

Waughop Lake Data Summary Report

2020 - 2024



February 2025

FINAL



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PRESENTED TO

City of Lakewood Planning & Public Works Engineering

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EXECUTIVE SUMMARY

Location & Background:

Waughop Lake is a small lake in Lakewood, Washington, within the popular Fort Steilacoom Park. It is used for recreational activities such as fishing, bird watching, walking and jogging. Waughop Lake has a long history of harmful algae blooms (HABs) due to nutrient-rich sediments from past agricultural waste discharges (1900-1965), leading to poor water quality and frequent health advisories.

Lake Management Plan:

In 2014, the City of Lakewood, with funding from the Washington State Department of Ecology investigated the poor water quality condition of Waughop Lake and subsequently developed a lake management plan to address the lake's water quality issues. The plan proposed two main management action for consideration that would be implemented in two phases:

- 1. **Aluminum Sulfate (Alum) Treatment** To remove phosphorus from the water and inactivate phosphorus in the sediments which fuel excess algae growth and HABs.
- 2. **Dredging** Dredge the lake to remove phosphorus-rich sediments. This option was considered but ultimately not pursued due to cost and feasibility concerns.

Implementation of Alum Treatments:

The City established a policy to move forward with the implementation of alum treatments aimed at reducing phosphorus and HABs, thereby improving the lake's water quality. No additional actions were included in this policy besides the alum treatments.

- In 2019, Tetra Tech designed an alum treatment strategy to remove phosphorus from the lake's water column and inactivate phosphorus in the lake sediments, thereby reducing the potential for HABs and limiting the occurrence and severity of blooms.
- Three alum treatments were conducted:
 - o 2020 (March & July): Two high-dose applications (40 mg Al/L each, total 80 mg Al/L)
 - 2023 (June): A third treatment at a lower dose (20 mg Al/L) based on water quality monitoring data.

Results & Findings:

Execution of the plan has led to effective management of HABs in Waughop Lake as the City's policy intended. The following area a summary of the results of the alum treatments that were implemented.

- Effective Phosphorus Reduction: The alum treatments significantly lowered phosphorus levels in the lake and subsequently reduced toxic algae blooms.
- Harmful Algae Bloom Control: No toxic algae blooms occurred in 2020, 2021, 2023 or 2024, a first in over a decade.
- **Cyanotoxin Reduction:** Only one low-level microcystin detection occurred in Waughop Lake, in 2022, and the concentration of microcystin was well below state recreational guidelines.
- **Challenges:** Despite improvements, external phosphorus loading (from groundwater or stormwater) and drastic lake level fluctuations during the summers contribute to additional nutrient issues.



• **Sustainability:** Water quality benefits from the 2020 treatments lasted into early 2022, but the 2023 treatment had shorter-lived effects.

Future Recommendations:

- Continue long-term water quality monitoring to adapt management strategies in the future.
- Further phosphorus stripping or sediment inactivation treatments may be necessary.
- Investigate external phosphorus sources (groundwater/stormwater) to guide future lake management.

Overall, the alum treatments have, in accordance with City policy, successfully improved control of toxic algae blooms in Waughop Lake. Ongoing management and monitoring, however, will be needed to maintain progress.



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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition		
Alum	Aluminum sulfate		
APAM	Aquatic plant and algae management		
Chl	Chlorophyll a		
City	City of Lakewood		
DA	Dissolved aluminum		
DO	Dissolved oxygen		
Ecology	Washington Department of Ecology		
ft	feet		
HABs	Harmful algal blooms		
kg	kilograms		
m	meter		
mg/L	Milligrams per liter		
mg CaCO ₃ /L	Milligrams of calcium carbonate per liter		
PCD	Pierce Conservation District		
SRP	Soluble reactive phosphorus		
ТА	Total aluminum		
TN	Total nitrogen		
TP	Total phosphorus		
µg/L	Micrograms per liter		



1.0 INTRODUCTION

This report summarizes the water quality and sediment data collected from Waughop Lake from March 2020, prior to the application of aluminum sulfate (alum), through December 2024. Data summarized in this report was collected before, during, and after the 2020 and 2023 alum applications. The water quality and sediment data summarized in this report was collected by personnel from Tetra Tech, Inc., hired by the City of Lakewood (City), as well as staff from SOLitude Lake Management (alum applicator, formerly known as HAB Aquatics) and volunteer monitors organized by the Pierce Conservation District (PCD).

2.0 BACKGROUND

Waughop Lake is a small lake (33 acres) located in the City of Lakewood, Washington, approximately 42 miles south of Seattle, WA (Figure 1). Waughop Lake is the centerpiece of the popular Fort Steilacoom Park and is used for fishing, model boat racing, kayaking, canoeing, and bird watching. The shoreline area is heavily used by hikers, joggers, and dog walkers. There is a mile long asphalt perimeter walking path around the lake.

Waughop Lake has a mean depth of 7 feet (ft) (2.1 meters [m]) and an approximate volume of 271,365 m³. Waughop Lake sits in a basin surrounded by slopes to the north, south, and west, with open flat meadows to the east. The lake's catchment area is approximately 497 acres with contributing surface drainage area of about 217 acres. The Pierce College campus covers about 66 acres. Residential properties covering approximately 130 acres lies southwest of the lake and are served by septic systems.

No creeks or other natural surface water channels flow into the lake. Stormwater runoff from a portion of Pierce College campus is conveyed through a pipeline to the lake. There are no natural or man-made outlets to the lake and water leaves the lake via seepage and evaporation. Waughop Lake is a glacial kettle lake that appears to be in direct contact with the shallow groundwater-flow system.

Waughop Lake has a long history of toxic cyanobacteria blooms, also referred to as harmful algae blooms (HABs). Health advisories issued by the Tacoma-Pierce County Health Department have been common for Waughop Lake during the past 15 years. In June 2010, the health department issued an advisory not to eat fish from the lake and for a short period of time in 2011, cyanobacteria toxin concentrations were so high that the lake was closed to all uses. Since 2007, toxicity data have been collected and maintained by Ecology on its Washington State Toxic Algae website. Of the 195 water samples collected from Waughop Lake from July 2007 to September 2018, 141 exceeded the state recreation guideline value for microcystin (6 μ g/L, recently updated to 8 μ g/L).

In 2014, the City received a grant from Ecology to develop a lake management plan for Waughop Lake. The City hired the consulting firm Brown and Caldwell, as well as the University of Washington Tacoma to conduct a monitoring program and develop a lake management plan. The goal of the management plan was to develop strategies to improve and protect the beneficial lake uses impaired by excess nutrients and cyanobacteria (Brown and Caldwell, 2017). Nuisance algae growth and cyanobacteria blooms in lakes are caused by excessive nutrient loading, particularly phosphorus. Phosphorus is typically the limiting nutrient for algae growth in western Washington lakes.

Waughop Lake's water quality problems likely began well over 100 years ago when the surrounding area was first used to raise livestock and grow crops for the nearby state mental hospital (Brown and Caldwell, 2017). Manure and other agricultural wastes were discharged into the lake from about 1900-1965 and likely contributed to the buildup of nutrient rich sediments (City of Lakewood, 2012; LaFontaine, 2012).



A monitoring program was conducted by University of Washington Tacoma from October 2014 – October 2015 and confirmed that phosphorus was the limiting nutrient for cyanobacteria blooms in Waughop Lake and that internal cycling of phosphorus from the enriched lake sediments to the water column was the largest source fueling cyanobacteria blooms (Brown and Caldwell, 2017). The lake management plan evaluated several potential lake management measures to reduce phosphorus and control cyanobacteria blooms. The lake management plan included a proposed phased approach for implementing the management measures outlined in the plan (Brown and Caldwell, 2017). This phased implementation approach included:

- Phase 1 which would consist of a whole-lake aluminum sulfate (alum) treatment to remove phosphorus from the water column and inactivate phosphorus in the sediments, thereby reducing the potential for cyanobacteria blooms. Phase 1 also included monitoring by the City to evaluate the effectiveness and longevity of the alum treatment and the collection of sediment data to refine construction cost estimates and support permit applications for dredging.
- Phase 2 would involve dredging of the lake to remove phosphorus-rich bottom sediment, provided that the City can secure the necessary funds and permits. Dredging was expected to be the most effective long-term measure for reducing phosphorus and subsequent cyanobacteria blooms but also by far the most expensive and challenging to implement.

The lake management plan also included a recommendation that the City evaluate whether a bottom aeration and vertical-mixing system would reduce phosphorus release from the bottom sediments and disrupt cyanobacteria growth in the water column.

The City explored the feasibility of dredging the lake and hired Tetra Tech, Inc. to review the information presented in the lake management plan and evaluate the feasibility of dredging to remove phosphorus-rich sediments from the lake. Tetra Tech, Inc. reviewed 4 dredging alternatives – 2 shallow dredging options and 2 deep dredging options. It was estimated that the dredging alternatives 50-year life cycle costs ranged from \$7.9 to \$34.5 million (in 2018 dollars) with a probability of success (phosphorus removal and HABs reduction) ranging from 20% to 90% over the 50-year period. The dredging alternative would also result in no direct use of the lake for a year or more and have significant impacts to recreation at Fort Steilacoom Park. Difficulties obtaining necessary permits for the dredging alternatives and adverse impacts to existing aquatic life were also anticipated.

Aeration and vertical-mixing systems to reduce phosphorus release from the bottom sediments and disrupt cyanobacteria growth were briefly evaluated. However, due to the shallowness of the lake, the decreasing water levels during the summer season, and the very loose bottom sediments, these systems would not have been appropriate. Waughop Lake is a shallow waterbody that mixes frequently, almost consistently, throughout the year, so aeration and/or a vertical-mixing system would not have significant changes on the current conditions in the lake.

The City decided to move forward with the implementation of a whole-lake alum treatment to inactivate sediment phosphorus and reduce phosphorus concentrations in the water column, and in 2018 hired Tetra Tech, Inc. to assist with the planning, design, and implementation of the treatment. An alum treatment was chosen due to its proven record of removing phosphorus from the lake water column and inactivating mobile phosphorus in lake sediments. A alum treatment was also determined to be cost effective and easily be adaptive based on changing lake water quality conditions. Other management alternatives, such as the dredging options, were orders of magnitude more expensive and more invasive to park visitors. While dredging was expected to be the most effective long-term measure for reducing phosphorus and HABs and may have provided a pathway to complete restoration, the City manages the lake from a public safety perspective and primary goal was to reduce the occurrence and intensity of toxic cyanobacteria blooms.



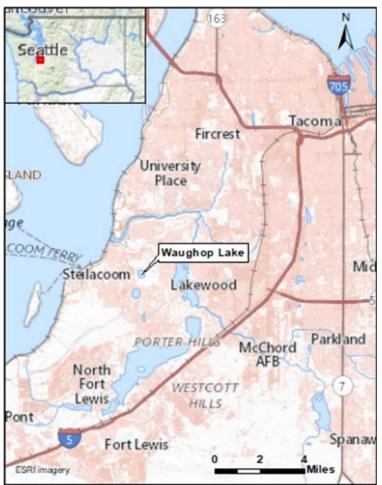


Figure 1. Map of Waughop Lake and Surrounding Area.

3.0 ALUM TREATMENT PLANNING AND DESIGN

3.1 ALUM OVERVIEW

Alum is a widely used chemical in wastewater and drinking water treatment facilities to clarify and remove impurities from water. In lakes, alum has been one of the most successfully implemented and effective in-lake treatments to reduce internal loading of phosphorus and remove phosphorus from the water column. Alum has been applied to well over 250 lakes worldwide and has been used for 50 years (Cooke et al., 2005, Brattebo et al., 2015, Huser et al., 2016).

Alum works by binding phosphorus from the water column and the sediment to aluminum. Alum is typically applied to the surface of a lake from a boat or barge equipped with nozzles or small hoses. In low-alkalinity lakes, like Waughop Lake, a buffer (sodium aluminate) is also used and simultaneously applied to the lake surface from separate nozzles or hoses. Alum and sodium aluminate are applied at a ratio that prevents major changes in lake pH during the application.

Alum hydrolyzes when it mixes with lake water and forms a white hydroxide floc that quickly settles to the lake bottom. The alum floc typically settles at a rate of 1.0 m per 6.5 minutes (Holz, James, and Barrow, 2021). As the





alum floc settles it removes soluble and particulate phosphorus from the water column through chemical binding of aluminum with phosphorus (also referred to as water column stripping). There is an immediate increase in water clarity following a properly dosed alum treatment due to the removal of algae and other particulate matter from the water column. The alum floc settles to the lake bottom and binds with sediment phosphorus in a form that is insensitive to anoxic conditions. That is, the phosphorus remains bound with aluminum even in low or zero dissolved oxygen, contrary to iron bound phosphorus. The floc condenses and settles into the lake sediments over time. As the floc settles it continues to bind phosphorus so long as binding sites are available.

Alum has been shown to be highly effective at reducing internal loading in both shallow (unstratified), as well as deep (stratified) lakes (Welch and Cooke, 1999; Cooke et al., 2005; Huser et al., 2016). The effectiveness at reducing whole-lake total phosphorus (TP) and sediment phosphorus release rate following an alum treatment averaged between 51 and 73% in six unstratified lakes and was maintained near that level to 5 to 11 years (Cooke et al., 2005). The 2004 treatment of Green Lake was still effective after 11 years (Welch et al., 2017).

Alum was used in Lake Ketchum (Snohomish County, WA) to successfully inactivate sediment phosphorus and eliminate internal phosphorus loading from lake sediments that were enriched by a legacy of inputs and runoff from a former dairy farm (Brattebo et al., 2017; Brattebo et al., 2024). The elimination of internal phosphorus loading lead to a reduction in toxic algae blooms, improved lake water quality, and restoration of both habitat and recreational activities. Small annual alum treatments began in 2016 at Lake Ketchum and have continued each year since, with the latest treatment occurring in March 2024. The goal of the small annual treatments is to neutralize the large inflow of phosphorus from the lake inlet that enters the lake each year with winter precipitation. The small annual alum treatments have consistently removed phosphorus from the Lake Ketchum water column each spring and prevented the occurrence of toxic cyanobacteria blooms (Figure 2). Alum is also used annually at Lake Oswego, Oregon, both to intercept and remove phosphorus from the inflow and to reduce phosphorus within the water column and reduce internal phosphorus loading (Rosenkranz, 2024).



Figure 2. Lake Ketchum Photographs Before and After Restoration.

3.2 ALUM TREAMENT DOSE DETERMINATION AND APPLICATION STRATEGY

In early 2019, Tetra Tech calculated the alum treatment dose for Waughop Lake based on sediment data obtained from the University of Puget Sound (Peterson, 2016) and the limited water column phosphorus data available for the lake. Working with the City, Tetra Tech developed a range of alum dosing alternatives and application strategies to be considered given the relative risks of obtaining the water quality goals for the lake



relative to the reduction of HAB events. The uncertainties at the time were based on a number of unknowns and uncontrollable conditions, such as groundwater phosphorus loading, lake recharge, and the reliability of the data collected to date.

Based on the limited sediment and lake data available at the time, the estimated phosphorus inactivation and water column stripping dose for Waughop Lake was 320 mg Al/L. That estimated dose was 8 to 16 times greater than the common dose used with the Puget Sound lakes region. The dose was based on the concentration of mobile phosphorus (loosely sorbed phosphorus and iron bound phosphorus) and one third of the concentration of biogenic phosphorus in the top 50 cm of the sediments. According to the sediment data from the University of Puget Sound, the average mobile phosphorus concentration in the top 50 cm was 735 mg/kg and the average biogenic phosphorus concentration was 379 mg/kg. These sediment concentrations varied slightly from results obtained from a core collected right before treatment in March 2020. The average mobile phosphorus concentration in the top 30 cm of the core collected in March 2020 was lower at 410 mg/kg however the average biogenic concentration was much higher at 1,373 mg/kg (Appendix A). The calculated alum dose based on the sediment data collected in March 2020 was lower, 230 mg Al/L, compared to the original calculated dose but still much greater than common doses used in the region. The lake TP concentration was assumed to be 69 µg/L for purposes of calculating the amount of aluminum needed to strip the phosphorus from the water column. It was determined based on cost, the uncertainty of the groundwater phosphorus loading dynamics, unknowns associated with lake recharge, and the variable matrix of the sediment, that the dose calculated may be more than was needed or may still require periodic maintenance doses to inactivate future phosphorus loading. Hence the large, 320 mg Al/L or 230 mg Al/L, dose was not recommended for Waughop Lake at that time.

The application dose and application strategy that was recommended was to proceed with a treatment dose of 120 mg Al/L applied over the course of three separate application events. The recommended dose was still 3 to 6 times greater than the average lake dose for the Puget Sound region, but it was based on the high sediment phosphorus concentrations and predicted to change the dynamics of the sediments and inactivate a significant amount of sediment phosphorus. Mobile sediment phosphorus concentrations in the lake are relatively high due to past practices of discharging manure and other agricultural wastes into the lake (Brown and Caldwell, 2017). Given lake and sediment conditions prior to treatment, it was recommended that the total alum dose (120 mg Al/L) be applied to the lake in three separate applications, at a dose of 40 mg Al/L, over the course of a year. The multiple applications were recommended to allow the sediment physical characteristics to change, become slightly denser, resulting in a more stable, less fluid lake bottom.

However, given the data variability and unknowns at the time, it was also recommended that the phosphorus inactivation program at Waughop Lake be adaptive and rely on additional data collected one and two years after the initiation of alum treatments. An adaptive program would enable an informed understanding of the degree to which the physical and chemical characteristics of the lake changed due to the alum treatments and allow for modifications to treatments based on actual lake responses. Ultimately, the adaptive program resulted in only two applications being completed in 2020 with a third, smaller application occurring in 2023.

4.0 ALUM TREATMENT IMPLEMENTATION

4.1 2020 ALUM TREATMENTS

Two whole-lake alum treatments, buffered with sodium aluminate, were conducted in 2020 to remove phosphorus from the water column and to inactivate the release of phosphorus from the lake sediments to reduce algal production. An early-season treatment was conducted from March 24th to March 25th, and a second application was conducted from July 14th to July 16th. Maps of treatment coverage from the March 2020 and the July 2020 applications are provided in Figure 3 and photos during treatment are shown in Figure 4. Photos of increased





clarity in the water column following the July treatment are shown in Figure 5. Samples for water quality analysis were collected by Tetra Tech staff before and after each treatment, and in-situ monitoring of dissolved oxygen (DO), conductivity, temperature, and pH were conducted prior to, during, and after treatment.

The alum treatments in March and July of 2020 had relatively high doses of 40 mg Al/L applied to the whole lake, for a total dose of 80 mg Al/L. As stated earlier, the targeted dose was determined based on available phosphorus loading and sediment phosphorus data and was designed to inactivate sediment phosphorus and strip the water column of phosphorus. Two of the planned 40 mg Al/L doses were applied in 2020. This strategy of phased application was recommended to allow the lake sediments to consolidate from their very fluid state and maximize the effectiveness of the treatment. This strategy also allows for adaptive management based on results from on-going water quality monitoring efforts.

Immediately following each alum treatment, there was a significant increase in water clarity due to the stripping of algae and particulate matter from the water column (Figure 5). Water clarity remained clear throughout the summer of 2020 due to the dramatic reduction in phosphorus concentrations and subsequent algal production. Waughop Lake did not experience a cyanobacteria bloom in 2020. The Washington State Toxic Algae monitoring program indicates that reoccurring toxic algae blooms were observed every year on record from 2007-2018 (King County, 2018).





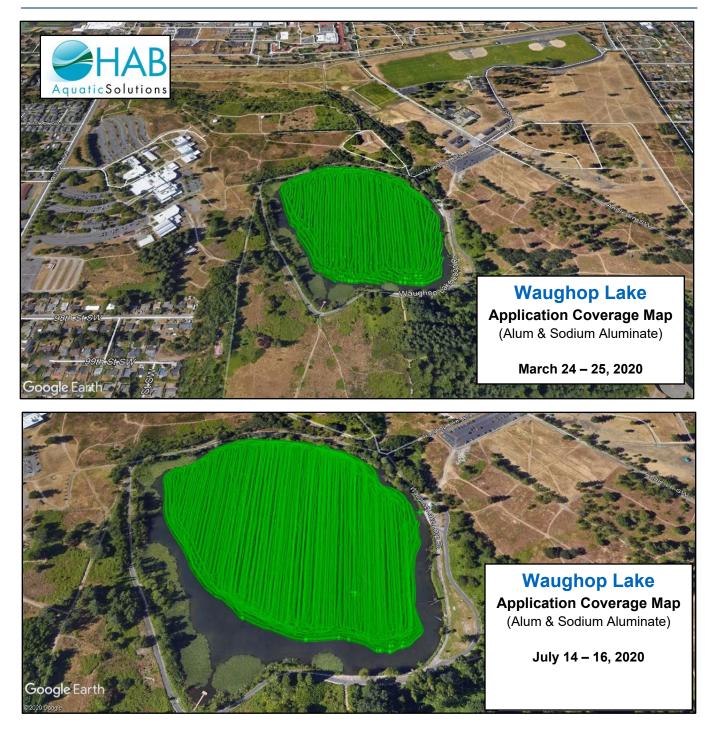


Figure 3. Phosphorus inactivation application coverage map for 2020 alum treatments in March (upper) and July (lower) at Waughop Lake. Both treatments in 2020 covered the whole lake within the depth capabilities of the application vessel. The difference in the green shaded area between March and July was due to much lower lake levels in July and decreased water volume.





Figure 4. Chemical distribution systems for 2020 alum treatments in March (left) and July (right) at Waughop Lake.

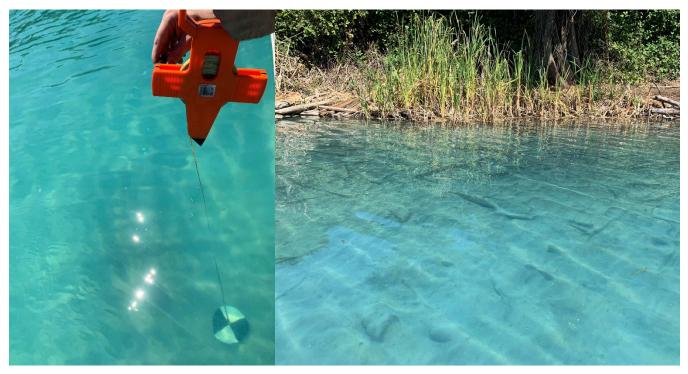


Figure 5. Water clarity to the lake bottom on July 15th, 2020 during alum treatment at Waughop Lake.



4.2 2023 ALUM TREAMENT

One whole-lake alum treatment, buffered with sodium aluminate, was conducted in 2023 to remove phosphorus from the water column and to continue to inactivate the release of phosphorus from the lake sediment to reduce algal production. The treatment was conducted on June 28th and 29th, 2023. Photos of the chemical distribution during the 2023 treatment are shown in Figures 6 and 7. A photo of increased water clarity in the water column immediately after treatment is shown in Figure 8. Samples for water quality analysis were collected by Tetra Tech staff before and after the treatment, and in-situ monitoring of dissolved oxygen (DO), conductivity, temperature, and pH were conducted prior to, during, and after treatment.

The alum treatment in June 2023 had a dose of 20 mg Al/L applied to the whole lake. The alum treatments in March and July of 2020 had relatively high doses of 40 mg Al/L each, for a total dose of 80 mg Al/L. The dose for the 2023 treatment was based on water quality data collected in 2021 and 2022. The original plan was to apply alum at a dose of 40 mg Al/L three times over the course of a year. However, based on the lake's positive response to the 2020 alum treatments, the City decided to postpone the third treatment until water quality conditions warranted an application. Total phosphorus and chlorophyll concentrations in Waughop Lake remained relatively low following the 2020 alum treatments and had begun to increase starting in the winter of 2021 and summer of 2022. Based on the increased TP, chlorophyll, and algal production the City decided to treat the lake with alum in June 2023 to reduce water column phosphorus concentrations and reduce the potential for HAB event occurrences and intensity during the summer of 2023.

A similar increase in water clarity was observed immediately following the June 2023 alum treatment. Similar to the applications in 2020, the increase in water clarity was due to the stripping of algae and particulate matter from the water column. Water clarity remained high through the summer (September 2023) before decreasing with increased algae production in October 2023. The effectiveness of the 2023 alum treatment was expected to be similar to that observed following the 2020 treatments, however, treatment effectiveness in 2023 was hindered by extreme low water levels and climatic conditions. These conditions enhanced water column mixing and phosphorus migration from lake sediments making both the phosphorus concentration and bio-availability greater, as seen with increased phosphorus concentrations in the fall and winter of 2023 (See Section 6.4).





Figure 6. Chemical distribution system for 2023 alum treatment in June at Waughop Lake.



Figure 7. Alum barge during application on second day of alum treatment in June 2023 at Waughop Lake.





Figure 8. Water clarity to the lake bottom on June 29th during alum treatment at Waughop Lake.

5.0 LAKE MONITORING

A water quality monitoring program was implemented to evaluate the short-term and long-term effects of the Waughop Lake alum treatments conducted in 2020 and 2023. The data obtained from the monitoring program was used to assess management progress relative to the reduction of HABs in Waughop Lake and to plan future lake management actions.

Tetra Tech staff conducted monthly monitoring from March through October 2020 and from May through October 2023. Additional monitoring was conducted by Tetra Tech in January and March 2021. Tetra Tech conducted quarterly monitoring following the June 2023 alum treatment in December 2023, March 2024, and June 2024. Additional in-situ monitoring was conducted before, during, and after the alum treatments in March 2020, July 2020, and June 2023. All in-situ monitoring included measurements of DO, conductivity, temperature, and pH at either one or two established monitoring station(s) (Figure 9). At the lake sites, these parameters were measured at 0.5-meter (m) intervals within the water column. Tetra Tech also recorded Secchi disk depth, or transparency, and lake water level during each monitoring event, and made observations on the weather and water conditions, as well as waterfowl and aquatic life observed at the time of sampling. Tables summarizing in-situ monitoring data collected by Tetra Tech are included in Appendix B.

In 2023, the City was also required to measure lake pH continuously during the alum treatment. Prior to the start of the alum treatment, on June 27th, Tetra Tech staff deployed a HOBO pH and temperature data logger from an old set of dock pilings near the northeast shoreline. The logger was deployed such that pH measurements were from about 0.5 m below the water surface. The logger remained in the lake and recorded pH and temperature measurements every 15 mins from shortly after noon on June 27th through 12:30 pm on June 30th.

In 2020, water samples were collected for laboratory analysis before and after each alum treatment at depths of 1 m and 1.5 m. Monthly water quality samples were collected from March through October 2020 at a depth of 1 m.



Samples collected in January and March 2021 were collected at a depth of 1 m. Samples were initially collected at two stations, but due to the small size of the lake, data did not vary significantly between the stations and the second station was eventually excluded from sampling activities. All water samples collected in 2020 were analyzed to determine total phosphorus (TP), total nitrogen (TN(), alkalinity, sulfate, and chlorophyll *a* concentrations. Select samples were also analyzed for soluble reactive phosphorus (SRP), ammonia, total aluminum (TA), dissolved aluminum, total organic carbon (TOC) and dissolved organic carbon (DOC). All laboratory data reports are included in Appendix C.

In 2023, water samples were typically collected for laboratory analysis at 1 m depth below the water surface at the mid-lake station. Samples were collected for laboratory analysis at a depth of 0.5 m above the lake bottom during the sampling events immediately before and after the June 2023 alum treatment. Water samples were analyzed to determine TP, SPR, TN, nitrate+nitrite as nitrogen (NO3+NO2), alkalinity, sulfate, TA, DOC, hardness and chlorophyll concentrations. Select samples were also analyzed for dissolved aluminum. The Washington State Department of Ecology required additional analyses for chloride, calcium, magnesium, potassium, sodium, bicarbonate, carbonate, and total sulfides before and after the June 2023 alum treatment. All laboratory data reports are included in Appendix C.

Table 1 summarizes the monitoring events conducted by Tetra Tech in 2020, 2021, 2023, and 2024.

The PCD through volunteer lake monitors also conducted monthly monitoring events at Waughop Lake from May through October 2021 – 2024. The PCD measured water column temperature, DO, shallow pH, and Secchi disk depth each month and collected water samples at 1 m depth for analysis of TP, SRP, TN, chlorophyll, and occasionally sulfate, alkalinity, and total aluminum. The laboratory data from PCD's monitoring events are included within the data analysis for this report. The annual data summary reports prepared by PCD for 2021, 2022, and 2023, as well as the laboratory data reports for 2024, are included in Appendix D.







Date	Sample Depth(s)	Sampling Station(s)	Notes
3/23/2020	1 m, 1.5 m	Mid-Lake, Station #2	Pre-treatment
3/26/2020	1 m, 1.5 m	Mid-Lake, Station #2	Post-treatment
4/10/2020	1 m, 1.5 m	Mid-Lake, Station #2	Monthly
5/27/2020	1 m	Mid-Lake	Monthly
6/18/2020	1 m	Mid-Lake	Monthly
7/13/2020	1 m, 1.5 m	Mid-Lake, Station #2	Pre-Treatment
7/17/2020	1 m, 1.5 m	Mid-Lake	Post-Treatment
8/7/2020	1 m	Mid-Lake	Monthly
9/11/2020	1 m	Mid-Lake	Monthly
10/19/2020	1 m	Mid-Lake	Monthly
1/19/2021	1 m	Mid-Lake	Supplemental Monthly
3/17/2021	1 m	Mid-Lake	Supplemental Monthly
5/23/2023	0.5 m	Mid-Lake	Monthly
6/27/2023	1 m, 1.8 m	Mid-Lake	Pre-Treatment
6/29/2023	0.5 m, 1 m, 1.8 m	Mid-Lake, West Shore	Post-Treatment (aluminum only)
6/30/2023	1 m, 1.8 m	Mid-Lake	Post-Treatment
7/13/2023	1 m, 1.8 m	Mid-Lake	Post-Treatment & Monthly
8/15/2023	1 m, 1.5 m (sulfides only)	Mid-Lake	Monthly
9/14/2023	1 m, 1.5 m (sulfides only)	Mid-Lake	Monthly
10/11/2023	1 m	Mid-Lake	Monthly
12/12/2023	1 m, 1.8 m (sulfides only)	Mid-Lake	Quarterly
3/13/2024	1 m, 2 m (sulfides only)	Mid-Lake	Quarterly
6/27/2024	1 m, 2 m (sulfides only)	Mid-Lake	Quarterly (one year post treatment)

Table 1. Tetra Tech Sampling Schedule at Waughop Lake, 2020 – 2024.

6.0 LAKE MONITORING RESULTS

6.1 WATER LEVEL & LAKE VOLUME

Water level in Waughop Lake was recorded during each monitoring event based on the installed gage. The lake gage measurements showed a steady decline of water level during the summer months for all years (Figure 10). In 2020, the lake level decreased from 6.1 feet (ft) in late March to a low of 3.55 ft in September. Similarly in 2021, the lake level decreased from 6.1 ft in mid-March to a low of 3.56 ft in September.

In 2022 water levels at the lake were much higher than in 2020 and 2021 but still showed a steady decrease throughout the summer months, decreasing from a high of 7.5 ft in May 2022 to a low of 4.75 ft in November. Water levels in 2023 also decreased from a high of 5.57 ft in May to a low of 3.0 ft in mid-October. The first monitoring event in 2023 was not until May so water level during early spring of 2023 is unknown. In 2024, the lake level decreased from 5.68 ft in March to 3.0 ft in October.





The water level in Waughop Lake usually increases steadily during the winter months before declining during the summer months. However, during the summers of 2023 and 2024 water level was much lower than recorded in previous years (Figure 10). Minimum water levels in 2020, 2021, and 2022 were 3.55 ft, 3.56 ft, and 4.75 ft, respectively, 0.5 to 1.75 ft higher than in 2023 and 2024. Maximum water levels typically observed in the spring were also lower in 2023 and 2024 compared to previous years. March water level in 2024 was a half-foot lower than water levels observed in March 2020 and 2021.

A USGS groundwater monitoring test hole (site 471032122292701) is located approximately 4 miles east of Waughop Lake and has a record of field measurements of groundwater level in 2020 – 2024. A comparison of lake level in Waughop Lake and groundwater level at the USGS monitoring site indicates that there is a strong correlation between water level in Waughop Lake and local groundwater levels, as shown in Figure 10. The ground elevation at the USGS groundwater monitoring test hole is 272.76 ft NAVD88. Groundwater measurements at the test hole ranged from about 32.8 ft to 48.7 ft below ground surface during 2020 through 2024, or approximately 224.1 to 240 ft NAVD88. The elevation of the gage at Waughop Lake is unknown; however, based on LiDAR, the shoreline elevation is approximately 228 ft NAVD88. The difference in water level elevation at the tot local groundwater flow patterns, with higher ground surface and groundwater elevations at the test hole site to the east (USGS, 2010). Unfortunately, there were only two field measurements of groundwater level at the test hole in 2023, during April and December, and only one measurement in 2024 in March, so we do not know how low the groundwater level in the test hole could have been during the summers of 2023 and 2024. Based on measurements collected in 2021, we can expect that groundwater levels during the summers of 2023 and 2024 were low.

Lake volume, which changes with decreasing and increasing water levels, was estimated using information on lake stage and corresponding change in lake storage that was included in the lake water budget summary in the lake management plan (Brown and Caldwell, 2017). The average change in lake storage, in ac-ft, per change in lake stage (ft) was estimated to be 33.5 ac-ft. It was assumed that lake volume at "full pool" was 220 ac-ft (271,365 m³) and that "full pool" corresponded to a gage height of 6.1 ft. Using the gage height data collected by Tetra Tech personnel, as well as PCD volunteer monitors, lake volume was estimated for each sampling date (Figure 11).

Lake volume in the spring of 2020 and 2021 was at or near "full pool", the assumed full volume of 220 ac-ft. In the spring of 2022, lake volume was well above "full poll" at about 260 ac-ft (Figure 11). Lake volume decreased over the summers of both 2020 and 2021 by about 38%. The decrease in lake volume during the summer of 2022 was slightly smaller than in previous years, decreasing by about 34% from the maximum volume observed in May of 267 ac-ft. In 2023 and 2024, lake volume did not reach "full pool" of 220 ac-ft according to the available data. In 2023, the earliest the lake level was observed was in May so the lake could have been higher earlier during the spring. Nevertheless, lake volume during the summer of 2023 decreased by 45%. In 2024, maximum lake volume occurred in March at 206 ac-ft and decreased by 44% over the summer (Figure 11). Lake volume in May 2024 was quite a bit less than lake volume in May 2023; 189 ac-ft vs. 211 ac-ft. Based on the lake level data and estimated lake volumes from 2020 through 2024, an overall trend in decreasing lake volume is apparent.

Major changes in lake volume significantly impact water quality. When lake volume decreases, nutrients, metals, salts, and other pollutants become more concentrated as there is less water to dilute them. Lower water levels and volume can also lead to increased sediment resuspension which causes turbidity, increased nutrient concentrations, and general disruption to the water column. Increased sediment resuspension can affect light penetration and in turn aquatic plant growth. Aquatic plant growth is also negatively impacted by fluctuating water levels and the resulting unstable littoral environment. Dramatic fluctuations in water level as observed in Waughop Lake can disrupt aquatic habitats and the littoral zone, affecting the distribution and abundance of plant and animal species.





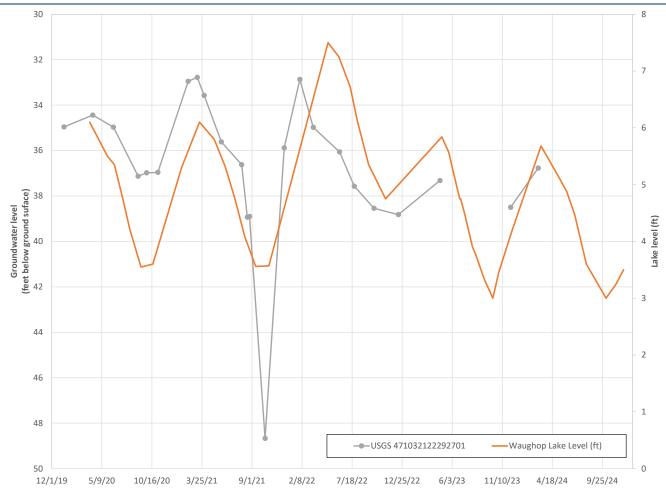


Figure 10. Water level in Waughop Lake and local groundwater level in 2020 – 2024.

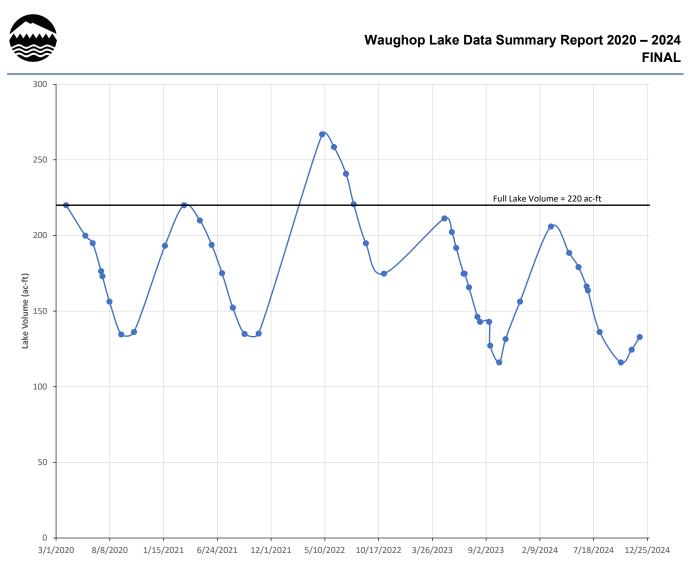


Figure 11. Estimated Waughop Lake volume in 2020 through 2024.

6.2 WATER TEMPERATURE, DISSOLVED OXYGEN, CONDUCTIVITY, AND PH

Tetra Tech collected profiles of water temperature, DO, conductivity, and pH. Measurements were recorded at 0.5-meter intervals at each station during their monitoring events in 2020, 2021, 2023, and 2024. In 2020 and January/March 2021, profiles started at the surface and ended 0.5 m above the bottom. In 2023 and 2024 profile measurements started at 0.5 m below the water surface and ending at 0.5 m above the bottom. Profile depths ranged from 1.45 to 2.5 meters deep at the mid-lake station depending on water level conditions. Due to the similarity in data across stations, profiles at the mid-lake station are considered representative of conditions at Waughop Lake and are discussed in detail below.

6.2.1 Water Temperature

Water temperatures at Waughop Lake in 2020 ranged from 9°C to 25.6°C at the mid-lake station. The warmest temperatures were observed in July while the coldest temperatures were observed in March. During the summer months (June through September), temperatures ranged from 20.1°C to 25.6°C. Temperature did not vary significantly throughout the water column, as Waughop Lake is a shallow lake that mixes frequently throughout the year (Figure 12). Water temperatures at the mid-lake station were colder in January 2021 (average 6.9°C)





throughout the water column) than observed in March-October 2020. Temperatures in March 2021 were similar to those measured in March 2020, with average water temperature throughout the water column of 9.7°C versus 10.0°C, which was the average in March 2020. There was no stratification observed within the lake during the monitoring events in 2020 and 2021.

Water temperatures in May through December 2023 ranged from 7.2°C to 25.7°C at the mid-lake station. A similar range to temperatures observed in 2020. The warmest temperatures in 2023 were observed in August while the coldest temperatures were observed in December (Figure 13). During the summer months (June through September), temperatures ranged from 20.3°C to 25.7°C.

Water temperature at the mid-lake station in March 2024 averaged 7.6°C, which was colder than the average water column temperatures measured in March 2020 (10.0°C) and March 2021 (9.7°C). June 2024 water temperatures were also slightly cooler than temperatures in June 2023 (Figure 13). The average water column temperature in June 2024 was 21.4°C compared to 22.3°C in 2023. Water temperatures June 2020 however were cooler than both 2023 and 2024 with a water column average of 20.5°C.

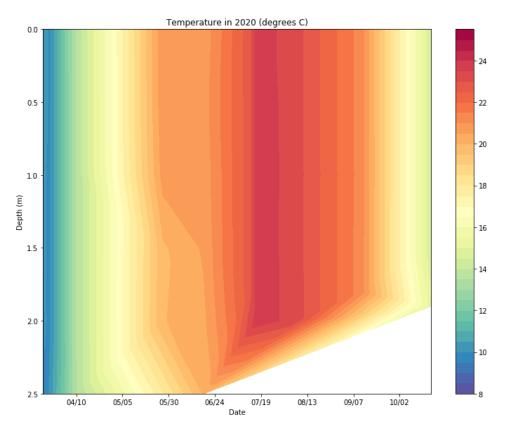
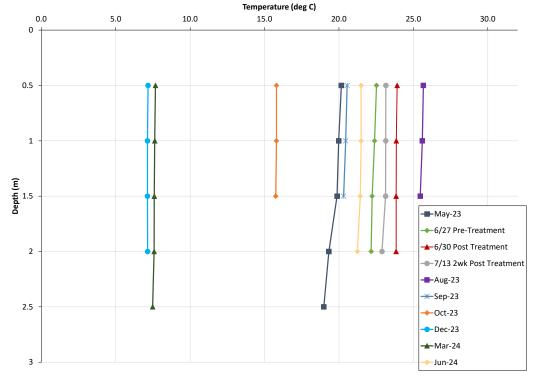


Figure 12. Water temperatures at Waughop Lake in 2020.







6.2.2 Dissolved Oxygen

Dissolved oxygen concentrations in 2020 and January/March 2021 ranged from 1.1 (near the bottom sediment) to 14 mg/L at the mid-lake station. Minimum DO occurred near the bottom of each profile, when the Hydrolab multiparameter sonde was near the lake bottom. Excluding the bottom measurements, DO ranged from 7.4 to 14 mg/L, with an average of 10.7 mg/L, and did not vary significantly throughout the water column. The highest DO concentrations were observed prior to the first alum treatment in March and corresponded to maximum chlorophyll concentrations and high productivity. A decrease in DO was observed following each alum treatment. Higher DO concentrations in March and October 2020 are likely due to colder water temperatures, which increases the DO saturation level. DO concentrations in Waughop Lake during 2020 and January/March 2021 are shown in Figure 14.

Dissolved oxygen concentrations measured in 2023 and March/June 2024 ranged from 7.8 (0.5 m from the bottom) to 13.3 mg/L at the mid-lake station. Field crews did not collect DO concentrations near or within the sediment at the lake bottom in order to protect the monitoring equipment and calibration. Dissolved oxygen averaged 10.1 mg/L and did not vary significantly throughout the water column in 2023 (Figure 15). The highest DO concentrations were observed in December 2023 and March 2024 and corresponded to maximum chlorophyll concentrations and high productivity. Higher DO concentrations in December and March could also be due to colder water temperatures, which increases the DO saturation level. A decrease in DO was observed immediately following the June 2023 alum treatment but rebounded back to pre-treatment concentrations within 2 weeks post treatment.



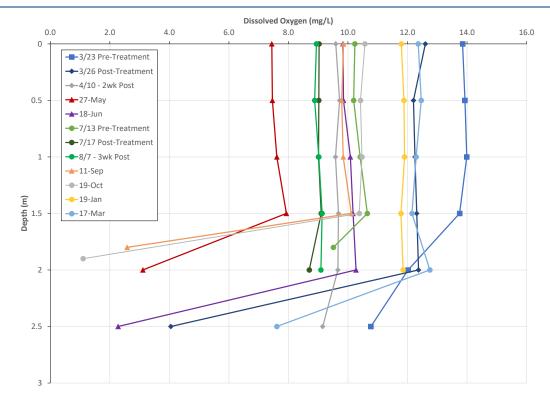
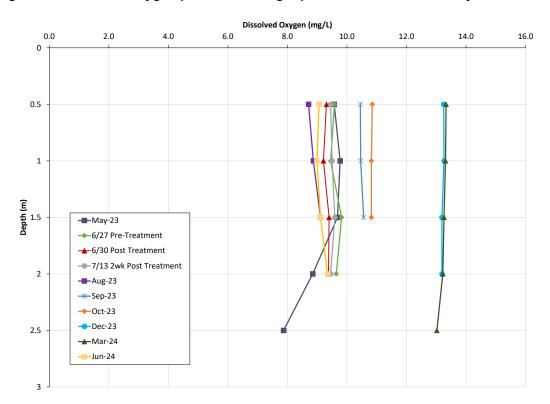
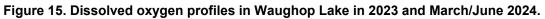


Figure 14. Dissolved oxygen profiles in Waughop Lake in 2020 and January/March 2021.







6.2.3 pH

In 2020, pH varied throughout the water column and was generally higher at the surface and lower at deeper locations. At the mid-lake station, pH ranged from 6.7 to 9.2 across all 2020 monitoring dates and January/March 2021 (Figure 16). The highest pH values were observed prior to the July alum treatment and near the surface in January 2021. There was a decrease in pH following both the March and July 2020 alum treatments, however pH values never fell below 7.0 following treatment. The higher pH values in July and January were most likely influenced by photosynthesis.

In 2023, pH also varied slightly throughout the water column and was generally higher at the surface and lower at deeper locations. At the mid-lake station, pH ranged from 7.2 to 8.8 across all 2023 and March/June 2024 monitoring dates (Figure 17). The highest pH values were observed in March 2024 and were similar to pH values measured in October 2023. The high pH values in March 2024 were likely influenced by photosynthesis as chlorophyll concentrations were at their highest measured concentration. A decrease in pH throughout the water column was observed following the June 2023 alum treatment.

pH in the lake was also monitored continuously during the June 2024 alum treatment and for 24 hours post treatment (Figure 18). pH prior to the start of the treatment was high, around 8.5. pH decreased initially after the alum treatment started the morning of June 28th, then stabilized overnight. There was another slight decrease in pH after the start of the treatment the second morning on June 29th, but then pH stabilized at around 7.1 and continued to remain stable for 24 hours following treatment (Figure 18).

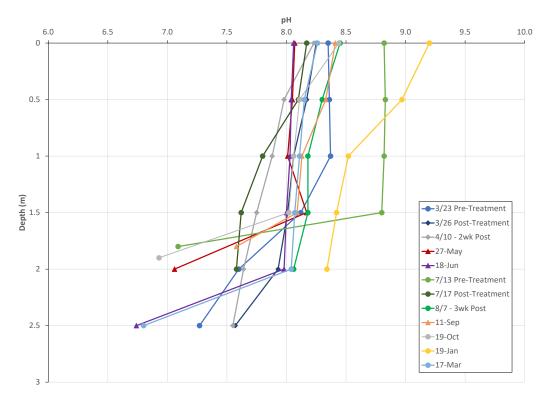


Figure 16. pH profiles in Waughop Lake in 2020 and January/March 2021.



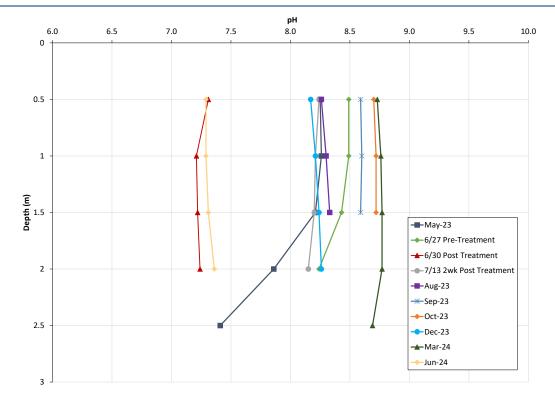


Figure 17. pH profiles in Waughop Lake in 2023 and March/June 2024.

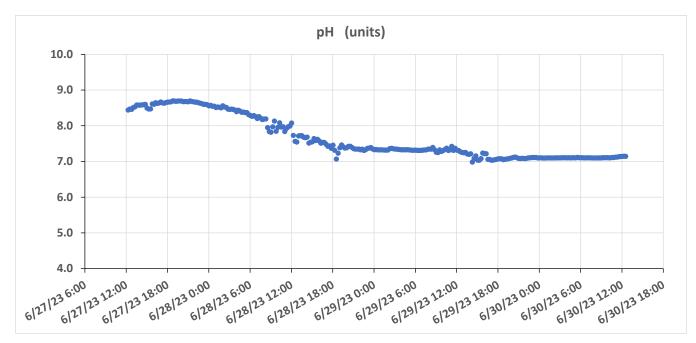


Figure 18. Continuous pH measurements in Waughop Lake during the June 2023 Alum Treatment.



6.2.4 Conductivity

In 2020 and early 2021, specific conductivity was generally uniform throughout the water column, varying only at the bottom of the profile, likely due to interaction with lake-bottom sediments. Specific conductivity varied over the course of the monitoring period and generally increased as a result of alum treatments (Figure 19).

Prior to the first 2020 alum treatment, conductivity in Waughop Lake had an average value of 46 μ S/cm. One day after treatment, the average conductivity had increased to an average of 218 μ S/cm and stayed in that range until the July alum treatment. After the July treatment, the average conductivity increased to an average of 494 μ S/cm and reached a maximum average of 556 μ S/cm in September before decreasing somewhat in October. Conductivity continued to decrease in January and March 2021 with water column averages of 317 and 307 μ S/cm (Figure 19). Freshwater rivers and lakes generally have conductivity values between 50 and 1,500 μ S/cm (Huron River Watershed Council, 2013).

