030	3			x				x	x	x																	
Day 9-20		8/8/2024	1030	3			x				x	x	x																	

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/12/24	**Time**
Received By:	**Date** 8/12/24	**Time** 11:30
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	phone: 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																	
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus														
Day 9-21		8/8/2024	1030	3			x				x	x	x															
Day 9-22		8/8/2024	1030	3			x				x	x	x															
Day 9-23		8/8/2024	1030	3			x				x	x	x															
Day 9-24		8/8/2024	1030	3			x				x	x	x															
Day 9-25		8/8/2024	1030	3			x				x	x	x															
Day 9-26		8/8/2024	1030	3			x				x	x	x															
Day 9-27		8/8/2024	1030	3			x				x	x	x															
Day 9-28		8/8/2024	1030	3			x				x	x	x															
Day 9-29		8/8/2024	1030	3			x				x	x	x															
Day 9-30		8/8/2024	1030	3			x				x	x	x															

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/12/24	**Time**
Received By:	**Date** 8/12/24	**Time** 11:30
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																	
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus														
Day 9-31		8/8/2024	1030	3			x				x	x	x														
Day 9-32		8/8/2024	1030	3			x				x	x	x														
Day 9-33		8/8/2024	1030	3			x				x	x	x														
Day 9-34		8/8/2024	1030	3			x				x	x	x														
Day 9-35		8/8/2024	1030	3			x				x	x	x														
Day 9-36		8/8/2024	1030	3			x				x	x	x														

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/12/24	**Time**
Received By:	**Date** 8/12/24	**Time** 11:30
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

Chain of Custody

Control Number:

Date: 8/2/24 Page: 1 of 1

Project Manager: John Rudolph	phone: 858-243-8158	Bill To: John Rudolph	Report To: John Rudolph
Project Name: GEI EVMWD SOD Study		Company: WSP USA	Company: WSP USA
Proj# US0024915.6871		Address: 9177 Sky Park Court, San Diego, CA 92123	Email: john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		Lab Use	
QC Level:	TAT:	Preservatives	

Sample Data					Matrix						Analyses																	
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus														
Day 10-1		8/9/2024	0930	3			x				x	x	x															
Day 10-2		8/9/2024	0930	3			x				x	x	x															
Day 10-3		8/9/2024	0930	3			x				x	x	x															
Day 10-4		8/9/2024	0930	3			x				x	x	x															
Day 10-5		8/9/2024	0930	3			x				x	x	x															
Day 10-6		8/9/2024	0930	3			x				x	x	x															
Day 10-7		8/9/2024	0930	3			x				x	x	x															
Day 10-8		8/9/2024	0930	3			x				x	x	x															
Day 10-9		8/9/2024	0930	3			x				x	x	x															
Day 10-10		8/9/2024	0930	3			x				x	x	x															

Samplers Signature	Date	Time
Relinquished By:	Date 8/12/24	Time
Received By:	Date 8/12/24	Time 11:30
Relinquished By:	Date	Time
Received By (LAB):	Date	Time

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 Page: 1 of 1

Project Manager: John Rudolph	phone: 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court, San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		Lab Use	
QC Level:	**TAT:**	Preservatives	

Sample Data					Matrix						Analyses																	
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus														
Day 10-11		8/9/2024	0930	3			x				x	x	x															
Day 10-12		8/9/2024	0930	3			x				x	x	x															
Day 10-13		8/9/2024	0930	3			x				x	x	x															
Day 10-14		8/9/2024	0930	3			x				x	x	x															
Day 10-15		8/9/2024	0930	3			x				x	x	x															
Day 10-16		8/9/2024	0930	3			x				x	x	x															
Day 10-17		8/9/2024	0930	3			x				x	x	x															
Day 10-18		8/9/2024	0930	3			x				x	x	x															
Day 10-19		8/9/2024	0930	3			x				x	x	x															
Day 10-20		8/9/2024	0930	3			x				x	x	x															

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/12/24	**Time**
Received By:	**Date** 8/12/24	**Time** 11:30
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus													
Day 10-21		8/9/2024	0930	3			x				x	x	x														
Day 10-22		8/9/2024	0930	3			x				x	x	x														
Day 10-23		8/9/2024	0930	3			x				x	x	x														
Day 10-24		8/9/2024	0930	3			x				x	x	x														
Day 10-25		8/9/2024	0930	3			x				x	x	x														
Day 10-26		8/9/2024	0930	3			x				x	x	x														
Day 10-27		8/9/2024	0930	3			x				x	x	x														
Day 10-28		8/9/2024	0930	3			x				x	x	x														
Day 10-29		8/9/2024	0930	3			x				x	x	x														
Day 10-30		8/9/2024	0930	3			x				x	x	x														

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/12/24	**Time**
Received By:	**Date** 8/12/24	**Time** 11:30
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

Attachment A-2

wsp

Chain of Custody

Control Number:

Date: 8/2/24 **Page:** 1 of 1

Project Manager: John Rudolph	**phone:** 858-243-8158	**Bill To:** John Rudolph	**Report To:** John Rudolph
Project Name: GEI EVMWD SOD Study		**Company:** WSP USA	**Company:** WSP USA
Proj# US0024915.6871		**Address:** 9177 Sky Park Court, San Diego, CA 92123	**Email:** john.rudolph@wsp.com (electronic copies only)
Sampler's Name: John Rudolph		**Lab Use**	
QC Level:	**TAT:**	**Preservatives**	

Sample Data					Matrix						Analyses																	
Sample Station ID	Client ID	Date Collected	Time Collected	# Containers	Soil/Sediment	Seawater	Freshwater	Algae	Filter	Benthic Macroinverts	Total Iron	Total Nitrogen, Total Phosphorus	Dissolved Iron, Ortho-Phosphorus														
Day 10-31		8/9/2024	0930	3			x				x	x	x															
Day 10-32		8/9/2024	0930	3			x				x	x	x															
Day 10-33		8/9/2024	0930	3			x				x	x	x															
Day 10-34		8/9/2024	0930	3			x				x	x	x															
Day 10-35		8/9/2024	0930	3			x				x	x	x															
Day 10-36		8/9/2024	0930	3			x				x	x	x															

Samplers Signature	**Date**	**Time**
Relinquished By:	**Date** 8/12/24	**Time**
Received By:	**Date** 8/12/24	**Time** 1:30
Relinquished By:	**Date**	**Time**
Received By (LAB):	**Date**	**Time**

For Lab Use

Lab No.:

Does COC match samples: Y or N
Broken container: Y or N

Received within holding time: Y or N
COC seal intact: Y or N

Any other problems: Y or N
If problems, Amec contacted: Y or N

Date contacted: ____/____/____
Temperature (°C): _____

Comments

Dissolved iron and Ortho-phosphorus have already been filtered.

PHYSIS
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

Project Iteration ID: 2407005-004
Client Name: WSP USA
Project Name: GEI EVMWD SOD Study Project # US0024915.6871
COC Page Number: 13 of 13
Bottle Label Color: NA

Sample Receipt Summary

Receiving Info

1. Initials Received By: YE
2. Date Received: 8/12/24
3. Time Received: 1440
4. Client Name: WSP
5. Courier Information: (Please circle)
   - Client
   - UPS
   - Area Fast
   - DRS
   - FedEx
   - GSO/GLS
   - Ontrac
   - PAMS
   - PHYSIS Driver: Jeny
     - i. Start Time: _____
     - ii. End Time: _____
     - iii. Total Mileage: _____
     - iv. Number of Pickups: _____
6. Container Information: (Please put the # of containers or circle none)
   - 2 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): See comments 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:

1 cooler is at 1.8°C
2nd cooler is at 14.3°C

Ammonia Subsample Analysis - Overyling Water

Client: WSP
Project ID: LE-SOD-2024
Test No.:

Test Species: N/A
Start Date: 07/30/2024 0715
End Date: 8/9/24 0715

DI Blank: 0.0

10 mg/L Ammonia Stock: ~~9.07~~ MK 9.53

(x1.22)

Sample ID	Test Day	Vial #	Ammonia (mg/L as N)	Ammonia (mg/L as NH_3)	Initials	Notes
LE-SOD	0	1	<1.00		MK	9/12/24
LE-SOD	1	1	1.76			
LE-SOD	1	2	1.21			
LE-SOD	1	3	1.87			
LE-SOD	1	4	1.28			
LE-SOD	1	5	1.01			
LE-SOD	1	6	1.79			
LE-SOD	1	7	1.15			
LE-SOD	1	8	1.29			
LE-SOD	1	9	1.43			
LE-SOD	1	10	1.40			
LE-SOD	1	11	1.13			
LE-SOD	1	12	1.52			
LE-SOD	1	13	1.03			
LE-SOD	1	14	1.50			
LE-SOD	1	15	1.55			
LE-SOD	1	16	1.37			
LE-SOD	1	17	1.39			
LE-SOD	1	18	1.82			
LE-SOD	1	19	1.39			
LE-SOD	1	20	1.98			
LE-SOD	1	21	1.74			
LE-SOD	1	22	1.11			
LE-SOD	1	23	1.27			
LE-SOD	1	24	1.19			

Note: The meter detection limit for ammonia is 1.00 mg/L (as N)

Comments:

QC Check: MK 9/20

Final Review: AG 9/20/24

Ammonia Subsample Analysis - Overyling Water

Client: WSP
Project ID: LE-SOD-2024
Test No.:

Test Species: N/A
Start Date: 07/30/2024 0715
End Date: 8/9/24 0715

DI Blank: 0.0

10 mg/L Ammonia Stock: 9.53

(x1.22)

Sample ID	Test Day	Vial #	Ammonia (mg/L as N)	Ammonia (mg/L as NH_3)	Initials	Notes
LE-SOD	1	25	1.13		MK	9/12/24
LE-SOD	1	26	1.42			
LE-SOD	1	27	1.24			
LE-SOD	1	28	1.15			
LE-SOD	1	29	1.62			
LE-SOD	1	30	1.46			
LE-SOD	1	31	1.16			
LE-SOD	1	32	1.23			
LE-SOD	1	33	1.39			
LE-SOD	1	34	1.18			
LE-SOD	1	35	1.47			
LE-SOD	1	36	1.26		↓	
LE-SOD	2	1	2.36		JF/MK	
LE-SOD	2	2	1.86			
LE-SOD	2	3	2.26			
LE-SOD	2	4	1.96			
LE-SOD	2	5	1.43			
LE-SOD	2	6	2.24			
LE-SOD	2	7	1.35			
LE-SOD	2	8	1.48			
LE-SOD	2	9	1.84			
LE-SOD	2	10	1.54			
LE-SOD	2	11	1.56			
LE-SOD	2	12	2.61			
LE-SOD	2	13	1.32		↓	↓

Note: The meter detection limit for ammonia is 1.00 mg/L (as N)

Comments:

QC Check: MK 9/20

Final Review: MG 9/20/24

Ammonia Subsample Analysis - Overyling Water

Client: WSP
Project ID: LE-SOD-2024
Test No.:

Test Species: NA
Start Date: 07/30/2024 0715
End Date: 8/9/2024 0715

DI Blank: 0.0

10 mg/L Ammonia Stock: 9.53

(x1.22)

Sample ID	Test Day	Vial #	Ammonia (mg/L as N)	Ammonia (mg/L as NH_3)	Initials	Notes
LE-SOD	2	14	1.79		JF/MK	9/12/24
LE-SOD	2	15	2.02			
LE-SOD	2	16	1.68			
LE-SOD	2	17	1.61			
LE-SOD	2	18	2.17			
LE-SOD	2	19	1.91			
LE-SOD	2	20	2.45			
LE-SOD	2	21	2.10			
LE-SOD	2	22	1.43			
LE-SOD	2	23	1.58			
LE-SOD	2	24	1.26			
LE-SOD	2	25	1.54			
LE-SOD	2	26	1.69			
LE-SOD	2	27	1.17			
LE-SOD	2	28	1.28			
LE-SOD	2	29	2.02			
LE-SOD	2	30	1.81			
LE-SOD	2	31	1.77			
LE-SOD	2	32	1.87			
LE-SOD	2	33	1.66			
LE-SOD	2	34	1.84			
LE-SOD	2	35	1.84			
LE-SOD	2	36	1.74			
					↓	↓

Note: The meter detection limit for ammonia is 1.00 mg/L (as N)

Comments:

QC Check: MK 9/20

Final Review: AG 9/20/24

Ammonia Subsample Analysis - Overyling Water

Client: WSP
Project ID: LE-SOD-2024
Test No.:

Test Species: NA
Start Date: 07/30/2024 0715
End Date: 8/9/2024 0715

DI Blank: 0.0

10 mg/L Ammonia Stock: 9.53

(x1.22)

Sample ID	Test Day	Vial #	Ammonia (mg/L as N)	Ammonia (mg/L as NH_3)	Initials	Notes
LE-SOD	3	1	2.93		JF/MK	9/12/24
LE-SOD	3	2	2.00			
LE-SOD	3	3	2.65			
LE-SOD	3	4	2.14			
LE-SOD	3	5	1.70			
LE-SOD	3	6	2.66			
LE-SOD	3	7	1.84			
LE-SOD	3	8	1.72			
LE-SOD	3	9	2.60			
LE-SOD	3	10	1.98			
LE-SOD	3	11	1.76			
LE-SOD	3	12	3.16			
LE-SOD	3	13	1.39			
LE-SOD	3	14	2.42			
LE-SOD	3	15	1.53			
LE-SOD	3	16	1.96			
LE-SOD	3	17	2.31			
LE-SOD	3	18	2.67			
LE-SOD	3	19	2.29			
LE-SOD	3	20	3.11			
LE-SOD	3	21	2.52			
LE-SOD	3	22	1.66			
LE-SOD	3	23	1.87			
LE-SOD	3	24	1.36			
LE-SOD	3	25	1.73		↓	↓

Note: The meter detection limit for ammonia is 1.00 mg/L (as N)

Comments:

QC Check: MK 9/20

Final Review: AG 9/20/24

Ammonia Subsample Analysis - Overyling Water

Client: WSP
Project ID: LE-SOD-2024
Test No.:

Test Species: N A
Start Date: 07/30/2024 0715
End Date: 8/9/2024 0715

DI Blank: 0.0

10 mg/L Ammonia Stock: 9.53

(x1.22)

Sample ID	Test Day	Vial #	Ammonia (mg/L as N)	Ammonia (mg/L as NH_3)	Initials	Notes
LE-SOD	3	26	1.99		JF/MK	9/12/24
LE-SOD	3	27	1.74			
LE-SOD	3	28	1.59			
LE-SOD	3	29	2.47			
LE-SOD	3	30	2.35			
LE-SOD	3	31	2.06			
LE-SOD	3	32	2.20			
LE-SOD	3	33	1.87			
LE-SOD	3	34	2.12			
LE-SOD	3	35	2.09			
LE-SOD	3	36	2.10		↓	↓
LE-SOD	4	1	2.70		JF/MK	9/13/24
LE-SOD	4	2	2.22			
LE-SOD	4	3	2.88			
LE-SOD	4	4	2.28			
LE-SOD	4	5	1.91			
LE-SOD	4	6	2.97			
LE-SOD	4	7	1.98			
LE-SOD	4	8	1.86			
LE-SOD	4	9	2.53			
LE-SOD	4	10	2.14			
LE-SOD	4	11	1.87			
LE-SOD	4	12	3.85			
LE-SOD	4	13	1.41			
LE-SOD	4	14	2.53		↓	↓

Blank 0.0 S 9.64

Note: The meter detection limit for ammonia is 1.00 mg/L (as N)

Comments:

QC Check: MK 9/20

Final Review: 9/20/24

WSP Environmental Laboratory, 4905 Morena Blvd, Ste. 1304, San Diego, CA 92117

Ammonia Subsample Analysis - Overyling Water

Client: WSP
Project ID: LE-SOD-2024
Test No.:

Test Species: NA
Start Date: 07/30/2024 0715
End Date: 8/9/2024 0715

DI Blank: 0.0

10 mg/L Ammonia Stock: 9.64

(x1.22)

Sample ID	Test Day	Vial #	Ammonia (mg/L as N)	Ammonia (mg/L as NH_3)	Initials	Notes
LE-SOD	4	15	2.04		MK/JF	9/13/24
LE-SOD	4	16	2.13			
LE-SOD	4	17	2.41			
LE-SOD	4	18	3.12			
LE-SOD	4	19	1.49			
LE-SOD	4	20	3.56			
LE-SOD	4	21	2.89			
LE-SOD	4	22	1.71			
LE-SOD	4	23	2.08			
LE-SOD	4	24	1.61			
LE-SOD	4	25	1.99			
LE-SOD	4	26	1.90			
LE-SOD	4	27	2.62			
LE-SOD	4	28	1.87			
LE-SOD	4	29	2.84			
LE-SOD	4	30	2.64			
LE-SOD	4	31	2.22			
LE-SOD	4	32	2.52			
LE-SOD	4	33	2.07			
LE-SOD	4	34	2.27			
LE-SOD	4	35	2.45			
LE-SOD	4	36	2.19			
LE-SOD	5	1	3.50			
LE-SOD	5	2	1.93			
LE-SOD	5	3	3.01		↓	↓

Note: The meter detection limit for ammonia is 1.00 mg/L (as N)

Comments:

QC Check: MK 9/26

Final Review: AG 9/20/24

WSP Environmental Laboratory, 4905 Morena Blvd, Ste. 1304, San Diego, CA 92117

Ammonia Subsample Analysis - Overyling Water

Client: WSP
Project ID: LE-SOD-2024
Test No.:

Test Species: ~~AG~~ NA
Start Date: 07/30/2024 0715
End Date: 8/9/2024 0715

DI Blank: 0.0
10 mg/L Ammonia Stock: 9.64

(x1.22)

Sample ID	Test Day	Vial #	Ammonia (mg/L as N)	Ammonia (mg/L as NH_3)	Initials	Notes
LE-SOD	5	4	2.07		MK/JF	9/13/24
LE-SOD	5	5	1.62			
LE-SOD	5	6	3.01			
LE-SOD	5	7	2.39			
LE-SOD	5	8	1.91			
LE-SOD	5	9	2.99			
LE-SOD	5	10	2.27			
LE-SOD	5	~~11 12 JF~~	1.72			
~~LE-SOD~~	~~5~~	~~12~~	3.81			
LE-SOD	5	13	~~JF 3.81~~ 1.17			
LE-SOD	5	14	~~JF 1.17~~ 1.52			
LE-SOD	5	15	~~JF 1.52~~ 1.48			
LE-SOD	5	16	~~JF 1.48~~ 2.19			
LE-SOD	5	17	2.56			
LE-SOD	5	18	3.22			
LE-SOD	5	19	2.81			
LE-SOD	5	20	3.84			
LE-SOD	5	21	3.03			
LE-SOD	5	22	1.72			
LE-SOD	5	23	2.21			
LE-SOD	5	24	1.69			
LE-SOD	5	25	1.77			
LE-SOD	5	26	2.86			
LE-SOD	5	27	2.14			
LE-SOD	5	28	1.88			
LE-SOD	5	29	2.79			

Note: The meter detection limit for ammonia is 1.00 mg/L (as N)

QC Check: MK 9/20
Final Review: AG 9/20/24

Comments

Ammonia Subsample Analysis - Overyling Water

Client: WSP
Project ID: LE-SOD-2024
Test No.:

Test Species: NA
Start Date: 07/30/2024 0715
End Date: 08/09/2024 0715

DI Blank: 0.0

10 mg/L Ammonia Stock: 9.64

(x1.22)

Sample ID	Test Day	Vial #	Ammonia (mg/L as N)	Ammonia (mg/L as NH_3)	Initials	Notes
LE-SOD	5	30	2.84		JF/MK	9/13/24
LE-SOD	5	31	1.89			
LE-SOD	5	32	2.62			
LE-SOD	5	33	2.19			
LE-SOD	5	34	2.04			
LE-SOD	5	35	2.50			
LE-SOD	5	36	1.52			
LE-SOD	6	1	3.40			
LE-SOD	6	2	1.94			
LE-SOD	6	3	2.88			
LE-SOD	6	4	2.09			
LE-SOD	6	5	1.50			
LE-SOD	6	6	2.90			
LE-SOD	6	7	2.71			
LE-SOD	6	8	1.82			
LE-SOD	6	9	MK ~~2.42~~ 3.07			
LE-SOD	6	10	MK ~~1.51~~ 2.42			
LE-SOD	6	11	MK ~~4.17~~ 1.51			
LE-SOD	6	12	MK ~~1.09~~ 4.17			
LE-SOD	6	13	MK ~~2.77~~ 1.09			
LE-SOD	6	14	2.64 MK 78			
LE-SOD	6	15	2.64			
LE-SOD	6	16	2.18			
LE-SOD	6	17	2.31			
LE-SOD	6	18	3.11		↓	↓

Note: The meter detection limit for ammonia is 1.00 mg/L (as N)

Comments:

QC Check: MK 9/20

Final Review: AG 9/20/24

Ammonia Subsample Analysis - Overyling Water

Client: WSP
Project ID: LE-SOD-2024
Test No.:

Test Species: NA
Start Date: 07/30/2024 0715
End Date: 08/09/2024 0715

DI Blank: 0.0

10 mg/L Ammonia Stock: 9.64

(x1.22)

Sample ID	Test Day	Vial #	Ammonia (mg/L as N)	Ammonia (mg/L as NH_3)	Initials	Notes
LE-SOD	6	19	3.49 MK 03		JF/MK	9/13/24
LE-SOD	6	20	3.99			
LE-SOD	6	21	2.89			
LE-SOD	6	22	1.47			
LE-SOD	6	23	2.17			
LE-SOD	6	24	1.56			
LE-SOD	6	25	1.62			
LE-SOD	6	26	3.00			
LE-SOD	6	27	1.51			
LE-SOD	6	28	1.97			
LE-SOD	6	29	3.06			
LE-SOD	6	30	3.08			
LE-SOD	6	31	3.04			
LE-SOD	6	32	2.99			
LE-SOD	6	33	2.03			
LE-SOD	6	34	1.99			
LE-SOD	6	35	2.51			
LE-SOD	6	36	2.40			
LE-SOD	7	1	3.34			
LE-SOD	7	2	1.99			
LE-SOD	7	3	2.75			
LE-SOD	7	4	2.10			
LE-SOD	7	5	1.71			
LE-SOD	7	6	3.09			
LE-SOD	7	7	2.79			

Note: The meter detection limit for ammonia is 1.06 mg/L (as N)

Comments:

QC Check: MK 9/20

Final Review: AG 9/20/24

Ammonia Subsample Analysis - Overyling Water

Client: WSP
Project ID: LE-SOD-2024
Test No.:

Test Species: ~~AG~~ N/A AB
Start Date: 07/30/2024 0715
End Date: 08/09/2024 0715

DI Blank: 0.0

10 mg/L Ammonia Stock: 9.64

(x1.22)

Sample ID	Test Day	Vial #	Ammonia (mg/L as N)	Ammonia (mg/L as NH_3)	Initials	Notes
LE-SOD	7	8	1.37		JF/MK	9/13/24
LE-SOD	7	9	3.21			
LE-SOD	7	10	2.49			
LE-SOD	7	11	1.58			
LE-SOD	7	12	4.40			
LE-SOD	7	13	1.19			
LE-SOD	7	14	2.83			
LE-SOD	7	15	1.30			
LE-SOD	7	16	MK ~~3.09~~ 2.12			
LE-SOD	7	17	MK ~~2.79~~ 2.87			
LE-SOD	7	18	MK ~~1.37~~ 3.05			
LE-SOD	7	19	3.14			
LE-SOD	7	20	3.89			
LE-SOD	7	21	2.69			
LE-SOD	7	22	1.89			
LE-SOD	7	23	1.83			
LE-SOD	7	24	1.79			
LE-SOD	7	25	1.79			
LE-SOD	7	26	3.09			
LE-SOD	7	27	2.24			
LE-SOD	7	28	2.04			
LE-SOD	7	29	2.91			
LE-SOD	7	30	3.15			
LE-SOD	7	31	2.24			
LE-SOD	7	32	2.75		↓	↓

Note: The meter detection limit for ammonia is 1.00 mg/L (as N)

Comments:

QC Check: MF 9/20

Final Review: 9/20/24 AG

Ammonia Subsample Analysis - Overyling Water

Client: WSP
Project ID: LE-SOD-2024
Test No.:

Test Species: N/A
Start Date: 07/30/2024 0715
End Date: 08/09/2024 0715

DI Blank: 0.0

10 mg/L Ammonia Stock: 9.64

(x1.22)

Sample ID	Test Day	Vial #	Ammonia (mg/L as N)	Ammonia (mg/L as NH_3)	Initials	Notes
LE-SOD	7	33	1.99		JF/MK	9/13/24
LE-SOD	7	34	2.16			
LE-SOD	7	35	2.36			
LE-SOD	7	36	2.36			
LE-SOD	8	1	3.55			
LE-SOD	8	2	2.16			
LE-SOD	8	3	2.68			
LE-SOD	8	4	2.36			
LE-SOD	8	5	1.90			
LE-SOD	8	6	3.25			
LE-SOD	8	7	2.86			
LE-SOD	8	8	1.61			
LE-SOD	8	9	3.46			
LE-SOD	8	10	2.43			
LE-SOD	8	11	1.73			
LE-SOD	8	12	4.54			
LE-SOD	8	13	1.28			
LE-SOD	8	14	2.84			
LE-SOD	8	15	1.68			
LE-SOD	8	16	2.14			
LE-SOD	8	17	2.96			
LE-SOD	8	18	3.23			
LE-SOD	8	19	2.85			
LE-SOD	8	20	4.04			
LE-SOD	8	21	2.90			
LE-SOD	8	22	2.07		↓	↓

Note: The meter detection limit for ammonia is 1.00 mg/L (as N)

QC Check: MK 9/20

Final Review: AG 9/20/24

Comments

Attachment A-2

Ammonia Subsample Analysis - Overyling Water

Client: WSP
Project ID: LE-SOD-2024
Test No.:

Test Species: N/A
Start Date: 07/30/2024 0715
End Date: 08/09/2024 0715

DI Blank: 0.0

10 mg/L Ammonia Stock: MK ~~9.59~~ 9.64 (x1.22)

Sample ID	Test Day	Vial #	Ammonia (mg/L as N)	Ammonia (mg/L as NH_3)	Initials	Notes
LE-SOD	8	23	1.95		JF/MK	9/13/24
LE-SOD	8	24	1.89			
LE-SOD	8	25	2.05			
LE-SOD	8	26	3.35			
LE-SOD	8	27	2.24			
LE-SOD	8	28	2.05			
LE-SOD	8	29	3.02			
LE-SOD	8	30	3.31			
LE-SOD	8	31	2.35			
LE-SOD	8	32	3.41			
LE-SOD	8	33	2.03			
LE-SOD	8	34	2.23			
LE-SOD	8	35	2.31			
LE-SOD	8	36	2.57		↓	↓
LE-SOD	9	1	3.58		MK	9/16/24
LE-SOD	9	2	2.03			
LE-SOD	9	3	2.56			
LE-SOD	9	4	2.35			
LE-SOD	9	5	1.96			
LE-SOD	9	6	3.21			
LE-SOD	9	7	2.74			
LE-SOD	9	8	1.60			
LE-SOD	9	9	3.26			
LE-SOD	9	10	2.39			
LE-SOD	9	11	1.66			
LE-SOD	9	12	4.64		↓	↓

Ø 0.0
S: 9.64 Day 9

Note: The meter detection limit for ammonia is 1.00 mg/L (as N)

QC Check: MK 9/20

Final Review: AG 9/20/24

Comments

Ammonia Subsample Analysis - Overyling Water

Client: WSP
Project ID: LE-SOD-2024
Test No.:

Test Species: N/A
Start Date: 07/30/2024 0715
End Date: 08/09/2024 0715

DI Blank: 0.0

10 mg/L Ammonia Stock: 9.59

(x1.22)

Sample ID	Test Day	Vial #	Ammonia (mg/L as N)	Ammonia (mg/L as NH_3)	Initials	Notes
LE-SOD	9	13	~~3.58~~ 1.35		MK	9/16/24
LE-SOD	9	14	~~2.03~~ 2.73			
LE-SOD	9	15	~~2.56~~ 1.66			
LE-SOD	9	16	1.98			
LE-SOD	9	17	2.92			
LE-SOD	9	18	3.26			
LE-SOD	9	19	3.03			
LE-SOD	9	20	3.89			
LE-SOD	9	21	2.84			
LE-SOD	9	22	2.08			
LE-SOD	9	23	1.93			
LE-SOD	9	24	1.79			
LE-SOD	9	25	2.09			
LE-SOD	9	26	3.07			
LE-SOD	9	27	2.18			
LE-SOD	9	28	1.89			
LE-SOD	9	29	2.78			
LE-SOD	9	30	2.99			
LE-SOD	9	31	2.47			
LE-SOD	9	32	3.45			
LE-SOD	9	33	2.65			
LE-SOD	9	34	2.46			
LE-SOD	9	35	2.24			
LE-SOD	9	36	2.36			
LE-SOD	10	1	3.44			
LE-SOD	10	2	2.33		↓	↓

Note: The meter detection limit for ammonia is 1.00 mg/L (as N)

QC Check: MK 9/20

Final Review: AG 9/20/24

Comments

Ammonia Subsample Analysis - Overyling Water

Client: WSP
Project ID: LE-SOD-2024
Test No.:

Test Species: N/A
Start Date: 07/30/2024 0715
End Date: 08/09/2024 0715

DI Blank: 0.0

10 mg/L Ammonia Stock: 9.53

(x1.22)

Sample ID	Test Day	Vial #	Ammonia (mg/L as N)	Ammonia (mg/L as NH_3)	Initials	Notes
LE-SOD	10	3	2.29		MK	9/16/24
LE-SOD	10	4	2.68			
LE-SOD	10	5	2.11			
LE-SOD	10	6	2.72			
LE-SOD	10	7	2.98			
LE-SOD	10	8	1.43			
LE-SOD	10	9	3.73			
LE-SOD	10	10	2.77			
LE-SOD	10	11	1.64			
LE-SOD	10	12	4.93			
LE-SOD	10	13	1.5 MK B4			
LE-SOD	10	14	2.88			
LE-SOD	10	15	1.72			
LE-SOD	10	16	1.65			
LE-SOD	10	17	3.04			
LE-SOD	10	18	2.84			
LE-SOD	10	19	3.16			
LE-SOD	10	20	3.29			
LE-SOD	10	21	2.48			
LE-SOD	10	22	2.07			
LE-SOD	10	23	1.43			
LE-SOD	10	24	2.00			
LE-SOD	10	25	2.22			
LE-SOD	10	26	3.54			
LE-SOD	10	27	2.19			
LE-SOD	10	28	2.08		↓	↓

Note: The meter detection limit for ammonia is 1.00 mg/L (as N)

QC Check: MK 9/20

Final Review: AG 9/20/24

Comments

Ammonia Subsample Analysis - Overyling Water

Client: WSP
Project ID: LE-SOD-2024
Test No.:

Test Species: N/A
Start Date: 07/30/2024 0715
End Date: 08/09/2024 0715

DI Blank: 0.0

10 mg/L Ammonia Stock: 9.53

(x1.22)

Sample ID	Test Day	Vial #	Ammonia (mg/L as N)	Ammonia (mg/L as NH_3)	Initials	Notes
LE-SOD	10	29	2.21		MK	9/16/24
LE-SOD	10	30	3.25		↓	↓
LE-SOD	10	31	2.46			
LE-SOD	10	32	3.33			
LE-SOD	10	33	1.76			
LE-SOD	10	34	2.39			
LE-SOD	10	35	1.74			
LE-SOD	10	36	2.63			

Note: The meter detection limit for ammonia is 1.00 mg/L (as N)

QC Check: MK 9/20

Final Review: AG 9/20/24

Comments

WSP Environmental Laboratory, 4905 Morena Blvd, Ste. 1304, San Diego, CA 92117

PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

October 01, 2024

John D. Rudolph
WSP USA
9177 Sky Park Court
San Diego, CA 92123-

Project Name: GEI EVMWD SOD Study Project # US0024915.6871
Physis Project ID: 2407005-002

Dear John,

Enclosed are the analytical results for samples submitted to PHYSIS Environmental Laboratories, Inc. (PHYSIS) on 8/2/2024. A total of 8 samples were received for analysis in accordance with the attached chain of custody (COC). Per the COC, the samples were analyzed for:

Conventionals
Total Sulfides by Plumb, 1981/TERL
Total Phosphorus by SM 4500-P E
Total Organic Carbon by EPA 9060
Total Nitrogen by EPA 9060
Total Kjeldahl Nitrogen by EPA 351.3
Total Carbon by EPA 9060
Particle Size Distribution by SM 2560 D
Nitrite as N by EPA 300.0
Nitrate as N by EPA 300.0
Dissolved Orthophosphate as P by EPA 300.0
Ammonia as N by SM 4500-NH3 D
Elements
Trace Iron (Fe) & Total Phosphorus by EPA 6020
Organics
Percent Solids by SM 2540 B

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

PHYSIS
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ENVIRONMENTAL LABORATORIES, INC.
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Misty Mercier
714 602-5320
Extension 202
mistymercier@physislabs.com

1904 E. Wright Circle Anaheim, CA 92806 (714) 602-5320 fax (714) 602-5321 www.physislabs.com CA ELAP #2769

PHYSIS
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PROJECT SAMPLE LIST

WSP USA

PHYSIS Project ID: 2407005-002

GEI EVMWD SOD Study Project # US0024915.6871

Total Samples: 8

PHYSIS ID	Sample ID	Description	Date	Time	Matrix	Sample Type
121747	LE-SOD-01	Sediment	7/26/2024	8:20	Sediment	Not Specified
121748	LE-SOD-02	Sediment	7/25/2024	12:45	Sediment	Not Specified
121749	LE-SOD-03	Sediment	7/26/2024	9:50	Sediment	Not Specified
121750	LE-SOD-06	Sediment	7/25/2024	9:30	Sediment	Not Specified
121751	LE-SOD-01	Porewater	8/2/2024	10:30	Pore Water	Not Specified
121752	LE-SOD-02	Porewater	8/2/2024	10:45	Pore Water	Not Specified
121753	LE-SOD-03	Porewater	8/2/2024	11:00	Pore Water	Not Specified
121754	LE-SOD-06	Porewater	8/2/2024	11:15	Pore Water	Not Specified

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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

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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

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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.

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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

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ANALYTICAL REPORT

PHYSIS
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PHYSIS
TERRA FAUNA FLORA AQUA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

PHYSIS Project ID: 2407005-002
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121751-R1	**LE-SOD-01 Porewater**		**Matrix: Pore Water**					**Sampled: 02-Aug-24 10:30**		**Received:**	**02-Aug-24**
Ammonia as N	SM 4500-NH3 D	mg/L	20.4	50	0.007	0.03	NA		C-77082	13-Aug-24	13-Aug-24
Dissolved Orthophosphate as P	EPA 300.0	mg/L	3.71	1	0.002	0.005	NA		C-83037	06-Sep-24	06-Sep-24
Sample ID: 121752-R1	**LE-SOD-02 Porewater**		**Matrix: Pore Water**					**Sampled: 02-Aug-24 10:45**		**Received:**	**02-Aug-24**
Ammonia as N	SM 4500-NH3 D	mg/L	26.6	50	0.007	0.03	NA		C-77082	13-Aug-24	13-Aug-24
Dissolved Orthophosphate as P	EPA 300.0	mg/L	3.67	1	0.002	0.005	NA		C-83037	06-Sep-24	06-Sep-24
Sample ID: 121753-R1	**LE-SOD-03 Porewater**		**Matrix: Pore Water**					**Sampled: 02-Aug-24 11:00**		**Received:**	**02-Aug-24**
Ammonia as N	SM 4500-NH3 D	mg/L	17.8	50	0.007	0.03	NA		C-77082	13-Aug-24	13-Aug-24
Dissolved Orthophosphate as P	EPA 300.0	mg/L	4.16	1	0.002	0.005	NA		C-83037	06-Sep-24	06-Sep-24
Sample ID: 121754-R1	**LE-SOD-06 Porewater**		**Matrix: Pore Water**					**Sampled: 02-Aug-24 11:15**		**Received:**	**02-Aug-24**
Ammonia as N	SM 4500-NH3 D	mg/L	14.4	50	0.007	0.03	NA		C-77082	13-Aug-24	13-Aug-24
Dissolved Orthophosphate as P	EPA 300.0	mg/L	2.81	1	0.002	0.005	NA		C-83037	06-Sep-24	06-Sep-24

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Innovative Solutions for Nature

PHYSIS Project ID: 2407005-002
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121747-R1	**LE-SOD-01 Sediment**		**Matrix: Sediment**					**Sampled: 26-Jul-24 8:20**		**Received:**	**02-Aug-24**
Ammonia as N	SM 4500-NH3 D	mg/dry kg	413	1	0.02	0.03	NA		C-77081	12-Aug-24	13-Aug-24
Nitrate as N	EPA 300.0	mg/dry kg	0.598	1	0.01	0.05	NA		C-83037	06-Sep-24	06-Sep-24
Nitrite as N	EPA 300.0	mg/dry kg	ND	1	0.01	0.05	NA		C-83037	06-Sep-24	06-Sep-24
Percent Solids	SM 2540 B	%	6.88	1	0.1	0.1	NA		C-78077	12-Aug-24	14-Aug-24
Total Carbon	EPA 9060	% dry weight	8.42	1	0.01	0.01	NA		O-36080	26-Aug-24	27-Aug-24
Total Kjeldahl Nitrogen	EPA 351.3	mg/dry kg	15200	1	0.6	5	NA		C-76079	26-Aug-24	09-Sep-24
Total Nitrogen	EPA 9060	% dry weight	0.94	1	0.01	0.01	NA		O-36080	26-Aug-24	27-Aug-24
Total Organic Carbon	EPA 9060	% dry weight	5.92	1	0.01	0.01	NA		O-36080	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/dry kg	6820	1	0.016	0.05	NA		C-87038	30-Sep-24	30-Sep-24
Total Sulfides	Plumb, 1981 and TERL	mg/dry kg	892	1	0.2	0.4	NA		C-82121	14-Aug-24	14-Aug-24
Sample ID: 121748-R1	**LE-SOD-02 Sediment**		**Matrix: Sediment**					**Sampled: 25-Jul-24 12:45**		**Received:**	**02-Aug-24**
Ammonia as N	SM 4500-NH3 D	mg/dry kg	401	1	0.02	0.03	NA		C-77081	12-Aug-24	13-Aug-24
Nitrate as N	EPA 300.0	mg/dry kg	0.599	1	0.01	0.05	NA		C-83037	06-Sep-24	06-Sep-24
Nitrite as N	EPA 300.0	mg/dry kg	ND	1	0.01	0.05	NA		C-83037	06-Sep-24	06-Sep-24
Percent Solids	SM 2540 B	%	8.89	1	0.1	0.1	NA		C-78077	12-Aug-24	14-Aug-24
Total Carbon	EPA 9060	% dry weight	10.4	1	0.01	0.01	NA		O-36080	26-Aug-24	27-Aug-24
Total Kjeldahl Nitrogen	EPA 351.3	mg/dry kg	8700	1	0.6	5	NA		C-76079	26-Aug-24	09-Sep-24
Total Nitrogen	EPA 9060	% dry weight	1.24	1	0.01	0.01	NA		O-36080	26-Aug-24	27-Aug-24
Total Organic Carbon	EPA 9060	% dry weight	7.12	1	0.01	0.01	NA		O-36080	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/dry kg	2710	1	0.016	0.05	NA		C-87038	30-Sep-24	30-Sep-24
Total Sulfides	Plumb, 1981 and TERL	mg/dry kg	870	1	0.2	0.4	NA		C-82121	14-Aug-24	14-Aug-24

PHYSIS
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PHYSIS Project ID: 2407005-002
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121749-R1	**LE-SOD-03 Sediment**		**Matrix: Sediment**					**Sampled: 26-Jul-24 9:50**		**Received:**	**02-Aug-24**
Ammonia as N	SM 4500-NH3 D	mg/dry kg	272	1	0.02	0.03	NA		C-77081	12-Aug-24	13-Aug-24
Nitrate as N	EPA 300.0	mg/dry kg	0.596	1	0.01	0.05	NA		C-83037	06-Sep-24	06-Sep-24
Nitrite as N	EPA 300.0	mg/dry kg	ND	1	0.01	0.05	NA		C-83037	06-Sep-24	06-Sep-24
Percent Solids	SM 2540 B	%	10.9	1	0.1	0.1	NA		C-78077	12-Aug-24	14-Aug-24
Total Carbon	EPA 9060	% dry weight	10.4	1	0.01	0.01	NA		O-36080	26-Aug-24	27-Aug-24
Total Kjeldahl Nitrogen	EPA 351.3	mg/dry kg	7370	1	0.6	5	NA		C-76079	26-Aug-24	09-Sep-24
Total Nitrogen	EPA 9060	% dry weight	2	1	0.01	0.01	NA		O-36080	26-Aug-24	27-Aug-24
Total Organic Carbon	EPA 9060	% dry weight	7.36	1	0.01	0.01	NA		O-36080	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/dry kg	2100	1	0.016	0.05	NA		C-87038	30-Sep-24	30-Sep-24
Total Sulfides	Plumb, 1981 and TERL	mg/dry kg	567	1	0.2	0.4	NA		C-82121	14-Aug-24	14-Aug-24
Sample ID: 121750-R1	**LE-SOD-06 Sediment**		**Matrix: Sediment**					**Sampled: 25-Jul-24 9:30**		**Received:**	**02-Aug-24**
Ammonia as N	SM 4500-NH3 D	mg/dry kg	77.9	1	0.02	0.03	NA		C-77081	12-Aug-24	13-Aug-24
Nitrate as N	EPA 300.0	mg/dry kg	0.597	1	0.01	0.05	NA		C-83037	06-Sep-24	06-Sep-24
Nitrite as N	EPA 300.0	mg/dry kg	ND	1	0.01	0.05	NA		C-83037	06-Sep-24	06-Sep-24
Percent Solids	SM 2540 B	%	26.8	1	0.1	0.1	NA		C-78077	12-Aug-24	14-Aug-24
Total Carbon	EPA 9060	% dry weight	4.63	1	0.01	0.01	NA		O-36080	26-Aug-24	27-Aug-24
Total Kjeldahl Nitrogen	EPA 351.3	mg/dry kg	2710	1	0.6	5	NA		C-76079	26-Aug-24	09-Sep-24
Total Nitrogen	EPA 9060	% dry weight	1.83	1	0.01	0.01	NA		O-36080	26-Aug-24	27-Aug-24
Total Organic Carbon	EPA 9060	% dry weight	3.49	1	0.01	0.01	NA		O-36080	26-Aug-24	27-Aug-24
Total Phosphorus	SM 4500-P E	mg/dry kg	908	1	0.016	0.05	NA		C-87038	30-Sep-24	30-Sep-24
Total Sulfides	Plumb, 1981 and TERL	mg/dry kg	418	1	0.2	0.4	NA		C-82121	14-Aug-24	14-Aug-24

PHYSIS
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Innovative Solutions for Nature

PHYSIS Project ID: 2407005-002
Client: WSP USA
Project: GEI EVMWD SOD Study Project # US0024915.6871

Elements

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121747-R1	**LE-SOD-01 Sediment**		**Matrix: Sediment**					**Sampled:**	**26-Jul-24 8:20**	**Received:**	**02-Aug-24**
Iron (Fe)	EPA 6020	µg/dry g	88900	1	1	5	NA		E-29151	26-Aug-24	26-Aug-24
Sample ID: 121748-R1	**LE-SOD-02 Sediment**		**Matrix: Sediment**					**Sampled:**	**25-Jul-24 12:45**	**Received:**	**02-Aug-24**
Iron (Fe)	EPA 6020	µg/dry g	30700	1	1	5	NA		E-29151	26-Aug-24	26-Aug-24
Sample ID: 121749-R1	**LE-SOD-03 Sediment**		**Matrix: Sediment**					**Sampled:**	**26-Jul-24 9:50**	**Received:**	**02-Aug-24**
Iron (Fe)	EPA 6020	µg/dry g	37300	1	1	5	NA		E-29151	26-Aug-24	26-Aug-24
Sample ID: 121750-R1	**LE-SOD-06 Sediment**		**Matrix: Sediment**					**Sampled:**	**25-Jul-24 9:30**	**Received:**	**02-Aug-24**
Iron (Fe)	EPA 6020	µg/dry g	45900	1	1	5	NA		E-29151	26-Aug-24	26-Aug-24

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Particle Size Distribution

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121747-R1	**LE-SOD-01 Sediment**		**Matrix: Sediment**					**Sampled: 26-Jul-24 8:20**		**Received:**	**02-Aug-24**
Clay <0.0039 mm	SM 2560 D	%	8.37	1	0.05	0.1	NA		C-73076	22-Aug-24	29-Aug-24
Granule 2.0 <4.0 mm	SM 2560 D	%	ND	1	0.05	0.1	NA		C-73076	22-Aug-24	29-Aug-24
Kurtosis	SM 2560 D		0.966	1			NA		C-73076	22-Aug-24	29-Aug-24
Mean (mm)	SM 2560 D		0.0165	1			NA		C-73076	22-Aug-24	29-Aug-24
Mean (phi)	SM 2560 D		5.92	1			NA		C-73076	22-Aug-24	29-Aug-24
Sand 0.0625 to <2.0 mm	SM 2560 D	%	19.7	1	0.05	0.1	NA		C-73076	22-Aug-24	29-Aug-24
Silt 0.0039 to <0.0625 mm	SM 2560 D	%	71.9	1	0.05	0.1	NA		C-73076	22-Aug-24	29-Aug-24
Skewness	SM 2560 D		0.145	1			NA		C-73076	22-Aug-24	29-Aug-24
Sorting	SM 2560 D		1.68	1			NA		C-73076	22-Aug-24	29-Aug-24
Sample ID: 121748-R1	**LE-SOD-02 Sediment**		**Matrix: Sediment**					**Sampled: 25-Jul-24 12:45**		**Received:**	**02-Aug-24**
Clay <0.0039 mm	SM 2560 D	%	6.73	1	0.05	0.1	NA		C-73076	22-Aug-24	29-Aug-24
Granule 2.0 <4.0 mm	SM 2560 D	%	ND	1	0.05	0.1	NA		C-73076	22-Aug-24	29-Aug-24
Kurtosis	SM 2560 D		0.957	1			NA		C-73076	22-Aug-24	29-Aug-24
Mean (mm)	SM 2560 D		0.0183	1			NA		C-73076	22-Aug-24	29-Aug-24
Mean (phi)	SM 2560 D		5.77	1			NA		C-73076	22-Aug-24	29-Aug-24
Sand 0.0625 to <2.0 mm	SM 2560 D	%	28.8	1	0.05	0.1	NA		C-73076	22-Aug-24	29-Aug-24
Silt 0.0039 to <0.0625 mm	SM 2560 D	%	64.5	1	0.05	0.1	NA		C-73076	22-Aug-24	29-Aug-24
Skewness	SM 2560 D		0.127	1			NA		C-73076	22-Aug-24	29-Aug-24
Sorting	SM 2560 D		1.68	1			NA		C-73076	22-Aug-24	29-Aug-24

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Particle Size Distribution

ANALYTE	Method	Units	RESULT	DF	MDL	RL	Fraction	QA CODE	Batch ID	Date Processed	Date Analyzed
Sample ID: 121749-R1	**LE-SOD-03 Sediment**		**Matrix: Sediment**					**Sampled: 26-Jul-24 9:50**		**Received:**	**02-Aug-24**
Clay <0.0039 mm	SM 2560 D	%	9.14	1	0.05	0.1	NA		C-73076	22-Aug-24	29-Aug-24
Granule 2.0 <4.0 mm	SM 2560 D	%	ND	1	0.05	0.1	NA		C-73076	22-Aug-24	29-Aug-24
Kurtosis	SM 2560 D		0.928	1			NA		C-73076	22-Aug-24	29-Aug-24
Mean (mm)	SM 2560 D		0.0159	1			NA		C-73076	22-Aug-24	29-Aug-24
Mean (phi)	SM 2560 D		5.98	1			NA		C-73076	22-Aug-24	29-Aug-24
Sand 0.0625 to <2.0 mm	SM 2560 D	%	25.1	1	0.05	0.1	NA		C-73076	22-Aug-24	29-Aug-24
Silt 0.0039 to <0.0625 mm	SM 2560 D	%	65.8	1	0.05	0.1	NA		C-73076	22-Aug-24	29-Aug-24
Skewness	SM 2560 D		0.126	1			NA		C-73076	22-Aug-24	29-Aug-24
Sorting	SM 2560 D		1.78	1			NA		C-73076	22-Aug-24	29-Aug-24
Sample ID: 121750-R1	**LE-SOD-06 Sediment**		**Matrix: Sediment**					**Sampled: 25-Jul-24 9:30**		**Received:**	**02-Aug-24**
Clay <0.0039 mm	SM 2560 D	%	4.58	1	0.05	0.1	NA		C-73076	22-Aug-24	29-Aug-24
Granule 2.0 <4.0 mm	SM 2560 D	%	ND	1	0.05	0.1	NA		C-73076	22-Aug-24	29-Aug-24
Kurtosis	SM 2560 D		1.07	1			NA		C-73076	22-Aug-24	29-Aug-24
Mean (mm)	SM 2560 D		0.0224	1			NA		C-73076	22-Aug-24	29-Aug-24
Mean (phi)	SM 2560 D		5.48	1			NA		C-73076	22-Aug-24	29-Aug-24
Sand 0.0625 to <2.0 mm	SM 2560 D	%	18.6	1	0.05	0.1	NA		C-73076	22-Aug-24	29-Aug-24
Silt 0.0039 to <0.0625 mm	SM 2560 D	%	76.8	1	0.05	0.1	NA		C-73076	22-Aug-24	29-Aug-24
Skewness	SM 2560 D		0.215	1			NA		C-73076	22-Aug-24	29-Aug-24
Sorting	SM 2560 D		1.42	1			NA		C-73076	22-Aug-24	29-Aug-24

QUALITY CONTROL REPORT

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Innovative Solutions for Nature

PHYSIS Project ID: 2407005-002
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Project: GEI EVMWD SOD Study Project # US0024915.6871

Conventionals

QUALITY CONTROL REPORT

SAMPLE ID		BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS	QA CODE
Ammonia as N		**Method: SM 4500-NH3 D**			**Fraction: NA**					**Prepared: 12-Aug-24**			**Analyzed: 13-Aug-24**		
121742-B1	QAQC Procedural Blank	C-77081	ND	1	0.02	0.03	mg/dry kg								
121742-BS1	QAQC Procedural Blank	C-77081	3.9	1	0.02	0.03	mg/dry kg	4.15	0	94	78 - 121%	PASS			
121742-BS2	QAQC Procedural Blank	C-77081	4.36	1	0.02	0.03	mg/dry kg	4.15	0	105	78 - 121%	PASS	11	30	PASS
121747-MS1	LE-SOD-01	C-77081	712	1	0.02	0.03	mg/dry kg	297	413	101	78 - 121%	PASS			
121747-MS2	LE-SOD-01	C-77081	736	1	0.02	0.03	mg/dry kg	296	413	109	78 - 121%	PASS	8	30	PASS
121747-R2	LE-SOD-01	C-77081	441	1	0.02	0.03	mg/dry kg						7	30	PASS
121743-B1	QAQC Procedural Blank	C-77082	ND	1	0.007	0.03	mg/L								
121743-BS1	QAQC Procedural Blank	C-77082	0.109	1	0.007	0.03	mg/L	0.1	0	109	62 - 157%	PASS			
121743-BS2	QAQC Procedural Blank	C-77082	0.105	1	0.007	0.03	mg/L	0.1	0	105	62 - 157%	PASS	4	30	PASS
Dissolved Orthophosphate as P		**Method: EPA 300.0**			**Fraction: NA**					**Prepared: 06-Sep-24**			**Analyzed: 06-Sep-24**		
121743-B1	QAQC Procedural Blank	C-83037	ND	1	0.002	0.005	mg/L								
121743-BS1	QAQC Procedural Blank	C-83037	2.15	1	0.002	0.005	mg/L	2	0	108	90 - 110%	PASS			
121743-BS2	QAQC Procedural Blank	C-83037	2.13	1	0.002	0.005	mg/L	2	0	107	90 - 110%	PASS	1	30	PASS
121751-MS1	LE-SOD-01	C-83037	5.76	1	0.002	0.005	mg/L	2	3.71	103	80 - 120%	PASS			
121751-MS2	LE-SOD-01	C-83037	5.81	1	0.002	0.005	mg/L	2	3.71	105	80 - 120%	PASS	2	30	PASS
121751-R2	LE-SOD-01	C-83037	3.77	1	0.002	0.005	mg/L						2	30	PASS
Nitrate as N		**Method: EPA 300.0**			**Fraction: NA**					**Prepared: 06-Sep-24**			**Analyzed: 06-Sep-24**		
121742-B1	QAQC Procedural Blank	C-83037	ND	1	0.01	0.05	mg/dry kg								
121742-BS1	QAQC Procedural Blank	C-83037	4.91	1	0.01	0.05	mg/dry kg	5	0	98	90 - 110%	PASS			
121742-BS2	QAQC Procedural Blank	C-83037	4.89	1	0.01	0.05	mg/dry kg	5	0	98	90 - 110%	PASS	0	30	PASS

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Elements — QUALITY CONTROL REPORT

ANALYTE	FRACTION	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS		QA CODEc
Sample ID: 121742-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 6020				Batch ID: E-29151		Prepared: 26-Aug-24					Analyzed: 26-Aug-24		
Iron (Fe)	NA	ND	1	1	5	µg/dry g									
Sample ID: 121742-BS1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 6020				Batch ID: E-29151		Prepared: 26-Aug-24					Analyzed: 26-Aug-24		
Iron (Fe)	NA	1.99	1	1	5	µg/dry g	2	0	100	85 - 115%	PASS				
Sample ID: 121742-BS2	**QAQC Procedural Blank**					**Matrix: BlankMatrix**		**Sampled:**					**Received:**		
		Method: EPA 6020				Batch ID: E-29151		Prepared: 26-Aug-24					Analyzed: 26-Aug-24		
Iron (Fe)	NA	1.95	1	1	5	µg/dry g	2	0	98	85 - 115%	PASS	2	30	PASS	
Sample ID: 121744-CRM1	**QAQC CRM - ERA D111-540**					**Matrix: Sediment**		**Sampled:**					**Received:**		
		Method: EPA 6020				Batch ID: E-29151		Prepared: 26-Aug-24					Analyzed: 26-Aug-24		
Iron (Fe)	NA	22400	1	1	5	µg/dry g	25400		88	80 - 120%	PASS				
Sample ID: 121747-R2	**LE-SOD-01 Sediment**					**Matrix: Sediment**		**Sampled: 26-Jul-24 8:20**					**Received: 02-Aug-24**		
		Method: EPA 6020				Batch ID: E-29151		Prepared: 26-Aug-24					Analyzed: 26-Aug-24		
Iron (Fe)	NA	130000	1	1	5	µg/dry g						38	30	FAIL	NH

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Particle Size Distribution

QUALITY CONTROL REPORT

ANALYTE	FRACTION	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS	PRECISION %	PRECISION LIMITS	QA CODEc
Sample ID: 121742-B1	**QAQC Procedural Blank**					**Matrix: BlankMatrix**	**Sampled:**					**Received:**	
	Method: SM 2560 D					Batch ID: C-73076	Prepared: 22-Aug-24					Analyzed: 29-Aug-24	
Clay <0.0039 mm	NA	ND	1	0.05	0.1	%							
Granule 2.0 <4.0 mm	NA	ND	1	0.05	0.1	%							
Sand 0.0625 to <2.0 mm	NA	ND	1	0.05	0.1	%							
Silt 0.0039 to <0.0625 mm	NA	ND	1	0.05	0.1	%							
Sample ID: 121746-LCM1	**QAQC LCM - Physis PSD**					**Matrix: Sediment**	**Sampled:**					**Received:**	
	Method: SM 2560 D					Batch ID: C-73076	Prepared: 22-Aug-24					Analyzed: 29-Aug-24	
Clay <0.0039 mm	NA	6.79	1	0.05	0.1	%		9.1		75			
Granule 2.0 <4.0 mm	NA	0	1	0.05	0.1	%							
Sand 0.0625 to <2.0 mm	NA	58.6	1	0.05	0.1	%		58.6		100			
Silt 0.0039 to <0.0625 mm	NA	34.6	1	0.05	0.1	%		32.3		107			

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Conventionals

QUALITY CONTROL REPORT

SAMPLE ID		BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS		QA CODE
121747-MS1	LE-SOD-01	C-83037	5.17	1	0.01	0.05	mg/dry kg	5	0.598	91	80 - 120%	PASS				
121747-MS2	LE-SOD-01	C-83037	5.13	1	0.01	0.05	mg/dry kg	5	0.598	91	80 - 120%	PASS	0	30	PASS	
121747-R2	LE-SOD-01	C-83037	0.599	1	0.01	0.05	mg/dry kg						0	30	PASS	
Nitrite as N		**Method: EPA 300.0**					**Fraction: NA**				**Prepared: 06-Sep-24**			**Analyzed: 06-Sep-24**		
121742-B1	QAQC Procedural Blank	C-83037	ND	1	0.01	0.05	mg/dry kg									
121742-BS1	QAQC Procedural Blank	C-83037	1.63	1	0.01	0.05	mg/dry kg	1.5	0	109	90 - 110%	PASS				
121742-BS2	QAQC Procedural Blank	C-83037	1.63	1	0.01	0.05	mg/dry kg	1.5	0	109	90 - 110%	PASS	0	30	PASS	
121747-MS1	LE-SOD-01	C-83037	1.68	1	0.01	0.05	mg/dry kg	1.5	0	112	80 - 120%	PASS				
121747-MS2	LE-SOD-01	C-83037	1.67	1	0.01	0.05	mg/dry kg	1.5	0	111	80 - 120%	PASS	1	30	PASS	
121747-R2	LE-SOD-01	C-83037	ND	1	0.01	0.05	mg/dry kg						0	30	PASS	
Percent Solids		**Method: SM 2540 B**					**Fraction: NA**				**Prepared: 12-Aug-24**			**Analyzed: 14-Aug-24**		
121742-B1	QAQC Procedural Blank	C-78077	ND	1	0.1	0.1	%									
121747-R2	LE-SOD-01	C-78077	6.6	1	0.1	0.1	%						4	30	PASS	
Total Carbon		**Method: EPA 9060**					**Fraction: NA**				**Prepared: 26-Aug-24**			**Analyzed: 27-Aug-24**		
121747-R2	LE-SOD-01	O-36080	8.06	1	0.01	0.01	% dry weight						4	30	PASS	
Total Kjeldahl Nitrogen		**Method: EPA 351.3**					**Fraction: NA**				**Prepared: 26-Aug-24**			**Analyzed: 09-Sep-24**		
121742-B1	QAQC Procedural Blank	C-76079	ND	1	0.6	5	mg/dry kg									
121742-BS1	QAQC Procedural Blank	C-76079	1260	1	0.6	5	mg/dry kg	1140	0	111	80 - 120%	PASS				
121742-BS2	QAQC Procedural Blank	C-76079	1200	1	0.6	5	mg/dry kg	1140	0	105	80 - 120%	PASS	6	30	PASS	
121749-MS1	LE-SOD-03	C-76079	8530	1	0.6	5	mg/dry kg	2280	7370	51	75 - 125%	FAIL				SH
121749-MS2	LE-SOD-03	C-76079	9270	1	0.6	5	mg/dry kg	2220	7370	86	75 - 125%	PASS	51	30	FAIL	SH
121749-R2	LE-SOD-03	C-76079	8070	1	0.6	5	mg/dry kg						9	30	PASS	

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Conventionals — QUALITY CONTROL REPORT

SAMPLE ID		BATCH ID	RESULT	DF	MDL	RL	UNITS	SPIKE LEVEL	SOURCE RESULT	ACCURACY %	ACCURACY LIMITS		PRECISION %	PRECISION LIMITS	QA CODE
Total Nitrogen		**Method: EPA 9060**					**Fraction: NA**				**Prepared: 26-Aug-24**			**Analyzed: 27-Aug-24**	
121742-B1	QAQC Procedural Blank	O-36080	ND	1	0.01	0.01	% dry weight								
121747-R2	LE-SOD-01	O-36080	0.89	1	0.01	0.01	% dry weight						5	30	PASS
Total Organic Carbon		**Method: EPA 9060**					**Fraction: NA**				**Prepared: 26-Aug-24**			**Analyzed: 27-Aug-24**	
121742-B1	QAQC Procedural Blank	O-36080	ND	1	0.01	0.01	% dry weight								
121745-CRM 1	QAQC CRM - SRM 1941 b	O-36080	2.9	1	0.01	0.01	% dry weight	2.99		97	75 - 125%	PASS			
121747-R2	LE-SOD-01	O-36080	5.6	1	0.01	0.01	% dry weight						6	30	PASS
Total Phosphorus		**Method: SM 4500-P E**					**Fraction: NA**				**Prepared: 30-Sep-24**			**Analyzed: 30-Sep-24**	
121742-B1	QAQC Procedural Blank	C-87038	ND	1	0.016	0.05	mg/dry kg								
121742-BS1	QAQC Procedural Blank	C-87038	5370	1	0.016	0.05	mg/dry kg	4670	0	115	70 - 130%	PASS			
121742-BS2	QAQC Procedural Blank	C-87038	5320	1	0.016	0.05	mg/dry kg	4670	0	114	70 - 130%	PASS	1	30	PASS
121749-MS1	LE-SOD-03	C-87038	7240	1	0.016	0.05	mg/dry kg	4670	2100	110	70 - 130%	PASS			
121749-MS2	LE-SOD-03	C-87038	7030	1	0.016	0.05	mg/dry kg	4670	2100	106	70 - 130%	PASS	4	30	PASS
121749-R2	LE-SOD-03	C-87038	2320	1	0.016	0.05	mg/dry kg						10	30	PASS
Total Sulfides		**Method: Plumb, 1981 and TERL**					**Fraction: NA**				**Prepared: 14-Aug-24**			**Analyzed: 14-Aug-24**	
121742-B1	QAQC Procedural Blank	C-82121	ND	1	0.2	0.4	mg/dry kg								
121742-BS1	QAQC Procedural Blank	C-82121	20.6	1	0.2	0.4	mg/dry kg	20.7	0	100	66 - 116%	PASS			
121742-BS2	QAQC Procedural Blank	C-82121	21	1	0.2	0.4	mg/dry kg	20.7	0	101	66 - 116%	PASS	1	30	PASS
121747-MS1	LE-SOD-01	C-82121	2270	1	0.2	0.4	mg/dry kg	1470	892	94	66 - 116%	PASS			
121747-MS2	LE-SOD-01	C-82121	2030	1	0.2	0.4	mg/dry kg	1460	892	78	66 - 116%	PASS	19	30	PASS
121747-R2	LE-SOD-01	C-82121	1040	1	0.2	0.4	mg/dry kg						15	30	PASS

Attachment A-2

CHAIN OF CUSTODY

PHASE
TERRA AURA
ENVIRONMENTAL LABORATORIES, INC.
Innovative Solutions for Nature

SRTC SePRO Research & Technology Campus SePRO

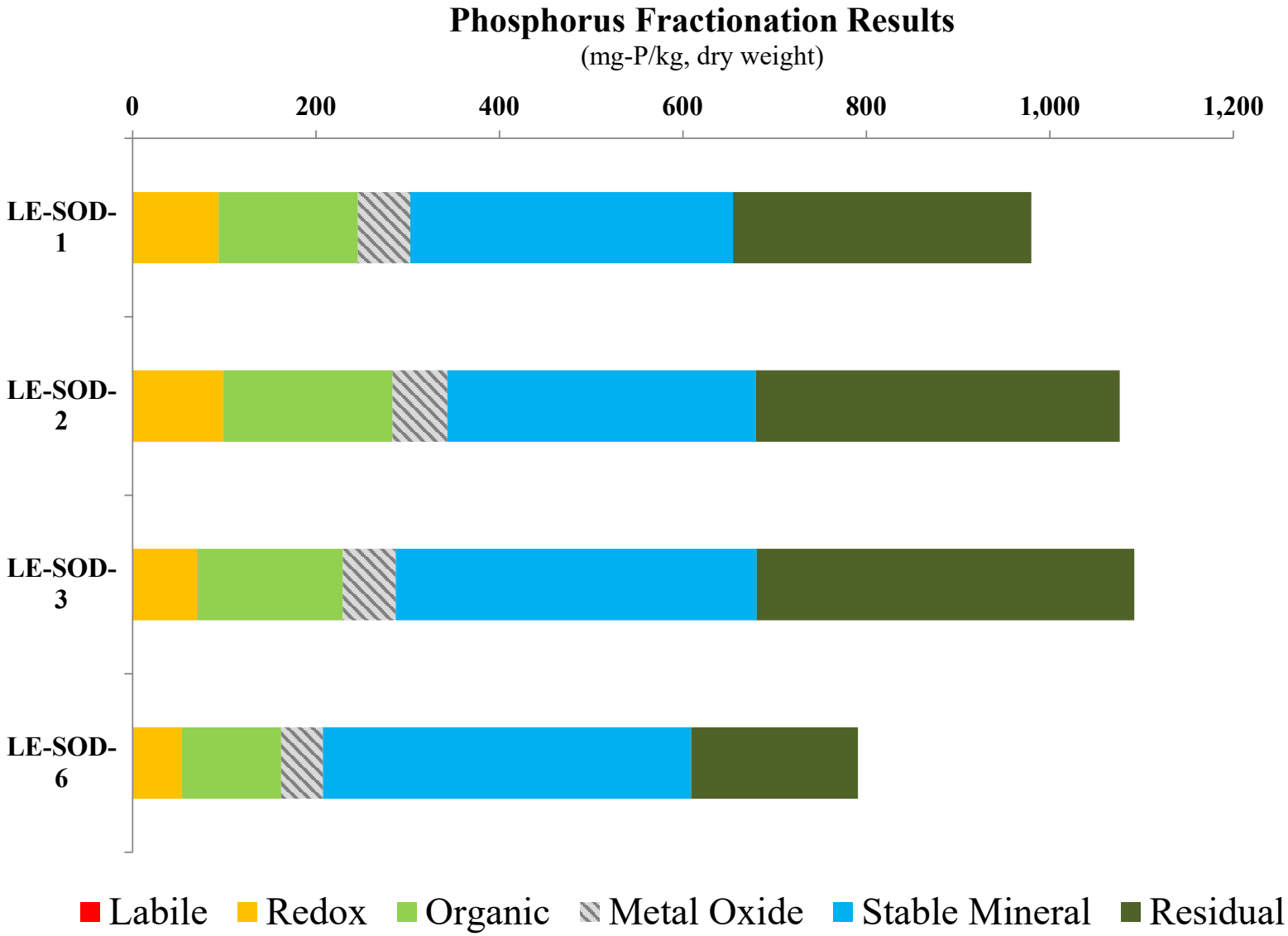
Company Name:	WSP E&E	**Report Date:**	8/22/2024
Billing Address:	977 Sky Park Court, San Diego, CA 92123	**Sample Collection Date:**	7/25 - 07/26/2024
City, State, Zip:	Lake Elsinore, CA	**Waterbody Name:**	Lake Elsinore
Contact Person:	John Rudolph	**Project Name:**	Lake Elsinore SOD Study
Email Address:	john.rudolph@wsp.com	**Size (ac.):**	3,000
Telephone:	858-243-8158	**Average Water Depth (ft):**	18
Chain of Custody:	20745	**Calculated Osgood Index:**	1.6

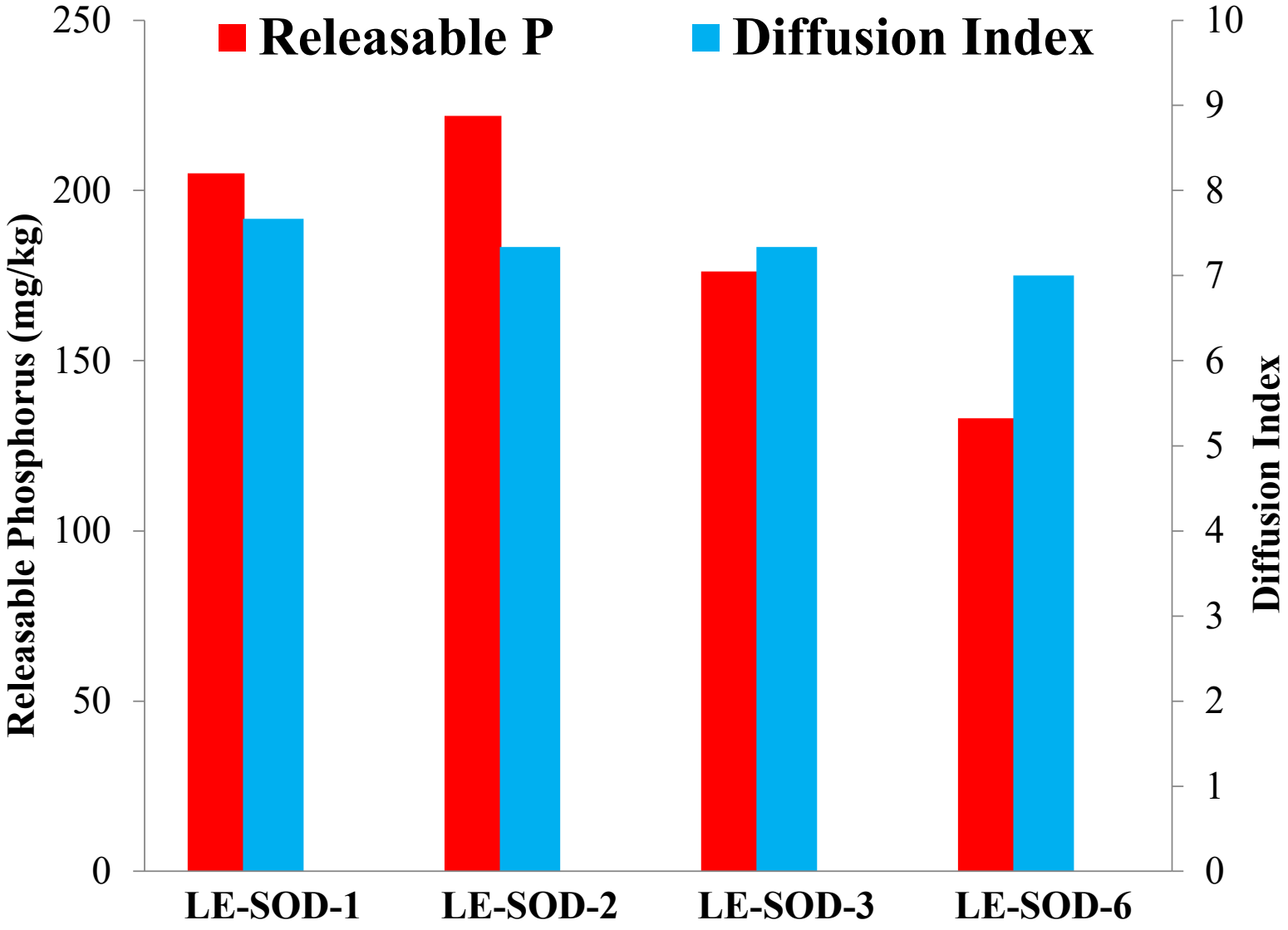
Sample Name	Site Depth (ft)	% Solids	Labile P (mg-P/kg)	Redox Sensitive P (mg-P/kg)	Organic P (mg-P/kg)	Metal Oxide P (mg-P/kg)	Stable Mineral P (mg-P/kg)	Residual P (mg-P/kg)	Total P (mg-P/kg)
LE-SOD-1	18	13%	*	94	152	57	352	325	980
LE-SOD-2	18	10%	*	99	185	60	336	397	1,076
LE-SOD-3	18	11%	*	70	159	58	394	411	1,092
LE-SOD-6	18	26%	*	54	108	45	402	182	791

^All concentrations reported in dry weight (mg/kg)

*** Concentration was less than reportable limits with 99% confidence**

Sample Name	Wet Bulk Density (kg/L)	Site Specific Osgood Index	Diffusion Index	Redox Release Index	Organic P Release Index	pH Release Index	Overall Phosphorus Burial Potential	Releasable P (mg/kg)	% Releasable P
LE-SOD-1	1.14	1.6	7.7	10.0	7.3	1.7	High	205	21%
LE-SOD-2	1.09	1.6	7.3	10.0	6.7	1.0	High	222	21%
LE-SOD-3	1.08	1.6	7.3	10.0	6.7	1.0	High	176	16%
LE-SOD-6	1.17	1.6	7.0	8.0	7.3	1.7	High	133	17%


Phosphorus Fractionation Results
(mg-P/kg, dry weight)
0
200
400
600
800
1,000
1,200
LE-SOD-1
LE-SOD-2
LE-SOD-3
LE-SOD-6
Labile
Redox
Organic
Metal Oxide
Stable Mineral
Residual


Releasable P
Diffusion Index
Releasable Phosphorus (mg/kg)
Diffusion Index
250
200
150
100
50
0
10
9
8
7
6
5
4
3
2
1
0
LE-SOD-1
LE-SOD-2
LE-SOD-3
LE-SOD-6

Diffusion Related Parameters

Sample Name	% Solids	Total Organic Matter Content	Wet Bulk Density (g/cm^3)	Dry Bulk Density (g/cm^3)	Particle Density (g/cm^3)	Porosity	Sediment Expansion Coefficient	Site Specific Osgood Index	Diffusion Index
LE-SOD-1	13%	20%	1.14	0.94	1.88	50%	84%	1.6	7.7
LE-SOD-2	10%	25%	1.09	0.83	1.38	40%	87%	1.6	7.3
LE-SOD-3	11%	25%	1.08	0.87	1.46	40%	86%	1.6	7.3
LE-SOD-6	26%	12%	1.17	1.04	2.07	50%	71%	1.6	7.0

Iron Related Insight

Sample Name	Redox P Release Parameters				Iron Stability and Stripping Potential				
	% Soluble Manganese	Bioavailable Organic Matter Content	Redox Sensitive Fe to P Molar Ratio	Redox Release Index	% Dissolved Iron	% Redox Sensitive Iron	% Metal Oxide Iron	Total Relevant Fe to P Molar Ratio	Iron-Stripping Potential
LE-SOD-1	69%	10%	2	10	0%	42%	58%	2	Low
LE-SOD-2	75%	13%	2	10	0%	54%	46%	2	Low
LE-SOD-3	77%	12%	2	10	0%	43%	57%	2	Low
LE-SOD-6	63%	6%	3	8	0%	36%	64%	3	Low

Sample Name	Site Depth (ft)	Organic P Release Parameters				pH Release Parameters			
		% Bioavailable Organic Matter	% Bioavailable Organic Phosphorus	Carbon to Phosphorus Ratio	Organic P Release Index	Sediment pH	Metal Oxide to P Molar Ratio	% Metal Oxide Aluminum	pH release index
LE-SOD-1	18	49%	32%	294	7.3	7.5	35	87%	1.7
LE-SOD-2	18	50%	32%	305	6.7	7.4	26	87%	1.0
LE-SOD-3	18	49%	28%	351	6.7	7.5	26	88%	1.0
LE-SOD-6	18	51%	37%	258	7.3	7.5	37	86%	1.7

Phosphorus Burial Insight

Sample Name	Organic P Burial Parameters				Stable Mineral Formation				Overall Phosphorus Burial Potential
	% Refractory Organic Matter	% Refractory Organic Phosphorus	Carbon to Phosphorus Ratio	Organic P Burial Potential	% Stable Mineral P out of Total P	Acid Soluble Calcium Content (g/kg)	Lanthanum Content (mg/kg)	Stable P Mineral Formation Potential	
LE-SOD-1	51%	68%	294	Low	36%	18.4	0	Moderate	High
LE-SOD-2	50%	68%	305	Moderate	31%	21.3	0	Moderate	High
LE-SOD-3	51%	72%	351	Moderate	36%	39.4	0	Moderate	High
LE-SOD-6	49%	63%	258	Low	51%	10.1	0	High	High

General Index Interpretation Guidance			
Index or Parameter	**Low (Less than 4)**	**Moderate (Between 4 to 6)**	**High (Greater than 6)**
Diffusion Index	Generally better sediment quality and lower depth of diffusion from underlying sediment.	Average sediment quality and anticipated depth of diffusion.	Poor sediment quality leading to greater depth of diffusion from underlying sediment.
Redox P Release Index	Less likely to experience anoxia and P-release from redox sensitve iron-oxides.	Moderate likelihood for anoxia and redox related P-release.	More likely to experience anoxia and P-release from redox sensitve iron-oxides.
Iron Stripping Potential	Low likelihood of excess iron-oxides preventing sediment P-release.	Excess iron may prevent some sediment P-release.	High likelihood of excess iron-oxides preventing sediment P-release.
Organic P Release Index	Most organic P will be buried as refractory P after bacterial decomposition.	Some organic P will be buried and some will be released.	Most organic P will be released into the water colum after bacterial decomposition.
pH Release Index	Environmental conditions are unlikley to lead to the release of metal oxide P.	Some potential for the release of metal oxide P.	Environmental conditions are very likley to lead to the release of metal oxide P.
Organic Matter Burial Potential	Most organic P will be released into the water colum after bacterial decomposition.	Some organic P will be buried and some will be released.	Most organic P will be buried as refractory P after bacterial decomposition.
Stable P Mineral Formation Potential	Environmental conditions are not favorable for apatite formation.	Some apatite formation or La treatment success.	Conditions are favorable for apatite formation or La treatment is effective.
Overall Phosphorus Burial Potential	Most sediment phosphorus will eventually be released into the water column.	Similar amounts of P will be buried and released.	Most sediment P will be buried or bound before diffusing into the water column.

^All indices range from 0 (lowest) to 10 (highest) based on parameters on pages 4 and 5

SePRO Research & Technology Campus
16013 Watson Seed Farm Road, Whitakers, NC, 27891

SeSCRIPT* Analysis

Attachment A-3 Field Collection Log

WATER QUALITY FIELD DATASHEET

Date: 07/26/24 Location: Lake Elsinore Station: LE-SOD 1

Time on Station: 7:05 Time off Station: _____ Staff Initials: B.S.

Weather Conditions: Clear Wind (mph & direction): 5 mph S south wind

Lat: _____ Long: _____

Water Depth (m): ~~9~~ 9.0 Secchi Depth (m): 0.80

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)
0	29.4	2689	9.20	8.38	66.1	8.86
1	29.5	2689	9.20	8.36	77.0	8.49
2	29.4	2690	9.19	8.23	85.7	8.62
3	29.1	2692	9.13	6.02	98.8	6.62
4	29.0	2692	9.13	5.96	105.9	6.25
5	28.9	2692	9.12	5.64	113.1	6.06
6	28.8	2692	9.12	5.43	119.6	5.52
7	28.7	2694	9.07	4.20	126.9	6.94
8	28.2	2699	8.64	0.62	-244.8	4.90
~~9~~ 8.5	27.8	2699	8.38	0.30	-268.3	2.62
10						
11						
12						
13						
14						
15						

WATER QUALITY FIELD DATASHEET

Date: 07/25/24 Location: Lake Elsinore Station: LESOD-02

Time on Station: 1140 Time off Station: _____ Staff Initials: JR, NT

Weather Conditions: Clear, Hot Wind (mph & direction): 0

Lat: _____ Long: _____

Water Depth (m): 9.8 Secchi Depth (m): _____

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)
0	30,9	2692	9,36	14.0	99,5	8,23
1	29,6	2697	9,31	10,8	114,8	8,61
2	29,2	2694	9,24	7,9	130,2	6,99
3	28.9	2692	9,13	5,4	132,6	5,50
4	28,8	2691	9,11	5,1	137,5	5,71
5	28,8	2692	9,09	4,6	141,6	5,73
6	28,7	2692	8,98	2,0	145,7	6,75
7	28,5	2691	8,89	0,54	-186,3	6,68
8	28,3	2689	8,83	0,22	-225,8	4,12
9	27,8	2690	8,63	0,20	-263,4	2,29
9,5 ~~10~~	27,6	2692	8,48	0,19	-278,1	1,85
11						
12						
13						
14						
15						

WATER QUALITY FIELD DATASHEET

Date: 7/26/24 Location: Lake Elsinore Station: LE-SOD3

Time on Station: 0900 Time off Station: _____ Staff Initials: JR, HK

Weather Conditions: Clear Wind (mph & direction): 0

Lat: _____ Long: _____

Water Depth (m): 9.0 Secchi Depth (m): 0.7

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)
0	29.8	2688	9.26	10.7	58.7	9.45
1	29.7	2689	9.22	9.8	74.6	9.62
2	29.7	2689	9.20	9.0	108.5	9.06
3	29.6	2690	9.18	8.7	115.8	9.03
4	29.3	2693	9.16	7.5	124.4	7.32
5	28.9	2695	9.00	2.7	132.9	5.02
6	28.5	2695	8.91	0.50	-64.6	5.62
7	28.0	2696	8.69	0.24	-220.4	3.36
8	27.2	2692	8.57	0.26	-259.2	1.93
9.5	~~9~~	27.6	2695	8.48	0.18	-274.7	1.80
10							
11							
12							
13							
14							
15							

WATER QUALITY FIELD DATASHEET

Date: 7/25/24 Location: Lake Elsinore Station: LE-SOD6

Time on Station: 0805 Time off Station: _____ Staff Initials: JR, NT

Weather Conditions: Clear, Hot Wind (mph & direction): 0

Lat: _____ Long: _____

Water Depth (m): 7.0m Secchi Depth (m): 0.90

Comments:

Depth (m)	Temp (°C)	Sp. Cond (µS/cm)	pH	DO (mg/L)	ORP (mV)	Turbidity (NTU)
0	29.1	2690	9.19	7.78	82.7	6.95
1	29.1	2690	9.18	7.39	88.9	6.91
2	29.1	2691	9.18	7.26	94.3	7.38
3	29.1	2692	9.14	6.26	99.9	6.51
4	28.9	2692	9.06	2.60	106.9	5.77
5	28.6	2694	8.95	0.37	-167.8	5.35
6	27.3	2689	8.79	0.26	-265.3	4.25
6.5 ~~7~~	27.9	2692	8.60	0.22	-285.9	4.05
8						
9						
10						
11						
12						
13						
14						
15						

STATION OCCUPATION

EVMWD LEAMS Replacement – SOD Study

Agency Code: WSP
Vessel Name: Dangler
Latitude:
Longitude:
Arrival Time (hh:mm): 0705
Depth (m): 8.6

Weather

Clear	X	Rain	
Overcast		Thunderstorm	
Partly cloudy		Fog	
Drizzle		Fog & Drizzle	
Hazey		Smoky	X

Sea State

Calm	X
Choppy	
Rough	
Confused	

Salinity (ppt): (Estuary Sites only)

Station ID: LE-SOD 1

Date: 7/26/24

Abandoned site? (Y or N (If Y explain in comments)):

Station Fail Code (2):

Wind

Speed (kts): 5 South
Direction (4):

Swell

Period (s): 6
Height (ft):
Direction (1):

Nav Type

DGPS	
GPS	X
WAAS	

Equipment Type

Core		Van Veen	X
Petite Ponar		Tandem Van Veen	

Station Comments

GRAB EVENTS

(Check all sample types that apply)

#	Time (hh:mm)	Latitude (DD°MM.mmmm)	Longitude (DDD°MM.mmmm)	Depth (m)	Distance to target (m)	Grab Fail Code (7)	Penetration (cm)	Composition (3)	Odor (4)	Color (5)	Shell Hash (6) (N/L/M/H)	Infauna (Y/N)	Sed Chem (Y/N)	Grain Size (Y/N)	Sed Tox (Y/N)	Debris (Y/N)
1	0730	N 33.6910	W 117.36172	8.6			14	silt	Sulfide	dark grey	N	N	Y	Y	N	N
Grab Event Comments: 0750																
2	0745	33.66910	117.36164	8.6			14	silt	Sulfuric	dark grey	N	N	Y	Y	N	N
Grab Event Comments:																
3	0820	33.66991	117.36161	8.6			14	Silt	Sulfuric	dark grey	N	N	Y	Y	N	N
Grab Event Comments:																
Grab Event Comments:																
Grab Event Comments:																
Grab Event Comments:																

STATION OCCUPATION

EVMWD LEAMS Replacement – SOD Study

Agency Code	WSP
Vessel Name	Dangler
Latitude	
Longitude	
Arrival Time (hh:mm)	1140
Depth (m)	9.8

Weather

Clear	X	Rain	
Overcast		Thunderstorm	
Partly cloudy		Fog	
Drizzle		Fog & Drizzle	
Hazey		Smoky	

Sea State

Calm	X
Choppy	
Rough	
Confused	

Salinity (ppt): Estuary Sites only

Station ID: LE-SOD2

Date: 7/25/24

Abandoned site? Y or N (If Y explain in comments)

Station Fail Code (2)

Wind

Speed (kts): 0

Direction (4):

Swell

Period (s): 0

Height (ft):

Direction (1):

Nav Type

DGPS	
GPS	X
WAAS	

Equipment Type

Core		Van Veen	X
Petite Ponar		Tandem Van Veen	

Station Comments

GRAB EVENTS

(Check all sample types that apply)

#	Time (hh:mm)	Latitude (DD°MM.mmmm)	Longitude (DDD°MM.mmmm)	Depth (m)	Distance to target (m)	Grab Fail Code (7)	Penetration (cm)	Composition (3)	Odor (4)	Color (5)	Shell Hash (6) (N/L/M/H)	Infauna (Y/N)	Sed Chem (Y/N)	Grain Size (Y/N)	Sed Tox (Y/N)	Debris (Y/N)
1	12:05						13	silt	sulfide	black	N	N	Y	Y	N	N
Grab Event Comments:																
2	12:30						13	silt	sulfide	black	N	N	Y	Y	N	N
Grab Event Comments:																
3	12:45						13	silt	sulfide	black	N	N	Y	Y	N	N
Grab Event Comments:																
Grab Event Comments:																
Grab Event Comments:																
Grab Event Comments:																

STATION OCCUPATION

EVMWD LEAMS Replacement – SOD Study

Agency Code: WSP
Vessel Name: Dangler
Latitude:
Longitude:
Arrival Time (hh:mm): 0955
Depth (m): ~~8~~ 9

Weather

Clear	X	Rain	
Overcast		Thunderstorm	
Partly cloudy		Fog	
Drizzle		Fog & Drizzle	
Hazey		Smoky	X

Sea State

Calm	X
Choppy	
Rough	
Confused	

Salinity (ppt): (Estuary Sites only)

Station ID: LE-SOD-03

Date: 7/26/24

Abandoned site? (Y or N (If Y explain in comments)):

Station Fail Code (2):

Wind

Speed (kts): 0
Direction (4):

Swell

Period (s): 0
Height (ft):
Direction (1):

Nav Type

DGPS	
GPS	X
WAAS	

Equipment Type

Core		Van Veen	X
Petite Ponar		Tandem Van Veen	

Station Comments

GRAB EVENTS

(Check all sample types that apply)

#	Time (hh:mm)	Latitude (DD°MM.mmmm)	Longitude (DDD°MM.mmmm)	Depth (m)	Distance to target (m)	Grab Fail Code (7)	Penetration (cm)	Composition (3)	Odor (4)	Color (5)	Shell Hash (6) (N/L/MH)	Infauna (Y/N)	Sed Chem (Y/N)	Grain Size (Y/N)	Sed Tox (Y/N)	Debris (Y/N)
1	0915	33.660190	117.34984	8.5			14	silt	sulfur	dark grey	N	N	Y	Y	N	N
Grab Event Comments:																
2	0935	33.660190	117.34986	8.6			14	silt	sulfur	dark grey	N	N	Y	Y	N	N
Grab Event Comments:																
3	0950	33.660188	117.34985	8.4			14	silt	sulfur	dark grey	N	N	Y	Y	N	N
Grab Event Comments:																
Grab Event Comments:																
Grab Event Comments:																
Grab Event Comments:																

STATION OCCUPATION

EVMWD LEAMS Replacement – SOD Study

Agency Code: WSP
Vessel Name: Dangler
Latitude:
Longitude:
Arrival Time (hh:mm): 0805
Depth (m):

Weather

Clear	X	Rain	
Overcast		Thunderstorm	
Partly cloudy		Fog	
Drizzle		Fog & Drizzle	
Hazey		Smoky	

Sea State

Calm	X
Choppy	
Rough	
Confused	

Salinity (ppt): (Estuary Sites only)

Abandoned site? (Y or N (If Y explain in comments)):

Station ID: LE-SOD6

Date: 7/25/24

Station Fail Code (2):

Wind

Speed (kts): 0
Direction (4):

Swell

Period (s): 0
Height (ft):
Direction (1):

Nav Type

DGPS	
GPS	X
WAAS	

Equipment Type

Core		Van Veen	X
Petite Ponar		Tandem Van Veen	

Station Comments

GRAB EVENTS

(Check all sample types that apply)

#	Time (hh:mm)	Latitude (DD°MM.mmmm)	Longitude (DDD°MM.mmmm)	Depth (m)	Distance to target (m)	Grab Fail Code (7)	Penetration (cm)	Composition (3)	Odor (4)	Color (5)	Shell Hash (6) (N/L/M/H)	Infauna (Y/N)	Sed Chem (Y/N)	Grain Size (Y/N)	Sed Tox (Y/N)	Debris (Y/N)
1	08:40			7			13	Silt	sulfides	Dark Gray	N	N	Y	Y	N	N
Grab Event Comments:																
2	09:10			7			13	Silt	sulfides	DRK GRY	N	N	Y	Y	N	N
Grab Event Comments:																
3	09:30			7			13	Silt	Sulfides	DRK GRY	N	N	Y	Y	N	N
Grab Event Comments:																
4	11:19			7			13	Silt	Sulfide	DRK GRY	N	N	Y	Y	N	N
Grab Event Comments:																
Grab Event Comments:																
Grab Event Comments:																

Appendix B Technical Memorandum, Hydrodynamic Simulation of Oxygenation Alternatives in Lake Elsinore

Appendix B

Hydrodynamics, Mixing and Simulation of Oxygenation in Lake Elsinore

Introduction

Water quality monitoring has demonstrated ongoing challenges in significantly improving water quality in Lake Elsinore. While axial flow pumps and diffused aeration systems provide for some additional mixing of (typically) high dissolved oxygen (DO) surface waters downward into the lower portions of the water column, anoxic conditions that enhance nutrient release from bottom sediments and negatively impact ecology of the lake persist for much of the year. Oxygenation is proposed as a strategy to increase DO, suppress nutrient release and improve overall water quality by direct delivery of DO to bottom waters. To understand and optimize oxygenation, it is important to consider hydrodynamic processes operating in Lake Elsinore. This was done by considering both 1) direct empirical field measurements of water circulation and mixing using acoustic Doppler current profile (ADCP) and 2) 3-D numerical simulations.

Velocity Data Summary

Stationary up-looking ADCP measurements were made in 2001 (August 23 to September 7) to measure typical currents in Lake Elsinore. Results show high daytime velocities in the upper portion of the water column, often reaching 20 cm/s or more, oriented in the direction of the strong afternoon winds, and slower but still significant velocities (often near 5 cm/s) closer to the bottom sediments (Fig. 1). These bottom currents are often ~180° out of phase with the direction of surface currents and exhibit marked diel flow reversals (Fig. 1).

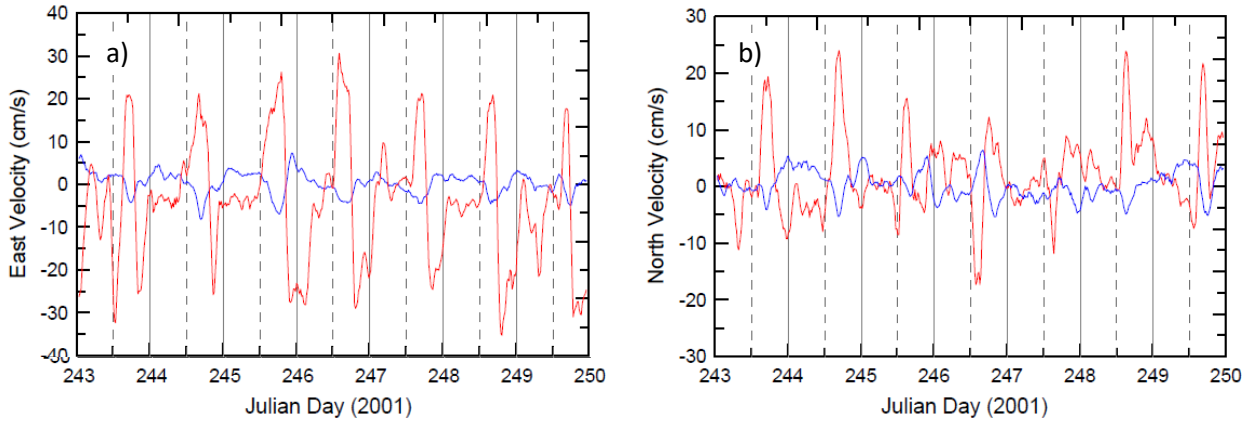


Fig. 1. Up looking ADCP data for a) east velocity and b) north velocity on 8/31-9/7/2001. Blue and red lines are 1.4 and 6.2 m above sediments.

Hydrodynamic Model Calibration

An existing application of the 3-D Aquatic Ecosystem Model (AEM3D) was calibrated to the ADCP data for the 15 day period in the summer of 2001 to simulate hydrodynamics in the lake to help understand lake-wide circulation and mixing. The model used a 40 m x 40 m x 0.4 m grid with a 60 sec timestep; model predictions (red lines) can be compared with up-looking ADCP measurements made in 2001 (blue lines) (Fig. 2). The east component of the velocity vectors (east velocities) were very well-reproduced at near-surface and lower depths (Fig. 2, upper panels), although some discrepancies were often present

between predicted and observed north velocities (Fig. 2, lower panels). The cause for the discrepancies is not readily apparent, but lack of high quality onsite meteorological data for this measurement period is thought to account for much of the apparent error; notwithstanding, the overall agreement is thought to be adequate for understanding circulation, mixing and distribution of DO within the lake.

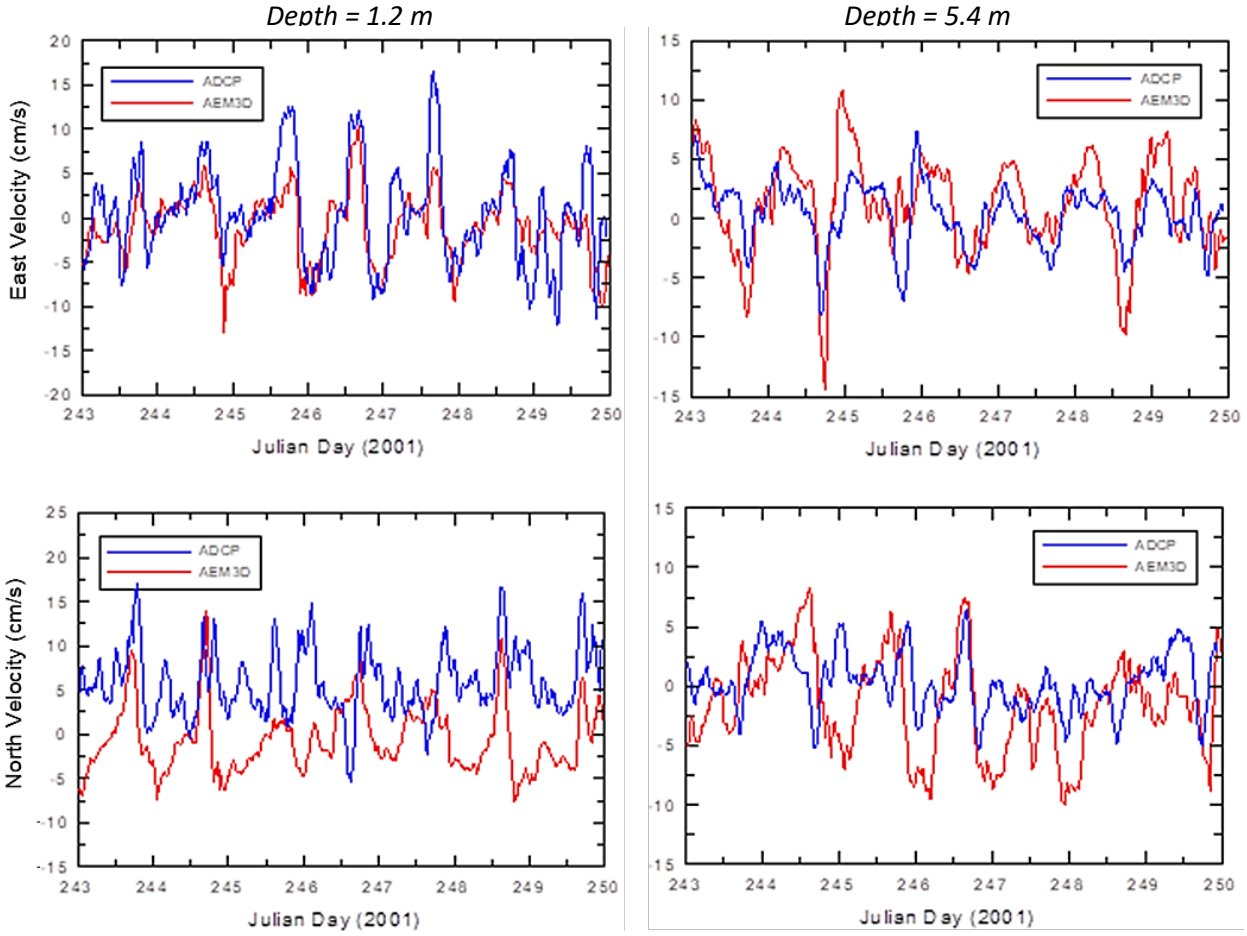


Fig. 2. Velocity vectors comparing ADCP (blue line) and AEM3D-predicted value (red line): upper panels represent east velocity; lower panels represent north velocity for depths of 1.2 m and 5.4 m.

Simulation of 1-Day Tracer Pulse

The AEM3D model was used to simulate a 1-day pulse of a tracer introduced just above the bottom sediments on August 24, 2001, in the deepest part of the lake. Model results demonstrated the presence of a strong clockwise circulation that transported the tracer rapidly to the southwest region of the lake (about 3500 m traveled distance) within 36 h of the initiation of the 24 h pulse (average velocity of about 2.7 cm/s) (Fig, 3). Direct empirical measurements via ADCP as well as hydrodynamic simulations thus highlight the presence of high bottom water velocities often found in Lake Elsinore with the potential for rapid distribution of O_2 added to the lake.

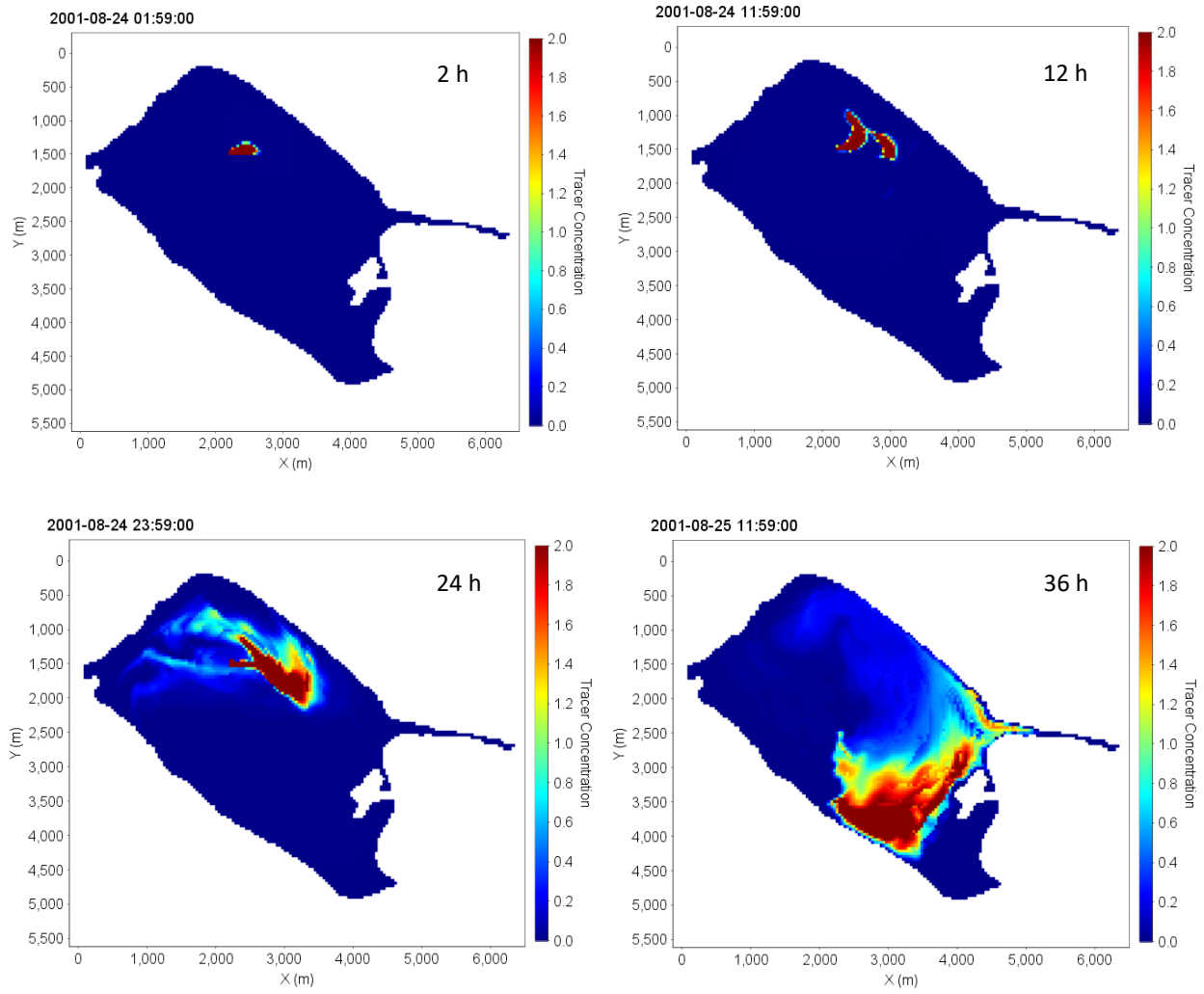


Fig. 3. Snapshots of bottom water concentrations of a numerical tracer 2, 12, 24 and 36 h after start of 24-h tracer pulse at input concentration of 100 (arbitrary units).

Simulations of Bottom DO Concentrations Under Alternative Oxygenation Scenarios

A set of full-year simulations were conducted to quantify bottom water DO for a reference (no O_2) condition and oxygenation at 15,000 lbs O_2/d using two different distribution options; spoke diffusers or jet configurations. For this comparison, summer lake level was selected to be about 1240 ft above mean sea level, an elevation often considered to be representative of nominal conditions at the lake. Meteorological conditions for 2016 were used as representative of future conditions under a drier, hotter climate. For the simulation, 5,000 acre-feet of recycled water was delivered by EVMWD via the discharge channel to the lake assuming recent total P and total N concentrations of 0.5 and 5.0 mg/L, respectively. No significant runoff or other external loading of nutrients was assumed. Internal nutrient recycling rates (at reference temperature of 20 °C) were set at 7 mg o-PO_4-P/m^2/d and 85 mg NH_4-N/m^2/d, respectively. Sediment oxygen demand (SOD) was allowed to vary across the lake, with values of 1 g/m^2/d in the deeper parts of the lake and grading to as low as 0.1 g/m^2/d in the shallowest water overlying coarse-textured sediment within the wave-mixed layer. It should be noted that the simulations were not intended to represent any specific year or specific water quality condition but rather serve as a

generic type of condition to allow broad comparison between the 3 different oxygenation scenarios: no oxygenation, oxygenation using the spoke diffusers, and oxygenation using a localized two-site jet delivery).

The oxygenation scenarios were simulated by applying negative SOD value at specific grid locations (shown in crimson) conforming to 15,000 lbs O_2 per day in a spoke and two-site jet configuration (Fig. 4).

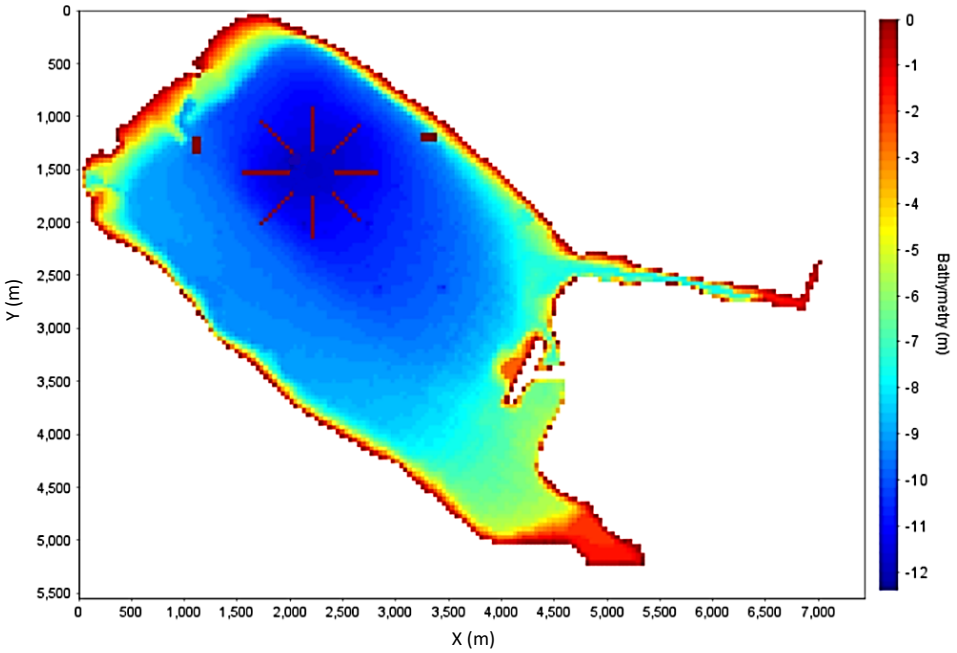


Fig. 4. Locations of O_2 injection mapped onto bathymetry (depth in meters below full pool of 1255 ft elevation).

The total lake sediment area with DO less than 2 mg/L present each day was calculated from simulation results under the reference (Fig. 5, blue line, no oxygenation) and spoke and two-site jet configurations (Fig. 5, red and green lines, respectively). Under the reference condition as simulated, transient periods of hypoxia were present in winter and spring and extending up to over 1,500 acres in lateral extent, but hypoxia generally persisted for not more than 7-10 days (Fig. 5, blue line). Hypoxia covered a larger area and was much more persistent in summer and fall, reaching up to 2150 acres and persisting for the latter part of summer and well into fall.

Oxygenation using the spoke diffuser design dramatically reduced the extent and duration of hypoxia, with hypoxic sediments typically <150-200 acres in extent (Fig. 5, red line). Particularly notable was the dramatic reduction in summer and fall of the predicted area of hypoxic sediment both on an individual daily basis (Fig. 5) and as monthly averages (Fig. 6). The spoke diffuser distribution option was predicted to be more effective at reducing the lateral extent of hypoxia compared with the two-site jet delivery, although both systems were predicted to achieve significant improvements in DO when compared with the reference (no oxygenation) condition.

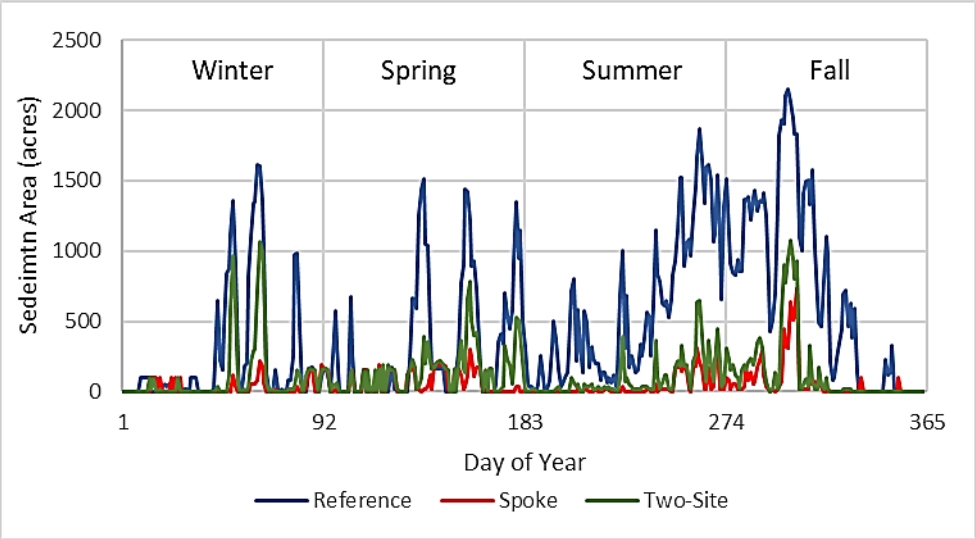


Fig. 5. Area of hypoxic sediments (DO <2 mg/L) comparing reference (no oxygenation, blue line) with spoke (red line) and two-site jet (green line) distribution.

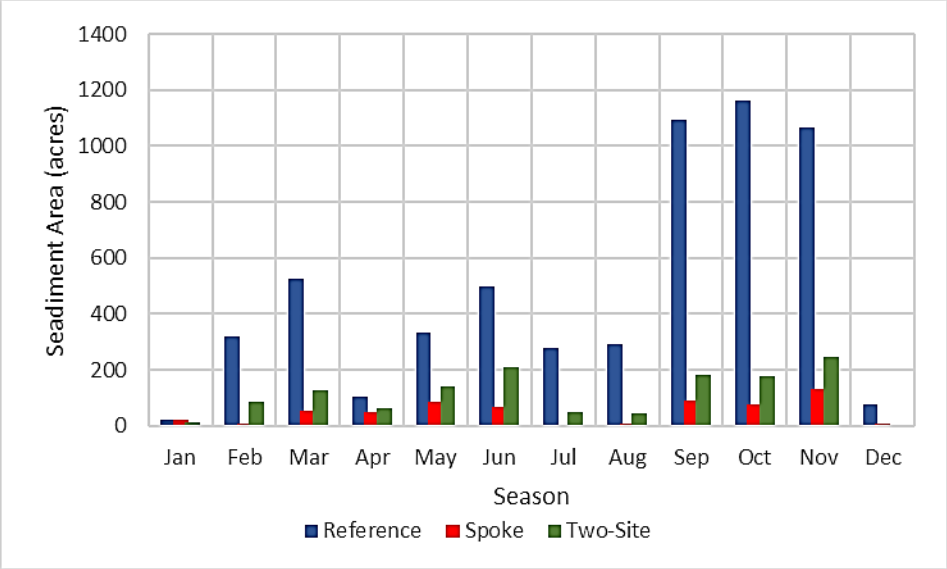


Fig. 6. Monthly average area of hypoxic sediments comparing reference (no oxygenation) with spoke diffusers and two-site jet delivery distribution.

Attachments

Attachment B-1. Hydrodynamics, Mixing and Fate of O_2 in Lake Elsinore. Presentation to Technical Team, May 2024.