In 2023 and 2024 specific conductivity profiles were uniform throughout the water column. Similar to conditions observed in 2020, specific conductivity varied over the course of the monitoring period and generally increased as a result of the 2023 alum treatment (Figure 20). Prior to the June 2023 alum treatment, conductivity in Waughop Lake had an average value of 153 μ S/cm. This is a substantial decreased from average conductivities measured in January and March 2021. One day after the June 2023 treatment, the average conductivity had increased to an average of 286 μ S/cm, similar to observed conductivities following that 2020 alum treatments. Conductivity remained higher than pre-treatment levels through June 2024, although conductivity measurements in March and June 2024 were lower than those measured in 2023. Maximum conductivity was measured in August 2023 (Figure 20).

An increase in specific conductivity was anticipated as a direct result of the alum treatments. However, the effect was prolonged due to the lack of flushing in Waughop Lake and the lowering of the water level during the summer months. The drastic water level decreases in Waughop Lake have a concentrating effect throughout the summer as lake volume decreases. Water level and lake volume decreases during the summer due to evaporation which leaves behind dissolved minerals, salts, nutrients, etc. in the water column. Therefore, the amount of minerals and salts in the lake become more concentrated within a smaller volume of water leading to higher measurements of specific conductivity. As groundwater flow increases over the winter, a reduction of specific conductivity is expected. This reduction has already been observed in the winters following the alum treatments.





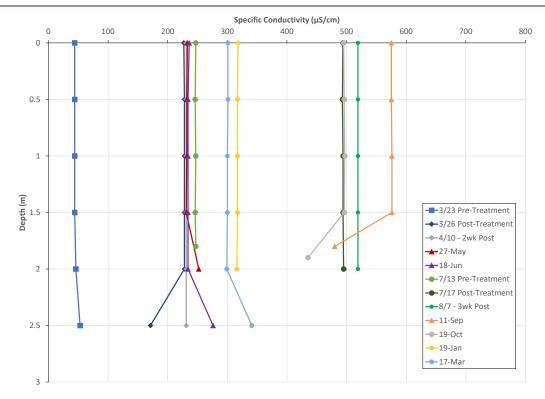


Figure 19. Conductivity profiles in Waughop Lake in 2020 and January/March 2021.

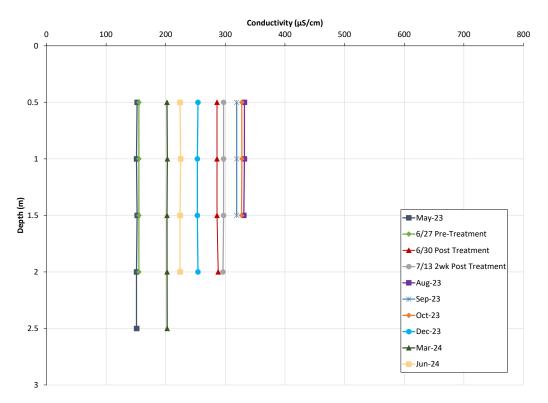


Figure 20. Conductivity profiles in Waughop Lake in 2023 and March/June 2024.



6.3 WATER CLARITY

Water clarity, or transparency, was measured with a Secchi disk during each monitoring event and numerous times during each alum treatment. Prior to the first alum treatment in March 2020, water clarity at Waughop Lake was less than 1 m at the mid-lake station. After the first day of treatment with alum, water clarity had increased to 1.7 m, and after completion of the March alum treatment, water clarity had increased such that the Secchi disk was visible at the bottom of the lake at 2.5 m depth. The high level of clarity was maintained throughout the summer of 2020 and the Secchi disk continued to be visible at the bottom of the lake. All measurements of water clarity from March 25 through October 19, 2020, were recorded at the bottom of the lake, varying between 1.45 to 2.5 m depending on location and date. Water clarity at Waughop Lake in 2020 is shown in Figure 21. The apparent decreasing trend from July to October 2020 is a representation of the decreasing lake level and does not represent a decline in water clarity. Higher levels of water clarity corresponded with lower observed chlorophyll concentrations and a reduction in algal production due to the alum treatments.

The increase in water clarity was persistent throughout 2020 and early 2021 (Figure 21). In March 2021, the Secchi disk was not visible all the way to the lake bottom for the first time since the March 2020 alum treatment. The slight decrease in water clarity observed in March 2021 is likely due to the seasonal winds and storm events resulting in some sediment mixing and resuspension, as well as spring algal activity. The lake bottom sediments are known to be very loose and observed to be easily resuspended in the water column.

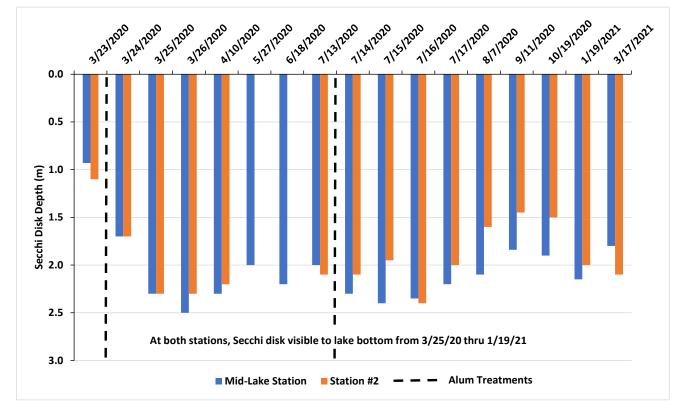


Figure 21. Secchi disk depth (water transparency) in Waughop Lake during 2020 and January/March 2021.

Water clarity in Waughop Lake during the summers of 2021 and 2022 was substantially less than in 2020 (Figure 22). May – October average Secchi disk depth was 1.2 m in 2021 and 0.92 m in 2022, compared to an average of



2.1 m in 2020. Chlorophyll concentrations were still significantly reduced from pre-treatment conditions in 2021 but increased during the summer of 2022 which most likely influenced water transparency.

Water clarity was less than 1 m deep at the mid-lake station prior to the June 2023 alum treatment (Figure 23). As was the case in 2020, after the first day of treatment with alum, water clarity had increased significantly to 2.2 m, and after completion of the treatment, water clarity had increased such that the Secchi disk was visible at the bottom of the lake (Figure 23). The high level of clarity was maintained throughout most of the summer of 2023 and the Secchi disk continued to be visible at the bottom or near the bottom of the lake through September. Average May to October Secchi disk depth for 2023 was 1.6 m. Water clarity decreased substantially in October and December 2023, with corresponding high concentrations of chlorophyll, back to less than 1 m. Water clarity remained low in March and May 2024 before increasing in early June (Figure 23). May to October average Secchi disk depth in 2024 was low compared to previously years at just 0.81 m.

There is a strong relationship between water clarity and chlorophyll concentrations and algal production in Waughop Lake. The photic zone in lakes, the zone where there is enough light for algal production, is typically around three times the Secchi disk depth. At times throughout the summer season, due to the shallowness of the lake, the majority of the water column in is in the photic zone. Higher levels of water clarity in Waughop Lake corresponded with lower observed chlorophyll concentration and a reduction in algal production following all three alum treatments. There is also a relationship between water clarity and lake water levels. In all years, there is a decrease in water clarity in the fall which is typically when the lake experiences its lowest water levels. Decreased water clarity in October 2023 corresponded with the lowest lake levels recorded and sediment resuspension, given the very shallow water depths, could have contributed to decreased clarity.

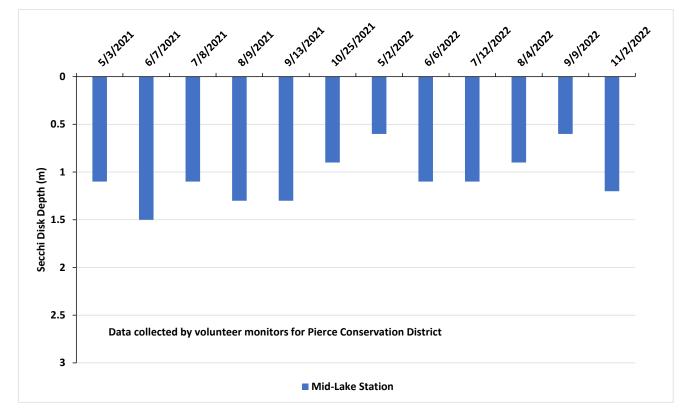
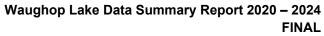


Figure 22. Secchi disk depth (water transparency) in Waughop Lake during 2021 and 2022.



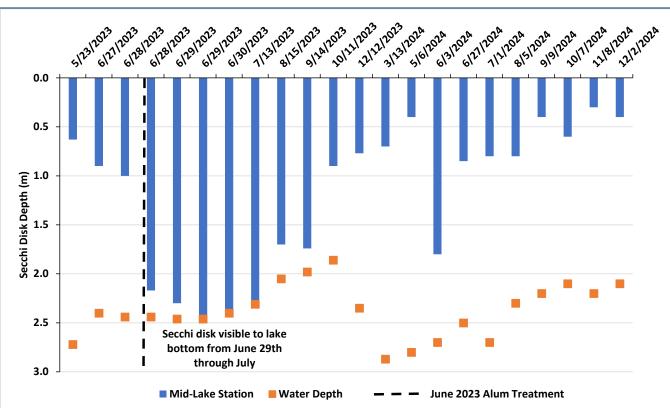


Figure 23. Secchi disk depth (water transparency) in Waughop Lake during 2023 and 2024.

6.4 TOTAL AND SOLUBLE PHOSPHORUS

6.4.1 Total Phosphorus

Prior to the March 2020 alum treatment, the average total phosphorus (TP) concentration in Waughop Lake was 89 μ g/L. Total phosphorus concentrations at the mid-lake station prior to treatment were 85 and 96 μ g/L at 1 m and 1.5 m depths, respectively (Figure 24). At Station #2, TP concentrations were 90 and 85 μ g/L at 1 m and 1.5 m depths, respectively (Figure 24). Total phosphorus concentrations measured in Waughop Lake prior to the March 2020 alum treatment were similar to concentrations measured in previous year by various other entities. Total phosphorus concentrations in Waughop Lake during October 2014 through October 2015 ranged from 34 to 170 μ g/L (Brown and Caldwell, 2017). According to the Waughop Lake Management Plan, TP concentrations during the 2014-2015 study were similar to concentrations measured by LaFontaine in 2007 which were as high as 85 μ g/L (LaFontaine, 2012). Samples collected by PCD between 2011 and 2014 had an average TP of 61 μ g/L with a maximum of 130 μ g/L (Brown and Caldwell, 2017). Summer average TP concentrations above 30 μ g/L are considered indicative of eutrophic, or overly productive, conditions (Welch and Jacoby, 2004; Nürnberg, 1996). To limit the risk of cyanobacteria dominance and potential presence of cyanotoxins in a waterbody, lake TP concentrations should remain below 30 μ g/L (Downing et al., 2001).

Immediately after the March 2020 alum treatment, water column TP was reduced by 75 to 82% to an average of 13 μ g/L (Figure 24). A gradual increase in TP was observed from April to July corresponding to warmer weather and increasing lake productivity. In July, one day before beginning the second alum treatment, the average lake TP was 29.4 μ g/L, which was the highest average TP recorded in 2020, but still only one third of the pre-treatment





TP concentrations. Total phosphorus immediately decreased following the July alum treatment to 5 ug/L, and two weeks after treatment, TP was 11.4 ug/L. The general trend of increasing TP throughout the summer— decreasing only due to alum treatments—is consistent with seasonal productivity and the lowering of water level in the lake which had a concentrating effect due to lower lake volumes. However, despite these effects, water column TP concentrations remained in the target range of less than 35 µg/L for the duration of the post-treatment monitoring in 2020.

Total phosphorus concentrations in January and March 2021 were consistent with post-treatment levels observed in 2020. Starting in May 2021, TP concentrations increased and fluctuated between 26 and 44 μ g/L throughout the summer of 2021 with an average TP over the summer of 35 μ g/L (Figure 24). Total phosphorus concentrations in May – October 2022 were higher than those observed in 2021 and ranged from 30 μ g/L to 290 μ g/L (Figure 24). The very high TP concentration of 290 μ g/L on July 12th, 2022, is suspected to be an outlier, however a similar spike in TP was also observed in June 2024 and was attributed to wind driven sediment resuspension during an incredibly windy day. So, the spike observed in July 2022 could have also been due to low water levels and subsequent wind sediment resuspension. Regardless, there was a general trend of increasing water column TP concentrations in the lake between 2021 and 2022, with the majority of samples having TP concentrations above the target range of less than 35 μ g/L.

In May and June 2023, prior to the 2023 alum treatment, the average TP concentration in Waughop Lake was 42 μ g/L (Figure 24). Similar to conditions in 2020, immediately after the June 2023 alum treatment, water column TP was reduced by 79% to 9 μ g/L. A gradual increase in TP concentration was observed from July to October 2023 corresponding to warmer weather and the lowering of water level in the lake which had a concentrating effect on TP due to lower lake volumes. Despite the extreme low water levels and decreased lake volume, water column TP concentrations remained in the target range of less than 35 μ g/L for most of the summer and early fall 2023. Although TP had increased to around 40 μ g/L in October and December 2023, concentrations during the growing period in 2023 (July through September) were lower than in 2022 and much lower than TP observed in March 2020 prior to any alum treatments.

Total phosphorus concentrations increased in May 2024, up to around 50 μ g/L, and remained elevated throughout the summer season and into the fall and early winter (Figure 24). Total phosphorus concentrations in November and December 2024 were similar to those measured in May, 52 and 51 μ g/L, respectively. As mentioned earlier, there was a spike in TP concentration measured on June 27th, 2024 which was thought to be the result of low water levels and wind driven sediment resuspension, especially given that the TP concentrations measured on June 3rd and July 1st, just a few days after the 27th, were 37 and 41 μ g/L, respectively. The source of phosphorus contributing to increasing TP concentrations in the lake is unknown. Most likely the major phosphorus loading source is from groundwater, but it could also be from localized runoff and stormwater inputs. During the summer months however groundwater inputs are assumed to be negligible and increases in TP concentration are due to either a concentrating effect of lower lake volume or internal loading from the sediments. If internal loading was occurring during the summer, there would be a corresponding increase in the total mass of phosphorus in the lake and not just an increase in concentration. An increase in TP concentration can be observed simply because the amount of water in the lake is less (concentration is mass divided by water volume - μ g of phosphorus / volume of water).

To help further evaluate phosphorus in Waughop Lake, even with decreasing water levels during the summer, which had a concentrating effect on TP concentration, the mass of TP in the whole lake was calculated for each sampling event using estimated lake volumes and TP concentrations. To calculate TP mass, the concentration of TP on each sampling day was multiplied by the estimated lake volume for that day and then converted to kilograms (kg). Figure 25 shows the mass of TP in Waughop Lake for sampling events that had water level recorded to estimate lake volume. Total phosphorus mass was not calculated for the sampling event in July 2022 that had a very high TP concentration as it is believed to be an outlier. Total phosphorus mass in Waughop Lake



decreased dramatically, as expected, following the first alum treatment in March 2020 as well as the alum treatment in July 2020. The mass of TP in the lake remained low through most of 2021 then increased to above 10 kg during 2022 and 2023. Following the June 2023 alum treatment, TP mass in the lake was dramatically reduced and remained at 5 kg or below until October 2023. From October 2023 through May 2024 there was a small increasing trend in TP mass in the lake. This was most likely due to increasing inflows and external or groundwater loading of phosphorus into the lake.

During the summer of 2024, TP mass was stable and generally below 10 kg with the exception of the one high TP concentration measured in June on the windy day (Figure 25). The high TP concentrations in June was mostly likely due to sediment resuspension into the water column due to wind and the shallowness of the lake. The stability and slightly decreasing trend of the mass of TP in the lake over the summer of 2024 shows that lowering water levels and decreased lake volume did have a concentrating effect on TP concentration as TP concentrations increased over the summer period, but TP mass did not (Figures 24 and 25). In October 2024, there was a slight decrease in TP mass, possibly due to settling, before TP mass increased slightly in November and December 2024. Lake level also increased slightly in November and December 2024, the TP mass in the lake was around 8.4 kg which is much lower than the TP mass in the lake in March 2020 (23 kg) prior to any alum treatment (Figure 25).

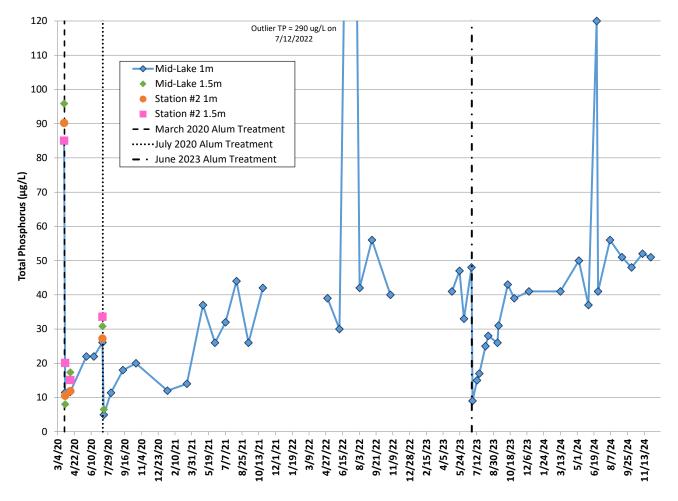


Figure 24. Total phosphorus concentrations in Waughop Lake in 2020 -2024.



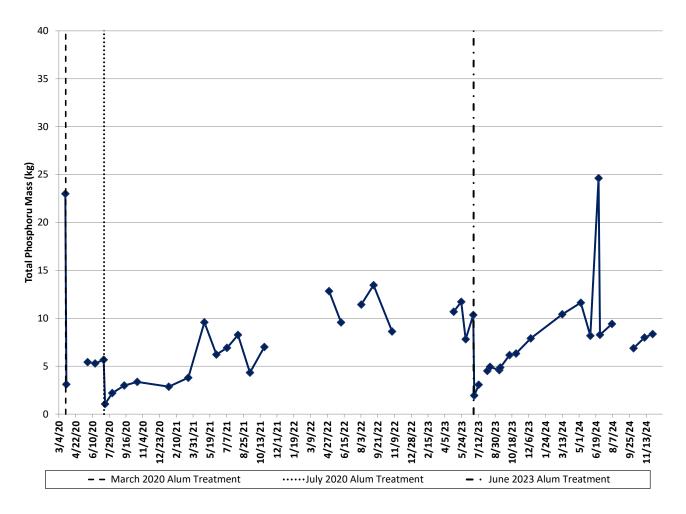


Figure 25. Total phosphorus mass in Waughop Lake 2020 - 2024.

6.4.2 Soluble Phosphorus

Soluble Reactive Phosphorus (SRP) was relatively low prior to the March 2020 alum treatment, ranging from 3 to 5 μ g/L. Most likely SRP concentrations were low due to algal uptake and algal productivity as this is the fraction that is most available for algal uptake. Nevertheless, a significant reduction in SRP to below the detection limit of 1 μ g/L was observed after the March 2020 treatment and SRP concentrations were consistently less than 1 μ g/L throughout the summer and fall of 2020. Samples were not collected for SRP analysis in January and March 2021 however SRP concentrations measured in samples collected May – October 2021 and 2022, were consistently at or below the detection limit of 1 μ g/L. On occasion during those two summers, SRP concentrations measured at just above the detection limit at 2 μ g/L.

In 2023, prior to the June alum treatment, SRP concentrations in the lake were still low and ranged from below the detection limit to $2 \mu g/L$. There was not a significant change in SRP concentrations following the treatment and concentrations during the rest of the summer in 2023 ranged from below the detection limit to $3 \mu g/L$.

Soluble phosphorus concentrations in 2024 were slightly higher than those in 2023, ranging from below the detection limit to a maximum of 7 µg/L measured in May 2024. During the summer (June – September) of 2024,



SRP was below the detection limit or just slightly higher at 2 μ g/L. In October 2024, SRP increased to 5 μ g/L, before decreasing again to below or near the detection limit in November and December 2024.

6.5 CHLOROPHYLL-A

Prior to the March 2020 alum treatment, the average chlorophyll concentration in Waughop Lake was 52 μ g/L (Figure 26). There was some slight variability in chlorophyll concentrations in the lake prior to treatment with concentrations ranging from 45 μ g/L at 1 m depth at Station #2 to 81 μ g/L at 1.5 m depth at the mid-lake station. Immediately after the March alum treatment, the chlorophyll concentration was dramatically reduced to an average of 1 μ g/L. This reduction in chlorophyll in the water column reflects the physical removal of algae from the water column as a result of the alum treatment and represents a shift from a highly productive hypereutrophic state to a borderline oligotrophic-mesotrophic state (Welch & Jacoby, 2004). A slight increase in chlorophyll was observed from April to July corresponding to increasing lake productivity, but concentrations were still less than 10 percent of the concentrations in March prior to the first treatment and were mostly less than 5 μ g/L. After the July 2020 alum treatment, chlorophyll concentrations were consistently low, ranging from 0.4 to 4.5 ug/L throughout October 2020 even with the concentrating effect of the lowering water level in the lake. These chlorophyll concentrations indicate the lake remained in a borderline oligotrophic-mesotrophic state in 2020.

There was a slight increase in chlorophyll observed from October 2020 to March 2021, from 2.5 to around 5.5 μ g/L (Figure 26). Chlorophyll concentrations during the summer of 2021 remained below the eutrophic boundary of 9.0 μ g/L and reflected more of a mesotrophic, or well-balanced system. However, there was a large increase in chlorophyll in October 2021 when concentrations peaked at 33 μ g/L. Chlorophyll concentrations were also elevated in the lake at the start of the growing season in May 2022 and were generally higher in 2022 than in 2021. During June - October 2022, chlorophyll concentrations fluctuated over the season and ranged from 5.9 to 22 μ g/L (Figure 26). On July 25th and August 15th, 2022, samples were collected from Waughop Lake and analyzed for cyanotoxins by King County Environmental Laboratory due to the presence of a noticeable bloom. The sample from July 25th had a detection for microcystin (0.225 μ g/L) but well below the state recreational guideline of 8 μ g/L. The sample collected on August 15th also had a small detection of microcystin (0.190 μ g/L) which was well below the state guideline. Anatoxin-a was not detected in either sample collected in 2022.

Spring chlorophyll concentrations in 2023 were similar to those measured in 2022. The average chlorophyll concentration in Waughop Lake in May and June 2023, prior to the alum treatment, was 12.5 µg/L (Figure 26). Immediately after the June alum treatment, the chlorophyll concentration was dramatically reduced to 0.7 µg/L. As was the case in 2020, this reduction in chlorophyll in the water column reflected the physical removal of algae from the water column as a result of the alum treatment. Chlorophyll concentrations remained low, averaging 5.4 µg/L for the remainder of the summer, July through September 2023 (Figure 26). These chlorophyll concentrations indicate the lake remained in a mesotrophic state (moderately productive) through the summer. There was an increase in chlorophyll in October 2023, which may have been the result of the concentrating effect of lowering water level of the lake, but chlorophyll was also high in December, when water level had started to increase. Precipitation and groundwater recharge also increased in December was 54 µg/L, which was very high compared to concentrations measured since the 2020 alum treatment. The lake was green in color in December 2023, but field crews did not observe a scum or any indication that the algae present was cyanobacteria. The algae observed in December 2023 appeared to be green algae.

Chlorophyll concentrations remained elevated in 2024 with a maximum concentration of 67 μ g/L observed in March 2024 (Figure 26). This concentration is similar to concentrations observed prior to the 2020 alum treatments. Following the peak in March, chlorophyll concentrations during May through October 2024 averaged 20 μ g/L. The chlorophyll concentration increased in November 2024 to just under 50 μ g/L, which is consistent with the low water clarity (Secchi disk depth of only 0.3 m). In December 2024, the reported chlorophyll





concentration was 109 μ g/L, which is considered to be an outlier and suspect data point. The very high chlorophyll concentration is inconsistent with the measured TP concentration in December of 51 μ g/L and results in a chlorophyll to TP ratio of 2.1 to 1. Typical chlorophyll to TP ratios range from 0.3 to 0.6 and can reach as high as 1 to 1.5 in hypereutrophic waterbodies. The sample collected in December by PCD volunteer monitors may have accidentally contained a large portion of algal scum or algal mat that could have artificially inflated the chlorophyll concentration. The December chlorophyll concentration is included in Figure 26 below but not considered to be a valid data point.

In May 2024 there was concern that the lake had a large bloom of a small species of cyanobacteria, either *Synechocystis* or *Gloeothece*. A sample was collected and sent to the King County Environmental Laboratory for cyanotoxin analysis on May 8th, 2024. A sample was also collected in mid-May by City staff and shipped to Dr. Barry Rosen, a phycologist at Florida Gulf Coast University, for algal identification. Neither microcystin nor anatoxin-a was detected in the sample and microscopy conducted by Dr. Rosen revealed that there were no cyanobacteria species present in the lake. Dr. Rosen identified that the dinoflagellate *Parvodinium* was abundant in the lake as well as two species of green algae, *Chlamydomonas* and *Tetraedron*.

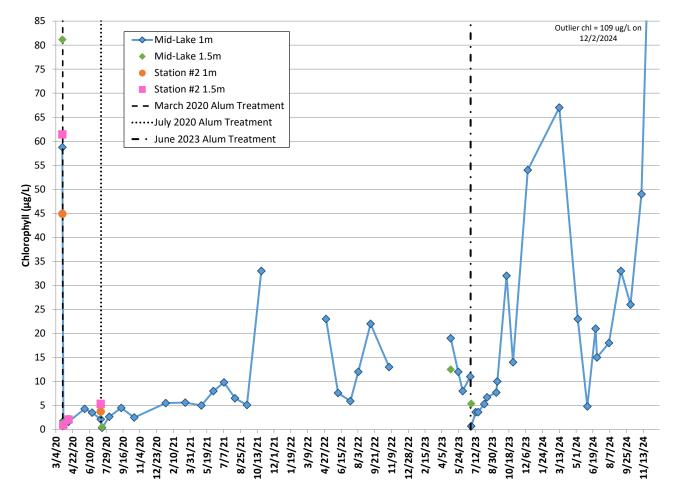


Figure 26. Chlorophyll concentrations in Waughop Lake in 2020 – 2024.

6.6 NITROGEN

The average total nitrogen (TN) concentration in Waughop Lake prior to the March 2020 alum treatment was 1,650 µg/L (Figure 27). Following the March treatment, TN was reduced by 70% from pre-treatment



concentrations due to its tie to organic compounds. There was an immediate, temporary decrease in TN observed following the July 2020 alum treatment but TN concentrations returned to near post March treatment concentrations by early August 2020 and remained relatively steady through the end of monitoring in October 2020 (Figure 27). Nitrate and nitrite concentrations were also reduced following the March treatment, by 25 to 50%. The average nitrate and nitrite concentration in the lake prior to treatment was 48 µg/L. The average nitrate and nitrite concentration in the lake prior to treatment was 48 µg/L.

In January 2021, a temporary increase in TN concentration was observed from the relatively steady posttreatment levels in 2020. However, the January 2021 concentration (1,160 μ g/L) was still lower than the March 2020 pre-treatment TN concentrations. After the temporary increase in TN in January, concentrations decreased to 527 μ g/L, only slightly higher than the post-treatment 2020 concentrations, by March 2021 (Figure 27). The general trend of lower TN concentrations after the 2020 alum treatments is likely a response to the reduction in biogenic production due to phosphorus inactivation.

Total nitrogen concentrations fluctuated with a general increasing trend through the summers of 2021 and 2022. Concentrations ranged from 206 μ g/L in September 2021 to 1,170 μ g/L in June 2023, right before the 2023 alum treatment (Figure 27). Seasonal fluctuations of TN was anticipated based on plant and algal productivity, as well as external nitrogen loading from groundwater and direct precipitation.

After the 2023 alum treatment, TN was reduced by 46% from a pre-treatment average concentration of 1,060 μ g/L to an immediate post-treatment average concentration of 545 μ g/L (Figure 27). Total nitrogen concentrations remained reduced through July 2023 then started to increase to near pre-treatment concentrations in August. In December 2023, TN had returned to pre-treatment levels at 1,040 μ g/L. Total nitrogen remained high and generally increased through 2024 (Figure 27). Nitrate and nitrite concentrations were at or near detection limits (10 μ g/L) prior to the 2023 treatment and remained stable throughout the monitoring period with the exception of a slight increase to 17-19 μ g/L, measured the day after treatment.

Alum does not specifically target nitrogen species in the water column or sediment. The reductions in nitrogen following each alum treatment was due to its tie with organic compounds in the water column which are physically removed with the alum floc. It is not uncommon to see a temporary reduction in nitrogen following an alum treatment followed by a rebound back to pre-treatment concentrations.



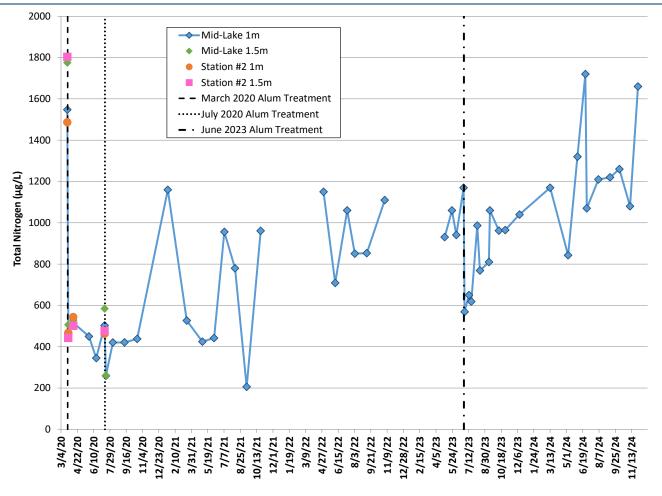


Figure 27. Total nitrogen concentrations in Waughop Lake in 2020 – 2024.

6.7 ALKALINITY

Lake alkalinity (as calcium carbonate) was significantly reduced following each alum treatment, which is expected following an alum treatment given that alum is an acidic compound. Alkalinity decreased by 50 percent to a low of 10 mg CaCO₃/L following the March 2020 alum treatment and then gradually increased to pre-treatment levels of 20 mg CaCO₃/L by July. A reduction in alkalinity was again observed following the alum treatment in July 2020, but a return to pre-treatment levels was achieved by October (Figure 28). The lowest alkalinity recorded in 2020 was 6.3 mg CaCO₃/L in September, reflecting the slower rebound following the July alum treatment. The observed reduction and slower rebound of alkalinity following each 2020 alum treatment is a direct result of the low build-up of alkalinity that normally occurs in lakes due to surface runoff and stream inflow. Given the lack of surface water input of calcium and carbonate, the only source to Waughop Lake is from atmospheric fallout which is very low in the Puget Sound region. Hence with the hydration of Al there is a reduction in reserve carbonate to help the alkalinity rebound like in other lakes.

January 2021 samples were not analyzed for alkalinity, but the March 2021 concentration of 15 mg CaCO₃/L indicated only a slight decrease in lake alkalinity when compared to the October 2020 concentration and pre-



treatment concentration in March 2020 (Figure 28). The slight decrease is likely tied to the dramatic increase of water level in the lake over the winter season which had a diluting effect due to higher lake volumes.

Over the course of 2021 and 2022, lake alkalinity steadily increased (Figure 28). Towards the end of 2021 and during 2022, alkalinity in the lake increased dramatically from pre-treatment concentrations in 2020 of around 20 mg CaCO₃/L. Maximum alkalinity in 2022 and 2023 prior to the June 2023 alum treatment was 58.2 mg CaCO₃/L. It is unknown what caused the increase in alkalinity at the end of 2021 and during 2022 but it could be the result of higher-than-normal inflows from groundwater and precipitation. Water levels during the end of 2021 and 2022 were also higher than typical indicating increased inflows.

As previously observed with the 2020 treatments, alkalinity was significantly reduced following the June 2023 alum treatment. Alkalinity decreased from a pre-treatment average of around 53 mg CaCO₃/L to an average of around 38 mg CaCO₃/L. Alkalinity in the lake remained stable, at around 30 mg CaCO₃/L for most of the summer and then gradually decreased over the fall and winter of 2023. A sharp increase in lake alkalinity was observed between the beginning of May 2024 to end of June 2024 with the last measured concentration reaching 47.2 mg CaCO₃/L in November 2024 (Figure 28).

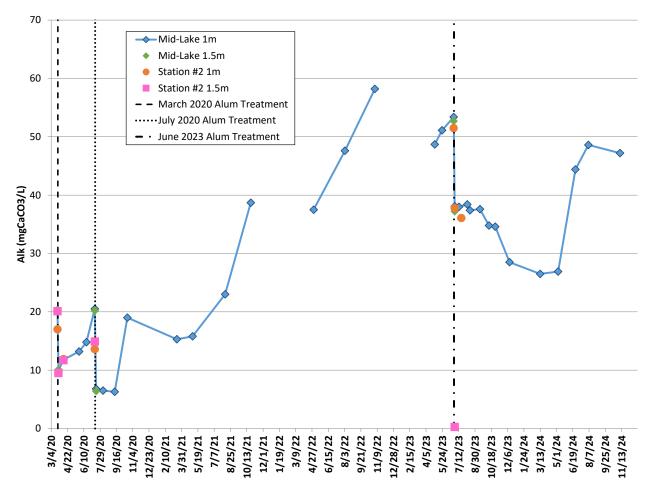


Figure 28. Alkalinity in Waughop Lake in 2020 – 2024.

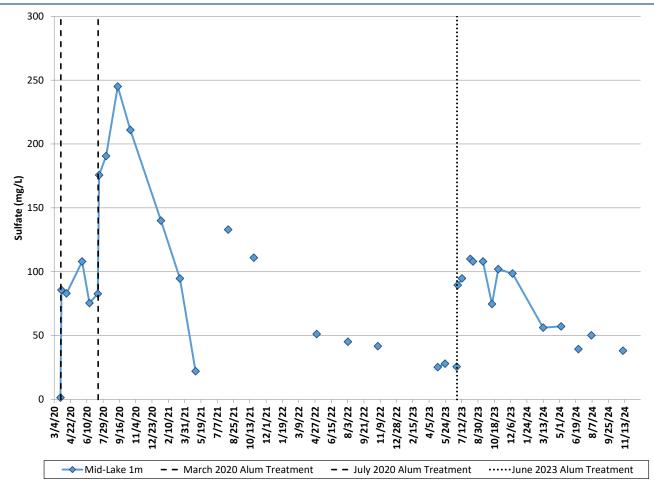


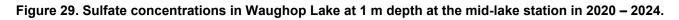
6.8 SULFATE

Sulfate concentrations in Waughop Lake increased following the alum treatments. At a depth of 1 m at the midlake station, sulfate concentrations ranged from a low of 1.5 mg/L before the March treatment to a high of 245 mg/L in September after treatments (Figure 29). Due to the lack of inflow and outflow from the lake, a temporary increase in sulfate was expected. The normal settling of the sulfate following alum treatments was observed to be slower given that there is no outlet and no flushing. In addition, the high levels of sulfate in the sediment contributed to the observed increase as sulfate was likely entering the water column to replace the loss of negative carbonate ions with the reduction in alkalinity. As expected, sulfate again increased after the July 2020 treatment. A decrease in sulfate was observed from September to October 2020 with an increase in fall inflow to the lake.

Sulfate concentrations continued to decrease during the winter season of 2020 as expected with the seasonal increase in groundwater inflow to the lake. In May 2021 the concentration of sulfate in the lake at 1 m depth was 22.1 mg/L, still higher than the pre-treatment concentrations in March 2020, but significantly lower than the high concentration of 245 mg/L measured in September 2020 (Figure 29). Sulfate was only analyzed for a handful of samples collected over the summers of 2021 and 2022. There was an unexplained dramatic increase in sulfate concentration between May 2021 and August 2021 when the sulfate concentration in the lake at 1 m depth reached 133 mg/L. Following that increase sulfate concentrations in the lake declined steadily to a low of around 26 mg/L immediately prior to the June 2023 alum treatment (Figure 29). Following the 2023 alum treatment, sulfate increased, as expected, to around 92 mg/L. Sulfate was expected as groundwater flow increased over the winter. Sulfate concentrations did decrease from December 2023 to March 2024 and remained around 50 mg/L throughout 2024 (Figure 29). In December 2024 the concentration of sulfate had decreased to 38.2 mg/L (Figure 29).







6.9 TOTAL SULFIDES

Prior to the June 2023 alum treatment, Ecology required that the City collect samples as part of their permit monitoring in Waughop Lake for analysis of total sulfides. Samples were collected by Tetra Tech for total sulfides analysis beginning the day before treatment, on June 27th, 2023. Samples were collected at a depth of 1 m and at a depth of 0.5 m off the bottom, if water depths allowed. Samples were analyzed by Fremont Analytical using method SM 4500-S2-D which quantifies total sulfides in the water including dissolved hydrogen sulfide, hydrosulfide, and metallic sulfides (which are common in suspended particulates). Table 2 summarizes total sulfides results from samples collected at Waughop Lake before and after the June alum treatment.

Total sulfides concentrations were 1.6 and 2.8 mg/L in surface and bottom samples respectively, prior to the June 2023 alum treatment. Following the treatment, surface total sulfides concentrations increased but bottom concentrations decreased (Table 2). Two weeks post treatment, the surface total sulfides concentration had decreased substantially while the bottom concentration increased back to near pre-treatment levels. Starting in August, two months post-treatment, total sulfides in Waughop Lake decreased even further to concentrations near or at the detection limit or below the reporting limit. Concentrations in red italicized font in Table 2 indicate samples that were reported below the detection limit and the concentration in the table is the detection limit for that sample. Total sulfides concentrations in the lake remained low through November 2024 (the last date samples were collected and analyzed for total sulfides) and were just above the detection limit (Table 2).





Data	Time Devied	Total Su	ılfides (mg/L)
Date	Time Period	1 m	0.5 m off bottom
6/27/2023	Day before Treatment	1.6	2.8
6/30/2023	Day after Treatment	4	1.2
7/13/2023	2 Weeks Post Treatment	0.8	2.4
8/15/2023	Two Months After	0.6	0.128 (ND)
9/14/2023	Three Months After	0.0138 (ND)	0.0139 (J)
10/11/2023	Four Months After	0.0138 (ND)	
12/12/2023	Six Months After	0.0336 (J)	0.0383 (J)
3/13/2024	Nine Months After	0.0232 (J)	0.107
5/6/2024	PCD May Event	0.0500 (ND)	0.0500 (ND)
6/27/2024	Twelve Months After	0.0508	0.117
8/5/2024	PCD August Event	0.0500 (ND)	0.0500 (ND)
11/8/2024	PCD November Event	0.052	0.052

 Table 2. Waughop Lake Total Sulfides Concentrations, 2023 and 2024.

6.10 ALUMINUM

Following the March 2020 alum treatment, both Total Aluminum (TA) and dissolved aluminum (DA) increased due to the aluminum addition but did not reach exceedingly high levels. Surprisingly, the highest levels of TA and DA were observed one day before the July alum treatment (Figure 30; Table 3). The high aluminum concentrations were not anticipated and did not correspond to dramatic changes in measurements of pH and DO, which were all considered normal. Therefore, the high aluminum concentrations in July were likely a result of interactions between aluminum and organic compounds in the lake. Under the somewhat alkaline conditions at Waughop Lake (average pH above 8.0), the solubility of aluminum is enhanced, and may form complexes with dissolved organic carbon (DOC). The complexing of aluminum and DOC has been observed in other lakes (Long Lake, Kitsap County; Cooke et al. 2005) because of humic substances in the water column and is a likely cause of high aluminum concentrations were also impacted by the lowering of water level in the lake which has a concentrating effect due to lower lake volumes.

A decrease in both TA and DA was observed following the July 2020 alum treatment. Despite the high levels in early July, DA quickly returned to similar levels observed in pre-treatment conditions. Total aluminum fluctuated through the late summer 2020 with a general decreasing trend. A similar effect was observed when DA decreased following an alum treatment in Long Lake, Kitsap County and the decrease was thought to have been the result of natural levels of aluminum complexed with humic materials by the alum floc in the relatively browwater lake (Cooke et al. 2005).

Following the high concentration of both TA and DA in July 2020, Tetra Tech reached out to the contract laboratory, IEH Analytical, to see if samples could be analyzed for DOC and total organic carbon (TOC). Unfortunately, the July and August samples had already been disposed of, however, DOC and TOC were both analyzed in September and DOC in October. DOC and TOC concentrations in September were essentially the same, 4.18 and 4.22 mg/L, respectively, indicating that all of the organic carbon in the lake is in the dissolved fraction.



In early 2021, the decreasing trend in TA concentration observed in the fall of 2020 continued, and pre-treatment equilibrium concentrations were achieved (Figure 30; Table 3). In March 2020, prior to alum treatments, TA was $62 \mu g/L$, while in January and March of 2021 measured TA concentrations were $54 \mu g/L$ and 69 ug/L, respectively. Samples collected by PCD were analyzed for TA three times per year in 2021 and 2022; May, August, and either October or November. Total aluminum concentrations in the lake increased from March 2021 to May 2021 and remained elevated through the end of the monitoring period in 2022 (Figure 30; Table 3). It is unknown what caused the sudden increase in TA concentrations. Unfortunately, there is limited to no corresponding data for DOC and hardness for TA samples in 2020 - 2022, so acute and chronic TA criteria could not be calculated using the EPA calculator.

Monitoring requirements for alum treatments changed prior to the 2023 June treatment and samples for analysis of TA, DOC and hardness were required to be collected by Ecology. Immediately following the June alum treatment (1 hour after treatment completion), TA increased due to the aluminum addition and temporarily exceeded the EPA aluminum acute and chronic criterion (Figure 30; Table 3). Total aluminum concentrations from samples collected the day after treatment were substantially lower and below both the acute and chronic EPA criterion concentrations (Table 3). The EPA aluminum criteria were calculated using an EPA published aluminum criteria spreadsheet and are based on concentrations of DOC, hardness, and pH. The EPA aluminum criteria are for total recoverable aluminum.

Total aluminum concentrations remained below the EPA acute and chronic criterion through the rest of 2023 and most of 2024. However, there was a slight increase in TA in July, two-weeks post treatment and again in September, before concentrations decreased to less than pre-treatment concentrations in December (Table 3). Total aluminum concentrations remained stable through May 2024. There was a spike in TA in June 2024 which was confirmed by the laboratory. Total phosphorus concentrations were also very high on the June sampling date and the spike in TP and TA is thought to be caused by wind driven sediment resuspension with the low water levels. The spike in TA in June 2024 was above the EPA chronic criterion but not the acute criterion (Table 3). Total aluminum concentrations were lower in August and November 2024 but still slightly higher than the concentrations measured prior to the spike in June (Figure 30). August and November 2024 TA concentrations were both below the EPA acute and chronic criterion (Table 3).

Dissolved aluminum (DA) was higher than expected in June 2023 prior to the alum treatment. There was an immediate decrease in DA following the treatment (Table 3). A similar effect was observed when DA decreased following the July 2020 alum treatment. Concentrations of DA increased two weeks post treatment and remained at concentrations higher than pre-treatment through August. Samples for DA were not collected after two months post treatment (Table 3). Following the high concentration of DA in July, Tetra Tech reached out to the contract laboratory, IEH Analytical, to see if samples could be re-analyzed for confirmation. IEH Analytical confirmed the DA concentrations from July. DOC concentrations increased steadily back to pre-treatment levels or higher throughout the summer. Samples for total organic carbon (TOC) analysis were not collected in 2023 but based on previous data, all of the organic carbon in Waughop Lake is typically in the dissolved fraction. The increased DA concentrations are most likely due to the complexing of aluminum and DOC in the water column.



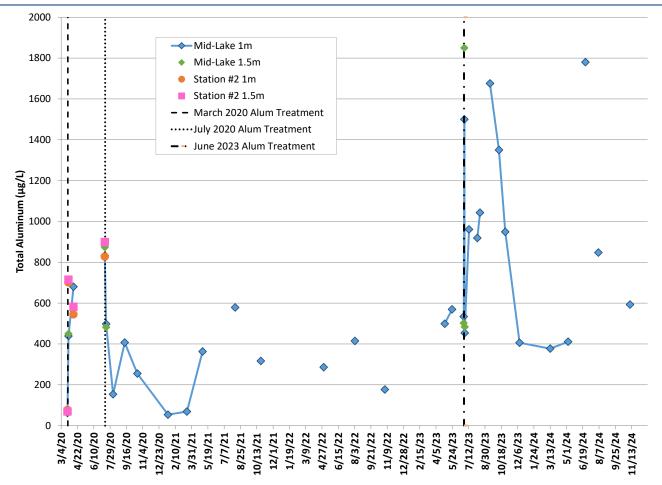


Figure 30. Total aluminum concentrations in Lake Waughop in 2020 – 2024.



Date	Time Period	Depth (m)	Total Aluminum (ug/L)	Dissolved Aluminum (ug/L)	DOC (mg/L)	Hardness (mg CaCO3/L)	рН	Cri Total A	uminum teria luminum g/L)
								Acute	Chronic
3/23/2020	Day Before	1	62	28			8.37		
5/25/2020	Buy Belore	1.5	72	17			8.12		
3/26/2020	Day After	1	439	37			8.06		
5/20/2020	Day Arter	1.5	450	38			8.01		
4/10/2020	.020 2-weeks Post	1	680	14			7.88		
4/10/2020	Z-WEEKS POST	1.5	584	17			7.75		
7/12/2020	Day Bafara	1	833	763			8.82		
7/13/2020	Day Before	1.5	874	764			8.8		
7/17/2020	Day After	1	498	21			7.8		
	-	1.5	482	19			7.62		
8/7/2020	3-weeks Post	1	154	66			8.18		
9/11/2020	Monthly	1	407	27	4.18		8.13		
10/19/2020	Monthly	1	255	24	4.05		8.06		
1/19/2021	Monthly	1	54	8	4.98		8.52		
3/17/2021	Monthly	1	69	14	3.59		8.11		
5/3/2021	Monthly PCD	1	363				6.9		
8/9/2021	Monthly PCD	1	579				7.9		
10/25/2021	Monthly PCD	1	317				7.25		
5/2/2022	Monthly PCD	1	286				7.5		
8/4/2022	Monthly PCD	1	415				7.5		
11/2/2022	Monthly PCD	1	177				7		
5/1/2023	Monthly PCD	1	499				8.5		
5/23/2023	Month Before	1	569		8.4	23.8	8.25	3900	1600
6/27/2023	Day Before	1	535	408.3	9.43	19.6	8.49	4400	2100

 Table 3. Waughop Lake Aluminum Concentrations, 2020 – 2024.



Date	Time Period	Depth (m)	Total Aluminum (ug/L)	Dissolved Aluminum (ug/L)	DOC (mg/L)	Hardness (mg CaCO3/L)	рН	Cri Total A	uminum teria luminum g/L)
c /o = /o o o o						10.0		Acute	Chronic
6/27/2023	Day Before	1.8	503	428.4	8.98	18.3	8.43	4200	2000
6/29/2023	1 hr Post	1	1500	41.4			6.99	1300*	500*
6/29/2023	1 hr Post	1.8	1850	39.2			6.95	1200*	480*
6/30/2023	Day After	1	454	61.4	5.94	17.9	7.21	1600	590
6/30/2023	Day After	1.8	484	50.7	6.01	17.9	7.22	1600	600
7/13/2023	2-weeks Post	1	961	845.8	6.21	19.5	8.21	3500	1600
7/13/2023	2-weeks Post	1.8	969	821.9	5.97	19.8	8.20	3400	1600
8/15/2023	Two Months After	1	1043	995.3	7.7	20.9	8.30	3900	1700
9/14/2023	Three Months After	1	1676		9.7	21.8	8.60	4500	2200
10/11/2023	Four Months After	1	1350		11.6	20.3	8.72	4900	2400
12/12/2023	Six Months After	1	406		10.7	18.2	8.21	4000	1500
3/13/2024	Nine Months After	1	377		13.4	18.5	8.76	4900	2600
5/6/2024	Monthly PCD	1	411		22.9	19	7.5	2700	840
6/27/2024	Twelve Months After	1	1780		12.7	22.5	7.29	2400	740
8/5/2024	Monthly PCD	1	848		11.4	25	8.0	3800	1200
11/8/2024	Monthly PCD	1	593		20.7	21.2	8.4	4500	1800

*Estimated based on DOC of 6 mg/L and a hardness of 18 mg CaCO $_3/L$



6.11 ADDITIONAL PARAMETERS REQUIRED BY ECOLOGY

Prior to the June 2023 alum treatment, Ecology required that the City collect additional samples for analysis of chloride, calcium, magnesium, potassium, sodium, carbonate (CO₃), and bicarbonate (HCO₃) as part of the APAM permit required monitoring. Tetra Tech collected samples for the above analyses starting the day before treatment. Samples were collected at a depth of 1 m and on occasion at 0.5 m off the bottom. Table 4 summarizes the data results for these additional requested parameters.