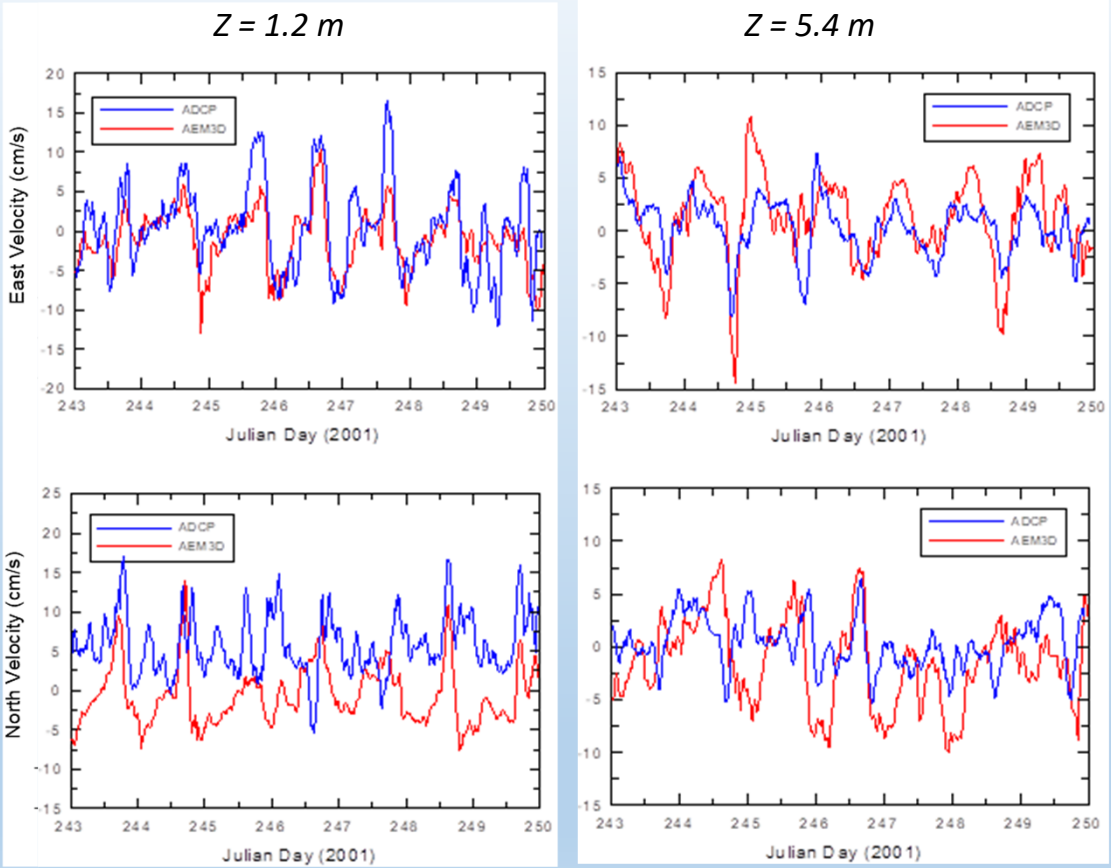
Attachment B-1 PowerPoint Slideshow of Hydrodynamics and Mixing in Lake Elsinore

Hydrodynamics, Mixing and Fate of O_2 in Lake Elsinore

- Oxygenation of Lake Elsinore is under consideration as a remedial action to improve water quality and help meet nutrient offset objectives
- While oxygenation is frequently used in lakes and reservoirs sufficiently deep to thermally stratify, it is not generally used in shallow lakes that do not seasonally stratify
- Objective of this analysis is to improve understanding of the hydrodynamics and mixing in Lake Elsinore, and the distribution and fate of O_2 added via oxygenation in Lake Elsinore

1. Modeling of hydrodynamics

- An AEM3D model previously developed for the lake was used to understand how hydrodynamics would distribute and mix DO added via an oxygenation system
- Model used a 40 m x 40 m x 0.4 m grid with a 60 sec timestep
- Model predictions (red lines) compared with uplooking ADCP measurements made in 2001 (blue lines)
- East velocities were very well-reproduced at near-surface and lower depths, while a small offset was generally present for north velocities
- Lack of high quality onsite meteorological data may account for some of these discrepancies, but agreement is thought to be adequate



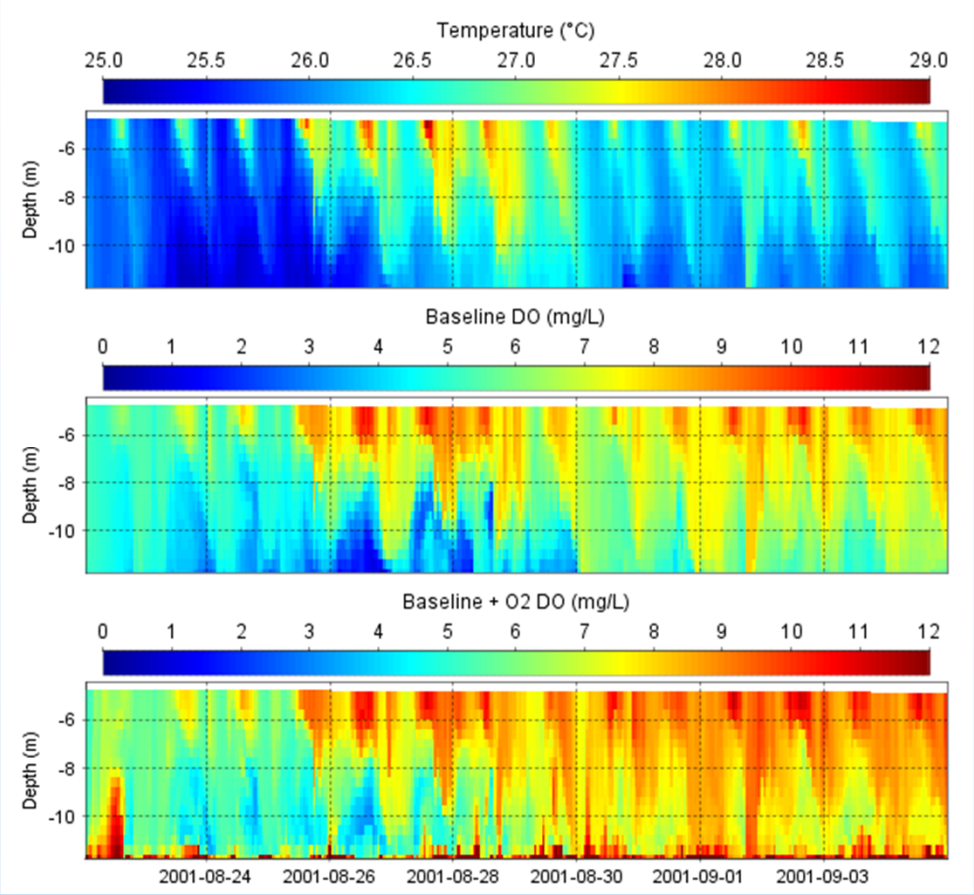
2. Modeling of DO

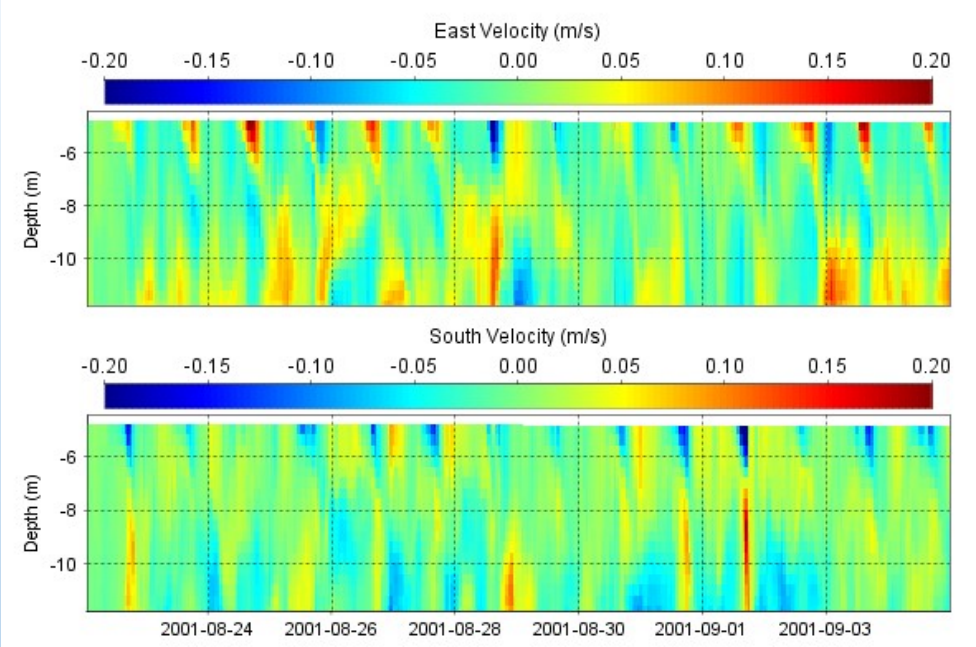
I. 1240’ (Aug 2001) Results

- 3D hydrodynamic modeling was then used to predict the distribution and fate of 15,000 lbs of O_2 distributed to bottom waters using a spoke design in the deepest part of the lake
- O_2 was added by simply assigning an SOD value of -35.2 g/m^2/d (i.e., flux out) at 40 m x 40 m grid cells (n=121) comprising the spoke
- Three lake levels (approximately 1233’, 1240’ and 1255’) were assessed using available lake water quality and meteorological data for the summers of 2016, 2001 and 2005, respectively
- Baseline and oxygenated scenarios were simulated for each scenario to allow direct comparisons
- Evaluation of natural reaeration, SOD and photosynthesis/respiration effects also conducted at 1240’



a. 1240': Profile contour plots at center of diffuser array

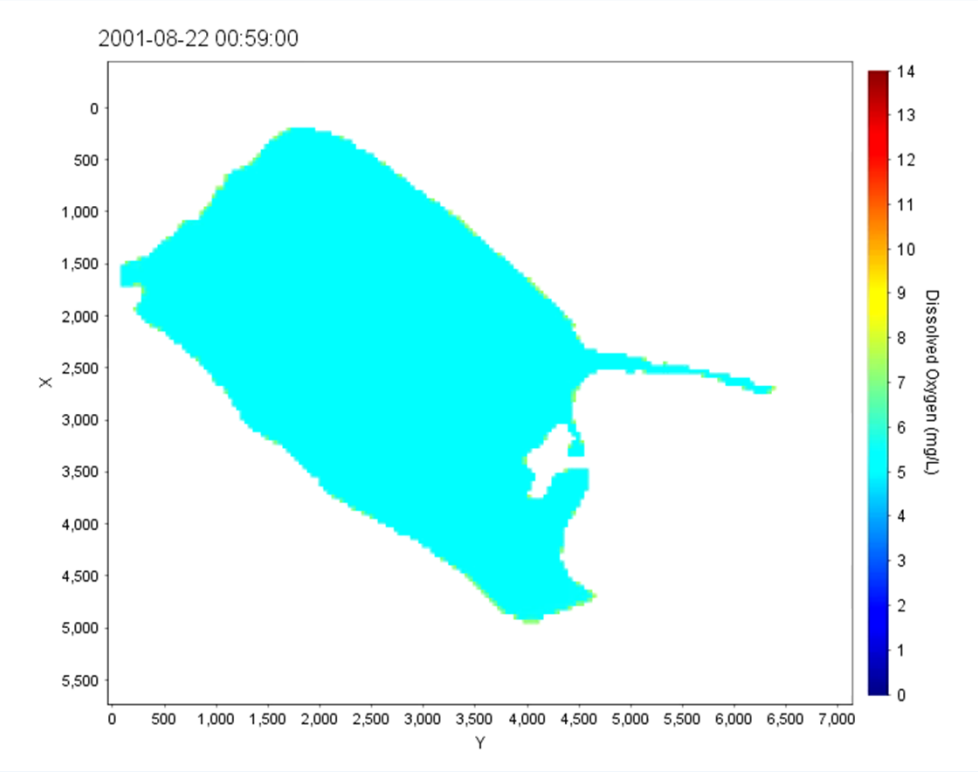




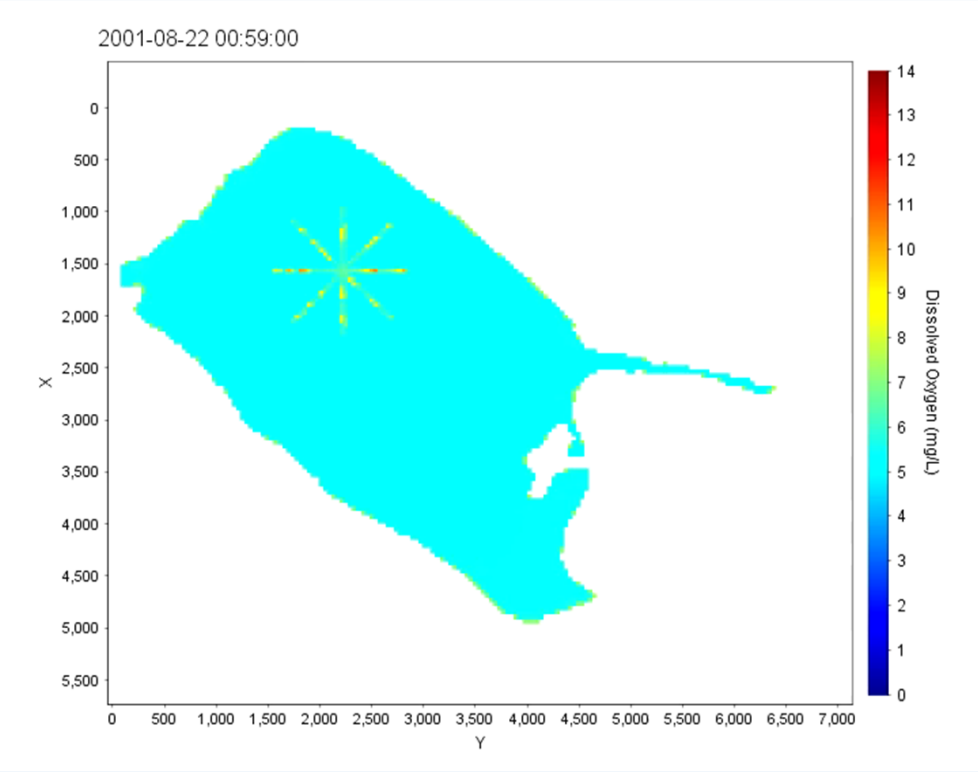
- Uniform temperature and DO profiles (at 26°C and 5.4 mg/L) rapidly develop strong diurnal and vertical gradients
- Oxygenation able to limit DO depletion over first week after which natural mixing occurs

b. 1240': DO at 0.3 m above bottom sediments *(DO_{init} = 5.4, weak stratification early then mixes)*

Baseline

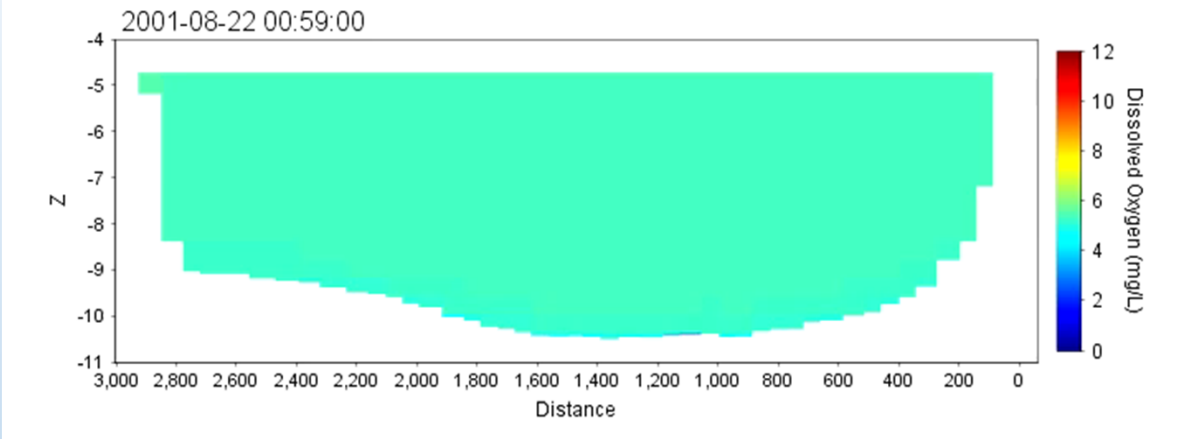


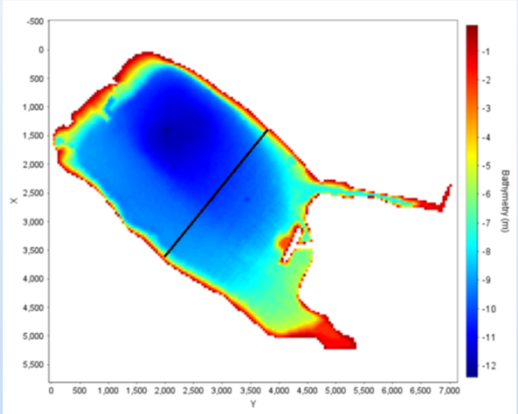
Baseline + Oxygenation



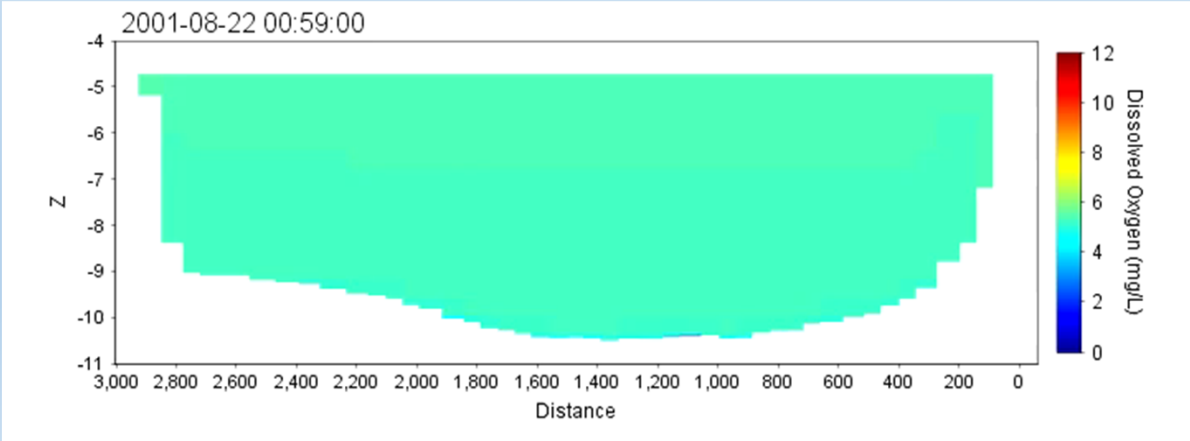
c. 1240': DO at curtain across transverse axis of lake

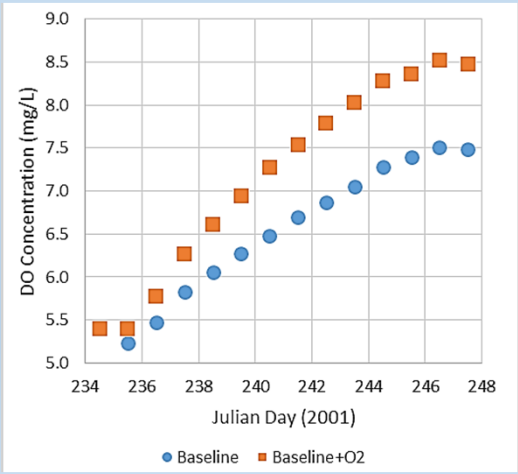
Baseline





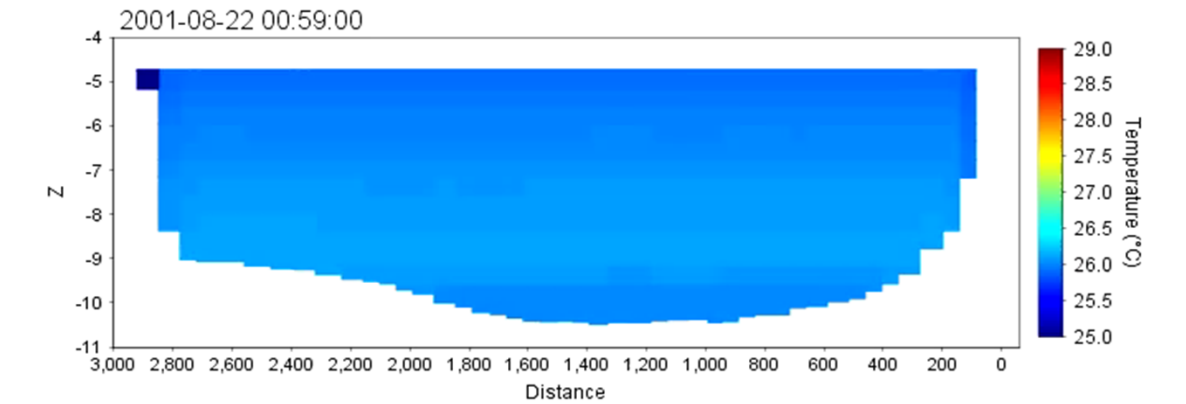
Baseline + Oxygenation





d. 1240': Temperature and Current Velocity at curtain across middle of lake (transverse axis)

Temperature

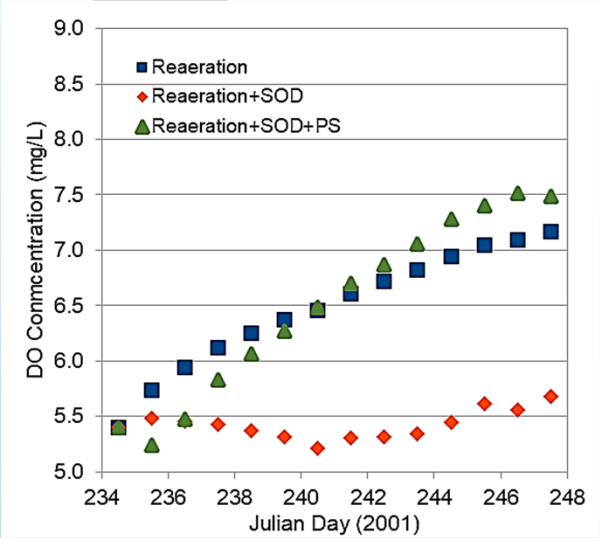


Velocity

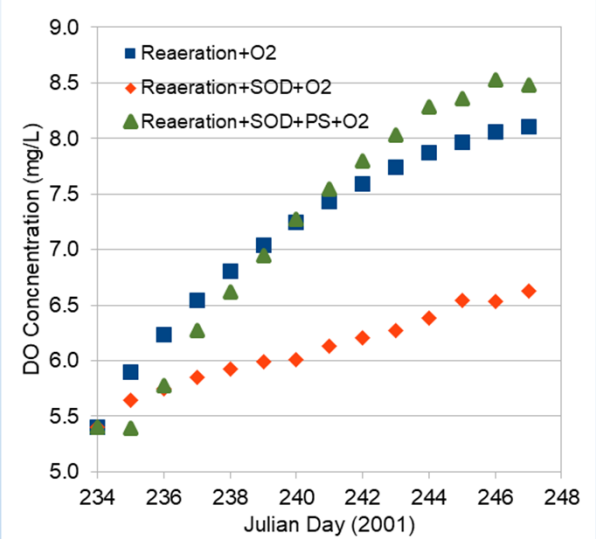
Velocity movie removed to make file small enough to email.

e. 1240': Evaluation of natural reaeration, SOD and photosynthesis/respiration

Baseline



Baseline + Oxygenation



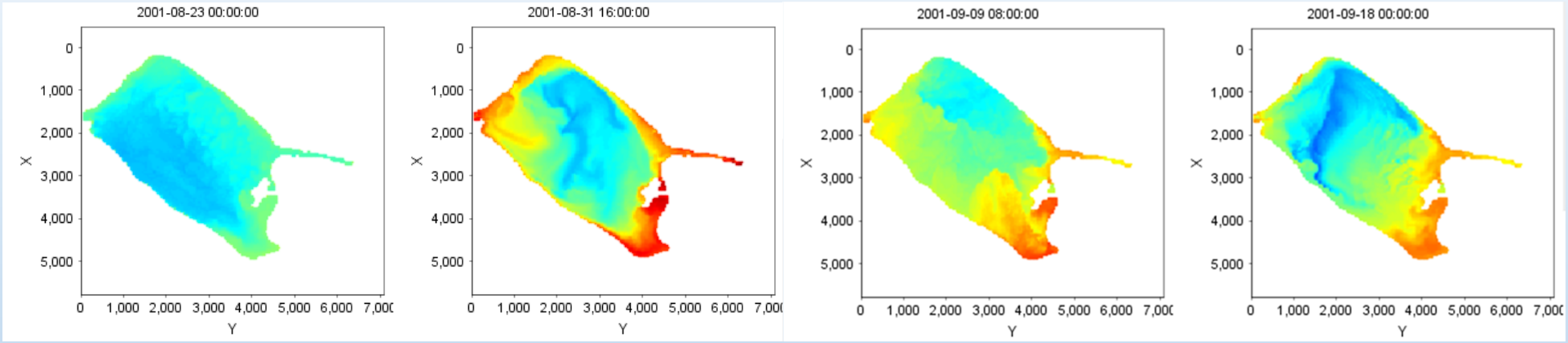
- Natural reaeration from the atmosphere follows Fick's 1st law and can be written as:

$$\frac{dC}{dt} = \frac{k}{\bar{Z}}\left(C_{aq} - \frac{C_g}{H}\right)$$ where k=mass transfer coefficient = 0.46 m/d

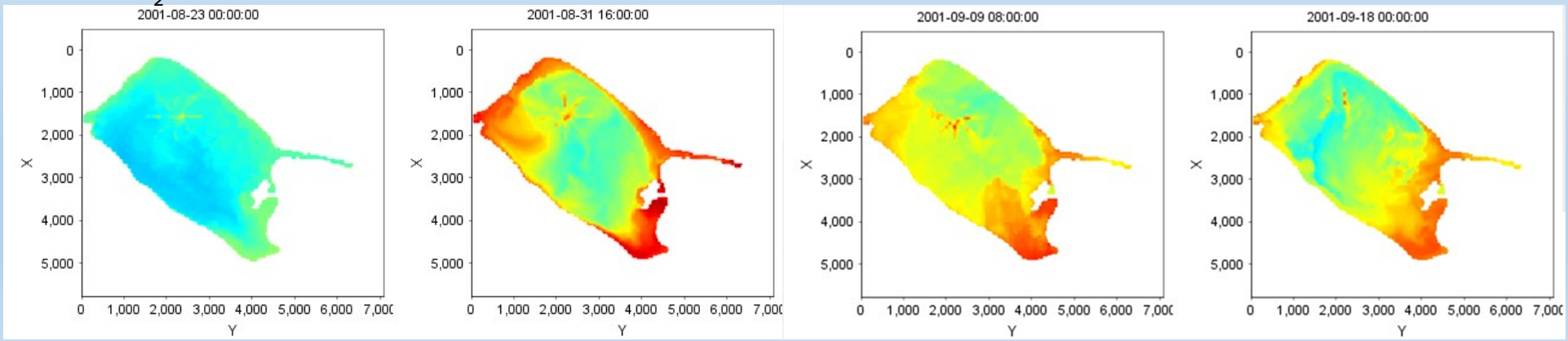
- Incorporation of SOD greatly reduces DO concentrations and balances natural reaeration
- Incorporation of net photosynthesis (PS) adds additional DO and more than offsets SOD
- Oxygenation (right-hand figure) increased DO levels under all 3 theoretical scenarios

f. 1240': 28 d Simulation

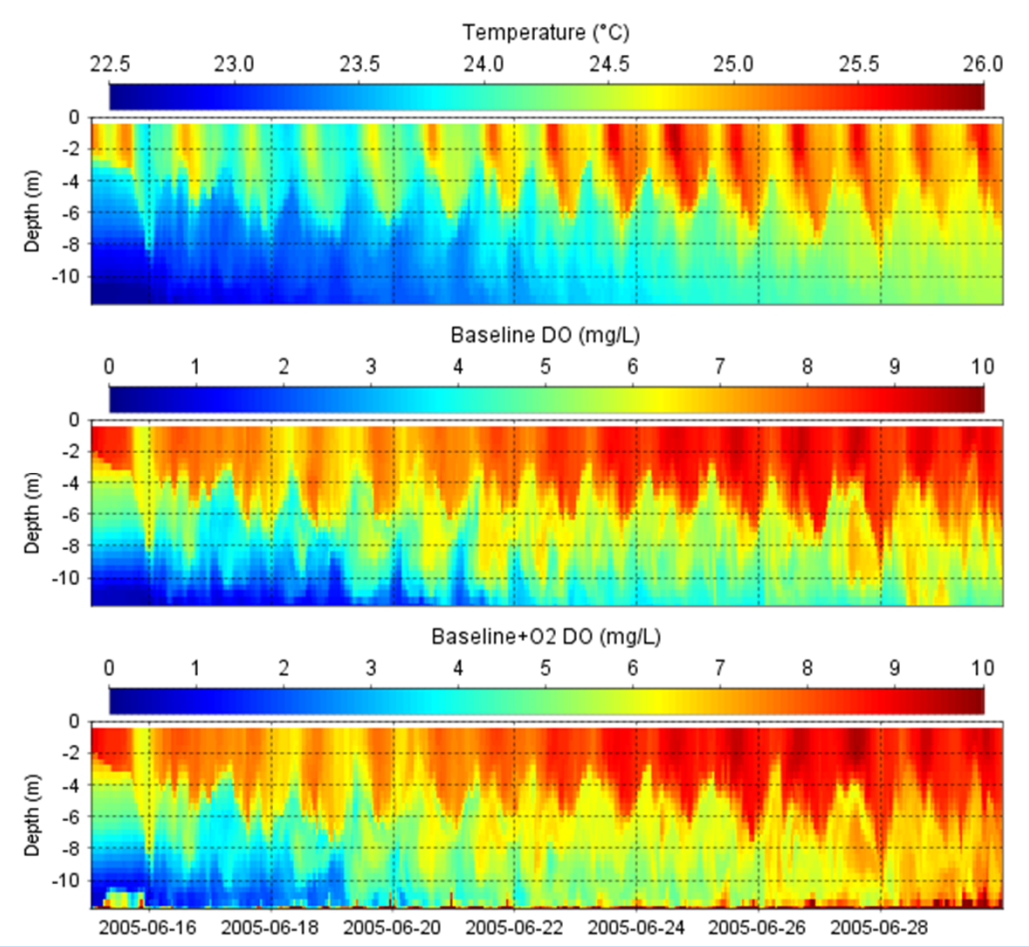
Baseline

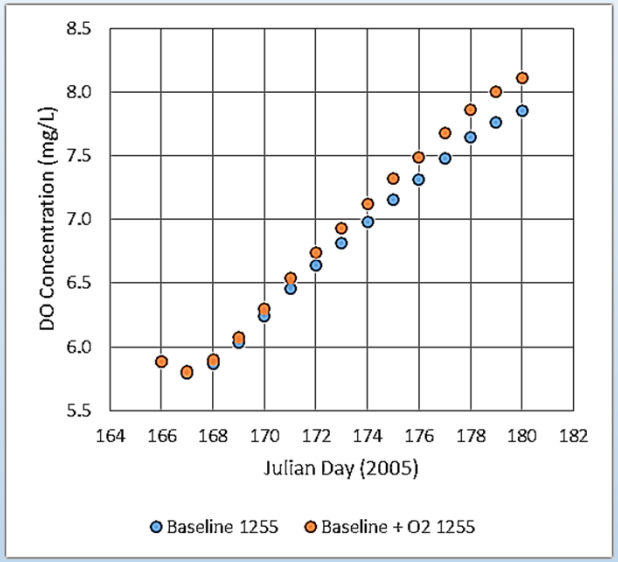


Baseline+O_2



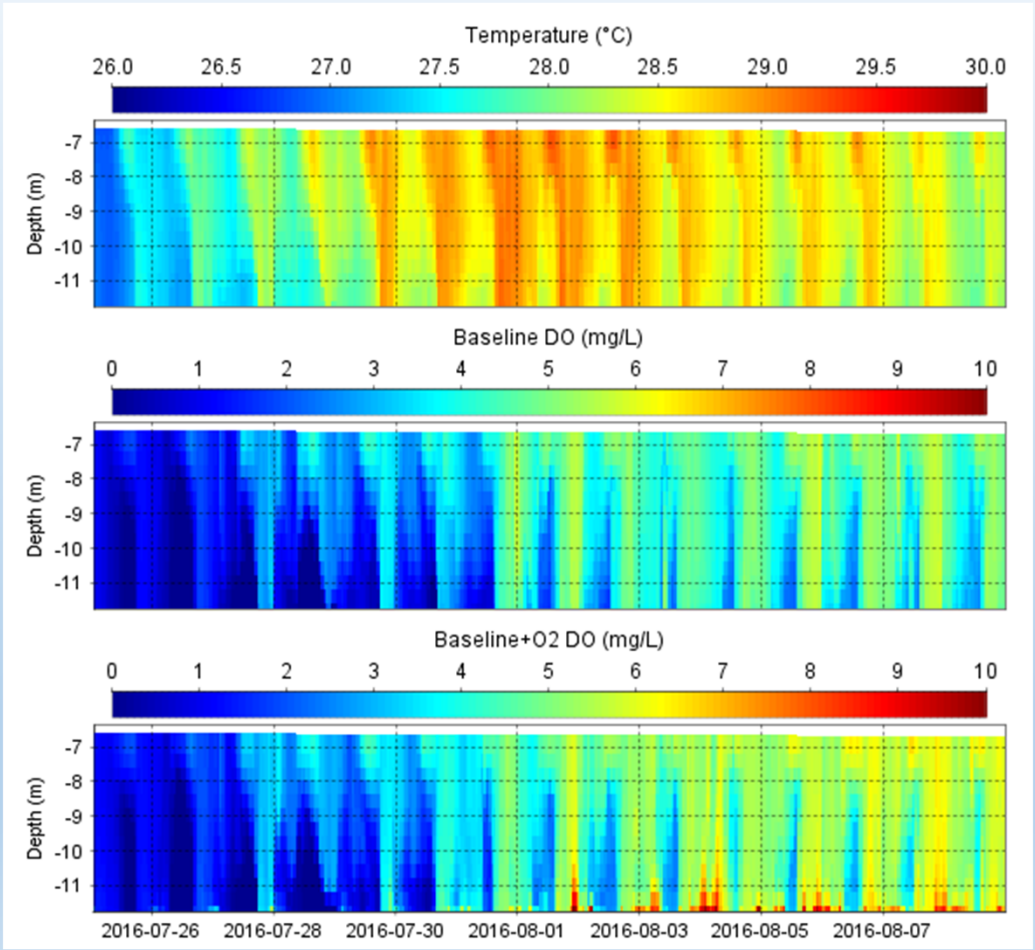
II. 1254.5’ (Jun 2005) Results

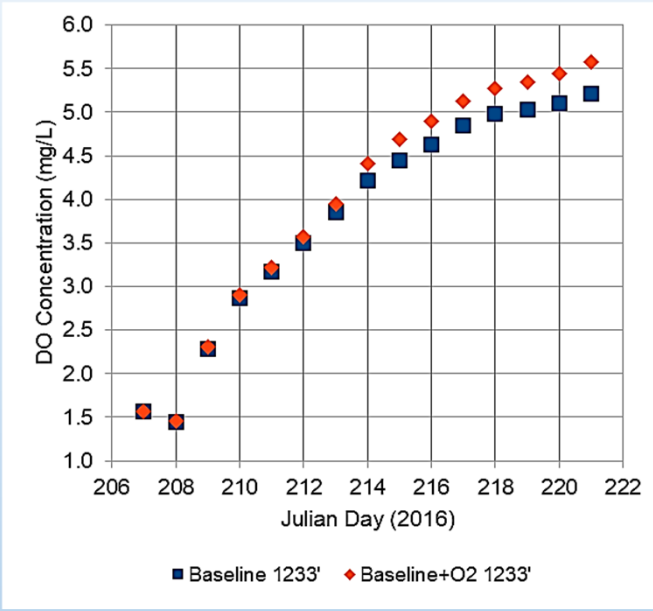




- Very large lake volume results in modest basin average DO increase over time

III. 1233’ (Jul 2016) Results





- Very low initial DO levels (<2 mg/L) and high oxygen demand limits capacity of oxygenation to quickly improve DO levels

Conclusions

- Lake Elsinore experiences complex hydrodynamics with extensive lateral transport and dispersion in surface and bottom waters
- Oxygen delivered into the deepest part of the lake using a large “spoke” diffuser is predicted to increase bottom water DO levels, with dynamic bottom water currents rapidly redistributing DO across the lake
- Strong daytime photosynthetic production of DO and high SOD appears to limit loss to atmosphere of oxygenation-generated O_2 under most conditions
- Online monitoring of lake DO combined with O_2 delivery control logic should be able to optimize operations
- Capacity of O_2 to diffuse through benthic boundary layer, oxidize ferrous sulfides and reduce PO_4-P and NH_4-N flux become key questions

Appendix C Cost Estimates of Alternatives Evaluated in Detail

LAKE ELSINORE OXYGENATION CAPITAL COSTS

#	Items	Units	Unit Rate ($)	SHORELINE SIDE-STREAM (METHOD 1)							
				SPEECE		MOLEAR		BLUE-IN-GREEN		OST	
				Quantity	Total ($)	Quantity	Total ($)	Quantity	Total ($)	Quantity	Total ($)
General Items											
1	Pre-Cast Crib Installed	EA	$250,000	0	$ -	0	$ -			0	$ -
Mechanical Items											
2	42" Transmission Pipes to/From Deep Zone	LF	$ 300	16,000	$ 4,800,000	16,000	$ 4,800,000			16,000	$ 4,800,000
3	42" Spokes/Diffuser Lines Installed	LF	$ 300	12,000	$ 3,600,000	12,000	$ 3,600,000			12,000	$ 3,600,000
4	Oxygen System Installed	LS	VARIES	1	$ 4,800,000	1	$ 4,400,000			1	$ 3,600,000
5	Low Press Sumbersible Pumps Installed	EA	$ 150,000	0	$ -	0	$ -			0	$ -
6a	High Press Vertical Turbine Pumps Installed (±240 HP)	EA	$ 100,000	0	$ -	0	$ -			0	$ -
6b	High Press Vertical Turbine Pumps Installed (±415 HP)	EA	$ 300,000	0	$ -	0	$ -			0	$ -
7	High Press Submersible Pumps Installed (±550 HP)	EA	$ 400,000	2	$ 800,000	2	$ 800,000			2	$ 800,000
8	LOX System	EA	$0 (Lease)	0	$ -	0	$ -			0	$ -
9a	Oxygen Supply	LF	$ 25	100	$ 2,500	100	$ 2,500			100	$ 2,500
9b	Power Supply	LF	$ 25	4,000	$ 100,000	4,000	$ 100,000			4,000	$ 100,000
10	Misc Gates/Dock/Mechanical Systems	EA	$ 400,000	0	$ -	0	$ -			0	$ -
Electrical/Control											
11	Distribution Power	EA	$ 250,000	1	$ 250,000	1	$ 250,000			1	$ 250,000
12	System Controls and Instrumentation	EA	$ 250,000	1	$ 250,000	1	$ 250,000			1	$ 250,000
Subtotal					$ 14,602,500		$ 14,202,500				$ 13,402,500
13	20% OVERHEAD, TAXES, BONDING, INSURANCE				$ 2,920,500		$ 2,840,500				$ 2,680,500
14	20% CONTINGENCY				$ 2,920,500		$ 2,840,500				$ 2,680,500
	TOTAL				**$ 20,500,000**		**$ 19,900,000**				**$ 18,800,000**

N/A

LAKE ELSINORE OXYGENATION ANNUAL O&M COSTS

#	Items	SHORELINE SIDE-STREAM (METHOD 1)
		Total ($)
1	Power (Assumes $0.26/kWh)	$ 1,800,000
2	Liquid Oxygen	$700,000 + delivery + storage lease
3	Diver for Equipment Inspection (2 times per year)	$ 50,000
	TOTAL	**$ 2,550,000**

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LAKE ELSINORE OXYGENATION CAPITAL COSTS

#	Items	Units	Unit Rate ($)	SUBMERGED (METHOD 2)							
				SPEECE		MOLEAR		BLUE-IN-GREEN		OST	
				Quantity	Total ($)	Quantity	Total ($)	Quantity	Total ($)	Quantity	Total ($)
General Items											
1	Pre-Cast Crib Installed	EA	$250,000	0	$ -					0	$ -
Mechanical Items											
2	42" Transmission Pipes to/From Deep Zone	LF	$ 300	0	$ -					0	$ -
3	42" Spokes/Diffuser Lines Installed	LF	$ 300	12,000	$ 3,600,000					12,000	$ 3,600,000
4	Oxygen System Installed	LS	VARIES	1	$ 2,400,000					1	$ 1,800,000
5	Low Press Sumbersible Pumps Installed	EA	$ 150,000	0	$ -					0	$ -
6a	High Press Vertical Turbine Pumps Installed (±240 HP)	EA	$ 100,000	0	$ -					0	$ -
6b	High Press Vertical Turbine Pumps Installed (±415 HP)	EA	$ 300,000	0	$ -					0	$ -
7	High Press Submersible Pumps Installed (±550 HP)	EA	$ 400,000	1	$ 400,000					1	$ 400,000
8	LOX System	EA	$0 (Lease)			N/A		N/A			
9a	Oxygen Supply	LF	$ 25	4,000	$ 100,000					4,000	$ 100,000
9b	Power Supply	LF	$ 25	4,000	$ 100,000					4,000	$ 100,000
10	Misc Gates/Dock/Mechanical Systems	EA	$ 400,000	0	$ -					0	$ -
Electrical/Control											
11	Distribution Power	EA	$ 250,000	1	$ 250,000					1	$ 250,000
12	System Controls and Instrumentation	EA	$ 250,000	1	$ 250,000					1	$ 250,000
Subtotal					$ 7,100,000						$ 6,500,000
13	20% OVERHEAD, TAXES, BONDING, INSURANCE				$ 1,420,000						$ 1,300,000
14	20% CONTINGENCY				$ 1,420,000						$ 1,300,000
	TOTAL				**$ 10,000,000**						**$ 9,100,000**

LAKE ELSINORE OXYGENATION ANNUAL O&M COSTS

#	Items	SUBMERGED (METHOD 2)
		Total ($)
1	Power (Assumes $0.26/kWh)	$ 900,000
2	Liquid Oxygen	$700,000 + delivery + storage lease
3	Diver for Equipment Inspection (2 times per year)	$ 50,000
	TOTAL	**$ 1,650,000**

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LAKE ELSINORE OXYGENATION CAPITAL COSTS

#	Items	Units	Unit Rate ($)	PLATFORM DELIVERY FULL STREAM (METHOD 3)							
				SPEECE		MOLEAR		BLUE-IN-GREEN		OST	
				Quantity	Total ($)	Quantity	Total ($)	Quantity	Total ($)	Quantity	Total ($)
General Items											
1	Pre-Cast Crib Installed	EA	$250,000	4	$ 1,000,000	4	$ 1,000,000			4	$ 1,000,000
Mechanical Items											
2	42" Transmission Pipes to/From Deep Zone	LF	$ 300	0	$ -	0	$ -			0	$ -
3	42" Spokes/Diffuser Lines Installed	LF	$ 300	12,000	$ 3,600,000	12,000	$ 3,600,000			12,000	$ 3,600,000
4	Oxygen System Installed	LS	VARIES	1	$ 4,800,000	1	$ 4,400,000			1	$ 3,600,000
5	Low Press Sumbersible Pumps Installed	EA	$ 150,000	0	$ -	0	$ -			0	$ -
6a	High Press Vertical Turbine Pumps Installed (±240 HP)	EA	$ 100,000	0	$ -	0	$ -			0	$ -
6b	High Press Vertical Turbine Pumps Installed (±415 HP)	EA	$ 300,000	2	$ 600,000	2	$ 600,000			2	$ 600,000
7	High Press Submersible Pumps Installed (±550 HP)	EA	$ 400,000	0	$ -	0	$ -			0	$ -
8	LOX System	EA	$0 (Lease)					N/A			
9a	Oxygen Supply	LF	$ 25	4,000	$ 100,000	4,000	$ 100,000			4,000	$ 100,000
9b	Power Supply	LF	$ 25	4,000	$ 100,000	4,000	$ 100,000			4,000	$ 100,000
10	Misc Gates/Dock/Mechanical Systems	EA	$ 400,000	1	$ 400,000	1	$ 400,000			1	$ 400,000
Electrical/Control											
11	Distribution Power	EA	$ 250,000	1	$ 250,000	1	$ 250,000			1	$ 250,000
12	System Controls and Instrumentation	EA	$ 250,000	1	$ 250,000	1	$ 250,000			1	$ 250,000
Subtotal					$ 11,100,000		$ 10,700,000				$ 9,900,000
13	20% OVERHEAD, TAXES, BONDING, INSURANCE				$ 2,220,000		$ 2,140,000				$ 1,980,000
14	20% CONTINGENCY				$ 2,220,000		$ 2,140,000				$ 1,980,000
			TOTAL		**$ 15,600,000**		**$ 15,000,000**				**$ 13,900,000**

LAKE ELSINORE OXYGENATION ANNUAL O&M COSTS

#	Items	PLATFORM DELIVERY FULL STREAM (METHOD 3)
		Total ($)
1	Power (Assumes $0.26/kWh)	$ 1,400,000
2	Liquid Oxygen	$700,000 + delivery + storage lease
3	Diver for Equipment Inspection (2 times per year)	N/A
	TOTAL	**$ 2,100,000**

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LAKE ELSINORE OXYGENATION CAPITAL COSTS

#	Items	Units	Unit Rate ($)	TWO STREAM CARRIER WATER (METHOD 4)							
				SPEECE		MOLEAR		BLUE-IN-GREEN		OST	
				Quantity	Total ($)	Quantity	Total ($)	Quantity	Total ($)	Quantity	Total ($)
General Items											
1	Pre-Cast Crib Installed	EA	$250,000	4	$ 1,000,000			4	$ 1,000,000	4	$ 1,000,000
Mechanical Items											
2	42" Transmission Pipes to/From Deep Zone	LF	$ 300	0	$ -			0	$ -	0	$ -
3	42" Spokes/Diffuser Lines Installed	LF	$ 300	12,000	$ 3,600,000			12,000	$ 3,600,000	12,000	$ 3,600,000
4	Oxygen System Installed	LS	VARIES	1	$ 2,400,000			1	$ 1,000,000	1	$ 1,800,000
5	Low Press Sumbersible Pumps Installed	EA	$ 150,000	4	$ 600,000			4	$ 600,000	4	$ 600,000
6a	High Press Vertical Turbine Pumps Installed (±240 HP)	EA	$ 100,000	2	$ 200,000			2	$ 200,000	2	$ 200,000
6b	High Press Vertical Turbine Pumps Installed (±415 HP)	EA	$ 300,000	0	$ -			0	$ -	0	$ -
7	High Press Submersible Pumps Installed (±550 HP)	EA	$ 400,000	0	$ -			0	$ -	0	$ -
8	LOX System	EA	$0 (Lease)				N/A				
9a	Oxygen Supply	LF	$ 25	4,000	$ 100,000			4,000	$ 100,000	4,000	$ 100,000
9b	Power Supply	LF	$ 25	4,000	$ 100,000			4,000	$ 100,000	4,000	$ 100,000
10	Misc Gates/Dock/Mechanical Systems	EA	$ 400,000	1	$ 400,000			1	$ 400,000	1	$ 400,000
Electrical/Control											
11	Distribution Power	EA	$ 250,000	1	$ 250,000			1	$ 250,000	1	$ 250,000
12	System Controls and Instrumentation	EA	$ 250,000	1	$ 250,000			1	$ 250,000	1	$ 250,000
Subtotal					$ 8,900,000				$ 7,500,000		$ 8,300,000
13	20% OVERHEAD, TAXES, BONDING, INSURANCE				$ 1,780,000				$ 1,500,000		$ 1,660,000
14	20% CONTINGENCY				$ 1,780,000				$ 1,500,000		$ 1,660,000
	TOTAL				**$ 12,500,000**				**$ 10,500,000**		**$ 11,700,000**

LAKE ELSINORE OXYGENATION ANNUAL O&M COSTS

#	Items	TWO STREAM CARRIER WATER (METHOD 4)
		Total ($)
1	Power (Assumes $0.26/kWh)	$ 1,050,000
2	Liquid Oxygen	$700,000 + delivery + storage lease
3	Diver for Equipment Inspection (2 times per year)	N/A
	TOTAL	**$ 1,750,000**

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LAKE ELSINORE OXYGENATION CAPITAL COSTS

#	Items	Units	Unit Rate ($)	MOLEAR FLOATING BARGE (METHOD 5)							
				SPEECE		MOLEAR		BLUE-IN-GREEN		OST	
				Quantity	Total ($)	Quantity	Total ($)	Quantity	Total ($)	Quantity	Total ($)
General Items											
1	Pre-Cast Crib Installed	EA	$250,000			0	$ -				
Mechanical Items											
2	42" Transmission Pipes to/From Deep Zone	LF	$ 300			0	$ -				
3	42" Spokes/Diffuser Lines Installed	LF	$ 300			0	$ -				
4	Oxygen System Installed (See Note 1)	LS	VARIES			1	$ 9,900,000				
5	Low Press Sumbersible Pumps Installed	EA	$ 150,000			0	$ -				
6a	High Press Vertical Turbine Pumps Installed (±240 HP)	EA	$ 100,000			0	$ -				
6b	High Press Vertical Turbine Pumps Installed (±415 HP)	EA	$ 300,000			0	$ -				
7	High Press Submersible Pumps Installed (±550 HP)	EA	$ 400,000			0	$ -				
8	LOX System	EA	$0 (Lease)	N/A				N/A		N/A	
9a	Oxygen Supply	LF	$ 25			0	$ -				
9b	Power Supply	LF	$ 25			0	$ -				
10	Misc Gates/Dock/Mechanical Systems	EA	$ 400,000			0	$ -				
Electrical/Control											
11	Distribution Power	EA	$ 250,000			0	$ -				
12	System Controls and Instrumentation	EA	$ 250,000			0	$ -				
Subtotal							$ 9,900,000				
13	20% OVERHEAD, TAXES, BONDING, INSURANCE (See Note 2)						$ -				
14	20% CONTINGENCY (See Note 2)						$ -				
	TOTAL						**$ 9,900,000**				

Note:

1. Based on costs from City of Lake Elsinore to purchase and install two 2,500 lb/day Molear barges (+/- $3.3M for both).
2. As the price for the Oxygen System is based on an actual proposal from a contractor, it is assumed that overhead, contingency, taxes, etc. is already built into the price.

LAKE ELSINORE OXYGENATION ANNUAL O&M COSTS

#	Items	FLOATING BARGE (MOLEAR)
		Total ($)
1	Power (Assumes $0.26/kWh - See Note 3 below)	$ 1,620,000
2	Liquid Oxygen	N/A
3	Diver for Equipment Inspection (2 times per year)	N/A
	TOTAL	**$ 1,620,000**

Note:

3. Each 2,500 lb/day barge contains one 125 hp pump and one 40 hp pump, which is assumed to both run 24/7 for the entire year.

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Appendix D LEAMS Condition Assessment Report

Lake Elsinore

Condition Assessment of EVMWD Aeration System

August 2024
(February 2025 – Revision 01)
(March 2025 – Revision 02)

Prepared For:

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PACE JN C197

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Attachment D-2: Atlas Copco Compressor Maintenance Checklist
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1 Introduction

1.1 Lake Elsinore Background

To provide an overall understanding of the Lake Elsinore aeration system and this condition assessment report, the following sections present a brief background on the history of Lake Elsinore and its aeration system.

In 2003, Elsinore Valley Municipal Water District (EVMWD) began to discharge recycled water into Lake Elsinore to maintain water levels at or above the target of 1,240 feet. The discharged recycled water contains nutrients, such as nitrogen and phosphorus. To reduce fish kills and improve water quality in Lake Elsinore, two projects were planned, designed, and installed in the early 2000s. Project 1 involved vertical propeller mixers, but their effectiveness was limited. Project 2 implemented air-induced mixing along coarse-bubble diffuser lines.

Project 2's air-induced mixing system was strategically designed with two large fan-shaped configurations, each consisting of six diffuser lines. One fan layout was installed on the north shore, and another on the south shore (Figure 1-1).

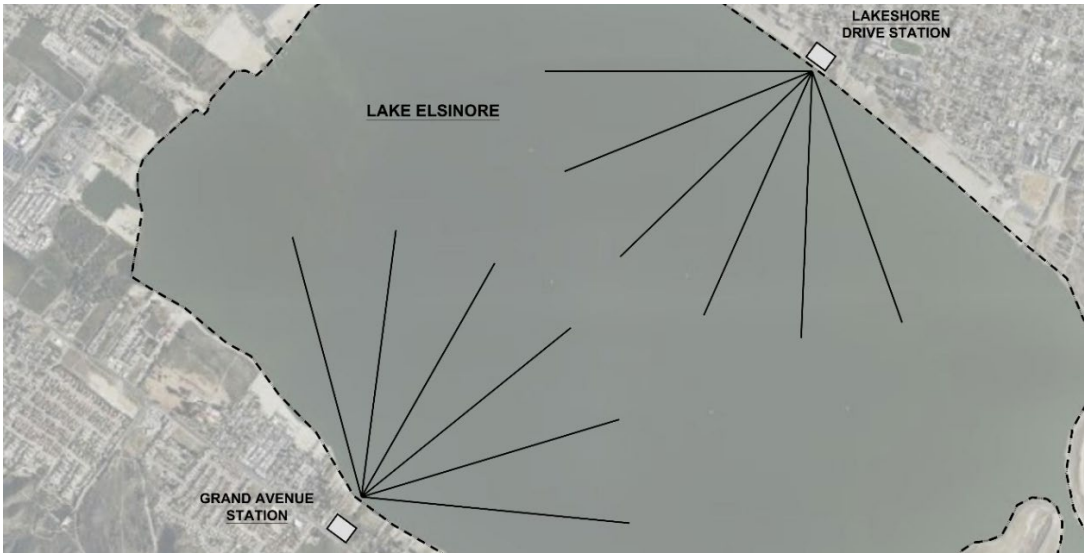


Figure 1-1: Overall Layout of Aeration Systems

The system has been in operation for about 17 years, running over 2,000 hours annually. Although the original design focused on automating air delivery, it was soon discovered that air mixing was most effective between 10 a.m. and 4 p.m. during non-winter months. As a result, the system now operates on a timer only during this window.

The development of Project 2 began in 1993, with Rich Geney[1] from GESI and limnologist Dr. Arlo Fast[1] providing concept layouts and equipment specifications to Lake Elsinore San Jacinto Water Authority (LESJWA) Consultant Black & Veatch. Between 2003 and 2005, these concepts were refined and presented to LESJWA and EVMWD for installation. Correspondence from this period indicates that Geney and Fast designed a system consisting of 12 diffuser lines, each 4,000 feet in length, totaling 48,000 feet of diffuser piping (6 x 4,000 feet per fan).

[1] The status of Mr. Geney and Dr. Fast are not known, and neither is readily available online.

The air mixing system's design and sizing were based on proprietary mixing models and the experience of Dr. Fast and his colleagues. They determined that Lake Elsinore would be easier to mix due to its weak thermocline differential pressure, compared to deeper lakes with less wind. On February 19, 2004, Rich Geney sent an email summarizing the final design for equipment procurements by GESI. The equipment package included four air compressors (2 x 2) feeding the 48,000 feet of diffuser piping, with a listed cost of $536,000 as of February 19, 2003.

Based on a May 2002 report by Dr. Fast, the original intent was to provide an airflow of 1,500 standard cubic feet per minute (scfm) per shoreline fan diffuser layout. The final design and installation used approximately 2,064 scfm, which has an approximate safety factor of 1.4.

1.2 Project Background

Project 2 (aeration system) has been in operation since 2007. As such, it is believed that the effectiveness of the system to increase dissolved oxygen (DO) levels and decrease nutrient releases from lake bottom sediments has decreased. In 2020, Dr. Alex Horne and Dr. Michael Anderson drafted a white paper which stated that in recent years, the DO levels have dropped below 2 mg/L in mid-April, instead of early July. Additionally, the nitrogen offsets have been consistently decreasing. As such, Dr. Alex Horne and Dr. Michael Anderson have suggested numerous approaches to solving these issues, with lake bottom oxygenation as the primary recommendation. It should be noted that a larger or rehabilitation of the existing aeration system was not recommended due to the uncertainty of its effectiveness.

In 2023, EVMWD sent out a Request for Proposal (RFP) to select a qualified team of consultants to "Evaluate Future Options for The Lake Elsinore Aeration and Mixing." GEI Consultants assembled a team of experts, including PACE, with significant experience at Lake Elsinore and in water quality assessments.

1.3 Objective

One of the project tasks is to assess the current conditions of the aeration system and to provide near-term recommendations to help keep the aeration system running while the new strategy/technology is being designed and implemented.

This condition assessment report aims to:

1. Evaluate the current state of the aeration system
2. Estimate the remaining service life of the aeration compressors
3. Provide recommendations for potential improvements

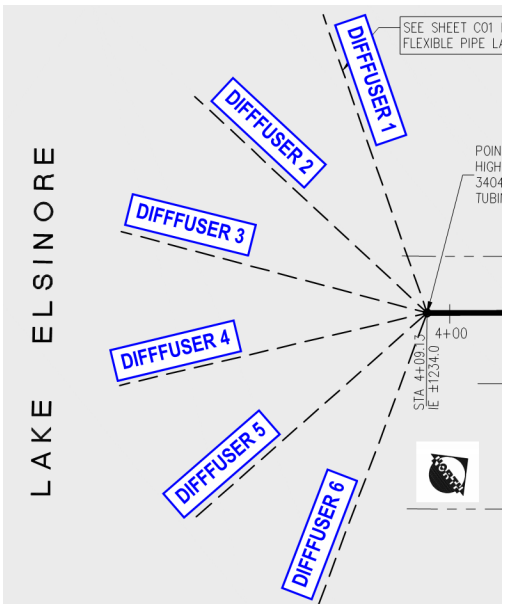
The evaluation is based on the following:

1. Site visit of both Aeration Systems (Lakeshore Drive and Grand Ave. Stations) and associated observations
2. Review of EVMWD maintenance records
3. Interviews with Maintenance Staff
    a. Maintenance of the compressor systems was historically coordinated through mechanical maintenance and performed by Osterbauer or Atlas Copco. In early 2021, maintenance staff took over maintenance and repair of the compressor systems.
4. Interviews with Atlas Copco representatives (Heath Blanchard, Gatlin Gold, and Dennis Livingston)
    a. All three individuals are technical experts for the Atlas Copco compressors and provide valuable insight on their experiences with compressors

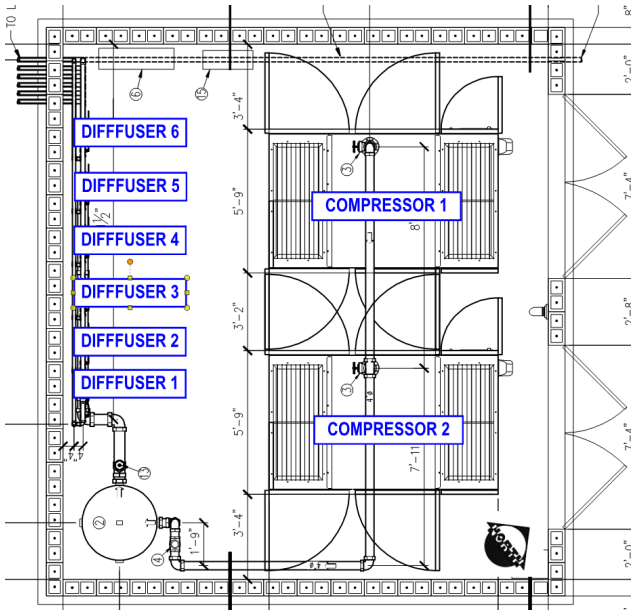
5. Interviews with Mark Piascik
    a. Mark has been working with EVMWD to maintain the diffuser lines for numerous years. He provides valuable insight on the condition of the existing diffuser lines.