For most parameters, there was little difference between concentrations prior to the alum treatment and concentrations post treatment (Table 4). Sodium concentrations in the lake increased following the alum treatment, from an average of 28.3 mg/L to an average of 52.6 mg/L post treatment through December 2023. This increase was expected given that sodium is a main component of the buffer applied during treatment, sodium aluminate. The increase in sodium could have also been partially due to the concentrating effect of lowering lake water levels. Sodium levels in March and June 2024 were less than concentrations in December 2023. All parameters with the exception of chloride, decreased slightly from October 2023 to June 2024, which corresponded to an increase in lake water levels and volume.

Bicarbonate and alkalinity concentrations were very similar throughout the monitoring period and decreased following the treatment as expected. As stated previously, alum is an acidic compound and alkalinity/bicarbonate would be expected to decrease as alum is added. Prior to the alum treatment, bicarbonate averaged 51.1 mg CaCO₃/L and alkalinity averaged 53.1 mg CaCO₃/L. Post treatment bicarbonate concentrations averaged 33.8 mg CaCO₃/L and alkalinity averaged 36.4 mg CaCO₃/L through December 2023. This indicates that the majority of the alkalinity in Waughop Lake is due to the presence of bicarbonate in the water. Carbonate concentrations measured before and after the alum treatment were consistently below the detection limit of 1 mg CaCO₃/L. This was also expected given that carbonate becomes dominant in waters at pH values greater than 10.3. Bicarbonate is typically the dominant form of the carbonate cycle in surface waters with pH between 6.3 and 10.3.



Date	Time Period	Depth (m)	Chloride (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	HCO3 (mg CaCO3/L)	CO3 (mg CaCO3/L)
c/27/2022	Day Before	1	4.62	5.99	1.12	3.37	28.5	51	<1.00
6/27/2023	Treatment	1.8	4.94	5.81	0.913	2.92	28	51.1	<1.00
c/20/2022	Day After	1	4.73	5.84	0.804	2.73	48.8	32.3	<1.00
6/30/2023	Treatment	1.8	4.41	5.82	0.816	2.71	48.5	30.6	<1.00
7/13/2023	2 Weeks Post	1	3.99	6.36	0.876	3.05	50.5	36.9	<1.00
//13/2023	Treatment	1.8	3.99	6.47	0.896	2.98	50.8	38	<1.00
8/15/2023	Two Months After	1	4.52	6.74	0.998	4.81	56.6	36.3	<1.00
9/14/2023	Three Months After	1	5.15	6.98	1.06	3.46	62.8	36.7	<1.00
10/11/2023	Four Months After	1	4.62	6.43	1.03	3.51	58.1	32.9	<1.00
12/12/2023	Six Months After	1	4.62	5.74	0.94	3.07	45	26.5	<1.00
3/13/2024	Nine Months After	1	5.36	5.92	0.902	2.77	34.7	25.6	<1.00
5/6/2024	PCD May Event	1	3.99	6.04	0.953	2.88		25.6	<1.00
6/27/2024	Twelve Months After	1	4.52	7.23	1.08	3.16	37.1	25	<1.00
8/5/2024	PCD August Event	1	5.47	8.06	1.18	3.59		44.7	<1.00
11/8/2024	PCD November Event	1	4.62	6.67	1.11	3.82		43.1	<1.00
Pre-Treatr	ment Average		4.78	5.9	1.02	3.15	28.3	51.1	<1.00
Post-Treat	ment Average		4.61	6.5	0.97	3.27	49.3	33.4	<1.00

Table 4. Summary of Additional Water Quality Parameters Requested by Ecology Before and After the June 2023 Alum Treatment.



7.0 LAKE SEDIMENT MONITORING

Personnel from HAB Aquatics (currently known as SOLitude Lake Management), the contractor who conducted all three alum applications, collected sediment cores from Waughop Lake on the day prior to the March 2020 treatment (March 23, 2020), immediately following the March treatment on March 25, 2020, and immediately following the July 2020 treatment on July 16, 2020. The purpose of collecting the sediment core prior to the March 2020 treatment was to obtain baseline sediment characteristics and data prior to the application of alum. The purpose of collecting the sediment core immediately following the March treatment was mostly to visually see the alum floc layer, however, it was decided to also send the core to the laboratory for analysis. A comparison between the two cores collected in March and the visible alum floc layer is shown in Figure 31. During the July 2020 treatment, the City and Tetra Tech decided to have HAB Aquatics collect a third core upon completion of the application. Analysis of this third core would provide insights into the aluminum binding efficiency and conversion of mobile phosphorus to aluminum bound phosphorus following the March treatment.

Each of the three sediment cores were hand delivered to IEH Analytical Laboratory in Seattle, WA. Each of the cores were sectioned by the laboratory into the following sample increments: 0 to 10 cm, 11 to 20 cm, 21 to 30 cm, and 30 to 40 cm (or until the bottom of the core). The core collected on March 23, 2020 was 43 cm long, the core collected on March 25, 2020 was shorter and only 35 cm long, and the core collected on July 16, 2020 was 40 cm long. Due to budget constraints larger than normal increments, 10 cm vs. 2 or 5 cm, were analyzed for Waughop Lake. Each of the sediment increments were analyzed for the following parameters: TP, loosely-bound phosphorus, iron bound phosphorus, aluminum bound phosphorus, biogenic phosphorus, organic phosphorus, calcium bound phosphorus, total aluminum, total iron, total calcium, % solids, and % water. Unfortunately, due to issues in the laboratory, the core collected on July 16, 2020 was only analyzed for the phosphorus fractions and was not analyzed for total aluminum, total iron, or total calcium. To determine the different phosphorus fractions in each sediment increment digestions were used by the laboratory as outlined in Rydin & Welch (1998). Laboratory data reports for the three sediment cores are included in Appendix A.







Figure 31. Sediment core collected prior to treatment on March 23, 2020 (left) and sediment core collected immediately following treatment on March 25, 2020 (right) with visible alum floc layer.

7.1 SEDIMENT CORE DATA

Data from the sediment cores collected post alum application on March 25 and July 16, 2020, show the expected increase in AI and aluminum bound phosphorus, and the subsequent decrease in iron bound phosphorus (mobile phosphorus) that is observed after nearly every alum treatment studied (Cooke et al., 2005; Rydin and Welch, 1999; Rydin et al., 2000; Reitzel et al., 2005). The conversion of iron bound phosphorus to stable aluminum bound phosphorus is the primary objective of an alum treatment. Figures 32 and 33 show the profiles of iron bound and aluminum bound phosphorus in the three sediment cores.

Iron bound phosphorus in the top 10 cm was 396 mg/kg prior to the March 2020 alum treatment and 462 mg/kg immediately following the March treatment. Iron bound phosphorus in the top 10 cm of the core collected in July 2020 had decreased to 294 mg/kg (Figure 32). For reference, iron bound phosphorus concentrations in sediments at Lake Ketchum prior to alum ranged from 140 to 215 mg/kg and in Wapato Lake iron bound phosphorus in the top 10 cm ranged from 199 to 368 mg/kg prior to alum. An immediately decrease in iron bound phosphorus was not expected following an application as it takes time for the alum floc to integrate into the lake sediments. So the decrease in iron bound phosphorus observed in the July core was most likely the result of the March treatment. There was a corresponding increase in aluminum bound phosphorus from 1403 mg/kg in the March 23 core to 2096 mg/kg in the July core (Figure 33). Total aluminum, while only available for the two cores collected in March, also increased in the top 10 cm following the treatment. The total aluminum concentration in the top 10 cm of the pre-treatment core was 11,845 mg/kg compared to 13,298 mg/kg in the core immediately collected post-treatment.

There was an overall increase in sediment TP between the core collected pre-treatment and the two cores collected following the March and July applications. This is not unusual as the alum application removes most all



of the particulates and TP from the water column as the floc settles to the lake bottom, which would result in the addition of phosphorus to the sediments.

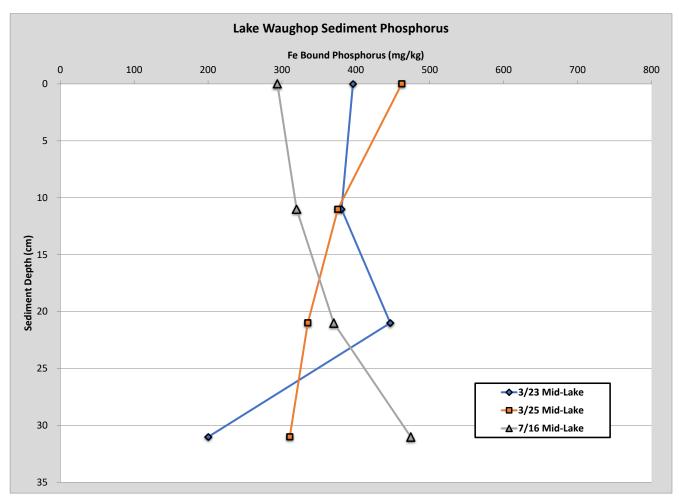


Figure 32. Iron bound phosphorus profiles in Waughop Lake sediments, 2020.



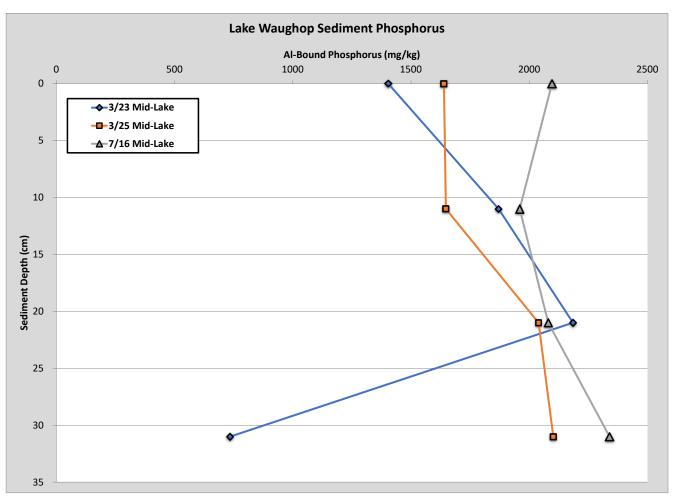


Figure 33. Aluminum bound phosphorus profiles in Waughop Lake sediments, 2020.





8.0 SUMMARY AND DISCUSSION

Following the 2020 treatments, Waughop Lake did not experience a toxic algae bloom for the first time in over a decade. Similar to conditions following the 2020 alum treatments, in 2023, Waughop Lake did not experience a toxic algae bloom. In 2022, the cyanotoxin microcystin was detected at concentrations just above the detection limit but well below the state recreational guideline. The growth of toxic algae was reduced by the two whole-lake buffered alum treatments conducted in March and July 2020 and the whole-lake buffered alum treatment conducted in June 2023. The alum treatments were designed to remove phosphorus from the water column and to inactivate the release of phosphorus from the lake sediments to reduce algal production.

In-situ water quality monitoring was conducted by Tetra Tech staff before, during, and after the alum treatments, with water samples collected for laboratory analysis before and after each treatment. Tetra Tech staff also conducted in-situ monitoring and collected water samples for analysis monthly from May through October 2023. Volunteer monitors associated with PCD conducted monthly monitoring at Waughop Lake May through October in 2021, 2022, 2023, and May through December 2024. Data collected by both Tetra Tech and volunteer monitors associated with PCD was presented in this report. Below is a summary of findings from the 2020 – 2024 monitoring conducted by both Tetra Tech and PCD at Waughop Lake.

- Waughop Lake experienced dramatic water level fluctuations with significant loss of water throughout each summer.
 - Water level decreased steadily over the summer months during all years due to limited recharge, even during 2022 when lake water levels were overall much higher than other years.
 - Water levels in the summer of 2023 and 2024 were much lower than recorded in previous years with minimum gage depths of 3.0 ft 0.5 to 1.75 ft lower than minimums recorded in 2020 2022.
 - Water levels in 2022 were much higher than recorded in other years with a maximum gage measurement of 7.5 ft in May and a low of 4.75 ft in November.
 - Low water levels and lake volumes during the summer have a concentrating effect on nutrients, aluminum, and other parameters.
 - Water level in Waughop Lake is correlated with groundwater levels and reflects direct contact with the shallow groundwater-flow system.
 - The drastic water level decreases in Waughop Lake have a concentrating effect throughout the summer.
 - Lake volume decreased by 38% during the summers of 2020 and 2021, by 34% during the summer of 2022 and by 45% and 44% in 2023 and 2024, respectively.
- Temperature, pH, DO, and conductivity did not vary significantly throughout the water column.
 - Waughop Lake is a shallow lake that mixes frequently throughout the year with no evidence of stratification occurring in the summer.
 - Higher values of pH and DO were most likely due to higher photosynthetic activity in the water column.
 - o Conductivity temporarily increased following the alum treatments.
 - There was a slight decrease in water column pH following each alum treatment, but water column average pH never fell below 7.0.
- Alum treatments reduced phosphorus concentrations and internal loading in Waughop Lake.



- After the 2020 alum treatments, water column TP concentrations remained well below the target range of less than 35 μg/L through March 2021. Average water column TP during the growing season of 2021 was right at the target concentration of 35 μg/L.
- $_{\odot}$ Despite the concentrating effects of lowering water levels, water column TP after the June 2023 alum treatment remained well below the 35 μ g/L target level for the duration of the summer.
- The mass of phosphorus in Waughop Lake decreased dramatically following the alum treatments and remained low throughout the summer of 2023 and 2024 compared to pretreatment levels.
- Alum treatments reduced algal production and the occurrence of cyanobacteria blooms in Waughop Lake.
 - Waughop Lake did not experience a toxic bloom in 2020 or 2021 that had been reoccurring every year on record from 2007-2018 (King County, 2018).
 - Chlorophyll concentrations in the lake were below the eutrophic boundary of 9.0 µg/L during 2020 and 2021 and reflected more of a mesotrophic, or well-balanced system.
 - In 2022 chlorophyll concentrations were higher and averaged about 14 μg/L during the growing season. Samples collected for cyanotoxin analysis had detections for microcystin at levels just above the detection limit but well below the state recreational guideline of 8 μg/L.
 - Waughop Lake did not experience a toxic bloom in 2023, even with more than favorable climatic and hydrologic conditions. Chlorophyll concentrations were reduced following the June 2023 treatment from an average of 12.5 μg/L to 5.4 μg/L prior to a large increase in October 2023.
 - Increased water clarity was observed throughout the summers of 2020 and 2023 and to some extent in 2021 due to the decrease in algae.
 - Waughop Lake also did not experience a toxic bloom in 2024 even though chlorophyll concentrations were elevated throughout the year. A sample was collected for cyanotoxin analyses in May 2024 and a second sample was collected in mid-May 2024 for algal identification. There were no cyanobacteria species present in the sample collected in mid-May 2024.
- The alum treatments did temporarily impact lake chemical composition.
 - Concentrations of aluminum and sulfate were temporarily increased in the lake. However, total aluminum concentrations only exceeded the calculated EPA aluminum criteria immediately following treatment, with concentrations decreasing dramatically the day after treatment.
 - Nitrogen and alkalinity were temporarily reduced in the lake as was expected.
 - Concentration of total sulfides varied after the 2023 alum treatment but eventually were well below pre-treatment concentrations and typically below the detection limit.
 - Concentrations of chloride, calcium, magnesium, potassium, and carbonate were unchanged following the 2023 alum treatment.
 - Sodium was temporarily increased but with concentrations trending downwards toward pretreatment levels.
- Improved water quality in 2020, 2021, and 2023 compared to pre-treatment conditions.
 - After the first alum treatment in March 2020, average TP and chlorophyll were significantly reduced from March 2020 through March 2021. Although average TP and chlorophyll increased slightly during the summer of 2021, TP concentrations were near the target level of 35 µg/L and chlorophyll concentrations were below the eutrophic boundary.
 - Water clarity increased and the Secchi disk was visible to the lake bottom through January 2021. On average water clarity increased significantly from March 2020 through March 2021.





- After the June 2023 alum treatment, average TP and chlorophyll were substantially reduced throughout the remainder of the 2023 summer.
- Water clarity increased and the Secchi disk was visible to the lake bottom through September 2023.
- Higher levels of water clarity in Waughop Lake corresponded with lower observed chlorophyll concentration and a reduction in algal production following all three alum treatments. In all years, there is a decrease in water clarity in the fall which is typically when the lake experiences its lowest water levels.
- Waughop Lake water column nutrient concentrations are influenced by external loading with water recharge in the winter and early spring months, as well as wind and subsequent sediment resuspension due to the shallowness of the lake.

9.0 RECOMMENDATIONS FOR FUTURE WORK

The 2020 and 2023 alum treatments dramatically reduced phosphorus availability in Waughop Lake and prevented the occurrence of a toxic algae bloom in 2020, 2021, 2023 and 2024, even with elevated chlorophyll concentrations in late 2023 and throughout 2024. Water quality improvements resulting from the 2020 treatments lasted through early 2022 but improvements from the 2023 treatments were shorter lived. This is most likely due to continued internal and external loading of phosphorus and adverse climatic and hydrologic conditions, as well as the reduced alum dosing in 2023. Dramatic decreases in water level during the summer growing season, exacerbates eutrophication, sediment resuspension, and increases nutrient concentrations, all potentially leading to higher algal production. Although water quality conditions in Waughop Lake during 2024 were reflective of a eutrophic system, with high chlorophyll concentrations, rather than a more mesotrophic system, there was no documented cyanobacteria bloom or cyanotoxins in the lake in 2024. In 2024 lake volume decreased by almost half during the summer exacerbating eutrophic conditions. A total phosphorus target range of around 35 μ g/L is still a reasonable goal for Waughop Lake and will help control dominance by cyanobacteria and potentially toxic algal species. Additional water column phosphorus stripping or sediment inactivation treatments will most likely be needed in the future to continue to limit HAB events. Future treatments could explore modifications to the buffering and/or aluminum trichloride or other products, in addition to or versus alum to accelerate the general water chemistry recovery due to the limited surface water input of calcium, sodium, and flushing of sulfate.

Long-term monitoring in Waughop Lake is recommended to track water quality parameters, observe any changes in the lake, and to continue to monitor the effectiveness of the alum treatments. Long-term monitoring also will provide the necessary data for adaptive management. In addition to monthly sampling for TP, TN, SRP, and chlorophyll, periodic analysis (every other month) for alkalinity, sulfate, TA, DOC, and hardness are recommended. In-situ monitoring to collect profiles of water temperature, DO, pH, and conductivity should also occur monthly. Continued water quality monitoring will allow for adaptive management of the lake and help inform management decisions, such as aquatic plant management and the potential use of other phosphorus inactivation products instead of alum for possible future phosphorus inactivation treatments, if needed. A high degree of water clarity paired with abundant solar energy may allow for an increase in aquatic plant production, so continued monitoring of conditions at Waughop Lake should include observations of changes to aquatic plants such as mapping for density and community structure. Sediment core collection and analysis of phosphorus fractions, as well as TA, total iron, and total calcium, is also recommended to evaluate sediment chemistry pre- and post-treatment.

Since it has become apparent that there is some external loading of nutrients, especially phosphorus, from either groundwater inputs or stormwater runoff, it is recommended that monitoring of these two water sources to the lake also be conducted. Understanding the source and magnitude of nutrient loadings to the lake will help to guide future lake management decisions.





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APPENDIX A: SEDIMENT DATA





IEH ANALYTICAL LABORATORIES LABORATORY & CONSULTING SERVICES 3927 AURORA AVENUE NORTH, SEATTLE, WA 98103 PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1713770A		PAGE	1				
REPORT DATE:	06/23/20							
DATE SAMPLED:	03/23,25/20	DATE RECEIVED:		03/25/20				
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON								
SEDIMENT SAMPLES FROM TETRA TECH INC	2.							

CASE NARRATIVE

Two sediment cores were received by the laboratory in good condition and analyzed according to the chain of custody. Phosphorus fractions were determined according to the method of Rydin and Welch. Successive extractions with NH4Cl, Bicarbonate/Dithionate, NaOH, and HCL were performed and analyzed for phosphorus. One part of Organic P was determined by digesting the residue after the inorganic fractions were extracted. Organic P includes the P after the inorganic fractions plus Biogenic P. Total P is the sum of all fractions minus Biogenic P, which is part of the Organic P fraction. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows, while QA/QC data is contained on subsequent pages.

SAMPLE DATA - SEDIMENTS (DRY WT. BASIS)

	% SOLIDS	% WATER	TOTAL-P	LOOSELY BOUND P	FE BOUND P	AL BOUND P	BIOGENIC P	CA BOUND P	ORGANIC P	
				(NH4CL)	(DITHIONATE)	(NAOH)		(HCL)		
SAMPLE ID			(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	
Sediment Core 0-10	cm 3.77%	96.2%	3809	<2.00	396	1403	1527	156	1853	collected 3/23/20
Sediment Core 11-2	0cm 4.90%	95.1%	3876	<2.00	381	1870	1101	213	1411	
Sediment Core 21-3	0cm 7.21%	92.8%	4714	<2.00	446	2185	1491	316	1767	
Sediment Core 31-4	8cm 6.27%	93.7%	2188	<2.00	200	735	934	118	1134	
Sediment Core 0-10	cm 3.77%	96.2%	4077	<2.00	462	1639	1430	168	1807	
Sediment Core 11-2	0cm 5.03%	95.0%	3529	<2.00	376	1648	1020	184	1322	
Sediment Core 21-3	0cm 7.03%	93.0%	3881	<2.00	335	2039	941	283	1223	collected 3/25/20
Sediment Core 31-3	5cm 7.82%	92.2%	4261	<2.00	311	2101	1186	364	1485	



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QA/QC DATA- SEDIMENTS

QC PARAMETER	% SOLIDS	TOTAL-P	LOOSELY BOUND P	FE BOUND P	AL BOUND P	BIOGENIC P	CA BOUND P	ORGANIC P
-			(NH4CL)	(DITHIONATE)	(NAOH)		(HCL)	
		(mg/kg)						
METHOD	SM18 2540B	CALCULATED	SM18 4500PF	SM18 4500PF	SM18 4500PF	EPA 365.1	SM18 4500PF	EPA 365.1
DATE PREPARED	05/28/20	06/01/20	05/29/20	05/29/20	05/29/20	06/01/20	05/29/20	06/01/20
DATE ANALYZED	1.00%	5.00	2.00	2.00	2.00	2.00	2.00	2.00
DETECTION LIMIT								
DUPLICATE								
	Sediment Core 31-							
	35cm							
SAMPLE ID	7.82%	4261	<2.00	311	2101	1186	364	1485
ORIGINAL	7.86%	4323	<2.00	328	2137	1201	367	1491
DUPLICATE	0.56%	1.43%	NC	5.35%	1.66%	1.27%	0.74%	0.41%
RPD								
SPIKE SAMPLE								
SAMPLE ID								
ORIGINAL								
SPIKED SAMPLE								
SPIKE ADDED	NA							
% RECOVERY								
QC CHECK								
(mg/l)		1	0.042	0.042	0.042	0.007	0.042	0.007
FOUND TRUE			0.042 0.039	0.042 0.039	0.042 0.039	0.097	0.042 0.039	0.097 0.094
% RECOVERY	NA	NIA				0.094		
% KEUUVERY	NA	NA	107.69%	107.69%	107.69%	103.19%	107.69%	103.19%
BLANK	NA	NA	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
DLANK	1 1 1	1 1/ 1	×2.00	×2.00	×2.00	×2.00	~2.00	×2.00

RPD = RELATIVE PERCENT DIFFERENCE.

NA = NOT APPLICABLE OR NOT AVAILABLE.

OC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damien Hodomsh"

Damien Gadomski Project Manager



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

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FINAL REPORT, LABORATORY ANALYSIS OF	FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON							
SEDIMENT SAMPLES FROM TETRA TECH INC	2.							

CASE NARRATIVE

Two sediment cores were received by the laboratory and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows, while QA/QC data is contained on subsequent pages.

SAMPLE DATA - SEDIMENTS (DRY WT. BASIS)

SAMPLE ID	% SOLIDS	% WATER	ALUMINUM (mg/kg)	IRON (mg/kg)	CALCIUM (mg/kg)	MERCURY (mg/kg)	
Sediment Core 0-10cm	3.77%	96.2%	11845	7783	8055	<0.50	collected 3/23/20
Sediment Core 11-20cm	4.90%	95.1%	15674	9831	8674	< 0.50	
Sediment Core 21-30cm	7.21%	92.8%	16485	13103	8392	< 0.50	
Sediment Core 31-43cm	6.27%	93.7%	8118	5611	6419		
Sediment Core 0-10cm	3.77%	96.2%	13298	9729	8534	< 0.50	
Sediment Core 11-20cm	5.03%	95.0%	13744	9416	9106	< 0.50	
Sediment Core 21-30cm	7.03%	93.0%	16019	10875	9130	< 0.50	collected 3/25/20
Sediment Core 31-35cm	7.82%	92.2%	16476	12508	9316		collected 3/23/20



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FINAL REPORT, LABORATORY ANALYSIS OF	SELECTED PARAMETERS ON			
SEDIMENT SAMPLES FROM TETRA TECH ING	2.			

QA/QC DATA- SEDIMENTS

QC PARAMETER	% SOLIDS	ALUMINUM	IRON	CALCIUM	MERCURY
		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
METHOD	SM18 2540B	EPA 6010	EPA 6010	EPA 6010	EPA 6020
DATE ANALYZED	05/28/20	05/29/20	05/29/20	05/29/20	05/27/20
DETECTION LIMIT	1.00%	2.00	2.00	2.00	0.50
DUPLICATE					
SAMPLE ID	Sediment Core 31- 35cm	BATCH	BATCH	BATCH	BATCH
ORIGINAL	7.82%	<2.00	<2.00	<2.00	< 0.50
DUPLICATE	7.86%	<2.00	<2.00	<2.00	< 0.50
RPD	0.56%	NC	NC	NC	NC
SPIKE SAMPLE SAMPLE ID ORIGINAL SPIKED SAMPLE SPIKE ADDED % RECOVERY	NA	NA	NA	NA	NA
QC CHECK (mg/L)					
FOUND		0.466	0.528	9.87	0.002
TRUE		0.500	0.500	10.0	0.002
% RECOVERY	NA	93.20%	105.60%	98.70%	105.00%
BLANK	NA	<2.00	<2.00	<2.00	< 0.50

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DLE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damin Hodemsh

Damien Gadomski Project Manager

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LABORATORY & CONSULTING SERVICES 3927 AURORA AVENUE NORTH, SEATTLE, WA 98103 PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1715123A	PAGE	1					
REPORT DATE:	08/15/20							
DATE SAMPLED:	07/16/20	DATE RECEIVED:	07/16/20					
FINAL REPORT, LABORATORY ANALY	SIS OF SELECTED PARAM	IETERS ON						
SEDIMENT SAMPLES FROM TETRA TECH								

CASE NARRATIVE

Four sediment samples were received by the laboratory in good condition and analyzed according to the chain of custody. Phosphorus fractions were determined according to the method of Rydin and Welch. Successive extractions with NH4Cl, Bicarbonate/Dithionate, NaOH, and HCL were performed and analyzed for phosphorus. One part of Organic P was determined by digesting the residue after the inorganic fractions were extracted. Organic P includes the P after the inorganic fractions plus Biogenic P. Total P is the sum of all fractions minus Biogenic P, which is part of the Organic P fraction. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows, while QA/QC data is contained on subsequent pages.

SAMPLE DATA - SEDIMENTS (DRY WT. BASIS)

	% SOLIDS	% WATER	TOTAL-P	LOOSELY BOUND P	FE BOUND P	AL BOUND P	BIOGENIC P	CA BOUND P	ORGANIC P
				(NH4CL)	(DITHIONATE)	(NAOH)		(HCL)	
SAMPLE ID			(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Warghop 0-10cm	3.25%	96.8%	5204	<2.00	294	2096	2228	113	2702
Warghop 11-20cm	4.85%	95.1%	3862	<2.00	320	1959	1183	156	1427
Warghop 21-30cm	6.17%	93.8%	4024	<2.00	370	2080	995	145	1429
Warghop 31-40cm	7.34%	92.7%	4191	<2.00	474	2340	889	247	1130



LABORATORY & CONSULTING SERVICES 3927 AURORA AVENUE NORTH, SEATTLE, WA 98103 PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1715123A	PAGE	2	
REPORT DATE:	08/15/20			
DATE SAMPLED:	07/16/20	DATE RECEIVED:	07/16/20	
FINAL REPORT, LABORATORY AN	ALYSIS OF SELECTED PARAME	TERS ON		
SEDIMENT SAMPLES FROM TETR	А ТЕСН			

QA/QC DATA- SEDIMENTS

QC PARAMETER	% SOLIDS	TOTAL-P	LOOSELY BOUND P	FE BOUND P	AL BOUND P	BIOGENIC P	CA BOUND P	ORGANIC P
X ••••••••••••••••••••••••••••••••••••			(NH4CL)	(DITHIONATE)	(NAOH)		(HCL)	
		(mg/kg)						
METHOD	SM18 2540B	CALCULATED	SM18 4500PF	SM18 4500PF	SM18 4500PF	EPA 365.1	SM18 4500PF	EPA 365.1
DATE PREPARED	08/05/20	08/10/20	08/06/20	08/06/20	08/07/20	08/10/20	08/07/20	08/10/20
DATE ANALYZED	1.00%	5.00	2.00	2.00	2.00	2.00	2.00	2.00
DETECTION LIMIT								
DUPLICATE								
	Warghop 31-40cm							
SAMPLE ID	7.34%	4191	<2.00	474	2340	889	247	1130
ORIGINAL	7.42%	4201	<2.00	423	2436	867	248	1094
DUPLICATE	0.98%	0.23%	NC	11.30%	4.02%	2.46%	0.28%	3.26%
RPD	017 070	0.12070					012070	0.11070
SPIKE SAMPLE								
SAMPLE ID								
ORIGINAL								
SPIKED SAMPLE								
SPIKE ADDED	NA							
% RECOVERY								
QC CHECK								
(mg/l)			0.040	0.040	0.000	0.000	0.000	0.000
FOUND			0.040	0.040	0.039	0.099	0.039	0.099
TRUE			0.039	0.039	0.039	0.094	0.039	0.094
% RECOVERY	NA	NA	102.56%	102.56%	100.00%	105.32%	100.00%	105.32%
BLANK	NA	NA	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
DLAINK	INA	INA	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00

RPD = RELATIVE PERCENT DIFFERENCE.	
NA = NOT APPLICABLE OR NOT AVAILABLE.	
NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT.	
OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TO LOW RELATIVE TO SAMPLE CONCENTRATION.	

SUBMITTED BY:

Damien Godemsh" Damien Gadomski Project Manager

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APPENDIX B: FIELD DATA TABLES

Date	Year	Time	Location	Pre-, During, or Post- Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	рН	Secchi (m)	
3/23/2020	2020	12:00 PM	Mid-Lake Station	Pre-Treatment	0	10.22	0.044	13.85	8.35	0.93	
3/23/2020	2020	12:00 PM	Mid-Lake Station	Pre-Treatment	0.5	10.23	0.044	13.93	8.36		
3/23/2020	2020	12:00 PM	Mid-Lake Station	Pre-Treatment	1	10.19	0.044	13.99	8.37		
3/23/2020	2020	12:00 PM	Mid-Lake Station	Pre-Treatment	1.5	10.04	0.044	13.75	8.12		
3/23/2020	2020	12:00 PM	Mid-Lake Station	Pre-Treatment	2	9.32	0.046	12.02	7.60		
3/23/2020	2020	12:00 PM	Mid-Lake Station	Pre-Treatment	2.5	8.98	0.053	10.77	7.27		
3/23/2020	2020	12:30 PM	Station #2	Pre-Treatment	0	10.64	0.044	13.49	8.09	1.1	
3/23/2020	2020	12:30 PM	Station #2	Pre-Treatment	0.5	10.61	0.044	13.45	8.02		
3/23/2020	2020	12:30 PM	Station #2	Pre-Treatment	1	10.59	0.044	13.33	7.97		
3/23/2020	2020	12:30 PM	Station #2	Pre-Treatment	1.5	10.28	0.044	13.48	8.03		
3/23/2020	2020	12:30 PM	Station #2	Pre-Treatment	2	9.62	0.046	11.85	7.64		
3/23/2020	2020	12:30 PM	Station #2	Pre-Treatment	2.5	9.04	0.060	2.72	6.81		
3/24/2020	2020	10:00 AM	Mid-Lake Station	During treatment	0	10.19	0.045	13.02	8.25	0.95	
3/24/2020	2020	10:00 AM	Mid-Lake Station	During treatment	0.5	10.19	0.045	13.02	8.19		
3/24/2020	2020	10:00 AM	Mid-Lake Station	During treatment	1	10.17	0.045	12.98	8.13		
3/24/2020	2020	10:00 AM	Mid-Lake Station	During treatment	1.5	10.11	0.045	12.79	8.04		
3/24/2020	2020	10:00 AM	Mid-Lake Station	During treatment	2	10.07	0.045	12.90	7.59		
3/24/2020	2020	10:00 AM	Mid-Lake Station	During treatment	2.5	9.64	0.091	5.10	6.98		
3/24/2020	2020	10:15 AM	Station #2	During treatment	0	10.15	0.045	12.99	7.80	0.9	
3/24/2020	2020	10:15 AM	Station #2	During treatment	0.5	10.18	0.045	13.11	7.98		
3/24/2020	2020	10:15 AM	Station #2	During treatment	1	10.18	0.045	13.02	8.03		
3/24/2020	2020	10:15 AM	Station #2	During treatment	1.5	9.99	0.045	12.42	7.71		
3/24/2020	2020	10:15 AM	Station #2	During treatment	2	9.82	0.045	10.74	7.44		
3/24/2020	2020	10:15 AM	Station #2	During treatment	2.5	9.45	0.050	4.80	7.01		
3/24/2020	2020	10:30 AM	East bank 10 mins after passing	During treatment	0	10.22	0.058	13.16	7.12		
3/24/2020	2020	10:30 AM	East bank 10 mins after passing	During treatment	0.5	10.23	0.066	13.12	7.14		
3/24/2020	2020	10:30 AM	East bank 10 mins after passing	During treatment	1	10.23	0.080	13.09	7.14		
3/24/2020	2020	10:30 AM	East bank 10 mins after passing	During treatment	1.5	10.22	0.107	12.91	7.03		
3/24/2020	2020	10:30 AM	East bank 10 mins after passing	During treatment	1.8	10.23	0.140	12.84	6.70		
3/24/2020	2020	1:00 PM	East bank	During treatment	0	10.44	0.051	13.58	8.45	1	
3/24/2020	2020	1:00 PM	East bank	During treatment	0.5	10.45	0.052	13.86	8.45		
3/24/2020	2020	1:00 PM	East bank	During treatment	1	10.42	0.052	14.29	8.33		
3/24/2020	2020	1:00 PM	East bank	During treatment	1.5	10.41	0.052	14.05	8.21		
3/24/2020	2020	1:00 PM	East bank	During treatment	1.8	10.37	0.083	13.33	7.94		

Table B-1. Waughop Lake Field Monitoring Data Collected by Tetra Tech, 2020-2021.

Notes

Note	Secchi (m)	рН	Dissolved Oxygen (mg/L)	Conductivity (mS/cm)	Temperature (°C)	Depth (m)	Pre-, During, or Post- Treatment	Location	Time	Year	Date
	1	7.94	13.41	0.084	10.36	0	During treatment	North end 10 mins after passing	1:30 PM	2020	3/24/2020
		7.99	13.61	0.069	10.38	0.5	During treatment	North end 10 mins after passing	1:30 PM	2020	3/24/2020
		8.02	13.37	0.086	10.37	1	During treatment	North end 10 mins after passing	1:30 PM	2020	3/24/2020
		7.91	13.03	0.127	10.19	1.5	During treatment	North end 10 mins after passing	1:30 PM	2020	3/24/2020
		7.80	13.29	0.149	10.27	2	During treatment	North end 10 mins after passing	1:30 PM	2020	3/24/2020
		7.74	12.74	0.156	10.27	2.5	During treatment	North end 10 mins after passing	1:30 PM	2020	3/24/2020
		7.83	12.48	0.101	10.17	3	During treatment	North end 10 mins after passing	1:30 PM	2020	3/24/2020
floc visi	1.1	7.73	12.60	0.083	10.31	0	During treatment	Station #2	2:00 PM	2020	3/24/2020
		7.69	12.51	0.084	10.32	0.5	During treatment	Station #2	2:00 PM	2020	3/24/2020
		7.65	12.40	0.097	10.05	1	During treatment	Station #2	2:00 PM	2020	3/24/2020
		7.58	12.32	0.140	10.07	1.5	During treatment	Station #2	2:00 PM	2020	3/24/2020
		7.54	12.46	0.161	10.16	2	During treatment	Station #2	2:00 PM	2020	3/24/2020
		7.30	8.63	0.090	9.78	2.5	During treatment	Station #2	2:00 PM	2020	3/24/2020
	1.15	7.66	12.60	0.091	10.30	0	During treatment	Mid-Lake Station	11:30 AM	2020	3/24/2020
		7.64	12.39	0.096	10.28	0.5	During treatment	Mid-Lake Station	11:30 AM	2020	3/24/2020
		7.63	12.39	0.107	10.29	1	During treatment	Mid-Lake Station	11:30 AM	2020	3/24/2020
		7.61	12.29	0.143	10.24	1.5	During treatment	Mid-Lake Station	11:30 AM	2020	3/24/2020
		7.84	12.23	0.167	10.16	2	During treatment	Mid-Lake Station	11:30 AM	2020	3/24/2020
		7.89	11.45	0.146	9.75	2.5	During treatment	Mid-Lake Station	11:30 AM	2020	3/24/2020
	1.4	7.96	13.37	0.083	10.59	0	During treatment	East bank	6:00 PM	2020	3/24/2020
		7.92	13.80	0.087	10.55	0.5	During treatment	East bank	6:00 PM	2020	3/24/2020
		7.85	13.52	0.088	10.48	1	During treatment	East bank	6:00 PM	2020	3/24/2020
		7.78	13.55	0.090	10.46	1.5	During treatment	East bank	6:00 PM	2020	3/24/2020
	1.8	7.80	12.93	0.110	10.44	0	During treatment	North end	6:00 PM	2020	3/24/2020
		7.82	13.15	0.110	10.46	0.5	During treatment	North end	6:00 PM	2020	3/24/2020
		7.80	13.60	0.110	10.47	1	During treatment	North end	6:00 PM	2020	3/24/2020
		7.74	13.13	0.133	10.40	1.5	During treatment	North end	6:00 PM	2020	3/24/2020
		7.65	12.80	0.145	10.29	2	During treatment	North end	6:00 PM	2020	3/24/2020
		7.57	12.80	0.173	10.26	2.5	During treatment	North end	6:00 PM	2020	3/24/2020
		7.28	12.73	0.180	10.21	3	During treatment	North end	6:00 PM	2020	3/24/2020
	1.7	7.61	13.20	0.114	10.43	0	During treatment	Mid-Lake Station	6:00 PM	2020	3/24/2020
		7.73	13.20	0.121	10.53	0.5	During treatment	Mid-Lake Station	6:00 PM	2020	3/24/2020
		7.75	13.09	0.133	10.51	1	During treatment	Mid-Lake Station	6:00 PM	2020	3/24/2020
		7.71	13.12	0.196	10.45	1.5	During treatment	Mid-Lake Station	6:00 PM	2020	3/24/2020
		7.68	12.86	0.267	10.51	2	During treatment	Mid-Lake Station	6:00 PM	2020	3/24/2020

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Να	Secchi (m)	рН	Dissolved Oxygen (mg/L)	Conductivity (mS/cm)	Temperature (°C)	Depth (m)	Pre-, During, or Post- Treatment	Location	Time	Year	Date
		7.71	12.85	0.236	10.39	2.5	During treatment	Mid-Lake Station	6:00 PM	2020	3/24/2020
floc still fa	1.7	8.20	12.99	0.136	10.59	0	During treatment	Station #2	6:00 PM	2020	3/24/2020
		8.14	12.78	0.151	10.63	0.5	During treatment	Station #2	6:00 PM	2020	3/24/2020
		8.08	13.09	0.157	10.62	1	During treatment	Station #2	6:00 PM	2020	3/24/2020
		7.95	12.96	0.164	10.58	1.5	During treatment	Station #2	6:00 PM	2020	3/24/2020
		7.89	13.14	0.263	10.53	2	During treatment	Station #2	6:00 PM	2020	3/24/2020
		7.71	12.27	0.178	9.93	2.5	During treatment	Station #2	6:00 PM	2020	3/24/2020
	2.50	8.22	12.81	0.164	9.87	0	During treatment	Mid-Lake Station	10:00 AM	2020	3/25/2020
		8.03	12.95	0.166	9.95	0.5	During treatment	Mid-Lake Station	10:00 AM	2020	3/25/2020
		7.98	13.10	0.167	9.93	1	During treatment	Mid-Lake Station	10:00 AM	2020	3/25/2020
		8.02	12.99	0.204	9.95	1.5	During treatment	Mid-Lake Station	10:00 AM	2020	3/25/2020
		8.33	12.68	0.246	9.97	2	During treatment	Mid-Lake Station	10:00 AM	2020	3/25/2020
		8.08	8.59	0.233	9.91	2.5	During treatment	Mid-Lake Station	10:00 AM	2020	3/25/2020
	2.4	7.85	13.04	0.157	9.82	0	During treatment	Station #2	10:00 AM	2020	3/25/2020
		7.79	12.84	0.157	9.91	0.5	During treatment	Station #2	10:00 AM	2020	3/25/2020
		7.85	12.64	0.192	9.87	1	During treatment	Station #2	10:00 AM	2020	3/25/2020
		7.93	12.69	0.245	9.89	1.5	During treatment	Station #2	10:00 AM	2020	3/25/2020
		7.80	12.81	0.276	9.91	2	During treatment	Station #2	10:00 AM	2020	3/25/2020
		7.50	6.90	0.154	9.82	2.5	During treatment	Station #2	10:00 AM	2020	3/25/2020
	1.9	7.51	12.94	0.152	9.92	0	During treatment	East bank	10:30 AM	2020	3/25/2020
		7.50	13.01	0.154	9.89	0.5	During treatment	East bank	10:30 AM	2020	3/25/2020
		7.50	13.12	0.156	9.91	1	During treatment	East bank	10:30 AM	2020	3/25/2020
		7.51	13.08	0.162	9.92	1.5	During treatment	East bank	10:30 AM	2020	3/25/2020
		7.48	12.17	0.162	9.93	1.7	During treatment	East bank	10:30 AM	2020	3/25/2020
	2.9	7.44	12.81	0.164	10.03	0	During treatment	North end	10:30 AM	2020	3/25/2020
		7.44	12.95	0.167	10.04	0.5	During treatment	North end	10:30 AM	2020	3/25/2020
		7.46	12.94	0.202	10.09	1	During treatment	North end	10:30 AM	2020	3/25/2020
		7.49	12.90	0.236	10.19	1.5	During treatment	North end	10:30 AM	2020	3/25/2020
		7.49	12.64	0.252	10.18	2	During treatment	North end	10:30 AM	2020	3/25/2020
		7.48	12.43	0.250	10.13	2.5	During treatment	North end	10:30 AM	2020	3/25/2020
		7.33	11.64	0.238	9.60	3	During treatment	North end	10:30 AM	2020	3/25/2020
	2.3	7.49	12.98	0.176	10.16	0	Post-treatment	Station #2	1:00 PM	2020	3/25/2020
		7.55	13.17	0.173	10.17	0.5	Post-treatment	Station #2	1:00 PM	2020	3/25/2020
		7.58	13.02	0.209	10.11	1	Post-treatment	Station #2	1:00 PM	2020	3/25/2020
		6.83	13.15	0.300	10.11	1.5	Post-treatment	Station #2	1:00 PM	2020	3/25/2020
		5.81	13.18	0.339	10.13	2	Post-treatment	Station #2	1:00 PM	2020	3/25/2020
		5.39	12.98	0.241	10.15	2.5	Post-treatment	Station #2	1:00 PM	2020	3/25/2020
	2.3	7.57	12.78	0.188	10.41	0	Post-treatment	Mid-Lake Station	1:00 PM	2020	3/25/2020
		7.92	12.89	0.188	10.41	0.5	Post-treatment	Mid-Lake Station	1:00 PM	2020	3/25/2020
		7.75	12.77	0.192	10.34	1	Post-treatment	Mid-Lake Station	1:00 PM	2020	3/25/2020
		7.70	13.02	0.231	10.15	1.5	Post-treatment	Mid-Lake Station	1:00 PM	2020	3/25/2020

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Date	Year	Time	Location	Pre-, During, or Post- Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	рН	Secchi (m)	1
3/25/2020	2020	1:00 PM	Mid-Lake Station	Post-treatment	2	10.20	0.312	13.13	8.33		
3/25/2020	2020	1:00 PM	Mid-Lake Station	Post-treatment	2.5	10.14	0.253	10.83	8.16		
3/25/2020	2020	2:00 PM	North end	Post-treatment	0	10.53	0.192	13.11	7.32	2.6	
3/25/2020	2020	2:00 PM	North end	Post-treatment	0.5	10.38	0.205	13.04	7.30		
3/25/2020	2020	2:00 PM	North end	Post-treatment	1	10.27	0.224	12.69	7.29		
3/25/2020	2020	2:00 PM	North end	Post-treatment	1.5	10.16	0.243	13.24	7.31		
3/25/2020	2020	2:00 PM	North end	Post-treatment	2	10.17	0.279	12.92	7.34		
3/25/2020	2020	2:00 PM	North end	Post-treatment	2.5	10.18	0.317	13.02	7.60		
3/25/2020	2020	2:00 PM	North end	Post-treatment	2.9	9.87	0.289	4.09	7.30		
3/26/2020	2020	11:00	Mid-Lake Station	Post-treatment	0	9.730	0.23	12.60	8.25	2.5	
3/26/2020	2020	11:00	Mid-Lake Station	Post-treatment	0.5	9.73	0.228	12.20	8.17		
3/26/2020	2020	11:00	Mid-Lake Station	Post-treatment	1	9.74	0.228	12.25	8.06		
3/26/2020	2020	11:00	Mid-Lake Station	Post-treatment	1.5	9.74	0.228	12.31	8.01		
3/26/2020	2020	11:00	Mid-Lake Station	Post-treatment	2	9.73	0.228	12.37	7.93		
3/26/2020	2020	11:00	Mid-Lake Station	Post-treatment	2.5	9.98	0.171	4.05	7.57		
3/26/2020	2020	11:00	Station #2	Post-treatment	0	9.99	0.246	12.13	7.44	2.3	
3/26/2020	2020	11:00	Station #2	Post-treatment	0.5	9.99	0.247	12.26	7.42		
3/26/2020	2020	11:00	Station #2	Post-treatment	1	10.00	0.248	12.26	7.41		
3/26/2020	2020	11:00	Station #2	Post-treatment	1.5	9.99	0.247	12.35	7.39		
3/26/2020	2020	11:00	Station #2	Post-treatment	2	9.96	0.243	12.42	7.39		
3/26/2020	2020	11:00	Station #2	Post-treatment	2.5	9.94	0.168	1.70	7.19		
4/10/2020	2020	11:00	Mid-Lake Station	Post-treatment	0	13.52	0.231	9.59	8.23	2.3	
4/10/2020	2020	11:00	Mid-Lake Station	Post-treatment	0.5	13.51	0.231	9.72	7.98		
4/10/2020	2020	11:00	Mid-Lake Station	Post-treatment	1	13.51	0.231	9.58	7.88		
4/10/2020	2020	11:00	Mid-Lake Station	Post-treatment	1.5	13.51	0.231	9.68	7.75		
4/10/2020	2020	11:00	Mid-Lake Station	Post-treatment	2	13.51	0.231	9.66	7.64		
4/10/2020	2020	11:00	Mid-Lake Station	Post-treatment	2.5	13.45	0.231	9.15	7.55		
4/10/2020	2020	11:00	Station #2	Post-treatment	0	13.65	0.231	9.66	7.40	2.2	
4/10/2020	2020	11:00	Station #2	Post-treatment	0.5	13.62	0.232	9.47	7.33		
4/10/2020	2020	11:00	Station #2	Post-treatment	1	13.66	0.231	9.52	7.27		
4/10/2020	2020	11:00	Station #2	Post-treatment	1.5	13.64	0.231	9.57	7.24		
4/10/2020	2020	11:00	Station #2	Post-treatment	2	13.61	0.231	9.59	7.20		
4/10/2020	2020	11:00	Station #2	Post-treatment	2.3	12.20	0.170	3.31	6.83		
5/27/2020	2020	14:30	Mid-Lake Station	Monthly Sampling	0	20.94	0.233	7.44	8.07	2.00	GAGE 5.5' note: DO
5/27/2020	2020	14:30	Mid-Lake Station	Monthly Sampling	0.5	20.88	0.232	7.46	8.05		
5/27/2020	2020	14:30	Mid-Lake Station	Monthly Sampling	1	20.73	0.232	7.61	8.01		
5/27/2020	2020	14:30	Mid-Lake Station	Monthly Sampling	1.5	19.91	0.231	7.93	8.17		
5/27/2020	2020	14:30	Mid-Lake Station	Monthly Sampling	2	19.96	0.252	3.11	7.06		
6/18/2020	2020	11:00	Mid-Lake Station	Monthly Sampling	0	20.65	0.236	9.83	8.06	2.2	GA
6/18/2020	2020	11:00	Mid-Lake Station	Monthly Sampling	0.5	20.75	0.234	9.85	8.04		
6/18/2020	2020	11:00	Mid-Lake Station	Monthly Sampling	1	20.67	0.234	10.08	8.03		