2 Lakeshore Drive Station

On June 12, 2024, representatives from PACE (Andy Komor and Evan Chen), EVMWD (Sudhir Mohleji and Quentin Marty), and Atlas Copco (Heath Blanchard, Gatlin Gold, and Dennis Livingston) met to review and evaluate the conditions of the existing aeration system at the Lakeshore Drive Station. The compressor layout and labeling of the Lakeshore Drive Aeration System is depicted in Figure 2-1 below.



(a) Diffuser Line Layout inside Lake Elsinore



(b) Diffuser Line Layout inside Lakeshore Drive Station

Figure 2-1: Lakeshore Drive Aeration System Plan View

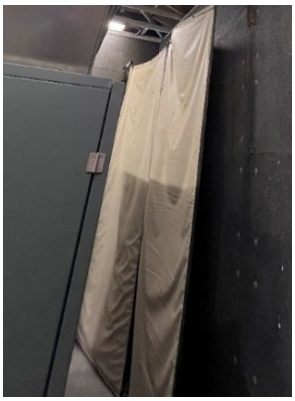
As shown in Figure 2-1, the diffuser line labeling inside the Lakeshore Drive Station and inside Lake Elsinore is mirrored.

2.1 Observations of Existing Equipment and its Conditions

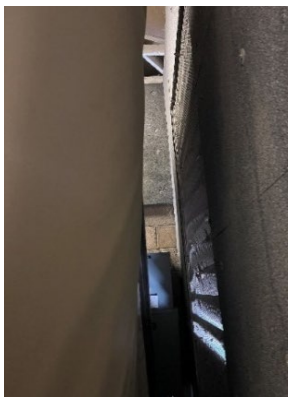
This section details general and equipment observations (from both PACE and Atlas Copco), equipment condition, and approximate remaining life of compressors. The start-up tests and observations during the start-up are discussed in **Section 2.2** and equipment recommendations are discussed in **Section 2.3**.

2.1.1 General Observations

The site and building were generally clean and appeared well maintained. Multiple forms of noise reduction were noted, including sound and vibration absorbing wall panels, sound traps on the exterior of the louvers, and noise-reducing blankets hung from the ceiling (Figure 2-2a).



(a) Example of Sound-Reducing Blanket



(b) Blanket Covering Louver

Figure 2-2: Photos of Sound-Reducing Blankets

These forms of sound-reducing materials reduce the noise from the compressors that would otherwise affect nearby residents. Unfortunately, the sound-reducing blankets are placed in front of the building louvers. These louvers are the only means of ventilation for the building, as there are no fans to push air into or pull air out of the building. If these louvers are blocked, as shown Figure 2-2b, it becomes difficult for fresh air to reach the compressors and allows hot air to build up inside the building.

Additionally, Atlas Copco's site visit report (Attachment D-1) noted that the building was noticeably warm and ventilation was inadequate. The blocked louvers, building temperature, and inadequate ventilation has negative effects on the compressor and the implications will be discussed in *Section 2.1.2*.

The conditions of the existing equipment are summarized in Table 2-1.

Table 2-1: Equipment List for Lakeshore Drive Station

Item #	Equipment Type	Quantity	Manufacturer	Model	Specifications
1	Compressor	2	Atlas Copco	ZE4-D-350	200 HP, 3/60/230-460V, 50 PSI, 1032 CFM
2	Air Receiver*	1	Hanson Tank	36-VM-400-R	400-gallon Air Receiver
3A	Rotameter (Type A)	5	King Instruments	7205-0231-A	0 to 430 SCFM (30 PSI & 70°F), 50 to 510 SCFM (48 PSI & 70°F), Used for Diffuser Line 1, 2, 3, 4, and 6
3B	Rotameter (Type B)	1	King Instruments	7205-0231-A	0 to 245 SCFM (14.7 PSI & 70°F), Used for Diffuser Line 5
4A	Pressure Gauge (Type A)	4	Winters	-	0 to 100 psi (Used for Diffuser Line 2, 4, 5, and 6)
4B	Pressure Gauge (Type B)	2	Unknown	-	Used for Diffuser Line 1 and 3
5	Exhaust Fan	0	-	-	-

Note:

* Manufacturer and model was not visible during the site visit, so the manufacturer and model was taken from the old construction submittals.

The equipment in Table 2-1 is organized in the order they are encountered in the aeration system. First, the compressors take in air from the building, then the compressed air travels through the air receiver, rotameters, and pressure gauges before exiting the Lakeshore Drive Station and discharging into the diffuser lines inside Lake Elsinore.

2.1.2 Compressors

2.1.2.1 Compressor Running Hours

The total running hours for Compressor 1 and 2 were 17,039 and 18,460 hours, respectively (Figure 2-3).



(a) Compressor 1 (b) Compressor 2

Figure 2-3: Photo of Lakeshore Drive Compressor Running Hours

The total running hours can be categorized into two distinct categories; loaded and unloaded. Per Figure 2-3, the compressor hours are only displayed as "running" and "loaded" hours. The compressor does not display the unloaded hours, but it can be calculated by subtracting the loaded hours from the running hours.

The breakdown of the running hours into loaded and unloaded hours is shown in Figure 2-4. The running hours indicate the total time the compressor is operational, including both loaded and unloaded hours. Loaded hours indicate the periods when the compressor is running and actively compressing air. On the other hand, unloaded hours refer to the hours when the compressor is running but not actively compressing air. During these unloaded hours, the compressor still consumes approximately 25% of its total power. These unload cycles typically occur during start-up or when both compressors are running simultaneously.

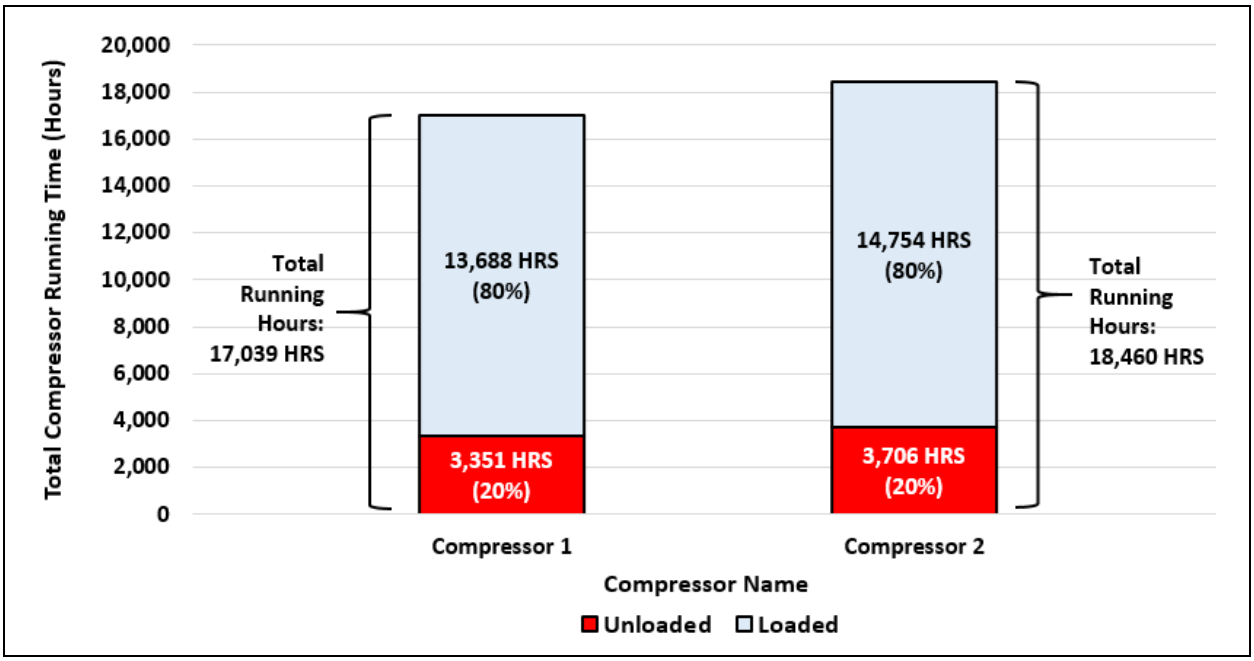


Figure 2-4: Lakeshore Drive Compressors Loaded vs. Unloaded Hours

For Compressors 1 and 2, the total running time is composed of approximately 80% loaded hours and 20% unloaded hours. This indicates that about 20% of the time the compressors are operational, they are not producing air, resulting in power wastage and discharging super-heated air into the building.

The loaded hours data from Figure 2-4 can be used to estimate the average annual runtime of the compressors. The compressors at the Lakeshore Drive Station have been fully operational for approximately 14 years, spanning from 2010 to 2024. Based on the distribution of loaded hours over this period, Compressor 1 averages 977 loaded hours per year, while Compressor 2 averages 1,053 loaded hours per year. Together, they account for a combined average loaded time of 2,030 hours annually. This figure serves as a general benchmark for their annual runtime, although actual runtime may vary yearly based on EVMWD's operational requirements.

Based on conversations with EVMWD, there is no written requirement or permit for the number of hours of operation per year for the aeration system. There is a verbal understanding between the Regional Water Quality Control Board and EVMWD that the aeration system at both stations should operate for a minimum of 2,000 hours per year.

2.1.2.2 Estimated Remaining Life – Based on Running Hours

Per Atlas Copco, the compressors have an expected lifecycle of approximately 80,000 running hours before a potential complete replacement may be necessary. However, this lifecycle is highly dependent on adhering to regular and proper maintenance procedures.

Figure 2-5, below, analyzes the current condition of the compressors based on their total running hours and expected lifecycle.

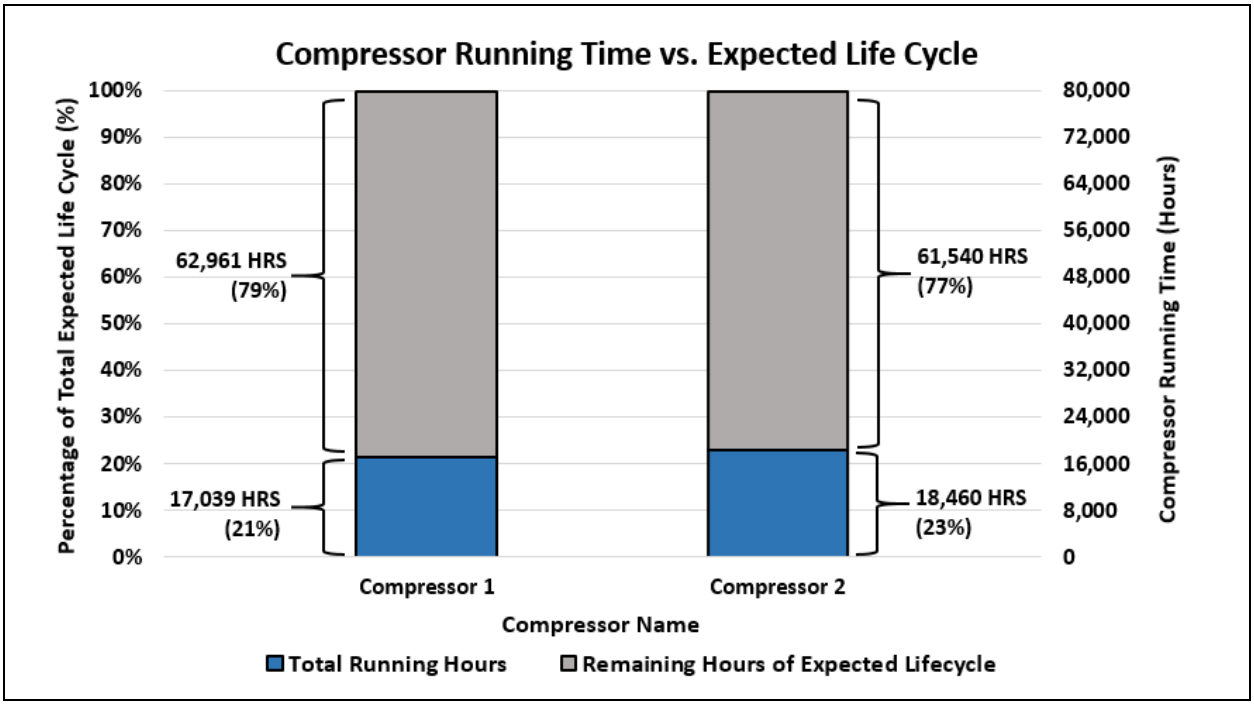


Figure 2-5: Lakeshore Drive Compressors Running Time Versus Expected Life Cycle

Based on Figure 2-5, Compressor 1 has run for around 21% of its total expected lifecycle, with around 63,000 hours of run time remaining. Compressor 2 has run for 23% of its total expected lifecycle, with around 62,000 hours of run time remaining. Given that the compressors have been in operation for approximately 14 years (2010 to 2024), and assuming that the average run time remains consistent, it is

projected that the compressors could take around 50 years (year 2074) to reach the end of their expected lifecycle. Note that this is a simplistic method of estimating the estimated remaining life of the compressors, and does not take into account the environment, operating conditions, and maintenance. An alternative approach to estimate the remaining life of the compressors, is by reviewing the annual maintenance and repair costs.

2.1.2.3 Estimated Remaining Life – Based on Maintenance Records

This section provides an alternative method to estimate the remaining life of the compressors by reviewing historical maintenance records. By analyzing maintenance records, it is possible to examine how much EVMWD spends annually on maintenance repairs, which correlates to how the compressor has been running. If the maintenance costs are high and don't follow the typical trend, then it could show that the compressors are nearing the end of their practical service life.

EVMWD provided PACE with all available maintenance records to facilitate this analysis. PACE reviewed these records and compiled the annual maintenance costs into a graph (Figure 2-6). There were gaps in the maintenance cost data where no information was available, which will reduce the accuracy of the projected annual maintenance costs.

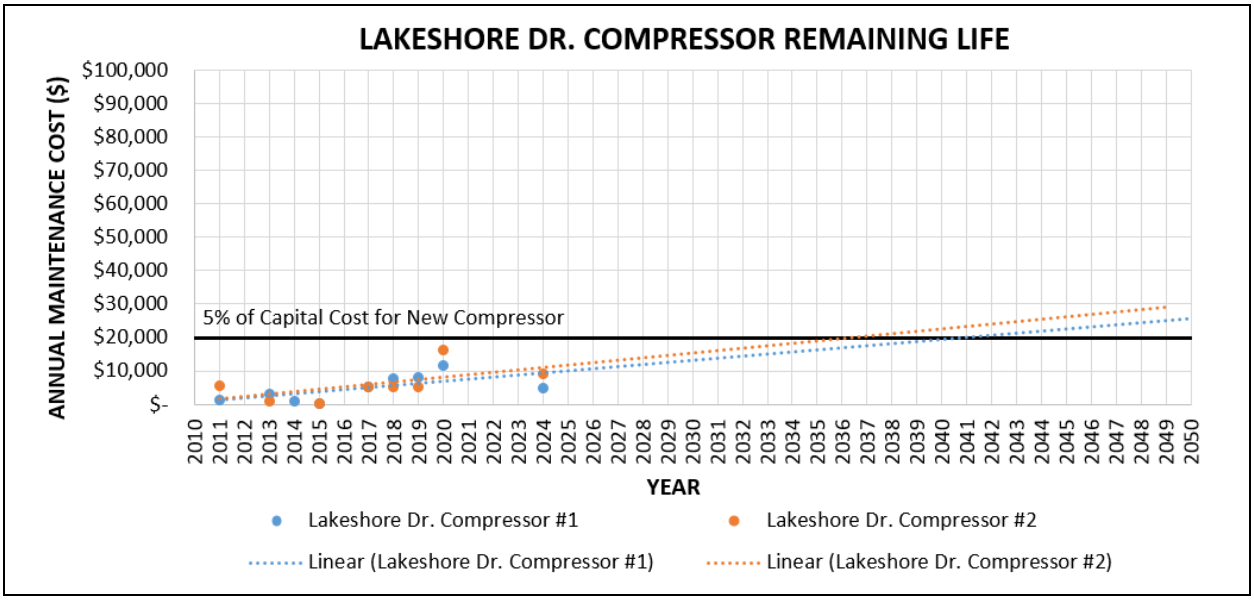


Figure 2-6: Lakeshore Drive Compressor Remaining Life Based on Annual Maintenance Cost

Generally, it is an industry rule of thumb to budget, at most 5% of replacement costs, for annual maintenance costs. Once this value is exceeded, it is typically recommended to analyze current maintenance processes (i.e. preventative vs reactive maintenance) and whether a complete replacement is necessary. Preventative maintenance is the practice of regularly maintaining the equipment to prevent it from breaking down, while reactive maintenance is the practice of only repairing the equipment when it breaks down. If preventative maintenance is consistently performed and the compressors still need additional expensive repairs, then it may be a sign that the compressor is coming to its end of useful life.

Figure 2-6 presents the annual maintenance costs over time for both Compressor #1 and #2. A best-fit linear line is used to project future costs. The dark horizontal line represents 5% of the capital cost for a new compressor. Based on a rough-order magnitude cost estimate, the capital replacement cost of each compressor is estimated at approximately $400,000. Using the 5% maintenance cost threshold, the annual budgeted maintenance cost is recommended to be around $20,000. Based on the linear projection shown

in Figure 2-6, the annual maintenance cost for both compressors will reach $20,000 each in year 2040 (15 years from now).

This estimate is approximate and it is recommended that EVMWD continue tracking and monitoring the annual maintenance and repair costs for each compressor. If, in the following years, the maintenance costs exceed 5%, then EVMWD should weigh the advantages and disadvantages of the repair. Items that should be considered include:

- The remaining operational duration of the system.
- The expected lifespan extension provided by the repair.

This report outlines near-term goals, as the system is likely to be replaced with a different system in the next few years. During this interim period, while the new oxygenation system is being designed and constructed, EVMWD must continue operating the aeration system to maintain nutrient offsets. Since the system cannot be entirely shut down in the event of a failure, the costs and benefits of each repair should be carefully evaluated.

2.1.3 Air Receiver

Following the compressors, the air flows into the air receiver, as shown in Figure 2-7. The purpose of an air receiver is to provide storage for the compressed air to assist with short-term peak demands in the system. It will also collect condensate at the bottom, which needs to be consistently drained.



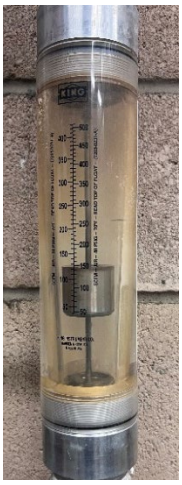
Figure 2-7: Photo of Lakeshore Drive Air Receiver

2.1.4 Rotameters

Immediately following the air receiver and before reaching the pressure gauges are the rotameters, which measure airflow. The rotameters were generally found to be in good condition. Notably, the rotameter for Diffuser Line 5 appears to have been recently replaced, as it shows the airflow measurement under standard conditions, unlike the others that display measurements under non-standard conditions. Additionally, the rotameter for Diffuser Line 5 looks newer and lacks the yellow tint seen on the other rotameters (Figure 2-8).



(a) Diffuser Line 1 – Item 3A



(b) Diffuser Line 2 – Item 3A



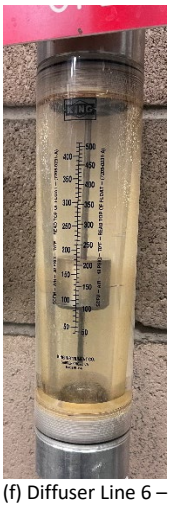
(c) Diffuser Line 3 – Item 3A



(d) Diffuser Line 4 – Item 3A



(e) Diffuser Line 5 – Item 3B



(f) Diffuser Line 6 – Item 3A

Figure 2-8: Photos of Lakeshore Drive Rotameters on Discharge Lines

2.1.5 Pressure Gauges

Before the compressed air exits the Lakeshore Drive Station, it passes through pipes equipped with pressure gauges. Each diffuser line has its own pressure gauge to monitor discharge pressure. The pressure gauges for Diffuser Line 1 and 3 (Figure 2-9a and c) were found in poor condition, making them difficult to read and collect accurate information. In contrast, the pressure gauges for Diffuser Line 2, 4, 5, and 6 (Figure 2-9b, d, e, and f) were clean and easy to read.



(a) Diffuser Line 1 – Item 4B



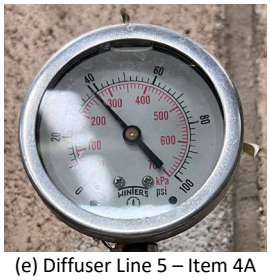
(b) Diffuser Line 2 – Item 4A



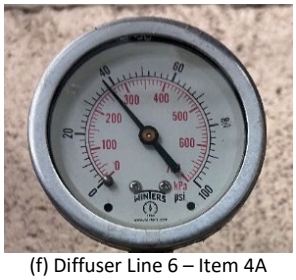
(c) Diffuser Line 3 – Item 4B



(d) Diffuser Line 4 – Item 4A



(e) Diffuser Line 5 – Item 4A



(f) Diffuser Line 6 – Item 4A

Figure 2-9: Photos of Lakeshore Drive Pressure Gauges on Discharge Lines

2.2 Compressor Start-Up and Testing

After initial observations of the existing equipment were made, the compressors at the Lakeshore Drive Station were started up and tested. The purpose of the start-up and testing included:

- Record airflow and pressure of one vs. dual compressor operation
- Observe and note any issues during start-up and noise during start-up
- Functionality of compressors
- Loading/Unloading Cycles
- Have Atlas Copco inspect the compressors and note any issues
    - Atlas Copco's Site Visit Reports are provided in Attachment D-1

During compressor startup, Atlas Copco observed that only Compressor 1 was functioning, while Compressor 2 was malfunctioning and not operating properly. A detailed inspection revealed that the air throttle valve was not opening in response to the load signal, a malfunction typically associated with diaphragm issues. The diaphragm of the air throttle valve is a flexible disc that typically moves up and down to allow flow. Based on Atlas Copco's maintenance checklist (Attachment D-2), the air throttle valve's diaphragm should be replaced every time the compressor runs 4,000 hours.

During the start-up of the aeration system, Compressor 1's discharge pressure cycled between 40 and 55 psig. At approximately 55 psig, the compressor unloaded and released excess hot air into the building to relieve pressure. Note that, when the compressor unloads, the pressurized heated air is discharged into the compressor cabinet and building. This condition actively contributes to high oil temperature alarms and equipment shutdowns. It remained unloaded until the pressure dropped to approximately 40 psig, at which point it reloaded. The discharge pressure data, recorded by the Elsinore Valley Municipal Water District (EVMWD), is illustrated in Figure 2-10, providing a graphical representation of the start-up process.

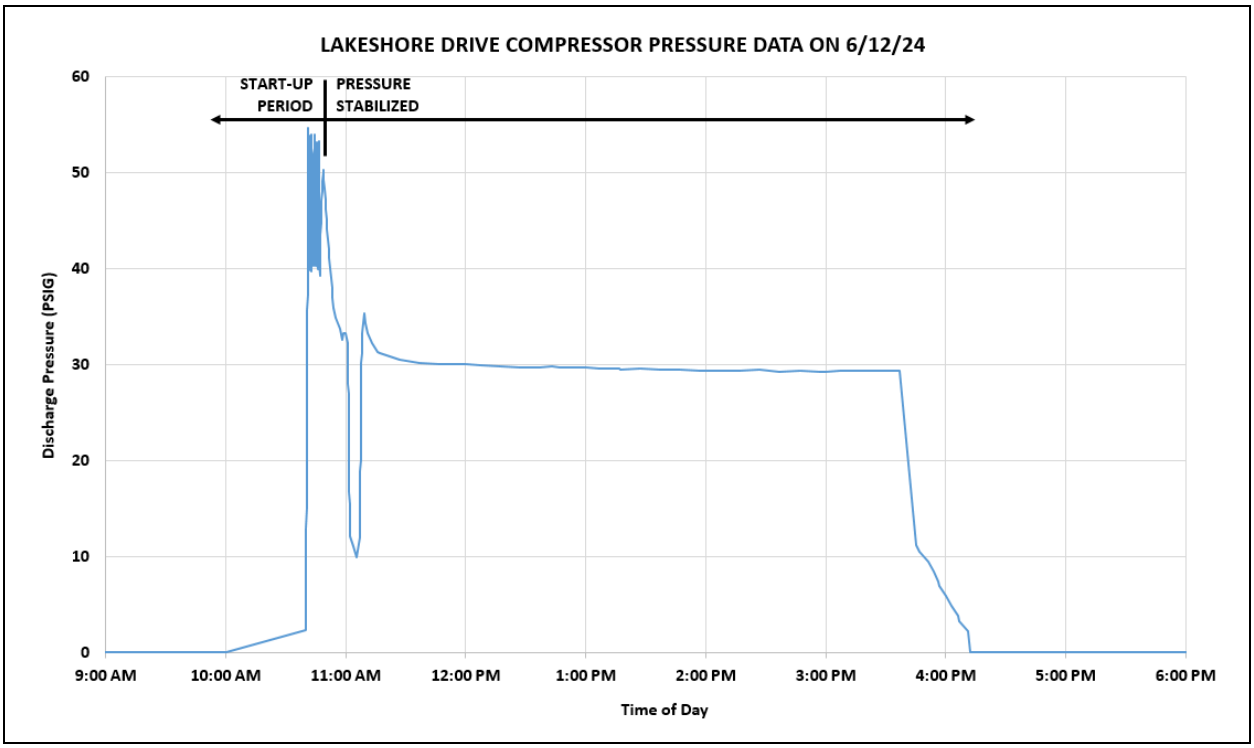


Figure 2-10: Start-up for Lakeshore Drive Compressor 1

As seen in Figure 2-10, between 10:40 and 10:50 am, Compressor 1 was consistently cycling between 40 and 55 psig during the start-up period. This cycling is a normal operational procedure and does not negatively affect the aeration system, other than discharging hot air into the room. When the aeration system turns off for the day, water flows back through the holes of the diffuser line. During start-up of the following day, the compressor has to push all of the water out of the diffuser lines before it can properly begin to provide air to Lake Elsinore.

Figure 2-10 also indicates that Compressor 1 compresses air until it reaches approximately 55 psig. The maximum allowable pressure for the compressors is 58 psig. Once Compressor 1 reaches 55 psig, it unloads and relieves pressure until it drops to about 40 psig, at which point the compressor loads again and compresses air until 55 psig.

This start-up process should not have any negative effects on the compressors and the short-time required for this procedure means that it does not take up a lot of the run-time of the compressors and does not consume more energy than required.

Once most/all of the water was pushed out of the diffuser line, the discharge pressure stabilized around 30 psig. Based on the data provided from EVMWD, Figure 2-10, there was a drop in pressure to around 10 psi for roughly 10 to 15 minutes. This drop in pressure was not observed during the site visit, so it is not clear what may have caused this.

The Lake Elsinore – Lake Watch website reports a lake elevation on 6/12/24 of approximately 1249 feet. The diffuser lines, installed at the lake bottom elevation of 1218 feet, experienced 31 feet (13.5 psig) of hydrostatic pressure. This means when Compressor 1 stabilized at 30 psig, the friction loss through the diffuser lines was approximately 16.5 psig. Even at its highest water depth (when lake elevation is 1255 feet – a.k.a. 16 psig), the compressors would be capable of pushing through the water depth, with a total pressure requirement of approximately 32.5 psig required. Figure 2-10 shows there was no unloading/loading after the initial start-up period. Once Compressor 1 had successfully pushed out the water from the diffuser lines and stabilized at roughly 30 psig, it continued to run smoothly at 30 psig and did not unload further (which means it did not release hot air into the building).

During start-up, Atlas Copco conducted inspections and tests on Compressor 1, noting several issues (Attachment D-1). One of the main issues was related to temperature errors and settings found on the compressor display. Atlas Copco noted that the oil shutdown threshold was raised to handle higher temperatures and shutdowns occurred with ambient room temperatures reaching 129°F. Both of these are related to the room temperature. An oil shutdown threshold greater than recommended levels, 159°F, will cause the oil to degrade faster. Temperature shutdowns means that the compressors cannot run when needed, especially during hot days when the lake may be stratified.

Another issue noted on Compressor 1 was that one power leg was significantly hotter than the others, with a temperature of 125°F compared to 86°F. The power legs refer to the individual electrical conductors that carry a phase of power, basically providing power to the compressors. Atlas Copco attributes this uneven power leg temperature to loose lugs. The lugs secure the wires to the terminals, so when they are loose, there is higher electrical resistance, leading to more heat generation and potential wire insulation damage.

Finally, Atlas Copco noted that there was oil leaking from Compressor 1's vent ports, which is typically attributed to the lack of gearcase vent service.

Since Compressor 2 was not able to run during the site visit, the dual compressor operation could not be observed. In place of this, EVMWD has provided compressor pressure data from a previous run date, specifically September 15, 2022 (Figure 2-11). Note that only pressure data is capable of being automatically recorded, so airflow during dual compressor operation could not be observed.

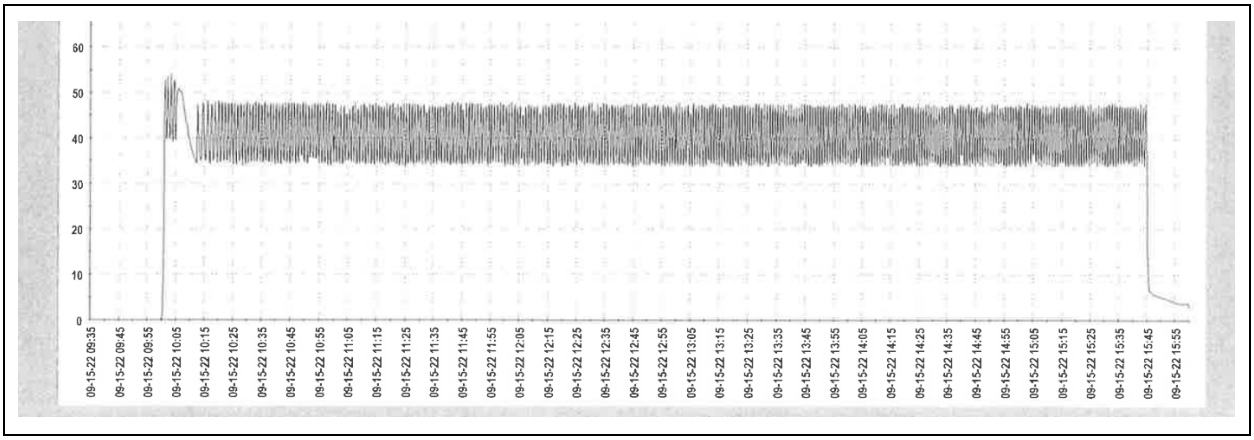


Figure 2-11: Lakeshore Drive Compressors Pressure Data on 9/15/2022

Figure 2-11 indicates that the same start-up process was observed on September 15, 2022. The start-up lasted roughly 10-minutes, similar to observations during the site visit. After start-up, the pressure dropped to 35 psig, at which point, the aeration system began to cycle between approximately 35 and 50 psig every 60 seconds. At 50 psig, the secondary compressor unloaded, blowing off pressure and releasing hot air into the building. When the pressure fell to 35 psig, the secondary compressor reintroduced compressed air into the system.

When a compressor unloads, it is still powered on but not producing and releasing any compressed air. During this period, Atlas Copco states that the compressor still consumes approximately 25% of the required power.

Additionally, when looking at the total run time per day (10 am to 4 pm), if the aeration system unloads and cycles every 60 seconds, this indicates that the compressor unloads approximately 360 times per day. Especially on hot days and without proper ventilation, the hot air discharged during the cycling process begins to build up in the building and can cause the air to be heated, triggering temperature based shutdowns which interrupt the aeration process for the day and directly contribute to premature failure of ancillary equipment to excessive heat. Temperature based shutdowns cannot be corrected until the equipment cools, typically extending equipment reset timing to the next day.

Once the pressure stabilized at around 30 psig, the rotameters were read to determine the airflow. The data is summarized in Table 2-2.

Table 2-2: Diffuser Line Air flow and Pressure Readings

	Diffuser Line 1	Diffuser Line 2	Diffuser Line 3	Diffuser Line 4	Diffuser Line 5	Diffuser Line 6	Total***
Airflow* (CFM)	120	130	130	150	160**	190	880

Note:

* Rotameters read at 30 PSIG and 70°F

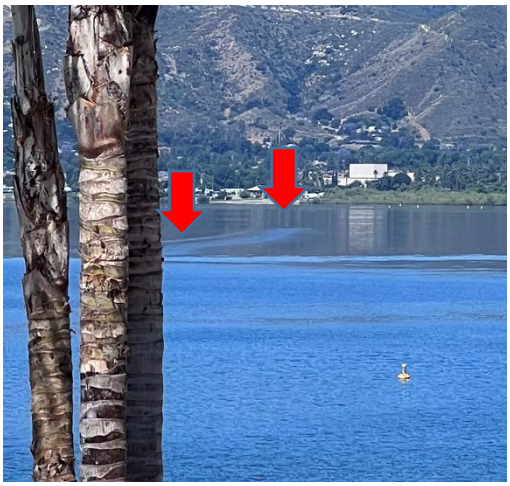
** Rotameter only provides reading at STP (1 atm, 70°F) and was converted to 30 PSIG and 70°F

*** Due to old age and inaccuracy of rotameters, ±25% from compressor air flow is expected, and actual airflow is unknown

The varying airflow readings can be attributed to the topography of Lake Elsinore. Diffuser Line 1 is installed in the deeper portion of the lake, while Diffuser Line 6 is in a shallower section. As a result, Diffuser Line 1 experiences a higher hydrostatic pressure, requiring the diffuser lines in the shallower water to need more airflow to balance the pressure within the diffuser line.

During EVMWD's diffuser line service event in March 2024, Diffuser Line 1 was not cleaned so that the difference between maintained and non-maintained diffuser lines can be determined. Diffuser Line 2, which is closest to Diffuser Line 1 was used as a comparison to assess the impact of cleaning. Diffuser Line 1 exhibit a 10% lower flow rate compared to Diffuser Line 2, suggesting that cleaning and re-drilling the holes did not significantly improve airflow. Nonetheless, regular maintenance and cleaning of the lines remain crucial to prevent the accumulation of debris, which can build up over time, if neglected.

Once the air was able to push out the water, bubbles were observed at the surface of Lake Elsinore, as shown in Figure 2-12.



(a) Diffuser Line 1



(b) Diffuser Line 6

Figure 2-12: Photos of Aeration Bubbles

Figure 2-12 shows that the bubbles coming from Diffuser Line 6 are more prominent than those coming from Diffuser Line 1. This is expected, as there is less airflow to Diffuser Line 1. Visually, the system appears to operate correctly. Most aeration system activity occurs underwater, with surface observations limited to the bubbles it generates.

2.3 Lakeshore Drive Station Recommendations

The following recommendations are based on previously discussed observations, and include suggestions from Atlas Copco and PACE. These recommendations address near-term needs while the new system is being designed and constructed.

The following Attachments provide documents to guide maintenance efforts, ensuring the longevity and efficiency of the compressors.

1. Atlas Copco Maintenance Checklist (Attachment D-2)
2. Atlas Copco Maintenance Quote (Attachment D-3)
   - Estimated around $55,000 total or $13,750 per compressor
3. Atlas Copco Operation and Maintenance Manual (Attachment D-5)

The majority of the issues previously noted include noise, old instrumentation, and building temperature. The over pressurization and unloading cycles have generated more heat than originally anticipated, while the addition of sound blankets has altered the building's insulation characteristics.

2.3.1 Instrumentation Replacement

It is recommended to replace the dirty and worn out pressure gauges with new ones that are easier to read. Since the original edition of this report was provided to EVMWD, the pressure gauges have been replaced.

Another item noted is the different rotameters present. Since the compressors typically operate at 30 psig – during one compressor operation, and 50 psig – two compressor operation, it makes it easier to determine the air flow rate at these conditions if the rotameters are calibrated and show air flow rates at these pressures. Figure 2-8e shows the rotameter rated for airflow at STP, which is 14.7 psia or 0 psig. Although it is still possible to convert from STP to different pressure requirements, it adds an extra step.

2.3.2 Building Temperature

The building air temperature affects the performance and longevity of the compressors. Since the compressors use building air as their inlet, it is crucial to keep the building air cool to prevent overheating, which could cause compressor wear and trigger fault alarms. Atlas Copco's operation and maintenance manual recommends a maximum inlet temperature of 104°F. The ambient temperatures in the City of Lake Elsinore reach well above this threshold, often exceeding 110°F for several weeks during summer months.

Since PACE's site visit, EVMWD have removed the aeration compressor doors to help aid in the cooling of the compressors.

To facilitate cooling, the following are recommended:

1. Move and/or remove noise-reducing blankets
    a. Do not block louvers, so that air has an easier time entering the building. It is understood that the noise-reducing blankets were put up due to noise, so it may not be possible to move or remove these without affecting the neighbors.

2. Install exhaust/supply fans
    a. As-built drawings show two exhaust fans, however, none were observed during the site-visit. The designed exhaust fans help to draw the hot air out of the building so that it can be replaced by fresh outdoor air. Especially during hot summer days, when two compressors are operating simultaneously, and consistently cycling and blowing off hot air into the room, this can cause the air in the room to be heated.
    b. If a negative pressure exhaust fan is used, it will pull the hot air out of the building. This removed air will then be replaced by the fresh outdoor air that travels in mainly through the building louvers and any other openings.
    c. If a positive pressure supply fan is used, it will push fresh outdoor air into the building, mixing it with the heated building air, which will then be pushed out of any building openings.
    d. Either method is an acceptable approach to providing more ventilation to the existing building.

3. Only run one compressor at a time
    a. The compressor design was purposefully oversized to be conservative. Upon reevaluating the design, it was found that one compressor operating at 1,030 SCFM provides 70% of the original mixing energy (1,500 CFM) intended for the lake. Because the compressors were oversized in 2003 compared to the original specifications, and the diffuser pipe diameter was reduced to cut initial costs, it is not recommended to operate the second compressor simultaneously under normal conditions. Operating only the duty compressor will prevent excessive heat buildup from unloading cycles due to over-pressurization. This will reduce mechanical problems, lower electrical demand, extend equipment life, and minimize noise and vibration.

2.3.3 General Compressor Maintenance

Atlas Copco noted several items during their visual inspections and observations of the Lakeshore Drive compressors. Their recommendations, summarized from the site visit report (Attachment D-1), are as follows:

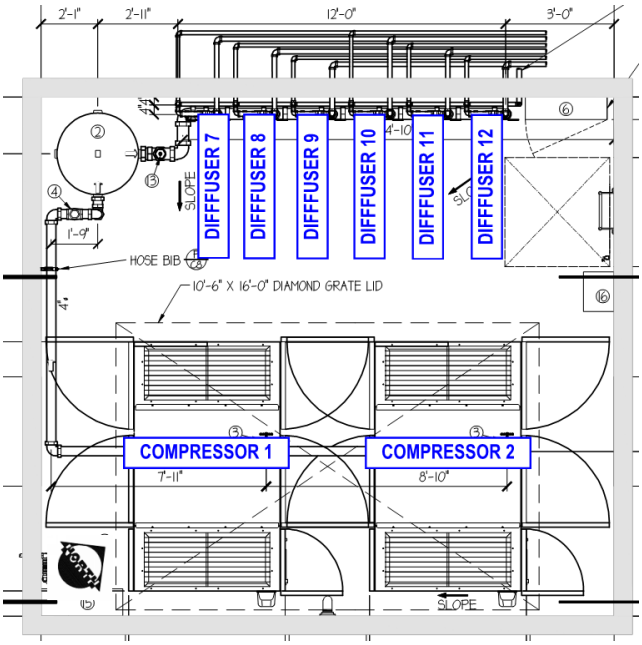
1. Reset the oil shutdown temperature to 159°F to prevent fast oil degradation and potential machine damage.
    a. It is understood that the oil shutdown temperature may have been raised due to the high building temperatures, however, it is important to leave these settings at their recommended values, unless otherwise told by Atlas Copco or another compressor specialist. Although the high temperatures are causing the compressors to shut down, the faults (i.e. oil shutdown temperatures) are in place to protect the compressors from unnecessary damage.

2. Tighten the lugs on both the incoming power lines and the outgoing connections to the motor.
    a. Tightening the lugs should reduce the resistance on the electrical power leg and prevent the power legs from overheating and rising to abnormal temperatures (i.e. 125°F vs 86°F).

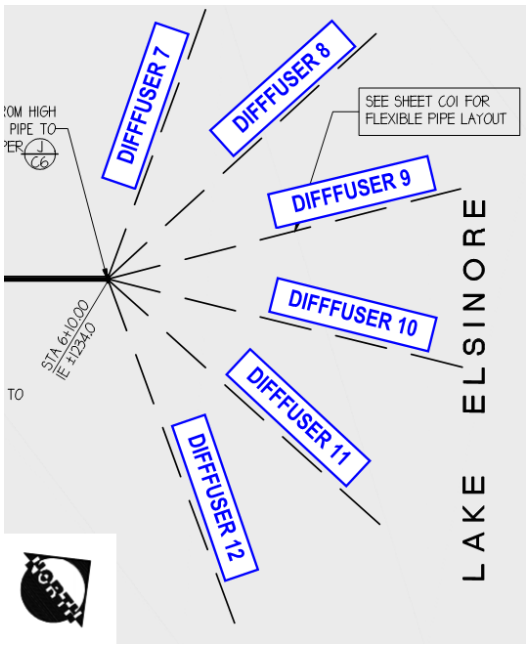
3. Perform a 16k hour service on both compressors
    a. Atlas Copco recommends performing standard maintenance after a set number of running hours (Attachment D-2). For instance, the 16k hour service should be done when the compressor reaches 16,000 hours of total runtime.
    b. Atlas Copco advises performing the 16k hour service for both Compressor 1 and 2. This includes overhauling the check valve, changing the oil and filters, and noting any damage to Compressor 2's throttle valve.
        i. It is not required for Atlas Copco to provide the maintenance service, although they are most familiar with their equipment and associated maintenance needs. The Elsinore Valley Municipal Water District can select any qualified company to perform the necessary maintenance.

3 Grand Ave Station

After the assessment at the Lakeshore Drive Station, representatives from PACE (Andy Komor and Evan Chen), EVMWD (Quentin Marty), and Atlas Copco (Heath Blanchard, Gatlin Gold, and Dennis Livingston) met to review and evaluate the conditions of the existing aeration system at the Grand Ave Station. The compressor layout and labeling of the Grand Ave Aeration System is depicted in Figure 3-1 below.



(a) Diffuser Line Layout inside Grand Ave Station



(b) Diffuser Line Layout inside Lake Elsinore

Figure 3-1: Grand Ave Aeration System Plan View

3.1 Observations of Existing Equipment and its Conditions

This section details general and equipment observations (from both PACE and Atlas Copco), equipment condition, and approximate remaining life of compressors. The start-up tests and observations during the start-up are discussed in **Section 3.2** and equipment recommendations are discussed in **Section 3.3**.

3.1.1 General Observations

The Grand Ave Station site generally looked clean. There are two compressor exhaust vents, two general vault exhaust vents, and two passive air intake vents (Figure 3-2).



(a) Compressor Exhaust Vents



(b) General Vault Exhaust Vent



(c) Passive Air Intake Vent

Figure 3-2: Photos of Grand Ave Station Ventilation System Vents

Unlike the Lakeshore Drive Station, which relies on passive air intake for fresh air, the Grand Ave Station uses two exhaust fans (Figure 3-3) to create negative air pressure and circulate air inside the vault.



Figure 3-3: Photos of Exhaust Fans

The exhaust fans were not running during the site visit.

The existing equipment at the Grand Ave Station is summarized in Table 3-1, below.

Table 3-1: Equipment List for Grand Ave Station

Item #	Equipment Type	Quantity	Manufacturer	Model	Specifications
1	Compressor	2	Atlas Copco	ZE4-D-350	200 HP, 3/60/230-460V, 50 PSI, 1032 CFM
2	Air Receiver*	1	Hanson Tank	36-VM-400-R	400-gallon Air Receiver
3A	Rotameter (Type A)	4	King Instruments	7205-0231-A	0 to 430 SCFM (30 PSI & 70°F), 50 to 510 SCFM (48 PSI & 70°F), Used for Diffuser Line 7, 8, 11, and 12
3B	Rotameter (Type B)	2	King Instruments	7205-0231-A	0 to 245 SCFM (14.7 PSI & 70°F), Used for Diffuser Line 9 and 10
4	Pressure Gauge	6	Winters	-	0 to 100 psi
5	Exhaust Fan*	2	Greenheck	SE1-12-426-D-1	749 CFM at 0.2 inwg, 1550 RPM, 1/10 hp, 1/60/115V

Note:
* Manufacturer and model was not visible during the site visit, so the manufacturer and model was taken from the old construction submittals.

Besides the exhaust fan, the equipment in Table 3-1 is organized in the order they are encountered in the aeration system. The compressors take in air from the vault, and the compressed air travels through the air receiver, rotameters, and pressure gauges before exiting the Grand Ave Station and discharging into Lake Elsinore.

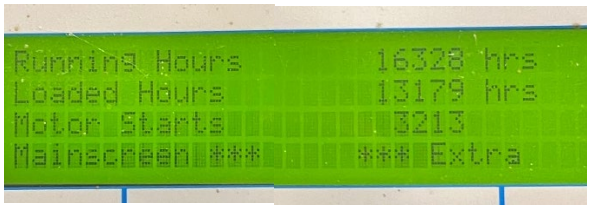
3.1.2 Compressors

3.1.2.1 Compressor Running Hours

Compressor 1 and 2 at the Grand Ave Station have running hours of 14,347 and 16,328 hours, respectively (Figure 3-4).



(a) Compressor 1



(a) Compressor 2

Figure 3-4: Photos of Grand Ave Compressor Running Hours

Compressor 1 displayed 4,347 total running hours and 3,912 loaded hours, which seemed unreasonably low. After discussions with Atlas Copco, it was determined that the correct values should be 14,347 total running hours and 13,912 loaded hours. The total running hours can be categorized into two distinct categories; loaded and unloaded (Figure 3-5).

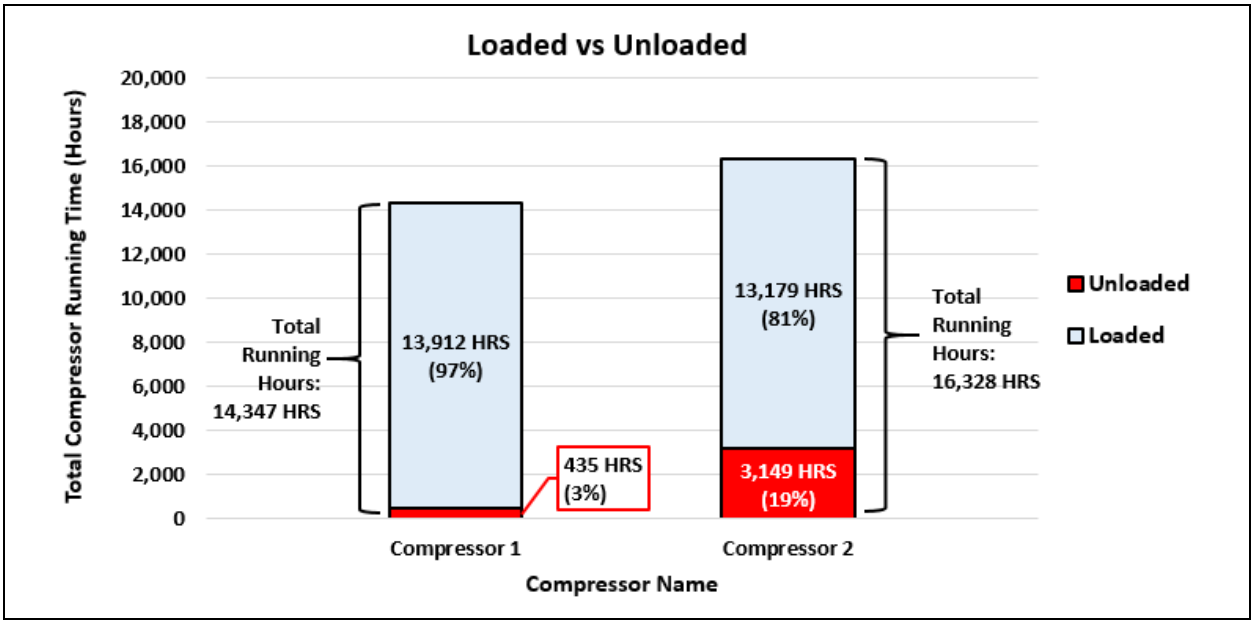


Figure 3-5: Grand Ave Compressors Loaded vs. Unloaded Hours

For Grand Ave Compressor 1, the total running time is composed of approximately 97% loaded hours and 3% unloaded hours. Grand Ave Compressor 2 has approximately 81% loaded hours and 19% unloaded hours. This indicates that about 3% of the time Compressor 1 and 19% of the time Compressor 2 are operational, they are not producing air and wasting power.

The loaded hours data from Figure 3-5 can be used to estimate the average annual runtime of the compressors. The compressors at the Grand Avenue Station have been fully operational for approximately 14 years, spanning from 2010 to 2024. Based on the distribution of loaded hours over this period, Compressor 1 averages 1,000 loaded hours per year, while Compressor 2 averages 1,053 loaded hours per year. Together, they account for a combined average loaded time of 2,030 hours annually. This figure

serves as a general benchmark for their annual runtime, although actual runtime may vary yearly based on EVMWD's operational requirements.

3.1.2.2 Estimated Remaining Life – Based on Running Hours

Per Atlas Copco the compressors have an expected lifecycle of approximately 80,000 hours before a potential complete replacement may be necessary. Figure 3-6, below, analyzes the current condition of the compressors based on their total running hours.

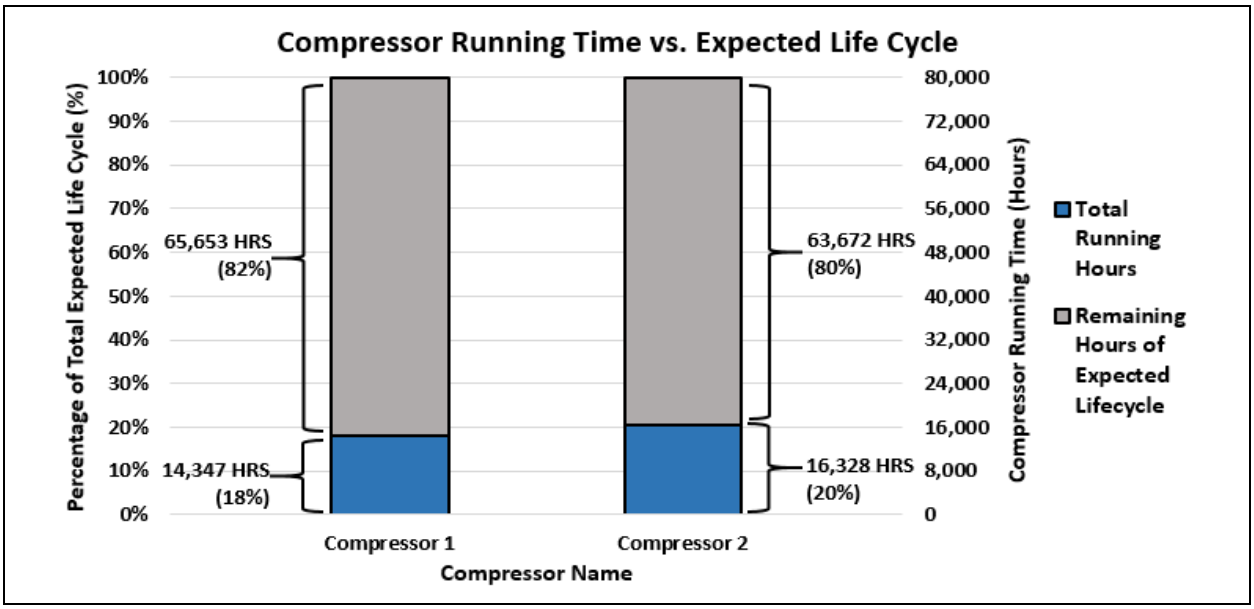


Figure 3-6: Grand Ave Compressor Running Time Versus Expected Life Cycle

Based on Figure 3-6, Compressor 1 has run for around 18% of its total expected lifecycle, with approximately 65,700 hours of run time remaining. Compressor 2 has run for 20% of its total expected lifecycle, with around 63,700 hours of run time remaining. Given that the compressors have been in operation for approximately 14 years (2010 to 2024), and assuming that the average run time remains consistent, it is projected that Compressor 1 and 2 could take around 55 years (2080), respectively, before reaching its expected lifecycle. Note that this is a simplistic method of estimating the remaining life of the compressors and does not take into account the environment, operating conditions, and maintenance. An alternative approach to estimate the remaining life of the compressors is by reviewing the annual maintenance and repair costs.

3.1.2.3 Estimated Remaining Life – Based on Maintenance Records

This section provides an alternative method to estimate the remaining life of the compressors by reviewing historical maintenance records. By analyzing maintenance records, it is possible to examine how much EVMWD spends annually on maintenance repairs, which correlates to how the compressor has been running. If the maintenance costs are high and don't follow the typical trend, then it could show that the compressors are nearing the end of their practical service life.

EVMWD provided PACE with available maintenance records to facilitate this analysis. PACE reviewed these records and compiled the annual maintenance costs into a graph (Figure 3-7). There were gaps in the maintenance cost data where no information was available, which will reduce the accuracy of the projected annual maintenance costs.

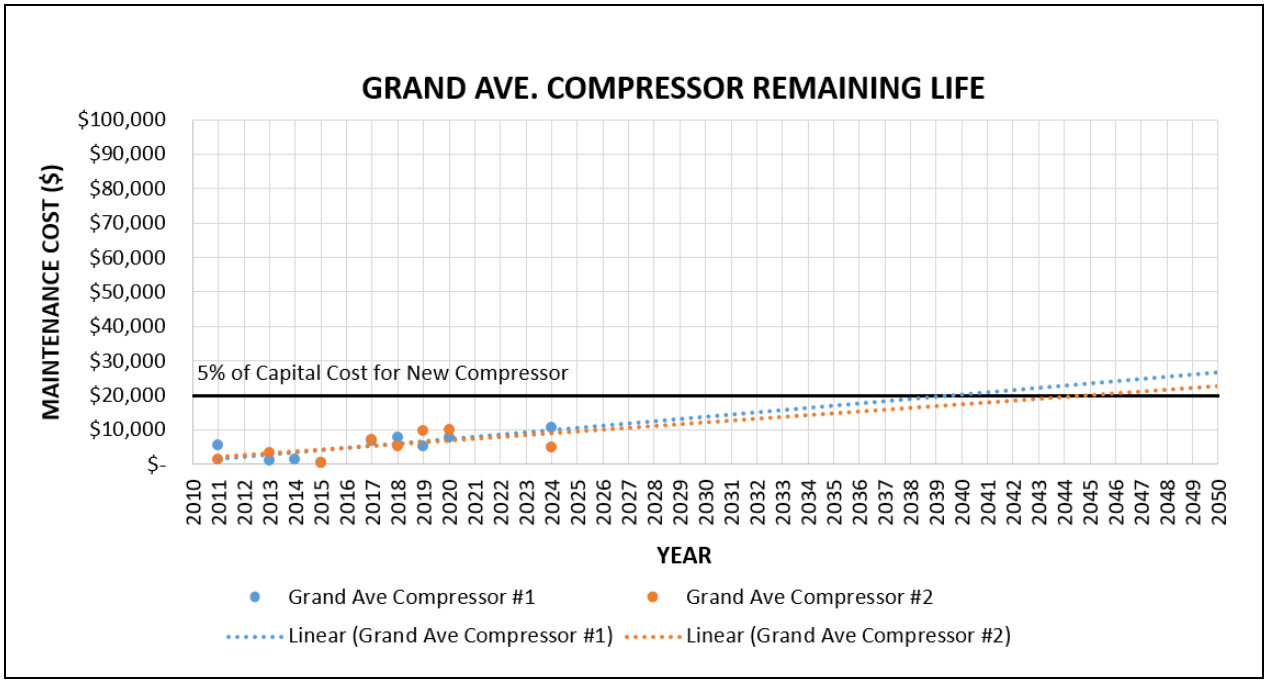


Figure 3-7: Grand Ave Drive Compressor Remaining Life Based on Annual Maintenance Cost

Generally, it is an industry rule of thumb to budget at most 5% of replacement costs for annual maintenance. Once this value is exceeded, it is typically recommended to analyze current maintenance processes and procedures. For instance, it should be analyzed if the maintenance costs are from preventative or reactive maintenance. Preventative maintenance is the practice of regularly maintaining the equipment to prevent it from breaking down, while reactive maintenance is the practice of only repairing the equipment when it breaks down. If preventative maintenance is consistently performed and the compressors still need additional expensive repairs, then it may be a sign that the compressor is coming to its end of useful life.