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Not	Secchi (m)	рН	Dissolved Oxygen (mg/L)	Conductivity (mS/cm)	Temperature (°C)	Depth (m)	Pre-, During, or Post- Treatment	Location	Time	Year	Date
		8.00	10.17	0.234	20.57	1.5	Monthly Sampling	Mid-Lake Station	11:00	2020	6/18/2020
		7.98	10.27	0.234	20.37	2	Monthly Sampling	Mid-Lake Station	11:00	2020	6/18/2020
		6.74	2.28	0.276	20.06	2.5	Monthly Sampling	Mid-Lake Station	11:00	2020	6/18/2020
secchi at	2	8.82	10.23	0.247	22.79	0	Pre-Treatment	Mid-Lake Station	12:00	2020	7/13/2020
		8.83	10.19	0.246	22.78	0.5	Pre-Treatment	Mid-Lake Station	12:00	2020	7/13/2020
		8.82	10.41	0.247	22.78	1	Pre-Treatment	Mid-Lake Station	12:00	2020	7/13/2020
		8.80	10.65	0.246	22.78	1.5	Pre-Treatment	Mid-Lake Station	12:00	2020	7/13/2020
		7.09	9.51	0.247	22.78	1.8	Pre-Treatment	Mid-Lake Station	12:00	2020	7/13/2020
secchi bottom.	2.10	8.72	10.56	0.248	22.92	0	Pre-Treatment	Station #2	12:30	2020	7/13/2020
		8.73	10.55	0.248	22.92	0.5	Pre-Treatment	Station #2	12:30	2020	7/13/2020
		8.73	10.45	0.247	22.92	1	Pre-Treatment	Station #2	12:30	2020	7/13/2020
		8.72	10.76	0.248	22.92	1.5	Pre-Treatment	Station #2	12:30	2020	7/13/2020
		8.73	10.66	0.247	22.94	1.9	Pre-Treatment	Station #2	12:30	2020	7/13/2020
	2.15	8.73	10.68	0.247	22.73	0	During treatment	Mid-Lake Station	9:00	2020	7/14/2020
		8.70	10.54	0.247	22.75	0.5	During treatment	Mid-Lake Station	9:00	2020	7/14/2020
		8.64	10.42	0.247	22.71	1	During treatment	Mid-Lake Station	9:00	2020	7/14/2020
		8.61	10.59	0.248	22.58	1.5	During treatment	Mid-Lake Station	9:00	2020	7/14/2020
		8.54	10.46	0.250	22.49	2	During treatment	Mid-Lake Station	9:00	2020	7/14/2020
reading 2.4m in		7.36	3.68	0.273	22.05	2.4	During treatment	Mid-Lake Station	9:00	2020	7/14/2020
in floc ~10 mins after pa	1.60	8.61	10.32	0.248	22.74	0	During treatment	Station #2	9:30	2020	7/14/2020
		8.55	10.38	0.251	22.72	0.5	During treatment	Station #2	9:30	2020	7/14/2020
		8.29	10.31	0.289	22.69	1	During treatment	Station #2	9:30	2020	7/14/2020
		8.15	10.48	0.311	22.70	1.5	During treatment	Station #2	9:30	2020	7/14/2020
		7.82	10.30	0.311	22.47	2	During treatment	Station #2	9:30	2020	7/14/2020
		8.15	10.16	0.333	22.57	0	During treatment	In floc just after pass	9:30	2020	7/14/2020
		8.19	10.35	0.341	22.67	0.5	During treatment	In floc just after pass	9:30	2020	7/14/2020
		8.10	10.53	0.337	22.65	1	During treatment	In floc just after pass	9:30	2020	7/14/2020
		8.16	10.24	0.346	22.44	1.5	During treatment	In floc just after pass	9:30	2020	7/14/2020
reading in bo		7.20	2.60	0.340	22.19	1.8	During treatment	In floc just after pass	9:30	2020	7/14/2020
recently	1.6	8.04	10.22	0.276	23.02	0	During treatment	Mid-Lake Station	11:30	2020	7/14/2020
		8.03	10.28	0.281	23.01	0.5	During treatment	Mid-Lake Station	11:30	2020	7/14/2020
		8.07	10.43	0.328	22.93	1	During treatment	Mid-Lake Station	11:30	2020	7/14/2020
		8.10	10.64	0.338	22.83	1.5	During treatment	Mid-Lake Station	11:30	2020	7/14/2020
		8.05	10.53	0.324	22.74	2	During treatment	Mid-Lake Station	11:30	2020	7/14/2020
	2	8.14	10.33	0.268	23.21	0	During treatment	Station #2	11:30	2020	7/14/2020
		8.16	10.38	0.272	23.21	0.5	During treatment	Station #2	11:30	2020	7/14/2020

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	secchi at bottom
	secchi bottom. Lake level 4.8'
	reading 2.4m in bottom muck in floc ~10 mins after passing. Secchi in much
	reading in bottom much
	recently treated

Date	Year	Time	Location	Pre-, During, or Post- Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	рН	Secchi (m)	Notes
7/14/2020	2020	11:30	Station #2	During treatment	1	23.19	0.279	10.54	8.16		
7/14/2020	2020	11:30	Station #2	During treatment	1.5	23.19	0.285	10.57	8.17		
7/14/2020	2020	11:30	Station #2	During treatment	2	23.20	0.319	13.67	8.06		reading in bottom
7/14/2020	2020	12:00	West side in untreated area	During treatment	0	23.18	0.271	10.36	8.21	1.5	secchi at bottom
7/14/2020	2020	12:00	West side in untreated area	During treatment	0.5	23.20	0.275	1018.00	8.21		
7/14/2020	2020	12:00	West side in untreated area	During treatment	1	22.82	0.257	10.53	8.24		
7/14/2020	2020	12:00	West side in untreated area	During treatment	1.5	22.90	0.320	0.55	6.91		reading at bottom
7/14/2020	2020	12:00	North end	During treatment	0	23.53	0.276	10.16	8.01	2.2	secchi at bottom
7/14/2020	2020	12:00	North end	During treatment	0.5	23.14	0.279	10.30	8.04		
7/14/2020	2020	12:00	North end	During treatment	1	22.84	0.299	10.24	8.08		
7/14/2020	2020	12:00	North end	During treatment	1.5	22.55	0.258	10.34	8.03		
7/14/2020	2020	12:00	North end	During treatment	2	22.48	0.259	10.26	8.05		
7/14/2020	2020	12:30	East bank	During treatment	0	23.55	0.269	9.99	8.11	1.9	in muck
7/14/2020	2020	12:30	East bank	During treatment	0.5	23.40	0.275	9.97	8.11		
7/14/2020	2020	12:30	East bank	During treatment	1	23.08	0.278	10.20	8.08		
7/14/2020	2020	12:30	East bank	During treatment	1.5	23.07	0.279	10.27	8.06		
7/14/2020	2020	15:30	Mid-Lake Station	During treatment	0	24.21	0.321	10.33	8.04	2.00	secchi at bottom
7/14/2020	2020	15:30	Mid-Lake Station	During treatment	0.5	24.21	0.322	10.14	8.02		
7/14/2020	2020	15:30	Mid-Lake Station	During treatment	1	24.18	0.322	9.99	8.01		
7/14/2020	2020	15:30	Mid-Lake Station	During treatment	1.5	24.07	0.311	10.95	8.04		
7/14/2020	2020	15:30	Mid-Lake Station	During treatment	2	24.62	0.278	6.03	7.10		reading at bottom
7/14/2020	2020	15:45	North end	During treatment	0	24.49	0.306	10.05	7.91	2.2	
7/14/2020	2020	15:45	North end	During treatment	0.5	24.37	0.311	10.19	7.92		
7/14/2020	2020	15:45	North end	During treatment	1	24.03	0.316	10.48	7.90		
7/14/2020	2020	15:45	North end	During treatment	1.5	23.89	0.309	10.52	7.90		
7/14/2020	2020	15:45	North end	During treatment	2	23.86	0.329	10.12	7.60		
7/14/2020	2020	15:45	North end	During treatment	2.2	24.13	0.326	2.99	6.54		reading at bottom
7/14/2020	2020	15:45	East bank	During treatment	0	24.41	0.285	10.12	7.76	1.6	secchi at bottom
7/14/2020	2020	15:45	East bank	During treatment	0.5	24.27	0.295	10.43	7.82		
7/14/2020	2020	15:45	East bank	During treatment	1	24.01	0.287	10.82	7.93		
7/14/2020	2020	15:45	East bank	During treatment	1.5	23.61	0.300	11.36	7.91		
7/14/2020	2020	16:00	Station #2	During treatment	0	24.85	0.322	10.19	7.92	1.7	secchi at bottom
7/14/2020	2020	16:00	Station #2	During treatment	0.5	24.82	0.319	10.25	7.91		
7/14/2020	2020	16:00	Station #2	During treatment	1	23.85	0.361	10.49	7.88		
7/14/2020	2020	16:00	Station #2	During treatment	1.5	23.62	0.349	10.67	7.92		
7/14/2020	2020	17:00	Mid-Lake Station	During treatment	0	24.77	0.376	9.85	7.87	2.30	secchi at bottom
7/14/2020	2020	17:00	Mid-Lake Station	During treatment	0.5	24.78	0.384	10.11	7.86		

Date	Year	Time	Location	Pre-, During, or Post-	Depth	Temperature	Conductivity	Dissolved	pН	Secchi Notes
Date	rear	Time	Location	Treatment	(m)	(°C)	(mS/cm)	Oxygen (mg/L)	рп	(m) Notes
7/14/2020	2020	17:00	Mid-Lake Station	During treatment	1	24.42	0.344	10.37	7.91	
7/14/2020	2020	17:00	Mid-Lake Station	During treatment	1.5	23.70	0.338	10.83	7.97	
7/14/2020	2020	17:00	Mid-Lake Station	During treatment	2	23.60	0.347	10.74	7.97	
7/14/2020	2020	17:00	North end	During treatment	0	24.51	0.311	10.19	7.97	2.1 secchi at bottom
7/14/2020	2020	17:00	North end	During treatment	0.5	24.53	0.321	10.22	7.93	
7/14/2020	2020	17:00	North end	During treatment	1	24.20	0.337	10.58	7.97	
7/14/2020	2020	17:00	North end	During treatment	1.5	23.97	0.327	10.54	7.98	
7/14/2020	2020	17:00	North end	During treatment	2	24.01	0.338	11.46	7.96	
7/14/2020	2020	17:00	Station #2	During treatment	0	24.81	0.315	10.46	7.95	2.1 secchi at bottom
7/14/2020	2020	17:00	Station #2	During treatment	0.5	24.82	0.313	10.07	7.94	
7/14/2020	2020	17:00	Station #2	During treatment	1	24.22	0.336	10.91	7.94	
7/14/2020	2020	17:00	Station #2	During treatment	1.5	23.80	0.343	11.09	7.96	
7/14/2020	2020	17:00	Station #2	During treatment	2	23.80	0.344	11.04	7.97	
7/15/2020	2020	10:00	Station #2	During treatment	0	23.50	0.346	10.12	8.38	1.95 secchi at bottom
7/15/2020	2020	10:00	Station #2	During treatment	0.5	23.49	0.343	10.25	8.26	
7/15/2020	2020	10:00	Station #2	During treatment	1	23.19	0.335	10.29	8.17	
7/15/2020	2020	10:00	Station #2	During treatment	1.5	23.17	0.335	10.19	8.08	
7/15/2020	2020	10:00	Station #2	During treatment	2	23.56	0.338	10.97	7.90	
7/15/2020	2020	10:00	Mid-Lake Station	During treatment	0	23.51	0.337	9.90	8.03	
7/15/2020	2020	10:00	Mid-Lake Station	During treatment	0.5	23.49	0.343	9.93	7.96	
7/15/2020	2020	10:00	Mid-Lake Station	During treatment	1	23.46	0.350	10.15	7.85	
7/15/2020	2020	10:00	Mid-Lake Station	During treatment	1.5	23.46	0.381	10.25	7.71	
7/15/2020	2020	10:00	Mid-Lake Station	During treatment	2	23.53	0.326	8.69	7.57	reading at bottom
7/15/2020	2020	10:30	North end	During treatment	0	23.51	0.330	10.09	7.94	
7/15/2020	2020	10:30	North end	During treatment	0.5	23.47	0.337	10.17	7.94	
7/15/2020	2020	10:30	North end	During treatment	1	23.37	0.347	10.18	8.12	
7/15/2020	2020	10:30	North end	During treatment	1.5	23.37	0.350	10.24	8.24	
7/15/2020	2020	10:30	North end	During treatment	2	23.43	0.355	11.49	8.21	
7/15/2020	2020	12:00	Station #2	During treatment	0	23.89	0.367	10.02	7.93	1.7 secchi at bottom
7/15/2020	2020	12:00	Station #2	During treatment	0.5	23.88	0.368	10.16	7.86	
7/15/2020	2020	12:00	Station #2	During treatment	1	23.85	0.364	10.29	7.83	
7/15/2020	2020	12:00	Station #2	During treatment	1.5	23.79	0.360	10.46	7.84	
7/15/2020	2020	12:00	Mid-Lake Station	During treatment	0	23.78	0.350	9.96	7.82	2.1 secchi at bottom
7/15/2020	2020	12:00	Mid-Lake Station	During treatment	0.5	23.77	0.350	10.05	7.81	
7/15/2020	2020	12:00	Mid-Lake Station	During treatment	1	23.75	0.349	10.32	7.78	
7/15/2020	2020	12:00	Mid-Lake Station	During treatment	1.5	23.67	0.349	10.34	7.79	
7/15/2020	2020	12:00	Mid-Lake Station	During treatment	2	23.51	0.347	10.31	7.82	
7/15/2020	2020	14:30	Station #2	During treatment	0	24.48	0.384	10.16	7.82	1.8 secchi at bottom
7/15/2020	2020	14:30	Station #2	During treatment	0.5	24.48	0.383	10.07	7.81	
7/15/2020	2020	14:30	Station #2	During treatment	1	24.37	0.378	10.25	7.82	
7/15/2020	2020	14:30	Station #2	During treatment	1.5	24.30	0.374	10.34	7.86	

Date	Year	Time	Location	Pre-, During, or Post- Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	рН	Secchi (m)	Notes
7/15/2020	2020	3:00 PM	Mid-Lake Station	During treatment	0	24.34	0.362	9.90	7.83	2.1	secchi at bo
7/15/2020	2020	3:00 PM	Mid-Lake Station	During treatment	0.5	24.34	0.364	9.87	7.85		
7/15/2020	2020	3:00 PM	Mid-Lake Station	During treatment	1	24.34	0.362	9.98	7.86		
7/15/2020	2020	3:00 PM	Mid-Lake Station	During treatment	1.5	24.37	0.372	10.12	7.85		
7/15/2020	2020	3:00 PM	Mid-Lake Station	During treatment	2	24.39	0.378	10.31	7.85		
7/15/2020	2020	3:00 PM	In floc just after pass, W of lake gage	During treatment	0	24.36	0.373	9.78	7.57		
7/15/2020	2020	3:00 PM	In floc just after pass, W of lake gage	During treatment	0.5	24.38	0.375	9.74	7.71		
7/15/2020	2020	3:00 PM	In floc just after pass, W of lake gage	During treatment	1	24.33	0.366	9.96	7.69		
7/15/2020	2020	3:00 PM	In floc just after pass, W of lake gage	During treatment	1.5	24.38	0.371	10.08	7.71		
7/15/2020	2020	3:00 PM	In floc just after pass, W of lake gage	During treatment	2	24.32	0.383	10.10	7.69		
7/15/2020	2020	5:00 PM	Station #2	During treatment	0	25.45	0.424	9.26	7.94	1.90	secchi at bo
7/15/2020	2020	5:00 PM	Station #2	During treatment	0.5	25.10	0.413	9.70	7.88		
7/15/2020	2020	5:00 PM	Station #2	During treatment	1	24.96	0.411	9.78	7.84		
7/15/2020	2020	5:00 PM	Station #2	During treatment	1.5	24.64	0.401	10.11	7.83		
7/15/2020	2020	5:00 PM	Station #2	During treatment	2	25.02	0.397	11.42	7.65		
7/15/2020	2020	5:00 PM	Mid-Lake Station	During treatment	0	25.01	0.402	9.78	7.68	2.4	secchi at bo
7/15/2020	2020	5:00 PM	Mid-Lake Station	During treatment	0.5	25.00	0.400	9.77	7.69		
7/15/2020	2020	5:00 PM	Mid-Lake Station	During treatment	1	24.71	0.391	9.92	7.64		
7/15/2020	2020	5:00 PM	Mid-Lake Station	During treatment	1.5	24.69	0.398	9.98	7.52		
7/15/2020	2020	5:00 PM	Mid-Lake Station	During treatment	2	24.61	0.415	10.15	7.64		
7/15/2020	2020	5:00 PM	In floc just after pass, W of lake gage	During treatment	0.5	24.85	0.393	9.83	7.72		
7/15/2020	2020	5:00 PM	In floc just after pass, W of lake gage	During treatment	1	24.81	0.427	10.02	7.62		
7/15/2020	2020	8:00 PM	East bank	During treatment	0	25.24	0.395	9.15	7.93	1.6	secchi at bo
7/15/2020	2020	8:00 PM	East bank	During treatment	0.5	25.17	0.397	9.92	7.86		
7/15/2020	2020	8:00 PM	East bank	During treatment	1	25.01	0.412	10.03	7.82		
7/15/2020	2020	8:00 PM	East bank	During treatment	1.5	24.88	0.421	10.28	7.82		
7/15/2020	2020	8:00 PM	North end	During treatment	0	25.24	0.447	9.46	7.78	2.1	secchi at bo
7/15/2020	2020	8:00 PM	North end	During treatment	0.5	24.27	0.447	9.69	7.75		
7/15/2020	2020	8:00 PM	North end	During treatment	1	25.16	0.452	9.85	7.68		

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0	secchi at bottom
4	secchi at bottom
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6	secchi at bottom
1	secchi at bottom

Date	Year	Time	Location	Pre-, During, or Post- Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	рН	Secchi (m) Notes
7/15/2020	2020	8:00 PM	North end	During treatment	1.5	25.08	0.445	9.98	7.70	
7/15/2020	2020	8:00 PM	North end	During treatment	2	24.84	0.411	10.37	7.76	
7/15/2020	2020	8:00 PM	Mid-Lake Station	During treatment	0	25.57	0.452	9.09	7.66	2.05 secchi at bottom
7/15/2020	2020	8:00 PM	Mid-Lake Station	During treatment	0.5	25.43	0.444	9.21	7.58	
7/15/2020	2020	8:00 PM	Mid-Lake Station	During treatment	1	24.97	0.441	9.80	7.50	
7/15/2020	2020	8:00 PM	Mid-Lake Station	During treatment	1.5	24.81	0.398	10.01	7.57	
7/15/2020	2020	8:00 PM	Mid-Lake Station	During treatment	2	24.8	0.395	4.41	7.47	reading at bottom
7/15/2020	2020	8:00 PM	Station #2	During treatment	0	25.15	0.473	9.04	7.51	1.7 secchi at bottom
7/15/2020	2020	8:00 PM	Station #2	During treatment	0.5	25.44	0.469	9.19	7.50	
7/15/2020	2020	8:00 PM	Station #2	During treatment	1	25.39	0.466	9.41	7.58	
7/15/2020	2020	8:00 PM	Station #2	During treatment	1.5	25.08	0.453	9.75	7.76	
7/16/2020	2020	10:00 AM	Mid-Lake Station	During treatment	0	23.73	0.453	9.38	8.54	2.35 secchi at bottom
7/16/2020	2020	10:00 AM	Mid-Lake Station	During treatment	0.5	23.78	0.448	9.41	8.38	
7/16/2020	2020	10:00 AM	Mid-Lake Station	During treatment	1	23.81	0.461	9.51	8.31	
7/16/2020	2020	10:00 AM	Mid-Lake Station	During treatment	1.5	23.79	0.485	9.33	8.24	
7/16/2020	2020	10:00 AM	Mid-Lake Station	During treatment	2	23.61	0.462	9.37	8.24	
7/16/2020	2020	10:00 AM	Station #2	During treatment	0	23.76	0.465	9.24	8.04	2.4 secchi at bottom
7/16/2020	2020	10:00 AM	Station #2	During treatment	0.5	23.8	0.464	9.31	8.01	
7/16/2020	2020	10:00 AM	Station #2	During treatment	1	23.78	0.466	9.45	7.96	
7/16/2020	2020	10:00 AM	Station #2	During treatment	1.5	23.77	0.466	9.30	7.88	
7/16/2020	2020	10:00 AM	Station #2	During treatment	2	23.73	0.479	9.12	7.82	
7/16/2020	2020	10:00 AM	Station #2	During treatment	2.3	23.74	0.507	7.25	7.33	reading at bottom
7/16/2020	2020	10:30 AM	North end	During treatment	0	23.94	0.445	9.50	7.83	2.1 secchi at bottom
7/16/2020	2020	10:30 AM	North end	During treatment	0.5	23.94	0.445	9.46	7.85	
7/16/2020	2020	10:30 AM	North end	During treatment	1	23.93	0.446	9.47	7.86	
7/16/2020	2020	10:30 AM	North end	During treatment	1.5	23.89	0.479	9.82	7.89	
7/16/2020	2020	10:30 AM	North end	During treatment	2	23.92	0.486	9.52	7.83	
7/16/2020	2020	10:30 AM	In floc 5 mins after passing	During treatment	0	23.79	0.513	9.61	7.81	
7/16/2020	2020	10:30 AM	In floc 5 mins after passing	During treatment	0.5	23.79	0.495	9.55	7.84	
7/16/2020	2020	10:30 AM	In floc 5 mins after passing	During treatment	1	23.79	0.506	9.47	7.88	
7/16/2020	2020	12:00 PM	Station #2	During treatment	0	24.03	0.499	9.29	7.58	1.7 secchi at bottom
7/16/2020	2020	12:00 PM	Station #2	During treatment	0.5	23.99	0.510	9.22	7.62	
7/16/2020	2020	12:00 PM	Station #2	During treatment	1	23.94	0.538	9.23	7.62	
7/16/2020	2020	12:00 PM	Station #2	During treatment	1.5	23.86	0.522	9.27	7.57	
7/16/2020	2020	12:00 PM	Mid-Lake Station	During treatment	0	24	0.473	9.13	7.69	2.3 secchi at bottom. Floc still visible in water column
7/16/2020	2020	12:00 PM	Mid-Lake Station	During treatment	0.5	24	0.475	9.19	7.66	
7/16/2020	2020	12:00 PM	Mid-Lake Station	During treatment	1	23.98	0.485	9.17	7.64	
7/16/2020	2020	12:00 PM	Mid-Lake Station	During treatment	1.5	23.99	0.498	9.36	7.69	

Date	Year	Time	Location	Pre-, During, or Post- Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	рН	Secchi (m)	Notes
7/16/2020	2020	12:00 PM	Mid-Lake Station	During treatment	2	24	0.508	9.32	7.86		
7/16/2020	2020	2:00 PM	Mid-Lake Station	Post-treatment	0	24.4	0.483	9.35	7.75	2.1	secchi at bottom
7/16/2020	2020	2:00 PM	Mid-Lake Station	Post-treatment	0.5	24.42	0.483	9.38	7.56		
7/16/2020	2020	2:00 PM	Mid-Lake Station	Post-treatment	1	24.37	0.484	9.43	7.33		
7/16/2020	2020	2:00 PM	Mid-Lake Station	Post-treatment	1.5	24.38	0.489	9.45	7.14		
7/16/2020	2020	2:00 PM	Mid-Lake Station	Post-treatment	2	24.43	0.505	12.76	7.12		reading at bottom
7/16/2020	2020	2:00 PM	Station #2	Post-treatment	0	24.51	0.484	9.06	7.13	1.95	secchi at bottom
7/16/2020	2020	2:00 PM	Station #2	Post-treatment	0.5	24.51	0.485	9.23	7.05		
7/16/2020	2020	2:00 PM	Station #2	Post-treatment	1	24.51	0.486	9.23	6.97		
7/16/2020	2020	2:00 PM	Station #2	Post-treatment	1.5	24.51	0.486	9.26	6.93		
7/16/2020	2020	2:00 PM	North end	Post-treatment	0	24.78	0.487	9.15	7.20	2.3	secchi at bottom
7/16/2020	2020	2:00 PM	North end	Post-treatment	0.5	24.59	0.494	9.24	7.17		
7/16/2020	2020	2:00 PM	North end	Post-treatment	1	24.23	0.505	9.29	7.00		
7/16/2020	2020	2:00 PM	North end	Post-treatment	1.5	24.23	0.506	9.47	6.86		
7/16/2020	2020	2:00 PM	North end	Post-treatment	2	24.23	0.506	9.59	6.76		
7/17/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	0	23.79	0.494	9.03	8.17	2.2	secchi at bottom
7/17/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	0.5	23.84	0.493	9.02	8.10		
7/17/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	1	23.86	0.494	9.01	7.80		
7/17/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	1.5	23.85	0.494	9.10	7.62		
7/17/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	2	23.85	0.495	8.70	7.58		
7/17/2020	2020	12:00 PM	Station #2	Post-treatment	0	23.81	0.497	8.84	7.32	2	secchi at bottom. GAGE 4.7'
7/17/2020	2020	12:00 PM	Station #2	Post-treatment	0.5	23.81	0.498	8.74	7.28		
7/17/2020	2020	12:00 PM	Station #2	Post-treatment	1	23.81	0.497	8.87	7.26		
7/17/2020	2020	12:00 PM	Station #2	Post-treatment	1.5	23.81	0.497	8.90	7.24		
7/17/2020	2020	12:00 PM	Station #2	Post-treatment	2	24.17	0.494	8.11	7.03		
8/7/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	0	23.2	0.519	8.94	8.45	2.1	secchi at bottom
8/7/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	0.5	23.2	0.519	8.88	8.30		
8/7/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	1	23.21	0.519	9.02	8.18		
8/7/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	1.5	23.21	0.519	9.13	8.18		
8/7/2020	2020	11:30 AM	Mid-Lake Station	Post-treatment	2	23.22	0.519	9.09	8.06		
8/7/2020	2020	12:00 PM	Station #2	Post-treatment	0	23.29	0.521	9.04	7.82	1.6	secchi at bottom. GAGE 4.2'
8/7/2020	2020	12:00 PM	Station #2	Post-treatment	0.5	23.28	0.519	8.95	7.82		
8/7/2020	2020	12:00 PM	Station #2	Post-treatment	1	23.29	0.519	8.93	7.81		
8/7/2020	2020	12:00 PM	Station #2	Post-treatment	1.5	23.3	0.519	4.19	7.30		at bottom
9/11/2020	2020	11:30 AM	Mid-Lake Station	Monthly Sampling	0	21.28	0.575	9.85	8.41	1.84	in muck. GAGE 3.55'
9/11/2020	2020	11:30 AM	Mid-Lake Station	Monthly Sampling	0.5	21.28	0.575	9.79	8.33		
9/11/2020	2020	11:30 AM	Mid-Lake Station	Monthly Sampling	1	21.29	0.576	9.84	8.13		
9/11/2020	2020	11:30 AM	Mid-Lake Station	Monthly Sampling	1.5	21.26	0.576	10.11	8.09		
9/11/2020	2020	11:30 AM	Mid-Lake Station	Monthly Sampling	1.8	21.26	0.480	2.58	7.58		at bottom
9/11/2020	2020	12:00 PM	Station #2	Monthly Sampling	0	21.39	0.578	9.82	7.65	1.45	secchi at bottom

Data	Maria		• • • • •	Pre-, During, or Post-	Depth	Temperature	Conductivity	Dissolved		Secchi	
Date	Year	Time	Location	Treatment	(m)	(°C)	(mS/cm)	Oxygen (mg/L)	рН	(m)	Notes
9/11/2020	2020	12:00 PM	Station #2	Monthly Sampling	0.5	21.38	0.576	9.79	7.66		
9/11/2020	2020	12:00 PM	Station #2	Monthly Sampling	1	21.37	0.576	9.81	7.66		
9/11/2020	2020	12:00 PM	Station #2	Monthly Sampling	1.5	21.4	0.506	6.83	6.97		at bottom
10/19/2020	2020		Mid-Lake Station	Monthly Sampling	0	14.49	0.495	10.57	8.44	1.9	secchi at bottom. GAGE 3.6' . After bringing up secchi, sulfur smell was
10/19/2020	2020			Montiny Sampling	0	14.45	0.495	10.57	0.44	1.9	observed, but 1m depth samples don't smell noticeably
10/19/2020	2020		Mid-Lake Station	Monthly Sampling	0.5	14.48	0.496	10.42	8.11		
10/19/2020	2020		Mid-Lake Station	Monthly Sampling	1	14.49	0.497	10.47	8.06		
10/19/2020	2020		Mid-Lake Station	Monthly Sampling	1.5	14.5	0.496	10.38	8.02		
10/19/2020	2020		Mid-Lake Station	Monthly Sampling	1.9	15.21	0.435	1.10	6.93		bottom
10/19/2020	2020		Station #2	Monthly Sampling	0	14.54	0.496	10.35	7.33	1.5	secchi at bottom
10/19/2020	2020		Station #2	Monthly Sampling	0.5	14.51	0.497	10.50	7.36		
10/19/2020	2020		Station #2	Monthly Sampling	1	14.52	0.497	10.48	7.39		
10/19/2020	2020		Station #2	Monthly Sampling	1.5	14.59	0.496	5.68	7.16		
1/19/2021	2021		Mid-Lake Station	Off-Season Sampling	0	7.04	0.318	11.79	9.20	2.15	secchi at bottom. GAGE 5.3'
1/19/2021	2021		Mid-Lake Station	Off-Season Sampling	0.5	7.01	0.317	11.88	8.97		
1/19/2021	2021		Mid-Lake Station	Off-Season Sampling	1	7.00	0.317	11.90	8.52		
1/19/2021	2021		Mid-Lake Station	Off-Season Sampling	1.5	6.93	0.317	11.78	8.42		
1/19/2021	2021		Mid-Lake Station	Off-Season Sampling	2	6.74	0.316	11.85	8.34		
1/19/2021	2021		Station #2	Off-Season Sampling	0	6.92	0.320	11.97	8.04	2.0	secchi at bottom
1/19/2021	2021		Station #2	Off-Season Sampling	0.5	6.89	0.317	12.17	8.13		
1/19/2021	2021		Station #2	Off-Season Sampling	1	6.94	0.319	12.01	8.04		
1/19/2021	2021		Station #2	Off-Season Sampling	1.5	6.87	0.318	12.01	8.00		
1/19/2021	2021		Station #2	Off-Season Sampling	2	6.89	0.317	12.03	7.97		
3/17/2021	2021		Mid-Lake Station	Off-Season Sampling	0	9.98	3.010	12.36	8.26	1.8	secchi NOT bottom. Gage 6.1 ft. several ducks observed
3/17/2021	2021		Mid-Lake Station	Off-Season Sampling	0.5	9.91	0.301	12.46	8.15		
3/17/2021	2021		Mid-Lake Station	Off-Season Sampling	1	9.64	0.300	12.29	8.11		
3/17/2021	2021		Mid-Lake Station	Off-Season Sampling	1.5	8.98	0.300	12.15	8.07		
3/17/2021	2021		Mid-Lake Station	Off-Season Sampling	2	8.90	0.299	12.75	8.04		
3/17/2021	2021		Mid-Lake Station	Off-Season Sampling	2.5	8.92	0.341	7.61	6.80		bottom
3/17/2021	2021		Station #2	Off-Season Sampling	0	10.09	0.301	11.82	7.44	2.1	just above/at bottom
3/17/2021	2021		Station #2	Off-Season Sampling	0.5	10.04	0.301	11.92	7.42		
3/17/2021	2021		Station #2	Off-Season Sampling	1	9.99	0.302	12.08	7.48		
3/17/2021	2021		Station #2	Off-Season Sampling	1.5	9.86	0.301	12.14	7.50		
3/17/2021	2021		Station #2	Off-Season Sampling	2	9.98	0.288	12.01	7.26		
3/17/2021	2021		Station #2	Off-Season Sampling	2.4	9.72	0.286	8.10	7.00		resting at bottom in muck

Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	рН	Secchi (m)	Water Depth (m)	Notes
5/23/2023	2023	11:40 AM	Mid-Lake	Monthly	0.5	20.16	0.152	9.57	105.10	8.25	0.63	2.72	gage 5.54'
5/23/2023	2023	11:40 AM	Mid-Lake	Monthly	1	19.98	0.151	9.77	107.20	8.26			
5/23/2023	2023	11:40 AM	Mid-Lake	Monthly	1.5	19.87	0.152	9.68	105.80	8.21			
5/23/2023	2023	11:40 AM	Mid-Lake	Monthly	2	19.32	0.151	8.85	95.30	7.86			
5/23/2023	2023	11:40 AM	Mid-Lake	Monthly	2.5	18.98	0.151	7.87	83.90	7.41			
6/27/2023	2023	12:16 PM	Mid-Lake	Pre Treatment/Monthly	0.5	22.52	0.155	9.58	112.70	8.49	0.90	2.40	gage 4.75
6/27/2023	2023	12:16 PM	Mid-Lake	Pre Treatment/Monthly	1	22.39	0.155	9.45	113.90	8.49			
6/27/2023	2023	12:16 PM	Mid-Lake	Pre Treatment/Monthly	1.5	22.23	0.155	9.82	112.80	8.43			
6/27/2023	2023	12:16 PM	Mid-Lake	Pre Treatment/Monthly	2	22.16	0.155	9.64	107.30	8.24			
6/28/2023	2023	8:39 AM	Mid-Lake	Morning of Treatment	0.5	22.38	0.155	9.35	108.30	8.40	1.00	2.44	gage 4.75
6/28/2023	2023	8:39 AM	Mid-Lake	Morning of Treatment	1	22.37	0.155	9.35	109.10	8.41			
6/28/2023	2023	8:39 AM	Mid-Lake	Morning of Treatment	1.5	22.36	0.155	9.43	109.70	8.37			
6/28/2023	2023	8:39 AM	Mid-Lake	Morning of Treatment	2	22.31	0.155	8.75	101.20	8.16			
6/28/2023	2023	8:28 AM	Station #2	Morning of Treatment	0.5	22.25	0.155	9.09	105.50	8.16	0.93	1.85	
6/28/2023	2023	8:28 AM	Station #2	Morning of Treatment	1	22.30	0.155	9.25	107.00	8.23			
6/28/2023	2023	8:28 AM	Station #2	Morning of Treatment	1.5	22.26	0.155	9.16	106.10	8.17			
6/28/2023	2023	9:50 AM	Station #2	During	0.5	22.50	0.156	9.35	108.70	8.39	1.10		
6/28/2023	2023	9:50 AM	Station #2	During	1	22.40	0.156	9.21	106.90	8.33			
6/28/2023	2023	9:50 AM	Station #2	During	1.5	22.32	0.156	9.05	104.70	8.13			
6/28/2023	2023	10:02 AM	Mid-Lake	During	0.5	22.58	0.155	9.61	111.80	8.50			
6/28/2023	2023	10:02 AM	Mid-Lake	During	1	22.58	0.155	9.75	114.90	8.49			

Table B-2. Waughop Lake Field Monitoring Data Collected by Tetra Tech, 2023-2024.

Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	рН	Secchi (m)	Water Depth (m)	Notes
6/28/2023	2023	10:02 AM	Mid-Lake	During	1.5	22.30	0.155	9.06	105.00	8.34			
6/28/2023	2023	10:02 AM	Mid-Lake	During	2	22.13	0.155	7.88	90.80	7.80			
6/28/2023	2023	11:14 AM	In Floc	During	0.5	22.69	0.179	9.50	111.00	7.80			
6/28/2023	2023	11:14 AM	In Floc	During	1.5	22.46	0.157	9.52	110.80	8.05			
6/28/2023	2023	11:24 AM	Mid-Lake	During	0.5	22.75	0.170	9.49	110.90	7.91	1.13		
6/28/2023	2023	11:24 AM	Mid-Lake	During	1	22.71	0.169	9.72	114.20	7.92			
6/28/2023	2023	11:24 AM	Mid-Lake	During	1.5	22.68	0.163	9.70	113.20	8.03			
6/28/2023	2023	11:24 AM	Mid-Lake	During	2	22.27	0.161	9.18	106.80	7.91			
6/28/2023	2023	11:40 AM	Station #2	During	0.5	22.82	0.166	9.42	110.10	7.91	0.97		
6/28/2023	2023	11:40 AM	Station #2	During	1	22.81	0.169	9.52	111.30	7.82			
6/28/2023	2023	11:40 AM	Station #2	During	1.5	22.79	0.167	9.19	107.40	7.69			
6/28/2023	2023	12:45 PM	Station #2	During	0.5	23.12	0.174	9.50	111.70	7.96	1.08		
6/28/2023	2023	12:45 PM	Station #2	During	1	7.63	0.174	9.47	111.40	7.93			
6/28/2023	2023	12:45 PM	Station #2	During	1.5	7.65	0.175	9.52	112.00	7.92			
6/28/2023	2023	12:56 PM	Mid-Lake	During	0.5	23.12	0.207	9.45	111.20	7.63	1.20		
6/28/2023	2023	12:56 PM	Mid-Lake	During	1	23.14	0.204	9.62	113.20	7.65			
6/28/2023	2023	12:56 PM	Mid-Lake	During	1.5	22.93	0.202	9.41	110.30	7.64			
6/28/2023	2023	12:56 PM	Mid-Lake	During	2	22.70	0.195	9.20	107.40	7.58			
6/28/2023	2023	2:39 PM	Station #2	During	0.5	23.75	0.209	9.36	111.50	7.59	1.29		
6/28/2023	2023	2:39 PM	Station #2	During	1	23.68	0.228	9.45	112.50	7.46			
6/28/2023	2023	2:39 PM	Station #2	During	1.5	23.68	0.234	4.94	58.80	7.33			

I	Notes

Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	рН	Secchi (m)	Water Depth (m)	Notes
6/28/2023	2023	2:55 PM	Mid-Lake	During	0.5	23.73	0.202	9.65	115.20	7.67	1.33		
6/28/2023	2023	2:55 PM	Mid-Lake	During	1	23.34	0.208	9.72	115.00	7.55			
6/28/2023	2023	2:55 PM	Mid-Lake	During	1.5	23.14	0.213	9.87	116.40	7.55			
6/28/2023	2023	2:55 PM	Mid-Lake	During	2	22.87	0.202	10.18	118.60	7.55			
6/28/2023	2023	4:07 PM	Station #2	During	0.5	24.35	0.215	9.45	114.00	7.55	1.48		
6/28/2023	2023	4:07 PM	Station #2	During	1	24.23	0.228	9.40	113.30	7.44			
6/28/2023	2023	4:07 PM	Station #2	During	1.5	23.39	0.216	9.88	117.00	7.41			
6/28/2023	2023	4:20 PM	Mid-Lake	During	0.5	24.14	0.222	9.57	115.00	7.51	1.53		
6/28/2023	2023	4:20 PM	Mid-Lake	During	1	23.64	0.230	9.64	114.70	7.44			
6/28/2023	2023	4:20 PM	Mid-Lake	During	1.5	23.68	0.230	9.74	116.00	7.41			
6/28/2023	2023	4:20 PM	Mid-Lake	During	2	23.37	0.219	9.78	116.00	7.42			
6/28/2023	2023	6:30 PM	Station #2	After 1st day Application	0.5	24.30	0.239	9.61	115.80	7.53	1.73		
6/28/2023	2023	6:30 PM	Station #2	After 1st day Application	1	24.29	0.242	9.87	118.90	7.46			
6/28/2023	2023	6:30 PM	Station #2	After 1st day Application	1.5	24.25	0.251	9.80	118.00	7.41			
6/28/2023	2023	6:45 PM	Mid-Lake	After 1st day Application	0.5	24.26	0.267	9.36	112.60	7.32	2.17		
6/28/2023	2023	6:45 PM	Mid-Lake	After 1st day Application	1	24.25	0.262	9.81	118.10	7.27			
6/28/2023	2023	6:45 PM	Mid-Lake	After 1st day Application	1.5	24.08	0.250	9.79	117.50	7.36			
6/28/2023	2023	6:45 PM	Mid-Lake	After 1st day Application	2	23.85	0.241	10.27	122.60	7.35			
6/29/2023	2023	6:55 AM	Mid-Lake	Before 2nd day Application	0.5	23.08	0.232			7.61	2.3		gage 4.75; DO not recorded due to b
6/29/2023	2023	6:55 AM	Mid-Lake	Before 2nd day Application	1	23.19	0.232			7.60			
6/29/2023	2023	6:55 AM	Mid-Lake	Before 2nd day Application	1.5	23.19	0.231			7.59			

Notes
gage 4.75; DO not recorded due to barge motor and interference

Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	рН	Secchi (m)	Water Depth (m)	
6/29/2023	2023	6:55 AM	Mid-Lake	Before 2nd day Application	2	23.17	0.230			7.59			
6/29/2023	2023	7:45 AM	Station #2	During	0.5	23.10	0.239	9.76	114.60	7.54	bottom	1.92	
6/29/2023	2023	7:45 AM	Station #2	During	1	23.15	0.238	9.79	115.10	7.47	bottom		
6/29/2023	2023	7:45 AM	Station #2	During	1.5	23.12	0.239	9.71	114.10	7.48	bottom		
6/29/2023	2023	7:30 AM	Mid-Lake	During	0.5	23.17	0.232	10.05	118.50	7.65	2.20	2.46	windy; barge c
6/29/2023	2023	7:30 AM	Mid-Lake	During	1	23.14	0.235	9.93	117.30	7.57			
6/29/2023	2023	7:30 AM	Mid-Lake	During	1.5	23.10	0.236	9.62	113.20	7.53			
6/29/2023	2023	7:30 AM	Mid-Lake	During	2	23.11	0.234	9.77	114.70	7.49			
6/29/2023	2023	9:25 AM	Station #2	During	0.5	23.09	0.284	9.59	112.50	7.27	bottom	1.92	
6/29/2023	2023	9:25 AM	Station #2	During	1	23.08	0.286	9.77	114.70	7.15	bottom		
6/29/2023	2023	9:25 AM	Station #2	During	1.5	23.07	0.286	9.71	115.10	7.14	bottom		
6/29/2023	2023	9:40 AM	Mid-Lake	During	0.5	23.12	0.273	9.65	113.30	7.26	bottom	2.46	
6/29/2023	2023	9:40 AM	Mid-Lake	During	1	23.13	0.272	9.80	115.10	7.19	bottom		
6/29/2023	2023	9:40 AM	Mid-Lake	During	1.5	23.15	0.283	9.65	113.40	7.13	bottom		
6/29/2023	2023	9:40 AM	Mid-Lake	During	2	23.16	0.299	9.64	113.30	7.06	bottom		
6/29/2023	2023	10:55 AM	Station #2	During	0.5	23.42	0.302	9.20	108.70	7.03	bottom		
6/29/2023	2023	10:55 AM	Station #2	During	1	23.42	0.302	9.28	109.80	6.99	bottom		
6/29/2023	2023	10:55 AM	Station #2	During	1.5	23.38	0.302	9.26	109.40	6.98	bottom		
6/29/2023	2023	11:15 AM	Mid-Lake	During	0.5	23.40	0.276	9.59	112.90	7.25	bottom		
6/29/2023	2023	11:15 AM	Mid-Lake	During	1	23.35	0.278	9.65	113.90	7.21	bottom		
6/29/2023	2023	11:15 AM	Mid-Lake	During	1.5	23.33	0.281	9.83	116.10	7.12	bottom		

Notes
windy, lots of geese
edrove by right when collecting 2 m measurements

Notes	Water Depth (m)	Secchi (m)	рН	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Conductivity (mS/cm)	Temperature (°C)	Depth (m)	Pre-, During, or Post-Treatment	Location	Time	Year	Date
		bottom	7.14	114.30	9.70	0.289	23.33	2	During	Mid-Lake	11:15 AM	2023	6/29/2023
very windy; waves a		bottom	7.08	115.30	9.67	0.293	23.90	0.5	After 2nd Day Application	Station #2	12:53 PM	2023	6/29/2023
		bottom	6.98	114.60	9.62	0.293	23.84	1	After 2nd Day Application	Station #2	12:53 PM	2023	6/29/2023
		bottom	6.94	114.20	9.59	0.294	23.83	1.5	After 2nd Day Application	Station #2	12:53 PM	2023	6/29/2023
		bottom	7.11	114.80	9.65	0.276	23.76	0.5	After 2nd Day Application	Mid-Lake	1:10 PM	2023	6/29/2023
		bottom	6.99	116.40	9.80	0.276	23.71	1	After 2nd Day Application	Mid-Lake	1:10 PM	2023	6/29/2023
		bottom	6.95	116.90	9.85	0.276	23.71	1.5	After 2nd Day Application	Mid-Lake	1:10 PM	2023	6/29/2023
		bottom	6.98	117.70	9.91	0.276	23.70	2	After 2nd Day Application	Mid-Lake	1:10 PM	2023	6/29/2023
gage 4.7	2.40	bottom	7.31	110.80	9.31	0.286	23.91	0.5	Post Treatment - Day After	Mid-Lake	12:10 PM	2023	6/30/2023
		bottom	7.21	110.80	9.21	0.286	23.85	1	Post Treatment - Day After	Mid-Lake	12:10 PM	2023	6/30/2023
		bottom	7.22	111.50	9.40	0.286	23.84	1.5	Post Treatment - Day After	Mid-Lake	12:10 PM	2023	6/30/2023
		bottom	7.24	111.20	9.38	0.288	23.84	2	Post Treatment - Day After	Mid-Lake	12:10 PM	2023	6/30/2023
	1.88	bottom	7.30	110.50	9.23	0.286	23.91	0.5	Post Treatment - Day After	Station #2	11:54 AM	2023	6/30/2023
		bottom	7.29	110.80	9.37	0.286	23.90	1	Post Treatment - Day After	Station #2	11:54 AM	2023	6/30/2023
		bottom	7.26	110.60	9.33	0.286	23.91	1.5	Post Treatment - Day After	Station #2	11:54 AM	2023	6/30/2023
gage 4.4	2.31	bottom	8.24	111.00	9.45	0.297	23.15	0.5	2 wk Post Treatment - July Monthly	Mid-Lake	11:00 AM	2023	7/13/2023
		bottom	8.21	111.50	9.50	0.297	23.14	1	2 wk Post Treatment - July Monthly	Mid-Lake	11:00 AM	2023	7/13/2023
		bottom	8.20	112.80	9.59	0.297	23.13	1.5	2 wk Post Treatment - July Monthly	Mid-Lake	11:00 AM	2023	7/13/2023
		bottom	8.15	110.30	9.45	0.296	22.89	2	2 wk Post Treatment - July Monthly	Mid-Lake	11:00 AM	2023	7/13/2023
gage 3.8 ft; lost about 0.7 m of wat jumping, no odor, sli	2.05	1.70	8.26	107.80	8.71	0.332	25.67	0.5	Monthly Post Treatment	Mid-Lake	9:30 AM	2023	8/15/2023

Notes
very windy; waves and white caps
gage 4.75
gage 4.48
gage 3.8 ft; lost about 0.7 m of water depth since July; many fish jumping, no odor, slight green color

Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	рН	Secchi (m)	Water Depth (m)	Notes
8/15/2023	2023	9:30 AM	Mid-Lake	Monthly Post Treatment	1	25.60	0.332	8.87	109.40	8.30			
8/15/2023	2023	9:30 AM	Mid-Lake	Monthly Post Treatment	1.5	25.46	0.331	9.11	112.10	8.33			
9/14/2023	2023	10:20 AM	Mid-Lake	Monthly Post Treatment (HL4)	0.5	20.55	0.346	10.44	116.50	8.72	1.74	1.98	gage 3.33 bottom of lake de
9/14/2023	2023	10:20 AM	Mid-Lake	Monthly Post Treatment (HL4)	1	20.46	0.345	10.76	120.10	8.71			
9/14/2023	2023	10:20 AM	Mid-Lake	Monthly Post Treatment (HL4)	1.5	20.28	0.345	10.65	118.80	8.71			
9/14/2023	2023	10:20 AM	Mid-Lake	Monthly Post Treatment (MS5)	0.5	20.55	0.319	10.45	115.50	8.59	1.74	1.98	gage 3.33 bottom of lake de
9/14/2023	2023	10:20 AM	Mid-Lake	Monthly Post Treatment (MS5)	1	20.45	0.319	10.46	115.40	8.60			
9/14/2023	2023	10:20 AM	Mid-Lake	Monthly Post Treatment (MS5)	1.5	20.31	0.319	10.56	116.30	8.59			
10/11/2023	2023	10:30 AM	Mid-Lake	Monthly Post Treatment (MS5)	0.5	15.80	0.328	10.85	111.10	8.70	0.90	1.86	gage 3.0; raining hard, made se
10/11/2023	2023	10:30 AM	Mid-Lake	Monthly Post Treatment (MS5)	1	15.80	0.328	10.82	110.70	8.72			
10/11/2023	2023	10:30 AM	Mid-Lake	Monthly Post Treatment (MS5)	1.5	15.75	0.327	10.82	110.50	8.72			
12/12/2023	2023	10:18 AM	Mid-Lake	Quarterly Post Treatment (MS5)	0.5	7.17	0.254	13.25	108.50	8.17	0.77	2.35	gage 4.2; water is green, fish jumping, g picking up anchor; water level mu
12/12/2023	2023	10:18 AM	Mid-Lake	Quarterly Post Treatment (MS5)	1	7.13	0.253	13.26	108.50	8.21			
12/12/2023	2023	10:18 AM	Mid-Lake	Quarterly Post Treatment (MS5)	1.5	7.13	0.253	13.19	108.00	8.24			
12/12/2023	2023	10:18 AM	Mid-Lake	Quarterly Post Treatment (MS5)	2	7.14	0.254	13.19	108.00	8.26			
3/13/2024	2024	9:30	Mid-Lake	Quarterly Post Treatment (MS5)	0.5	7.67	0.202	13.33	109.40	8.73	0.7	2.9	gage 5.68 ft; sunny 40, water is green observed, rotten egg smell when pull water leaves hands feelir
3/13/2024	2024	9:30	Mid-Lake	Quarterly Post Treatment (MS5)	1	7.62	0.203	13.31	109.80	8.76			
3/13/2024	2024	9:30	Mid-Lake	Quarterly Post Treatment (MS5)	1.5	7.59	0.202	13.26	109.20	8.77			
3/13/2024	2024	9:30	Mid-Lake	Quarterly Post Treatment (MS5)	2	7.58	0.202	13.22	108.80	8.77			
3/13/2024	2024	9:30	Mid-Lake	Quarterly Post Treatment (MS5)	2.5	7.48	0.202	13.02	107.20	8.69			
6/27/2024	2024	10:30	Mid-Lake	Quarterly Post Treatment (MS5)	0.5	21.48	0.224	9.06	102.40	7.29	0.85	2.50	gage (big) 4.5 ft; cloudy, very windy, affected by choppy water, geese and d

er th)	Notes
8	gage 3.33 bottom of lake depth gage; very windy
8	gage 3.33 bottom of lake depth gage; very windy
6	gage 3.0; raining hard, made secchi disk reading difficult
5	gage 4.2; water is green, fish jumping, geese on the lake, no smell when picking up anchor; water level much higher, 40 and overcast
)	gage 5.68 ft; sunny 40, water is green and cloudy, waterfowl and fish observed, rotten egg smell when pulling up seechi disk and anchor; water leaves hands feeling slimy and sticky
0	gage (big) 4.5 ft; cloudy, very windy, 50-60 deg C, secchi probably affected by choppy water, geese and ducks, kingfisher, sparrows, bald

Date	Year	Time	Location	Pre-, During, or Post-Treatment	Depth (m)	Temperature (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	рН	Secchi (m)	Water Depth (m)	
													eagle and ospre location as last yea slight hydrogen su middle of lake, bu
6/27/2024	2024	10:30	Mid-Lake	Quarterly Post Treatment (MS5)	1	21.49	0.225	8.99	101.70	7.29			
6/27/2024	2024	10:30	Mid-Lake	Quarterly Post Treatment (MS5)	1.5	21.43	0.224	9.11	103.10	7.31			
6/27/2024	2024	10:30	Mid-Lake	Quarterly Post Treatment (MS5)	2	21.24	0.224	9.35	105.40	7.36			

Notes

prey observed flying around lake; osprey nest in same year, brownish/green tint to water, feels slimy to touch, n sulfide smell near lily pads on north shore, no odor at , buoy is not located at GPS coordinates, samples were collected at GPS coordinates



APPENDIX C: LABORATORY DATA REPORTS



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1712538	PAG	JE 1	
REPORT DATE:	04/28/20			
DATE SAMPLED:	03/23/20	DATE RECEIVED:	03/23/20	
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELEC	TED PARAMETERS ON WATER		
SAMPLES FROM TETRA TECH	I INC.			