Figure 3-7 presents the annual maintenances costs plotted over time for both Compressor #1 and #2. A best-fit linear line is used to project future costs The dark horizontal line represents 5% of the capital cost for a new compressor. Based on a rough-order magnitude, the capital replacement cost of each compressor is estimated at approximately $400,000 (materials and installation). Using the 5% maintenance cost threshold, the annual budgeted maintenance cost is recommended to be around $20,000. Based on the linear projection shown in Figure 3-7, the annual maintenance cost for both compressors will reach $20,000 each in year 2040 (15 years from now).

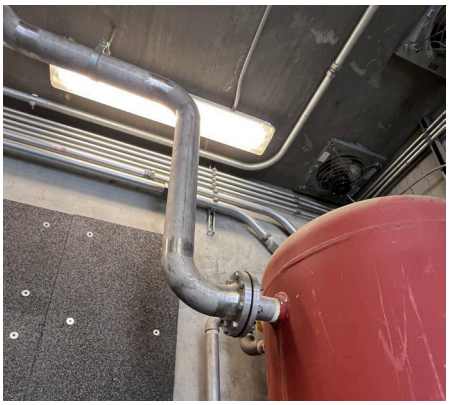
This estimate is approximate and it is recommended that EVMWD continue tracking and monitoring the annual maintenance and repair costs for each compressor. If, in the following years, the maintenance cost exceeds 5%, then EVMWD should weigh the advantages and disadvantages of the repair. Items that should be considered include:

- The remaining operational duration of the system.
- The expected lifespan extension provided by the repair.

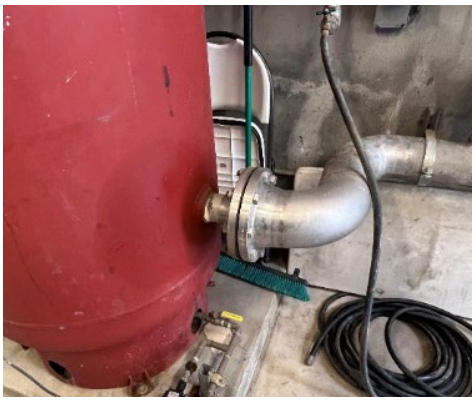
This report outlines near-term goals, as the system is likely to be replaced with a different system in the next few years. During this interim period, while the new oxygenation system is being designed and constructed, EVMWD must continue operating the aeration system to maintain nutrient offsets. Since the system cannot be entirely shut down in the event of a failure, the costs and benefits of each repair should be carefully evaluated.

3.1.3 Air Receiver

Following the compressors, the air flows into the air receiver, as shown in Figure 3-8. The air receiver appeared in good condition.



(a) Air Receiver Inlet



(b) Air Receiver Outlet

Figure 3-8: Photo of Grand Ave Air Receiver

3.1.4 Rotameters

Immediately following the air receiver are the rotameters, which looked in fair or good condition. It appeared that the rotameters for Diffuser Line 9 and 10 (Figure 3-9c and d) were replaced, as it shows the airflow measurement under standard conditions and do not have an orange tint.



(a) Diffuser Line 7 – Item 3A



(b) Diffuser Line 8 – Item 3A



(c) Diffuser Line 9 – Item 3B



(d) Diffuser Line 10 – Item 3B



(e) Diffuser Line 11 – Item 3A



(f) Diffuser Line 12 – Item 3A

Figure 3-9: Photos of Grand Ave Rotameters on Discharge Lines

3.1.5 Pressure Gauges

Before the compressed air exits the Grand Ave Station, it passes through pipes equipped with pressure gauges. Each diffuser line has its own pressure gauge to monitor discharge pressure. Unlike the pressure gauges at the Lakeshore Drive Station, all pressure gauges were clean and easy to read (Figure 3-10).



(a) Diffuser Line 7 – Item 4



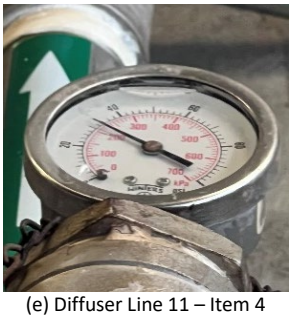
(b) Diffuser Line 8 – Item 4



(c) Diffuser Line 9 – Item 4



(d) Diffuser Line 10 – Item 4



(e) Diffuser Line 11 – Item 4



(f) Diffuser Line 12 – Item 4

Figure 3-10: Photos of Grand Ave Pressure Gauges on Discharge Lines

3.2 Compressor Start-Up and Testing

The purposes of the testing are the same as those for the Lakeshore Drive Station and is listed below for the reader's convenience:

- Record airflow and pressure with one vs. dual compressor operation
- Observe and note any issues during start-up and noise during start-up
- Functionality of compressors
- Loading/Unloading Cycles
- Have Atlas Copco inspect the compressors and note any issues
    - Atlas Copco's Site Visit Reports are provided in Attachment D-1

When PACE arrived at the Grand Ave Station, the compressors had completed their start-up procedure, so PACE did not witness it. To supplement, PACE obtained the operational pressure data from EVMWD (Figure 3-11). Atlas Copco inspected both compressors and found that while both were running, Compressor 1 was not loaded due to a leak in the throttle valve.

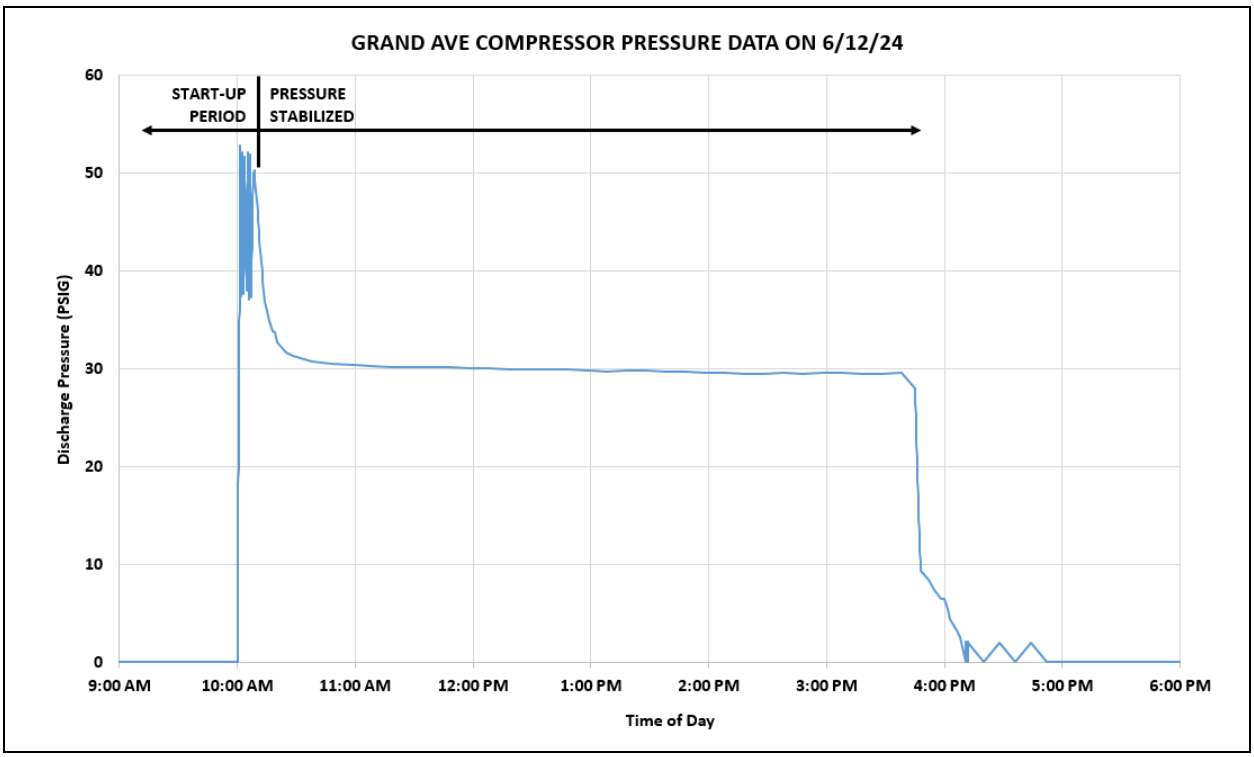


Figure 3-11: Grand Ave Station Compressor Discharge Pressure

Figure 3-11, shows Compressor 2 cycling between 40 and 44 psig during the initial start-up, which lasted about 10 minutes. This is a normal procedure that was also observed at the Lakeshore Drive Station. When the compressors shut down, water from Lake Elsinore flows back into the diffuser lines. Each morning, the compressors must push this water out before they can begin normal aeration. Once most/all of the water was pushed out of the diffuser lines, the discharge pressure stabilized around 30 psig, similar to Lakeshore Drive Station.

The Lake Elsinore – Lake Watch website reports a lake elevation on 6/12/24 of approximately 1249 feet. The diffuser lines, installed at the lake bottom elevation of 1218 feet, experienced 31 feet (13.5 psig) of hydrostatic pressure. This means when Compressor 2 stabilized at 30 psig, the friction loss through the diffuser lines was approximately 16.5 psig. Even at its highest water depth (when lake elevation is 1255 feet – a.k.a. 16 psig), the compressors would be capable of pushing through the water depth, with a total pressure requirement of approximately 32.5 psig required. Figure 3-11 shows there was no unloading/loading after the initial start-up period. Once Compressor 2 had successfully pushed out the water from the diffuser lines and stabilized at roughly 30 psig, it continued to run smoothly at 30 psig and did not unload further (which means it did not release hot air into the vault).

Atlas Copco inspected Compressor 2 and found no major issues (Attachment D-1). A minor issue was a power leg running hotter than the others, likely due to a loose connection causing overheating.

Since Compressor 1 could not produce compressed air during the site visit, dual compressor operation could not be observed. EVMWD provided pressure data from a previous run on 9/15/22 (Figure 3-12). Note that only pressure data is automatically recorded, so airflow during dual compressor operation could not be measured.

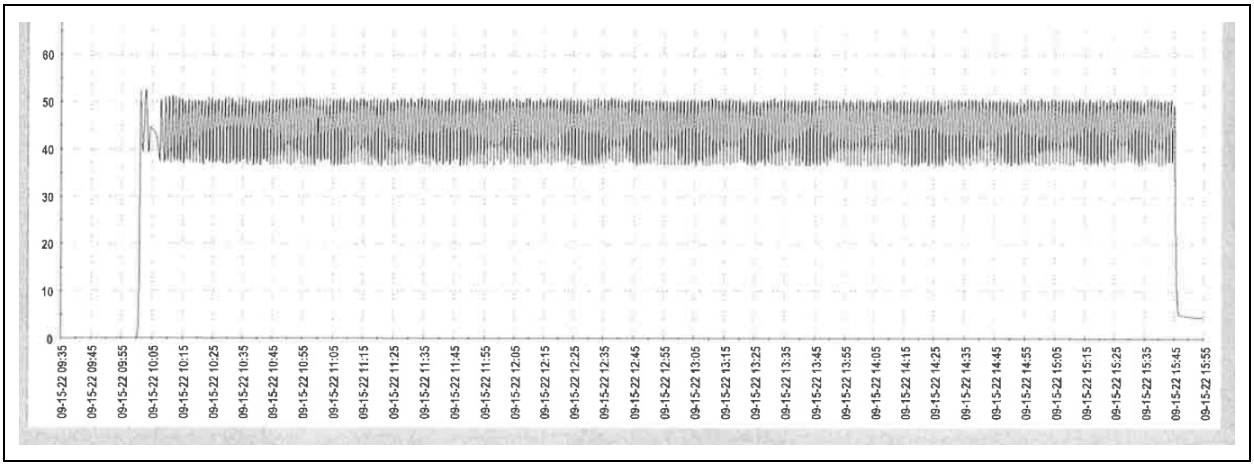


Figure 3-12: Grand Ave Compressors Pressure Data on 9/15/2022

Figure 3-12 indicates that the same start-up process was observed on September 15, 2022. The start-up lasted roughly 10-minutes. After start-up, the pressure dropped to 35 psig, at which point, the aeration system began to cycle between approximately 35 and 50 psig every 60 seconds. At 50 psig, the secondary compressor unloaded, blowing off pressure and releasing hot air into the vault. Note that, when the compressor unloads, the pressurized heated air is discharged into the compressor cabinet and vault. This condition actively contributes to high oil temperature alarms and equipment shutdowns. When the pressure fell to 35 psig, the secondary compressor reintroduced compressed air into the system.

When a compressor unloads, it is still powered on but not producing and releasing any compressed air. During this period, Atlas Copco states that the compressor still consumes approximately 25% of the required power.

Additionally, when looking at the total run time per day (10 am to 4 pm), if the aeration system unloads and cycles every 60 seconds, this means that in one day, the compressor unloads approximately 360 times per day. Especially on hot days and without proper ventilation, the hot air discharged during the cycling process begins to build up in the vault and can cause the air to be heated, triggering temperature based shutdowns which interrupt the aeration process for the day and directly contribute to premature failure of ancillary equipment to excessive heat. Temperature based shutdowns cannot be corrected until the equipment cools, typically extending equipment reset timing to the next day.

Airflow was recorded for the Grand Ave Aeration System at around 1:00 pm, when the pressure stabilized around 30 psig (Table 3-2).

Table 3-2: Diffuser Line Air flow and Pressure Readings

	Diffuser Line 7	Diffuser Line 8	Diffuser Line 9	Diffuser Line 10	Diffuser Line 11	Diffuser Line 12	Total***
Airflow* (CFM)	120	130	140**	145**	120	120	780

Note:

* Rotameters read at 30 PSIG and 70°F

** Rotameter only provides reading at STP (1 atm, 70°F) and was converted to 30 PSIG and 70°F

*** Due to old age and inaccuracy of rotameters, ±25% from compressor air flow is expected, and actual airflow is unknown

Recent bathymetry maps indicate that the diffuser lines from the Grand Ave Station are placed at approximately the same depth, so the varying flow cannot be explained by this. The higher flow rate in Diffuser 9 and 10 may be due to cleaner hoses.

3.3 Grand Avenue Station Recommendations

The following recommendations are based on previously discussed observations, and include suggestions from Atlas Copco and PACE. These recommendations address near-term needs while the new system is being designed and constructed.

The following Attachments provide documents to guide maintenance efforts, ensuring the longevity and efficiency of the compressors.

1. Atlas Copco Compressor Maintenance Checklist (Attachment D-2)
2. Atlas Copco Maintenance Quote (Attachment D-3)
   - Estimated around $55,000 total or $13,750 per compressor
3. Atlas Copco Compressor Operation and Maintenance Manual (Attachment D-5)

The majority of issues previously noted include old instrumentation and vault temperature. The over pressurization and unloading cycles have generated more heat than originally anticipated.

3.3.1 Instrumentation Replacement

If rotameters are replaced in the future, it is recommended to choose ones that show airflow rates at 30 psig and 50 psig, rather than just at STP. Since the compressors typically operate at 30 psig during single compressor operation and 50 psig during dual compressor operation, calibrating rotameters to these conditions simplifies determining airflow rates. While it is possible to convert from STP to different pressures, it adds an extra step to the process.

3.3.2 Vault Temperature

The vault air temperature affects the performance and longevity of the compressors. Since the compressors use vault air as their inlet, it is crucial to keep the vault air cool to prevent overheating, which could cause compressor wear and trigger fault alarms. Atlas Copco's operation and maintenance manual recommends a maximum inlet temperature of 104°F. The ambient temperatures in the City of Lake Elsinore reach well above this threshold, often exceeding 110°F for several weeks during summer months.

The Grand Ave Station, being an underground vault, has an advantage compared to the Lakeshore Drive Station. While the top portion of the vault is exposed, it is covered by a canopy, reducing direct sunlight exposure and preventing the vault from overheating.

The vault temperature is more likely to rise due to the compressor unloading cycle and lack of airflow. While the vault was cool upon entry and not as hot as the ambient temperature, only one compressor was running that day, meaning no additional heat was generated from the secondary compressor unloading and releasing hot air into the vault. If vault temperatures remain an issue, the following recommendations are made:

1. Continuously run exhaust fans
   a. This will continuously draw in fresh ambient air and push out any heating air that may be building up in the vault.

2. Upsize exhaust fans
    a. Upsize the existing exhaust fans to provide more airflow, if the existing exhaust fans are not sufficient to prevent the compressors from overheating.

3. Only run one compressor at a time
    a. The compressor design was purposefully oversized to be conservative. Upon reevaluating the design, it was found that one compressor operating at 1,030 SCFM provides 70% of the original mixing energy (1,500 CFM) intended for the lake. Because the compressors were oversized in 2003 compared to the original specifications, and the diffuser pipe diameter was reduced to cut initial costs, it is not recommended to operate the second compressor simultaneously under normal conditions. Operating only the duty compressor will prevent excessive heat buildup from unloading cycles due to over-pressurization. This will reduce mechanical problems, lower electrical demand, extend equipment life, and minimize noise and vibration.

3.3.3 General Compressor Maintenance

Atlas Copco has provided the following recommendations, which are summarized from their site visit report (Attachment D-1):

1. Tighten the lugs on both the incoming power lines and outgoing connections to the motor.
    a. Tightening the lugs should reduce the resistance on the electrical power leg and prevent the power legs from overheating and rising to abnormal temperatures.

2. Perform a 16k hour service on both compressors.
    a. Atlas Copco recommends performing standard maintenance after a set number of running hours (Attachment D-2). For instance, the 16k hour service should be done when the compressor reaches 16,000 hours of total runtime.
    b. Atlas Copco advises performing the 16k hour service for both Compressor 1 and 2, including all standard maintenance and inspection/repair of Compressor 1's throttle valve.
        i. It is not required for Atlas Copco to provide the maintenance service, although they are the most familiar with their own equipment and associated maintenance requirements. The Elsinore Valley Municipal Water District can select any qualified company to perform the necessary maintenance.

4 Aeration Diffuser Line System

4.1 HDPE Diffuser Line

During the site visit, it was not possible to float the diffuser lines as they were not isolated from the rest of the lake and would run the risk of boaters accidentally running across and cutting the pipe. Not all diffuser line holes are redrilled annually, only those that appear clogged, typically around 10 holes per line.

Mark Piascik provided a 2014 report (Attachment D-4) detailing typical maintenance for the Lakeshore Drive and Grand Ave diffuser lines. No recent reports were available, as EVMWD does not produce similar reports for diffuser line maintenance. The 2014 report, although not the most recent, provides a representative overview of the annual maintenance work performed on these systems.

4.1.1 Conclusions Based on Interview with Mark Piascik

Each year, portions of the diffuser line require replacement. These lines are often damaged when anchors are dropped on them or cut when someone attempts to retrieve an anchor. Examples of broken diffuser lines are shown in Figure 4-1.



(a) Broken Diffuser Line in April 2017



(b) Repaired Diffuser Line in April 2017



(c) Floated Diffuser Line in April 2018



(d) Floated Diffuser Line in April 2018

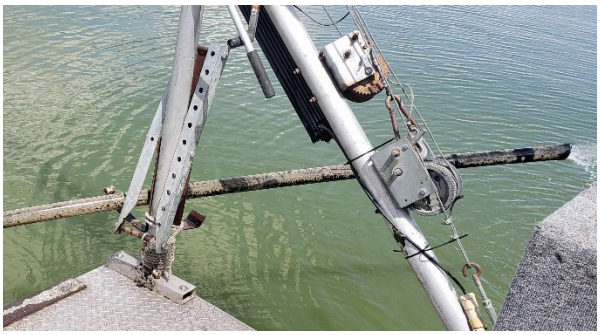
Figure 4-1: Photos of Diffuser Line



(e) Floated Diffuser Line in April 2021



(f) Diffuser Line Repair in May 2021



(g) Broken Diffuser Line in May 2023



(h) Broken Diffuser Line in May 2023



(i) Diffuser Line Repair in May 2023



(j) End of Diffuser Line in February 2024

Figure 4-1: Photos of Diffuser Line (Continued)

During repairs, the diffuser line interiors are inspected (Figure 4-2). There has been no visible deterioration inside the lines that would require a complete replacement. While the exterior of the diffuser lines shows some discoloration, there are no tears or rips that would warrant replacing the entire line or large sections of it. Despite minor external wear, the lines remain functional and do not require full replacement.

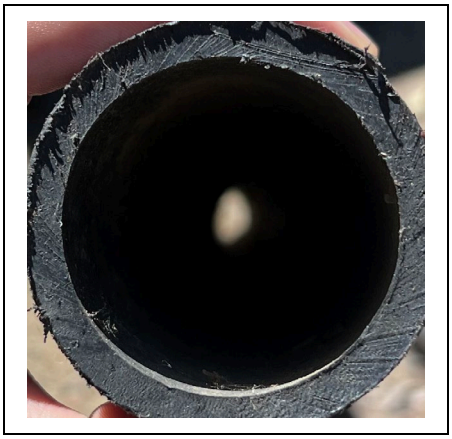


Figure 4-2: Photo of Inside of Diffuser Line Piece

A study conducted in Austria examined the condition of an existing HDPE pipe that transports dirty wastewater under similar environmental conditions. The results of the Austrian study are summarized in the next section and related to the conditions of the Lake Elsinore HDPE diffuser lines.

4.1.2 Conclusions Based on Other Studies

The pipe used for the diffuser lines are a 2-inch SDR 13.5 HDPE pipe, manufactured by Centennial Plastic, Inc. This 2-inch pipe is rated for 128 psi at 73°F. The pressure carrying capacity of the HDPE pipe will decrease as temperature increases (Table 4-1).

Table 4-1: Internal Pressure Rating (from Centennial Plastics, Inc.)

Temperature (°F)	Pressure Capacity (PSIG)
73	125
80	118
90	112
100	100
110	93
120	87
130	62

The pressure inside the aeration pipes can reach up to 55 psig, especially during startup. During the site visit, it was not possible to determine the discharge temperature from the compressor after the after cooler, however, when touching the stainless steel pipe at the Lakeshore Drive station, the stainless steel pipes were not hot, meaning the temperature of the air is below 100°F. The pressure capacity of the HDPE pipe at 100°F is 100 psig. The aeration system operating pressure is roughly half of this, so the aeration system is not operating the pipe at extreme conditions.

One of the concerns about the existing diffuser lines is the expected lifecycle and the remaining useful life. Typically, high density polyethylene (HDPE) pipes have a lifecycle of at least 50 years and up to 200 years, depending on the operating pressure and temperature.

Most HDPE pipe manufacturers provide a 50-year warranty on their pipes, indicating their expected minimum longevity. The HDPE pipes at Lake Elsinore, having been in operation for roughly 14 years, are well within this period.

Additionally, in 2021, a study examined pressurized HDPE pipelines installed in 1971 at the bottom of Lake Ossaich in Austria. These pipelines, used to transport wastewater at a maximum pressure of 60 psi, were

nearing the end of their planned 50-year lifecycle. Tests were conducted to evaluate the remaining lifespan of these HDPE pipes. The study concluded that the existing HDPE pipes could last for at least another 50 years, and possibly up to 100 years longer (Schulte, Ulrich, 2021).

Although the HDPE pipe from the 2021 study was carrying wastewater instead of gas, the pressure and installation location is comparable. The similar pressure conditions between Lake Ossaich and Lake Elsinore demonstrate that the material can withstand substantial internal pressures without significant degradation over time.

Furthermore, the underwater installation environment presents unique challenges such as exposure to potential biofouling and mechanical stresses from water currents. The fact that the HDPE pipes in Lake Ossiach have performed well under these conditions for 50 years suggests that HDPE pipes in similar environments would also exhibit prolonged durability.

This comparison is significant because it underscores the reliability of HDPE pipes in diverse applications and environments. The findings from the Lake Ossiach study provides valuable insights into the potential longevity and performance of HDPE pipes in other contexts, including those used for gas transportation.

Since the aeration system has only been operational for around 14 years, the 2-inch HDPE pipes should still be in good condition. Once the aeration system reaches a lifespan of 50 years, then the Elsinore Valley Municipal Water District (EVMWD) can potentially cut a piece of the existing HDPE pipe and perform their own cracking and thermal tests.

4.2 Diffuser Line Anchoring System

The anchoring system for the submerged diffuser lines is a challenge. The current anchoring system reportedly struggles to withstand mechanical stresses from water currents. According to Mark Piascik's inspection reports, Attachment D-4, many of the anchoring straps break and several blocks go missing each year. When this happens, the diffuser lines lose their weight and stability, causing them to float or snake, which reduces the efficiency of the aeration system.

Mark has tried to use plastic (Figure 4-3a) and stainless steel straps (Figure 4-3b), but neither have proven effective against the water currents.



(a) Broken Plastic Strap



(b) Stainless Steel Strap

Figure 4-3: Photos of Diffuser Line Anchoring Materials

To address this issue, a preliminary concept involves using a pipe stand bolted into a concrete block. The pipe stand would then be secured around the pipes. It is recommended to use all stainless steel 316L parts. A pipe stand is thicker and more durable than a strap and, when bolted down, should not detach

from the concrete slab. If the pipe stand does not fit tightly around the 2-inch air supply pipe and the 1.5-inch buoyancy line, a short section of additional pipe can be added to fill the gaps. An example is shown in Figure 4-4 below.

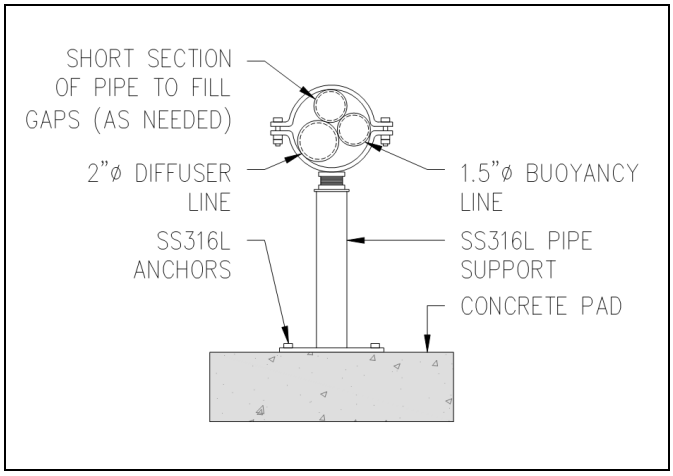


Figure 4-4: Pipe Support

5 References

Schulte, Ulrich, et al. *Pressure Pipeline Made of HDPE – Determination of Remaining Lifetime after 47 years of Operation in Lake Ossiach (Carinthia, Austria).* Proceedings of the 20th Plastic Pipes Conference PPXX, 2021, [PlasticPipe.org]. Accessed on 1 July 2024.

Attachment D-1 Atlas Copco Site Visit Reports

Attachment D-1

PACE
Advanced Water Engineering

Atlas Copco Site Visit Reports

Visit Report

Report date: Jun 15, 2024

ELSINORE VALLEY MWD
1306 LAKESHORE DRIVE
92530 LAKE ELSINORE CA
Contact: Evan Chen

Work Comments

Inspect Air Compressor #1
Compressor seems to be in good health visually and serviced. Function test shows machine is running okay and temperatures/pressures are within normal range. No abnormal sound was noted. Blower runs up to a high pressure to flush lines then the pressure goes down to as low as 32 PSIG. Room is warm and the room ventilation is not adequate. I noted that oil shutdown has been raised to handle the higher temperature. Cooling fans have excessive static pressure which will hamper cooling. Room is not vented properly. Some shutdowns were showing 129 deg F ambient temperature. Found one of the power legs was hotter (125 Deg F) then the others (86 Deg F). Some oil had been leaking from ventports, likely due to lack of gearcase vent service.
Recommend the following actions for continued operation of machines: 1. Perform full 16k service on blower, including check valve overhaul, throttle valve overhaul and oil/filters change. 2. Add positive air to the ventilation system. 3. Tighten lugs on incoming power as well as outgoing to the motor. 4. Set shutdown back to 159 Deg F for the oil to avoid causing damage to the machine due to fast oil degradation.

Time Confirmation

Date	Service Engineer
Jun 11, 2024	Dennis Livingston
Jun 11, 2024	Dennis Livingston
Jun 11, 2024	Dennis Livingston
Jun 12, 2024	Dennis Livingston

Equipment

Equipment:	ZE 4 D 3.5 60/ET	**Visit date:**	Jun 15, 2024
Serial Number:	AIF116514	**Order Number:**	407305096
Running Hours:	615312 hours	**PO number:**	COGS SALES
Load Hours:	13689 hours	**Contract Number:**	

Measurement Points

Counter	Reading after service	Before service	From last visit on
Actual running hours (Total)	615312 OPH		2021-02-23 615311 OPH
Running hours (Loaded)	13689 STD		2021-02-23 12686 STD
Motor start	3814 NT		2021-02-23 2832 NT

AUTHORIZATION TO CARRY OUT WORK WITH/WITHOUT AN ORDER NO.

Notes Customer will agree to supply Atlas Copco with a valid order number or payment for non-account holders for actual time spend, travelling and parts used during the breakdown intervention by next working day.

Customer Confirmation

Signed by Evan Chen at
(Being duly authorised to sign on behalf of the customer)

Service Engineer Confirmation

Signed by Dennis Livingston at

Atlas Copco Compressors, LLC
Corporate Office
300 Technology Center Way, Suite 550
Rock Hill, SC 29730
www.atlascopco.us
Corporate Tel: 803-817-7000

Visit Report

Report date: Jun 15, 2024

ELSINORE VALLEY MWD
1306 LAKESHORE DRIVE
92530 LAKE ELSINORE CA
Contact: Evan Chen

Work Comments

Inspect Air Compressor #2
Attempted to run compressor and found it not producing any air at all. Inspection revealed throttle valve not opening upon load signal. Likely due to lack of service (diaphragm).

Recommend Full 16k service on compressor. Any damage to throttle valve can be noted at that time. Also, ventilation considerations from compressor #1

Time Confirmation

Date	Service Engineer
Jun 13, 2024	Dennis Livingston
Jun 13, 2024	Dennis Livingston
Jun 13, 2024	Dennis Livingston

Equipment

Equipment:	ZE 4 D 3.5 60/ET	**Visit date:**	Jun 15, 2024
Serial Number:	AIF116487	**Order Number:**	407305168
Running Hours:	18460 hours	**PO number:**	GW SALES
Load Hours:	14754 hours	**Contract Number:**	

Measurement Points

Counter	Reading after service	Before service	From last visit on
Actual running hours (Total)	18460 OPH		2021-01-15 12888 OPH
Running hours (Loaded)	14754 STD		2020-08-05 9652 STD
Motor start	3479 NT		2020-08-05 3026 NT

AUTHORIZATION TO CARRY OUT WORK WITH/WITHOUT AN ORDER NO.

Notes Customer will agree to supply Atlas Copco with a valid order number or payment for non-account holders for actual time spend, travelling and parts used during the breakdown intervention by next working day.

Customer Confirmation

Signed by Evan Chen at
(Being duly authorised to sign on behalf of the customer)

Service Engineer Confirmation

Signed by Dennis Livingston at

Visit Report

Report date: Jun 15, 2024

ELSINORE VALLEY MWD
Grand Ave 16222
92530-3244 Lake Elsinore CA
Contact: Evan Chen

Work Comments

Inspect Air Compressor #1 (vault)
Compressor was running upon arrival. Found outlet element temp at 306, noted compressor was not actually loaded. Severe air leak from throttle valve, needs service.

Time Confirmation

Date	Service Engineer
Jun 13, 2024	Dennis Livingston

Equipment

Equipment:	ZE 4 D 3.5 60/ET	**Visit date:**	Jun 15, 2024
Serial Number:	AIF116920	**Order Number:**	407305284
Running Hours:	14347 hours	**PO number:**	GW
Load Hours:	13912 hours	**Contract Number:**	

Measurement Points

Counter	Reading after service	Before service	From last visit on
Actual running hours (Total)	14347 OPH		2021-06-16 13243 OPH
Running hours (Loaded)	13912 STD		2021-06-16 10645 STD
Motor start	828 NT		2021-06-16 2613 NT

AUTHORIZATION TO CARRY OUT WORK WITH/WITHOUT AN ORDER NO.

Notes Customer will agree to supply Atlas Copco with a valid order number or payment for non-account holders for actual time spend, travelling and parts used during the breakdown intervention by next working day.

Customer Confirmation

Signed by Evan Chen at
(Being duly authorised to sign on behalf of the customer)

Service Engineer Confirmation

Signed by Dennis Livingston at

Visit Report

Report date: Jun 15, 2024

ELSINORE VALLEY MWD
Grand Ave 16222
92530-3244 Lake Elsinore CA
Contact: Evan Chen

Work Comments

Inspect Air Compressor #2 (vault)
Compressor inspection, compressor was running upon arrival. Found machine in good health. No major leaks were noted, but compressor is in need of service, recommend 16k service on this machine. Also recommend tightening power lugs. Thermal imaging showed right power leg was loose and heating. Recommend adding positive ventilation to the room to help with the heat. Room was not too hot upon arrival.

Time Confirmation

Date	Service Engineer
Jun 12, 2024	Dennis Livingston
Jun 13, 2024	Dennis Livingston

Equipment

Equipment:	ZE 4 D 3.5 60/ET	**Visit date:**	Jun 15, 2024
Serial Number:	AIF116921	**Order Number:**	407305286
Running Hours:	16501 hours	**PO number:**	GW
Load Hours:	13179 hours	**Contract Number:**	

Measurement Points

Counter	Reading after service	Before service	From last visit on
Actual running hours (Total)	16501 OPH		2021-01-27 16500 OPH
Running hours (Loaded)	13179 STD		2020-09-01 9982 STD
Motor start	3213 NT		2020-10-16 276 NT

AUTHORIZATION TO CARRY OUT WORK WITH/WITHOUT AN ORDER NO.

Notes Customer will agree to supply Atlas Copco with a valid order number or payment for non-account holders for actual time spend, travelling and parts used during the breakdown intervention by next working day.

Customer Confirmation

Signed by Evan Chen at
(Being duly authorised to sign on behalf of the customer)

Service Engineer Confirmation

Signed by Dennis Livingston at

Attachment D-2 Atlas Copco Compressor Maintenance Checklist

Attachment D-2

PACE
Advanced Water Engineering

Atlas Copco Compressor Maintenance Checklist

Comments		Visit Interval (RHRS)	2,000	4,000	8,000	16,000	40,000	80,000
		Activities	Visit I	Visit A	Visit B	Visit C	Visit D	Visit E
	1	Take service reading(air,oil,water T+ P)	x	x	x	x	x	x
	2	Check coolers functions/clean if necessary	x	x	x	x	x	x
	3	Check for air- water- & oil leakage	x	x	x	x	x	x
	4	Check sensitive bolt/cpling connections	x	x	x	x	x	x
	5	Check/adjust safety valve+switches		x	x	x	x	x
	6	Check for presence of water in lube oil	x	x	x	x	x	x
or every 2 years	7	Change compressor oil				x	x	x
	8	Change compressor oil filter		x	x	x	x	x
	9	Check condition of air intake chamber	x	x	x	x	x	x
	10	Check air filter element(s)	x					
	11	Inspect/change air filter element(s)		x	x	x	x	x
	12	Check filter elmt of gear case breather	x					
	13	Replace filter elmt:gear case breather		x	x	x	x	x
	14	Check cycle of air intake throttle valve	x	x	x	x	x	x
	15	Replace diaphragm of air throttle valve		x	x	x	x	x
	16	Replace bearing block throttle valve			x	x	x	x
	17	Overhaul air intake valve				x	x	x
	18	Replace blow-off silencer throttle valve				x	x	x
	19	Check functioning of check valve	x	x	x			
	20	Overhaul check valve				x	x	x
	21	Check condition:balance piston diaphragm		x	x			
	22	Change balance piston diaphragm				x	x	x
	23	Check/clean condensate drain(s)	x	x	x	x	x	x
	24	Grease main drive motor bearings		x	x	x	x	x
	25	Clean fan cowl of electric motor		x	x	x	x	x
	26	Overhaul main drive motor					x	x
	27	Clean cooler block (int/ext)					x	x
	28	Check rubber inserts,drive coupl.(arr E)		x	x			
	29	Replace inserts, drive coupling (arr E)				x	x	x
	30	Check condition of drive gear teeth			x	x	x	x
	31	Replace main shaft bearings(second OH)						x
	32	Replace rubber buffers					x	x
	33	Take full set of S.P.M. readings	x	x	x	x	x	x
	34	Blastclean VSD cubicle, dry air max.1bar*		x	x	x	x	x
	35	Check loose wiring & connections in cubicle		x	x	x	x	x
	36	Replace carbon brush (only VSD motor)*			x	x	x	x
	37	Replace conv.fan (32.000-40.000 hrs)*					x	x
	36	Change cubicle filters		x	x	x	x	x
	38	Overhaul oil pump					x	x
	39	Check oil level	x	x	x	x	x	x
	40	Check silencer insert			x	x		
	41	Replace silencer insert					x	x
	42	Check loose wiring & connections in motorbox			x	x	x	x
	43	Replace diaphragm of drain(s) compressor			x	x	x	x
	44	Replace shaft seal						x
	45	Inspect/Clean fan of oil/aftercooler (ZE)		x	x	x	x	x
	46	Replace fan motor:oil/aftercooler (ZE)					x	x
	47	Overhaul oil-bypass					x	x

* Not applicable to non VSD Units

Attachment D-3 Budgetary Maintenance Quote from Atlas Copco

Attachment D-3

PACE
Advanced Water Engineering

Budgetary Maintenance Quote from Atlas Copco

Atlas Copco Compressor Services

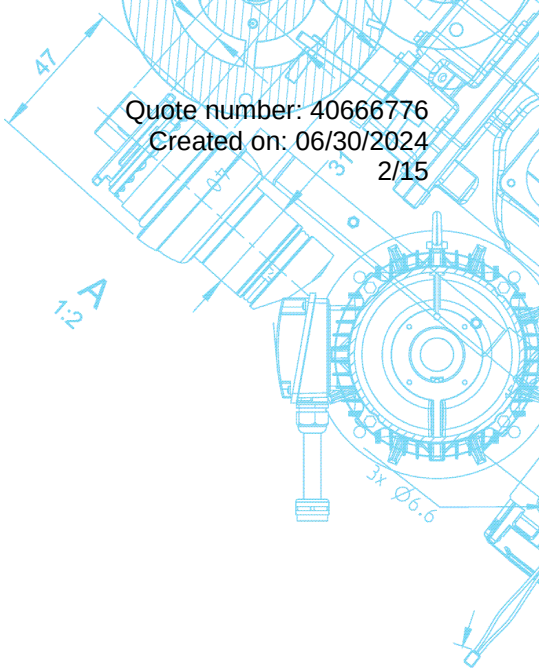


ELSINORE VALLEY MUN WATER DIST

Quote no: 40666776
Created: 06/30/24
Expiration: 07/30/24

Sustainable Productivity

Atlas Copco



Fixed Price Quote #40666776

ELSINORE VALLEY MUN WATER DIST

Attn to: **Sudhir Mohleji**

CHANEY ST 31315
LAKE ELSINORE, CA 92530-2743

Dear Sudhir,

We appreciate your interest in our Fixed Price Service.

Fixed Price services range from a simple inspection and diagnostics visit to a full overhaul of compressors and ancillary equipment. Fixed Prices are executed according to the manufacturer's recommendations, including all required parts/kits for the standard maintenance visit, labor, travel and accommodation, when needed, and a complete diagnostics report after each visit. Fixed price jobs are invoiced as one single price.

With Fixed Price services, the correct level of maintenance will be carried, according to parts wear needs, avoiding breakdowns. We only use Genuine Parts and Lubricants which will protect your investment and guarantee high performance levels.

Having the unit serviced by competent and experienced Atlas Copco service engineers is the best way to ensure maintenance is properly carried out and higher operational efficiency.

Atlas Copco is always available to provide you solutions for all of your compressed air needs, from generation to point of use, guaranteeing best performance from your whole system. Genuine parts and lubricants, specially developed for your compressor needs, are kept in stock and our service technicians are always up to date with our maintenance standards and will provide you with the best service in the market.

In case you need additional information on this quotation or any of our other service products, please feel free to contact me at any time.

Kind regards,

James Vida
Service Sales Manager

Cell: 562-237-0270
james.vida@atlascopco.com

Fixed Price Overview

FIXED PRICE SERVICE – WHAT IS IT?

The most efficient way you can conduct one-off basis services, done based on equipment running conditions and elapsed time

We focus on keeping our biggest enemy under control – energy consumption

Our technicians any future potential problems and prevent unnecessary downtime and additional breakdown costs

It is a proactive intervention, helping satisfy your requirements for planned production downtime and budget control

We reduce your administration costs, with easier order entering and follow-up

WHAT DO WE WANT TO DELIVER TO YOU?



Reduce energy consumption (the 'real enemy') and total cost of ownership	Machine uptime, availability and reliability	Keeping compressed air quality at maximum level	Best preventive maintenance solution which was designed for machine and adapted according to ambient conditions
Cheap parts lead to inferior performance, higher pressure drop and a higher risk of breakdown	A breakdown may cost our customers much more than the repair cost itself	Non-OEM filters will be clogged and decreased air quality compared to genuine filter performance	Preventive maintenance approach focusing on providing best performance

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Pricing and Services Summary

Machine Description	Serial Nr	Visits Type	Number of Oil Changes	Oil Type	One Time Price
ZE 4 160 1-3,5bar Pack A.C.	AIF116487	C	1	Roto-Z	$ 13,875.00
				Total Labor	$ 4,800.00
				Total Oil	$ 1,780.00
				Total Parts	$ 6,700.00
				Total Travel and Consumables	$ 595.00
ZE 4 160 1-3,5bar Pack A.C.	AIF116514	C	1	Roto-Z	$ 13,875.00
				Total Labor	$ 4,800.00
				Total Oil	$ 1,780.00
				Total Parts	$ 6,700.00
				Total Travel and Consumables	$ 595.00
ZE 4 160 1-3,5bar Pack A.C.	AIF116920	C	1	Roto-Z	$ 13,875.00
				Total Labor	$ 4,800.00
				Total Oil	$ 1,780.00
				Total Parts	$ 6,700.00
				Total Travel and Consumables	$ 595.00
ZE 4 160 1-3,5bar Pack A.C.	AIF116921	C	1	Roto-Z	$ 13,875.00
				Total Labor	$ 4,800.00
				Total Oil	$ 1,780.00
				Total Parts	$ 6,700.00
				Total Travel and Consumables	$ 595.00
Total Price (excluding sales tax and freight charges)					$ 55,500.00

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Scope of Work

We will provide all necessary material and labor to perform 16K PM services on four ZE4 compressors. See activities list below for full scope and parts to be replaced**. Please note; since two of the units are not running, additional repairs could be needed. If this is the case, a new quote will be provided.**

*****The above pricing does not include any sales tax or shipping charges*****

Please notice that the consolidated one time price per machine will be shown on the invoice.

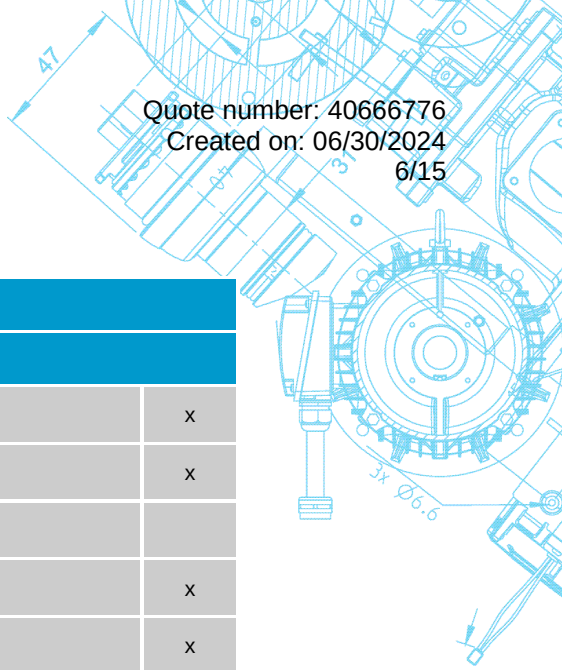
- **Pricing does not include freight**
- **Pricing does not include sales tax**
- Pricing applies to services performed during normal working hours, weekdays, from 7am – 4pm

Payment terms : Net 30 days after invoice date. Payment terms are subject to credit approval and may require a down payment.

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Activities list

Equipment: ZE 4 160 1-3,5bar Pack A.C. - AIF116487

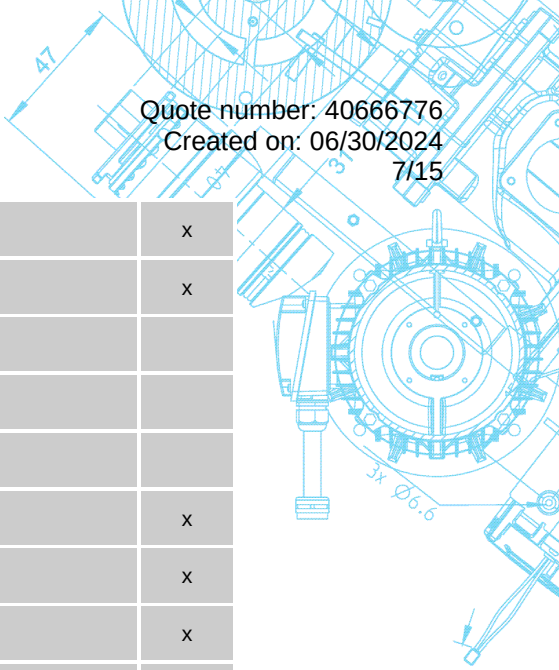
Item	Activities	
1	Take full set of S.P.M. readings	x
2	Change air filter element(s)	x
3	Check filter elmt of gear case breather	
4	Replace filter elmt:gear case breather	x
5	Check cycle of air intake throttle valve	x
6	Replace diaphragm of air throttle valve	x
7	Replace bearing block(air intake valve)	x
8	Overhaul air intake valve	x
9	Replace blow-off silencer	x
10	Check functioning of check valve	
11	Overhaul check valve	x
12	Check for air- water- & oil leakage	x
13	Check condition:balance piston diaphragm	
14	Change balance piston diaphragm	x
15	Check/clean condensate drain(s)	x
16	Grease main drive motor bearings	x
17	Clean fan cowl of electric motor	x
18	Overhaul main drive motor (if included in the service package)	
19	Inspect fan of oil/aftercooler (ZE)	x
20	Overhaul fan motor:oil/aftercooler	
21	Clean oil/aftercooler ext,as needed (ZE)	x
22	Clean cooler block (int/ext)	
23	Check sensitive bolt/cpling connections	x
24	Check rubber inserts,drive coupl.(arr E)	
25	Replace inserts, drive coupling (arr E)	

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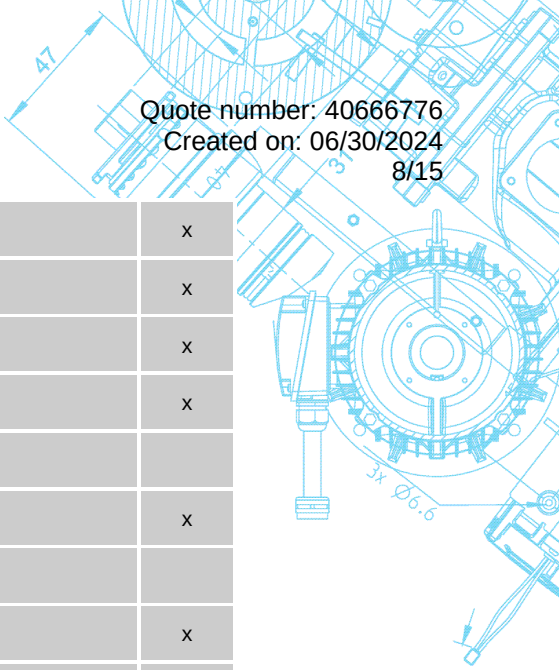
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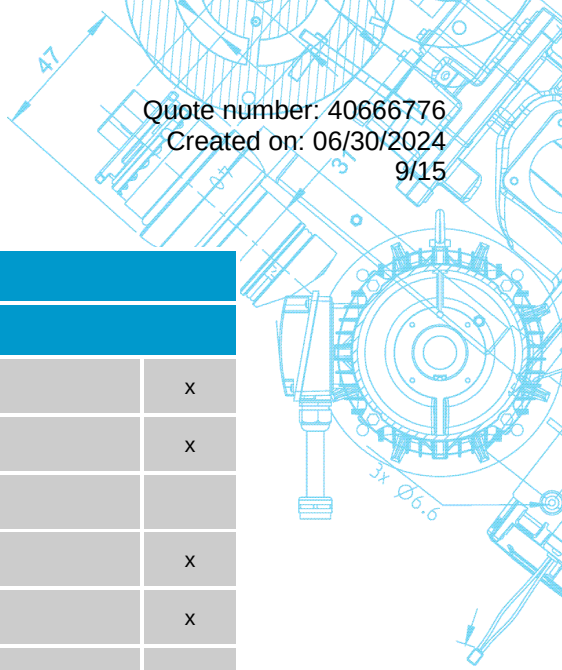
26	Check motor (coupling) alignment, arr.1	x
27	Check condition of drive gear teeth	x
28	Overhaul element	
29	Replace main shaft bearings(second OH)	
30	Replace rubber buffers	
31	Check safety valve+switches	x
32	Clean injector nozzle breather (needle)	x
33	Check for presence of water in lube oil	x
34	Change oil	x
35	Change compressor oil filter	x
36	Check condition of air intake chamber	x
37	Check air filter element(s)	

Equipment: ZE 4 160 1-3,5bar Pack A.C. - AIF116514

Item	Activities	
1	Take full set of S.P.M. readings	x
2	Change air filter element(s)	x
3	Check filter elmt of gear case breather	
4	Replace filter elmt:gear case breather	x
5	Check cycle of air intake throttle valve	x
6	Replace diaphragm of air throttle valve	x
7	Replace bearing block(air intake valve)	x
8	Overhaul air intake valve	x
9	Replace blow-off silencer	x
10	Check functioning of check valve	
11	Overhaul check valve	x
12	Check for air- water- & oil leakage	x
13	Check condition:balance piston diaphragm	



14	Change balance piston diaphragm	x
15	Check/clean condensate drain(s)	x
16	Grease main drive motor bearings	x
17	Clean fan cowl of electric motor	x
18	Overhaul main drive motor (if included in the service package)	
19	Inspect fan of oil/aftercooler (ZE)	x
20	Overhaul fan motor:oil/aftercooler	
21	Clean oil/aftercooler ext,as needed (ZE)	x
22	Clean cooler block (int/ext)	
23	Check sensitive bolt/cpling connections	x
24	Check rubber inserts,drive coupl.(arr E)	
25	Replace inserts, drive coupling (arr E)	
26	Check motor (coupling) alignment, arr.1	x
27	Check condition of drive gear teeth	x
28	Overhaul element	
29	Replace main shaft bearings(second OH)	
30	Replace rubber buffers	
31	Check safety valve+switches	x
32	Clean injector nozzle breather (needle)	x
33	Check for presence of water in lube oil	x
34	Change oil	x
35	Change compressor oil filter	x
36	Check condition of air intake chamber	x
37	Check air filter element(s)	



Equipment: ZE 4 160 1-3,5bar Pack A.C. - AIF116920

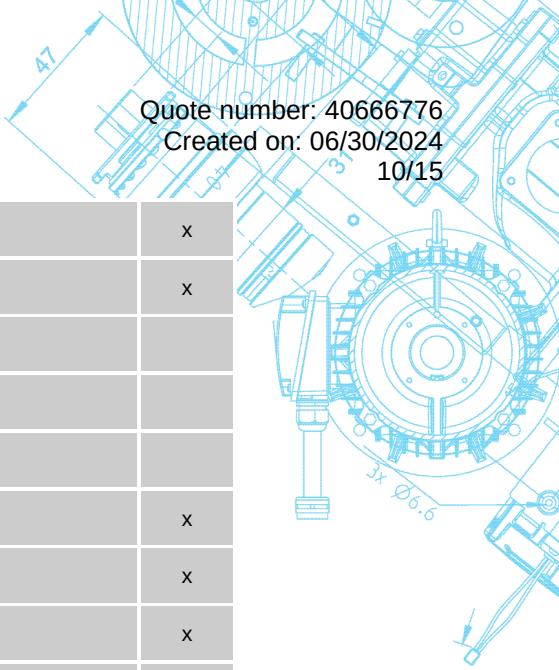
Item	Activities	
1	Take full set of S.P.M. readings	x
2	Change air filter element(s)	x
3	Check filter elmt of gear case breather	
4	Replace filter elmt:gear case breather	x
5	Check cycle of air intake throttle valve	x
6	Replace diaphragm of air throttle valve	x
7	Replace bearing block(air intake valve)	x
8	Overhaul air intake valve	x
9	Replace blow-off silencer	x
10	Check functioning of check valve	
11	Overhaul check valve	x
12	Check for air- water- & oil leakage	x
13	Check condition:balance piston diaphragm	
14	Change balance piston diaphragm	x
15	Check/clean condensate drain(s)	x
16	Grease main drive motor bearings	x
17	Clean fan cowl of electric motor	x
18	Overhaul main drive motor (if included in the service package)	
19	Inspect fan of oil/aftercooler (ZE)	x
20	Overhaul fan motor:oil/aftercooler	
21	Clean oil/aftercooler ext,as needed (ZE)	x
22	Clean cooler block (int/ext)	
23	Check sensitive bolt/cpling connections	x
24	Check rubber inserts,drive coupl.(arr E)	
25	Replace inserts, drive coupling (arr E)	

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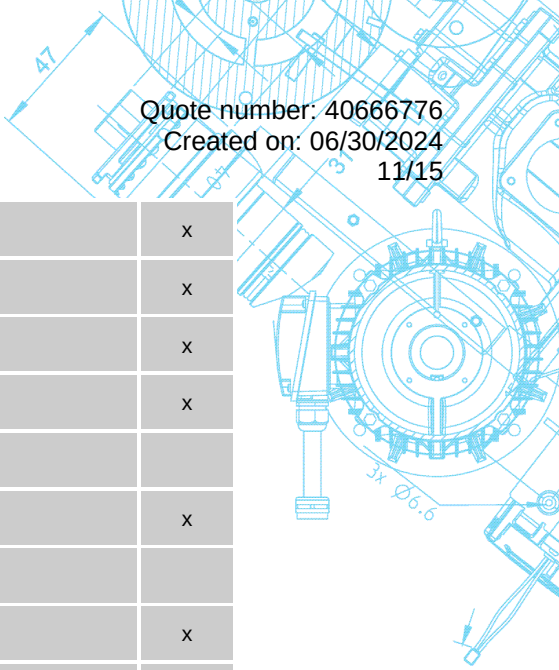
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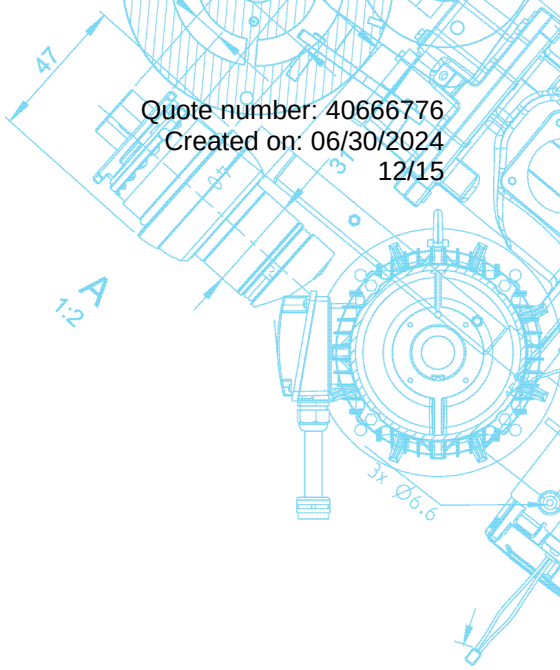
26	Check motor (coupling) alignment, arr.1	x
27	Check condition of drive gear teeth	x
28	Overhaul element	
29	Replace main shaft bearings(second OH)	
30	Replace rubber buffers	
31	Check safety valve+switches	x
32	Clean injector nozzle breather (needle)	x
33	Check for presence of water in lube oil	x
34	Change oil	x
35	Change compressor oil filter	x
36	Check condition of air intake chamber	x
37	Check air filter element(s)	

Equipment: ZE 4 160 1-3,5bar Pack A.C. - AIF116921

Item	Activities	
1	Take full set of S.P.M. readings	x
2	Change air filter element(s)	x
3	Check filter elmt of gear case breather	
4	Replace filter elmt:gear case breather	x
5	Check cycle of air intake throttle valve	x
6	Replace diaphragm of air throttle valve	x
7	Replace bearing block(air intake valve)	x
8	Overhaul air intake valve	x
9	Replace blow-off silencer	x
10	Check functioning of check valve	
11	Overhaul check valve	x
12	Check for air- water- & oil leakage	x
13	Check condition:balance piston diaphragm	



14	Change balance piston diaphragm	x
15	Check/clean condensate drain(s)	x
16	Grease main drive motor bearings	x
17	Clean fan cowl of electric motor	x
18	Overhaul main drive motor (if included in the service package)	
19	Inspect fan of oil/aftercooler (ZE)	x
20	Overhaul fan motor:oil/aftercooler	
21	Clean oil/aftercooler ext,as needed (ZE)	x
22	Clean cooler block (int/ext)	
23	Check sensitive bolt/cpling connections	x
24	Check rubber inserts,drive coupl.(arr E)	
25	Replace inserts, drive coupling (arr E)	
26	Check motor (coupling) alignment, arr.1	x
27	Check condition of drive gear teeth	x
28	Overhaul element	
29	Replace main shaft bearings(second OH)	
30	Replace rubber buffers	
31	Check safety valve+switches	x
32	Clean injector nozzle breather (needle)	x
33	Check for presence of water in lube oil	x
34	Change oil	x
35	Change compressor oil filter	x
36	Check condition of air intake chamber	x
37	Check air filter element(s)	



Parts list

Equipment: ZE 4 160 1-3,5bar Pack A.C. - AIF116487
Part Description
ZE85-185 ZA4 16000H MAINT KIT
ZR110-425 AC DRAIN VALVE KIT
KIT:OIL ANALYSIS
ROTO Z OIL

Equipment: ZE 4 160 1-3,5bar Pack A.C. - AIF116514
Part Description
ZE85-185 ZA4 16000H MAINT KIT
ZR110-425 AC DRAIN VALVE KIT
KIT:OIL ANALYSIS
ROTO Z OIL

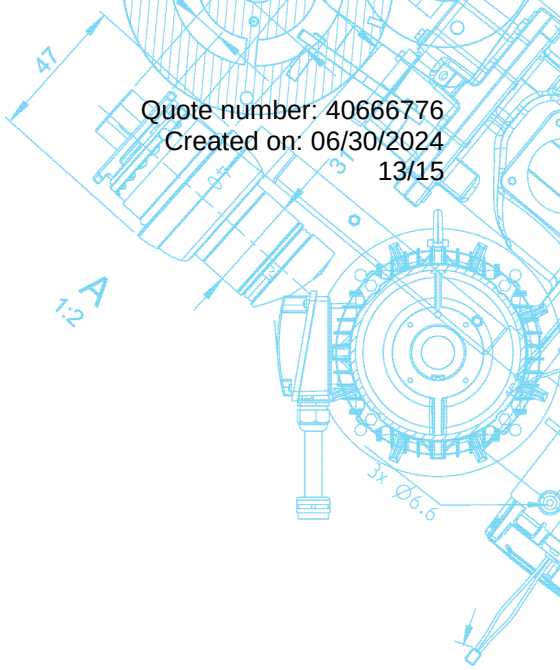
Equipment: ZE 4 160 1-3,5bar Pack A.C. - AIF116920
Part Description
ZE85-185 ZA4 16000H MAINT KIT
ZR110-425 AC DRAIN VALVE KIT
KIT:OIL ANALYSIS
ROTO Z OIL

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Equipment: ZE 4 160 1-3,5bar Pack A.C. - AIF116921
Part Description
ZE85-185 ZA4 16000H MAINT KIT
ZR110-425 AC DRAIN VALVE KIT
KIT:OIL ANALYSIS
ROTO Z OIL

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The following conditions apply

1. The Responsibilities and rights of the parties

1.1. The customer will ensure that:
- 1.1.1. The routine maintenance of the equipment is carried out in accordance with Atlas Copco's instruction book:
- 1.1.2. The equipment log book is filled in daily;
- 1.1.3. At all times the equipment is kept in the environmental conditions recommended by Atlas Copco and the instructions relating to the operation of the equipment as advised by Atlas Copco from time to time are followed.

1.2. The customer will confirm to Atlas Copco that the instruction manual for the equipment is in his possession.

1.3. Atlas Copco will contact the customer before the planned time for the visit. The customer will then ensure the equipment is available for inspection.

1.4. Maintenance and Inspection will be carried out during normal working hours, 8.00 am - 5.00 pm, Monday to Friday. If this is not practical, any extra cost incurred by Atlas Copco in carrying out maintenance or inspection outside normal working hours will be borne by the customer and invoiced separately.

1.5. If any major changes occur in the operating or site conditions of the equipment, this agreement shall become null and void. Major changes would normally involve re-location of the unit, change of coolant or power.

1.6. The customer shall inform Atlas Copco immediately in the event of: malfunctions such as abnormal noise, leakage or any other phenomenon that may result in premature failure of the equipment; malfunctions of the hour meter; a planned transfer of the equipment or changes in its environmental conditions.

1.7. The customer will give necessary assistance to Atlas Copco in the performance of its obligations under this agreement by providing lifting facilities, lighting and unrestricted access to the equipment at the agreed time. Any costs and/or expenses incurred by Atlas Copco as a result of access to the equipment or facilities being delayed from the agreed time will be borne by the customer and invoiced separately by Atlas Copco.

1.8. The customer shall be responsible for a 25% restocking fee for any replacement parts order cancelled after the shipment of the parts.

2. **Services**

2.1. The price includes all costs of labor and material to perform a fixed price repair as described in the "Quotation" section excluding applicable taxes, except where under the terms of this agreement Atlas Copco is entitled to make an extra charge for these.

2.2. After visit a report on the condition of the equipment will be submitted to the customer by Atlas Copco.

3. **Limitation and Termination**

3.1. Atlas Copco shall not be obliged to inspect any equipment in the event of:
- 3.1.1. Negligence by the customer in the performance of daily maintenance according to Clause 1.1;
- 3.1.2. Any failure of the equipment caused by unforeseen circumstances including, but not limited to failure, interruption or out of specification provision of services to the equipment such as quality and/or quantity of cooling water, air, electrical power etc., accidental or willful damage to the equipment by the customer or a third party.

3.2. This agreement may be terminated by mutual agreement in writing of the parties.

3.3. Atlas Copco shall be entitled to terminate this agreement by notice in writing to the customer:
- 3.3.1. In the circumstances referred to in Clauses 1.5 and 3.1;
- 3.3.2. If the customer goes into liquidation or makes any voluntary arrangement with its creditors or becomes subject to an administration order or an encumbrance takes possession of or a receiver is appointed over any of the property or assets of the customer;
- 3.3.3. If the customer ceases or threatens to cease to carry on business.

3.4. Neither party shall be liable to the other party for any indirect, consequential, incidental, special, punitive or exemplary damages or loss, of any kind, including, without limitation, any loss of business, lost profits or interruption of services (even if such party has been advised of the possibility of such damages or such damages could have been reasonably foreseen by such party). The total liability of the parties under this agreement after customer's payment of the purchase price for the product(s)/service(s) shall be limited to the amount of such purchase price as the exclusive remedy of the non-breaching party.

3.5. Temporary hire of equipment is not included to cover equipment outages unless otherwise agreed in writing by Atlas Copco.

4. **Force Majeure**

4.1. The delay or non-performance of any obligation under this agreement shall be excused if caused by an event beyond such party's reasonable control including but not limited to:
- 4.1.1. Acts of God, restriction in the use of power, storm, lock out, strike, fire, civil commotion or civil unrest, act of war, compliance with the regulation or order of any governmental authority, quarantine, epidemic, or pandemic.

5. **Guarantee**

5.1. Atlas Copco warrants that the products provided are free from defects in material and workmanship and services are performed in a workmanlike manner. Atlas Copco standard equipment warranty applies and is available upon request.

5.2. THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES (WRITTEN, ORAL, IMPLIED, OR OTHERWISE), AND ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY EXPRESSLY DISCLAIMED.

6. Environmental Damages

6.1. The Environmental Management at any site on which Atlas Copco equipment is used is the responsibility of the Customer. In this regard Atlas Copco disclaims any responsibility for any infringement which occurs related to Acts, Rules or Regulations pertaining to environmental pollution aspects such as noise, atmospheric, water, sewer, dangerous goods, waste disposal etc.

7. General

7.1. If any term of this agreement is held by any court or other competent authority to be void or unenforceable in whole or in part the other terms of this agreement and the remainder of the affected term shall continue to be valid.

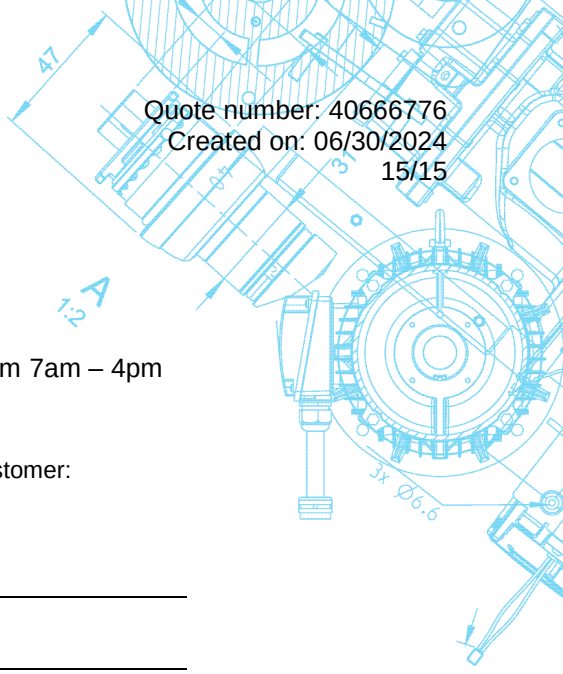
7.2. Any notice to be given by either party to the other under this agreement may be delivered by hand or sent by first class post to the other party at the address for that party shown in this agreement. Any notice delivered by hand shall be deemed to have been served on delivery and any notice sent by post shall be deemed to have been served within 48 hours after posting.

7.3. Any waiver by Atlas Copco of a breach of any terms of this agreement by the customer shall not be considered as a waiver of any subsequent breach of the same term or any other term.

7.4. Pricing does not include taxes and freight and will be added to the invoice.

8. SMARTLINK

The equipment may include a data monitoring service called SMARTLINK. The data received by Atlas Copco may be used by Atlas Copco and certain third party distributors and contractors for the purpose of increasing overall customer service. Atlas Copco will use commercially reasonable efforts to ensure that Purchaser's data is kept confidential. Purchaser acknowledges that the use of the SMARTLINK is provided "as is", that use of the service is entirely at Purchaser's risk, and that Atlas Copco may discontinue the SMARTLINK service at any time. Purchaser may request discontinuance of the SMARTLINK service at any time. SMARTLINK Terms and Conditions are available upon request.



Pricing does not include freight
Pricing does not include sales tax

Pricing applies to services performed during normal working hours, weekdays, from 7am – 4pm

Signed for and on behalf of Atlas Copco:	Signed for and on behalf of the customer:
Signature:	Signature:
Name: James Vida	Name: Angelo Heidt
Position: Service Sales Manager	Position:
Date: 06/30/2024	Date: 06/30/2024
	Customer# 100384242
	PO#

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Attachment D-4 Mark Piascik Diffuser Line Inspection Reports

Attachment D-4

PACE
Advanced Water Engineering

Mark Piascik Diffuser Line Inspection Reports

6/04/14 Lakeshore Dr. Aeration Lines Inspection Report

Line 1
Plugged Holes: 6
Missing Straps: 7
Missing Bricks: 20
Comments:

Line 2
Plugged Holes: 16
Missing Straps: 12
Missing Bricks: 25

Line 3
Plugged Holes: 9
Missing Straps: 17
Missing Bricks: 1
Comments:

Line 4
Plugged Holes: 2
Missing Straps: 10
Missing Bricks: 4

Line 5
Plugged Holes: 6
Missing Straps: 7
Missing Bricks: 15
Comments:

Line 6
Plugged Holes: 15
Missing Straps: 24
Missing Bricks: 21

Inspection totals: Lakeshore lines
Plugged Holes: 54
Missing Straps: 77
Missing Bricks: 86

6/04/14 Grand Ave. Aeration Lines Inspection Report

Line 7

Plugged Holes: 8
Missing Straps: 6
Missing Bricks: 11
Comments:

Line 8

Plugged Holes: 10
Missing Straps: 5
Missing Bricks: 12
Comments:

Line 9

Plugged Holes: 9
Missing Straps: 20
Missing Bricks: 31
Comments: An unnecessary ball valve, installed to test the line pressures, is leaking and should be removed and plugged.

Line 10

Plugged Holes: 10
Missing Straps: 12
Missing Bricks: 6
Comments

Line 11

Plugged Holes: 2
Missing Straps: 14
Missing Bricks: 16
Comments:

Line 12

Plugged Holes: 15
Missing Straps: 8
Missing Bricks: 11
Comments:

Inspection totals: Grand Ave Lines

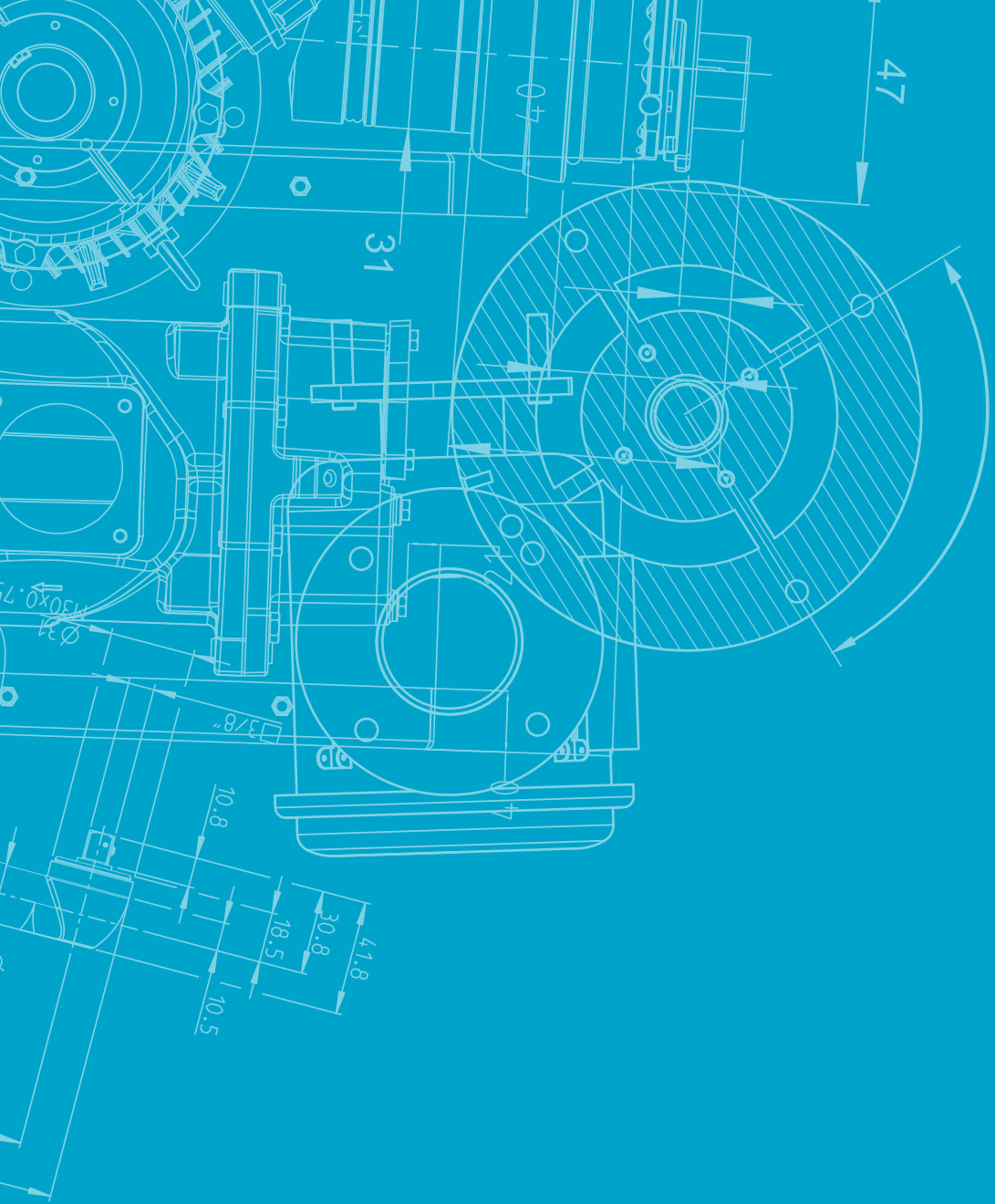
Plugged Holes: 54
Missing Straps: 65
Missing Bricks: 87

Attachment D-5 Atlas Copco Compressor Operation & Maintenance Manual

Attachment D-5

PACE
Advanced Water Engineering

Atlas Copco Compressor Operation & Maintenance Manual



Instruction book

Oil-free single stage screw compressors

AIF116920
ZE 4

Atlas Copco

Oil-free single stage screw compressors

ZE 4

AIF116920

Instruction book

Original instructions

WARNING



Read all safety warnings, instructions, illustrations and specifications provided with this product. Failure to follow all instructions listed in this instruction book may result in personal injury, death and/or property damage.

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This instruction book is valid for CE, non-CE as well as UKCA labelled machines. It meets the requirements for instructions specified by the applicable European directives or UK statutory instruments as identified in the Declaration of Conformity.

June 2024

No. AIF116920

www.atlascopco.com

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1 Safety precautions

1.1 Safety icons

Explanation

	Danger to life
	Warning
	Important note

1.2 General safety precautions

1. The operator must employ safe working practices and observe all related work safety requirements and regulations.
2. If any of the following statements does not comply with the applicable legislation, the stricter of the two shall apply.
3. Installation, operation, maintenance and repair work must only be performed by authorized, trained, specialized personnel. The personnel should apply safe working practices by use of personal protection equipment, appropriate tools and defined procedures.
4. The compressor is not considered capable of producing air of breathing quality. For air of breathing quality, the compressed air must be adequately purified according to the applicable legislation and standards.
5. Before any maintenance, repair work, adjustment or any other non-routine checks:
    - Stop the machine
    - Press the emergency stop button
    - Switch off the voltage
    - Depressurize the machine
    - Lock Out - Tag Out (LOTO):
        - Open the power isolating switch and lock it with a personal lock
        - Tag the power isolating switch with the name of the service technician.
    - On units powered by a frequency converter, wait 10 minutes before starting any electrical repair.
    - Never rely on indicator lamps or electrical door locks before maintenance work, always disconnect and check with measuring device.

	If the machine is equipped with an automatic restart after voltage failure function and if this function is active, be aware that the machine will restart automatically when the power is restored if it was running when the power was interrupted!

6. Never play with compressed air. Do not apply the air to your skin or direct an air stream at people. Never use the air to clean dirt from your clothes. When using the air to clean equipment, do so with extreme caution and wear eye protection.
7. The owner is responsible for maintaining the unit in safe operating condition. Parts and accessories shall be replaced if unsuitable for safe operation.
8. It is prohibited to walk or stand on the unit or on its components.
9. If compressed air is used in the food industry and more specifically for direct food contact, it is recommended, for optimal safety, to use certified Class 0 compressors in combination with appropriate filtration depending on the application. Please contact your customer center for advice on specific filtration.
10. The service switch should only be operated by a trained service specialist from the manufacturer.

1.3 Safety precautions during installation

	All responsibility for any damage or injury resulting from neglecting these precautions, or non-observance of the normal caution and care required for installation, operation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.

Precautions during installation

1. The machine must only be lifted using suitable equipment in accordance with the applicable safety regulations. Loose or pivoting parts must be securely fastened before lifting. It is strictly forbidden to dwell or stay in the risk zone under a lifted load. Lifting acceleration and deceleration must be kept within safe limits. Wear a safety helmet when working in the area of overhead or lifting equipment.
2. The unit is designed for indoor use. If the unit is installed outdoors, special precautions must be taken. Consult your supplier.
3. In case the device is a compressor, place the machine where the ambient air is as cool and clean as possible. If necessary, install a suction duct. Never obstruct the air inlet. Care must be taken to minimize the entry of moisture at the inlet air.
4. Any blanking flanges, plugs, caps and desiccant bags must be removed before connecting the pipes.
5. Air hoses must be of correct size and suitable for the working pressure. Never use frayed, damaged or worn hoses. Distribution pipes and connections must be of the correct size and suitable for the working pressure.
6. In case the device is a compressor, the aspirated air must be free of flammable fumes, vapors and particles, e.g. paint solvents, that can lead to internal fire or explosion.
7. In case the device is a compressor, arrange the air intake so that loose clothing worn by people cannot be drawn in.
8. Ensure that the discharge pipe from the compressor to the aftercooler or air net is free to expand under heat and that it is not in contact with or close to flammable materials.
9. No external force may be exerted on the air outlet valve; the connected pipe must be free of strain.
10. If remote control is installed, the machine must bear a clear sign stating: DANGER: This machine is remotely controlled and may start without warning.

The operator has to make sure that the machine is stopped and depressurized and that the electrical isolating switch is open, locked and labelled with a temporary warning before any maintenance or repair. As a further safeguard, persons switching on or off remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the start equipment.

11. Air-cooled machines must be installed in such a way that an adequate flow of cooling air is available and that the exhausted air does not recirculate to the compressor air inlet or cooling air inlet.
12. The electrical connections must correspond to the applicable codes. The machines must be earthed and protected against short circuits by fuses in all phases. A lockable power isolating switch must be installed near the compressor.
13. On machines with automatic start/stop system or if the automatic restart function after voltage failure is activated, a sign stating "This machine may start without warning" must be affixed near the instrument panel.
14. In multiple compressor systems, manual valves must be installed to isolate each compressor. Non-return valves (check valves) must not be relied upon for isolating pressure systems.
15. Never remove or tamper with the safety devices, guards or insulation fitted on the machine. Every pressure vessel or auxiliary installed outside the machine to contain air above atmospheric pressure must be protected by a pressure relieving device or devices as required.
16. Piping or other parts with a temperature in excess of 70˚C (158˚F) and which may be accidentally touched by personnel in normal operation must be guarded or insulated. Other high temperature piping must be clearly marked.
17. For water-cooled machines, the cooling water system installed outside the machine has to be protected by a safety device with set pressure according to the maximum cooling water inlet pressure.
18. If the ground is not level or can be subject to variable inclination, consult the manufacturer.
19. If the device is a dryer and no free extinguishing system is present in the air net close to the dryer, safety valves must be installed in the vessels of the dryer.

	Also consult the following safety precautions: Safety precautions during operation and Safety precautions during maintenance. These precautions apply to machinery processing or consuming air or inert gas. Processing of any other gas requires additional safety precautions typical to the application which are not included herein. Some precautions are general and cover several machine types and equipment; hence some statements may not apply to your machine.

1.4 Safety precautions during operation

	All responsibility for any damage or injury resulting from neglecting these precautions, or non observance of the normal caution and care required for installation, operation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.

Precautions during operation

1. Never touch any piping or components of the machine during operation.

2. Use only the correct type and size of hose end fittings and connections. When blowing through a hose or air line, ensure that the open end is held securely. A free end will whip and may cause injury. Make sure that a hose is fully depressurized before disconnecting it.
3. Persons switching on remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the remote start equipment.
4. Never operate the machine when there is a possibility of taking in flammable or toxic fumes, vapors or particles.
5. Never operate the machine below or in excess of its limit ratings.
6. Keep all bodywork doors shut during operation. The doors may be opened for short periods only, e.g. to carry out routine checks. Wear ear protectors when opening a door.

   On machines without bodywork, wear ear protection in the vicinity of the machine.
7. People staying in environments or rooms where the sound pressure level reaches or exceeds 80 dB(A) shall wear ear protectors.
8. Periodically check that:
   - All guards are in place and securely fastened
   - All hoses and/or pipes inside the machine are in good condition, secure and not rubbing
   - No leaks occur
   - All fasteners are tight
   - All electrical leads are secure and in good order
   - Safety valves and other pressure relief devices are not obstructed by dirt or paint
   - Air outlet valve and air net, i.e. pipes, couplings, manifolds, valves, hoses, etc. are in good repair, free of wear or abuse
   - Air cooling filters of the electrical cabinet are not clogged
9. If warm cooling air from compressors is used in air heating systems, e.g. to warm up a workroom, take precautions against air pollution and possible contamination of the breathing air.
10. On water-cooled compressors using open circuit cooling towers, protective measures must be taken to avoid the growth of harmful bacteria such as Legionella pneumophila bacteria.
11. Do not remove any of, or tamper with, the sound-damping material.
12. Never remove or tamper with the safety devices, guards or insulations fitted on the machine. Every pressure vessel or auxiliary installed outside the machine to contain air above atmospheric pressure shall be protected by a pressure relieving device or devices as required.
13. Yearly inspect the air receiver. Minimum wall thickness as specified in the instruction book must be respected. Local regulations remain applicable if they are more strict.
14. It is not allowed to directly use the hot water from the compressor cooling water circuit as process water in pollution-sensitive applications such as the food and pharmaceutical industry.

	Also consult following safety precautions: Safety precautions during installation and Safety precautions during maintenance. These precautions apply to machinery processing or consuming air or inert gas. Processing of any other gas requires additional safety precautions typical to the application which are not included herein. Some precautions are general and cover several machine types and equipment; hence some statements may not apply to your machine.

1.5 Safety precautions during maintenance or repair

	All responsibility for any damage or injury resulting from neglecting these precautions, or non-observance of the normal caution and care required for installation, operation, maintenance and repair, even if not expressly stated, will be disclaimed by the manufacturer.

Precautions during maintenance or repair

1. Always use the correct safety equipment (such as safety glasses, gloves, safety shoes, etc.).
2. Use only the correct tools for maintenance and repair work.
3. Use only genuine spare parts.
4. All maintenance work shall only be undertaken when the machine has cooled down.
5. A warning sign bearing a legend such as "work in progress; do not start" shall be attached to the starting equipment.
6. Persons switching on remotely controlled machines shall take adequate precautions to ensure that there is no one checking or working on the machine. To this end, a suitable notice shall be affixed to the remote start equipment.
7. Close the compressor air outlet valve before connecting or disconnecting a pipe.
8. Before removing any pressurized component, effectively isolate the machine from all sources of pressure and relieve the entire system of pressure.
9. Never use flammable solvents or carbon tetrachloride for cleaning parts. Take safety precautions against toxic vapours of cleaning liquids.
10. Scrupulously observe cleanliness during maintenance and repair. Keep dirt away by covering the parts and exposed openings with a clean cloth, paper or tape.
11. Never weld or perform any operation involving heat near the oil system. Oil tanks must be completely purged, e.g. by steam-cleaning, before carrying out such operations. Never weld on, or in any way modify, pressure vessels.
12. Whenever there is an indication or any suspicion that an internal part of a machine is overheated, the machine shall be stopped but no inspection covers shall be opened before sufficient cooling time has elapsed; this to avoid the risk of spontaneous ignition of the oil vapour when air is admitted.
13. Never use a light source with open flame for inspecting the interior of a machine, pressure vessel, etc.
14. Make sure that no tools, loose parts or rags are left in or on the machine.
15. All regulating and safety devices shall be maintained with due care to ensure that they function properly. They may not be put out of action.
16. Before clearing the machine for use after maintenance or overhaul, check that operating pressures, temperatures and time settings are correct. Check that all control and shut-down devices are fitted and that they function correctly. If the coupling guard of the compressor drive shaft was removed, check that it has been reinstalled.
17. Protect the motor, air filter, electrical and regulating components, etc. to prevent moisture from entering them, e.g. when steam-cleaning.
18. Make sure that all sound-damping material and vibration dampers, e.g. damping material on the bodywork and in the air inlet and outlet systems of the compressor, is in good condition. If damaged, replace it by genuine material from the manufacturer to prevent the sound pressure level from increasing.

19. Never use caustic solvents which can damage materials of the air net, e.g. polycarbonate bowls.

	Also consult following safety precautions: Safety precautions during installation and Safety precautions during operation. These precautions apply to machinery processing or consuming air or inert gas. Processing of any other gas requires additional safety precautions typical to the application which are not included herein. Some precautions are general and cover several machine types and equipment; hence some statements may not apply to your machine.

1.6 Dismantling and disposal

Dismantling

Once the end of life of the machine is reached, please follow next steps:

1. Stop the machine.
2. Check all safety precautions mentioned in the previous chapters to secure safe handling (for example, LOTO, cool-down, depressurize and discharge).
3. Separate the harmful from the safe components (for example, drain oil from oil containing parts).
4. Refer to the disposal topic mentioned below.

Disposal of electrical and electronic appliances (WEEE)

This equipment falls under the provisions of the European Directive 2012/19/EU on waste electrical and electronic appliances (WEEE) as well as under the UKCA Waste Electrical and Electronic Equipment regulations 2013 and may not be disposed as unsorted waste.



The equipment is labelled in accordance with the European Directive 2012/19/EU and the UKCA Waste Electrical and Electronic Equipment regulations 2013 with the crossed-out wheelie bin symbol.

At the end of life-time of the electric and electronic equipment (EEE) it must be taken to separate collection.

For more information check with your local waste authority, customer center or distributor.

Disposal of other used material

Used filters or any other used material (for example, filter bags, filter media, desiccant, lubricants, cleaning rags and machine parts) must be disposed of in an environmentally friendly and safe manner, and in line with the local recommendations and environmental legislation.

2 General description

2.1 Introduction

General views

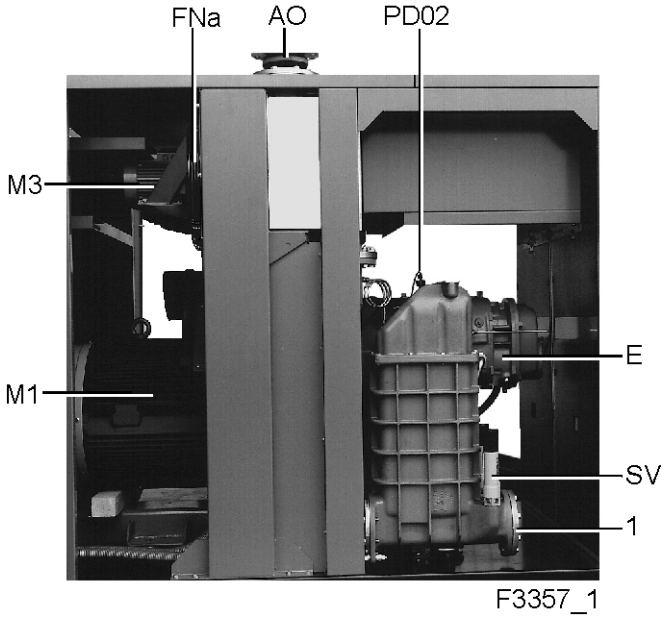


Figure 1: View of ZE 4 Pack with aftercooler and without full-load/no-load regulator

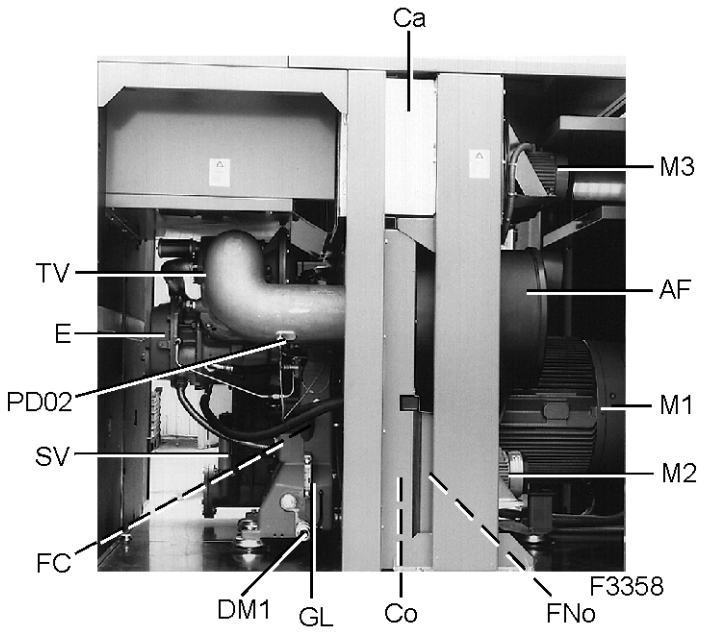


Figure 2: Rear view of ZE 4 Pack with aftercooler and full-load/no-load regulator

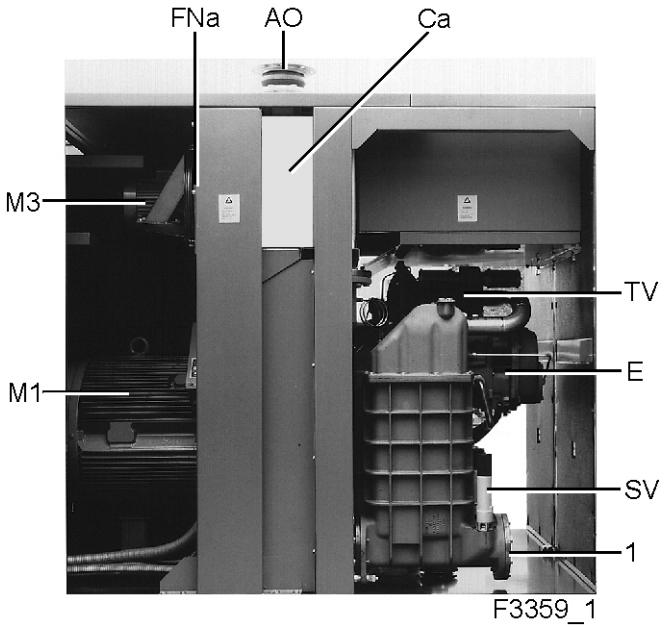


Figure 3: Front view of ZE 4 Pack with aftercooler and full-load/no-load regulator

Ref.	Name
AF	Air filter
AO	Air outlet
Ca	Aftercooler
Co	Oil cooler
Dm1	Drain valve, compressor sump
E	Compressor element
FC	Oil filler plug
FNa	Fan, aftercooler
FNo	Fan, oil cooler
Gl	Oil level sight-glass
M1	Compressor motor
M2	Fan motor, oil cooler
M3	Fan motor, aftercooler
PD02	Pressure sensor, dp of air filter
SV	Safety valve
TV	Full-load/no-load regulator
1	Flange for MD connection

ZE compressors are air-cooled.

The compressors include mainly:

- Air filter
- Full-load/no-load regulator
- Compressor element
- Drive coupling
- Gear casing
- Elektronikon^{TM} control system
- Safety valves
- Oil cooler

- Frame

Elektronikon control system

The compressor is controlled by an electronic regulator which:

- Controls the operation of the compressor
- Reduces the power consumption
- Warns the operator in case of an abnormal operating condition
- Protects the compressor
- Monitors components subject to service
- Automatically restarts the compressor after voltage failure (made inactive)

Full-load/no-load regulator

The compressors can be equipped with a full-load/no-load regulator.

Drive arrangement

On ARR E, the motor is flanged to the gear casing by means of a coupling housing. The motor/gear casing unit is supported on the frame by vibration dampers.

Connections

The connection pipes can be provided with ANSI flanges.

Canopy

The compressor is provided with a sound-insulated bodywork.

Aftercooler

On ZA 5, ZA 6 and ZE Pack compressors, a built-in aftercooler can also be ordered as an option.

2.2 Electrical system

Description

Arrangement E compressors are completely equipped and wired, and require only connection to the mains.

The system includes mainly:

- Compressor motor
- Elektronikon® control system including an electronic regulator and a control panel
- Pressure and temperature sensors
- On compressors with low-voltage motors, an electric cabinet including the starting equipment of the motor is also installed

2.3 Regulation

Flow diagrams

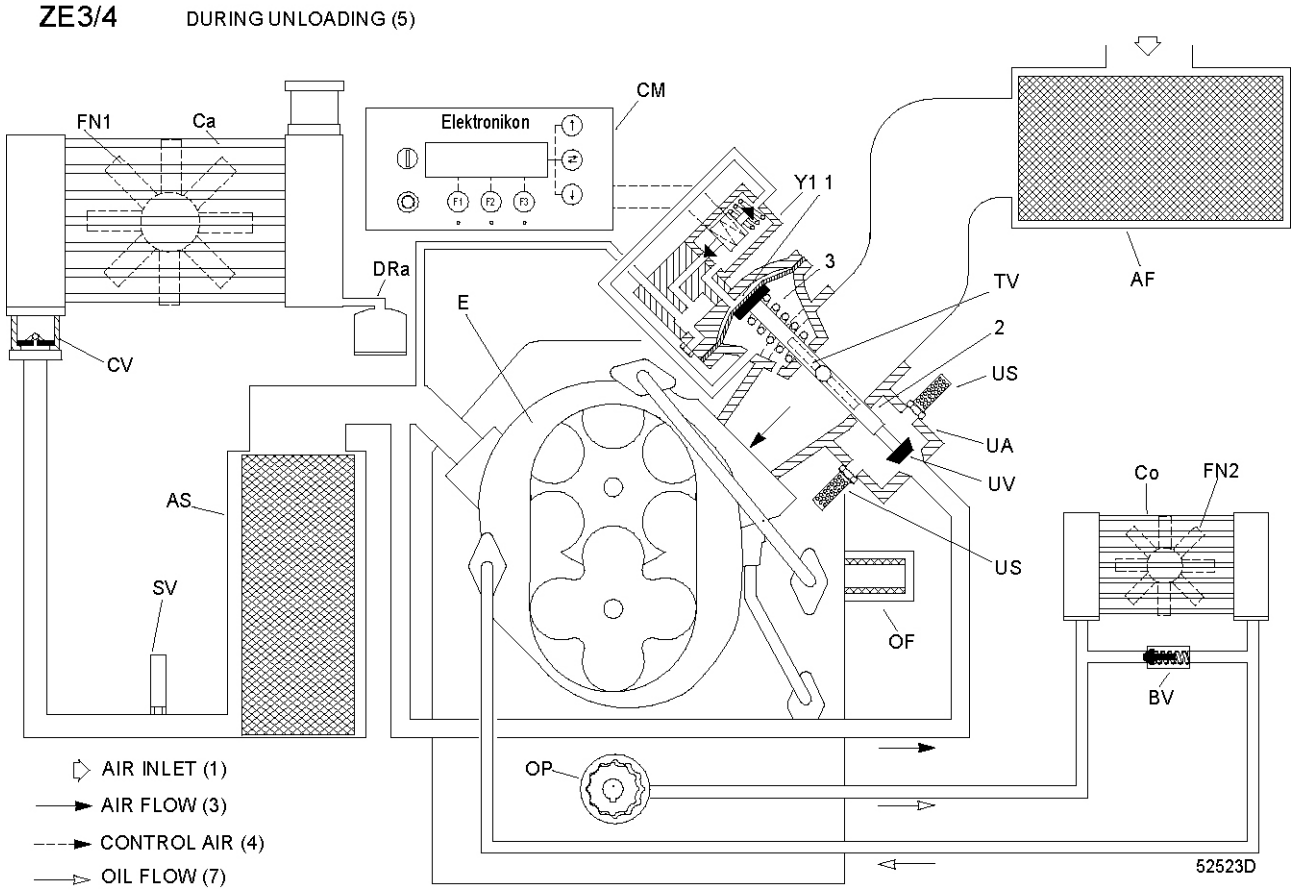


Figure 4: ZE 3-4 (with aftercooler) during unloading

Air flow

Air drawn through filter (AF) is compressed in compressor element (E) and discharged through check valve (CV) towards the air net.

Condensate drain system

If an aftercooler (Ca) is provided, a drain receiver (DRa) is installed downstream of the cooler to prevent condensate from entering the air outlet pipe. The drain receiver is provided with a float valve to automatically drain condensate and with a manual drain valve.

Oil system

On ZE 3 and ZE 4, oil is circulated by pump (OP) from the sump of the gear casing through cooler (Co), the cooling jacket of compressor element (E) and filter (OF) towards the bearings and timing gears.

A valve by-passes oil cooler (Co) when starting the compressor from cold condition to ensure rapid warming of the oil to normal working temperature.

Cooling system

The compressors are provided with an oil cooler.

On ZA 5, ZA 6 and ZE 3-4 with bodywork, an aftercooler (Ca) is available as option.

On ZE, the coolers are cooled by fans (FN1/2).

Regulating system

The system is controlled by the Elektronikon® regulator, which keeps the net pressure within programmable pressure limits by automatically loading and unloading the compressor depending on the air consumption.

During unloading:

If the air consumption is less than the air delivery of the compressor, the net pressure increases. When the net pressure reaches the upper limit of the working pressure (unloading pressure), solenoid valve (Y1) is de-energized. The plunger of solenoid valve (Y1) moves by spring force shutting off the supply of control air to unloader (UA):

- Control pressure is vented from chamber (1) of unloader (UA) through solenoid valve (Y1) and chamber (3) towards the inlet of compressor element (E).
- As there is no longer any pressure difference between chambers (1 and 3), plunger (2) returns by spring force keeping full-load/no-load valve (TV) closed and unloading valve (UV) open.
- Compressed air between check valve (CV) and valve (UV) is blown off through silencer (US). Check valve (CV) closes.

Air delivery is stopped (0%), the compressor runs unloaded.

During loading

When the net pressure decreases to the lower limit of the working pressure (loading pressure), solenoid valve (Y1) is energized. The plunger of solenoid valve (Y1) moves against spring force opening the supply port of control air to unloader (UA):

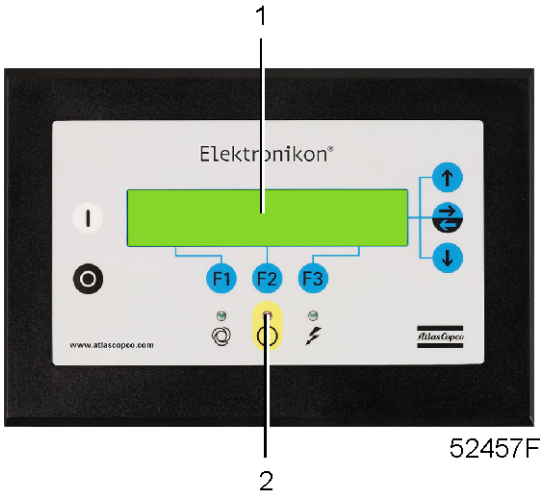
- Element outlet pressure at approx. 1.2 bar(a) is fed through solenoid valve (Y1) to chamber (1) of unloader (UA). As this pressure is higher than the pressure in chamber (3), full-load/no-load valve (TV) starts opening.
- Pressure is building up. As the pressure difference between chambers (1 and 3) increases, plunger (2) moves further against spring force until throttle valve (TV) is fully open and unloading valve (UV) closed.

  Air delivery is resumed (100%), the compressor runs loaded.

3 Elektronikon regulator

3.1 Elektronikon® regulator

Control panel



Introduction

In general, the Elektronikon regulator has following functions:

- Controlling the compressor
- Protecting the compressor
- Monitoring components subject to service
- Automatic restart after voltage failure (made inactive)

Automatic control of compressor operation

The regulator maintains the net pressure between programmable limits by automatically loading and unloading the compressor. A number of programmable settings, e.g. the unloading and loading pressures, the minimum stop time and the maximum number of motor starts are taken into account.

The regulator stops the compressor whenever possible to reduce the power consumption and restarts it automatically when the net pressure decreases. In case the expected unloading period is too short, the compressor is kept running to prevent too short standstill periods.

	A number of time-based automatic start/stop commands may be programmed. Take into account that a start command will be executed (if programmed and activated), even after manually stopping the compressor.

Protecting the compressor

Shut-down

Several sensors are provided on the compressor. If one of these measurements exceeds the programmed shut-down level, the compressor will be stopped. This will be indicated on display (1) and general alarm LED (2) will blink.

Remedy the trouble and reset the message. See also the Status data menu.

	Before remedying, consult the Safety precautions.

Shut-down warning

A shut-down warning level is a programmable level below the shut-down level.

If one of the measurements exceeds the programmed shut-down warning level, a message will appear on display (1) and general alarm LED (2) will light up, to warn the operator that the shut-down warning level is exceeded.

The message disappears as soon as the warning condition disappears.

Service warning

A number of service operations are grouped (called Level A, B, C, ...). Each level has a programmed time interval. If a time interval is exceeded, a message will appear on display (1) and the general alarm LED (2) will light up to warn the operator to carry out the service actions belonging to that level.

Automatic restart after voltage failure

The regulator has a built-in function to automatically restart the compressor if the voltage is restored after voltage failure. For compressors leaving the factory, this function is made inactive. If desired, the function can be activated. Consult the Atlas Copco Customer Centre.

	If activated and provided the regulator was in the automatic operation mode, the compressor will automatically restart if the supply voltage to the module is restored within a programmed time period. The power recovery time (the period within which the voltage must be restored to have an automatic restart) can be set between 1 and 3600 seconds or to “Infinite”. If the power recovery time is set to “Infinite”, the compressor will always restart after a voltage failure, no matter how long it takes to restore the voltage. A restart delay can also be programmed, allowing e.g. two compressors to be restarted one after the other.

3.2 Control panel

Elektronikon regulator

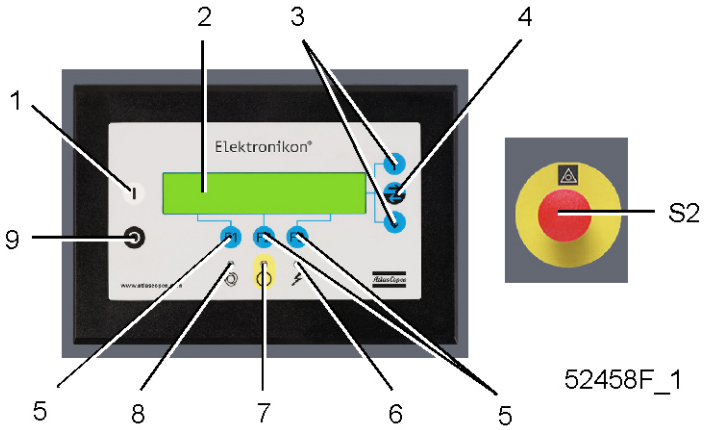


Figure 5: Control panel

Parts and functions

Reference	Designation	Function
1	Start button	Button to start the compressor. LED (8) lights up indicating that the Elektronikon regulator is operative.
2	Display	Shows messages about the compressor operating condition, a service need or a fault.
3	Scroll keys	Keys to scroll upwards or downwards through the display.
4	Tabulator key	Key to select the parameter indicated by the horizontal arrow. Only the parameters followed by an arrow pointing to the right can be modified.
5	Function keys	Keys to control and program the compressor.
6	Voltage on LED	Indicates that the voltage is switched on.
7	General alarm LED	Is lit if a shut-down warning condition exists or maintenance is required.
7	General alarm LED	Flashes if a shut-down condition exists, if an important sensor is out of order or after an emergency stop.
8	Automatic operation LED	Indicates that the regulator is automatically controlling the compressor.
9	Stop button	Button to stop the compressor. LED (8) goes out.
S2	Emergency stop button	Push button to stop the compressor immediately in the event of an emergency. After remedying the trouble, unlock the button by pulling it out.

3.3 Function keys

Control panel



Function keys

The keys (1) are used:

- To manually load/unload the compressor (not for VSD compressors)
- To call up or to program settings
- To reset a motor overload, shut-down or service message, or an emergency stop
- To access all data collected by the regulator

The functions of the keys vary depending on the displayed menu. The actual function is indicated just above the relevant key. The most common functions are listed below:

Designation	Function
“Add”	To add compressor start/stop commands (day/hour)
“Back”	To return to a previously shown option or menu
“Cancel”	To cancel a programmed setting when programming parameters
“Delete”	To delete compressor start/stop commands
“Help”	To find the Atlas Copco internet address
“Limits”	To show limits for a programmable setting
“Load”	To load the compressor manually
“Mainscreen”	To return from a menu to the main screen
“Menu”	Starting from the main screen, to have access to the submenus
“Menu”	Starting from a submenu, to return to a previous menu
“Modify”	To modify programmable settings
“Program”	To program modified settings
“Reset”	To reset a timer or message
“Return”	To return to a previously shown option or menu
“Unload”	To unload the compressor manually
“Extra”	To find the module configuration of the regulator

3.4 Scroll keys

Control panel



52460F

The keys (1) allow the operator to scroll through the display.

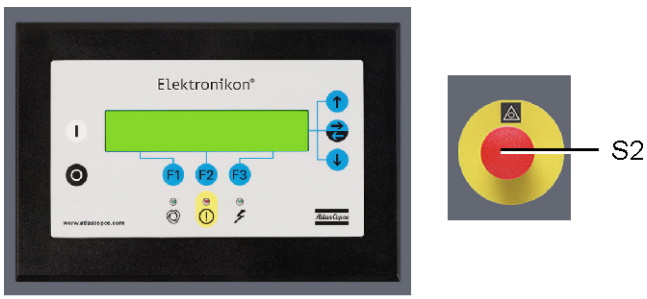
As long as a downwards pointing arrow is shown at the utmost right position of the display, the scroll key with the same symbol can be used to see the next item.

As long as an upwards pointing arrow is shown at the utmost right position of the display, the scroll key with the same symbol can be used to see the previous item.

When the scroll key is kept pressed, the scrolling is continued.

3.5 Emergency stop button

Control panel



52461F_1

In case of emergency, press button (S2) to stop the compressor immediately.

At the occurrence of an emergency stop, the compressor element is stopped immediately and the solenoid valve will be deactivated by Elektronikon ® regulator. No unload status is reached. The check valve prevents oil flow back from reversed rotation of the compressor element.

	Before starting any maintenance or repairs, wait until the compressor has stopped and open the isolating switch (customer's installation) to switch off the voltage to the compressor.
	Close the air outlet valve and open the manual condensate drain valves to depressurize the air system.
	Apply all relevant Safety precautions.

3.6 External compressor status indication

Warning

	Stop the compressor and switch off the voltage before connecting external equipment. Consult the Safety precautions.

Connections for external compressor status indication

Terminal strip (1X7) is provided with auxiliary contacts for external indication of:

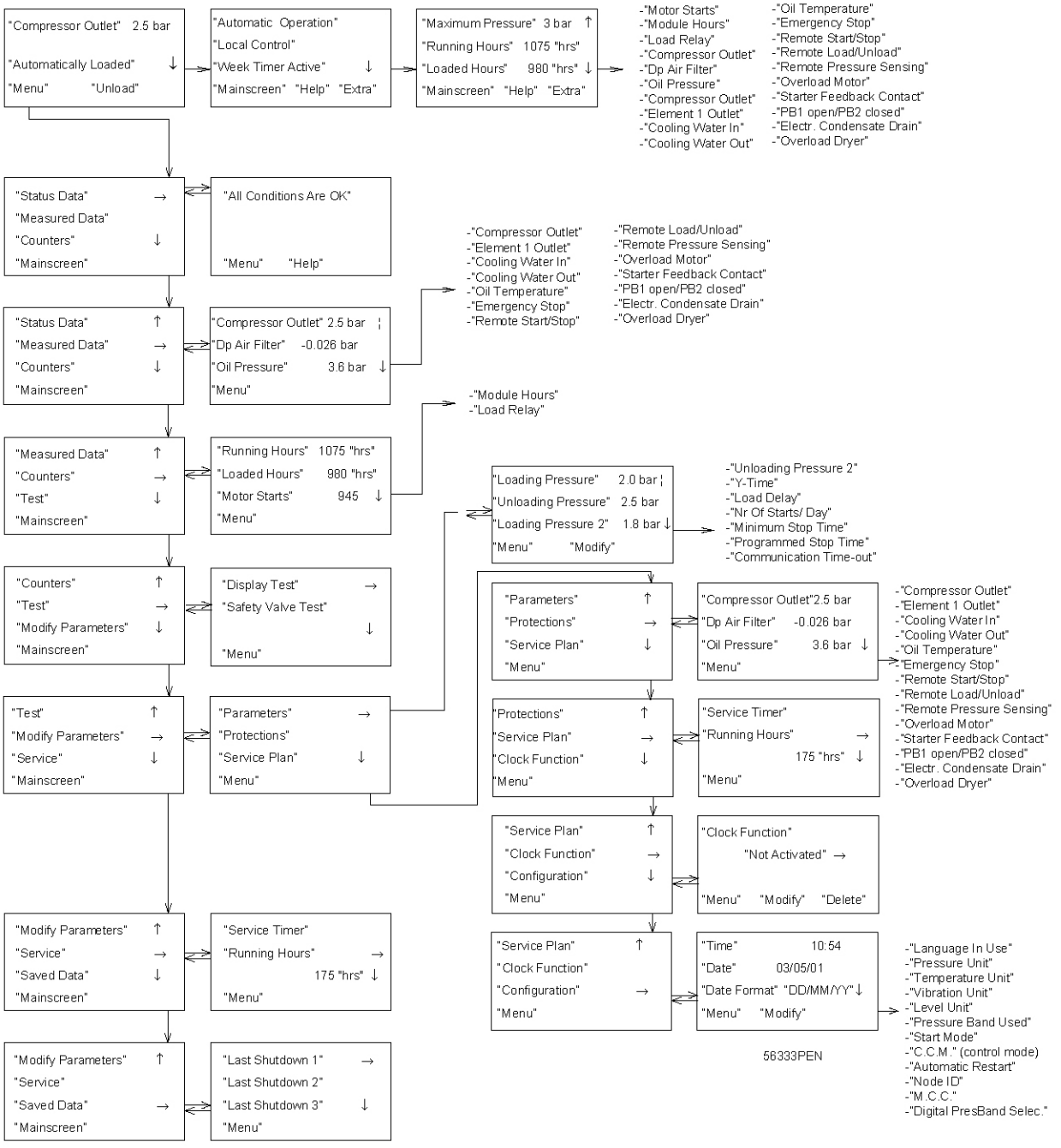
Indication	Relay	Terminals on strip 1X1	Maximum load
Automatic operation	K07	11-12	10 A / 230 V AC
Warning	K08	13-14	10 A / 230 V AC
Shut-down	K09	15-16	10 A / 230 V AC
Compressor loaded	K11	17-18	3 A / 230 V AC
Compressor running	K21	19-20	6 A / 230 V AC

3.7 Control programs

Description

In order to facilitate programming and controlling, menu-driven control programs have been implemented in the regulator.

Menu flow (simplified)



Main menu

Program	Function
Main screen	Shows in short the operation status of the compressor. Is the gateway to all functions.
“Status data”	Calls up the status of the compressor protection functions (shut-down, shut-down warning, service warning and warning). Resets a shut-down, motor overload and service condition.
“Measured data”	Calls up the data currently measured and the status of a number of inputs.

Program	Function
“Counters”	Calls up the running hours, regulator (module) hours and number of motor starts.
“Test”	Display test.
“Modify parameters”	**Modifies the settings for:** • Parameters (e.g. loading and unloading pressures) • Protections (e.g. temperature shut-down level) • Service plans (timers for service plans) • Clock functions (automatic compressor start/stop/pressure band commands) • Configuration (time, date, display language, ...)
“Service”	Calls up service plans and resets the timers after carrying out the service actions belonging to a plan.
“Saved data”	Calls up the saved data: last shut-down, last emergency stop data.
“Unload/Load”	Loads and unloads the compressor manually.

3.8 Calling up menus

Description

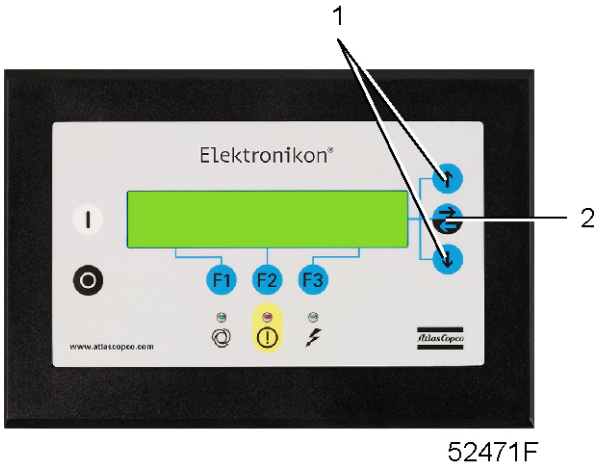


Figure 6: Control panel

When the voltage is switched on, the Main screen is shown automatically.

“Compressor Outlet”		2.5 bar	
.			
“Automatically Loaded”			↓
“Menu”		“Unload”	
F1	F2	F3	

Table 1: Example of Main screen of ZE 2 up to ZE 4 and ZA 2 up to ZA 6

After pressing the “Menu” (F1) key, the option “Status Data” will be followed by a horizontal arrow:

- Either press the tabulator key (2) to select this menu,
- or use the arrow down key (1) until the desired submenu is followed by a horizontal arrow and then press the tabulator key (2) to select this menu.