CASE NARRATIVE

Four water samples were received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	SRP	AMMONIA	N03+N02	TOTAL-N	ALKALINITY
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)
Mid-Lake 1m	0.085	0.005	0.046	0.040	1.55	20.3
Mid-Lake Bottom	0.096	0.004	0.055	0.049	1.78	20.3
Lake #2 1 m	0.090	0.003	0.037	0.052	1.49	17.0
Lake #2 Bottom	0.085	0.003	0.044	0.050	1.80	20.1

	SULFATE	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	1.45	0.062	0.028	59	12
Mid-Lake Bottom	<1.00	0.072	0.017	81	16
Lake #2 1 m	<1.00	0.077	0.022	45	12
Lake #2 Bottom	<1.00	0.069	0.021	61	15



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1712538	PA	AGE 2
REPORT DATE:	04/28/20		
DATE SAMPLED:	03/23/20	DATE RECEIVED:	03/23/20
FINAL REPORT, LABORATORY A	NALYSIS OF SELEC	TED PARAMETERS ON WATER	
SAMPLES FROM TETRA TECH IN	с.		

QA/QC DATA

QC PARAMETER	TOTAL-P	SRP	AMMONIA	N03+N02	TOTAL-N	ALKALINITY
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)
METHOD	SM18 4500PF	SM18 4500PF	SM184500NH3H	SM184500N03F	SM204500NC	SM18 2320B
DATE ANALYZED	03/30/20	03/25/20	03/25/20	03/25/20	03/31/20	04/28/20
DETECTION LIMIT	0.002	0.001	0.010	0.010	0.050	1.00
DUPLICATE						
SAMPLE ID	BATCH	Lake #2	Lake #2	Lake #2	BATCH	Lake #2 Bottom
SAMFLE ID	БАТСП	Bottom	Bottom	Bottom	DAICH	Lake #2 Bottom
ORIGINAL	< 0.002	0.003	0.044	0.050	0.443	20.1
DUPLICATE	< 0.002	0.003	0.040	0.045	0.429	20.5
RPD	NC	0.00%	9.52%	10.53%	3.15%	1.97%
SPIKE SAMPLE		Lake #2	Lake #2	Lake #2		
SAMPLE ID	BATCH	Bottom	Bottom	Bottom	BATCH	
ORIGINAL	< 0.002	0.003	0.044	0.050	0.443	
SPIKED SAMPLE	0.050	0.023	0.248	0.256	1.60	
SPIKE ADDED	0.050	0.020	0.200	0.200	1.00	
% RECOVERY	100.00%	100.00%	102.00%	103.00%	115.63%	NA
QC CHECK						
FOUND	0.095	0.042	0.328	0.416	0.500	101
TRUE	0.094	0.039	0.324	0.408	0.490	100
% RECOVERY	101.06%	107.69%	101.23%	101.96%	102.04%	101.00%
BLANK	< 0.002	< 0.001	< 0.010	< 0.010	< 0.050	NA
BLANK	< 0.002	< 0.001	<0.010	<0.010	< 0.050	NA



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1712538	PAG	GE 3
REPORT DATE:	04/28/20		
DATE SAMPLED:	03/23/20	DATE RECEIVED:	03/23/20
FINAL REPORT, LABORATO	RY ANALYSIS OF SELECTE	D PARAMETERS ON WATER	
SAMPLES FROM TETRA TEC	H INC.		

QA/QC DATA

QC PARAMETER	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a	PHAEO_a (ug/L)
METHOD	EPA 375.4	EPA 200.7	EPA 200.7	SM1810200H	SM1810200H
DATE ANALYZED	03/31/20	03/30/20	03/30/20	03/27/20	03/27/20
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
SAMPLE ID	Lake #2 Bottom	BATCH	Lake #2 Bottom	BATCH	BATCH
ORIGINAL	<1.00	< 0.003	0.021	7.7	1.0
DUPLICATE	<1.00	< 0.003	0.023	7.1	0.9
RPD	NC	NC	9.09%	8.00%	10.53%
SPIKE SAMPLE					
SAMPLE ID	Lake #2 Bottom	BATCH	Lake #2 Bottom		
ORIGINAL	<1.00	< 0.003	0.021		
SPIKED SAMPLE	10.3	0.477	0.485		
SPIKE ADDED	10.0	0.500	0.500		
% RECOVERY	103.00%	95.40%	92.80%	NA	NA
QC CHECK					
FOUND	10.5	0.482	0.482		
TRUE	10.0	0.500	0.500		
% RECOVERY	105.00%	96.40%	96.40%	NA	NA
BLANK	<1.00	< 0.003	< 0.003	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANCE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

Mamien Hodemsh"

Damien Gadomski, PhD Laboratory Manager

T TF		INVOICE		TO: (IF DIFFERENT	믂	핅	ä	FROM REPORT)	M RE	POR	리		ł		Ŗ	PROJECT INFORMATION	PORMATIC	ž
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Seattle, WA 98101			년 41 (11년													Client PO:		<u>.</u>
Contact: Iris Lippert, Shannon Brattebo		Contact	유 												2	Client Project	Waughop Lake	Lake
	innon.brattebo@tetratech.com	 Email:													ç			
Phone: 206-838-6258	Fax	Phone:						"	F ×∝									
Reporting/Invoicing Format	Turn Around Time (TAT)*					Analysi	Vsis	is Requested	Jeste	ő,								
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QC Data Reported	3 Business Da				<u></u>)				
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**Matrix: B=Biota, DW=Drinking Water, GW=Groun SL=Sludge, SW=Surface Water, WW=Wastewater	**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater	Comments:	ents:		يني. ا	- - -				[_						
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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1712546	PAG	E 1
REPORT DATE:	04/28/20		
DATE SAMPLED:	03/26/20	DATE RECEIVED:	03/26/20
FINAL REPORT, LABORATORY	ANALYSIS OF SEL	ECTED PARAMETERS ON WATER	
SAMPLES FROM TETRA TECH I	NC.		

CASE NARRATIVE

Four water samples were received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	SRP	AMMONIA	N03+N02	TOTAL-N	ALKALINITY
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)
Mid-Lake 1m	0.011	0.003	0.031	0.025	0.465	10.0
Mid-Lake Bottom	0.008	< 0.001	0.031	0.025	0.507	10.1
Lake #2 1 m	0.010	0.003	0.035	0.024	0.468	9.50
Lake #2 Bottom	0.020	< 0.001	0.032	0.024	0.443	9.50

	SULFATE	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	85.6	0.439	0.037	1.8	< 0.1
Mid-Lake Bottom	85.1	0.450	0.038	1.4	< 0.1
Lake #2 1 m	81.8	0.701	0.068	0.8	< 0.1
Lake #2 Bottom	94.9	0.715	0.044	0.9	< 0.1



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1712546	PA	GE 2		
REPORT DATE:	04/28/20				
DATE SAMPLED:	03/26/20	DATE RECEIVED:	03/26/20		
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECTEI	D PARAMETERS ON WATER			
SAMPLES FROM TETRA TECH INC.					

QA/QC DATA

QC PARAMETER	TOTAL-P	SRP	AMMONIA	N03+N02	TOTAL-N	ALKALINITY
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)
METHOD	SM18 4500PF	SM18 4500PF	SM184500NH3H	SM184500N03F	SM204500NC	SM18 2320B
DATE ANALYZED	03/30/20	03/27/20	03/27/20	03/27/20	03/31/20	04/08/20
DETECTION LIMIT	0.002	0.001	0.010	0.010	0.050	1.00
DUPLICATE						
SAMPLE ID	BATCH	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom
ORIGINAL	< 0.002	< 0.001	0.032	0.024	0.443	9.50
DUPLICATE	< 0.002	< 0.001	0.033	0.025	0.429	9.90
RPD	NC	NC	3.08%	4.08%	3.15%	4.12%
SAMPLE ID	ВАТСН	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	
ORIGINAL	< 0.002	< 0.001	0.032	0.024	0.443	
SPIKED SAMPLE	0.050	0.022	0.234	0.228	1.60	
SPIKE ADDED	0.050	0.020	0.200	0.200	1.00	
% RECOVERY	100.00%	110.00%	101.00%	102.00%	115.63%	NA
QC CHECK						
FOUND	0.095	0.042	0.325	0.406	0.500	100
					0.490	
TRUE	0.094	0.039	0.324	0.408	0.490	100
TRUE % RECOVERY		0.039 107.69%	0.324 100.31%	0.408 99.51%	0.490 102.04%	100 100.00%
	0.094					



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1712546	PA	GE 3				
REPORT DATE:	04/28/20						
DATE SAMPLED:	03/26/20	DATE RECEIVED:	03/26/20				
FINAL REPORT, LABORATOR	FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER						
SAMPLES FROM TETRA TECH INC.							

QA/QC DATA

QC PARAMETER	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a	PHAEO_a (ug/L)
	EPA 375.4			(ug/L) SM1810200H	
METHOD		EPA 200.7	EPA 200.7		SM1810200H
DATE ANALYZED	04/01/20	03/30/20	03/30/20	03/27/20	03/27/20
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
SAMPLE ID	Lake #2 Bottom	BATCH	BATCH	BATCH	BATCH
ORIGINAL	94.9	< 0.003	0.021	7.7	1.0
DUPLICATE	95.0	< 0.003	0.023	7.1	0.9
RPD	0.13%	NC	9.09%	8.00%	10.53%
SPIKE SAMPLE					
SAMPLE ID	Lake #2 Bottom	BATCH	BATCH		
ORIGINAL	94.9	< 0.003	0.021		
SPIKED SAMPLE	105	0.477	0.485		
SPIKE ADDED	10.0	0.500	0.500		
% RECOVERY	105.81%	95.40%	92.80%	NA	NA
QC CHECK					
FOUND	10.6	0.482	0.482		
TRUE	10.0	0.500	0.500		
% RECOVERY	106.00%	96.40%	96.40%	NA	NA
BLANK	<1.00	< 0.003	< 0.003	NA	NA

SUBMITTED BY:

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Damien Gadomski, PhD Laboratory Manager

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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1712845	PAC	JE 1					
REPORT DATE:	04/28/20							
DATE SAMPLED:	04/10/20	DATE RECEIVED:	04/10/20					
FINAL REPORT, LABORATOR	FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER							
SAMPLES FROM TETRA TECH INC.								

CASE NARRATIVE

Four water samples were received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	SRP	AMMONIA	N03+N02	TOTAL-N	ALKALINITY
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)
Mid-Lake 1m	0.012	< 0.001	0.094	0.021	0.516	11.8
Mid-Lake Bottom	0.017	< 0.001	0.097	0.021	0.529	11.9
Lake #2 1 m	0.012	< 0.001	0.091	0.020	0.544	11.9
Lake #2 Bottom	0.015	< 0.001	0.095	0.020	0.501	11.7

	SULFATE	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	83.0	0.680	0.014	1.6	1.1
Mid-Lake Bottom	83.5	0.584	0.017	2.1	1.4
Lake #2 1 m	81.4	0.545	0.014	2.1	1.0
Lake #2 Bottom	83.0	0.582	0.019	2.1	1.2



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1712845	PA	GE 2		
REPORT DATE:	04/28/20				
DATE SAMPLED:	04/10/20	DATE RECEIVED:	04/10/20		
FINAL REPORT, LABORATORY A	NALYSIS OF SELEC	TED PARAMETERS ON WATER			
SAMPLES FROM TETRA TECH INC.					

QA/QC DATA

QC PARAMETER	TOTAL-P	SRP	AMMONIA	N03+N02	TOTAL-N	ALKALINITY
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)
METHOD	SM18 4500PF	SM18 4500PF	SM184500NH3H	SM184500N03F	SM204500NC	SM18 2320B
DATE ANALYZED	04/13/20	04/11/20	04/15/20	04/15/20	04/14/20	04/15/20
DETECTION LIMIT	0.002	0.001	0.010	0.010	0.050	1.00
DUPLICATE						
SAMPLE ID	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom
ORIGINAL	0.015	< 0.001	0.095	0.020	0.501	11.7
DUPLICATE	0.015	<0.001	0.093	0.020	0.492	11.7
RPD	0.26%	<0.001 NC	2.34%	2.44%	1.88%	0.85%
KPD	0.20%	NC.	2.3470	2.4470	1.0070	0.8370
SPIKE SAMPLE						
51 IKE 5AWI EE						
SAMPLE ID	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom	
ORIGINAL	0.015	< 0.001	0.095	0.020	0.501	
SPIKED SAMPLE	0.069	0.020	0.293	0.226	1.48	
SPIKE ADDED	0.050	0.020	0.200	0.200	1.00	
% RECOVERY	108.73%	100.00%	99.02%	103.21%	97.48%	NA
	100.7570	100.0070	<i>))</i> .0270	105.2170	77.1070	1011
QC CHECK						
C						
FOUND	0.092	0.042	0.331	0.407	0.508	99.8
TRUE	0.094	0.039	0.324	0.408	0.490	100
% RECOVERY	97.87%	107.69%	102.10%	99.83%	103.67%	99.80%
BLANK	< 0.002	< 0.001	< 0.010	< 0.010	< 0.050	NA
DLAINK	<0.002	<0.001	<0.010	<0.010	<0.030	NA



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1712845	PA	GE 3				
REPORT DATE:	04/28/20						
DATE SAMPLED:	04/10/20	DATE RECEIVED:	04/10/20				
FINAL REPORT, LABORATO	FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER						
SAMPLES FROM TETRA TECH INC.							

QA/QC DATA

QC PARAMETER	SULFATE (mg/L)	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)	CHLOR_a (ug/L)	PHAEO_a (ug/L)
METHOD	EPA 375.4	EPA 200.7	EPA 200.7	SM1810200H	(ug/L) SM1810200H
DATE ANALYZED	04/16/20	04/13/20	04/13/20	04/13/20	04/13/20
	0 0 0	0.1.20120		0.1.20120	0 0 0
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
SAMPLE ID	Lake #2 Bottom	BATCH	Lake #2 Bottom	Lake #2 Bottom	Lake #2 Bottom
ORIGINAL	83.0	< 0.003	0.019	2.1	1.2
DUPLICATE	83.5	< 0.003	0.017	2.4	1.4
RPD	0.60%	NC	11.11%	13.33%	9.09%
SPIKE SAMPLE					
SAMPLE ID	Lake #2 Bottom	BATCH	Lake #2 Bottom		
ORIGINAL	83.0	< 0.003	0.019		
SPIKED SAMPLE	93.9	0.497	0.517		
SPIKE ADDED	10.0	0.500	0.500		
% RECOVERY	109.00%	99.40%	99.60%	NA	NA
QC CHECK					
FOUND	10.5	0.488	0.488		
TRUE	10.0	0.500	0.500		
% RECOVERY	105.00%	97.60%	97.60%	NA	NA
		-	-	-	
BLANK	<1.00	< 0.003	< 0.003	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE

ND - NOT APULCABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

Damien Hademsh Damien Gadomski, PhD

Laboratory Manager

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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1713845	PAG	E 1							
REPORT DATE:	06/15/20									
DATE SAMPLED:	05/27/20	DATE RECEIVED:	05/28/20							
FINAL REPORT, LABORATORY ANA	ALYSIS OF SELECTED PARA	METERS ON WATER								
SAMPLES FROM TETRA TECH INC.										

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	TOTAL-N	CHLOR_a	PHAEO_a	ALKALINITY	SULFATE
SAMPLE ID	(mg/L)	(mg/L)	(ug/L)	(ug/L)	(mgCaCO3/L)	(mg/L)
Mid-Lake 1m	0.022	0.450	4.3	2.1	13.2	108



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1713845	PAGE 2
REPORT DATE:	06/15/20	
DATE SAMPLED:	05/27/20	DATE RECEIVED: 05/28/20
FINAL REPORT, LABORATORY	ANALYSIS OF SELECT	ED PARAMETERS ON WATER
SAMPLES FROM TETRA TECH I	NC.	

QA/QC DATA

QC PARAMETER	TOTAL-P	TOTAL-N	CHLOR_a	PHAEO_a	ALKALINITY	SULFATE
	(mg/L)	(mg/L)	(ug/L)	(ug/L)	(mgCaCO3/L)	(mg/L)
METHOD	SM18 4500PF	SM204500NC	SM1810200H	SM1810200H	SM18 2320B	EPA 375.4
DATE ANALYZED	06/01/20	05/29/20	06/01/20	06/01/20	05/30/20	06/01/20
DETECTION LIMIT	0.002	0.050	0.1	0.1	1.00	1.00
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	Mid-Lake 1m
ORIGINAL	0.007	0.163	3.7	2.1	23.2	108
DUPLICATE	0.007	0.167	3.2	2.0	23.5	107
RPD	1.27%	2.00%	15.38%	3.43%	1.28%	0.93%
SPIKE SAMPLE		[
SAMPLE ID	BATCH	BATCH				Mid-Lake 1m
	0.007	0.1.0				100
ORIGINAL	0.007	0.163				108
SPIKED SAMPLE	0.056	1.15				120
SPIKE ADDED	0.050	1.00			37.4	10.0
% RECOVERY	97.93%	98.32%	NA	NA	NA	120.00%
QC CHECK						
FOUND	0.097	0.500			105	10.6
TRUE	0.094	0.499			100	10.0
% RECOVERY	103.19%	100.20%	NA	NA	105.00%	106.00%
BLANK	< 0.002	< 0.050	NA	NA	NA	<1.00

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

Mamien Hademsh"

Damien Gadomski, PhD Laboratory Manager

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3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1714341	PAGI	E 1
REPORT DATE:	07/01/20		
DATE SAMPLED:	06/18/20	DATE RECEIVED:	06/18/20
FINAL REPORT, LABORATORY ANA	ALYSIS OF SELECTED PARA	METERS ON WATER	
SAMPLES FROM TETRA TECH INC.			

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	TOTAL-N	CHLOR_a	PHAEO_a	SULFATE	ALKALINITY
SAMPLE ID	(mg/L)	(mg/L)	(ug/L)	(ug/L)	(mg/L)	(mgCaCO3/L)
Mid-Lake 1m	0.022	0.345	3.5	1.0	75.5	14.8



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3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1714341	PAGE	2
REPORT DATE:	07/01/20		
DATE SAMPLED:	06/18/20	DATE RECEIVED:	06/18/20
FINAL REPORT, LABORATORY	ANALYSIS OF SELECT	ED PARAMETERS ON WATER	
SAMPLES FROM TETRA TECH	INC.		

QA/QC DATA

QC PARAMETER	TOTAL-P	TOTAL-N	CHLOR_a	PHAEO_a	SULFATE	ALKALINITY
	(mg/L)	(mg/L)	(ug/L)	(ug/L)	(mg/L)	(mgCaCO3/L)
METHOD	SM18 4500PF	SM204500NC	SM1810200H	SM1810200H	EPA 375.4	SM18 2320B
DATE ANALYZED	06/29/20	06/23/20	06/23/20	06/23/20	06/19/20	06/26/20
DETECTION LIMIT	0.002	0.050	0.1	0.1	1.00	1.00
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	< 0.002	0.239	2.9	0.2	6.56	57.0
DUPLICATE	< 0.002	0.234	2.9	0.2	6.64	57.2
RPD	NC	2.03%	0.00%	0.00%	1.27%	0.35%
SPIKE SAMPLE						
		r	r	· · · · · ·		
SAMPLE ID	BATCH	BATCH			BATCH	
ORIGINAL	< 0.002	0.239			6.56	
SPIKED SAMPLE	0.052	1.27			17.6	
SPIKE ADDED	0.050	1.00			10.0	
% RECOVERY	104.00%	102.78%	NA	NA	110.58%	NA
QC CHECK						
FOUND	0.091	0.478			10.6	102
TRUE	0.094	0.499			10.0	100
% RECOVERY	96.81%	95.79%	NA	NA	106.00%	102.00%
		•	•			
BLANK	< 0.002	< 0.050	NA	NA	<1.00	NA

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

Mamien Hademsh"

Damien Gadomski, PhD Laboratory Manager

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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1714921	PAG	E 1
REPORT DATE:	08/26/20		
DATE SAMPLED:	07/13/20	DATE RECEIVED:	12/13/01
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELE	CTED PARAMETERS ON WATER	
SAMPLES FROM TETRA TECH	INC.		

CASE NARRATIVE

Four water samples were received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	SRP	AMMONIA	N03+N02	TOTAL-N	ALKALINITY
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)
Mid-Lake 1m	0.026	< 0.001	0.012	< 0.010	0.503	20.5
Mid-Lake Bottom	0.031	< 0.001	< 0.010	< 0.010	0.585	20.2
Station #2 1m	0.027	< 0.001	< 0.010	< 0.010	0.463	13.6
Station #2 Bottom	0.034	< 0.001	< 0.010	< 0.010	0.477	14.9

	SULFATE	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	82.7	0.833	0.763	2.1	0.1
Mid-Lake Bottom	71.5	0.874	0.764	3.6	1.0
Station #2 1m	69.0	0.828	0.801	3.7	0.6
Station #2 Bottom	95.7	0.899	0.780	5.3	0.9



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1714921	P	AGE 2
REPORT DATE:	08/26/20		
DATE SAMPLED:	07/13/20	DATE RECEIVED:	12/13/01
FINAL REPORT, LABORATORY A	NALYSIS OF SELEC	TED PARAMETERS ON WATER	
SAMPLES FROM TETRA TECH IN	с.		

QA/QC DATA

QC PARAMETER	TOTAL-P	SRP	AMMONIA	N03+N02	TOTAL-N	ALKALINITY
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)
METHOD	SM18 4500PF	SM18 4500PF	SM184500NH3H	SM184500N03F	SM204500NC	SM18 2320B
DATE ANALYZED	07/20/20	07/14/20	07/15/20	07/15/20	07/16/20	07/15/20
DETECTION LIMIT	0.002	0.001	0.010	0.010	0.050	1.00
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.008	0.005	0.018	0.054	0.228	70.4
DUPLICATE	0.008	0.005	0.017	0.056	0.213	70.8
RPD	2.55%	1.95%	7.04%	3.42%	6.90%	0.57%
SPIKE SAMPLE			1			
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SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.008	0.005	0.018	0.054	0.228	
SPIKED SAMPLE	0.060	0.023	0.222	0.257	1.24	
SPIKE ADDED	0.050	0.020	0.200	0.200	1.00	
% RECOVERY	104.63%	91.99%	101.68%	101.80%	100.88%	NA
QC CHECK						
FOUND	0.097	0.039	0.341	0.428	0.508	95.3
TRUE	0.094	0.039	0.324	0.408	0.490	100
% RECOVERY	103.19%	100.00%	105.22%	104.96%	103.67%	95.30%
BLANK	< 0.002	< 0.001	< 0.010	< 0.010	< 0.050	NA



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1714921	PAG	GE 3
REPORT DATE:	08/26/20		
DATE SAMPLED:	07/13/20	DATE RECEIVED:	12/13/01
FINAL REPORT, LABORATO	RY ANALYSIS OF SELECTE	D PARAMETERS ON WATER	
SAMPLES FROM TETRA TEC	H INC.		

QA/QC DATA

		TOTAL	DISSOLVED	CHIL OD	DUATO
QC PARAMETER	SULFATE	ALUMINUM	ALUMINUM	CHLOR_a	PHAEO_a
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
METHOD	EPA 375.4	EPA 200.8	EPA 200.8	SM1810200H	SM1810200H
DATE ANALYZED	07/17/20	07/21/20	07/21/20	07/17/20	07/17/20
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
SAMPLE ID	Station #2 Bottom	BATCH	Station #2 Bottom	BATCH	BATCH
ORIGINAL	95.7	0.019	0.780	5.6	<0.1
DUPLICATE	96.7	0.019	0.777	5.2	< 0.1
RPD	1.05%	0.00%	0.39%	7.41%	NC
SPIKE SAMPLE					
SAMPLE ID	Station #2 Bottom	BATCH	Station #2 Bottom		
ORIGINAL	95.7	0.018	0.780		
SPIKED SAMPLE	106	0.547	1.27		
SPIKE ADDED	10.0	0.500	0.500		
% RECOVERY	102.82%	105.80%	97.20%	NA	NA
QC CHECK					
FOUND	10.7	0.492	0.492		
TRUE	10.0	0.500	0.500		
% RECOVERY	107.00%	98.40%	98.40%	NA	NA
BLANK	<1.00	< 0.003	< 0.003	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.

SUBMITTED BY:

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Damien Gadomski, PhD Laboratory Manager

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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1715086	PAGE	1
REPORT DATE:	08/26/20		
DATE SAMPLED:	07/17/20	DATE RECEIVED:	07/17/20
FINAL REPORT, LABORATORY ANA	ALYSIS OF SELECTED PARA	METERS ON WATER	
SAMPLES FROM TETRA TECH INC.			

CASE NARRATIVE

Two water samples were received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	SRP	AMMONIA	N03+N02	TOTAL-N	ALKALINITY
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)
Mid-Lake 1m	0.005	< 0.001	0.036	< 0.010	0.260	6.80
Mid-Lake Bottom	0.007	< 0.001	0.036	< 0.010	0.261	6.40

	SULFATE	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	176	0.498	0.021	0.4	< 0.1
Mid-Lake Bottom	198	0.482	0.019	0.5	< 0.1



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1715086	PA	GE 2
REPORT DATE:	08/26/20		
DATE SAMPLED:	07/17/20	DATE RECEIVED:	07/17/20
FINAL REPORT, LABORATOR	RY ANALYSIS OF SELECTE	D PARAMETERS ON WATER	
SAMPLES FROM TETRA TEC	H INC.		

QA/QC DATA

QC PARAMETER	TOTAL-P	SRP	AMMONIA	N03+N02	TOTAL-N	ALKALINITY
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)
METHOD	SM18 4500PF	SM18 4500PF	SM184500NH3H	SM184500N03F	SM204500NC	SM18 2320B
DATE ANALYZED	07/27/20	07/17/20	07/18/20	07/18/20	07/27/20	07/21/20
DETECTION LIMIT	0.002	0.001	0.010	0.010	0.050	1.00
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.092	< 0.001	< 0.010	0.161	0.284	16.3
DUPLICATE	0.093	< 0.001	< 0.010	0.163	0.282	16.1
RPD	1.43%	NC	NC	1.29%	0.74%	1.23%
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	ВАТСН	BATCH	BATCH	
ORIGINAL	0.092	< 0.001	< 0.010	0.161	0.284	
SPIKED SAMPLE	0.144	0.019	0.232	0.360	1.30	
SPIKE ADDED	0.050	0.020	0.200	0.200	1.00	
% RECOVERY	103.82%	95.00%	115.86%	99.52%	101.28%	NA
QC CHECK						
FOUND	0.097	0.040	0.344	0.404	0.503	98.3
TRUE	0.094	0.039	0.324	0.408	0.490	100
% RECOVERY	103.19%	102.56%	106.17%	99.10%	102.65%	98.30%
BLANK	< 0.002	< 0.001	< 0.010	< 0.010	< 0.050	NA



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PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1715086	PAG	GE 3
REPORT DATE:	08/26/20		
DATE SAMPLED:	07/17/20	DATE RECEIVED:	07/17/20
FINAL REPORT, LABORATOR	RY ANALYSIS OF SELECTE	D PARAMETERS ON WATER	
SAMPLES FROM TETRA TEC	H INC.		

QA/QC DATA

QC PARAMETER	SULFATE	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLOR_a	PHAEO_a
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
METHOD	EPA 375.4	EPA 200.8	EPA 200.8	SM1810200H	SM1810200H
DATE ANALYZED	07/22/20	07/21/20	07/21/20	07/23/20	07/23/20
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
SAMPLE ID	Mid-Lake Bottom	BATCH	BATCH	BATCH	BATCH
ORIGINAL	198	0.023	< 0.003	11	2.3
DUPLICATE	200	0.025	< 0.003	11	2.4
RPD	0.74%	8.33%	NC	0.00%	4.38%
SPIKE SAMPLE					
SAMPLE ID	Mid-Lake Bottom	BATCH	BATCH		
ORIGINAL	198	0.023	< 0.003		
SPIKED SAMPLE	209	0.567	0.521		
SPIKE ADDED	10.0	0.500	0.500		
% RECOVERY	107.52%	108.80%	104.20%	NA	NA
QC CHECK					
FOUND	10.2	0.492	0.492		
TRUE	10.0	0.500	0.500		
% RECOVERY	102.00%	98.40%	98.40%	NA	NA
BLANK	<1.00	< 0.003	< 0.003	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.

SUBMITTED BY:

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Damien Gadomski, PhD Laboratory Manager

	Treinquished to IAL By (Signature) Date Time Time Time Time Time Time Time Tim	Daté / Timé	IVIS LIPPERT 7/17/20 Time IATM	blota, DW=Dhinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SW=Surface Water, WW=Wastewater								T26 I (T)71 SW Mid-Lake Bottom 3		Time Matrix*** (This Will Appear On The Report)	SAMPLING SAMPLE DESCRIPTION	_	Sample Disposal Specific Date: 4 weeks	Yes IN No I 3 Business Da I Standard		Turn Around Time (TAT)*	Fax	iris.lippert@tetratech.com; shannon.brattebo@tetratech.com	1: Iris Lippert, Shannon Brattebo		
4011	Received at IAL By	Shipped By	Dissolved aluminium and SKP samples not filtered, will need filtration	Comments:								x x x x x x x x x x x	x x x x x x x x x x	Number of Total Alka Total Alun Dissolved Sulfate Total Phos SRP Total Nitro NO3+NO2 Ammonia Chlorophy	Initianita Ninu Alu spha ogen 2-Nit	y minu orus troge	um	B		Analysis R	Phone: Fax:	Email:	Contact:		Address:
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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1715655	PAG	E 1	
REPORT DATE:	08/26/20			
DATE SAMPLED:	08/07/20	DATE RECEIVED:	08/07/20	
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELEC	TED PARAMETERS ON WATER		
SAMPLES FROM TETRA TECH	I INC.			

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	SRP	AMMONIA	N03+N02	TOTAL-N	ALKALINITY
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)
Mid-Lake 1m	0.011	< 0.001	< 0.010	< 0.010	0.421	6.50

	SULFATE	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	191	0.154	0.066	2.7	1.1



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1715655	PAG	E 2
REPORT DATE:	08/26/20		
DATE SAMPLED:	08/07/20	DATE RECEIVED:	08/07/20
FINAL REPORT, LABORATORY AN	ALYSIS OF SELECTED PARA	AMETERS ON WATER	
SAMPLES FROM TETRA TECH INC	۲ 		

QA/QC DATA

QC PARAMETER	TOTAL-P	SRP	AMMONIA	N03+N02	TOTAL-N	ALKALINITY
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)
METHOD	SM18 4500PF	SM18 4500PF	SM184500NH3H	SM184500N03F	SM204500NC	SM18 2320B
DATE ANALYZED	08/17/20	08/07/20	08/08/20	08/08/20	08/18/20	08/13/20
DETECTION LIMIT	0.002	0.001	0.010	0.010	0.050	1.00
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH
SAMPLE ID	BAICH	BAICH	BAICH	BAICH	BAICH	BAICH
ORIGINAL	0.005	< 0.001	< 0.010	0.211	0.372	21.6
DUPLICATE	0.005	< 0.001	< 0.010	0.212	0.341	21.5
RPD	5.77%	NC	NC	0.31%	8.58%	0.46%
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	
57 I.M EE ID	Diffeit	Diffeli	briten	briten	Darren	
ORIGINAL	0.005	< 0.001	< 0.010	0.211	0.372	
SPIKED SAMPLE	0.055	0.020	0.185	0.407	1.47	
SPIKE ADDED	0.050	0.020	0.200	0.200	1.00	
% RECOVERY	99.42%	100.00%	92.32%	97.91%	109.40%	NA
QC CHECK						
FOUND	0.004	0.020	0.220	0.400	0.524	06.5
FOUND	0.094	0.039	0.329	0.409	0.524	96.5
TRUE	0.094	0.039	0.324	0.408	0.490	100
% RECOVERY	100.00%	100.00%	101.69%	100.33%	106.94%	96.50%
BLANK	< 0.002	< 0.001	< 0.010	< 0.010	< 0.050	NA
DLAINK	<0.002	<0.001	<0.010	<0.010	<0.050	INA



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3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1715655	PAC	GE 3
REPORT DATE:	08/26/20		
DATE SAMPLED:	08/07/20	DATE RECEIVED:	08/07/20
FINAL REPORT, LABORATOR	RY ANALYSIS OF SELECTE	D PARAMETERS ON WATER	
SAMPLES FROM TETRA TEC	H INC.		

QA/QC DATA

QC PARAMETER	SULFATE	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLOR_a	PHAEO_a
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
METHOD	EPA 375.4	EPA 200.8	EPA 200.8	SM1810200H	SM1810200H
DATE ANALYZED	08/11/20		08/12/20	08/12/20	08/12/20
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
SAMPLE ID	Mid-Lake 1m	BATCH	Mid-Lake 1m	Mid-Lake 1m	Mid-Lake 1m
ORIGINAL	191	< 0.003	0.066	2.7	1.1
DUPLICATE	190	< 0.003	0.066	2.3	1.2
RPD	0.30%	NC	0.00%	13.33%	8.96%
SPIKE SAMPLE					
SAMPLE ID	Mid-Lake 1m	BATCH	Mid-Lake 1m		
ORIGINAL	191	< 0.003	0.066		
SPIKED SAMPLE	202	0.521	0.528		
SPIKE ADDED	10.0	0.500	0.500		
% RECOVERY	114.38%	104.20%	92.40%	NA	NA
QC CHECK					
FOUND	10.7	0.472	0.472		
TRUE	10.0	0.500	0.500		
% RECOVERY	107.00%	94.40%	94.40%	NA	NA
BLANK	<1.00	< 0.003	< 0.003	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE.

SUBMITTED BY:

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Damien Gadomski, PhD Laboratory Manager

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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1716594	PA	GE 1
REPORT DATE:	09/27/20		
DATE SAMPLED:	09/11/20	DATE RECEIVED:	09/11/20
FINAL REPORT, LABORATO	RY ANALYSIS OF SELECTEI	D PARAMETERS ON WATER	
SAMPLES FROM TETRA TE	CH INC.		

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	TOTAL-N	ALKALINITY
SAMPLE ID	(mg/L)	(mg/L)	(mgCaCO3/L)
Mid-Lake 1m	0.018	0.421	6.30

	SULFATE	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	245	0.407	0.027	4.5	1.9



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1716594	РА	GE 2
REPORT DATE:	09/27/20		
DATE SAMPLED:	09/11/20	DATE RECEIVED:	09/11/20
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECTED F	PARAMETERS ON WATER	
SAMPLES FROM TETRA TECH	INC.		

QA/QC DATA

TOTAL-P	TOTAL-N	ALKALINITY
(mg/L)	(mg/L)	(mgCaCO3/L)
SM18 4500PF	SM204500NC	SM18 2320B
09/22/20	09/23/20	09/15/20
0.002	0.050	1.00
BATCH	BATCH	BATCH
0.036	0.777	140
0.035	0.773	140
2.12%	0.53%	0.14%
BATCH	BATCH	
0.036	0.777	
0.090	1.70	
0.050	1.00	
108.38%	92.61%	NA
0.097	0.495	103
0.094	0.490	100
103.19%	101.02%	103.00%
< 0.002	< 0.050	NA
	SM18 4500PF 09/22/20 0.002 BATCH 0.036 0.035 2.12% BATCH 0.036 0.090 0.050 108.38% 0.097 0.094 103.19%	(mg/L) (mg/L) SM18 4500PF SM204500NC 09/22/20 09/23/20 0.002 0.050 BATCH BATCH 0.036 0.777 0.035 0.773 2.12% 0.53% BATCH BATCH 0.036 0.777 0.035 0.773 2.12% 0.53% 0.090 1.70 0.090 1.70 0.050 1.00 108.38% 92.61% 0.097 0.495 0.094 0.490 103.19% 101.02%



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1716594	PA	GE 3					
REPORT DATE:	09/27/20							
DATE SAMPLED:	09/11/20	DATE RECEIVED:	09/11/20					
FINAL REPORT, LABORATOR	FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER							
SAMPLES FROM TETRA TECH	INC.							

QA/QC DATA

OC PARAMETER	SULFATE	TOTAL	DISSOLVED	CHLOR a	PHAEO a
QUTARAMETER	SULFAIL	ALUMINUM	ALUMINUM	CHLOK_a	FHAEO_a
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
METHOD	EPA 375.4	EPA 200.8	EPA 200.8	SM1810200H	SM1810200H
DATE ANALYZED	09/23/20	09/22/20	09/22/20	09/16/20	09/16/20
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
DUFLICATE					
SAMPLE ID	Mid-Lake 1m	BATCH	Mid-Lake 1m	Mid-Lake 1m	Mid-Lake 1m
ORIGINAL	245	< 0.003	0.027	7.5	11
DUPLICATE	245	< 0.003	0.027	6.9	12
RPD	0.27%	NC	2.24%	7.41%	4.65%
SPIKE SAMPLE					
SPIKE SAMPLE					
SAMPLE ID	Mid-Lake 1m	BATCH	Mid-Lake 1m		
ORIGINAL	245	< 0.003	0.027		
SPIKED SAMPLE	254	0.525	0.548		
SPIKE ADDED	10.0	0.500	0.500		
% RECOVERY	92.59%	105.00%	104.18%	NA	NA
QC CHECK					
DOLDED	10.6	0.405	0.405		
FOUND	10.6	0.495	0.495		
TRUE	10.0	0.500	0.500	NT A	NLA
% RECOVERY	106.00%	99.00%	99.00%	NA	NA
BLANK	<1.00	< 0.003	< 0.003	NA	NA
DLANK	<1.00	<0.003	<0.003	1 N/A	INA

SUBMITTED BY:

Mamien Gademsh"

Damien Gadomski, PhD Laboratory Manager

	Relinquished to IAL By (Signature)	Received By	IVIS LIPPERE	**Matrix: B=Biota, DW=Drinking Water, GW=Groun SL=Sludge, SW=Surface Water, WW=Wastewater							-1/11/20 11:30 TV-1 SW		Date (mm-dd- Time Matrix** vv)	SAMPLING	Hold Dispose CReturn	Sample Disposal		QC Data Repo	Fax Email Mail	Reporting/Invoicing Format			Contact: Iris Lippert, Shannon Brattebo		<i>.</i>	Client: Tetra Tech Inc.		3927 Aurora Ave N · Seattle · WA · 98103	- そうが生まれですが、
	$\frac{1}{2} \frac{1}{2} \frac{1}$	Date	111/20	d Water, P=P								Mid Jaka 1m	(This Will Appear On The Report)	SAMPLE DESCRIPTION	*Advanced notice required for Rush Analysis	Specific Date: 4 weeks		🔲 3 Business Da 🔲 Standard	Next Day	Turn Around Time (TAT)*	Fax	<u>non.brattebo@tetratech.com</u>					F: 206-632-2417	aboratories the • WA • 98103	· · ·
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21.9° 1.00 tel		2 · · · · · · · · · · · · · · · · · · ·	Shipping Reference									NOND N	Metals Contai Temp					/N)	Case File Number	LAB USE ONLY		@tetratecn.com	Client Project: Vaugitup Lang	Client PO:	Quote No.:		PROJECT INFORMATION	716594 "-	, 1



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1718103	PAGE	1				
REPORT DATE:	12/02/20						
DATE SAMPLED:	10/19/20	DATE RECEIVED:	10/19/20				
FINAL REPORT, LABORATORY ANA	ALYSIS OF SELECTED PARA	METERS ON WATER					
SAMPLES FROM TETRA TECH INC.							

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	TOTAL-N	ALKALINITY	DOC
SAMPLE ID	(mg/L)	(mg/L)	(mgCaCO3/L)	(mg/L)
Mid-Lake 1m	0.020	0.438	19.0	4.05

	SULFATE	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	211	0.255	0.024	2.5	1.1



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1718103	PAG	GE 2					
REPORT DATE:	12/02/20							
DATE SAMPLED:	10/19/20	DATE RECEIVED:	10/19/20					
FINAL REPORT, LABORATOR	FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER							
SAMPLES FROM TETRA TECH INC.								

QA/QC DATA

QC PARAMETER	TOTAL-P	TOTAL-N	ALKALINITY	DOC
	(mg/L)	(mg/L)	(mgCaCO3/L)	(mg/L)
METHOD	SM18 4500PF	SM204500NC	SM18 2320B	EPA 415.1
DATE ANALYZED	10/26/20	10/27/20	10/24/20	10/30/20
DETECTION LIMIT	0.002	0.050	1.00	0.250
DUPLICATE				
SAMPLE ID	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.011	0.524	22.3	< 0.250
DUPLICATE	0.010	0.529	22.7	< 0.250
RPD	7.67%	1.05%	1.78%	NC
SPIKE SAMPLE SAMPLE ID	BATCH	ВАТСН		BATCH
SAMPLE ID	BAICH	БАТСП		БАТСП
ORIGINAL	0.011	0.524		< 0.250
SPIKED SAMPLE	0.067	1.68		4.34
SPIKE ADDED	0.050	1.00		4.50
% RECOVERY	111.35%	115.50%	NA	96.44%
QC CHECK				
FOUND	0.097	0.500	103	4.10
TRUE	0.094	0.490	100	4.00
% RECOVERY	103.19%	102.04%	103.00%	102.50%
BLANK	< 0.002	< 0.050	NA	< 0.250



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1718103	PA	GE 3					
REPORT DATE:	12/02/20							
DATE SAMPLED:	10/19/20	DATE RECEIVED:	10/19/20					
FINAL REPORT, LABORATO	FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER							
SAMPLES FROM TETRA TECH INC.								

QA/QC DATA

QC PARAMETER	SULFATE	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLOR_a	PHAEO_a	
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)	
METHOD	EPA 375.4	EPA 200.8	EPA 200.8	SM1810200H	SM1810200H	
DATE ANALYZED	10/22/20	10/22/20	10/22/20	10/23/20	10/23/20	
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1	
DUPLICATE						
SAMPLE ID	Mid-Lake 1m	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	211	0.023	< 0.003	4.7	3.4	
DUPLICATE	212	0.024	< 0.003	4.5	3.4	
RPD	0.45%	3.39%	NC	6.45%	2.62%	
SPIKE SAMPLE						
SAMPLE ID	Mid-Lake 1m	BATCH	BATCH			
ORIGINAL	211	0.023	< 0.003			
SPIKED SAMPLE	222	0.522	0.485			
SPIKE ADDED	10.0	0.500	0.500			
% RECOVERY	104.94%	99.80%	97.00%	NA	NA	
QC CHECK						
FOUND	10.8	0.485	0.485			
TRUE	10.0	0.500	0.500			
% RECOVERY	108.00%	97.00%	97.00%	NA	NA	
					-	
BLANK	<1.00	< 0.003	< 0.003	NA	NA	

RPD = RELATIVE PERCENT DIFFERENCE.

SUBMITTED BY:

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Damien Gadomski, PhD Laboratory Manager

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	Client Project: Waughop Lake		Gibbons	Harry G	Contact: Shannon Brattebo, Harry	10n Br	Shan	ontact:	<u></u>			Iris Lippert, Shannon Brattebo	Iris Lippert, Sh	Contact:
	Client PO:											3101	Seattle, WA 98101	
	Quote No.:							Address	A			Suite 650	1420 5th Ave, Suite 650	Address:
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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1720485	PA	GE 1
REPORT DATE:	02/23/21		
DATE SAMPLED:	01/19/21	DATE RECEIVED:	01/19/21
FINAL REPORT, LABORATO	RY ANALYSIS OF SELECTED	D PARAMETERS ON WATER	
SAMPLES FROM TETRA TEC	H INC.		

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	TOTAL-N	DOC
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)
Mid-Lake 1m	0.012	1.16	4.98

	SULFATE	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	140	0.054	0.008	5.5	1.7



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1720485	PA	GE 2
REPORT DATE:	02/23/21		
DATE SAMPLED:	01/19/21	DATE RECEIVED:	01/19/21
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECTED	PARAMETERS ON WATER	
SAMPLES FROM TETRA TECH	INC.		

QA/QC DATA

-		
TOTAL-P	TOTAL-N	DOC
(mg/L)	(mg/L)	(mg/L)
SM18 4500PF	SM204500NC	EPA 415.1
01/25/21	01/26/21	02/10/21
0.002	0.050	0.250
BATCH	BATCH	BATCH
0.005	0.339	2.49
0.005	0.315	2.40
2.62%	7.30%	3.52%
BATCH	BATCH	BATCH
0.005	0.339	2.49
0.057	1.47	6.83
0.050	1.00	4.50
104.07%	113.11%	96.64%
0.097	0.494	3.92
0.094	0.490	4.00
103.19%	100.82%	98.00%
< 0.002	< 0.050	< 0.250
	(mg/L) SM18 4500PF 01/25/21 0.002 BATCH 0.005 0.005 2.62% BATCH 0.005 0.057 0.057 0.050 104.07% 0.097 0.094 103.19%	(mg/L) (mg/L) SM18 4500PF SM204500NC 01/25/21 01/26/21 0.002 0.050 BATCH BATCH 0.005 0.339 0.005 0.315 2.62% 7.30% BATCH BATCH 0.005 0.315 2.62% 7.30% 0.005 0.339 0.005 1.147 0.050 1.00 104.07% 113.11% 0.097 0.494 0.094 0.490 103.19% 100.82%



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1720485	PA	GE 3	
REPORT DATE:	02/23/21			
DATE SAMPLED:	01/19/21	DATE RECEIVED:	01/19/21	
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECTED PA	ARAMETERS ON WATER		
SAMPLES FROM TETRA TECH	I INC.			

QA/QC DATA

QC PARAMETER	SULFATE	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLOR_a	PHAEO_a
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
METHOD	EPA 375.4	EPA 200.8	EPA 200.8	SM1810200H	SM1810200H
DATE ANALYZED	01/27/21	01/21/21	01/21/21	01/21/21	01/21/21
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	13800	< 0.003	< 0.003	3.2	14
DUPLICATE	13700	< 0.003	< 0.003	3.7	17
RPD	0.73%	NC	NC	15.38%	15.75%
SPIKE SAMPLE					
SAMPLE ID	BATCH	BATCH	BATCH		
ORIGINAL		< 0.003	< 0.003		
SPIKED SAMPLE		0.437	0.492		
SPIKE ADDED		0.500	0.500		
% RECOVERY	OR	87.40%	98.40%	NA	NA
QC CHECK					
FOUND	10.4	0.478	0.478		
TRUE	10.0	0.500	0.500		
% RECOVERY	104.00%	95.60%	95.60%	NA	NA
BLANK	<1.00	< 0.003	< 0.003	NA	NA

SUBMITTED BY:

Mamien Gademsh"

Damien Gadomski, PhD Laboratory Manager

Image:		Relinquish	Received By	Sampled By	**Matrix: B SL=Sludge												12/21	Date (mm-dd- yy)		Hold		🛛 Yes		Fax		Phone:	Email:	Contact:			Client: Te		
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Chain of Custody Form Client: Same Contact: Shannon Brattebo, Harry Gibbons Email: shannon.brattebo@tratech.com, Harry, Gibbons@terrateh.com, Harry, Gibbons@t		ignature)		+	inking Water, GV Water, WW=Wa												SW	Matrix**	16	Return	oosal	D No	orted	D Mail	ng Format		<u>atech.com; shan</u>	annon Brattebo	101	Suite 650)6-632-2715	Analytical La Irora Ave N • Sea
Chain of Custody Form Client: Same Contact: Stamon Brattebo, Harry Gibbons Email: shamon brattebo@etratech.com, Harry Gibbons@etratech.com,				$\frac{Date}{1/l} \sim \frac{1}{2l}$	V=Ground Water, P=Pa stewater												M	(This Will Ap	SAMPL	*Advanced notice re	Specific Date:		🛛 3 Business Da 🕽	□ Next Day		Fax	non.brattebo@tetratec					F: 206-632-2417	aboratories Ittle • WA • 98103
Chain of Custody Form Client: Same Contact: Shannon Brattebo, Harry Gibbons Email: shannon.brattebo@tratech.com, Harry, Gibbons@terrateh.com, Harry, Gibbons@t		Time 4:15 PN	Time	Time	aint, S=Soil, SD=Sedim									-			id-Lake 1m	pear On The Report)	E DESCRIPTION	quired for Rush Analysi	A HERE		X Standard	2 Business Day	ound Time (TAT)*		h.com				· .		
Chain of Custody Form E TO: (IF DIFFERENT FROM REPORT) Same I T DA INITOGEN Shannon Brattebo, Hany Gibbons Fax: Analysis Requested Fax: Analysis Requested Analysis Requested V Chlorophyll a Sulfate Analysis Requested V Sulfate Analysis Requested Dissolved Aluminum Dissolved Organic Ce / bor Analysis requested Dissolved Organic Ce / bor Metals Field Filtered (Y/N) Outsing Decking Requested I L S ^o C As is T-0					ent,																												
Chain of Custody Form E TO: (IF DIFFERENT FROM REPORT) Same I T Total Nitrogen Shannon.brattebo@letratech.com, Hany.Gibbons@letra Fax: Analysis Requested Fax: Analysis Requested V Chlorophyll a Sulfate Analysis Requested V Sulfate Analysis Requested V Sulfate V Su	200 - 10 M		shipi	Ple	Com DO				-			 	_	 		 \neg		· · · ·				ners				Phone	Email	Conta	•	Addre	Client		
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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1722021	PAGE 1
REPORT DATE:	03/26/21	
DATE SAMPLED:	03/17/21	DATE RECEIVED: 03/17/2
FINAL REPORT, LABORATORY AN	ALYSIS OF SELI	ECTED PARAMETERS ON WATER
SAMPLES FROM TETRA TECH INC		

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	TOTAL-N	DOC	ALKALINITY
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)
Mid-Lake 1m	0.014	0.527	3.59	15.3

	SULFATE	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	94.7	0.069	0.014	5.6	1.4



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1722021	PA	GE 2
REPORT DATE:	03/26/21		
DATE SAMPLED:	03/17/21	DATE RECEIVED:	03/17/21
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECTED I	PARAMETERS ON WATER	
SAMPLES FROM TETRA TECH	INC.		

QA/QC DATA

QC PARAMETER	TOTAL-P	TOTAL-N	DOC	ALKALINITY
	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)
METHOD	SM18 4500PF	SM204500NC	EPA 415.1	SM18 2320B
DATE ANALYZED	03/22/21	03/22/21	03/23/21	03/25/21
DETECTION LIMIT	0.002	0.050	0.250	1.00
DUPLICATE				
SAMPLE ID	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.004	0.180	2.03	66.8
DUPLICATE	0.004	0.178	1.97	67.8
RPD	0.82%	1.06%	2.95%	1.49%
SPIKE SAMPLE				
SAMPLE ID	BATCH	BATCH	BATCH	
SAMPLE ID	BAICH	БАТСП	DAICH	
ORIGINAL	0.004	0.180	2.03	
SPIKED SAMPLE	0.055	1.17	6.21	
SPIKE ADDED	0.050	1.00	4.50	
% RECOVERY	102.46%	98.57%	92.80%	NA
QC CHECK				
FOUND	0.094	0.507	3.62	104
TRUE	0.094	0.490	4.00	100
% RECOVERY	100.00%	103.47%	90.50%	104.00%
BLANK	< 0.002	< 0.050	< 0.250	NA



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1722021	PA	GE 3			
REPORT DATE:	03/26/21					
DATE SAMPLED:	03/17/21	DATE RECEIVED:	03/17/21			
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER						
SAMPLES FROM TETRA TECH	I INC.					

QA/QC DATA

	-				
QC PARAMETER	SULFATE	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLOR_a	PHAEO_a
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
METHOD	EPA 375.4	EPA 200.8	EPA 200.8	SM1810200H	SM1810200H
DATE ANALYZED	03/25/21	03/20/21	03/20/21	03/23/21	03/23/21
DETECTION LIMIT	1.00	0.003	0.003	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	BATCH	Mid-Lake 1m	BATCH	BATCH
ORIGINAL	143	< 0.003	0.014	2.1	0.2
DUPLICATE	142	< 0.003	0.013	2.3	0.2
RPD	1.07%	NC	7.41%	8.00%	0.00%
SPIKE SAMPLE					
SAMPLE ID	BATCH	BATCH	Mid-Lake 1m		
ORIGINAL	143	< 0.003	0.014		
SPIKED SAMPLE	152	0.528	0.546		
SPIKE ADDED	10.0	0.500	0.500		
% RECOVERY	84.66%	105.60%	106.40%	NA	NA
QC CHECK					
FOUND	10.1	0.507	0.507		
TRUE	10.0	0.500	0.500		
% RECOVERY	101.00%	101.40%	101.40%	NA	NA
BLANK	<1.00	< 0.003	< 0.003	NA	NA

SUBMITTED BY:

Mamien Gademsh"

Damien Gadomski, PhD Laboratory Manager

**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, S1=Sludge, SW=Surface Water, WW=Wastewater Sampled By IV1 5 L1 pp?TT Date 71/21 7. P/Y Received By Date 71me Relinquished to IAL By(Signature) Date 7. //21 Time		Reporting/Invoicing Formation Reporting/Invoicing Formation Mail Next D QC Data Reported No Specification Sample Disposal Return *Advanced Sample Dispose Return *Advanced Dispose Return *Advanced Old Dispose Return *Advanced Viol Z f/M SW (T	Contact: Iris Lippert, Shannon Braueuv Contact: Iris Lippert@tetratech.com; shannon.brattebo@tetratech.com Email: Iris Lippert@tetratech.com; shannon.brattebo@tetratech.com Email: 509-232-4312 Fax	REPORT TO: Tetra Tech Inc. Client: 1420 5th Ave, Suite 650 Address: Seattle, WA 98101 Seattle, WA 98101 Bratteho	IEH Analytical Laboratories 3927 Aurora Ave N • Seattle • WA • 98103 P: 206-632-2715 F: 206-632-2417
It. Comments: Shipped By Shipping Reference Received af IAL By Date Time Received af IAL By State S		Sie Number of Containers × Total Phosphorus × Total Nitrogen × Chlorophyll a × Sulfate × Alkalini ty × Total Alvminum × Dissolve& Alvminum × DOC- × Doc-	Email: shannon.brattebo@tetratech.com, Harry.suboons@euraech.com Phone: Fax: Analysis Requested LAB USE ONLY Case File Number	Client: Same Address Quote No.: Address Client PO: Contact: Shannon Brattebo, Harry Gibbons Contact: Shannon Brattebo, Harry Gibbons Client Project: Waughop Lake	μ.

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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1740273	PAC	GE 1		
REPORT DATE:	06/11/23				
DATE SAMPLED:	05/23/23	DATE RECEIVED:	05/23/23		
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELEC	CTED PARAMETERS ON WATER			
SAMPLES FROM TETRA TECH INC.					

CASE NARRATIVE

One water sample was received by the laboratory and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	SRP	N03+N02	TOTAL-N	DOC	ALKALINITY
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)
Mid-Lake 0.5m1	0.047	< 0.001	0.011	1.06	8.40	51.1

	TOTAL ALUMINUM	HARDNESS	SULFATE	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/CaCO3/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 0.5m1	0.5693	23.8	28.0	12	6.2



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CASE FILE NUMBER:	1740273	PAGE 2		
REPORT DATE:	06/11/23			
DATE SAMPLED:	05/23/23	DATE RECEIVED:	05/23/23	
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECTEI	D PARAMETERS ON WATER		
SAMPLES FROM TETRA TEC	H INC.			

QA/QC DATA

OC PARAMETER	TOTAL-P	SRP	N03+N02	TOTAL-N	DOC	ALKALINITY
QUITINI	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)
METHOD	SM18 4500PF	SM18 4500PF	SM184500N03F	SM204500NC	EPA 415.1	SM18 2320B
DATE ANALYZED	05/27/23	05/25/23	05/24/23	05/31/23	06/09/23	05/25/23
DETECTION LIMIT	0.002	0.001	0.010	0.050	0.250	1.00
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH
SAMFLEID	БАТСП	БАТСП	БАТСП	DAICH	DAICH	БАТСП
ORIGINAL	0.023	< 0.001	< 0.010	0.682	1.18	41.0
DUPLICATE	0.024	< 0.001	< 0.010	0.716	1.24	41.6
RPD	4.01%	NC	NC	4.86%	4.98%	1.45%
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	
SAMPLE ID	BAICH	BAICH	BAICH	BAICH	BAICH	
ORIGINAL	0.023	< 0.001	< 0.010	0.682	1.18	
SPIKED SAMPLE	0.076	0.020	0.194	1.74	5.52	
SPIKE ADDED	0.050	0.020	0.200	1.00	4.50	
% RECOVERY	106.14%	100.00%	96.78%	106.23%	96.49%	NA
QC CHECK						
FOUND	0.094	0.041	0.404	0.499	3.98	100
TRUE	0.094	0.039	0.408	0.499	4.00	100
% RECOVERY	100.00%	105.13%	99.02%	100.00%	99.50%	100.00%
BLANK	< 0.002	< 0.001	< 0.010	< 0.050	< 0.250	NA



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CASE FILE NUMBER:	1740273	PAGE 3				
REPORT DATE:	06/11/23					
DATE SAMPLED:	05/23/23	DATE RECEIVED:	05/23/23			
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER						
SAMPLES FROM TETRA TECH INC.						

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM	HARDNESS	SULFATE	CHLOR_a	PHAEO_a
	(mg/L)	(mgCaCO3/l)	(mg/L)	(ug/L)	(ug/L)
METHOD	EPA 200.8	SM18 2340C	EPA 375.4	SM1810200H	SM1810200H
DATE ANALYZED	06/01/23	05/30/23	05/26/23	05/31/23	05/31/23
DETECTION LIMIT	0.0030	2.00	1.00	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	BATCH	Mid-Lake 0.5m1	BATCH	BATCH
ORIGINAL	0.0051	17.8	28.0	2.3	3.8
DUPLICATE	0.0050	16.6	27.7	2.1	3.7
RPD	0.40%	6.82%	0.89%	8.00%	1.90%
SPIKE SAMPLE					
SAMPLE ID	BATCH	BATCH	Mid-Lake 0.5m1		
ORIGINAL	0.0051	17.8	28.0		
SPIKED SAMPLE	0.4983	35.6	37.7		
SPIKE ADDED	0.5000	20.0	10.0		
% RECOVERY	98.65%	88.93%	97.21%	NA	NA
QC CHECK					
FOUND	0.5034	36.9	10.2		
TRUE	0.5000	40.0	10.0		
% RECOVERY	100.68%	92.25%	102.00%	NA	NA
BLANK	< 0.0030	<2.00	<1.00	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Mamien Hademoh

Damien Gadomski, PhD Laboratory Manager

REPORT TO: P::006.022:715 F::006.022:717 INVOICE TO:	Open Stature Ave Nr. 6910 Op	4.7 C	2-54	Ń		16.402	6.1	$\left[\right]$	2	AZ	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	LE	SAMPLE	A		823/23	121	afor for	$\left\{ \right\}$
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P: 206-632-2715 F: 206-632-2417 INVOICE TO: (IF DIFFERENT FROM REPORT) Tetra Tech Inc. Client: Same 2003 Western Avenue, Suite 700 Address Seattle, WA 98121 Address Shannon Brattebo Contact: Shannon.brattebo@tetratech.com Email: Sige 979-9672 Fax	3927 Aurora Ave N · Seattle · WA · 98103 CHOIL OF COSTORY FOR COSTOR	SE ONLY	LABU				sted	dnes	is Re	alys	An							porting/Invoicin	Re
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P: 206-632-2715 F: 206-632-2417 INVOICE TO: (IF DIFFERENT FROM REPORT) Tetra Tech Inc. Client: Same 2003 Western Avenue, Suite 700 Address s: 2003 Western Avenue, Suite 700 Address Seattle, WA 98121 Contact: Shannon Brattebo	3927 Aurora Ave N · Seattle · WA · 98103 Chain Of Custory Form / Fill Of Custory Form / Fil						l.com	atech	Dtetra	ebo(c	.bratt	nnon	sha	nail:	<u> </u>		o@tetratech.com	shannon.bratteb	
P: 206-632-2715 F: 206-632-2417 INVOICE TO: (IF DIFFERENT FROM REPORT) Tetra Tech Inc. Client: Same 2003 Westem Avenue, Suite 700 Address Seattle, WA 98121 Address	3927 Aurora Ave N · Seattle · WA · 98103 CHAIL OF CUSIOUY FORM P: 206-632-2715 F: 206-632-2417 Tetra Tech Inc. INVOICE TO: (IF DIFFERENT FROM REPORT) P: 2003 Western Avenue, Suite 700 Client: Same Seattle, WA 98121 Address	t: Waughop L	Client Projec							tebo) Brat	Innor	Sha	ntact	<u> </u>		bo	Shannon Brattel	
P: 206-632-2715 F: 206-632-2417 INVOICE TO: (IF DIFFERENT FROM REPORT) RT TO: Tetra Tech Inc. Client: Same S: 2003 Western Avenue, Suite 700 Address	3927 Aurora Ave N · Seattle · WA · 98103 CHAIL OF CLOCKDAY FORM OF THE PROJECT INFORM P: 206-632-2715 F: 206-632-2417 INVOICE TO: (IF DIFFERENT FROM REPORT) PROJECT INFORM Tetra Tech Inc. Client: Same 2003 Western Avenue, Suite 700 Quote No.:	بر ا	Client Po														21	Seattle, WA 981	
P: 206-632-2715 F: 206-632-2417 INVOICE TO: (IF DIFFERENT FROM REPORT) / / / // // // // // // // // // // // // // // // // // // ///	3927 Aurora Ave N · Seattle · WA · 98103 CHIGHLOL CUSIONY LOTH P: 206-632-2715 F: 206-632-2417 INVOICE TO: (IF DIFFERENT FROM REPORT) PROJECT INFORM Client: Same	f.	Quote No										<i></i>	dres	<u>ک</u>		venue, Suite 700	2003 Western A	ŝ
P: 206-632-2715 F: 206-632-2417 / 70	3927 Aurora Ave N+ Seattle+WA+98103 P: 206-632-2715 F: 206-632-2417 / HO 273	NFORMATIO	PROJECT			ORT)	REP	ROM	NTF	ERE	DIFF	ne IF	Sar	ent:	<u>Ω</u> z			C: Tetra Tech Inc.	Client:
			1073	241												F: 206-632-2417	3-632-2715		
Chain of Culotody Earm 10																IONSTONIAS]

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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1741068	PAGE	1
REPORT DATE:	08/08/23		
DATE SAMPLED:	06/27/23	DATE RECEIVED:	06/27/23
FINAL REPORT, LABORATORY ANA	ALYSIS OF SELECTED PARA	METERS ON WATER	
SAMPLES FROM TETRA TECH INC.			

CASE NARRATIVE

Two water samples were received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	SRP	N03+N02	DOC	TOTAL-N	ALKALINITY	pН
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	
Mid-Lake 1m	0.048	0.002	< 0.010	9.43	1.17	53.4	7.70
Mid-Lake Bottom	0.047	0.002	< 0.010	8.98	1.20	52.7	7.91

	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	0.5345	0.4083	4.62	25.7	11	4.9
Mid-Lake Bottom	0.5026	0.4284	4.94	25.2		

	CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	HARDNESS	HCO3	CO3
SAMPLE ID	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
Mid-Lake 1m	5.99	1.12	3.37	28.5	19.6	51.0	<1.00
Mid-Lake Bottom	5.81	0.913	2.92	28.0	18.3	51.1	<1.00



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1741068	PAG	GE 2
REPORT DATE:	08/08/23		
DATE SAMPLED:	06/27/23	DATE RECEIVED:	06/27/23
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECT	TED PARAMETERS ON WATER	
SAMPLES FROM TETRA TECI	H INC.		

QA/QC DATA

QC PARAMETER	TOTAL-P	SRP	N03+N02	DOC	TOTAL-N	ALKALINITY	pН
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	
METHOD	SM20 4500PF	SM20 4500PF	SM204500N03F	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	07/01/23	06/28/23	06/28/23	07/11/23	07/03/23	06/29/23	06/27/23
DETECTION LIMIT	0.002	0.001	0.010	0.250	0.050	1.00	0.10
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.009	0.002	0.114	< 0.250	0.284	74.8	
DUPLICATE	0.008	0.002	0.121	< 0.250	0.295	73.8	
RPD	0.47%	5.48%	5.77%	NC	3.80%	1.35%	NA
SPIKE SAMPLE	DATCH	DATCH	DATCH	DATCH	DATCH		
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	0.009	0.002	0.114	< 0.250	0.284		
SPIKED SAMPLE	0.060	0.026	0.326	4.24	1.24		
SPIKE ADDED	0.050	0.020	0.200	4.50	1.00		
% RECOVERY	102.65%	119.05%	106.22%	94.18%	95.30%	NA	NA
QC CHECK							
FOUND	0.095	0.040	0.421	4.25	0.526	96.8	
TRUE	0.094	0.039	0.408	4.00	0.490	100	
% RECOVERY	101.06%	101.52%	103.09%	106.25%	107.35%	96.80%	NA
	0.000	0.001	0.010	0.050	0.070		
BLANK	< 0.002	< 0.001	< 0.010	< 0.250	< 0.050	NA	NA



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1741068	PAC	GE 3
REPORT DATE:	08/08/23		
DATE SAMPLED:	06/27/23	DATE RECEIVED:	06/27/23
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECTEI	D PARAMETERS ON WATER	
SAMPLES FROM TETRA TECH	HINC.		

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
METHOD	EPA 200.8	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H
DATE ANALYZED	07/06/23	07/10/23	06/29/23	07/07/23	07/06/23	07/06/23
DETECTION LIMIT	0.0030	0.0030	0.50	1.00	0.1	0.1
DUPLICATE						
SAMPLE ID	BATCH	BATCH	Mid-Lake Bottom	BATCH	BATCH	BATCH
ORIGINAL	0.0272	0.0507	4.94	17.7	36	9.7
DUPLICATE	0.0255	0.0524	4.94	17.9	37	8.5
RPD	6.62%	3.26%	0.00%	1.17%	3.64%	13.65%
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	Mid-Lake Bottom	BATCH		
ORIGINAL	0.0272	0.0507	4.94	17.7		
SPIKED SAMPLE	0.5633	0.5018	14.6	39.4		
SPIKE ADDED	0.5000	0.5000	20.0	20.0		
% RECOVERY	107.20%	90.22%	48.35%	108.34%	NA	NA
QC CHECK						
FOUND	0.5481	0.5220	30.4	9.57		
TRUE	0.5000	0.5000	30.0	10.0		
% RECOVERY	109.62%	104.39%	101.33%	95.70%	NA	NA
BLANK	< 0.0030	< 0.0030	< 0.50	<1.00	NA	NA



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1741068	PA	GE 4
REPORT DATE:	08/08/23		
DATE SAMPLED:	06/27/23	DATE RECEIVED:	06/27/23
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECTE	D PARAMETERS ON WATER	
SAMPLES FROM TETRA TECH	HINC.		

QA/QC DATA

QC PARAMETER	CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	HARDNESS	HCO3	CO3
QUFARAMETER	(mg/l)	(mg/l)		(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
METHOD			(mg/l)		(IngCaCO3/I) SM18 2340B	EPA 310.1	, U
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	EPA 200.7			EPA 310.1
DATE ANALYZED	06/30/23	06/30/23	06/30/23	06/30/23	06/30/23	06/29/23	06/29/23
DETECTION LIMIT	0.100	0.100	0.500	0.500	0.700	1.00	1.00
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	35.8	9.25	2.78	26.4	127		
DUPLICATE	35.8	9.24	2.75	26.5	127		
RPD	0.09%	0.09%	0.81%	0.23%	0.09%	NA	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH			
ORIGINAL	35.8	9.25	2.78	26.4			
SPIKED SAMPLE	46.4	19.6	13.5	37.5			
SPIKE ADDED	10.0	10.0	10.0	10.0			
% RECOVERY	105.80%	103.42%	107.48%	110.76%	NA	NA	NA
QC CHECK							
FOUND	9.79	9.82	10.1	10.2	64.9		
TRUE	10.0	10.0	10.0	10.0	66.2		
% RECOVERY	97.92%	98.16%	101.36%	102.47%	98.07%	NA	NA
	21.2210	20.1070	101.5070	102.1775	20.0770	1 12 1	1 12 1
BLANK	< 0.100	< 0.100	< 0.500	< 0.500	< 0.700	NA	NA
DLA HAIX	NO.100	NO.100	NO.300	<0.500	\0.700	11/1	11/1

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. DR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANCE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Mamien Hademsh"

Damien Gadomski, PhD Laboratory Manager

Relinquished to JAL By (Signature)	Received By	**Matrix: B=Biota, DW=Drinking Water, G SL=Sludge, SW=Surface Water, WW=W Sampled By			~			2	_	1740 SW	173(1)	(mm-dd- Time Matrix** yy)	SAMPLING	Hold Dispose U Return	odsi	X Yes Q No		G Fax IX Email G Mail	Reporting/Involcing Format		Email: shannon.brattebo@tetratech.com	Contact: Shannon Brattebo	Seattle, WA 98121	ξή Ι	Client: Tetra Tech Inc.	REPORT TO:	3927 Aurora Ave N • Seattle • WA • 98103 p· 206-632-24 F: 206-632-24	IEH Analytical Laboratories
Date 17/3 Time 3:35	Date Time	ater, P=Pain	197 GIV	1 NAD UTN						Mid-Lake Bottom	Mid-Lake 1m	(This Will Appear On The Report)	SAMPLE DESCRIPTION	*Advanced notice required tot sust Advanced	Specific Date: 4 Weeks		3 Business Da 🗘 Standard	🗖 Next Day 📮 2 Business Day	Turn Around Time (TAT)*	Fax				0			ttle • VVA • 98103 F: 206-632-2417	aboratories
Received at IAL By	Shipped By 2 SAMPLESASES S. 8 2 TOA	t, Comments: Dissolved aluminum, SRP, DOC, and chlorophyll samples not filtered, will need filtration	$ \Gamma $							x x x x x x x x x x x x x x x x x x x	x x x x x x x x x x x x x x x x x x x	Total Disso Sulfa Total SRP Total NO3 Disso Chlo Tota Chlo Bica Cart Tota Sod Pota pH	Alkali Alum Ived J te Phos Phos +NO2 olved rophy Hard ride rbona conate I Calc	nity inul Alui opho gen -Nit Org II a Ines	m minu prus roge anic as	n Cai			Analysis Analysis	Phone: Fax:	Email: Snahnou, Drahebouwieu accuraciu	Contac Snartholi Drawsov	Channed Dattich	Addres		(INVOICE TO: (IF DIFFERENT FROM REPORT)		Chain of Custody Form) 10/10
24	Shipping Reference	ered, will need filtration								10100	00000	Cor	Temp Lab ID				d		Caso Ella Number	I AB USE ONLY	- -		Client Project: Waughop Lake	Client PO:	Quote No.:		PROJECT INFORMATION	110/0 Page - or



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1741118	PA	GE 1
REPORT DATE:	08/08/23		
DATE SAMPLED:	06/29/23	DATE RECEIVED:	06/29/23
FINAL REPORT, LABORATO	RY ANALYSIS OF SELECTE	D PARAMETERS ON WATER	
SAMPLES FROM TETRA TEC	CH INC.		

CASE NARRATIVE

Three water samples were received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL	DISSOLVED
	ALUMINUM	ALUMINUM
SAMPLE ID	(mg/L)	(mg/L)
Mid-Lake 1m	1.50	0.0414
Mid-Lake 0.5m from bottom	1.85	0.0392
West Shore	1.51	0.0306



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1741118	РА	GE 2
REPORT DATE:	08/08/23		
DATE SAMPLED:	06/29/23	DATE RECEIVED:	06/29/23
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECTE	D PARAMETERS ON WATER	
SAMPLES FROM TETRA TECI	H INC.		

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM (mg/L)	DISSOLVED ALUMINUM (mg/L)
METHOD	EPA 200.8	EPA 200.8
DATE ANALYZED	07/06/23	07/10/23
DETECTION LIMIT	0.0030	0.0030
DUPLICATE		
SAMPLE ID	BATCH	BATCH
ORIGINAL	0.0272	0.0507
DUPLICATE	0.0255	0.0524
RPD	6.62%	3.26%
SPIKE SAMPLE		
SAMPLE ID	BATCH	BATCH
ORIGINAL	0.0272	0.0507
SPIKED SAMPLE	0.5633	0.5018
SPIKE ADDED	0.5000	0.5000
% RECOVERY	107.20%	90.22%
QC CHECK		
FOUND	0.5481	0.5220
TRUE	0.5000	0.5000
% RECOVERY	109.62%	104.39%
BLANK	< 0.0030	< 0.0030

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

Damien Hadomsh"

Damien Gadomski, PhD Laboratory Manager

Relinquished to IAL By (Signature)	Received By Park	Sampled By	**Matrix: B=Biota DM-									7	_	25:42 ATT		(mm-dd-		Hold Dien			- ax IX Email	Reporting	¹⁷ none: 509-97					REPORT TO:
		Sampled By										+	+	+	3		L Return	isp	D No	QC Data Reported	nail 🛛 Mail	Reporting/Invoicing Format	509-979-9672	shannon.brattebo@tetratech.com	Shannon Brattebo	Seattle, WA 98121	2003 Western Avenue Common	3927 Aurora Ave N • Seattle • WA • 98103 P: 206-632-2715 F: 206-632-24
	Date 06/29/23 3; 45	ound Water, P=Paint, S=S ater										West sh	Mid-lake	Mid-Lake 1m	(This Will Appear On The Report)	SAMPLE DESCRIPTION	*Advanced notice required for Rush Analysis	Specific Date:	S Dusiness Da U Standard	5 · ·	I Urn Around Time (TAT)*	Fax						tle • WA • 98103 F: 206-632-2417
						HT13	05/29/23						he O.Sm from total	1m	In The Report)			4 weeks			ime (TAT)*		Ел	Co		Ad		
Shipped By		Comments:		(\rightarrow	XX	××	Total All			IM			Analy	Phone:	Email: <u>shannon.brattebo@tetratech.com</u>	Contact: Shannon Brattebo		Address:	INVOICE TO: (IF DIFFERE Client: Same	
	Dissolved aluminum not filtered, will need filtration										>									-	Analysis Requested	Fax:	@tetratech.com	0			FFERENT FROM REPORT)	ain of Custody Form $/\mathcal{H}_{UV}$
Shipping Reference	will need filtration											S	Z		Field Filt Contain					Cas				Client Proj	Client PO:	Quote No.:	PROJEC	"JAIIIR"
Shipping Reference										\mathbb{P}		Indra	179 291	nacac	o Lab ID					Case File Number	LAB USE ONLY			Client Project: Waughop Lak	PO:	No:	PROJECT INFORMATION	³ age



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1741155	PAGE	1
REPORT DATE:	08/08/23		
DATE SAMPLED:	06/30/23	DATE RECEIVED:	06/30/23
FINAL REPORT, LABORATORY ANA	ALYSIS OF SELECTED PARA	METERS ON WATER	
SAMPLES FROM TETRA TECH INC.			

CASE NARRATIVE

Two water samples were received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	SRP	N03+N02	DOC	TOTAL-N	ALKALINITY	pН
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	
Mid-Lake 1m	0.009	0.003	0.019	5.94	0.569	38.1	7.10
Mid-Lake Bottom	0.009	0.002	0.017	6.01	0.580	37.2	7.02

	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	0.4539	0.0614	4.73	89.5	0.7	1.2
Mid-Lake Bottom	0.4839	0.0507	4.41	91.9		

	CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	HARDNESS	HCO3	CO3
SAMPLE ID	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
Mid-Lake 1m	5.84	0.804	2.73	48.8	17.9	32.3	<1.00
Mid-Lake Bottom	5.82	0.816	2.71	48.5	17.9	30.6	<1.00



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1741155	PAG	PAGE 2					
REPORT DATE:	08/08/23							
DATE SAMPLED:	06/30/23	DATE RECEIVED:	06/30/23					
FINAL REPORT, LABORATOR								
SAMPLES FROM TETRA TECH	HINC.							

QA/QC DATA

OC PARAMETER	TOTAL-P	SRP	N03+N02	DOC	TOTAL-N	ALKALINITY	pH
QUITINUMETER	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	pii
METHOD	SM20 4500PF	SM20 4500PF	SM204500N03F	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	07/10/23	07/01/23	07/01/23	07/11/23	07/08/23	07/10/23	07/01/23
DETECTION LIMIT	0.002	0.001	0.010	0.250	0.050	1.00	0.10
DETECTION EMMI	0.002	0.001	0.010	0.230	0.050	1.00	0.10
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.090	0.017	0.446	< 0.250	0.397	166	
DUPLICATE	0.092	0.017	0.449	< 0.250	0.444	164	
RPD	2.75%	1.20%	0.56%	NC	11.18%	1.01%	NA
			• • • •		•	•	
SPIKE SAMPLE							
	DATION	DATION	DATION	D. HEGH	DITON		
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	0.090	0.017	0.446	< 0.250	0.397		
SPIKED SAMPLE	0.135	0.037	0.657	4.24	1.49		
SPIKE ADDED	0.050	0.020	0.200	4.50	1.00		
% RECOVERY	90.60%	100.50%	105.29%	94.18%	109.10%	NA	NA
QC CHECK							
FOUND	0.094	0.039	0.417	4.25	0.499	96.8	
TRUE	0.094	0.039	0.408	4.00	0.490	100	
% RECOVERY	100.00%	98.98%	102.28%	106.25%	101.84%	96.80%	NA
BLANK	< 0.002	< 0.001	< 0.010	< 0.250	< 0.050	NA	NA



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1741155	PA	GE 3
REPORT DATE:	08/08/23		
DATE SAMPLED:	06/30/23	DATE RECEIVED:	06/30/23
FINAL REPORT, LABORATOR	RY ANALYSIS OF SELECTED	D PARAMETERS ON WATER	
SAMPLES FROM TETRA TEC	H INC.		

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
METHOD	EPA 200.8	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H
DATE ANALYZED	07/06/23	07/10/23	07/05/23	07/11/23	07/06/23	07/06/23
DETECTION LIMIT	0.0030	0.0030	0.50	1.00	0.1	0.1
DUPLICATE						
SAMPLE ID	BATCH	Mid-Lake Bottom	BATCH	Mid-Lake Bottom	BATCH	BATCH
ORIGINAL	0.0272	0.0507	20.0	91.9	8.5	2.7
DUPLICATE	0.0255	0.0524	19.3	95.0	8.5	2.7
RPD	6.62%	3.26%	3.21%	3.24%	0.00%	0.00%
SPIKE SAMPLE						
SAMPLE ID	BATCH	Mid-Lake Bottom	BATCH	Mid-Lake Bottom		
ORIGINAL	0.0272	0.0507	20.0	91.9		
SPIKED SAMPLE	0.5633	0.5018	38.9	103		
SPIKE ADDED	0.5000	0.5000	20.0	10.0		
% RECOVERY	107.20%	90.22%	94.60%	109.51%	NA	NA
QC CHECK						
FOUND	0.5481	0.5220	30.2	9.98		
TRUE	0.5000	0.5000	30.0	10.0		
% RECOVERY	109.62%	104.39%	100.67%	99.80%	NA	NA
BLANK	< 0.0030	< 0.0030	< 0.50	<1.00	NA	NA



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1741155	PAG	GE 4	
REPORT DATE:	08/08/23			
DATE SAMPLED:	06/30/23	DATE RECEIVED:	06/30/23	
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECTE	ED PARAMETERS ON WATER		
SAMPLES FROM TETRA TECH	I INC.			

QA/QC DATA

OC PARAMETER	CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	HARDNESS	HCO3	CO3
	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	07/06/23	07/06/23	07/06/23	07/06/23	07/06/23	07/10/23	07/10/23
DETECTION LIMIT	0.100	0.100	0.500	0.500	0.700	1.00	1.00
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	35.3	8.92	2.52	25.2	125		
DUPLICATE	35.3	8.92	2.56	25.1	125		
RPD	0.23%	0.02%	1.54%	0.13%	0.16%	NA	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH			
ORIGINAL	35.3	8.92	2.52	25.2			
SPIKED SAMPLE	45.5	19.1	12.7	35.8			
SPIKE ADDED	10.0	10.0	10.0	10.0			
% RECOVERY	102.06%	101.47%	102.13%	106.36%	NA	NA	NA
QC CHECK							
FOUND	9.93	9.68	9.88	10.2	64.7		
TRUE	10.0	10.0	10.0	10.0	66.2		
% RECOVERY	99.33%	96.85%	98.80%	101.53%	97.78%	NA	NA
BLANK	< 0.100	< 0.100	< 0.500	< 0.500	< 0.700	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. DR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANCE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

Mamien Hademsh"

Damien Gadomski, PhD Laboratory Manager

Relinquished	Received By	Sampled By	**Matrix: B=ł SL=Sludge,				/	/										06/30/23	0/20/23	Date (mm-dd- yy)		Hold		⊠Yes	G Fax D		Phone: 50		Contact: SI		ι. Ω	Client: Te	
Relinquished to IAL By (Signature)	e	Brant	3iota, DW≔Drii SW=Surface V								/							3:35	12:20	Time	z	Dispose	Sample Disposal	QC Data Reported	Email	Reporting/Invoicing Format	509-979-9672	annon.bratteb	Shannon Brattebo	Seattle, WA 98121)03 Western A	O: Tetra Tech Inc.	
gnature)		•	**Matrix: B=Biota, DW=Drinking Water, GW=Groun SL=Sludge, SW=Surface Water, WW=Wastewater								/	/	_				2	SW	SW	Matrix**	G	C Return	osal		- Mail	ıg Format		shannon.brattebo@tetratech.com	bo	121	2003 Western Avenue, Suite 700		27 Aurora Ave N • Seattle • WA • 981 P: 206-632-2715 F: 206-632-
Date 06/30/23	Date	Date 06/30/23	d Water, P=							/	/							Mid	M	(This Will A	SAMPL	*Advanced notice required for Rush Analysis	Specific Date:	U 3 Business Da U Standard	Next Day	Turn Arc	Fax				0		3927 Aurora Ave N • Seattle • WA • 98103 P: 206-632-2715 F: 206-632-2417
20: 4	Time	Time 12:20	aint, S=Soil, SD=Si						/	/	/	/	AT	1 061				Mid-Lake Bottom	Mid-Lake 1m	(This Will Appear On The Report)	SAMPLE DESCRIPTION	quired for Rush Ar	4 weeks	U standard	□ 2 Business Day	Turn Around Time (TAT)*							
Re	Sh									X	/		ß	30/23						nt) Number				rs			Ph	Em	Co		Ad	Clic	
Received at IAL By	Shipped By		Comments: Dis															×	×	Total Alk							Phone:	Email:	Contac Shannon Brattebo		Addres	INVOICE TO: (IF DIFFERENT FROM REPORT) Client: Same	
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ate b/30 □	Shipping Reference		RP, DOC, and chlorophyll samples not filtered, will need filtration				/													Temp					Case File	LAB USE ONLY	- - - -		t Project: V	Client PO:	Quote No.:	JECT INFO	
Пте П/-00	erence		ation									/			$\left(\right)$			129707	129701	Lab ID					Case File Number	ONLY			Client Project: Waughop Lake			PROJECT INFORMATION	



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1741377	PAGE	1
REPORT DATE:	09/14/23		
DATE SAMPLED:	07/13/23	DATE RECEIVED:	07/13/23
FINAL REPORT, LABORATORY	ANALYSIS OF SE	LECTED PARAMETERS ON WATER	
SAMPLES FROM TETRA TECH I	NC.		

CASE NARRATIVE

Two water samples were received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of these samples. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	SRP	N03+N02	DOC	TOTAL-N	ALKALINITY	pH
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	
Mid-Lake 1m	0.015	< 0.001	< 0.010	6.21	0.650	38.0	7.94
Mid-Lake Bottom	0.016	< 0.001	< 0.010	5.97	0.620	39.2	7.93

	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	0.9611	0.8458	3.99	94.8	3.6	1.5
Mid-Lake Bottom	0.9689	0.8219	3.99	97.6		

	CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	HARDNESS	HCO3	CO3
SAMPLE ID	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
Mid-Lake 1m	6.36	0.876	3.05	50.5	19.5	36.9	<1.00
Mid-Lake Bottom	6.47	0.896	2.98	50.8	19.8	38.0	<1.00



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1741377 PAGE 2							
REPORT DATE:	09/14/23							
DATE SAMPLED:	07/13/23	DATE RECEIVED:	07/13/23					
FINAL REPORT, LABORATORY	Y ANALYSIS OF SELEC	CTED PARAMETERS ON WATER						
SAMPLES FROM TETRA TECH INC.								

QA/QC DATA

DATE ANALYZED	(mg/L) SM20 4500PF 07/17/23	(mg/L) SM20 4500PF	(mg/L)	DOC (mg/L)	(mg/L)	(mgCaCO3/L)	pH
DATE ANALYZED	SM20 4500PF	SM20 4500PF				(IngCaCO ₅ /L)	
	07/17/23		SM204500N03F	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DETECTION LINUT		07/14/23	07/13/23	07/24/23	07/17/23	07/25/23	07/14/23
DETECTION LIMIT	0.002	0.001	0.010	0.250	0.050	1.00	0.10
					•		
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH	
	Diffen	Diffen	Diffen	Diffen	Diffen	DATEN	
ORIGINAL	0.151	< 0.001	< 0.010	< 0.250	0.545	158	
DUPLICATE	0.151	< 0.001	< 0.010	< 0.250	0.539	158	
RPD	0.04%	NC	NC	NC	1.11%	0.00%	NA
SPIKE SAMPLE							
_			Г		1		
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
	Diffen	2	2	Diffen	2		
ORIGINAL	0.151	< 0.001	< 0.010	< 0.250	0.545		
SPIKED SAMPLE	0.201	0.020	0.208	4.22	1.54		
SPIKE ADDED	0.050	0.020	0.200	4.50	1.00		
% RECOVERY	99.31%	100.00%	104.24%	93.84%	99.20%	NA	NA
QC CHECK							
FOUND	0.094	0.039	0.418	4.14	0.528	102	
TRUE	0.094	0.039	0.408	4.00	0.490	100	
% RECOVERY	100.00%	98.98%	102.45%	103.43%	107.76%	102.00%	NA
	.0.002	-0.001	.0.010	.0.250	-0.050	NT A	NT A
BLANK	< 0.002	< 0.001	< 0.010	< 0.250	< 0.050	NA	NA



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1741377	PA	GE 3					
REPORT DATE:	09/14/23							
DATE SAMPLED:	07/13/23	DATE RECEIVED:	07/13/23					
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECTEI	D PARAMETERS ON WATER						
SAMPLES FROM TETRA TECH INC.								

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
METHOD	EPA 200.8	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H
DATE ANALYZED	08/09/23	08/09/23	07/19/23	07/14/23	07/19/23	07/19/23
DETECTION LIMIT	0.0030	0.0030	0.50	1.00	0.1	0.1
DUPLICATE						
SAMPLE ID	BATCH	Mid-Lake 1m	Mid-Lake Bottom	Mid-Lake Bottom	BATCH	BATCH
ORIGINAL	< 0.0030	0.8458	3.99	97.6	4.0	0.9
DUPLICATE	< 0.0030	0.8164	4.52	94.8	4.0	0.9
RPD	NC	3.54%	12.35%	2.94%	0.00%	0.00%
SPIKE SAMPLE						
SAMPLE ID	BATCH	Mid-Lake 1m	Mid-Lake Bottom	Mid-Lake Bottom		
ORIGINAL	< 0.0030	0.8458	3.99	97.6		
SPIKED SAMPLE	0.4590	1.300	14.8	109		
SPIKE ADDED	0.5000	0.5000	10.0	10.0		
% RECOVERY	91.80%	90.84%	108.26%	115.34%	NA	NA
QC CHECK						
FOUND	0.4760	0.5220	30.5	9.84		
TRUE	0.5000	0.5000	30.0	10.0		
% RECOVERY	95.21%	104.39%	101.67%	98.40%	NA	NA
BLANK	< 0.0030	< 0.0030	< 0.50	<1.00	NA	NA



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1741377	PA	GE 4	
REPORT DATE:	09/14/23			
DATE SAMPLED:	07/13/23	DATE RECEIVED:	07/13/23	
FINAL REPORT, LABORATOR	RY ANALYSIS OF SELECTED	PARAMETERS ON WATER		
SAMPLES FROM TETRA TEC	H INC.			

QA/QC DATA

OC PARAMETER	CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	HARDNESS	HCO3	CO3
	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	07/18/23	07/18/23	07/18/23	07/18/23	07/18/23	07/25/23	07/25/23
DETECTION LIMIT	0.100	0.100	0.500	0.500	0.700	1.00	1.00
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	34.6	8.67	2.73	24.8	122		
DUPLICATE	34.5	8.65	2.68	25.0	122		
RPD	0.18%	0.29%	1.90%	0.42%	0.21%	NA	NA
SPIKE SAMPLE							
		1					
SAMPLE ID	BATCH	BATCH	BATCH	BATCH			
ORIGINAL	34.6	8.67	2.73	24.8			
SPIKED SAMPLE	44.9	18.5	12.7	35.9			
SPIKE ADDED	10.0	10.0	10.0	10.0			
% RECOVERY	103.17%	97.80%	99.85%	110.89%	NA	NA	NA
QC CHECK							
FOUND	9.73	9.49	9.98	10.1	63.4		
TRUE	10.0	10.0	10.0	10.0	66.2		
% RECOVERY	97.26%	94.89%	99.75%	100.86%	95.78%	NA	NA
BLANK	< 0.100	< 0.100	< 0.500	< 0.500	< 0.700	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. DR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANCE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

Mamien Hademsh"

Damien Gadomski, PhD Laboratory Manager

May Partal My	01	San Speel	Ŕ.	Sampled By Arthon Bryant	SL=Sludge, SW=Surface Water, WW=Wastewater	**Matrix: B=Biota, DW=Drinking Water, G			0					<u> </u>	ミン	7-17-13 1100 SW	(mmau)		SAMPLIN	Hold Dispose Return	Sample Disposal	X Yes Q No	QC Data Reported	🗆 Fax 🛛 🖾 Email 🔹 Mail	Reporting/Invoicing Format		Email: shannon.brattebo@tetratech.com	Contact: Shannon Brattebo	Seattle, WA 98121	Address: 2003 Western Avenue, Suite / 00	Client: letra lech inc.	REPORT TO:	P: 206-632-2715	3927 Aurora Ave N • Seattle • WA • 98103	IEH Analytical Laboratories
	Date 7/13, 173 Time 1400	4	Time	7/13/23 4400 1100	astewater	**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment,	t - V - a								Mid-Lake Bottom	Mid-Lake 1m		(This Will Appear On The Report)	SAMPLE DESCRIPTION	*Advanced notice required for Rush Analysis	Specific Date: 4 weeks	<u>+</u>	3 Business Da 🛱 Standard	Next Day Q 2 Business Day	Turn Around Time (TAT)*	Fax	3	and a second					F: 206-632-2417	ttle • WA • 98103	aboratories
	1400 RECEIVED ALLES AS is 18.20- 2	AD Las / mm	Shipped By		Dissolved alyminum, SRP, DOC, and chlorophyli samples not illered, whil ileve illusion	Commer	 7/3/23			╾┥┥┾╌╿┥┝╱┥┥┥┥┥┥╸┥╺┝╱┥╱┥╵┤╶┥╱┝╶┤	<u>╶</u> ╸╸╸╸╸╸╸╸╸╸╸				x x x x x x x x x x x x x x x x x x x	×	Tot Tot Diss Su To SF To NC Dis Cr To Cr Bid Cr So Cr To Cr So Cr To F To F F	tal N D3+N ssolv Ilorop tal H hlorid carbor arbor tal C otal N odium otass H eld F	kalir umir ed A hosp itrog IO2- ed C ohyli ardr e onate calciu fagn n iium	en Nitro Drga a ness e um nessit		n Car	bon			Phone: Fax:	Email: <u>shannon bratteboy@tetratech.coju</u>								f Clietody Form
	23	Date Time		China Deference	eu, win nopu instation	a will rood filtration									r ccusi	11717		Temp Lab ID		s Ra		Vec			Concello Number				Client Project. Waughop Lak	Client PO:	Quote No.:		PROJECT INFORMATION	t	Page f of f



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1742078	PAGE	21
REPORT DATE:	10/16/23		
DATE SAMPLED:	08/15/23	DATE RECEIVED:	08/15/23
FINAL REPORT, LABORATORY AN	ALYSIS OF SELECTED PARA	METERS ON WATER	
SAMPLES FROM TETRA TECH INC			

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	SRP	N03+N02	DOC	TOTAL-N	ALKALINITY	pН
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	
Mid-Lake 1m	0.028	0.001	< 0.010	7.70	0.769	37.4	7.94

	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	1.043	0.9953	4.52	108	6.7	3.4

	CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	HARDNESS	HCO3	CO3
SAMPLE ID	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
Mid-Lake 1m	6.74	0.998	4.81	56.6	20.9	36.3	<1.00



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1742078	PAG	GE 2	
REPORT DATE:	10/16/23			
DATE SAMPLED:	08/15/23	DATE RECEIVED:	08/15/23	
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELEC	FED PARAMETERS ON WATER		
SAMPLES FROM TETRA TECH	I INC.			