The arrow down key (1) can be used for a quick look at the actual compressor status.

3.9 Main screen menu

Function

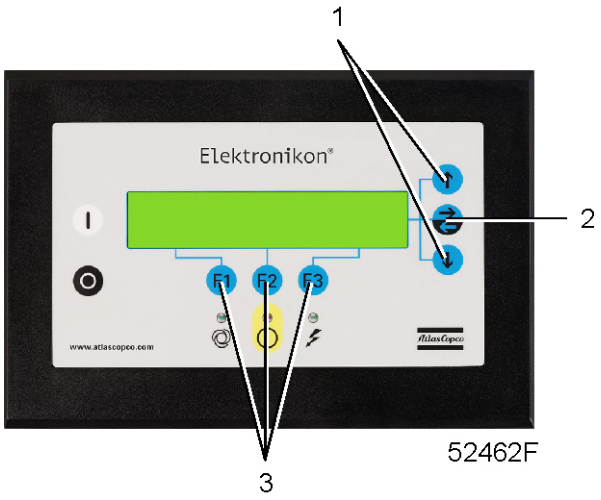


Figure 7: Control panel

The Main screen menu shows the status of the compressor operation and is the gateway to all functions implemented in the regulator.

Procedure

The Main screen is shown automatically when the voltage is switched on.

If the function or arrow keys (1, 2 and 3) are not used for some minutes, the regulator will automatically return to the Main screen.

Whenever displayed on a submenu screen, press the “Mainscreen” (F1) key to return to the Main screen.

“Compressor Outlet”		2.5 bar	
.			
“Automatically Loaded”			↓
“Menu”		“Unload”	
F1	F2	F3	

Table 2: Example of Main screen of ZE/ZA compressors

The display indicates:

- The name of the sensor and its actual reading
- Messages regarding the compressor operating condition
- Just above the function keys (3), the actual functions of these keys

3.10 Status data menu

Warning

	Before starting any maintenance or repairs, press the stop button (4), wait until the compressor has stopped, press the red emergency stop button and open the isolating switch (customer's installation) to switch off the voltage to the compressor.
	Close the air outlet valve and depressurize the air system.

Function

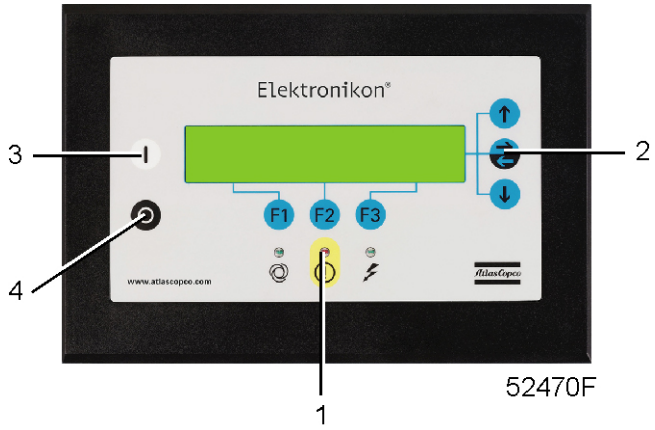


Figure 8: Control panel

The Status data submenu gives information regarding the status of the compressor protection functions (shut-down, shut-down warning and service warning) and allows resetting of a shut-down, motor overload and service condition.

Procedure

Starting from the Main screen (see Main screen menu):

- Press the key “Menu” (F1): the option “Status Data” will be followed by a horizontal arrow.
- Press the tabulator key (2).

No message exists

- General alarm LED (1) is out and the message on the display will indicate that all conditions are normal:

“All Conditions Are OK”			
.			
.			
“Menu”	“Help”		
F1	F2	F3	

A shut-down message exists

- In case the compressor is shut down, LED (1) will blink.
- In case of a shut-down due to too high a temperature at the outlet of the compressor element:

“Element Outlet”		239˚C	
.			
“Shutdown”	“Maximum”	235˚C	
“Menu***”	“Help”	“***Reset”	
F1	F2	F3	

- The indicators (***) are blinking. The screen shows the actual reading and the shut-down setting.
- It remains possible to scroll through other menus, e.g. to check the values of other parameters.

  When returning to the “Status Data” menu, the option “Shutdowns” will blink. This option can be selected by pressing the tabulator key (2) to return to the above shut-down screen.

Shut-down reset

- Switch off the voltage and remedy the trouble. After remedying and when the shut-down condition has disappeared, switch on the voltage and press the key “Reset” (F3).
- Press the keys “Menu” and “Mainscreen” to return to the Main screen and restart the compressor by means of start button (3).

A shut-down warning message exists

A shut-down warning level is a programmable level below the shut-down level.

- If a shut-down warning exists, LED (1) is alight. The Main screen will change into a screen similar to the one below:

“Compressor Outlet”		2.5 bar	
.			
***	“Shutdown Warning”	***	↓
“Menu***”		“***Unload”	
F1	F2	F3	

- The message “Shutdown Warning” appears.
- Press the key “Menu” (F1) and the tabulator key (2) to select the “Status data” menu; the option “Protection” is blinking.
- Scroll to this option and select it by pressing the tabulator key (2). A screen similar to the one below appears:

“Element 1 Outlet”		228˚C	
.			
“Shutd” “Warn” Maximum”		225˚C	
“Menu***”		***	
F1	F2	F3	

- The screen indicates that the temperature at the outlet of compressor element 1 exceeds the programmed shut-down warning level.
- If necessary, stop the compressor by means of stop button (4) and wait until it has stopped.
- Switch off the voltage, inspect and remedy.
- The warning message will disappear automatically as soon as the warning condition disappears.

A service warning exists

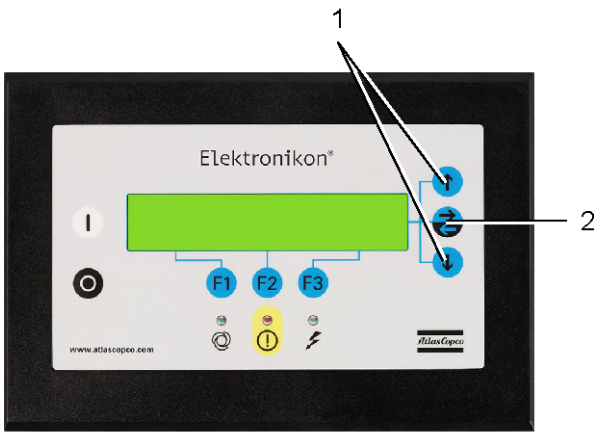
- LED (1) is alight. The Main screen will change into a screen similar to the one below:

“Compressor Outlet”		2.5 bar	
.			
“*Service Required*”			
“Menu***”		“***Unload”	
F1	F2	F3	

- The indicators (***) are blinking and the service warning message appears.
- Press the key Menu (F1) and the tabulator key (2) to select the “Status Data” menu: the option “Service” is blinking.
- Scroll to this option and select it by pressing the tabulator key (2); two options may blink:
  - “Inputs”: if the programmed service level of a component is exceeded (e.g. the maximum pressure drop of the air filter).
  - “Plan”: if a service plan interval is exceeded.
- Stop the compressor and switch off the voltage.
- In case the service message was referring to “Inputs” (air filter): replace the filter, switch on the voltage, scroll in the “Status Data” menu to “Inputs” and press the “Reset” key to reset the service message.
- In case the service message was referring to “Plan”: carry out the service actions related to the indicated plans. Reset the timers of the related plans. Contact your Atlas Copco Customer Centre. See section Service menu.

3.11 Measured data menu

Control panel



Function

To call up information regarding the actually measured data and the status of some inputs such as the motor overload protection. Consult the menu flow in section Control programs.

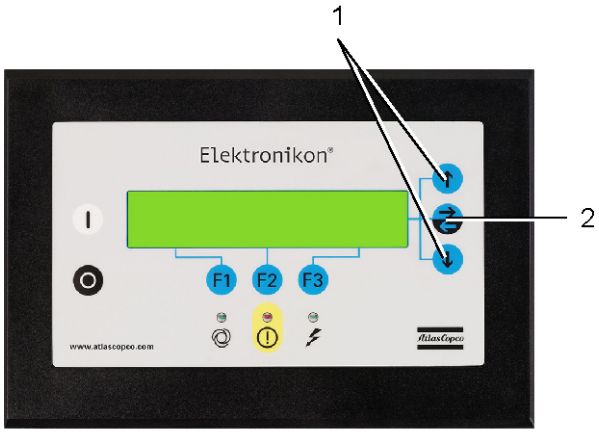
Procedure

Starting from the Main screen (see Main screen menu):

- Press the key “Menu” (F1).
- Press the arrow down key (1) until “Measured Data” is followed by a horizontal arrow.
- Activate the menu by pressing the tabulator key (2).
- By pressing the scroll keys (1), a number of actually measured data can be found.
- If one of the sensors is linked to a shut-down, service or warning function, both the actually measured value as well as the corresponding shut-down, warning or service level can be called up by pressing key (2).

3.12 Counters menu

Control panel



Function

To call up:

- The running hours
- The loaded hours
- The number of motor starts
- The number of hours the regulator (module) has been under tension
- The number of load cycles

Procedure

Starting from the Main screen (see Main screen menu):

- Press the key “Menu” (F1).
- Press the arrow down key (1) until “Counters” is followed by a horizontal arrow.
- Press the tabulator key (2) to activate the menu.
- By pressing the arrow key (1), the above-mentioned data can be found.

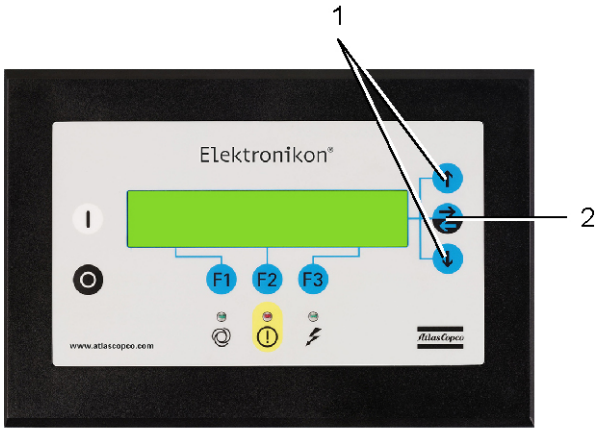
Example of a Counters screen

.			
“Running Hours”		2455 “hrs”	
“Loaded Hours”		1973 “hrs”	
“Motor starts”		945 “number”	↓

“Menu”			
F1	F2	F3	

3.13 Test menu

Control panel



Function

To carry out a display test, i.e. to check whether the display and LEDs are still intact.

Procedure

Starting from the Main screen (see Main screen menu):

- Press the “Menu” (F1) key.
- Press arrow down key (1) until “Test” is followed by a horizontal arrow.
- Activate the menu by pressing the key (2).
- The option “Display test” will be followed by a horizontal arrow.
- To test the display, press the key (2). During testing, the regulator will generate a series of patterns on the display which enable the operator to check that each pixel still functions normally; the LEDs are lit at the same time.
- Press the “Menu” key (F1) to return to the submenu.

3.14 Modify parameters menu

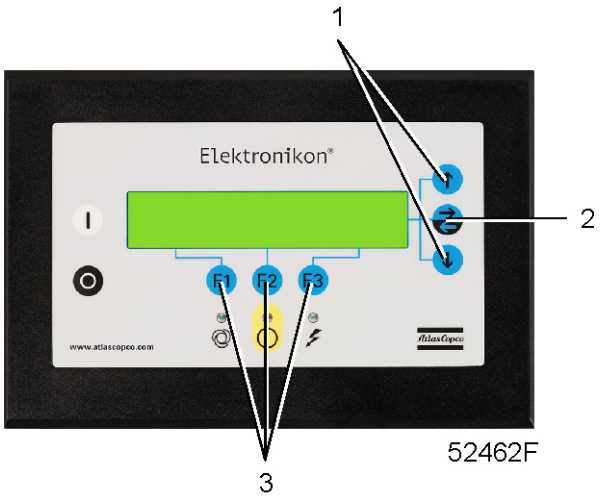
Function

To modify a number of programmable settings:

- Parameters (see section Modifying parameters).
- Protections (see section Modifying protections).
- Service plan settings (see section Modifying service plan settings).
- Clock function settings (see section Programming clock function settings).
- Configuration settings (see section Modifying configuration settings).

3.15 Modifying parameters

Control panel



Function

To modify a number of parameters. Consult the menu flow in section Control programs.

Procedure

Starting from the Main screen (see Main screen menu):

- Press the key “Menu” (F1).
- Press the arrow down key (1) until “Modify Parameters” is followed by a horizontal arrow.
- Activate the menu by pressing the tabulator key (2).
- The first item “Parameters” will be followed by a horizontal arrow.
- Press the tabulator key (2): the first items and their settings will appear.
- Press the arrow down key (1) until the parameter to be modified is followed by a horizontal arrow.

Modifying the loading pressure setpoint

If desired, the operator can program two pressure bands (Loading pressure/Unloading pressure and Loading pressure 2/Unloading pressure 2).

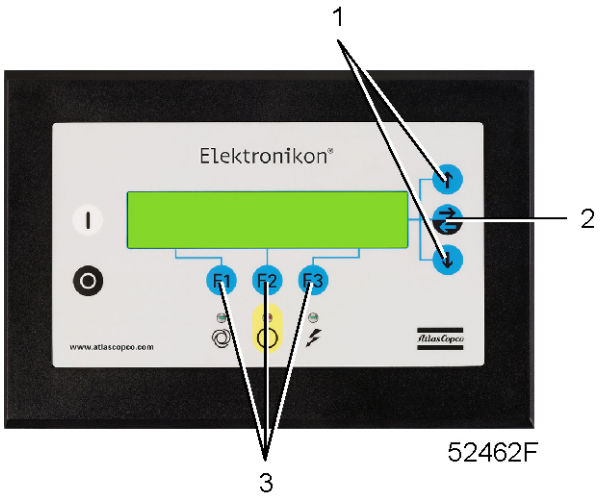
- Consult the steps above to select “Loading Pressure”.
- The screen shows the current setting. To modify this setting, press the key “Modify” (F2); the setting will blink.
- The key “Limits” (F2) can be used to find out the limitations for the parameter.
- Use the scroll keys (1) to change the setting.
- Press the key ”Program” (F1) to program the new value or the key “Cancel” (F3) to cancel the modification operation.
- The procedure to modify other pressure parameters is similar.

Attention

	The regulator will not accept new values beyond the limitations. Press the key “Limits” to check the limitations for the parameter.

3.16 Modifying protection settings

Control panel



Function

To modify protection settings:

- “Shutdown”, e.g. for the compressor element outlet temperature
- “Shutd. Warn.”, e.g. for the compressor element outlet temperature
- “Service” “Warning”, e.g. for the maximum pressure drop over the air filter

To check various compressor conditions, e.g. the status of the emergency stop button. Some parameters cannot be modified.

Procedure

Starting from the Main screen (see Main screen menu):

- Press the “Menu” (F1) key.
- Press the arrow down key (1) until “Modify Parameters” is followed by a horizontal arrow.
- Activate the menu by pressing the tabulator key (2).
- Press the arrow down key (1) until “Protections” is followed by a horizontal arrow.
- Press the tabulator key (2): the first items will appear.
- Press the arrow down key (1) until the item to be modified is followed by a horizontal arrow and press the tabulator key (2).

Modifying settings for the compressor element temperature

- Consult the steps above to select the parameter “Element 1 Outlet”.

- The screen (see example below) shows the current temperature on the first line and the shut-down setting on the third line. To modify the setting, press the “Modify” (F2) key; the setting will flash.
- The “Limits” (F2) key can be used to find out the limits for the parameter.
- Use the scroll keys (1) to change the setting.
- Press ”Program” (F1) to program the new value or “Cancel” (F3) to cancel the modification operation.
- The screen (see example below) shows a horizontal arrow indicating that the shut-down warning value can be modified (the procedure is similar to the description above).
- The procedure to modify other items is similar. For some settings, a delay can be programmed.

Example of the screen

“Element 1 Outlet”		178˚C	
			→
“Shutdown”	“Maximum”	235˚C	
“Menu”	“Modify”		
F1	F2	F3	

	The regulator will not accept new values beyond the limits. Press the key “Limits” to check the limits for the parameter.

3.17 Modifying service plans

Function

To modify the hour intervals for the service levels.

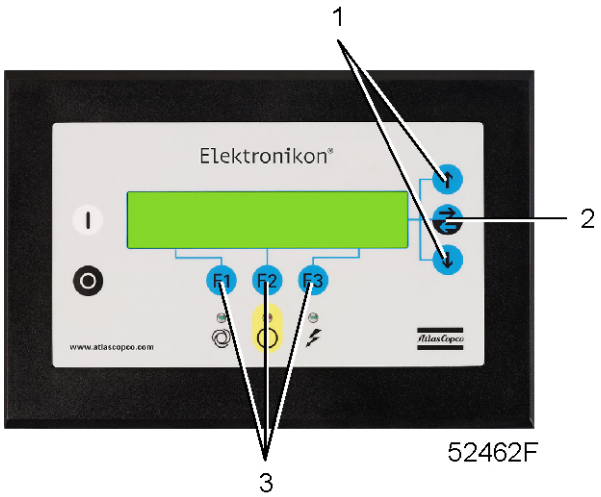
Service plans

The service actions to be carried out are grouped in plans called Service level A, B, C or D. When reaching an interval, a message will appear on the screen indicating which Service plans are to be carried out.

	Always consult your Atlas Copco Customer Centre in case any timer should be changed. The intervals must not exceed the programmed nominal values.

3.18 Programming clock function

Control panel



Function

To program:

- Time-based start/stop commands for the compressor
- Time-based change-over commands for the net pressure band

Programming start, stop and pressure band commands

In this example, the compressor will be programmed as follows:

- On Monday at 06:15 starting in pressure band 1
- On Friday at 18:00 changing over to pressure band 2
- On Saturday at 18:00 stopping

Starting from the Main screen (see Main screen menu):

- Press the key “Menu” (F1).
- Press the arrow down key (1) until “Modify Parameters” is followed by a horizontal arrow.
- Activate the menu by pressing tabulator key (2).
- Use the arrow down key (1) to scroll until the option “Clock Function” is followed by a horizontal arrow.
- Activate the menu by pressing tabulator key (2); following screen appears:

“Clock Function”			→
		“Not Activated”	
.			
“Menu”	“Modify”	“Delete”	
F1	F2	F3	

- Press the tabulator key (2), following screen appears:

“Monday”			→

“Tuesday”			
“Wednesday”			↓
“Menu”		“Delete”	
F1	F2	F3	

- Use the scroll keys (1) until the day on which a command must be programmed is followed by a horizontal arrow. Press the tabulator key (2); following screen appears:

--:--	----------		→
--:--	----------		
--:--	----------		↓
“Menu”	“Modify”	“Delete”	
F1	F2	F3	

- Press the key “Modify” (F2). The first two dashes will flash. Use the scroll keys (1) to enter “06”. Press the tabulator key (2) to jump to the following two dashes. Use the scroll keys to enter “15”. Press the tabulator key to jump to the row of dashes. Use the scroll keys to enter the command “Start” “Compressor”.
- Press the key “Program” to program the command : “06:15” “Start” “Compressor”.
- Press the arrow down key (1): the horizontal arrow indicates that the second line is accessible. Press the key “Modify” and modify this line in a similar way to the following command: ”06:15 Pressure Band 1”.
- Press the key “Menu” (F1) and scroll to “Friday”:

“Thursday”			↑
“Friday”			→
“Saturday”			↓
“Menu”		“Delete”	
F1	F2	F3	

- Programming the command to change over at 18 o’clock to “Pressure Band 2” is carried out in a similar way as described above.
- Press the key “Menu” (F1) and scroll to “Saturday”. Programming the command “18:00” “Compressor” “Stop” is carried out in a similar way as described above.

Activating/deactivating the timer

- The timer can only be activated if at least one start/stop command is programmed.
- Starting from the Main screen, press the key “Menu” (F1).
- Use arrow down key (1) until the option “Modify Parameters” is followed by a horizontal arrow.
- Press the tabulator key (2) to activate the menu.
- Use the arrow down key until the option “Clock Function” is followed by a horizontal arrow, press the tabulator key (2), following screen appears:

“Clock Function”			→
		“Not Activated”	
.			
“Menu”	“Modify”	“Delete”	
F1	F2	F3	

- Press the key “Modify”, “Not Activated” starts blinking.
- Press the arrow down key (1) “Not Activated” changes to “Activated”.
- Press the key “Program”.

	It is necessary to program the start/stop commands in successive order timewise. Program the commands from Monday till Sunday, e.g.: • 07.30 Start Compressor • 07.30 Pressure Band 1 • 08.30 Pressure Band 2 • 18.00 Stop Compressor
	Make sure that the timer function is activated (“Activated”). If not, the programmed start/ stop commands will not be executed.
	The timer can be deactivated again. In this case, the programmed start/stop commands will not be executed (but remain in the memory of the regulator).

Modifying a command

Suppose the command to stop the compressor on Saturday 18:00 is to be modified, i.e. stopping at 17 o'clock instead of 18 o'clock.

- Starting from the Main screen, press the key “Menu” (F1), press the arrow down key (1) until the option “Modify Parameters” is followed by a horizontal arrow.
- Activate the menu by pressing the tabulator key (2).
- Use the arrow down key (1) to scroll until the option “Clock Function” is followed by a horizontal arrow. Press the tabulator key, following screen appears:

“Clock Function”			→
		“Not Activated”	
.			
“Menu”	“Modify”	“Delete”	
F1	F2	F3	

- Press the tabulator key (2), following screen appears:

“Monday”			→
“Tuesday”			
“Wednesday”			↓
“Menu”		“Delete”	
F1	F2	F3	

- Scroll through the display until “Saturday” is followed by a horizontal arrow. Press the tabulator key (2). If necessary, scroll through the commands until the command to be modified is followed by a horizontal arrow. Press the key “Modify”, the first two digits of the command start blinking. Modify as required using the scroll keys, i.e. in the example above change “18” into “17” using the arrow up key (1).
- If necessary, press the tabulator key (2) to go to the next field to be modified, the minutes indication and the start/stop/pressure band indication.
- Press the key “Program” to program the new command or the key “Cancel” to quit without reprogramming.

Adding a command at the end of an existing list

- Starting from the Main screen, press the key “Menu” (F1), press the arrow down key until the option “Modify Parameters” is followed by a horizontal arrow.
- Activate the menu by pressing the tabulator key (2).
- Use the arrow down key (1) to scroll until the option “Clock Function” is followed by a horizontal arrow. Press the tabulator key, following screen appears:

“Clock Function”			→
		“Not Activated”	
.			
“Menu”	“Modify”	“Delete”	
F1	F2	F3	

Suppose the command to stop the compressor at 18:00 must be added to the list of Monday

- Press the tabulator key (2), following screen appears:

“Monday”			→
“Tuesday”			
“Wednesday”			↓
“Menu”		“Delete”	
F1	F2	F3	

- Scroll through the display until “Monday” is followed by a horizontal arrow. Press the tabulator key (2). Scroll through the compressor start/stop/pressure band commands until the first empty command line is indicated by the horizontal arrow.
- Press the key “Modify”; the first two digits start blinking. Enter “18:00” “Compressor” “Stop” using the scroll keys (1) to modify a field and the tabulator key (2) to jump from one field to another.
- Press the key “Program” to program the new command or the key “Cancel” to quit without reprogramming.

Adding a command between two existing commands

Suppose the command “17:00” “Pressure Band 2” must be added to the following list:

- “06:00” “Start” “Compressor”
- “06:00” “Pressure Band 1”
- “18:00” “Stop” “Compressor”

The regulator does not allow to enter a new command which is situated before the last command in the list timewise.

Scroll through the display until the command before which the new command must be entered is followed by a horizontal arrow (in the example above: “18:00” “Stop” “Compressor”) and press the key “Modify”.

Change this command to the new command (in the example above “17:00 Pressure Band 2”)

Press the arrow down key and add the last command of the list (in the example above “18:00” “Stop” “Compressor” and press the key “Program”.

Deleting a command

- Starting from the Main screen, press the key “Menu” (F1), press the arrow down key until the option “Modify Parameters” is followed by a horizontal arrow.
- Activate the menu by pressing the tabulator key (2).
- Use the scroll keys (1) to scroll until the option “Clock Function” is followed by a horizontal arrow. Press the tabulator key, following screen appears:

“Clock Function”			→
		“Not Activated”	
.			
“Menu”	“Modify”	“Delete”	
F1	F2	F3	

Deleting all commands

- Press the key “Delete” in the screen above. A question to confirm the deleting operation will appear.

Deleting all commands of a specific day

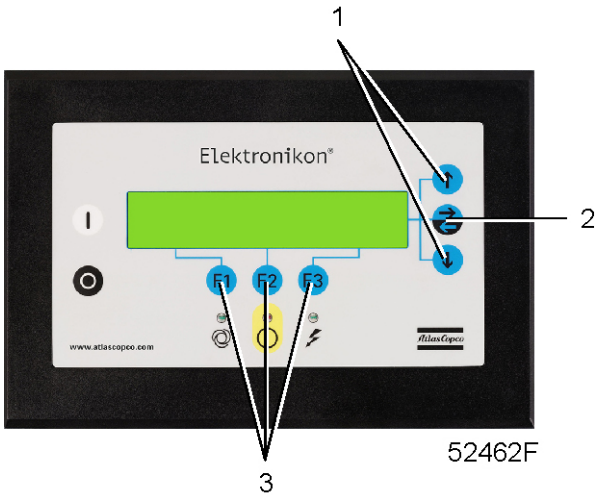
- Scroll through the display until the desired day is followed by a horizontal arrow. Press the key “Delete”, a question to confirm the deleting operation will appear.

Deleting a specific command

- Scroll through the display until the command to be deleted is followed by a horizontal arrow. Press the key “Delete”, a question to confirm the deleting operation will appear.

3.19 Modifying configuration settings

Control panel



Function

To modify a number of parameters. Consult the menu flow in section Control programs.

Procedure

Starting from the Main screen (see Main screen menu):

- Press the key “Menu” (F1).
- Press the arrow down key (1) until “Modify Parameters” is followed by an arrow pointing to the right.
- Activate the menu by pressing tabulator key (2).
- Press the arrow down key (1) to scroll until “Configuration” is followed by a horizontal arrow.
- Activate the menu by pressing tabulator key (2): the first item “Time” will appear. If another option is desired, scroll through the display until the option is followed by a horizontal arrow. Select the option by pressing the tabulator key (2).
- In case of the option “Time”, the second line on the screen indicates the actual setting, e.g. “14:30”. To modify this setting, press the key “Modify” (F2); the first field “14” will blink.
- Use the scroll keys (1) to change the setting, then press the tabulator key (2) to go to the next field “30”. The setting of this field can now be modified using the scroll keys (1).
- Press the key ”Program” (F1) to program the new value or the key “Cancel” (F3) to cancel the modification operation (the original value will be retained).
- The procedure to modify other parameters is similar.

Programming compressor control modes

The compressor can be controlled locally, remotely or via a local area network (LAN).

Procedure

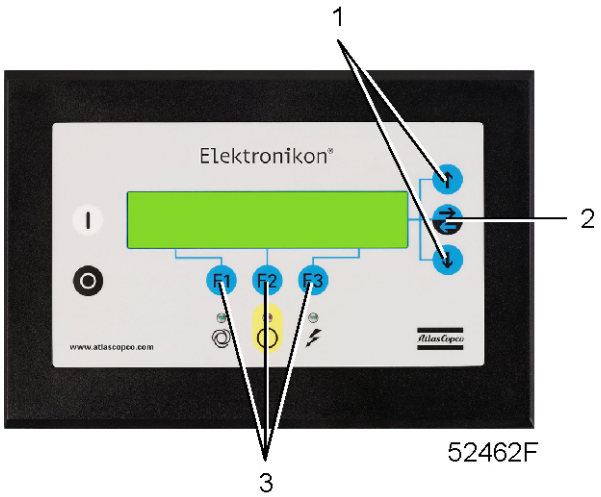
- Activate the menu “Configuration” as described above.
- The first option shown is “Time”, scroll through the display until the option “C.C.M.” is indicated and press the “Modify” key. Following screen appears:

.			
“CCM”		“Local Control”	
.			
“Program”		“Cancel”	
F1	F2	F3	

- “Local Control” is blinking; use the scroll keys (1) to select the desired control mode.
- Press the key “Program” to program the new control mode or “Cancel” to quit without reprogramming.

3.20 Service menu

Control panel



Function

- To reset the service plans which are carried out.
- To check when the next service plans are to be carried out.
- To find out which service plans were carried out previously.

Service plans

A number of service operations are grouped (called Level A, Level B, etc...). Each level stands for a number of service actions to be carried out at the time intervals programmed in the Elektronikon regulator.

When a service plan interval is reached, a message will appear on the screen, see section Status data. After carrying out the service actions related to the indicated levels, the timers are to be reset.

Example

Service plans	Intervals
Service plan A	Every 4000 running hours
Service plan B	Every 8000 running hours
Service plan C	Every 16000 running hours

Service actions according to	Intervals
Service plan A	4000 running hours
Service plan A and B	8000 running hours
Service plan A	12000 running hours
Service plan A, B and C	16000 running hours
...	...

Procedure

Starting from the Main screen (see Main screen menu):

- Press the key “Menu” (F1).

- Press the arrow down key (1) until “Service” is followed by a horizontal arrow.
- Activate the menu by pressing tabulator key (2).
- A screen similar to the one below appears:

“Service Timer”			
“Running Hours”			→
		7971 “hrs”	↓
“Menu”		“Reset”	
F1	F2	F3	

- The screen shows that the total compressor running time is 7971 hours.
- Press the tabulator key (2), following screen appears:

“Next Timer”			
“Level”		“A” “B”	
		8000 “hrs”	↓
“Back”		“Reset”	
F1	F2	F3	

- The screen shows that the next service plans to be carried out are plans A and B and that these plans are to be carried out every 8000 running hours.
- Press the arrow down key (1) to find out which service plans were carried out previously; following screen appears:

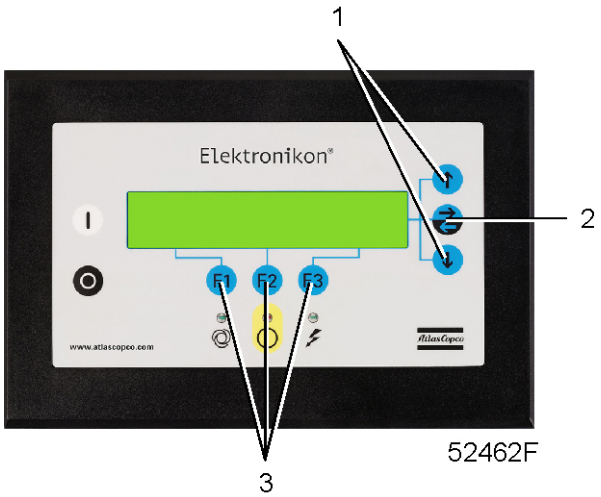
“Previous Timer”			↑
“Level”		“A”	
		4008 “hrs”	
“Back”			
F1	F2	F3	

- The screen shows that plan A was carried out at 4008 running hours.
- Stop the compressor, switch off the voltage and carry out the service operations related to the indicated service plans, see section Preventive maintenance schedule.
- Switch on the voltage and scroll to the “Next Timer” service screen.
- Press the “Reset” button (F3). Confirm the question for resetting.

	The “Reset” button only appears when the “Next Timer” level is almost reached.
	After pressing the arrow down key in the “Service Timer” screen, the “Life Time” hours are shown, i.e. the number of hours elapsed since initial programming ex-factory. This timer is not taken into account.

3.21 Saved data menu

Control panel



Function

To call up some data saved by the regulator. These data are:

- Last shut-down data
- Last emergency stop data

Procedure

Starting from the Main screen (see Main screen menu):

- Press the key “Menu” (F1).
- Press the arrow down key (1) until “Saved Data” is followed by a horizontal arrow.
- Activate the menu by pressing the tabulator key (2).
- The first option is shown “Last Shutdown 1”.
- Press the tabulator key (2) to find out the date, time and other data reflecting the status of the compressor at the last shut-down.
- If desired, scroll through the other items.

3.22 Programmable settings for ZE/ZA 3-4

Parameters

		Minimum setting	Factory setting	Maximum setting
Motor running time in star	sec	10	20	30
Load delay time (star-delta)	sec	5	5	30
Load delay time (no star-delta)	sec	20	20	30
Number of motor starts (star-delta)	starts/day	0	72	120
Number of motor starts (no star-delta)	starts/day	0	3	5
Minimum stop time	sec	20	20	99

		Minimum setting	Factory setting	Maximum setting
Programmed stop time (without full-load/no-load valve)	sec	0	0	20
Programmed stop time(with full-load/no-load valve)	sec	0	3	20
Power recovery time (ARAVF)	sec	15	15	3600
Restart delay (ARAVF)	sec	0	3	255
Communication time-out	sec	10	20	60
Unloading pressure	bar(e)	0.5	See table below	See table below
Loading pressure	bar(e)	0.5	See table below	See table below

Unloading pressures

ZE 4 with aftercooler 60 Hz

Nominal unloading pressure

Type	Gear sets	Unit	Nominal pressure	Maximum pressure
350	A, B, C, D, E, F, G	bar(e)	3.5	3.75

Loading pressures

ZE 4 with aftercooler 60 Hz

Nominal unloading pressure

Type	Gear sets	Unit	Nominal pressure	Maximum pressure
350	A, B, C, D, E, F, G	bar(e)	3.2	3.65

Protections

		Minimum setting	Factory setting	Maximum setting
Compressor outlet pressure for compressors without full-load/no-load valve (warning)				
325	psig	0	50.04	50.62
350	bar(e)	0	3.7	3.74
Compressor outlet pressure for compressors without full-load/no-load valve (shut-down)				
350	bar(e)	0	3.75	3.75
Compressor outlet pressure for compressors with full-load/no-load valve (warning)	bar(e)	0	4.5	5.0
Compressor outlet pressure for compressors with full-load/no-load valve (shut-down)	bar(e)	0	5.0	5.0

		Minimum setting	Factory setting	Maximum setting
Oil pressure (shut-down warning level)	bar(e)	1.0	1.5	2.0
Oil pressure (shut-down level)	bar(e)	1.0	1.4	2.0
Delay at start, oil pressure	sec	15	20	30
Delay at signal, oil pressure	sec	0	1	3
Compressor element 1 outlet temperature (ZE 3.0 up to 4.0 bar compressors) (shut-down warning level)	˚C	100	255	265
Compressor element 1 outlet temperature (ZE 3.0 up to 4.0 bar compressors) (shut-down level)	˚C	100	265	265
Delay at signal (compressor element 1 temperature)	sec	0	1	3
Oil temperature (shut-down warning level)	˚C	40	66	80
Oil temperature (shut-down level)	˚C	40	70	80
Delay at start, oil temperature	sec	50	70	100
Delay at signal, oil temperature	sec	0	1	3
Delay at start, motor overload	sec	0	1	3
Delay at signal, motor overload	sec	0	1	3
Delay at start, fan motor overload	sec	0	1	3
Delay at signal, fan motor overload	sec	0	1	3
Delay at start, starter feed-back contact = open	sec	0	23	40
Delay at signal, starter feed-back contact = closed	sec	0	2	3
Delay at start, compressor electronic condensate drain (warning)	sec	0	15	60
Delay at signal, compresor electronic condensate drain (warning)	sec	5	5	5
Delay at start, dryer-dryer fan overload (warning)	sec	0	1	3
Delay at signal, phase sequence	sec	0	1	2

Service settings

		Minimum setting	Factory setting	Maximum setting
Service plans				
Service plan A (operating hours)	hr	See remark	4000	See remark
Service plan B (operating hours)	hr	See remark	8000	See remark
Service plan C (operating hours)	hr	See remark	16000	See remark
Service plan D (operating hours)	hr	See remark	40000	See remark
Service plan I (operating hours)	hr	See remark	2000	See remark
Analog signals				
Air filter Dp	mbar	-55	-44	-44
Delay at signal, air filter Dp	sec	0	60	255

Remark

A number of service operations are grouped (Level A, Level B, ...). Each level stands for a number of service operations to be carried out at the programmed intervals. Consult your Atlas Copco Service Centre.

Terminology

Term	Explanation
ARAVF	Automatic restart after voltage failure. See Elektronikon regulator.
Compressor element 1	The regulator does not accept illogical settings, e.g. if the warning level is programmed at 205˚C/401˚F, the minimum limit for the shut-down level changes to 206˚C/402˚F. The recommended difference between the warning level and shut-down level is 10˚C/18˚F.
Required stop period/Minimum stop time	Once the compressor has automatically stopped, it will remain stopped for the minimum stop time (approx. 20 seconds), whatever the net air pressure. In automatic operation, the compressor will not be stopped by the regulator until a standstill period of at least the sum of the minimum stop time and required stop period is expected. However, if the decrease in net air pressure should require a new start of the compressor, the regulator will start the compressor after the minimum stop time.
Power recovery time	Is the period within which the voltage must be restored to have an automatic restart. Is accessible if the automatic restart is activated. To activate the automatic restart function, consult Atlas Copco.
Unloading/ Loading pressure	The regulator does not accept illogical settings, e.g. if the unloading pressure is programmed at 7.0 bar(e)/101 psig, the maximum limit for the loading pressure changes to 6.9 bar(e)/100 psig. The recommended minimum pressure difference between loading and unloading is 0.6 bar/9 psig.
Delay at shut-down signal	Is the time for which the signal must exist before the compressor is shut down. If it should be required to program this setting to another value, consult Atlas Copco.

4 Installation

4.1 Dimension drawing

Dimensions

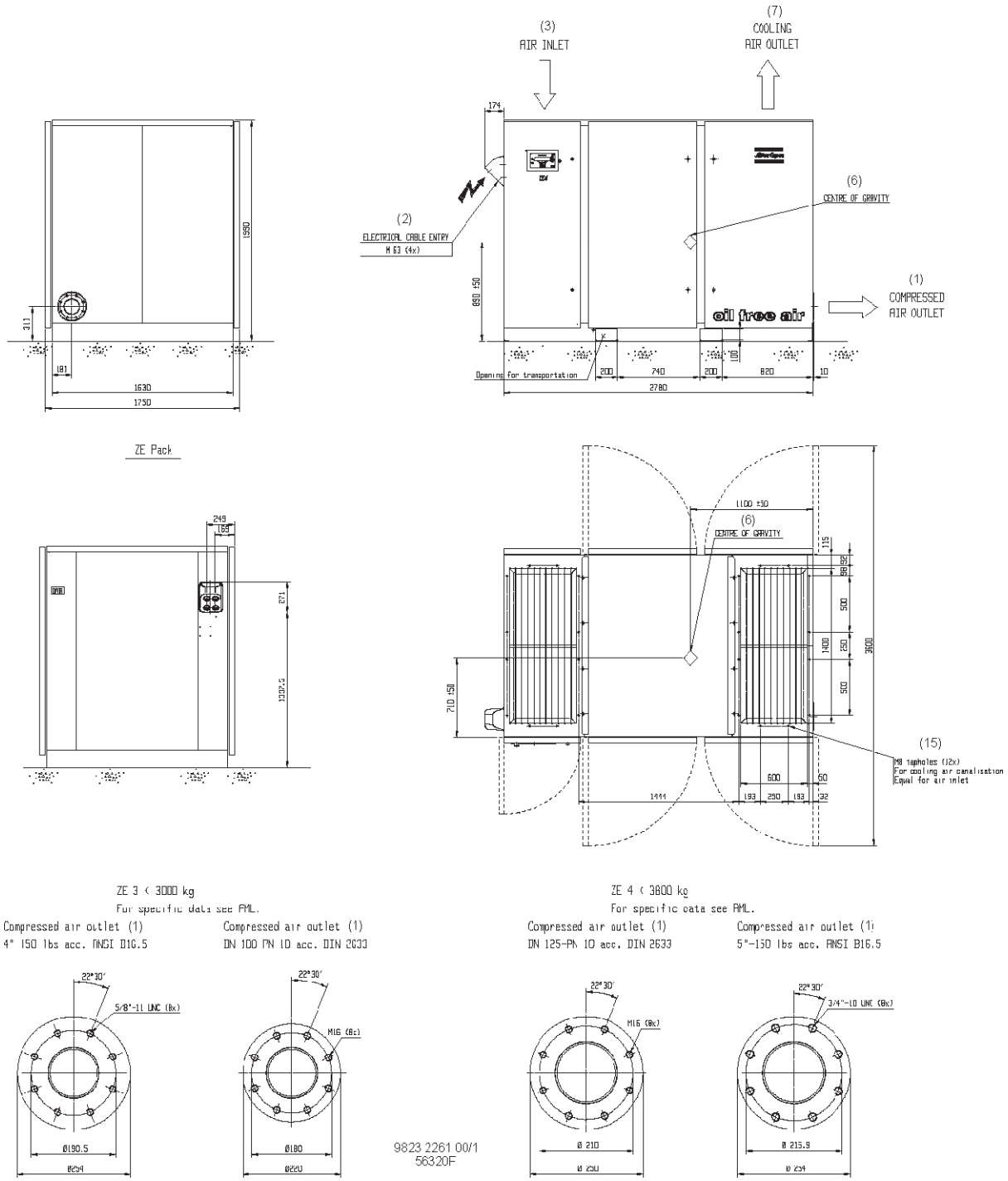


Figure 9: Dimension drawing of ZE 3 and ZE 4 Pack

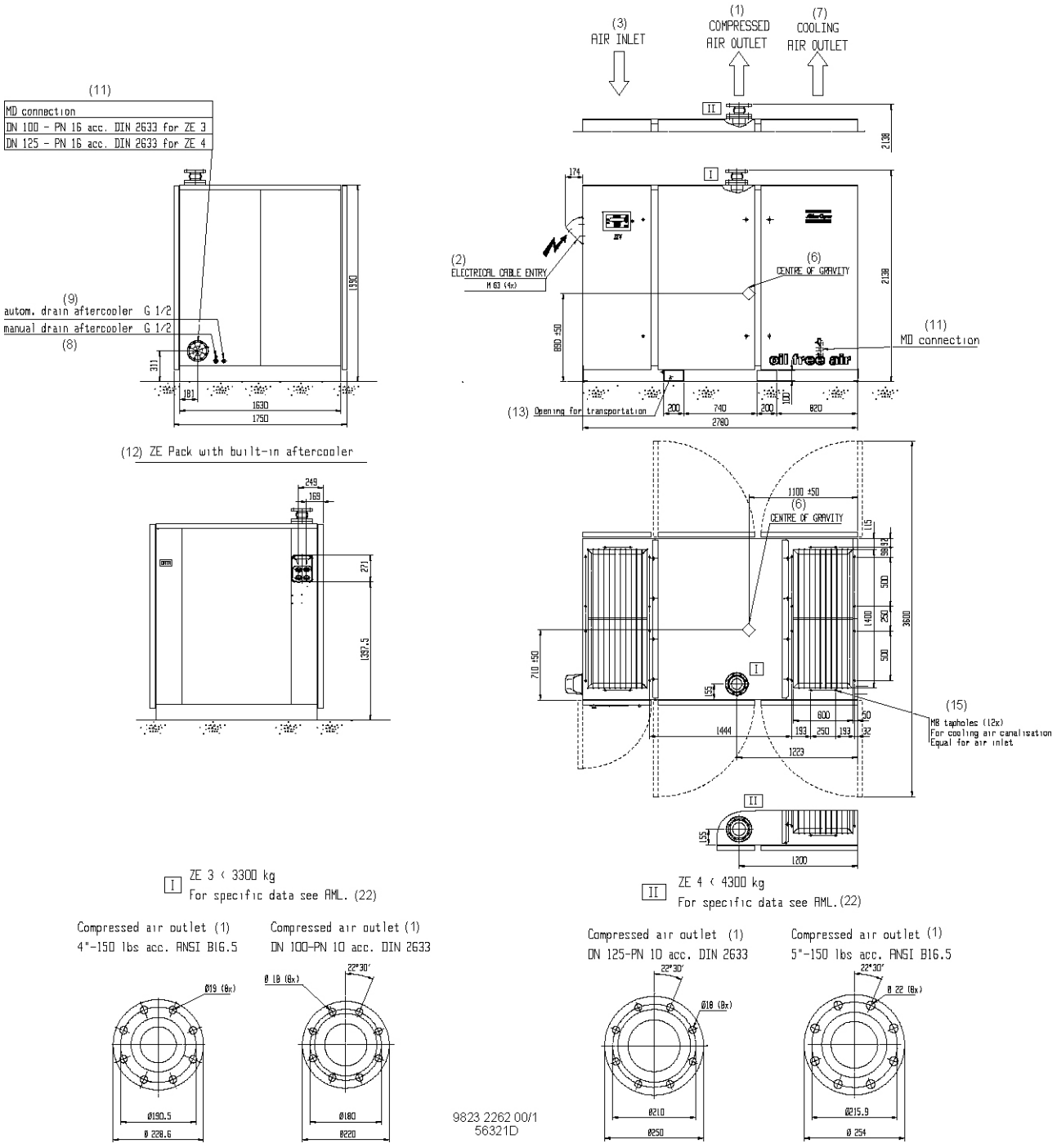


Figure 10: Dimension drawing of ZE 3 and ZE 4 Pack with aftercooler

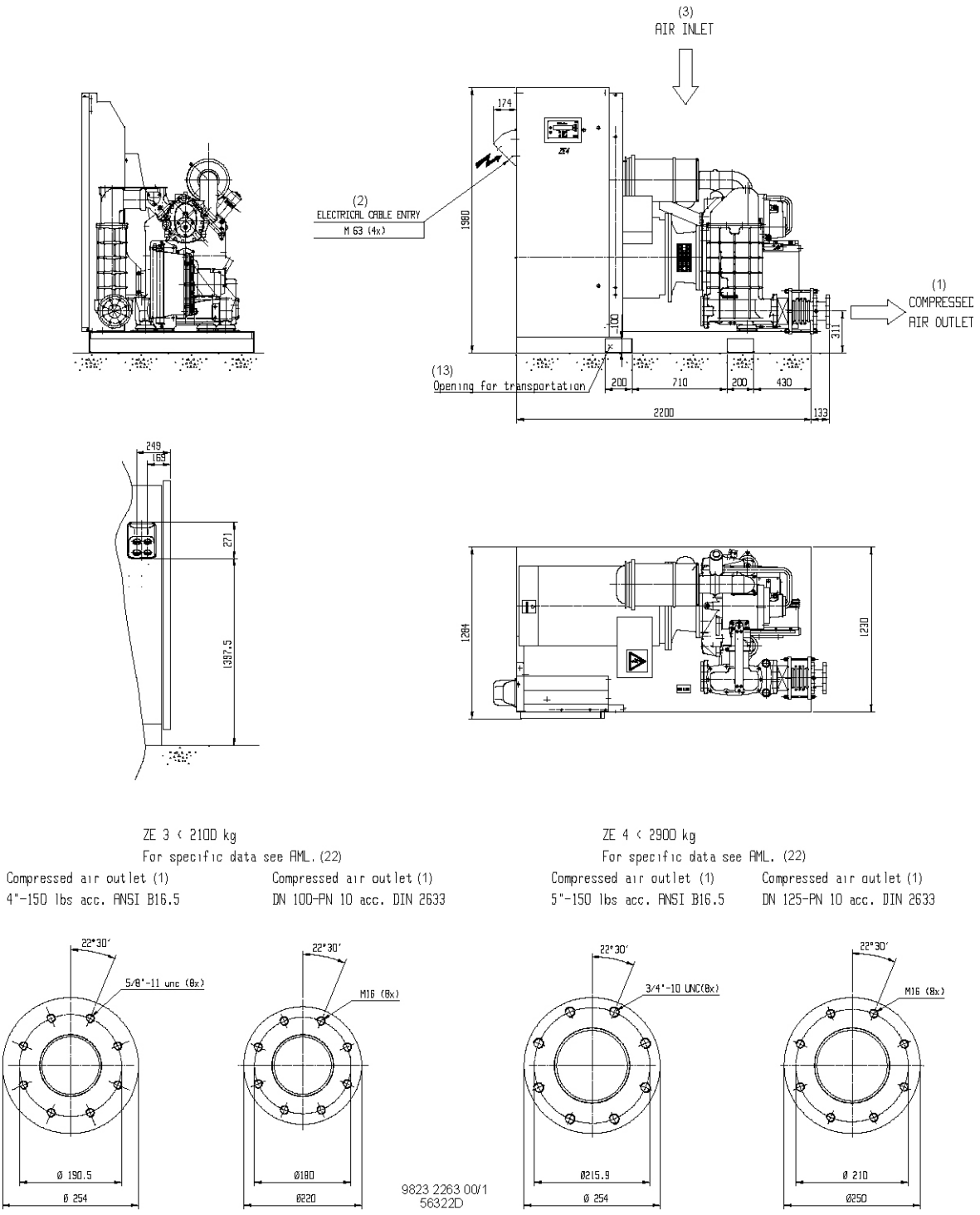


Figure 11: Dimension drawing of ZE 3 and ZE 4 non-silenced version

Reference	Name
1	Compressed air outlet
2	Electric cable entry
3	Air inlet
6	Center of gravity
7	Cooling air outlet

Reference	Name
8	Manual drain, aftercooler
9	Automatic drain, aftercooler
11	MD connection
12	ZE Pack with built-in aftercooler
13	Opening for transportation
15	M8 tapholes for cooling air canalization equal for air in
22	For specific data, see AML

4.2 Installation proposal

Compressor room example

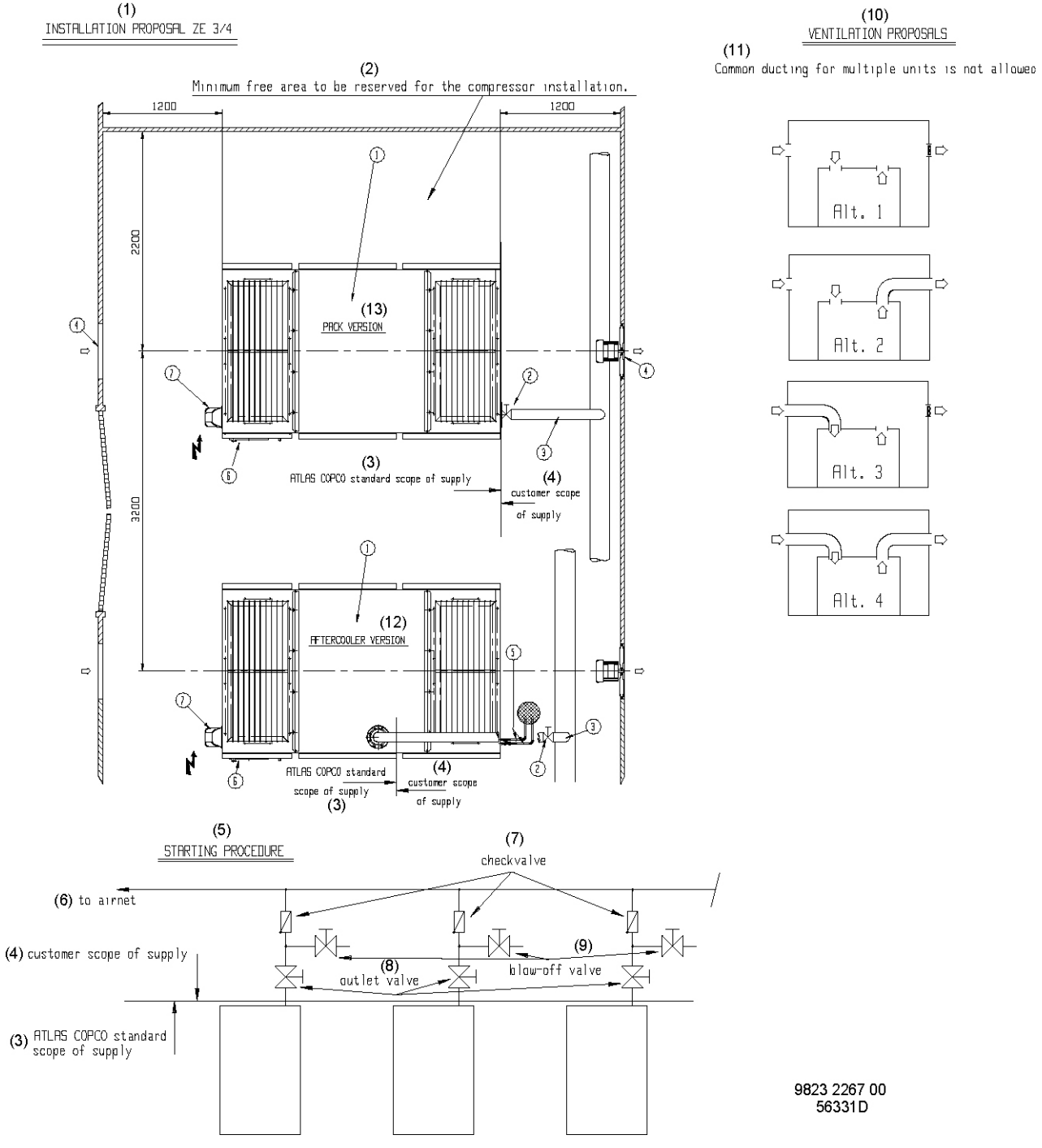


Figure 12: Installation proposal of ZE 3 and ZE 4

Reference	Name
1	Installation proposal
2	Minimum free area to be reserved for the compressor installation

Reference	Name
3	Atlas Copco standard scope of supply
4	Customer scope of supply
5	Starting procedure
6	To air net
7	Check valve
8	Air outlet valve
9	Blow-off valve
10	Ventilation proposals
11	Common ducting for multiple units is not allowed
12	Aftercooler version
13	Pack version

Warning



Thermal insulation should be provided on the compressor without aftercooler to protect against the high temperature of the air outlet valve and air delivery pipe.
When installing a non-silenced compressor, some precautions must be taken:

- Pipework and other parts with a temperature in excess of 80 ˚C (176 ˚F) and which may be accidentally touched by personnel shall be guarded or insulated.
- Never allow personnel near the safety valve while the compressor is running; opening of the safety valve may cause injury.
- As the sound pressure level of a non-silenced compressor is high, precautions must be taken to protect the hearing of personnel in the vicinity of the compressor.
- Note that power cables or other machinery in the vicinity of a non-silenced compressor may cause interference with the control signals of the electronic regulator.

Description

1. Install the compressor on a level floor suitable for taking its weight.

   Recommended minimum distance between the top of the bodywork and the ceiling:

   - 1200 mm (47 in) for ZE compressors equipped with an aftercooler
2. Remove the plastic plug (if provided) from the compressor air outlet pipe and install an air outlet valve. See section Dimension drawings for the dimensions.

   When installing a compressor without full-load/no-load regulator, and there is a possibility to start the compressor against backpressure, a blow-off valve and check valve must be installed as shown in "Starting procedure" on the drawings above.

   Close the air outlet valve and connect the air net to the compressor.

   The sum of the axial and the lateral movement of the compensator may not exceed:

   - 6 mm (0.23 in) for ZE/ZA 3-4 compressors
3. **The maximum total length of the air delivery pipe can be calculated as follows:**

   For SI Units:

   $L_{max} = (dp \times d^5 \times p) / (450 \times Qc^{1.85})$

   d = Inner diameter of the outlet pipe in mm

   dp = Pressure drop (recommended maximum = 0.1 bar)

   L = Length of outlet pipe in m

p = Absolute pressure at the compressor outlet in bar(a)

Q_c = Air flow (FAD) of the compressor in l/s

4. The inlet grids and ventilation fan should be installed in such a way that any recirculation of cooling air to the compressor is avoided. The air velocity to the grids should be limited to 5 m/s (16.4 ft/s).

   The temperature of the intake air should be:

Minimum temperature	0 ˚C (32 ˚F)
Maximum temperature for motor arrangement Arr. E	40 ˚C (104 ˚F)

   The maximum air temperature at the cooling air inlet grating must be limited to:

Arr. E	40 ˚C (104 ˚F)

   The maximum allowable pressure drop over the cooling air ducts depends on the ambient temperature. Consult Atlas Copco.

   The required ventilation capacity (per compressor installed) to limit the compressor room temperature can be calculated as follows:

   - Qv = 0.92 N/dT for compressors with aftercooler

5. On compressors with aftercooler, fit the manual drain valve. Lay out the drain piping from the valve and the automatic condensate outlet towards the condensate collector. The drain pipes must not dip into the water of the collector.
6. Elektronikon control system with control panel.
7. See section Electric cables for the recommended cable size of the supply cables. Check that the electrical connections correspond to the local codes. The installation must be earthed and protected against short circuits by fuses in all phases. An isolating switch must be installed near the compressor.