QA/QC DATA

QC PARAMETER	TOTAL-P	SRP	N03+N02	DOC	TOTAL-N	ALKALINITY	pН
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	1
METHOD	SM20 4500PF	SM20 4500PF	SM204500N03F	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	08/25/23	08/16/23	08/17/23	08/17/23	08/22/23	08/21/23	08/15/23
DETECTION LIMIT	0.002	0.001	0.010	0.250	0.050	1.00	0.10
			•				
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH	
SAMI EE ID	BAICH	BAICH	DATCH	BAICH	BAICH	BAICH	
ORIGINAL	0.005	< 0.001	0.091	< 0.250	0.179	79.5	
DUPLICATE	0.005	< 0.001	0.091	< 0.250	0.191	78.5	
RPD	5.60%	NC	0.60%	NC	6.49%	1.27%	NA
SPIKE SAMPLE							
			1 1		1		
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
SAMI LE ID	BATCH	BAICH	DATCH	BAICH	BAICH		
ORIGINAL	0.005	< 0.001	0.091	< 0.250	0.179		
SPIKED SAMPLE	0.053	0.022	0.298	4.07	1.36		
SPIKE ADDED	0.050	0.020	0.200	4.50	1.00		
% RECOVERY	96.66%	110.00%	103.44%	90.38%	117.60%	NA	NA
					-		
QC CHECK							
FOUND	0.093	0.040	0.414	4.02	0.510	101	
TRUE	0.094	0.039	0.408	4.00	0.490	100	
% RECOVERY	98.94%	101.52%	101.47%	100.50%	104.08%	101.00%	NA
BLANK	< 0.002	< 0.001	< 0.010	< 0.250	< 0.050	NA	NA
	98.94% <0.002	<0.001	<0.010	<0.250	<0.050	101.00% NA	



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1742078	PAG	GE 3
REPORT DATE:	10/16/23		
DATE SAMPLED:	08/15/23	DATE RECEIVED:	08/15/23
FINAL REPORT, LABORATOR	RY ANALYSIS OF SELECTED	D PARAMETERS ON WATER	
SAMPLES FROM TETRA TEC	H INC.		

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM	DISSOLVED ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
METHOD	EPA 200.8	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H
DATE ANALYZED	08/17/23	08/17/23	08/23/23	08/18/23	08/22/23	08/22/23
DETECTION LIMIT	0.0030	0.0030	0.50	1.00	0.1	0.1
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.1001	0.0148	2.31	23.5	6.4	2.4
DUPLICATE	0.1001	0.0141	2.52	23.3	6.4	2.0
RPD	0.00%	4.70%	8.70%	0.76%	0.00%	17.07%
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	0.1001	0.0148	2.31	23.5		
SPIKED SAMPLE	0.6313	0.5418	12.6	33.2		
SPIKE ADDED	0.5000	0.5000	10.0	10.0		
% RECOVERY	106.24%	105.41%	103.01%	97.11%	NA	NA
QC CHECK						
FOUND	0.5373	0.5369	30.9	9.86		
TRUE	0.5000	0.5000	30.0	10.0		
% RECOVERY	107.46%	107.38%	103.00%	98.60%	NA	NA
BLANK	< 0.0030	< 0.0030	< 0.50	<1.00	NA	NA



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3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1742078	PA	GE 4					
REPORT DATE:	10/16/23							
DATE SAMPLED:	08/15/23	DATE RECEIVED:	08/15/23					
FINAL REPORT, LABORATOR	RY ANALYSIS OF SELECTE	D PARAMETERS ON WATER						
SAMPLES FROM TETRA TECH INC.								

QA/QC DATA

OC PARAMETER	CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	HARDNESS	HCO3	CO3
QC PARAMETER							
	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	08/21/23	08/21/23	08/21/23	08/21/23	08/21/23	08/21/23	08/21/23
DETECTION LIMIT	0.100	0.100	0.500	0.500	0.700	1.00	1.00
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	8.47	1.06	0.565	2.39	26		
DUPLICATE	8.54	1.05	0.575	2.40	26		
RPD	0.82%	0.83%	1.76%	0.57%	0.54%	NA	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH			
ORIGINAL	8.47	1.06	0.565	2.39			
SPIKED SAMPLE	19.0	11.6	11.1	13.4			
SPIKE ADDED	10.0	10.0	10.0	10.0			
% RECOVERY	105.37%	105.45%	105.38%	110.56%	NA	NA	NA
QC CHECK							
FOUND	10.3	10.4	10.4	10.9	68.6		
TRUE	10.0	10.0	10.0	10.0	66.2		
% RECOVERY	102.88%	104.21%	104.21%	109.40%	103.71%	NA	NA
, NECOVERT	102.0070	107.21/0	104.2170	107.40/0	105.7170	1 1/ 1	1 12 1
BLANK	<0.100	< 0.100	< 0.500	< 0.500	< 0.700	NA	NA
DLAINE	<0.100	<0.100	\U.JUU	<0.500	<0.700	11/1	11/1

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. DR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANCE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

Mamien Hademsh"

Damien Gadomski, PhD Laboratory Manager

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Lab ID	Temp	Field F Contai	рН	Sodium Potass	Total N	Total C	Carbon	Bicarbo	Chlorid	Total H	Dissolv Chlorop	NO3+N	Total N	SRP	Sulfate Total P	Dissolv	Total A	Total A	Numbe	port)	(This Will Appear On The Report)	(This Will	Matrix**	Time	Date (mm-dd- yy)
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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1742786	PAGE	1
REPORT DATE:	10/16/23		
DATE SAMPLED:	09/14/23	DATE RECEIVED:	09/14/23
FINAL REPORT, LABORATORY AN	ALYSIS OF SELECTED PARA	METERS ON WATER	
SAMPLES FROM TETRA TECH INC.			

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	SRP	N03+N02	DOC	TOTAL-N	ALKALINITY	pН
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	
Mid-Lake 1m	0.031	< 0.001	< 0.010	9.70	1.06	37.6	8.09

	TOTAL ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	1.676	5.15	108	10	4.5

Γ		CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	HARDNESS	HCO3	CO3
	SAMPLE ID	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
	Mid-Lake 1m	6.98	1.06	3.46	62.8	21.8	36.7	<1.00



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1742786	PAG	GE 2	
REPORT DATE:	10/16/23			
DATE SAMPLED:	09/14/23	DATE RECEIVED:	09/14/23	
FINAL REPORT, LABORATORY	ANALYSIS OF SELEC	TED PARAMETERS ON WATER		
SAMPLES FROM TETRA TECH	INC.			

QA/QC DATA

QC PARAMETER	TOTAL-P	SRP	N03+N02	DOC	TOTAL-N	ALKALINITY	pН
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	1
METHOD	SM20 4500PF	SM20 4500PF	SM204500N03F	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	09/25/23	09/15/23	09/15/23	10/10/23	09/19/23	09/21/23	09/15/23
DETECTION LIMIT	0.002	0.001	0.010	0.250	0.050	1.00	0.10
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH	
SAMI LE ID	BAICH	BAICH	BAICH	BATCH	BAICH	BAICH	
ORIGINAL	0.062	0.002	0.019	1.11	0.565	86.4	
DUPLICATE	0.062	0.002	0.016	1.17	0.540	87.2	
RPD	0.32%	2.40%	12.10%	5.62%	4.52%	0.92%	NA
SPIKE SAMPLE							
			· · · · · ·				
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
SAMPLE ID	БАТСП	DATCH	DAICH	БАТСП	БАТСП		
ORIGINAL	0.062	0.002	0.019	1.11	0.565		
SPIKED SAMPLE	0.110	0.022	0.191	5.40	1.56		
SPIKE ADDED	0.050	0.020	0.200	4.50	1.00		
% RECOVERY	95.79%	103.46%	86.33%	95.51%	99.70%	NA	NA
					-		
QC CHECK							
FOUND	0.095	0.041	0.402	4.26	0.461	98.8	
TRUE	0.094	0.039	0.408	4.00	0.490	100	
% RECOVERY	101.06%	104.06%	98.53%	106.50%	94.08%	98.80%	NA
BLANK	< 0.002	< 0.001	< 0.010	< 0.250	< 0.050	NA	NA



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1742786	PAG	GE 3
REPORT DATE:	10/16/23		
DATE SAMPLED:	09/14/23	DATE RECEIVED:	09/14/23
FINAL REPORT, LABORATO	RY ANALYSIS OF SELECTED	D PARAMETERS ON WATER	
SAMPLES FROM TETRA TEC	H INC.		

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
METHOD	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H
DATE ANALYZED	09/25/23	09/21/23	09/22/23	09/29/23	09/29/23
DETECTION LIMIT	0.0030	0.50	1.00	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.0241	1.37	21.1	8.0	3.7
DUPLICATE	0.0239	1.37	21.5	7.7	3.5
RPD	0.61%	0.00%	1.59%	4.26%	3.70%
SPIKE SAMPLE					
SAMPLE ID	BATCH	BATCH	BATCH		
ORIGINAL	0.0241	1.37	21.1		
SPIKED SAMPLE	0.5328	11.9	31.5		
SPIKE ADDED	0.5000	10.0	10.0		
% RECOVERY	101.74%	105.11%	104.05%	NA	NA
QC CHECK					
FOUND	0.5276	31.3	9.93		
TRUE	0.5000	30.0	10.0		
% RECOVERY	105.52%	104.33%	99.35%	NA	NA
BLANK	< 0.0030	< 0.50	<1.00	NA	NA



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1742786	PA	GE 4	
REPORT DATE:	10/16/23			
DATE SAMPLED:	09/14/23	DATE RECEIVED:	09/14/23	
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECTE	D PARAMETERS ON WATER		
SAMPLES FROM TETRA TECH	I INC.			

QA/QC DATA

CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	HARDNESS	HCO3	CO3
						(mgCaCO3/l)
					, C	EPA 310.1
						09/30/23
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0.100	0.100	0.500	0.500	0.700	1.00	1.00
BATCH	BATCH	BATCH	BATCH	BATCH		
35.6	9.60	2.49	27.4	128		
35.7	9.62	2.52	27.5	129		
0.29%	0.15%	1.25%	0.21%	0.25%	NA	NA
BATCH	BATCH	BATCH	BATCH			
35.6	9.60	2.49	27.4			
45.6	19.9	12.8	37.1			
10.0	10.0	10.0	10.0			
99.77%	102.89%	103.58%	96.48%	NA	NA	NA
9.85	10.1	10.3	10.3	66.3		
10.0	10.0	10.0	10.0	66.2		
98.50%	101.23%	102.54%	102.58%	100.20%	NA	NA
< 0.100	< 0.100	< 0.500	< 0.500	< 0.700	NA	NA
	35.6 35.7 0.29% BATCH 35.6 45.6 10.0 99.77% 9.85 10.0 98.50%	(mg/l) (mg/l) EPA 200.7 EPA 200.7 09/30/23 09/30/23 0.100 0.100 BATCH BATCH 35.6 9.60 35.7 9.62 0.29% 0.15% BATCH BATCH 9.60 15% 9.60 10.0 9.85 10.1 10.0 10.0 98.50% 101.23%	(mg/l) (mg/l) (mg/l) EPA 200.7 EPA 200.7 EPA 200.7 09/30/23 09/30/23 09/30/23 0.100 0.100 0.500 BATCH BATCH BATCH 35.6 9.60 2.49 35.7 9.62 2.52 0.29% 0.15% 1.25% BATCH BATCH BATCH 9.60 2.49 35.6 9.60 2.49 45.6 19.9 12.8 10.0 10.0 10.0 99.77% 102.89% 103.58% 9.85 10.1 10.3 10.0 10.0 10.0 98.50% 101.23% 102.54%	(mg/l) (mg/l) (mg/l) (mg/l) (mg/l) EPA 200.7 EPA 200.7 EPA 200.7 EPA 200.7 09/30/23 09/30/23 09/30/23 09/30/23 09/30/23 09/30/23 09/30/23 09/30/23 0.100 0.100 0.500 0.500 0.500 BATCH BATCH BATCH BATCH BATCH 35.6 9.60 2.49 27.4 35.7 9.62 2.52 27.5 0.29% 0.15% 1.25% 0.21% BATCH BATCH BATCH BATCH 9.60 2.49 27.4 35.6 9.60 2.49 27.4 35.6 9.60 2.49 27.4 35.6 19.9 12.8 37.1 10.0 10.0 10.0 10.0 99.77% 102.89% 103.58% 96.48% 9.85 10.1 10.3 10.3 10.0 10.0 10.0 102.58%	(mg/l) (mg/l)<	(mg/l) (mg/l)<

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. DR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANCE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

Mamien Hademsh"

Damien Gadomski, PhD Laboratory Manager

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	ation	SRP, DOC, and chlorophyll samples not filtered, will need filtration	vill	ered	t filt	s not	nples	sam	hvll	ropt	chlo	Ind)с.	P DC	SRF			ents:	Comments:		**Matrix: B=Biota, DW=Drinking Water, GW=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater	**Matrix: B=Biota, DW=Drinking Water, GW=Groun SL=Sludge, SW=Surface Water, WW=Wastewater	: B=Biota, Ige, SW=:	**Matrix: SL=Slud
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np Lab ID	Temp	eld Filt	tassiu	dium	tal Ma	tal Ca	rbona	carbon	loride	tal Ha	loroph	03+NC ssolve	tal Niti		tal Ph	lfate		tal Alu	tal Alk	mber	Matrix** (This Will Appear On The Report)			Date (mm-dd-
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Client Project: Waughop Lake	lient Prc				1									0	Shannon Brattebo	on B	ann		Contact:	<u></u>		Shannon Brattebo	Shanno	Contact:
PO:	Client PO:																	:				Seattle, WA 98121	Seattle	
No.:	Quote No.:																	,	Address:	A	uite 700	2003 Western Avenue, Suite 700		Address:
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PROJECT INFORMATION	ROJEC							×		FROM REPORT)	P	ĭ ⊼			Ë	밁	₩		INVOICE TO: (IF DIFFERENT	Ī		1.200-002-1	01	REPORT TO:
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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1743346	PAGE	1
REPORT DATE:	11/09/23		
DATE SAMPLED:	10/11/23	DATE RECEIVED:	10/11/23
FINAL REPORT, LABORATORY AN	ALYSIS OF SELECTED PARA	METERS ON WATER	
SAMPLES FROM TETRA TECH INC			

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	SRP	N03+N02	DOC	TOTAL-N	ALKALINITY	pН
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	
Mid-Lake 1m	0.043	0.001	0.014	11.6	0.962	34.8	7.60

	TOTAL ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	1.35	4.62	74.7	32	11

	CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	HARDNESS	HCO3	CO3
SAMPLE ID	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
Mid-Lake 1m	6.43	1.03	3.51	58.1	20.3	32.9	<1.00



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1743346	PAGE	2
REPORT DATE:	11/09/23		
DATE SAMPLED:	10/11/23	DATE RECEIVED:	10/11/23
FINAL REPORT, LABORATORY A	NALYSIS OF SE	LECTED PARAMETERS ON WATER	
SAMPLES FROM TETRA TECH IN	IC.		

QA/QC DATA

OC PARAMETER	TOTAL-P	SRP	N03+N02	DOC	TOTAL-N	ALKALINITY	pH
QC IT II U III I I III	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	pm
METHOD	SM20 4500PF	SM20 4500PF	SM204500N03F	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	10/16/23	10/12/23	10/13/23	10/12/23	10/17/23	10/18/23	10/11/23
DETECTION LIMIT	0.002	0.001	0.010	0.250	0.050	1.00	0.10
DEFECTION	0.002	0.001	0.010	0.230	0.050	1.00	0.10
DUPLICATE							
	DATION	DATION	DATICI	DATION	DATCH	DATICIT	
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.080	0.018	0.012	< 0.250	0.391	58.4	
DUPLICATE	0.081	0.017	0.012	< 0.250	0.387	58.8	
RPD	0.98%	0.58%	1.70%	NC	1.03%	0.68%	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
SAMPLE ID	BAICH	BAICH	BAICH	BAICH	BAICH		
ORIGINAL	0.080	0.018	0.012	< 0.250	0.391		
SPIKED SAMPLE	0.130	0.038	0.201	3.89	1.35		
SPIKE ADDED	0.050	0.020	0.200	4.50	1.00		
% RECOVERY	100.25%	101.06%	94.47%	86.44%	96.30%	NA	NA
					-		
QC CHECK							
FOUND	0.094	0.040	0.408	3.91	0.441	102	
TRUE	0.094	0.039	0.408	4.00	0.469	100	
% RECOVERY	100.00%	101.52%	99.88%	97.63%	94.03%	102.00%	NA
BLANK	< 0.002	< 0.001	< 0.010	< 0.250	< 0.050	NA	NA



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1743346	PAG	GE 3
REPORT DATE:	11/09/23		
DATE SAMPLED:	10/11/23	DATE RECEIVED:	10/11/23
FINAL REPORT, LABORATOR	RY ANALYSIS OF SELECTEI	D PARAMETERS ON WATER	
SAMPLES FROM TETRA TEC	H INC.		

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
METHOD	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H
DATE ANALYZED	10/18/23	10/20/23	10/18/23	10/17/23	10/17/23
DETECTION LIMIT	0.0030	0.50	1.00	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.0155	31.4	6.29	0.5	1.6
DUPLICATE	0.0160	31.7	6.46	0.5	1.6
RPD	3.60%	1.00%	2.71%	0.00%	0.00%
SPIKE SAMPLE					
SAMPLE ID	BATCH	BATCH	BATCH		
ORIGINAL	0.0155	31.4	6.29		
SPIKED SAMPLE	0.4859	53.6	16.6		
SPIKE ADDED	0.5000	20.0	10.0		
% RECOVERY	94.09%	110.89%	103.18%	NA	NA
QC CHECK					
FOUND	0.4542	31.3	9.86		
TRUE	0.5000	30.0	10.0		
% RECOVERY	90.83%	104.33%	98.62%	NA	NA
BLANK	< 0.0030	< 0.50	<1.00	NA	NA



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1743346	PA	GE 4	
REPORT DATE:	11/09/23			
DATE SAMPLED:	10/11/23	DATE RECEIVED:	10/11/23	
FINAL REPORT, LABORATOR	RY ANALYSIS OF SELECTEI	D PARAMETERS ON WATER		
SAMPLES FROM TETRA TEC	H INC.			

QA/QC DATA

OC PARAMETER	CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	HARDNESS	HCO3	CO3
QUTARAMETER	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	EPA 200.7	(IngCaCO3/I) SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	10/26/23	10/26/23		10/26/23		10/26/23	
			10/26/23		10/26/23		10/26/23
DETECTION LIMIT	0.100	0.100	0.500	0.500	0.700	1.00	1.00
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	36.1	9.50	2.72	26.9	129		
DUPLICATE	37.9	9.98	2.85	28.2	136		
RPD	4.82%	4.94%	4.70%	4.66%	4.85%	NA	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH			
ORIGINAL	36.1	9.50	2.72	26.9			
SPIKED SAMPLE	46.5	19.8	13.4	38.2			
SPIKE ADDED	10.0	10.0	10.0	10.0			
% RECOVERY	103.75%	103.46%	106.61%	112.72%	NA	NA	NA
QC CHECK							
FOUND	10.1	9.97	10.3	10.2	66.3		
TRUE	10.0	10.0	10.0	10.0	66.2		
% RECOVERY	101.01%	99.69%	102.54%	102.43%	100.19%	NA	NA
	101.01/0	//.0//0	102.0170	102.1370	100.1770	1121	1 12 1
BLANK	< 0.100	< 0.100	< 0.500	< 0.500	< 0.700	NA	NA
DLA HAIX	N0.100	\0.100	10.500	10.000	10.700	11/1	1 12 1

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. DR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANCE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

Mamien Hademsh"

Damien Gadomski, PhD Laboratory Manager

LAB USE ONLY Case File Number Temp Lab ID NII need filtration	SRP, DOC, and chlorophyll samples not filtered, will need filtration SRP, DOC, and chlorophyll a X × NO3+NO2-Nitrogen A × × Dissolved Organic Carbon CGPU X × Total Hardness X × Total Hardness X × Chloride X × Chlorophyll a X × Chloride X × Chloride X × Chlorophyll a X × Chloride X × Chloride X × Chlorophyll samples not filtered, will need filtration X × Potassium X × Potassium X × Potassium X × Potassium X × Potassium X × Potassium X × Intered, will need filtration X × Potassium X × Potassium X × Potassium X × Potassium X × Potassium X × Potassium X × Potassium X × Potassium X × Intered, will need filtration X × Potassium X × Potassium X × Potassium X × Potassium		Image: Second	S Potassium	S Total Calcium	Provide * × Carbonate * × Carbonate * × Total Calcium	Image: Section of the section of t			Image: Second	N, SRP, DOC, and ch N, SRP, DOC, and ch X X NO3+NO2-Nitrogen No3+NO2-Nitrogen N, SRP, DOC, and ch X X Dissolved Organic Carbon X X N, SRP, DOC, and ch X X Total Hardness X X	A N , , , , , , , , , , , , , , , , , ,		Image: Substrate Ima	ad att AL bissolved aluminum By x x x	Received at IAL By	diment	Fax Turn Around Time (TAT)* a Business Da 2 Business Day a Business Da Standard Specific Date: 4 weeks SAMPLE DESCRIPTION Mid-Lake 1m Mid-Lake 1m Mid-Lake 80ttom Mid-Lake Solitom Sample Description Sample Description Mid-Lake 50ttom Mid-Lake Solitom Mid-Lake 50ttom Sample Solitom Sample Solitom Sample Solitom Sample Solitom Sample Solitom Sample Solitom Sample Solitom Time Sample Solitom Time	Turn Around Time (TAT)* ay 2 Business Day ess Da 3 Standard notice required for Rush Ar SAMPLE DESCRIPTION Mid-Lake 1m Mid-Lake 1m Mid-Lake Bettom ter, P=Paint, S=Soil, SD=Si Time	Around Time (2 Busines a Standard required for R ILE DESCRIP ILI-Lake 1m ILI-Lake 1m ILI-Lake Solitor Time Time	Mill Ap T T T T T T T T T T T T T T T T T T T	Turn A Next Day 3 Business Da Specific Date: SAMP (This Will, (This Will, (This Will, Mund Water, P=) ter ter ter ter	Fax Turn Ar D Next Day Specific Date: *Advanced notice r SAMPI (This Will A (This Will A Min Min Min Min Min Min Min Min	rre)	In the second se	Phone: Stys 9179-3472 Fax Turn Around Time (TAT)* QC Data Reported I Next Day I Z Business Da I Standard Date I Disposal Return *Advanced notice required for Rush Analysis SamPle Disposal Spocific Date: 4 weeks I Hold I Dispose Return *Advanced notice required for Rush Analysis SamPle Disposal SMPLE DESCRIPTION Date SAMPLING SAMPLE DESCRIPTION Immede Time Matrix** (This Will Appear On The Report) (I)[1][2] I/D : 3:0 SW Mid-Lake 1m I/D(11)[2] I/D : 3:0 SW Mid-Lake 1m I/D(11)[2] I/D : 3:0 SW Mid-Lake Beltom I/D(11)[2] SW Mid-Lake Beltom Mid-Lake Beltom I/D(11)[2] SW Mid-Lake Beltom Mid-Lake Beltom I/D(11)[2] SW I/D(11/2)[2] Time Summice SW-Surface Water, WM=Water, CMP-Ground Water, P=Paint, S=Soil, SD=Sedimenf, SI=Soil, SD=Sedimenf,	Sorg-979-96 Sample D Sample D Dispose SAMP Time Time Time By By By By By By By C Dispose SAMP Time Time Time Time	Phone: 5 Rep Rep Pate (mm-dd- yy) Io[11]12 Io[11]12 Io[11]12 Received By Relinquishec	
Client Project: Waughop Lak	lient Proje	<u></u>								.com	atech	Dietr	tebo	.brat	Shannon Brattebo shannon.brattebo@tetratech.com	Contac Shannon Brattebo Email: <u>shannon.brattebo(</u>								ratech.c	bo @tet	Shannon Brattebo shannon.brattebo@tetratech.com 509-979-9672	Shann shann	Contact: Email:	<u>ε π δ</u>
Page of Project INFORMATION Quote No.: Client PO:	Page	OF Custody Form / HJJU	1 4		J			RT) toc	Pop			Chain FERENT F				Chai INVOICE TO: (IF DIFFERENT Client: Same Addres					117	ies 98103 32-24	oratories • WA • 98103 F: 206-632-2417	IEH Analytical Laboratories 127 Aurora Ave N • Seattle • WA • 9810 P: 206-632-2715 F: 206-632-3 P: 100-632-2715 F: 206-632-3 Stern Avenue, Suite 700 VA 98121	Analy rora Av 6-632-3 4venue	IEH Analytical Laboratories 3927 Aurora Ave N • Seattle • WA • 98103 P: 206-632-2715 F: 206-632-2715 F: 206-632-2715 Tetra Tech Inc. 2003 Western Avenue, Suite 700 Seattle, WA 98121	Tetra 2003 V	REPORT TO: Client: Te Address: 20	



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1744586	PAGE	1
REPORT DATE:	12/26/23		
DATE SAMPLED:	12/12/23	DATE RECEIVED:	12/12/23
FINAL REPORT, LABORATORY ANA	ALYSIS OF SELECTED PARA	METERS ON WATER	
SAMPLES FROM TETRA TECH INC.			

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	SRP	N03+N02	DOC	TOTAL-N	ALKALINITY	pН
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	
Mid-Lake 1m	0.041	0.002	0.034	10.7	1.04	28.5	7.47

	TOTAL ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	0.406	4.62	98.6	54	7.4

	CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	HARDNESS	HCO3	CO3
SAMPLE ID	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
Mid-Lake 1m	5.74	0.940	3.07	45.0	18.2	26.5	<1.00



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1744586	PAC	GE 2	
REPORT DATE:	12/26/23			
DATE SAMPLED:	12/12/23	DATE RECEIVED:	12/12/23	
FINAL REPORT, LABORATORY	ANALYSIS OF SELE	CTED PARAMETERS ON WATER		
SAMPLES FROM TETRA TECH	INC.			

QA/QC DATA

OC PARAMETER	TOTAL-P	SRP	N03+N02	DOC	TOTAL-N	ALKALINITY	pН
QCTARAMETER	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	pm
METHOD	SM20 4500PF	SM20 4500PF	SM204500N03F	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	12/16/23	12/12/23	12/13/23	12/22/23	12/19/23	12/15/23	12/12/23
DETECTION LIMIT	0.002	0.001	0.010	0.250	0.050	1.00	0.10
DETECTION EIMIT	0.002	0.001	0.010	0.230	0.050	1.00	0.10
DUPLICATE							
DerEichte							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.038	0.002	0.504	< 0.250	0.851	33.2	
DUPLICATE	0.041	0.002	0.488	<0.250	0.827	32.7	
RPD	8.20%	0.42%	3.12%	NC	2.86%	1.52%	NA
iu b	0.2070	011270	011270	110	210070	110270	1,111
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	0.038	0.002	0.504	< 0.250	0.851		
SPIKED SAMPLE	0.038	0.002	0.304	3.99	1.81		
SPIKE ADDED	0.084	0.021	0.200	3.99 4.50	1.01		
% RECOVERY	93.01%	97.74%	106.54%	4.50 88.67%	95.50%	NA	NA
70 RECOVERT	93.0170	97.7470	100.34%	88.0770	95.50%	INA	INA
OC CHECK							
QUUILLER							
FOUND	0.095	0.040	0.432	3.92	0.441	99.3	
TRUE	0.094	0.039	0.408	4.00	0.469	100	
% RECOVERY	101.06%	101.52%	105.88%	98.08%	94.03%	99.30%	NA
	101.0070	101.0270	105.0070	20.0070	71.0070	77.5070	1111
BLANK	< 0.002	< 0.001	< 0.010	< 0.250	< 0.050	NA	NA
			I				



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1744586	PA	GE 3
REPORT DATE:	12/26/23		
DATE SAMPLED:	12/12/23	DATE RECEIVED:	12/12/23
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECTEI	D PARAMETERS ON WATER	
SAMPLES FROM TETRA TECI	H INC.		

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
METHOD	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H
DATE ANALYZED	12/14/23	12/13/23	12/13/23	12/19/23	12/19/23
DETECTION LIMIT	0.0030	0.50	1.00	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	Mid-Lake 1m	BATCH	BATCH	BATCH
ORIGINAL	0.0166	4.62	30.5	17	3.3
DUPLICATE	0.0184	4.52	31.3	19	3.5
RPD	10.19%	2.30%	2.58%	9.35%	5.88%
SPIKE SAMPLE					
SAMPLE ID	BATCH	Mid-Lake 1m	BATCH		
ORIGINAL	0.0166	4.62	30.5		
SPIKED SAMPLE	0.5563	14.7	41.5		
SPIKE ADDED	0.5000	20.0	10.0		
% RECOVERY	107.94%	50.45%	109.67%	NA	NA
QC CHECK					
FOUND	0.4954	30.9	9.70		
TRUE	0.5000	30.0	10.0		
% RECOVERY	99.08%	103.00%	97.00%	NA	NA
BLANK	< 0.0030	< 0.50	<1.00	NA	NA



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1744586	PAG	GE 4
REPORT DATE:	12/26/23		
DATE SAMPLED:	12/12/23	DATE RECEIVED:	12/12/23
FINAL REPORT, LABORATOR	RY ANALYSIS OF SELECTED	PARAMETERS ON WATER	
SAMPLES FROM TETRA TEC	H INC.		

QA/QC DATA

OC PARAMETER	CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	HARDNESS	HCO3	CO3
	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	12/14/23	12/14/23	12/14/23	12/14/23	12/14/23	12/15/23	12/15/23
DETECTION LIMIT	0.100	0.100	0.500	0.500	0.700	1.00	1.00
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	42.1	13.4	1.86	141	160		
DUPLICATE	44.8	12.2	1.93	136	162		
RPD	6.21%	9.21%	3.57%	3.31%	1.17%	NA	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH			
ORIGINAL	42.1	13.4	1.86	141			
SPIKED SAMPLE	50.8	25.0	12.4	151			
SPIKE ADDED	10.0	10.0	10.0	10.0			
% RECOVERY	87.00%	116.20%	105.09%	104.15%	NA	NA	NA
QC CHECK							
FOUND	10.4	10.2	10.3	10.6	68.2		
TRUE	10.0	10.0	10.0	10.0	66.2		
% RECOVERY	103.93%	102.50%	102.68%	105.71%	103.04%	NA	NA
		r					
BLANK	< 0.100	< 0.100	< 0.500	< 0.500	< 0.700	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. DR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANCE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

Mamien Hademsh"

Damien Gadomski, PhD Laboratory Manager

IEH Analytical Laboratories			hain of Clietody Earm	П 3 3		Page	o,
Client: Tetra Tech In-					Shr	X	
Address: 2003 Western Avenue	Client: Same	INVOICE TO: (IF DIFFERENT FROM REPORT) Client: Same	M REPORT)			PROJECT INFORMATION	IATION
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Ħ						Quote No.:	
	Contact: Shar	Shannon Brattebo				Client Drainet: Wallo	thon I ake
Phone: 509-979-9672	-	shannon.brattebo@tetratech.com	<u>>ch.com</u>			Client Project: vaugliop Law	JIIOD Lan
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Sw Did Sw	То	To SF To NC	Ch To Ch	Ca Tol	Pot Fiel		
Milu-Lake Im	×	x x x x x x	× × × × × ×	< x x x x x	× × z	<i>L</i> 001101	g_{2}
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					43840	<u></u>	
12/12/2013							
**Matrix: B=Biota. DW=Drint:							
d Water, P=Paint, S=Soil, SD=Sediment	Comments:						
	Comments:	SRP. DOC. and	chloronhvil samı	nine not filtain			
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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1746394	PA	GE 1
REPORT DATE:	03/27/24		
DATE SAMPLED:	03/13/24	DATE RECEIVED:	03/13/24
FINAL REPORT, LABORATOR	RY ANALYSIS OF SELEC	TED PARAMETERS ON WATER	
SAMPLES FROM TETRA TEC	H INC.		

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

	TOTAL-P	SRP	N03+N02	DOC	TOTAL-N	ALKALINITY	pН
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	
Mid-Lake 1m	0.041	< 0.001	< 0.010	13.4	1.17	26.5	7.84

	TOTAL ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	0.3773	5.36	56.2	67	9.9

Γ		CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	HARDNESS	HCO3	CO3
	SAMPLE ID	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
	Mid-Lake 1m	5.92	0.902	2.77	34.7	18.5	25.6	<1.00



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1746394	PA	PAGE 2			
REPORT DATE:	03/27/24					
DATE SAMPLED:	03/13/24	DATE RECEIVED:	03/13/24			
FINAL REPORT, LABORATOR	ANALYSIS OF SELECT	TED PARAMETERS ON WATER				
SAMPLES FROM TETRA TECH INC.						

QA/QC DATA

OC PARAMETER	TOTAL-P	SRP	N03+N02	DOC	TOTAL-N	ALKALINITY	pH
QUITINEIDIDI	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	pii
METHOD	SM20 4500PF	SM20 4500PF	SM204500N03F	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	03/18/24	03/13/24	03/15/24	03/19/24	03/18/24	03/14/24	03/13/24
DETECTION LIMIT	0.002	0.001	0.010	0.250	0.050	1.00	0.10
	0.002	01001	01010	01200	0.02.0	1100	0110
DUPLICATE							
SAMPLE ID	BATCH	BATCH	Mid-Lake 1m	BATCH	BATCH	Mid-Lake 1M	
		2			Diffen	Lind Daile IIII	
ORIGINAL	0.013	0.074	< 0.010	< 0.250	0.689	26.5	
DUPLICATE	0.013	0.072	< 0.010	< 0.250	0.698	26.7	
RPD	3.21%	1.97%	NC	NC	1.30%	0.75%	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	Mid-Lake 1m	BATCH	BATCH		
ORIGINAL	0.013	0.074	< 0.010	< 0.250	0.689		
SPIKED SAMPLE	0.062	0.093	0.240	4.67	1.64		
SPIKE ADDED	0.050	0.020	0.200	4.50	1.00		
% RECOVERY	98.18%	95.65%	119.88%	103.78%	95.20%	NA	NA
QC CHECK							
FOUND	0.093	0.040	0.423	3.83	0.445	102	
TRUE	0.093	0.039	0.408	4.00	0.469	102	
% RECOVERY	98.94%	101.52%	103.60%	4.00 95.78%	94.88%	102.00%	NA
/ RECOVERT	70.7470	101.3270	103.0070	25.1070	77.0070	102.0070	11/1
BLANK	< 0.002	< 0.001	< 0.010	< 0.250	< 0.050	NA	NA
			<u> </u>				



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1746394	PA	PAGE 3		
REPORT DATE:	03/27/24				
DATE SAMPLED:	03/13/24	DATE RECEIVED:	03/13/24		
FINAL REPORT, LABORATO	RY ANALYSIS OF SELECTEI	D PARAMETERS ON WATER			
SAMPLES FROM TETRA TEC	TH INC.				

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
METHOD	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H
DATE ANALYZED	03/25/24	03/20/24	03/18/24	03/15/24	03/15/24
DETECTION LIMIT	0.0030	0.50	1.00	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	Mid-Lake 1m	Mid-Lake 1m	BATCH	BATCH
ORIGINAL	0.0647	5.36	56.2	4.0	1.4
DUPLICATE	0.0666	5.15	56.9	3.7	1.6
RPD	2.93%	4.00%	1.32%	8.70%	15.61%
SPIKE SAMPLE					
SAMPLE ID	BATCH		Mid-Lake 1m		
ORIGINAL	0.0647		56.2		
SPIKED SAMPLE	0.6518		155		
SPIKE ADDED	0.5000		100		
% RECOVERY	117.42%	NA	99.13%	NA	NA
QC CHECK					
FOUND	0.5379	31.7	9.69		
TRUE	0.5000	30.0	10.0		
% RECOVERY	107.59%	105.81%	96.90%	NA	NA
			-	-	
BLANK	< 0.0030	< 0.50	<1.00	NA	NA



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1746394	PA	GE 4				
REPORT DATE:	03/27/24						
DATE SAMPLED:	03/13/24	DATE RECEIVED:	03/13/24				
FINAL REPORT, LABORATO	RY ANALYSIS OF SELECTEI	D PARAMETERS ON WATER					
SAMPLES FROM TETRA TECH INC.							

QA/QC DATA

OC PARAMETER	CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	HARDNESS	HCO3	CO3
QUITING MILTER	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	03/23/24	03/23/24	03/23/24	03/23/24	03/23/24	03/14/24	03/14/24
DETECTION LIMIT	0.100	0.100	0.500	0.500	0.700	1.00	1.00
DETECTION	0.100	0.100	0.500	0.500	0.700	1.00	1.00
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	29.7	6.38	2.32	16.2	100		
DUPLICATE	29.5	6.32	2.31	16.0	100		
RPD	0.72%	0.92%	0.70%	0.95%	0.77%	NA	NA
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH			
ORIGINAL	29.7	6.38	2.32	16			
SPIKED SAMPLE	39.9	16.4	13.1	27			
SPIKE ADDED	10.0	10.0	10.0	10.0			
% RECOVERY	102.05%	100.70%	107.73%	106.46%	NA	NA	NA
QC CHECK							
FOUND	10.3	10.2	10.8	10.8	67.9		
TRUE	10.0	10.0	10.0	10.0	66.2		
% RECOVERY	103.04%	102.50%	108.00%	108.00%	102.70%	NA	NA
BLANK	< 0.100	< 0.100	< 0.500	< 0.500	< 0.700	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. DR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANCE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Mamien Hademsh"

Damien Gadomski, PhD Laboratory Manager

Ì	Relinquished to IAL By (Signature)	Received By	Sampled By Hourn Brynnt	*Mafrix: B=Biota, DW=Drinking Water(, SL=Sludge, SW=Surface Water, WW=W					0	6)	3/13/24 (000 SW	Date (mm-dd- Time Matrix** (yy)	SAMPLING	Hold Dispose Return	Sample Disposal	X Yes Q No	QC Data Repo	🗖 Fax 🛛 Email 🔲 Mail	Reporting/Invoicing Format	Phone: 509-979-9672		Contact: Shannon Brattebo	Seattle, WA 98121	ι. Έ	Client: Tetra Tech Inc.		3927 Aurora Ave N • Seattle • WA • 98103	IEH Analytical Laboratories
	Date Time () 3/13/2 1 [3.35	Date	Date IIme 13755 (13/12/21 1335	*Mafrix: B=Biota, DW=Drinking Water, WV=Ground Water, P=Paint, S=Soil, SD=Sediment, SL=Sludge, SW=Surface Water, WW=Wastewater	1 3/13/24 3A-									Mid-Lake 1m	(This Will Appear On The Report)	SAMPLE DESCRIPTION	*Advanced notice required for Rush Analysis	Specific Date:4-weeks	- 2 weets 34	🖵 3 Business Da 🗖 Standard		Turn Around Time (TAT)*		om			00		F: 206-632-2417	attle • WA • 98103	_aboratories
	Hecenned at IAU BY WELL AS IS IS US			Comments: SRP, DOC, and chlorophyll samples not filtered, will need filtration										A x x x x x x x x x x x x x x x x x x x	Total A Total A PH Sulfate Total P SRP Total N NO3+N Dissolu Chlorol Total H Chlorid Bicarbor Total C Total N Sodium Potass	Ikalii Iumi Iumi itrog IO2- ed C ohyll ardr e onate alcii 1agn 1 ium	nity num en Nitro Drga a ess es um	us oger nic (· · · · · · · · · · · · · · · · · · ·	on		Analysis Requested	Phone: Fax:	Email: shannon.brattebo@tetratech.com	Contact: Shannon Brattebo		Address:			Chain of Custody Form 11/20	
hto-4	13-13-24 1:35			filtration										ACOM!	Contai Temp Lab ID	ner	s Re	cei	red		Case File Number	LAB USE ONLY			Client Project: Waughop Lake	Client PO:	Quote No.:		PROJECT INFORMATION		Page / of /



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1748847	PAG	E 1
REPORT DATE:	08/02/24		
DATE SAMPLED:	06/27/24	DATE RECEIVED:	06/27/24
FINAL REPORT, LABORATORY ANA	ALYSIS OF SELECTED PARAM	METERS ON WATER	
SAMPLES FROM TETRA TECH INC.			

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

	TOTAL-P	SRP	N03+N02	DOC	TOTAL-N	ALKALINITY	pН
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	
Mid-Lake 1m	0.120	0.001	< 0.010	12.7	1.72	44.4	6.46

	TOTAL ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Mid-Lake 1m	1.78	4.52	39.4	21	12

	CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	HARDNESS	HCO3	CO3
SAMPLE ID	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
Mid-Lake 1m	7.23	1.08	3.16	37.1	22.5	25.0	<1.00



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1748847	PA	GE 2
REPORT DATE:	08/02/24		
DATE SAMPLED:	06/27/24	DATE RECEIVED:	06/27/24
FINAL REPORT, LABORATOF	Y ANALYSIS OF SELECT	TED PARAMETERS ON WATER	
SAMPLES FROM TETRA TEC	HINC.		

QA/QC DATA

TOTAL-P	SRP	N03+N02	DOC	TOTAL-N	ALKALINITY	pН
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	-
SM20 4500PF	SM20 4500PF	SM204500N03F	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
07/06/24	06/28/24	06/28/24	07/08/24	07/02/24	07/02/24	06/27/24
0.002	0.001	0.010	0.250	0.050	1.00	0.10
					•	
Mid-Lake 1m	BATCH	BATCH	BATCH	BATCH	BATCH	
Wild-Lake IIII	DATCH	DATCH	Briten	DATCH	DATCH	
0.120	< 0.001	0.233	< 0.250	0.302	60.2	
0.121	< 0.001	0.231	< 0.250	0.304	60.0	
1.24%	NC	0.91%	NC	0.66%	0.33%	NA
Mid Labor 1	DATCH	DATCH	DATCH	DATCH		
Mid-Lake Im	BAICH	BAICH	BAICH	BAICH		
0.120	< 0.001	0.233	< 0.250	0.302		
0.170	0.019	0.446	4.03	0.768		
0.050	0.020	0.200	4.50	0.500		
100.80%	93.00%	106.29%	89.64%	93.20%	NA	NA
		11				
0.095	0.037	0.370	3.76	0.442	96.3	
0.094	0.039	0.408	4.00	0.469	100	
101.06%	93.91%	90.67%	94.00%	94.24%	96.30%	NA
		· · · · · ·			I	
< 0.002	< 0.001	< 0.010	< 0.250	< 0.050	NA	NA
	(mg/L) SM20 4500PF 07/06/24 0.002 Mid-Lake 1m 0.120 0.121 1.24% Mid-Lake 1m 0.120 0.170 0.050 100.80% 0.095 0.094 101.06%	(mg/L) (mg/L) SM20 4500PF SM20 4500PF 07/06/24 06/28/24 0.002 0.001 Mid-Lake 1m BATCH 0.120 <0.001	(mg/L) (mg/L) (mg/L) SM20 4500PF SM20 4500PF SM204500N03F 07/06/24 06/28/24 06/28/24 0.002 0.001 0.010 Mid-Lake 1m BATCH BATCH 0.120 <0.001	Img/L) (mg/L) (mg/L) (mg/L) (mg/L) SM20 4500PF SM20 4500PF SM204500N03F EPA 415.1 07/06/24 06/28/24 06/28/24 07/08/24 0.002 0.001 0.010 0.250 Mid-Lake 1m BATCH BATCH BATCH 0.120 <0.001	(mg/L) (mg/L)<	(mg/L) (mg/L)<

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1748847	PA	GE 3				
REPORT DATE:	08/02/24						
DATE SAMPLED:	06/27/24	DATE RECEIVED:	06/27/24				
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECTEI	D PARAMETERS ON WATER					
SAMPLES FROM TETRA TECH INC.							

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
METHOD	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H
DATE ANALYZED	07/02/24	07/15/24	07/16/24	07/12/24	07/12/24
DETECTION LIMIT	0.0030	0.50	1.00	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	Mid-Lake 1m	Mid-Lake 1m	BATCH	BATCH
ORIGINAL	0.0646	4.52	27.0	15	6.7
DUPLICATE	0.0729	4.83	27.6	16	8.0
RPD	12.09%	6.74%	2.17%	6.90%	17.27%
SPIKE SAMPLE					
SAMPLE ID	BATCH	BATCH	Mid-Lake 1m		
ORIGINAL	0.0646	4.52	27.0		
SPIKED SAMPLE	0.5909	15.1	37.5		
SPIKE ADDED	0.5000	10.0	10.0		
% RECOVERY	105.26%	106.16%	104.56%	NA	NA
QC CHECK					
FOUND	0.5490	30.4	9.66		
TRUE	0.5000	30.0	10.0		
% RECOVERY	109.80%	101.33%	96.60%	NA	NA
BLANK	< 0.0030	< 0.50	<1.00	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE

NA = NOT APPLICABLE OR NOT AVAILABLE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1748847	PAG	GE 4				
REPORT DATE:	08/02/24						
DATE SAMPLED:	06/27/24	DATE RECEIVED:	06/27/24				
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECTE	D PARAMETERS ON WATER					
SAMPLES FROM TETRA TECH INC.							

QA/QC DATA

,							
QC PARAMETER	CALCIUM	MAGNESIUM	POTASSIUM	SODIUM	HARDNESS	HCO3	CO3
	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	07/02/24	07/02/24	07/02/24	07/02/24	07/02/24	07/02/24	07/02/24
DETECTION LIMIT	0.100	0.100	0.500	0.500	0.700	1.00	1.00
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	29.2	6.56	2.24	15.9	100		
DUPLICATE	28.3	6.30	2.21	16.0	96.7		
RPD	3.24%	4.00%	0.97%	0.61%	3.44%	NA	NA
					•		
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH	BATCH			
ORIGINAL	29.2	6.56	2.24	15.9			
SPIKED SAMPLE	38.4	16.4	12.8	26.8			
SPIKE ADDED	10.0	10.0	10.0	10.0			
% RECOVERY	91.57%	98.70%	105.88%	109.10%	NA	NA	NA
QC CHECK							
Ì							
FOUND	10.3	10.5	10.6	10.6	69.1		
TRUE	10.0	10.0	10.0	10.0	66.2		
% RECOVERY	102.98%	105.39%	105.76%	105.59%	104.48%	NA	NA
					10.11070		
BLANK	< 0.100	< 0.100	< 0.500	< 0.500	< 0.700	NA	NA
5241.01	-0.100	.0.100	-0.200	-0.200	-0.700	1.12.1	1.12 1

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

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Damien Gadomski, PhD Laboratory Manager

Ein Analytical Laborations Chain of Customy Figure 1 Multiple 2 start Automatical Laborations Start Automatical Laborations Start Automatical Laborations Start Automatical Laborations start Automatical Laborations Star		Relinquish	Received By	Sampled By	**Matrix: B														06/27/2v	Date (mm-dd- yy)		Hold		⊠ Yes	G Fax		Phone: 5	Email:	Contact:		ši	Client: Te		
Option Chain of Custody Form 43022417 Invoice To, IP DFERENT FROM REPORT 43022417 On OF To, IP DFERENT FROM REPORT 43022417 On OF To, IP DFERENT FROM REPORT 43022417 On of Custody Form 44083 On of Custody Form 100 Isano 101 Same 101 Same 101 Same 101 Isano		ed to IAL By (Si			=Biota, DW=Dri , SW=Surface \	-													\$4:0	Time	SAMPLING	Dispose	Sample Disp	WC Data Nepu	Email	orting/Invoicin	09-979-9672	hannon.bratteb	shannon Bratteb	seattle, WA 981:	003 Western Av): etra Tech Inc.		3927 Auro
Option Chain of Custody Form 43022417 Invoice To, IP DFERENT FROM REPORT 43022417 On OF To, IP DFERENT FROM REPORT 43022417 On OF To, IP DFERENT FROM REPORT 43022417 On of Custody Form 44083 On of Custody Form 100 Isano 101 Same 101 Same 101 Same 101 Isano		ignature)		nt	nking Water, G\ Water, WW=Wa														WS	ĺ	6)	Return	osal		Mail	g Format		o@tetratech.cor	ŏ	21	venue, Suite 70		-632-2715	nalytical La
Chain of Custody Form		06/2-7/24 Time 14/5	Date	127/24	N=Ground Water, P=Paint, S=Soil, SD=Sedir Istewater														Mid-Lake 1m	(This Will Appear On The Report)	SAMPLE DESCRIPTION	*Advanced notice required for Rush Analys				Turn Around Time (TAT)*		n I					F: 206-632-2417	the WA 98103
Chain of Custody Form To: (IF DIFFERENT FROM REPORT) Same		Ree	Sul	2															Ч	Number	of		tain	ers			Phor	Ema	Cont		Addr	Clier	INV	
A chlorophyll samples not filtered, will need fi			2	7	nments														×								ie:			I	ess:	Et i		
A chlorophyll samples not filtered, will need fi			\mathbb{D}								-		-	- 	-	-	-	┢			mir	um					-	hann	hann			ame	- 	
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3600 Fremont Ave. N. Seattle, WA 98103 T: (206) 352-3790 F: (206) 352-7178 info@fremontanalytical.com

Tetra Tech, Inc. Shannon Brattebo 2003 Western Ave Suite 700 Seattle, WA 98121

RE: Waughop Lake Alum Work Order Number: 2306470

July 05, 2023

Attention Shannon Brattebo:

Fremont Analytical, Inc. received 2 sample(s) on 6/27/2023 for the analyses presented in the following report.