4.3 Electric cable size

General

	Local regulations remain applicable if they are stricter than the values proposed below.
	The voltage drop must not exceed 10% of the nominal voltage. It may be necessary to use cables with a larger size than those stated to comply with this requirement.
	The size is valid for cable PVC 70 ˚C (158 ˚F), at ambient temperature 40 ˚C (104 ˚F) according to EN60204.

Electrical connections

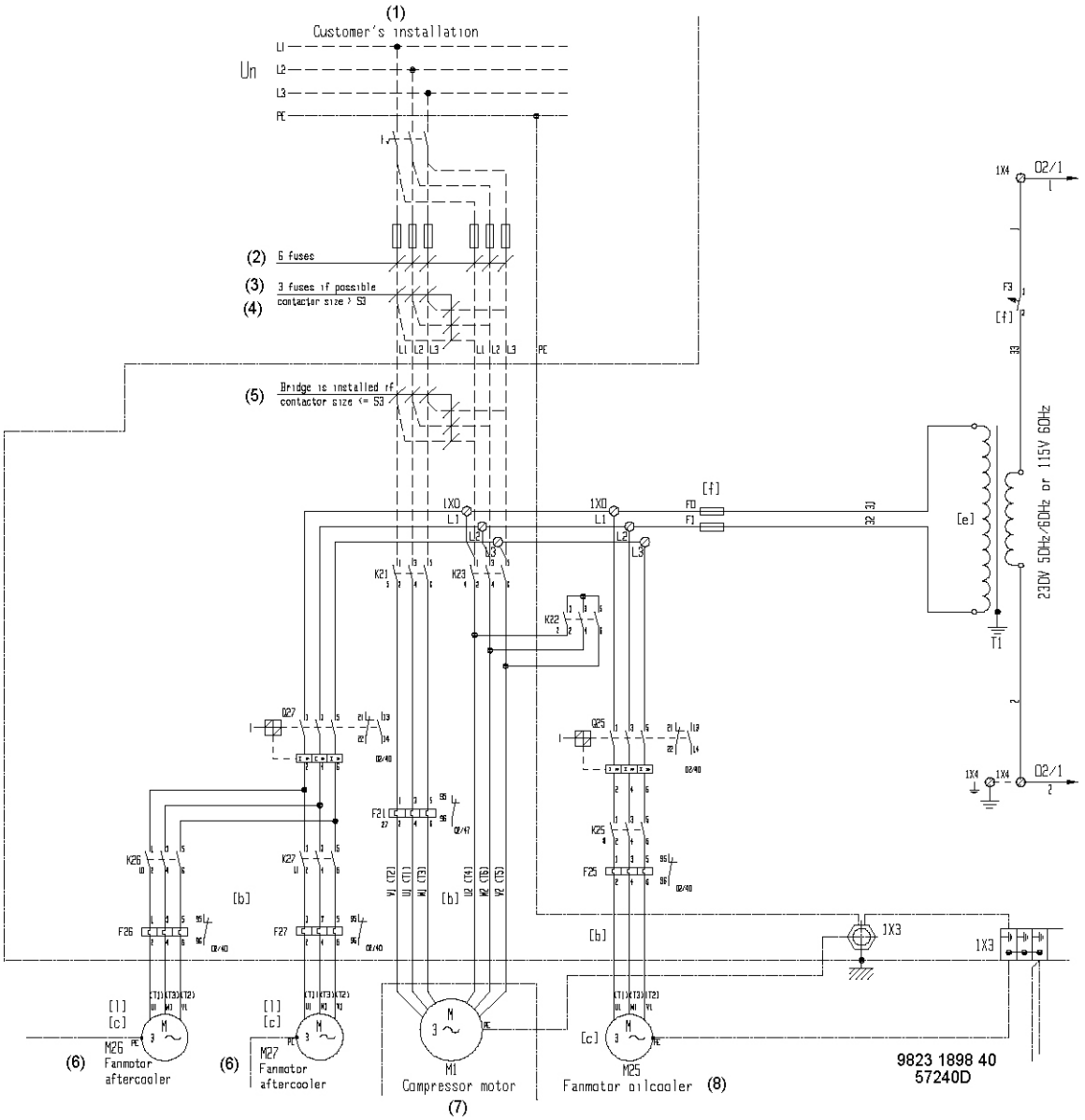


Figure 13: Electrical connections of ZE/ZA compressors with star-delta starter

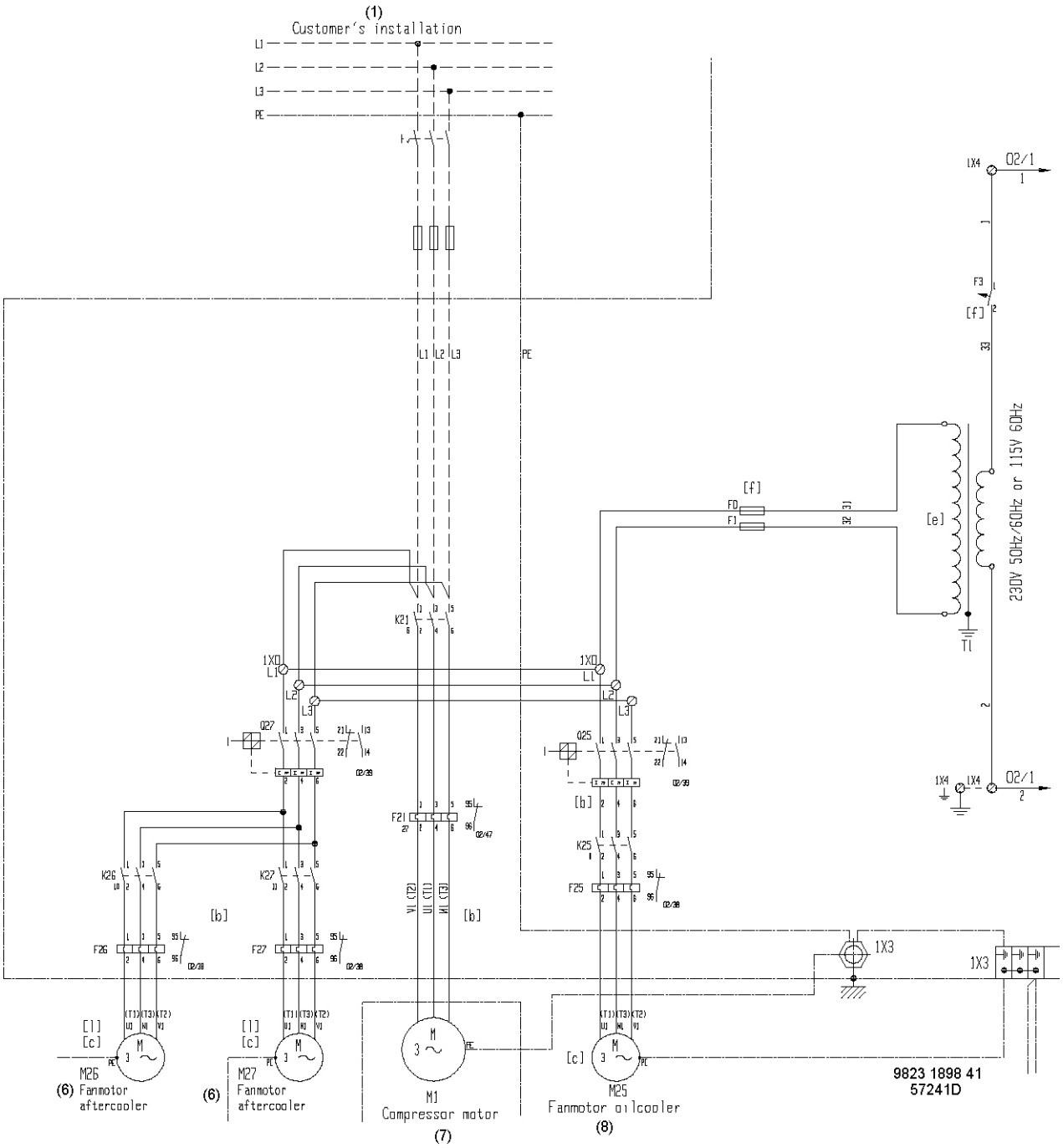


Figure 14: Electrical connections of ZE/ZA compressors with DOL starter

(1)	Customer's installation
(2)	6 fuses
(3)	3 fuses if possible
(4)	Contactor size > 50
(5)	Bridge is installed if contactor size <= 50
(6)	Fan motor aftercooler
(7)	Compressor motor
(8)	Fan motor oil cooler

ZE/ZA 3/4 60 Hz compressors

Mains + earth cable

Motor power	440/460 V
45 kW	3xAWG2 + AWG8
55 kW	3xAWG1 + AWG4
75 kW	3xAWG2/0 + AWG2
93 kW	3xAWG2/0 + AWG2
112 kW	2x(3xAWG0 + AWG4)
149 kW	2x(3xAWG3/0 + AWG2)
186 kW	2x(3xAWG4/0 + AWG2)

4.4 Quality of safety components

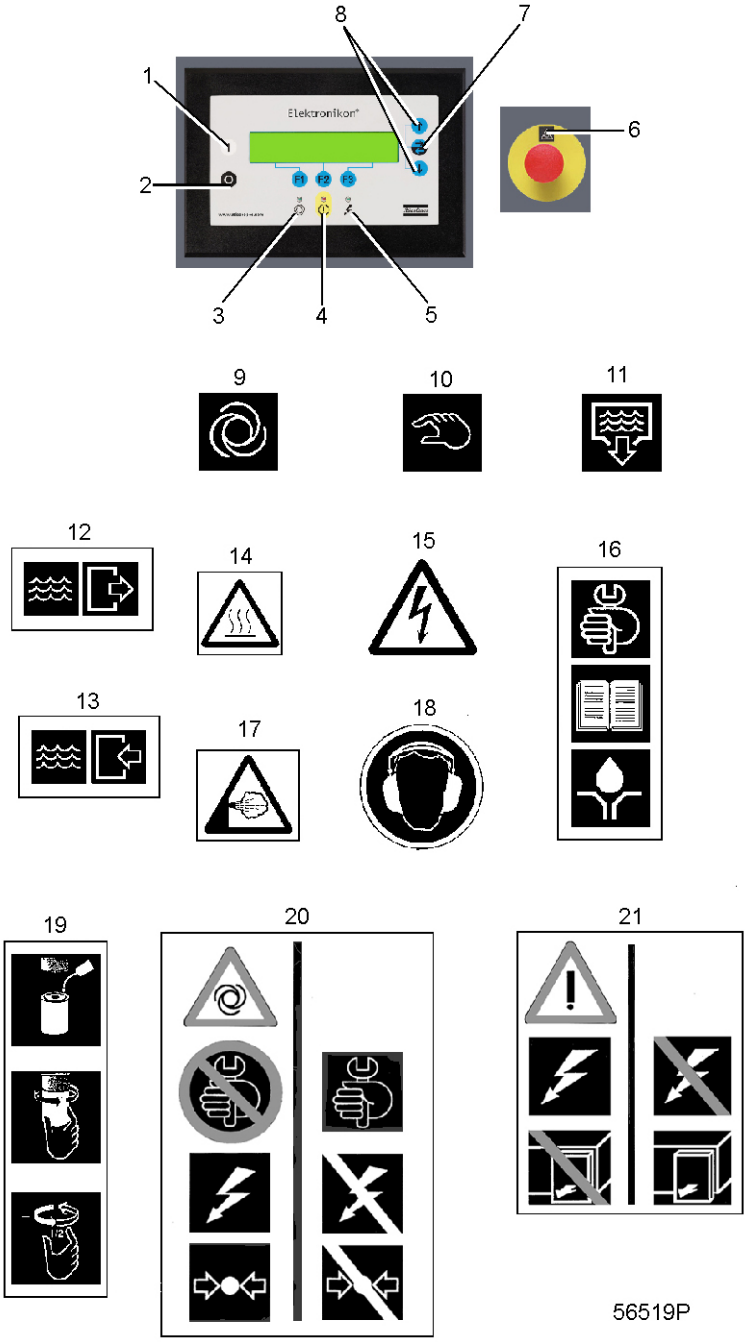
When installing a remote emergency stop button and a motor contactor, the following B10d values must be equal to or better than:

- Emergency stop button: **500 000**
- Main contactor: **1 333 333**

Every three (3) years the emergency circuit shall be tested by pushing the emergency stop button of the unit and the remote emergency stop button.

4.5 General pictographs

Pictographs



Reference	Name
1	Start
2	Stop
3	Automatic operation
4	Alarm

Reference	Name
5	Voltage on
6	Emergency stop
7	Key to go to next field on display
8	Keys to scroll through display
9	Pictograph, automatic
10	Pictograph, manual
11	Pictograph, drain outlet
12	Pictograph, water outlet
13	Pictograph, water inlet
14	Pictograph, warning: hot surface
15	Pictograph, warning: under tension
16	Pictograph, consult the instruction book before greasing
17	Pictograph, warning: exhaust
18	Pictograph, ear protection compulsory
19	Pictograph, oil gasket, screw on filter and tighten by hand (approx. one half turn)
20	Pictograph, switch off the voltage and depressurize the compressor before maintenance or repair
21	Pictograph, switch off the voltage before removing the protecting cover inside the electric cubicle

5 Operating instructions

5.1 Initial start-up

Safety precautions

	The operator must apply all relevant Safety precautions.

Outdoor/altitude operation

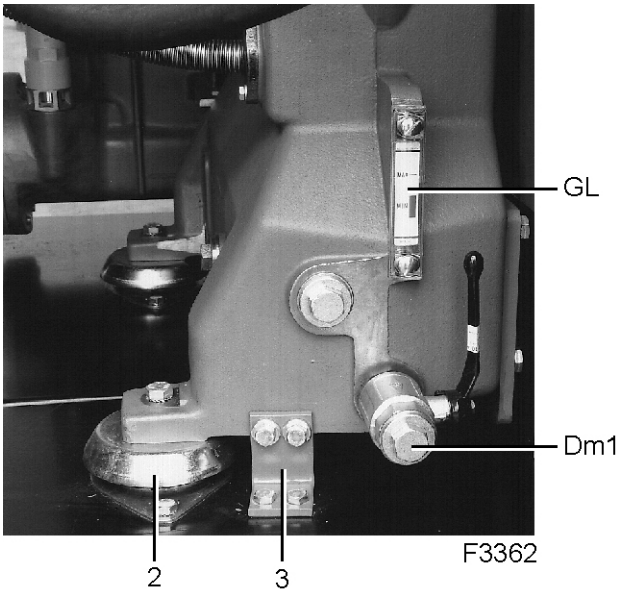
If the compressor is installed outdoors or if the air inlet temperature can be below 0 ˚C/32 ˚F, precautions must be taken. If this is the case, or if the compressor is being operated at high altitudes, consult the Atlas Copco Customer Centre.

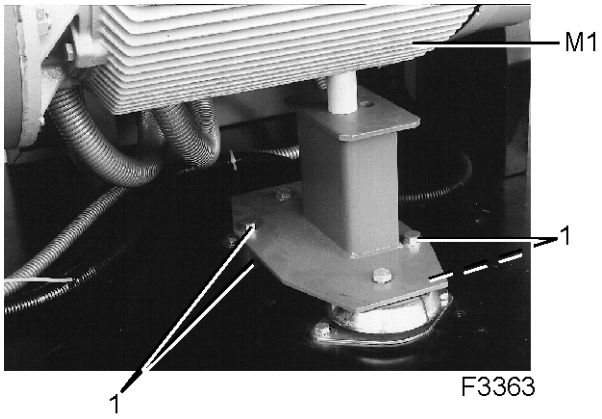
Moving/lifting

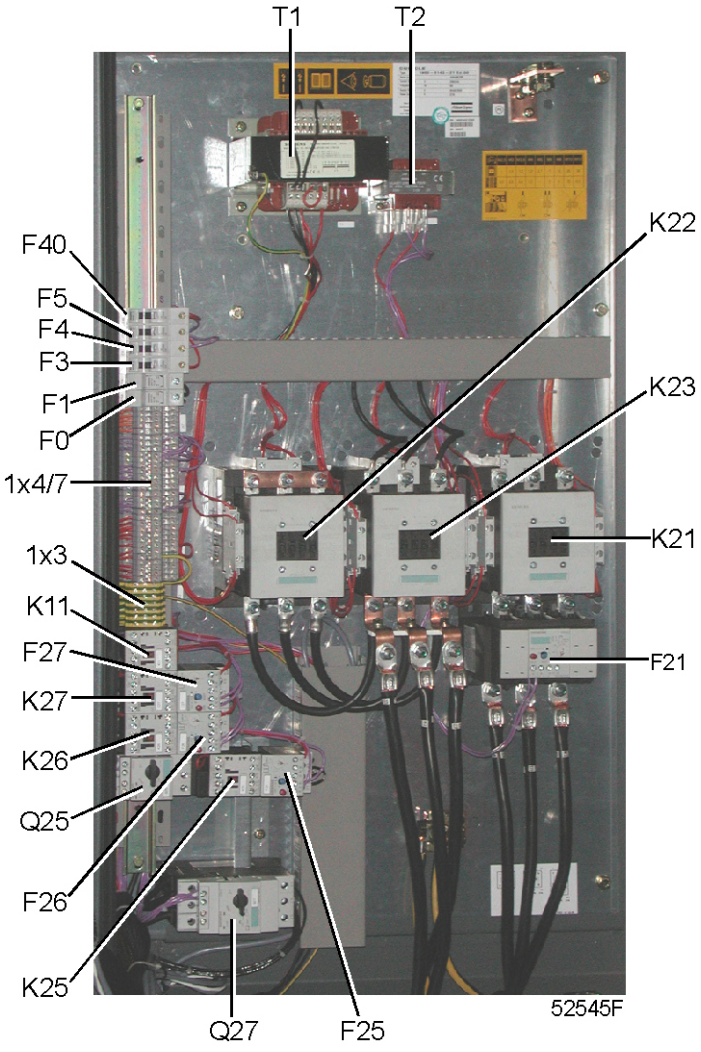
In order not to damage the frame, the compressor must be moved either by a lift truck or by using lifting equipment as described below.

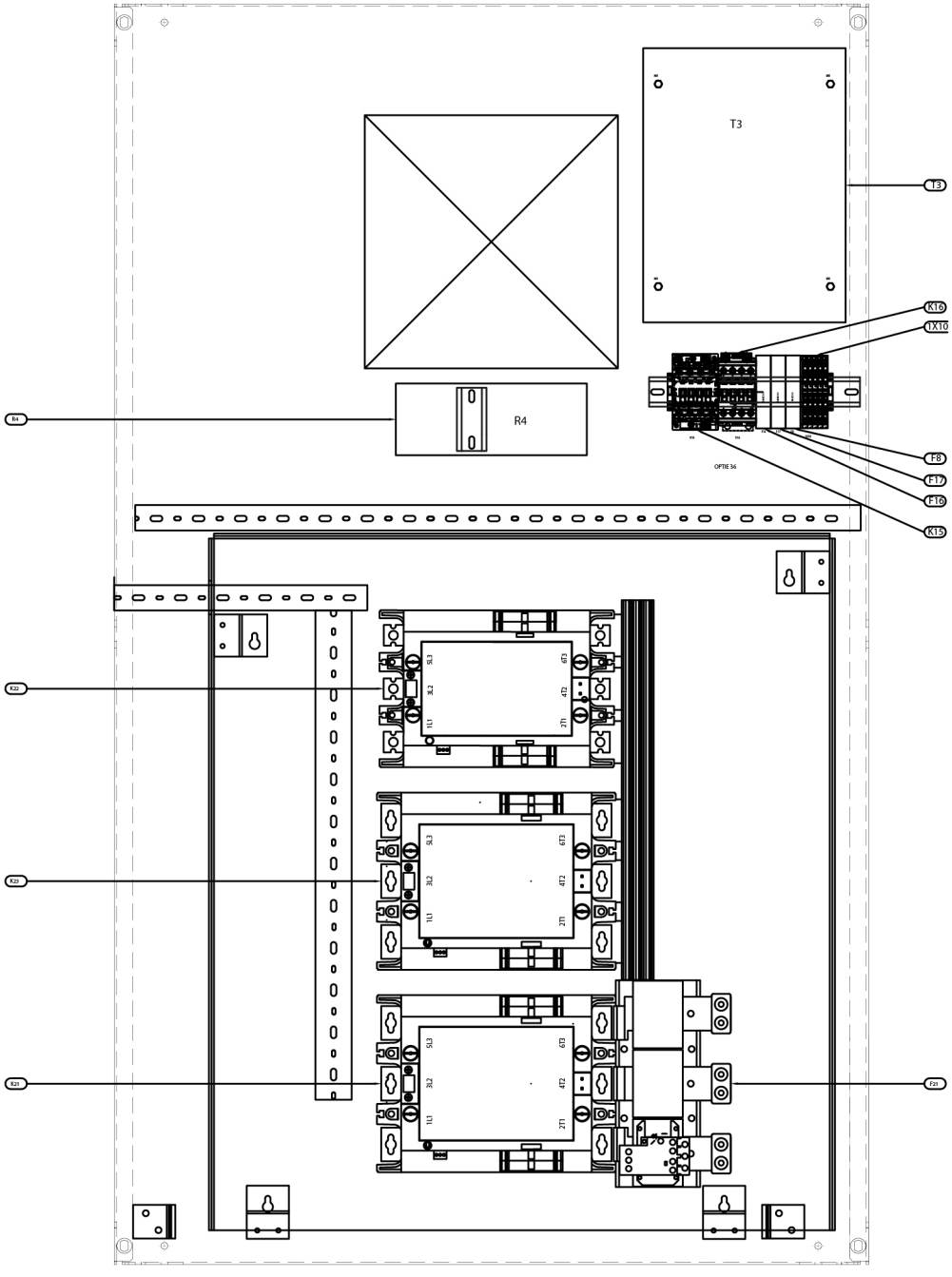
When moving the compressor with a lift truck, use the slots in the frame. Make sure that the forks protrude from the other side of the frame. When moving the compressor with a lifting device, insert beams in the slots. Make sure that the beams cannot slide and that they protrude from the frame equally. The chains must be held parallel to the bodywork by chain spreaders in order not to damage the compressor. The lifting equipment must be placed in such a way that the compressor is lifted perpendicularly. Lift gently and avoid twisting.

Preparation for initial start-up

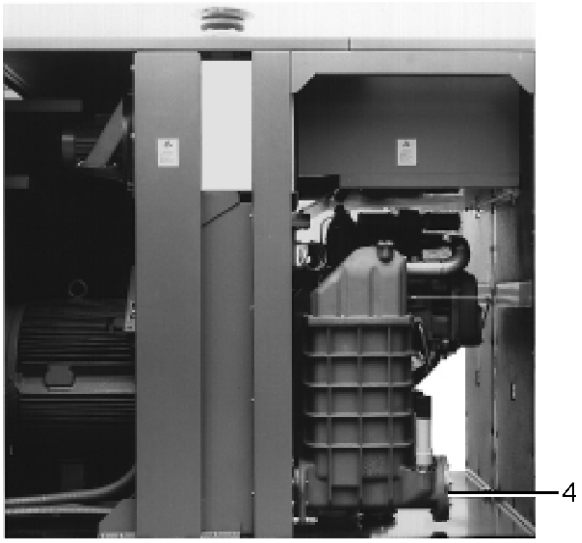



M1
1
1
F3363


T1
T2
F40
F5
F4
F3
F1
F0
1x4/7
1x3
K11
F27
K27
K26
Q25
F26
K25
K22
K23
K21
F21
Q27
F25
52545F



60406D



1. Install the compressor, see sections Electric cable size, Installation proposals, Dimension drawings and Settings of overload relay and fuses.
2. A number of VCI (Volatile Corrosion Inhibitor) plates are provided inside the bodywork to protect the compressor against corrosion. Remove the plates.
3. **The compressor and motor are secured to the frame immobilizing the vibration dampers during transport.**
   - Remove both transport supports (3) (one at each side of the gear casing) which fix the gear casing to the frame.
   - Remove the two long transport bolts and spacers (1) which fix the motor support to the frame.
4. On ZE compressors with aftercooler, remove flange (4) and take the silica gel bags out of the silencer. Reinstall the flange.
5. Check that the compressor is filled with oil: oil must be visible in oil level sight-glass (GI).
6. Check that the electrical connections correspond to the local codes. The installation must be earthed and protected by fuses in all phases. An isolating switch must be provided.
7. Check the voltage selecting wires at transformers (T1 and T2) for correct connection.
8. Check the setting of overload relay (F21) and that the relay is set for automatic resetting.
9. Switch on the voltage. Start the motor and stop it immediately. Check for correct direction of rotation as indicated by the arrow on the coupling housing or on the gear casing. On Arr. E compressors, the coupling can be observed through the openings in the coupling housing.

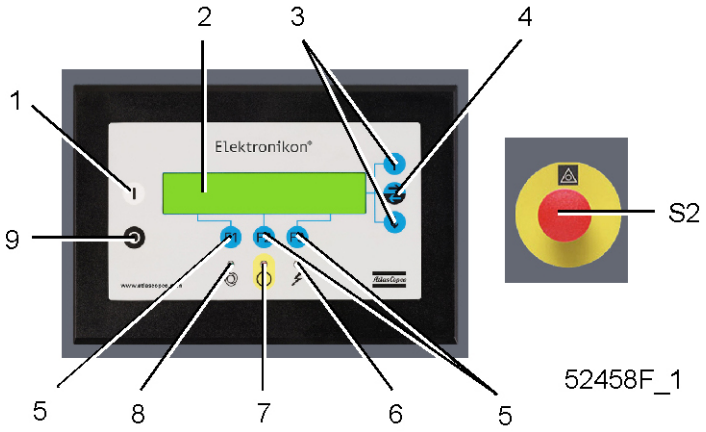
   If the rotation direction is wrong, switch off the voltage and reverse two electric input connections.
10. Run the compressor for a few minutes; stop the compressor and check the oil level, which must be in the middle of sight-glass (GL). Top up, if necessary.

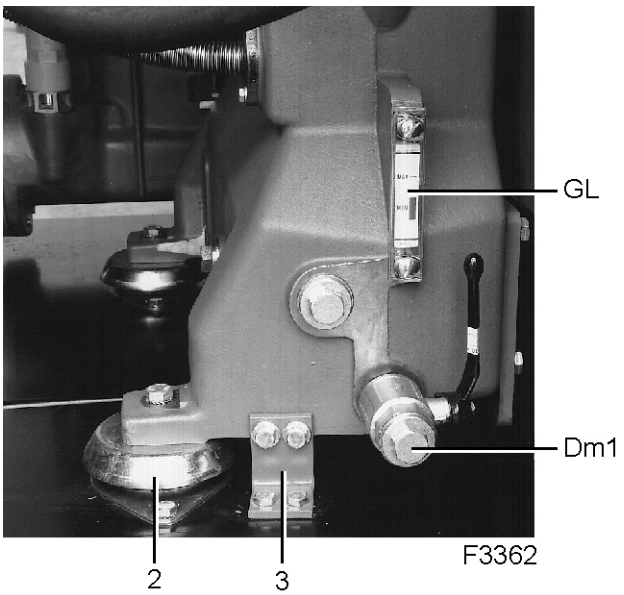
5.2 Before starting

Attention

	The operator must apply all relevant Safety precautions.

Procedure





1. Check the oil level, which must be in the middle of sight-glass (GL). Top up, if necessary, with the correct type of oil.
2. If an aftercooler is installed, close the drain valve of the drain receiver.
3. Open the air outlet valve (customer's installation).
4. Switch on the voltage and check that voltage on LED (6) lights up.

5.3 Starting

Control panel

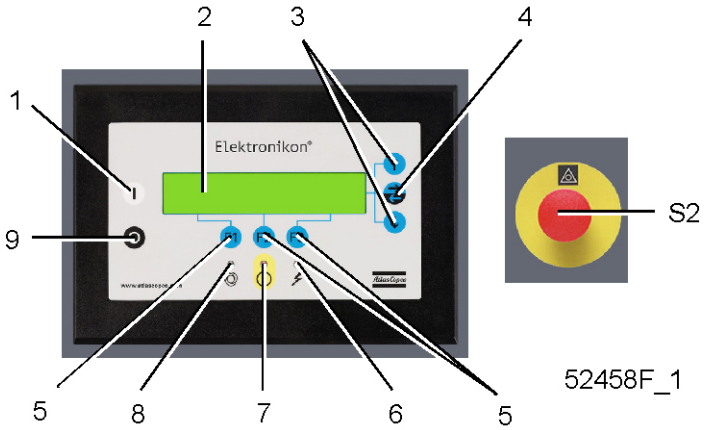


Figure 15: Control panel

Compressors with full-load/no-load regulator

1. Press start button (1). The compressor starts running in unloaded condition and automatic operation LED (8) lights up.
2. 25 seconds later (programmable), the compressor starts running loaded. The message on display (2) changes from “Automatically Unloaded” to “Automatically Loaded”.

Starting after emergency stopping or shut-down

Press the emergency stop button (S2/S3) (if not yet done so), switch off the voltage and then depressurize the compressor. After remedying the fault, unlock the emergency button by pulling it out, reset the regulator and restart the compressor as described above.

If the automatic restart function after voltage failure is activated (see section Electronic regulator) and the duration of repair is shorter than the programmed power recovery time, reset the display after remedying the fault: press the key “Reset”, the message “All Conditions Are OK” will appear, after which the compressor can be restarted. Press the keys “Menu” and “Mainscreen” to return to the main display.

Minimum stop time:

The compressor will not be allowed to restart within a programmed time (20 s) after a stop for whatever reason. A start command given during the minimum stop time will be memorized; automatic operation LED (8) lights up. The compressor will start when the minimum stop time has run out.

Manual restarting

In automatic operation, the regulator limits the number of motor starts.

On compressors with low-voltage motors, observe an interval of minimum 20 minutes between each manual start.

5.4 During operation

Control panel

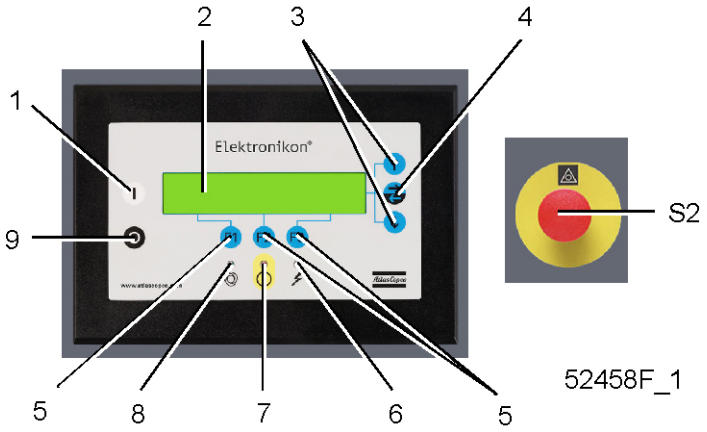


Figure 16: Control panel of MkIV regulator

Procedure

	When automatic operation LED (8) is alight, starting and stopping of the motor is automatically controlled: when the motor is stopped, it may restart automatically.

Check the readings on display (2).

Compressors equipped with a full-load/no-load regulator:

1. When reaching the pre-set unloading pressure, shown on display (2), the compressor will run unloaded. From now on, the electronic control module will calculate the optimum moment to stop and restart the compressor motor automatically, depending on the maximum permissible number of motor starts and on the air consumption.
2. To unload the compressor manually, press the key “Unload” (5).
3. To put the compressor back into automatic operation, press the key “Load” (5).
4. Keep all doors closed during operation.

	If the “Load” or “Unload” function is not indicated on the bottom line of the display (2), press key “Menu” (5) until the function “Mainscreen” appears above key (F1). Then press the key “Mainscreen”.

5.5 Checking the display

Control panel

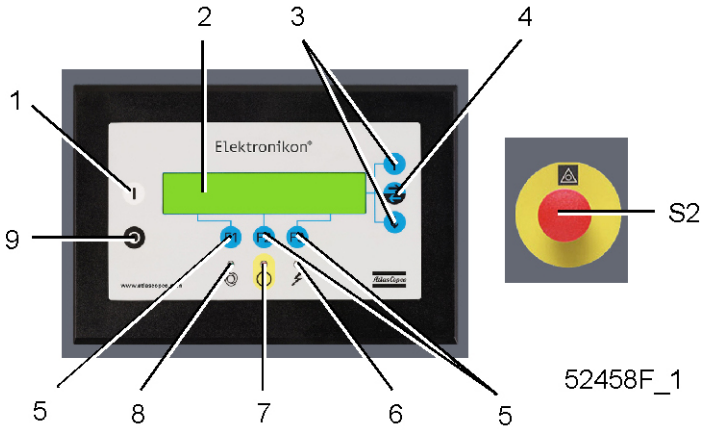


Figure 17: Control panel of MkIV regulator

Procedure

	Before carrying out any maintenance, repair or adjustment work, stop the compressor, press emergency stop button (S2/S3), switch off the voltage and depressurize the compressor.

Step	Action
1	Regularly check the display for readings and messages. Normally, the main display is shown, indicating the compressor outlet pressure, the status of the compressor and the functions of the keys below the display.
2	Always check the display and remedy the trouble if alarm LED (7) is alight or flashing.
3	The display will show a service message if a service plan interval has been exceeded or if a service level for a monitored component has been exceeded. Carry out the service actions of the indicated plans or replace the component and reset the relevant timer.
4	Regularly check the actual compressor condition: • The compressor control status (automatic or manual, local or remote) • The status of the compressor start/stop timer (active or not). The compressor is automatically started/stopped if these start/stop commands are programmed and activated. • The maximum working pressure • The outlet pressure • The pressure drop over the air filters • The oil pressure • The outlet temperature • The temperature of the compressor element • The oil temperature • The status of the drive motor and fan motor overload protection (normal or not) • The total running and loading hours

	Whenever a warning, service request, sensor error or motor overload message is displayed, the free spaces on the display between the function keys (5) are filled with flashing indicators (**). When more than one message needs to be displayed (e.g. both warning and service), the messages are continuously displayed for 3 seconds each.

5.6 Manual control on compressors equipped with a full-load/no-load regulator

Control panel

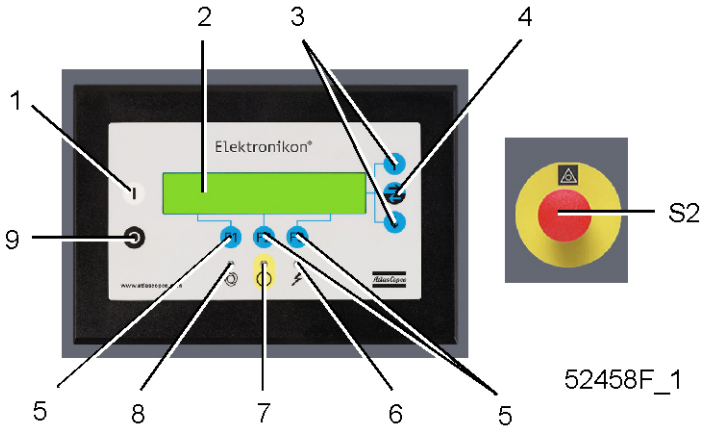


Figure 18: Control panel of MkIV regulator

General

Normally, the compressor runs in automatic operation, i.e. the electronic regulator loads, unloads, stops and restarts the compressor automatically. LED (8) is then alight.

If required, the compressor can be unloaded manually. In this case, the compressor is switched out of automatic operation, i.e. the compressor remains running unloaded unless it is loaded again manually.

Manual unloading

Press the key “Unload” (5). LED (8) goes out. The message “Manually Unloaded” appears on the display.

Manual loading

Press the key “Load” (5). LED (8) lights up. The “Load” command does not force the compressor in loaded condition, but it will switch the compressor to automatic operation again, i.e. the compressor will be loaded if the air net pressure drops below the programmed level.

	If the “Load” or “Unload” function is not indicated on the bottom line of display (2), press “Menu” (5) until “Mainscreen” appears above key (F1), then press “Mainscreen”.

5.7 Stopping

Control panel

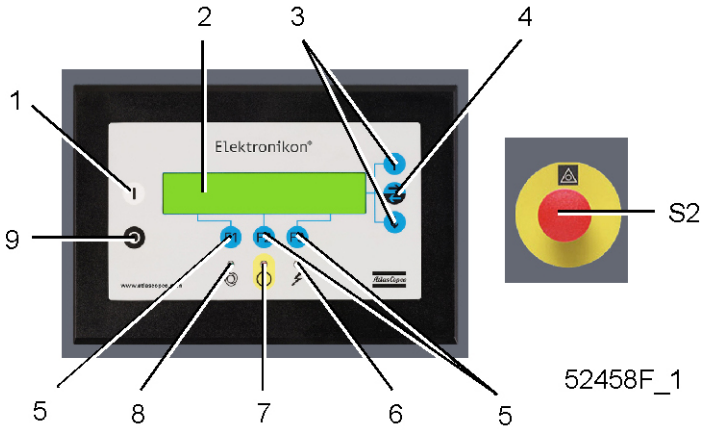


Figure 19: Control panel of MkIV regulator

Compressors with full-load/no-load regulator

1. Close the air outlet valve.
2. Press stop button (9). The compressor will run unloaded for 3 seconds and then stop.
3. To stop the compressor immediately, press the emergency stop button (S2/S3). Alarm LED (7) starts flashing. After remedying the trouble, unlock the emergency stop button by pulling it out.
4. If an aftercooler is installed, open the drain valve of the aftercooler drain receiver.

Emergency stopping

- To stop the compressor immediately, press emergency stop button (S2/S3). Alarm LED (7) starts blinking. After remedying the trouble, unlock the emergency stop button by pulling it out.
- After stopping, close the air outlet valve. If an aftercooler is installed, open the drain valve of the aftercooler drain receiver.

5.8 Taking out of operation

Procedure

Step	Action
1	Close the air outlet valve and stop the compressor.
2	Switch off the voltage and disconnect the compressor from the mains.
3	Shut off and depressurize the part of the air net which is connected to the outlet valve.
4	Disconnect the compressor air outlet pipe from the air net.
5	Drain the oil and condensate circuits. Catch the oil in a receptacle.
6	Disconnect the compressor condensate piping from the condensate drain net.

Table 3: At the end of the service life of the compressor, proceed as follows:

6 Maintenance

6.1 Preventive maintenance schedule

Safety precautions

	**Before carrying out any maintenance, repair work or adjustment, proceed as follows:** • Stop the compressor. • Press emergency stop button (S2/S3). • Close the air outlet valve and open the manual condensate drain valves. • Switch off the voltage. • Open and lock the isolating switch (installed by the customer). • Wait at least 6 minutes before starting any electrical repairs as hazardous high voltage remains on the condensers of the start and speed regulation unit for 6 minutes after the voltage is switched off. The operator must apply all relevant Safety precautions. Repairs inside the start and speed regulation cabinet may only be carried out by Atlas Copco.

Service agreements

Atlas Copco Customer Centers have a range of service agreements to suit your needs:

- An Inspection plan
- A Preventive maintenance plan
- A Total responsibility plan

Contact your Customer Center to agree on a tailor-made service agreement. It will ensure optimum operational efficiency, minimize downtime and reduce the total life cycle costs.

Warranty-Product Liability

Use only authorized parts. Any damage or malfunction caused by the use of unauthorized parts is not covered by Warranty or Product Liability.

Service kits

Atlas Copco Customer Centers will be glad to provide you with a wide range of service kits. Service kits comprise all parts needed for servicing components and offer the benefits of genuine Atlas Copco parts while keeping the maintenance budget low.

Regular checks

To ensure safe operation and long service life carry out following operations at the interval (period or running hours) which comes first. The longer interval checks must also include the shorter interval checks. The local Atlas Copco Customer Center may overrule the maintenance schedule depending on the environmental and working conditions of the compressor.

Period	Running hours	Operation
Daily	8	Check the readings.
Daily	8	On compressors with aftercooler, check that condensate is discharged during loading.
Daily	--	Check the oil level. Before starting, the level should be in the middle of the sight-glass.
Weekly	--	Drain condensate from the air receiver, if installed
Every 3 months	--	Clean compressor.
Every 3 months	--	Check for possible leaks.
Every 3 months	500	Check the coolers; clean them if necessary.
When displayed	--	Carry out service actions according to the displayed service plans

Service plan

A number of service operations are grouped (called level A, level B, level C, ...). Each level stands for a number of service actions to be carried out at the time intervals programmed in the Elektronikon regulator.

6.2 Motor greasing

General

	• The data below are valid for an air intake temperature of maximum 40 ˚C/104 ˚F. • Reset the regreasing service warning after regreasing.
	• Motor bearing maintenance is crucial to avoid motor damage. • Never mix greases of different brands or types. • Stop the compressor before greasing.

Maintenance is limited to applying the motor grease mass at the interval that is stated on the motor bearing data plate attached to the motor.

Contact your local Atlas Copco Customer Center in following cases:

- If not all the necessary data are present on the bearing plate.
- If the correct lubrication method is not clearly stated in the general instruction book.
- If the maximum ambient/bearing temperature differs from the one mentioned on the motor data plate.

Interval, grease quantity and grease type

Check the motor data plate for the correct motor type.

Motor type	Interval (hours)	Quantity (g)	Grease type
Siemens 1LA5 206-2	3000	15	Roto-Glide
Siemens 1LA5 207-2	3000	15	Roto-Glide
Siemens 1LA6 223-2	2000	20	Roto-Glide
Siemens 1LA6 228-2	2000	20	Roto-Glide
Siemens 1LA8 315-4	6000	20	Roto-Glide
Siemens 1LA8 317-4	6000	20	Roto-Glide
Siemens 1LA8 353-4 50 Hz YD	6000	20	Roto-Glide

Motor type	Interval (hours)	Quantity (g)	Grease type
Siemens 1LA8 353-4 50 Hz DOL and 60 Hz	6000	40	Roto-Glide
Siemens 1LA8 355-4	6000	40	Roto-Glide
Siemens 1LA8 357-4	6000	40	Roto-Glide
Siemens 1LG6 316-4 50 Hz	4000	40	Roto-Glide
Siemens 1LG6 316-4 60 Hz	6000	40	Roto-Glide
Siemens 1LG6 317-4 50 Hz	4000	40	Roto-Glide
Siemens 1LG6 317-4 60 Hz	6000	40	Roto-Glide
WEG 280S/M	2000	27	ESSO Polyrex EM
WEG 315S/M	2000	27	ESSO Polyrex EM
WEG 444/5T	2000	27	ESSO Polyrex EM
WEG 504/5T	2000	27	ESSO Polyrex EM
WEG W21 200/4	8000	45	ESSO Polyrex EM
WEG W21 250/4	8000	45	ESSO Polyrex EM
WEG W21 300/4	8000	45	ESSO Polyrex EM
WEG W21 350/4	8000	45	ESSO Polyrex EM

6.3 Oil specifications

Roto-Z lubricating oil

Use Atlas Copco Roto-Z oil which is specially developed for oil-free rotary compressors. This oil has a long service life and ensures optimum lubrication.

Atlas Copco Roto-Z oil can be ordered in following quantities:

Quantity (l)	Ordering number
5 l can	2908 8503 00
20 l can	2908 8501 01
209 l drum	2908 8500 00

6.4 Storage after installation

Procedure

Run the compressor, e.g. twice a week, until warm.

On compressors equipped with a full-load/no-load regulator, load and unload the compressor a few times to operate the components of the full-load/no-load system.

If the compressor is going to be stored without running from time to time, protective measures must be taken. Consult Atlas Copco.

6.5 Part numbers of filters

Air/oil filter kit

Use genuine spare parts only. The part numbers to order filters from Atlas Copco are:

ZE/ZA4	2906 0338 00

Table 4: Pack compressors

ZE/ZA4	2906 0337 00

Table 5: Non-silenced compressors

7 Servicing procedures

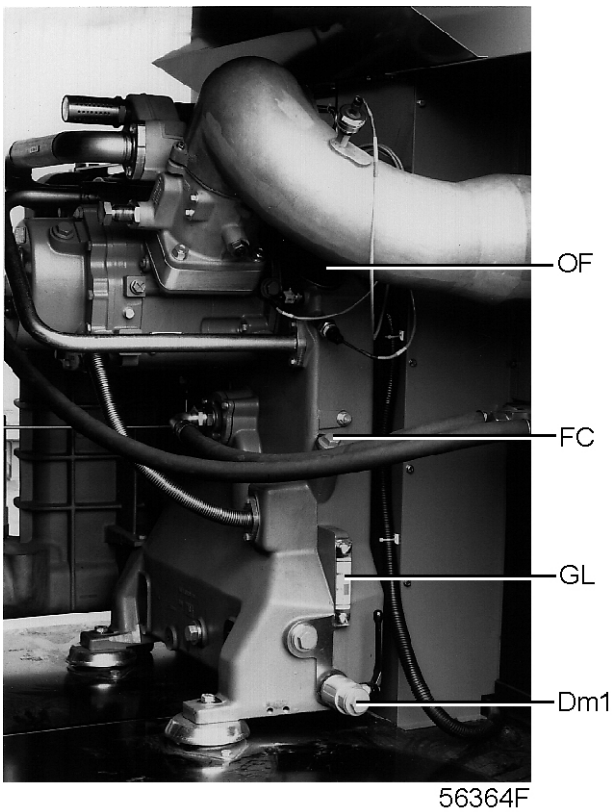
7.1 Air filters

Procedure

1. In dusty operating conditions where it will be necessary to replace the filter too frequently, an appropriate pre-filter of the dry type should be installed.
2. The filter must be serviced as soon as the service warning appears on the display.
3. Stop the compressor, press the emergency stop button and switch off the voltage. Never remove the elements while the compressor is running.
4. Remove the filter housing cover and clean the filter chamber. Clean the cover.
5. Remove the filter. Take care that no dirt drops into the inlet pipe. Clean and inspect the element sealing surface of the filter chamber.
6. Install the new or cleaned filter and fit the cover. Never install damaged or clogged filters.
7. Switch on the voltage, unlock the emergency stop button and reset the air filter service warning.

7.2 Oil and oil filter change

Oil system



56364F

Procedure

Step	Action
1	Run the compressor until warm.
2	Stop the compressor, press the emergency stop button.
3	Switch off the voltage.
4	The filler plug and drain points are painted yellow. Remove filler plug (FC). Drain the compressor sump by opening drain valve (Dm1). Drain the oil cooler by loosening its drain plugs. Close the drain valves and tighten the drain plugs after draining.
5	Remove the oil filters (OF). Clean the filter seats, oil the gaskets of the new filters and screw the filters into place until the gaskets contact the seats. Then tighten by hand.
6	Fill the compressor sump to the middle of the oil level sight-glass (GL). See section Oil specifications for the correct type of oil.
7	Reinstall the filler plug.
8	Switch on the voltage, unlock the emergency stop button and reset the oil and oil filter service warnings.
9	Run the compressor for a few minutes.
10	Stop the compressor, check that the oil level is in the middle of sight-glass (GL).
11	Top up, if necessary.

7.3 Safety valves

Testing

The valves can be tested on a separate compressed air line. If a valve does not open at the pressure specified in section Settings of safety valves, consult Atlas Copco.

	Never run the compressor without safety valves. No adjustments are allowed.

8 Problem solving

8.1 Problem solving

	Before carrying out any maintenance, repair or adjustment work, stop the compressor and switch off the voltage. Close the air outlet valve and open the manual condensate drain valves. Press the emergency stop button. Open and lock the isolating switch. The operator must apply all relevant Safety precautions.

Control panel

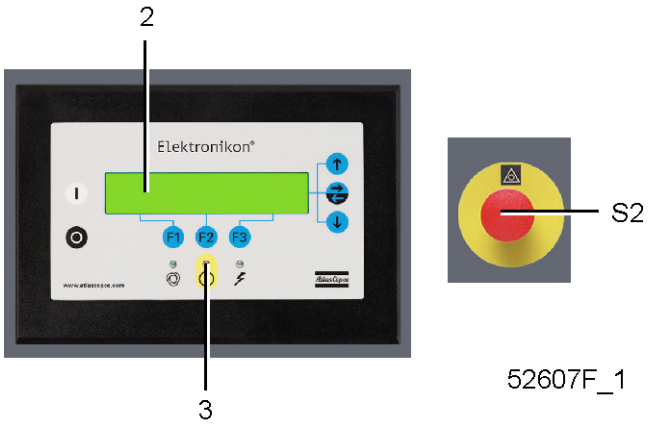


Figure 20: Control panel of MkIV regulator

Faults and remedies

Condition	Fault	Remedy
Compressor capacity or working pressure lower than normal	Air consumption exceeds capacity of compressor	Check pneumatic plant
	Safety valves leaking	Remove leaking valve and have it inspected
	On compressors equipped with a full-load/no-load regulator also: Unloading pressure incorrectly set	Correct as necessary
Oil pressure too low	Oil level too low	Top up level to the middle of the oil level sight-glass
	Oil filters clogged	Replace filters
Oil temperature above normal	Oil shut-down temperature incorrectly set	Correct setting to trip at the specified temperature
	On ZE compressors: insufficient cooling air flow	Check the cooling fan

Only on compressors equipped with a full-load/no-load regulator:

Condition	Fault	Remedy
Push button I is pressed, compressor starts running, but does not load after a delay time	Pressure in air net is above pre-set loading pressure	Wait until pressure in air net is lower than pre-set loading pressure

In all other cases contact your local Atlas Copco Customer Center.

9 Technical data

9.1 Readings

Important

	The readings below are valid when operating at reference conditions. See Reference conditions.

Readings on display

For the maximum working pressure and the outlet pressure, consult sections:

- Specific data ZE/ZA 4

Item	Reading
Outlet pressure	Depends on compressor type
dp of air filter	Below -0.044 bar
Oil pressure	2-2.2 bar(e)
Air outlet temperature	See below
Air temperature element 1 out	115-180 ˚C
Oil temperature	Approx. 30-40 ˚C

The air temperature at the outlet valve depends on the compressor type. The temperatures given below are average values and may differ depending on the compressor type.

Type	Unit	ZE/ZA 4
350	˚C	226

9.2 Settings of safety valves

Opening pressure of safety valve

- for compressors with a maximum working pressure up to 3.5 bar (51 psi) : 3.7 bar(e) (54 psig)

9.3 Settings of overload relay and fuses

ZE/ZA 3/4 compressors

60 Hz compressors with Y-D starter

Motor power (kW/hp)	Motor type	Supply voltage (V)	Maximum setting of overload relay (A)	Maximum fuse ratings (A) CSA HRC UL Class K5 Type 2 3 fuses 3 cables + bridges (installed by Siemens)	Maximum fuse ratings (A) CSA HRC UL Class K5 Type 2 2x3 fuses 2x3 cables	Maximum fuse ratings (A) CSA HRC UL Class K5 Type 2 3 fuses 2x3 cables	Maximum fuse ratings (A) CSA HRC UL Class K5 Type 2 3 fuses 3 cables + bridges (installed by Customer)
37/50	Siemens 1LA5 207-2	440/460	42	100	NA	NA	NA
45/60	Siemens 1LA6 223-2	440/460	47	100	NA	NA	NA
55/75	Siemens 1LA6 228-2	440/460	58	125	100	NA	NA
93/125	WEG 444/5T	440/460	81	NA	125	NA	200
150/200	WEG 504/5T	440/460	132	NA	175	300	NA
224/300	WEG 315S/M	440/460	197	NA	250	350	NA

60 Hz compressors with DOL starter

Motor power (kW/hp)	Motor type	Supply voltage (V)	Maximum setting of overload relay (A)	Maximum fuse ratings (A) CSA HRC 3 fuses	Maximum fuse ratings (A) UL Class K5 3 fuses
93/125	WEG 444/5T	440/460	140	200	200
150/200	WEG 504/5T	440/460	229	300	300

9.4 Fan motor circuit breakers

60 Hz compressors

Compressor type	Supply voltage (V)	Max. setting of circuit breaker, oil cooler fan motor (A)	Max. setting of circuit breaker, aftercooler fan motor (A)
ZE/ZA4	440/460	3	7.3

9.5 Reference conditions and limitations

Reference conditions

Item	Condition
Absolute inlet pressure	1 bar(a) (14.5 psi)
Relative air humidity	0 %

Item	Condition
Air inlet temperature	20 ˚C (68 ˚F)
Nominal effective working pressure	See Compressor data.

Limitations

Item	Limit
Maximum effective working pressure	See Compressor data.
Maximum air inlet temperature	40 ˚C (104 ˚F)
Minimum ambient temperature	0 ˚C (32 ˚F)

9.6 Common data

ZE/ZA 4

Type		D
Motor shaft speed		
- 60 Hz	rpm	3570
Power input, fan motor of optional aftercooler	kW	2x4.8
Sound pressure level, Pack compressors According to PNEUROP/CAGI test code with a tolerance of 3 dB(A) at 1 m distance in free field conditions.		
- at max. 2 bar 60 Hz	dB(A)	76
- at max. 2.75 bar 60 Hz	dB(A)	77
- at max. 4 bar 60 Hz	dB(A)	79
Oil capacity		
- ZE compressors	l	55

9.7 Specific data for ZE 4 and ZA 4 compressors

60 Hz compressors

Type		Unit	D
350	Nominal working pressure	bar(e)	3.5
	Maximum working pressure	bar(e)	3.75
	Power input	kW	141.8

10 Pressure equipment directives

PED instructions

This machine is a pressure assembly of cat. I according to 2014/68/EU.

Parts of article 4.3 of 2014/68/EU are subject to Sound Engineering Practice (SEP).

Parts of category I according to 2014/68/EU are integrated into the machine and fall under the exclusion of article 1.2, (f)(i).

Parts subject to the Simple Pressure Vessel Directive 2014/29/EU are excluded from 2014/68/EU according to article 1.2 (c).

The following pressure bearing parts are of category higher than I:

Compressor type	Pressure bearing part
ZA/ZE 3-4 and ZA 5-6	**Safety valve: Category IV** • Design code: AD-Merkblätter, A2

11 Documentation

Declaration of conformity

Typical example of a Declaration of Conformity document

EU DECLARATION OF CONFORMITY

We, ……(1)……., declare under our sole responsibility, that the product
Machine name ……..
Machine type ……..
Serial number ……..

Which falls under the provisions of article 12.2 of the EC Directive 2006/42/EC on the approximation of the laws of the Member States relating to machinery, is in conformity with the relevant Essential Health and Safety Requirements of this directive.

The machinery complies also with the requirements of the following directives and their amendments as indicated.

Directive on the approximation of laws of the Member States relating to		Harmonized and/or Technical Standards used		Att' mnt
……(2)……		……(3)……		

The harmonized and the technical standards used are identified in the attachments hereafter

……(4)…….. is authorized to compile the technical file.

	Conformity of the specification to the directives	Conformity of the product to the specification and by implication to the directives
Issued by	Engineering	Manufacturing
Name	……	……
Signature	……	……
Date	……	……
Place	……	……

Form 5009 xxxx xx
ed. xx, xxxx-xx-xx

….(5)….

58397_3D

Figure 21:

(1): Manufacturer

(2): Applicable directives

(3): Standards used

(4): Technical file holder

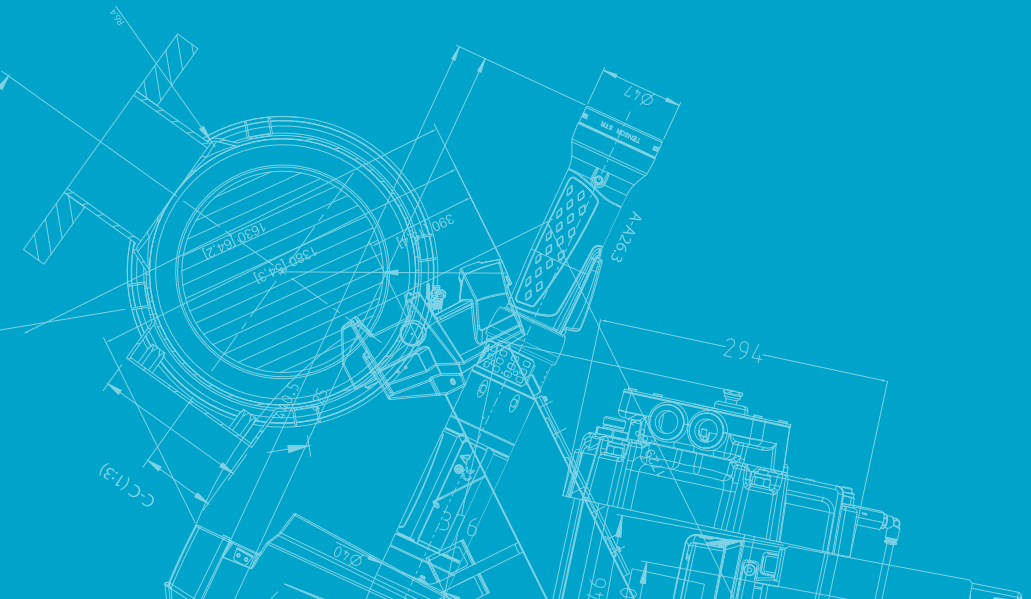
(5): Contact address of the manufacturer

On the Declaration of Conformity, the harmonized and/or other standards that have been used for the design are shown and/or referred to.

The Declaration of Conformity is part of the documentation that is supplied with this device.

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