Sulfide by SM 4500-S2-F

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes Project Manager

DoD-ELAP Accreditation #79636 by PJLA, ISO/IEC 17025:2017 and QSM 5.3 for Environmental Testing ORELAP Certification: WA 100009 (NELAP Recognized) for Environmental Testing Washington State Department of Ecology Accredited for Environmental Testing, Lab ID C910



CLIENT: Project: Work Order:	Tetra Tech, Inc. Waughop Lake Alum 2306470	Work Order S	Sample Summary
Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2306470-001 2306470-002	Mid-Lake 1 m Mid-Lake Bottom	06/27/2023 12:30 PM 06/27/2023 12:40 PM	06/27/2023 3:45 PM 06/27/2023 3:45 PM



Case Narrative

WO#: **2306470** Date: **7/5/2023**

CLIENT:Tetra Tech, Inc.Project:Waughop Lake Alum

I. SAMPLE RECEIPT:

Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:

Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms



 WO#:
 2306470

 Date Reported:
 7/5/2023

Qualifiers:

- * Flagged value is not within established control limits
- B Analyte detected in the associated Method Blank
- D Dilution was required
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- I Analyte with an internal standard that does not meet established acceptance criteria
- J Analyte detected below Reporting Limit
- N Tentatively Identified Compound (TIC)
- Q Analyte with an initial or continuing calibration that does not meet established acceptance criteria
- S Spike recovery outside accepted recovery limits
- ND Not detected at the Reporting Limit
- R High relative percent difference observed

Acronyms:

%Rec - Percent Recoverv CCB - Continued Calibration Blank CCV - Continued Calibration Verification **DF** - Dilution Factor **DUP - Sample Duplicate** HEM - Hexane Extractable Material ICV - Initial Calibration Verification LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate MCL - Maximum Contaminant Level MB or MBLANK - Method Blank MDL - Method Detection Limit MS/MSD - Matrix Spike / Matrix Spike Duplicate PDS - Post Digestion Spike Ref Val - Reference Value **REP - Sample Replicate RL** - Reporting Limit **RPD** - Relative Percent Difference **SD** - Serial Dilution SGT - Silica Gel Treatment SPK - Spike Surr - Surrogate



Analytical Report

 Work Order:
 2306470

 Date Reported:
 7/5/2023

CLIENT:Tetra Tech, Inc.Project:Waughop Lake Alum					
Lab ID: 2306470-001 Client Sample ID: Mid-Lake 1 n	n		Collection Matrix: V		6/27/2023 12:30:00 PM
Analyses	Result	RL Qual	Units	DF	Date Analyzed
Sulfide by SM 4500-S2-F			Batc	h ID: R8	5056 Analyst: SS
Sulfide	1.60	0.500	mg/L	1	7/3/2023 11:22:17 AM
Lab ID: 2306470-002 Client Sample ID: Mid-Lake Bo	ttom		Collection Matrix: V		6/27/2023 12:40:00 PM
Analyses	Result	RL Qual	Units	DF	Date Analyzed
Sulfide by SM 4500-S2-F			Batc	h ID: R8	5056 Analyst: SS
Sulfide	2.80	0.500	mg/L	1	7/3/2023 11:22:17 AM



Work Order:	2306470						QC SUMMARY REPORT
CLIENT:	Tetra Tech,	Inc.					
Project:	Waughop L	ake Alum					Sulfide by SM 4500-S2-F
Sample ID: MB-R8	35056	SampType: MBLK			Units: mg/L	Prep Date: 7/3/2023	RunNo: 85056
Client ID: MBLK	W	Batch ID: R85056				Analysis Date: 7/3/2023	SeqNo: 1775518
Analyte		Result	RL	SPK value	SPK Ref Val	%REC LowLimit HighLimit R	PD Ref Val %RPD RPDLimit Qual
Sulfide		ND	0.500				
Sample ID: LCS-R	85056	SampType: LCS			Units: mg/L	Prep Date: 7/3/2023	RunNo: 85056
Client ID: LCSW	,	Batch ID: R85056				Analysis Date: 7/3/2023	SeqNo: 1775519
Analyte		Result	RL	SPK value	SPK Ref Val	%REC LowLimit HighLimit R	PD Ref Val %RPD RPDLimit Qual
Sulfide		2.40	0.500	2.000	0	120 45.6 120	
Sample ID: 23064	70-001ADUP	SampType: DUP			Units: mg/L	Prep Date: 7/3/2023	RunNo: 85056
Client ID: Mid-La	ake 1 m	Batch ID: R85056				Analysis Date: 7/3/2023	SeqNo: 1775521
Analyte		Result	RL	SPK value	SPK Ref Val	%REC LowLimit HighLimit R	PD Ref Val %RPD RPDLimit Qual
Sulfide NOTES: R - High RPD of	oserved.	2.40	0.500				1.600 40.0 30 R
Sample ID: 23065	36-002AMS	SampType: MS			Units: mg/L	Prep Date: 7/3/2023	RunNo: 85056
Client ID: BATCI	н	Batch ID: R85056				Analysis Date: 7/3/2023	SeqNo: 1776234
Analyte		Result	RL	SPK value	SPK Ref Val	%REC LowLimit HighLimit R	PD Ref Val %RPD RPDLimit Qual
Sulfide		4.00	0.500	2.000	1.200	140 21.5 190	



Sample Log-In Check List

Client Name: TETRAS		Work Order N	umber: 2306470	
Logged by: Clare Gr	iggs	Date Received	d: 6/27/2023	3 3:45:00 PM
Chain of Custody				
1. Is Chain of Custody co	mplete?	Yes 🖌	No 🗌	Not Present
2. How was the sample de	elivered?	Client		
<u>Log In</u>				
	on shipping container/cooler? Custody Seals not intact)	Yes 🗌	No 🗌	Not Present
4. Was an attempt made t	o cool the samples?	Yes	No 🗹	
		Unknown prior to	receipt.	_
5. Were all items received	at a temperature of >2°C to 6°C *	Yes	No 🗌	NA 🗹
C Sample(s) in proper cor	tainor(c)?	Yes 🖌	No 🗌	
6. Sample(s) in proper cor7. Sufficient sample volum		Yes 🗸		
 Sufficient sample volum 8. Are samples properly pr 		Yes 🗸		
 9. Was preservative added 		Yes	No 🗹	NA
9				
10. Is there headspace in the	e VOA vials?	Yes	No 🗌	NA 🖌
11. Did all samples containe	ers arrive in good condition(unbroken)		No 🗌	
12. Does paperwork match	bottle labels?	Yes 🗹	No 🗌	
13 Are matrices correctly id	lentified on Chain of Custody?	Yes 🖌	No 🗌	
14. Is it clear what analyses		Yes 🗹		
15. Were all holding times a		Yes 🗸	No 🗌	
Special Handling (if a				
		Yes	No 🗌	NA 🖌
TO. Was client notified of a	Il discrepancies with this order?			
Person Notified:		Date:		
By Whom:		Via: 🗌 eMail 🗌] Phone 🗌 Fax	In Person
Regarding:				
Client Instructions	3:			
17. Additional remarks:				

Item Information

Item #	Temp ⁰C
Sample	17.3

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

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Date/Time	Pfint Name	Received (Signature)		Date/Time		ne (Print Name	Relinquished (Signature) x	Relinquist
Date/Time 6/27/23 1545	Ney Salkomini	* WWW A	23 3:40	Date/Time	duri t	Name M Br	Print Name	x Millin Hilling	Relinquist × ///
ment 2 Day (specify)	I have verified Client's agreen	I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.	alytical on beha	h Fremont An	reement wit Agreement.	nto this Ag side of this	orized to enter i front and back	I represent that I am authorized to enter into this Agreement wit to each of the terms on the front and backside of this Agreement	I repr to eac
🗌 3 Day 🗌 Same Day		Nitrate+Nitrite	hate Fluoride	de O-Phosphate	ate Bromide	ide Sulfate	te	: Nitrate	***Anion
Standard 🗌 Next Day	i Pb Sb Se Sr Sn Ti Ti V Zn	Co Cr Cu Fe Hg K Mg Mn Mo Na Ni	Ba Be Ca Cd	idi: Ag Al As B	TAL Individual:	1	RCRA-8 Priority Pollutants	MTCA-5	**Metals (Circle):
Turn-arc	, SW = Storm Water, WW = Waste Water	W = Water, DW = Drinking Water, GW = Ground Water,		SD = Sediment, SL = Solid,	S = Soil,	P = Product,	B = Bulk, O = Other,	AQ = Aqueous,	*Matrix: A = Air,
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							6/27/23	Mid-Lake 1 m	1 Mid-L
Comments			255 157 157 157 157 157 157 157 157 157 1	# of Local	pie Type (Matrix)*	ie Sample e Time	Sample	Name	Sample Name
	11111					ech.cor	bo@tetrate	Email(s); shannon.brattebo@tetratech.com	Email(s):
above) 🗍 Return to client	Retain volume (specify above)	Report To (PM): Shannon Brattebo, Tetra Tech	Shannon I	Report To (PM)			0	Telephone: 206-728-9655	Telephon
Lakewood, WA 98499-5027	Lakewood, WA 98499-5027	ucration: Waughop Lake, Lakewood, WA	ughop Lak	Location: Wa			A 98121	city, state, zip: Seattle, WA 98121	City, State
	253-983-7725 6000 Main St. SW	Byge	When	Collected by: (700	Ave. Suite	Address: 2003 Western Ave. Suite 700	Address:
ood.us	Attn: Weston Ott wott@cityoflakewood.us	9045	Project No: 100-RCE-T39045	Project No: 10				Tetra Tech, Inc.	client: T
boow	Bill to City of Lakewood	ke Alum	Project Name: Waughop Lake Alum	Project Name:			Technical Group Company	An Alliance Technicol Group Company	
mall: 2306470	Laboratory Project No (internal):	Page: 1 of: 1	Date: 6/27/2023	Date: 6/2	Seattle, WA 98103 Tel: 206-352-3790	Seattle, Tel: 20		FIGINO	
ces Agreement	Laboratory services	Chain of Custody Record & La	ain of Cu	Cha	3600 Fremont Ave N.	3600 Frem			
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3600 Fremont Ave. N. Seattle, WA 98103 T: (206) 352-3790 F: (206) 352-7178 info@fremontanalytical.com

Tetra Tech, Inc. Shannon Brattebo 2003 Western Ave Suite 700 Seattle, WA 98121

RE: Waughop Lake Alum Work Order Number: 2306536

July 07, 2023

Attention Shannon Brattebo:

Fremont Analytical, Inc. received 2 sample(s) on 6/30/2023 for the analyses presented in the following report.

Sulfide by SM 4500-S2-F

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes Project Manager

DoD-ELAP Accreditation #79636 by PJLA, ISO/IEC 17025:2017 and QSM 5.3 for Environmental Testing ORELAP Certification: WA 100009 (NELAP Recognized) for Environmental Testing Washington State Department of Ecology Accredited for Environmental Testing, Lab ID C910

Original



Vaughop Lake Alum 306536		Sample Summary
Client Sample ID	Date/Time Collected	Date/Time Received
Mid-Lake 1 M	06/30/2023 12:20 PM	06/30/2023 4:12 PM
Mid-Lake Bottom	06/30/2023 12:35 PM	06/30/2023 4:12 PM
	Client Sample ID Mid-Lake 1 M	Yaughop Lake Alum 306536 Client Sample ID Mid-Lake 1 M 06/30/2023 12:20 PM



Case Narrative

WO#: **2306536** Date: **7/7/2023**

CLIENT:Tetra Tech, Inc.Project:Waughop Lake Alum

I. SAMPLE RECEIPT:

Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:

Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms



 WO#:
 2306536

 Date Reported:
 7/7/2023

Qualifiers:

- * Flagged value is not within established control limits
- B Analyte detected in the associated Method Blank
- D Dilution was required
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- I Analyte with an internal standard that does not meet established acceptance criteria
- J Analyte detected below Reporting Limit
- N Tentatively Identified Compound (TIC)
- Q Analyte with an initial or continuing calibration that does not meet established acceptance criteria
- S Spike recovery outside accepted recovery limits
- ND Not detected at the Reporting Limit
- R High relative percent difference observed

Acronyms:

%Rec - Percent Recoverv CCB - Continued Calibration Blank CCV - Continued Calibration Verification **DF** - Dilution Factor **DUP - Sample Duplicate** HEM - Hexane Extractable Material ICV - Initial Calibration Verification LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate MCL - Maximum Contaminant Level MB or MBLANK - Method Blank MDL - Method Detection Limit MS/MSD - Matrix Spike / Matrix Spike Duplicate PDS - Post Digestion Spike Ref Val - Reference Value **REP - Sample Replicate RL** - Reporting Limit **RPD - Relative Percent Difference SD** - Serial Dilution SGT - Silica Gel Treatment SPK - Spike

Surr - Surrogate



Analytical Report

 Work Order:
 2306536

 Date Reported:
 7/7/2023

CLIENT:Tetra Tech, Inc.Project:Waughop Lake Alum					
Lab ID: 2306536-001 Client Sample ID: Mid-Lake 1 M	1		Collection I Matrix: Wa		6/30/2023 12:20:00 PM
Analyses	Result	PQL Qual	Units	DF	Date Analyzed
Sulfide by SM 4500-S2-F			Batch I	D: R8	5056 Analyst: SS
Sulfide	4.00	0.500	mg/L	1	7/3/2023 11:22:17 AM
Lab ID: 2306536-002 Client Sample ID: Mid-Lake Bo	ttom		Collection I Matrix: Wa		6/30/2023 12:35:00 PM
Analyses	Result	PQL Qual	Units	DF	Date Analyzed
Sulfide by SM 4500-S2-F			Batch I	D: R8	5056 Analyst: SS
Sulfide	1.20	0.500	mg/L	1	7/3/2023 11:22:17 AM



Work Order:	2306536						QC SUMMARY REF	PORT
CLIENT:	Tetra Tech,	Inc.						
Project:	Waughop L	ake Alum					Sulfide by SM 450	10-52-F
Sample ID: MB-R8	5056	SampType: MBLK			Units: mg/L	Prep Date: 7/3/2023	RunNo: 85056	
Client ID: MBLK	w	Batch ID: R85056				Analysis Date: 7/3/2023	SeqNo: 1775518	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC LowLimit HighLimit F	RPD Ref Val %RPD RPDLimit	Qual
Sulfide		ND	0.500					
Sample ID: LCS-R	85056	SampType: LCS			Units: mg/L	Prep Date: 7/3/2023	RunNo: 85056	
Client ID: LCSW		Batch ID: R85056				Analysis Date: 7/3/2023	SeqNo: 1775519	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC LowLimit HighLimit F	RPD Ref Val %RPD RPDLimit	Qual
Sulfide		2.40	0.500	2.000	0	120 45.6 120		
Sample ID: 230647	70-001ADUP	SampType: DUP			Units: mg/L	Prep Date: 7/3/2023	RunNo: 85056	
Client ID: BATCH	4	Batch ID: R85056				Analysis Date: 7/3/2023	SeqNo: 1775521	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC LowLimit HighLimit F	RPD Ref Val %RPD RPDLimit	Qual
Sulfide NOTES: R - High RPD ob	oserved.	2.40	0.500				1.600 40.0 30	R
Sample ID: 230653	36-002AMS	SampType: MS			Units: mg/L	Prep Date: 7/3/2023	RunNo: 85056	
Client ID: Mid-La	ake Bottom	Batch ID: R85056				Analysis Date: 7/3/2023	SeqNo: 1776234	
Analyte		Result	RL	SPK value	SPK Ref Val	%REC LowLimit HighLimit F	RPD Ref Val %RPD RPDLimit	Qual
Sulfide		4.00	0.500	2.000	1.200	140 21.5 190		



Sample Log-In Check List

Client Name:	TETRAS	Work Order Numb	per: 2306536	
Logged by:	Morgan Wilson	Date Received:	6/30/2023	3 4:20:00 PM
Chain of Cust	tody			
1. Is Chain of C	Custody complete?	Yes 🖌	No 🗌	Not Present
2. How was the	e sample delivered?	<u>Client</u>		
<u>Log In</u>				
	ls present on shipping container/cooler? ments for Custody Seals not intact)	Yes 🗌	No 🗌	Not Present
4. Was an atten	npt made to cool the samples?	Yes	No 🖌	
	<u>Ur</u>	<u>known prior to rec</u>	ceipt.	
5. Were all item	s received at a temperature of >2°C to 6°C *	Yes	No 🗌	NA 🔽
6 Sample(s) in	proper container(s)?	Yes 🖌	No 🗌	
	nple volume for indicated test(s)?	Yes 🗸	No 🗌	
	properly preserved?	Yes 🗸	No 🗌	
-	ative added to bottles?	Yes	No 🔽	NA 🗌
10 Is there head	space in the VOA vials?	Yes	No 🗌	NA 🖌
	es containers arrive in good condition(unbroken)?	Yes 🖌	No 🗌	
	ork match bottle labels?	Yes 🖌	No 🗌	
13 Are matrices	correctly identified on Chain of Custody?	Yes 🖌	No 🗌	
-	at analyses were requested?	Yes 🗹	No 🗌	
	ling times able to be met?	Yes 🖌	No 🗌	
Special Hand	lling (if applicable)			
-	notified of all discrepancies with this order?	Yes	No 🗌	NA 🔽
Persor	n Notified: Date	· [
By Wh			none 🗌 Fax	In Person
Regard				
-	Instructions:			
	þ			
17. Additional re	filidiks.			

Item Information

Item #	Temp ⁰C
Sample	19.8

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

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	3	3600 Fremont Ave N.	Chain	of Custo	Chain of Custody Record 8	& Laboratory Se	Laboratory Services Agreement	ent
L'EUOIL		Seattle, WA 98103 Tel: 206-352-3790	Date: 06/30	130/23	Page: 1 of:	-	t No (internal): 2306 53	
An Ajlyanse Technical Graup Company	p Campany		t Name: V	ghop Lake Al			ewood	e 8 o
client: Tetra Tech, Inc.			Project No: 100-RCE-T39045	CE-T39045		Attn: Weston Ott wott@cityoflakew	Attn: Weston Ott wott@cityoflakewood.us	Dog
2003 Western Ave.	Suite 700		Collected by:			253-983-7725 6000 Main St. SW	25 St. SW	
city, state, Zip: Seattle, WA 98121	21		Location: Waugh	op Lake, La	Location: Waughop Lake, Lakewood, WA	Lakewood,	_akewood, WA 98499-5027	
Telephone: 206-728-9655			Report To (PM): Sha	Innon Bratt	Report To (PM): Shannon Brattebo, Tetra Tech		Disposal: Samples will be disposed in 30 days unless otherwise requested Retain volume (specify above) Return to client	client
Email(s): shannon.brattebo@tetratech.com	tetratech.cor	п						
			0.460 (-0.00)	2 48-21-2-4-2-4-2-4-2-4-2-4-2-4-2-4-2-4-2-4-				
Sample Name	Sample Sample Date Time	ne (Matrix)*	Cont. Job 6	3000 000 55	000	1 3 13 1	Comments	
1 Mid-Lake 1 m	0630/23 12:	12:20 W				×		
2 Mid-Lake Bottom	66/30733 12	12:35 W				×		
3					5			
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5					AN 200			
6		/			Let all			
1		/			AIB 1			
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6								
10			7				(
IQ = Aqueous, B = Bulk, C	duct	, S = Soil, SD =	ment, SL = Solid,	Water,	GW = Gro	SW = Storm Water, WW -	Turn-aro	ndard Next Dav
***Anions (Circle): Nitrate Nitrite	Chloride Sul	sulfate Bromide	de O-Phosphate	Fluoride	Nitrate+Nitrite			
it I am autho terms on the	enter into this Ag	greement wit Agreement.	h Fremont Analytica	ıl on behalf of th	ne Client named above	, that I have verified Client's	s agreement	(specify)
Relinquished (Signature)	Print Name A	4	Date/Time	IC-14 Receiv	Received (Signature)	1 Print Name Kal	Date/Time	1612
Relinguished (Signature)	Print Name	1 4/4	Date/Time		Received (Signature) x	Print Name	Date/Time	
3								



3600 Fremont Ave. N. Seattle, WA 98103 T: (206) 352-3790 F: (206) 352-7178 info@fremontanalytical.com

Tetra Tech, Inc. Shannon Brattebo 2003 Western Ave Suite 700 Seattle, WA 98121

RE: Waughop Lake Alum Work Order Number: 2307159

July 20, 2023

Attention Shannon Brattebo:

Fremont Analytical, Inc. received 2 sample(s) on 7/13/2023 for the analyses presented in the following report.

Sulfide by SM 4500-S2-F

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes Project Manager

DoD-ELAP Accreditation #79636 by PJLA, ISO/IEC 17025:2017 and QSM 5.3 for Environmental Testing ORELAP Certification: WA 100009 (NELAP Recognized) for Environmental Testing Washington State Department of Ecology Accredited for Environmental Testing, Lab ID C910



CLIENT: Project: Work Order:	Tetra Tech, Inc. Waughop Lake Alum 2307159	Work Order S	Sample Summary
Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2307159-001	Mid-Lake 1 M	07/13/2023 11:00 AM	07/13/2023 2:09 PM
2307159-002	Mid-Lake Bottom	07/13/2023 11:15 AM	07/13/2023 2:09 PM



Case Narrative

WO#: **2307159** Date: **7/20/2023**

CLIENT:Tetra Tech, Inc.Project:Waughop Lake Alum

I. SAMPLE RECEIPT:

Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:

Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms



WO#: **2307159** Date Reported: **7/20/2023**

Qualifiers:

- * Associated LCS is outside of control limits
- B Analyte detected in the associated Method Blank
- D Dilution was required
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- I Analyte with an internal standard that does not meet established acceptance criteria
- J Analyte detected below Reporting Limit
- N Tentatively Identified Compound (TIC)
- Q Analyte with an initial or continuing calibration that does not meet established acceptance criteria
- S Spike recovery outside accepted recovery limits
- ND Not detected at the Method Detection Limit
- R High relative percent difference observed

Acronyms:

%Rec - Percent Recoverv CCB - Continued Calibration Blank CCV - Continued Calibration Verification **DF** - Dilution Factor **DUP - Sample Duplicate** HEM - Hexane Extractable Material ICV - Initial Calibration Verification LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate MCL - Maximum Contaminant Level MB or MBLANK - Method Blank MDL - Method Detection Limit MS/MSD - Matrix Spike / Matrix Spike Duplicate PDS - Post Digestion Spike Ref Val - Reference Value **REP - Sample Replicate RL** - Reporting Limit **RPD** - Relative Percent Difference **SD** - Serial Dilution SGT - Silica Gel Treatment SPK - Spike Surr - Surrogate



Analytical Report

 Work Order:
 2307159

 Date Reported:
 7/20/2023

Client: Tetra Tech, Inc.			c	ollectio	n Date: 7	/13/20	023 11:00:00 AM
Project: Waughop Lake Alum Lab ID: 2307159-001			N	latrix: V	/ater		
Client Sample ID: Mid-Lake 1 M Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
Sulfide by SM 4500-S2-F				Batch	n ID: R853	52	Analyst: AM
Sulfide	0.800	0.500	0.128		mg/L	1	07/17/23 16:30:46
Client: Tetra Tech, Inc.			С	ollectio	n Date: 7	/13/20	023 11:15:00 AM
Project: Waughop Lake Alum Lab ID: 2307159-002			•	Collectio Natrix: ∨		/13/20	023 11:15:00 AM
Project: Waughop Lake Alum	Result	RL	•			/13/20 DF	D23 11:15:00 AM
Project: Waughop Lake Alum Lab ID: 2307159-002 Client Sample ID: Mid-Lake Bottom	Result	RL	N	latrix: ∨ Qual	/ater	DF	



Work Order:	2307159									QC	SUMMA	RY REF	PORT
CLIENT: Project:	Tetra Tech, Waughop La										Sulfide b	y SM 450	0-S2-F
Sample ID: MB-R8	5352	SampType:	MBLK			Units: mg/L		Prep Date	e: 7/17/20	23	RunNo: 85:	352	
Client ID: MBLKW	N	Batch ID:	R85352					Analysis Date	e: 7/17/20 2	23	SeqNo: 178	30883	
Analyte		Re	esult	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			ND	0.500									
Sample ID: LCS-R8	35352	SampType:	LCS			Units: mg/L		Prep Date	e: 7/17/20	23	RunNo: 85:	352	
Client ID: LCSW		Batch ID:	R85352					Analysis Date	e: 7/17/20	23	SeqNo: 178	30884	
Analyte		Re	esult	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide		:	2.00	0.500	2.000	0	100	45.6	120				
Sample ID: 230715	9-001ADUP	SampType:	DUP			Units: mg/L		Prep Date	e: 7/17/20 2	23	RunNo: 85:	352	
Client ID: Mid-La	ke 1 M	Batch ID:	R85352					Analysis Date	e: 7/17/20	23	SeqNo: 178	30887	
Analyte		Re	esult	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide		0.	800	0.500						0.8000	0	30	
Sample ID: 230715	9-002AMS	SampType:	MS			Units: mg/L		Prep Date	e: 7/17/20 2	23	RunNo: 85:	352	
Client ID: Mid-La	ke Bottom	Batch ID:	R85352					Analysis Date	e: 7/17/20 2	23	SeqNo: 178	30889	
Analyte		Re	esult	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			4.80	0.500	2.000	2.400	120	21.5	190				



Sample Log-In Check List

Client Name:	TETRAS	Work Order Numb	oer: 2307159	
Logged by:	Morgan Wilson	Date Received:	7/13/2023	2:09:00 PM
Chain of Cust	tody			
	Custody complete?	Yes 🖌	No 🗌	Not Present
2. How was the	sample delivered?	<u>Client</u>		
<u>Log In</u>				
	ls present on shipping container/cooler? ments for Custody Seals not intact)	Yes 🗌	No 🗌	Not Present
4. Was an atten	npt made to cool the samples?	Yes	No 🖌	
	<u>Ur</u>	nknown prior to rec	eipt.	
5. Were all item	s received at a temperature of >2°C to 6°C *	Yes	No 🗌	NA 🗹
•	proper container(s)?	Yes 🗹	No 🗌	
	nple volume for indicated test(s)?	Yes 🖌	No 🗌	
8. Are samples	properly preserved?	Yes 🗹	No 🗌	_
9. Was preserva	ative added to bottles?	Yes	No 🗹	NA
10 Is there head	space in the VOA vials?	Yes	No 🗌	NA 🗹
	es containers arrive in good condition(unbroken)?	Yes 🖌	No 🗌	
	ork match bottle labels?	Yes 🖌	No 🗌	
13. Are matrices	correctly identified on Chain of Custody?	Yes 🗹	No 🗌	
14. Is it clear what	at analyses were requested?	Yes 🗹	No 🗌	
15. Were all hold	ling times able to be met?	Yes 🗹	No 🗌	
Special Hand	lling (if applicable)			
-	notified of all discrepancies with this order?	Yes	No 🗌	NA 🗹
_				
	n Notified: Date			
By Wh		eMail Ph	ione 🗌 Fax	In Person
Regard				
Client	Instructions:			
17. Additional re	emarks:			

Item Information

Item #	Temp ⁰C
Sample	21.4

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

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Print Name Date/Time	Received (Signature)	Relinquished (Signature) Print Name
60/1 52/211/	7/13/23 1410 Received Stepstyre	Relinguisbed (Signatura)
Date Time	h Fremont Analytical on behalf of the Chent named above, that 1 ha	I represent that I am authorized to enter into this Agreement wit to each of the terms on the front and backside of this Agreement.
a varified Client's apreement	hide O-Phosphate Fluoride Nitrate+Nitrite	***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide
Sb Se Sr Sn TI TI V Zn ES statituaru 🗆 men ver	Mg Min Mo Na Ni Pb	*•Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL Indiv
= Waste Water	SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW =	fatrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soll,
	71/8/23	12 All D
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		0
		Mid-Lake Bottom 7/(5/13 1115 W
		Mid-Lake 1 m 7/13/73 il oo W
SJUSTICS Comments	# 01 337 <td>Sample Name Sample Date Time (Matrix)*</td>	Sample Name Sample Date Time (Matrix)*
111111		Email(s); shannon.brattebo@tetratech.com
Retain volume (specify above) Return to client	Report To (PM): Shannon Brattebo, Tetra Tech	Telephone: 206-728-9655
Lakewood, WA 98499-5027	Location: Waughop Lake, Lakewood, WA	city, state, zip: Seattle, WA 98121
253-983-7725 6000 Main St. SW	collected by: Zuch Skelten (TT)	Address: 2003 Western Ave. Suite 700
Attn: Weston Ott wott@cityoflakewood.us	Project No: 100-RCE-T39045	client: Tetra Tech, Inc.
Special Remarks: Bill to City of Lakewood		An Alliance Technical Graug Company
Laboratory Project No (Internal): 2307159		Fremone seattle, WA 98103
aboratory Services Agreement	Chain of Custody Record & Labo	SAN AAAN 3600 Fremont Ave N.



3600 Fremont Ave. N. Seattle, WA 98103 T: (206) 352-3790 F: (206) 352-7178 info@fremontanalytical.com

Tetra Tech, Inc. Shannon Brattebo 2003 Western Ave Suite 700 Seattle, WA 98121

RE: Waughop Lake Alum Work Order Number: 2308209

August 22, 2023

Attention Shannon Brattebo:

Fremont Analytical, Inc. received 2 sample(s) on 8/15/2023 for the analyses presented in the following report.

Sulfide by SM 4500-S2-F

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes Project Manager

DoD-ELAP Accreditation #79636 by PJLA, ISO/IEC 17025:2017 and QSM 5.3 for Environmental Testing ORELAP Certification: WA 100009 (NELAP Recognized) for Environmental Testing Washington State Department of Ecology Accredited for Environmental Testing, Lab ID C910

Original



hop Lake Alum 209		
ient Sample ID	Date/Time Collected	Date/Time Received
d-Lake 1 m	08/15/2023 9:45 AM	08/15/2023 1:35 PM
d-Lake Bottom	08/15/2023 10:00 AM	08/15/2023 1:35 PM
	phop Lake Alum 209 ient Sample ID d-Lake 1 m d-Lake Bottom	ient Sample ID Date/Time Collected d-Lake 1 m 08/15/2023 9:45 AM



Case Narrative

WO#: **2308209** Date: **8/22/2023**

CLIENT:Tetra Tech, Inc.Project:Waughop Lake Alum

I. SAMPLE RECEIPT:

Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:

Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms



WO#: **2308209** Date Reported: **8/22/2023**

Qualifiers:

- * Associated LCS is outside of control limits
- B Analyte detected in the associated Method Blank
- D Dilution was required
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- I Analyte with an internal standard that does not meet established acceptance criteria
- J Analyte detected below Reporting Limit
- N Tentatively Identified Compound (TIC)
- Q Analyte with an initial or continuing calibration that does not meet established acceptance criteria
- S Spike recovery outside accepted recovery limits
- ND Not detected at the Method Detection Limit
- R High relative percent difference observed

Acronyms:

%Rec - Percent Recoverv **CCB** - Continued Calibration Blank CCV - Continued Calibration Verification **DF** - Dilution Factor **DUP - Sample Duplicate** HEM - Hexane Extractable Material ICV - Initial Calibration Verification LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate MCL - Maximum Contaminant Level MB or MBLANK - Method Blank MDL - Method Detection Limit MS/MSD - Matrix Spike / Matrix Spike Duplicate PDS - Post Digestion Spike Ref Val - Reference Value **REP - Sample Replicate RL** - Reporting Limit **RPD - Relative Percent Difference SD** - Serial Dilution SGT - Silica Gel Treatment SPK - Spike Surr - Surrogate



Analytical Report

 Work Order:
 2308209

 Date Reported:
 8/22/2023

Client: Tetra Tech, Inc.			С	ollectio	n Date: 8,	/15/20	023 9:45:00 AM
Project: Waughop Lake Alum Lab ID: 2308209-001	Matrix: Water						
Client Sample ID: Mid-Lake 1 m Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
Sulfide by SM 4500-S2-F				Batch	n ID: R860)63	Analyst: SS
Sulfide	0.600	0.500	0.128		mg/L	1	08/22/23 14:17:17
Client: Tetra Tech, Inc.			С	ollectio	n Date: 8,	/15/20	023 10:00:00 AM
Project: Waughop Lake Alum Lab ID: 2308209-002				ollectio		/15/20	023 10:00:00 AM
Project: Waughop Lake Alum	Result	RL				/15/20 DF	023 10:00:00 AM Date Analyzed
Project: Waughop Lake Alum Lab ID: 2308209-002 Client Sample ID: Mid-Lake Bottom	Result	RL	N	latrix: ∨ Qual	Vater	DF	



Work Order:	2308209									20	SUMMA		PORT
CLIENT:	Tetra Tech,	Inc.											_
Project:	Waughop L	ake Alum									Sulfide b	y SIN 450	0-52-F
Sample ID: MB-R	86063	SampType	: MBLK			Units: mg/L		Prep Da	te: 8/22/20 2	23	RunNo: 86	063	
Client ID: MBL	(W	Batch ID:	R86063					Analysis Da	te: 8/22/20 2	23	SeqNo: 17	95802	
Analyte		I	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			ND	0.500									
Sample ID: LCS-I	R86063	SampType	: LCS			Units: mg/L		Prep Da	te: 8/22/20 2	23	RunNo: 86	063	
Client ID: LCSV	V	Batch ID:	R86063					Analysis Da	te: 8/22/20 2	23	SeqNo: 17	95803	
Analyte		I	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			1.40	0.500	2.000	0	70.0	45.6	120				
Sample ID: LCSD	-R86063	SampType	: LCSD			Units: mg/L		Prep Da	te: 8/22/20 2	23	RunNo: 86	063	
Client ID: LCSV	V02	Batch ID:	R86063					Analysis Da	te: 8/22/20	23	SeqNo: 17	95804	
Analyte		I	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			1.40	0.500	2.000	0	70.0	45.6	120	1.400	0	20	
Sample ID: 23082	09-001ADUP	SampType	: DUP			Units: mg/L		Prep Da	te: 8/22/20 2	23	RunNo: 86	063	
Client ID: Mid-L	ake 1 m	Batch ID:	R86063					Analysis Da	te: 8/22/20 2	23	SeqNo: 17	95806	
Analyte		I	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide NOTES: R - High RPD o	bserved.		ND	0.500						0.6000	200	30	R
Sample ID: 23082	209-002AMS	SampType	: MS			Units: mg/L		Prep Da	te: 8/22/20 2	23	RunNo: 86	063	
Client ID: Mid-L	ake Bottom	Batch ID:	R86063					Analysis Da	te: 8/22/20 2	23	SeqNo: 17	95808	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide NOTES:			5.60	0.500	2.000	0	280	21.5	190				S

NOTES:

S - Outlying spike recoveries were associated with this sample.



Sample Log-In Check List

Client Name: TETRAS	Work Order Num	ber: 2308209	
Logged by: Clare Griggs	Date Received:	8/15/2023	1:35:00 PM
Chain of Custody			
1. Is Chain of Custody complete?	Yes 🖌	No 🗌	Not Present
2. How was the sample delivered?	Client		
Log In			
 Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact) 	Yes 🗌	No 🗌	Not Present
4. Was an attempt made to cool the samples?	Yes	No 🗹	NA 🗌
5. Were all items received at a temperature of >2°C to 6°C *	Yes 🗋	No 🗌	NA 🗹
6. Sample(s) in proper container(s)?	Yes 🖌	No 🗌	
7. Sufficient sample volume for indicated test(s)?	Yes 🖌	No 🗌	
8. Are samples properly preserved?	Yes 🖌	No 🗌	
9. Was preservative added to bottles?	Yes	No 🗹	NA 🗌
10. Is there headspace in the VOA vials?	Yes	No 🗌	NA 🔽
11. Did all samples containers arrive in good condition(unbroken)?	Yes 🖌	No 🗌	
12. Does paperwork match bottle labels?	Yes 🔽	No 🗌	
13. Are matrices correctly identified on Chain of Custody?	Yes 🖌	No 🗌	
14. Is it clear what analyses were requested?	Yes 🖌	No 🗌	
15. Were all holding times able to be met?	Yes 🔽	No 🗌	
Special Handling (if applicable)			
16. Was client notified of all discrepancies with this order?	Yes	No 🗌	NA 🗹
	ate: ia: eMail Pl	hone 🗌 Fax	In Person
17. Additional remarks:			

Item Information

Item #	Temp ⁰C
Sample	19.4

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

		3600 Fremont Ave N.	Ive N.	Chain	of Custo	Chain of Custody Record	& Labora	Laboratory Services Agreement	es Agreem	lent
Fremonu		Seattle, WA 98103 Tel: 206-352-3790	98103	Date:		Page: 1	of: 1 4	Laboratory Project No (internal):	ACC #	boles
An Aliyance Technical Graup Company	wheel.			Project Name: Waughop Lake Alum	jhop Lake Alu	m	S	Bill to City of Lakewood	ood	
client: Tetra Tech, Inc.				Project No: 100-RCE-T39045	CE-T39045		4 1	Attn: Weston Ott wott@cityoflakewood.us)d.us	
s. 2003 Western Ave.	Suite 700			Collected by:		****		253-983-7725 6000 Main St. SW		
city. state, Zip: Seattle, WA 98121	21			Location: Waugh	op Lake, La	Location: Waughop Lake, Lakewood, WA		Lakewood, WA 98499-5027	99-5027	
Telephone: 206-728-9655				Report To (PM): Shannon Brattebo,	innon Bratt	ebo, Tetra Tech	ch	Disposal: Samples will be disposed in 30 days unless ornerwise requessed. Retain volume (specify above) Retain to client	ove) Return to client	o client
Email(s): shannon.brattebo@tetratech.com	etratech.	com								
	Sample	0	Sample Type	# of		AT CON STORE OF THE OF			Comments	
1 Mid-Lake 1 m	8/15/23	0945	X	1						
2 Mid-Lake Bottom	8/15123	000	W	-			×			
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10	8/15/2	Ŵ						_		aund Time:
fatrix: A = Air, AQ = Aqueous, B = Bulk,	O = Other, P = Product,		S = Soil, SD = S	SD = Sediment, SL = Solid, W	W = Water, DW = Dr		er,		X Sta	ndard Next Day
**Metals (Circle): MTCA-5 RCRA-8	Priority Pollutants		Individual: Ag	Al As B Ba	0 0	U HE HE K ME MIN	IVID ING INI FU JU JE JI)	
***Anions (Circle): Nitrate Nitrite	Chloride	Sulfate	Bromide	de O-Phosphate	Fluoride N	Nitrate+Nitrite		if a Climite arrange	□ 3 Day	Same Day
I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.	o enter into the nd backside of	is Agreer [this Agr	nent with reement.	ı Fremont Analytic	al on behalf of ti	he Client named ab	ove, that I have ve	erified Client's agreemo	ent 🗌 2 Day	(specify)
Relinquished (Signature)	Adam	1 Bryun	imit	0%/ [5/23	1335 ×	x Contraction (Signature)	Print Name	Theft	Date/Time	13:35
Relinquished (Signature)	Print Name			Date/Time	Receiv ×	Received (Signature) x	Print Name	vame		
COC 1.3 - 11.06.20				www	.fremontar	www.fremontanalytical.com				Page
000 1.3 - 11.00.20										



3600 Fremont Ave. N. Seattle, WA 98103 T: (206) 352-3790 F: (206) 352-7178 info@fremontanalytical.com

Tetra Tech, Inc. Shannon Brattebo 2003 Western Ave Suite 700 Seattle, WA 98121

RE: Waughop Lake Alum Work Order Number: 2309168

September 21, 2023

Attention Shannon Brattebo:

Fremont Analytical, Inc. received 2 sample(s) on 9/14/2023 for the analyses presented in the following report.

Toal Sulfide by SM 4500-S2-D

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes Project Manager

DoD-ELAP Accreditation #79636 by PJLA, ISO/IEC 17025:2017 and QSM 5.3 for Environmental Testing ORELAP Certification: WA 100009 (NELAP Recognized) for Environmental Testing Washington State Department of Ecology Accredited for Environmental Testing, Lab ID C910



CLIENT: Project: Work Order:	Tetra Tech, Inc. Waughop Lake Alum 2309168	Work Order S	Sample Summary
Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2309168-001 2309168-002	Mid-Lake 1 m Mid-Lake Bottom	09/14/2023 10:27 AM 09/14/2023 10:37 AM	09/14/2023 3:52 PM 09/14/2023 3:52 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned



Case Narrative

WO#: **2309168** Date: **9/21/2023**

CLIENT:Tetra Tech, Inc.Project:Waughop Lake Alum

I. SAMPLE RECEIPT:

Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:

Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms



WO#: **2309168** Date Reported: **9/21/2023**

Qualifiers:

- * Associated LCS is outside of control limits
- B Analyte detected in the associated Method Blank
- D Dilution was required
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- I Analyte with an internal standard that does not meet established acceptance criteria
- J Analyte detected below Reporting Limit
- N Tentatively Identified Compound (TIC)
- Q Analyte with an initial or continuing calibration that does not meet established acceptance criteria
- S Spike recovery outside accepted recovery limits
- ND Not detected at the Method Detection Limit
- R High relative percent difference observed

Acronyms:

%Rec - Percent Recovery

- CCB Continued Calibration Blank
- CCV Continued Calibration Verification
- DF Dilution Factor
- DUP Sample Duplicate
- HEM Hexane Extractable Material
- ICV Initial Calibration Verification
- LCS/LCSD Laboratory Control Sample / Laboratory Control Sample Duplicate
- MCL Maximum Contaminant Level
- MB or MBLANK Method Blank
- MDL Method Detection Limit
- MS/MSD Matrix Spike / Matrix Spike Duplicate
- PDS Post Digestion Spike
- Ref Val Reference Value
- REP Sample Replicate
- RL Reporting Limit
- RPD Relative Percent Difference
- SD Serial Dilution
- SGT Silica Gel Treatment
- SPK Spike
- Surr Surrogate



Analytical Report

 Work Order:
 2309168

 Date Reported:
 9/21/2023

Client: Tetra Tech, Inc.			С	ollectio	n Date: 9,	/14/20	023 10:27:00 AM
Project: Waughop Lake Alum Lab ID: 2309168-001 Client Sample ID: Mid-Lake 1 m			N	latrix: V	Vater		
Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
<u>Toal Sulfide by SM 4500-S2-D</u>				Batcl	n ID: R866	639	Analyst: FG
Sulfide	ND	0.0500	0.0138		mg/L	1	09/21/23 9:39:01
Client: Tetra Tech, Inc.			С	ollectio	n Date: 9,	/14/20	023 10:37:00 AM
Client: Tetra Tech, Inc. Project: Waughop Lake Alum Lab ID: 2309168-002 Client Sample ID: Mid-Lake Bottom			-	ollectio Iatrix: V		/14/20	023 10:37:00 AM
Project: Waughop Lake Alum Lab ID: 2309168-002	Result	RL	-			/14/20 DF	D23 10:37:00 AM Date Analyzed
Project: Waughop Lake Alum Lab ID: 2309168-002 Client Sample ID: Mid-Lake Bottom	Result	RL	N	latrix: ∨ Qual	Vater	DF	



Work Order:	2309168									00.5			ORT
CLIENT:	Tetra Tech,	Inc.								•			_
Project:	Waughop L	ake Alum								Ioai	Sulfide by	y 51VI 450	0-52-D
Sample ID: LCS-R8	36639	SampType	LCS			Units: mg/L		Prep Date	e: 9/21/20	23	RunNo: 86	639	
Client ID: LCSW		Batch ID:	R86639					Analysis Date	e: 9/21/20	23	SeqNo: 18	07644	
Analyte		F	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide		0	.0997	0.0500	0.1000	0	99.7	80	120				
Sample ID: MB-R86	6639	SampType	MBLK			Units: mg/L		Prep Date	e: 9/21/20	23	RunNo: 86	639	
Client ID: MBLKW	v	Batch ID:	R86639					Analysis Date	e: 9/21/20	23	SeqNo: 18	07645	
Analyte		F	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			ND	0.0500									
Sample ID: 230916	8-001ADUP	SampType	DUP			Units: mg/L		Prep Date	e: 9/21/20	23	RunNo: 86	639	
Client ID: Mid-Lal	ke 1 m	Batch ID:	R86639					Analysis Date	e: 9/21/20	23	SeqNo: 18	07704	
Analyte		F	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			ND	0.0500						0	0	20	
Sample ID: 2309168	8-001AMS	SampType	MS			Units: mg/L		Prep Date	e: 9/21/20	23	RunNo: 86	639	
Client ID: Mid-Lal	ke 1 m	Batch ID:	R86639					Analysis Date	e: 9/21/20	23	SeqNo: 18	07705	
Analyte		F	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.103	0.0500	0.1000	0	103	80	120				
Sample ID: 2309168	8-001AMSD	SampType	MSD			Units: mg/L		Prep Date	e: 9/21/20	23	RunNo: 86	639	
Client ID: Mid-Lal	ke 1 m	Batch ID:	R86639					Analysis Date	e: 9/21/20	23	SeqNo: 18	07706	
Analyte		F	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.114	0.0500	0.1000	0	114	80	120	0.1030	10.1	20	



Client Name: TETRAS	Work Order Num	ber: 2309168	
Logged by: Lyann Rivera	Date Received:	9/14/2023	3:52:00 PM
Chain of Custody			
1. Is Chain of Custody complete?	Yes 🖌	No 🗌	Not Present
2. How was the sample delivered?	<u>Client</u>		
<u>Log In</u>			
 Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact) 	Yes	No 🗌	Not Present
4. Was an attempt made to cool the samples?	Yes	No 🗹	NA 🗌
Ur	<u>nknown prior to re</u>	<u>ceipt</u>	
5. Were all items received at a temperature of >2°C to 6°C *	Yes 🗌	No 🗌	NA 🗹
6. Sample(s) in proper container(s)?	Yes 🖌	No 🗌	
7 Sufficient sample volume for indicated test(s)?	Yes 🖌	No 🗌	
8. Are samples properly preserved?	Yes 🖌	No 🗌	
9. Was preservative added to bottles?	Yes	No 🖌	NA 🗌
10. Is there headspace in the VOA vials?	Yes	No 🗌	NA 🗹
11. Did all samples containers arrive in good condition(unbroken)?	Yes 🖌	No 🗌	
12. Does paperwork match bottle labels?	Yes 🖌	No 🗌	
13. Are matrices correctly identified on Chain of Custody?	Yes 🖌	No 🗌	
14. Is it clear what analyses were requested?	Yes 🖌	No 🗌	
15. Were all holding times able to be met?	Yes 🖌	No 🗌	
Special Handling (if applicable)			
16. Was client notified of all discrepancies with this order?	Yes 🗌	No 🗌	NA 🗸
Person Notified: Date	:		
By Whom: Via:	·	none 🗌 Fax	In Person
Regarding:			
Client Instructions:			
17. Additional remarks:			

Item Information

Item #	Temp ⁰C
Sample	14.7

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

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**Metals (Circle): MTCA-5	MICA-3	CA-5 RCRA-8	Priority Pollutants	ts TAL
***Anions (Circle):	Nitrate	Nitrite	Chloride	Sulfate
Relinquished (Signature)	re)	to each of the terms on the front and backside of this Agreement.	and the second se	f this
Delinquished (Signature)	A	the front	Print Name	By

	30	3600 Fremont Ave N.		Chain of Custody Record	Ø	Laboratory Services Agreement
	s	Seattle, WA 98103 Tel: 206-352-3790	Date:	Page: 1	°. 	o (internal): 2309168
An Alliance Technical Brown Company	o ma a ny		Project Name: W2	Project Name: Waughop Lake Alum	Special Remarks: Bill to City of Lakewood	Lakewood
_{client:} Tetra Tech, Inc.			Project No: 100-	Project No: 100-RCE-T39045	Attn: Weston Ott wott@citvoflakewood.us	Ott kewnod us
Address: 2003 Western Ave. Suite 700	Suite 700		Collected by: A	collected by: Adam Bryant	253-983-7725 6000 Main St. SW	CIM
city, state, zip: Seattle, WA 98121	21		Location: Waug	Location: Waughop Lake, Lakewood, WA		Lakewood, WA 98499-5027
Telephone: 206-728-9655			Report To (PM): S	Report To (PM): Shannon Brattebo, Tetra Tech		Disposal: Samples will be disposed in 30 days unless otherwise requested. Retain volume (specify above) Return to client
Email(s): shannon.brattebo@tetratech.com	etratech.c	öm				
				Constanting of the second		
Sample Name	Sample Date	Sample Type Time (Matrix)*	not LOC BY	A Contraction of the second se		Comments
1 Mid-Lake 1 m	09/14/23 1	10:27 W	1			
2 Mid-Lake Bottom	09/14/23 10:37	0:37 W	~		×	
3						
4						
5						
6						
7						
8						
9						
10						
*Matrix: A = Air, AQ = Aqueous, B = Bulk, O	= Other, P = Prod	luct, S = Soil, SI	O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid,	W = Water, DW = Drinking Water, GW = G	GW = Ground Water, SW = Storm Water, WW = Wa	WW = Waste Water Turn-around Time:
**Metals (Circle): MTCA-5 RCRA-8 F	Priority Pollutants	TAL Indi	Individual: Ag Al As B Ba Be Ca Cd Co	Cr Cu Fe Hg K Mg	Mn Mo Na Ni Pb Sb Se Sr Sn Ti Ti V 2	Zn 🛛 X Standard 🗍 Next Day
***Anions (Circle): Nitrate Nitrite	Chloride	Sulfate Bro	Bromide O-Phosphate	Fluoride Nitrate+Nitrite		3 Day Same Day
I represent that I am authorized to enter into this Agreement wit to each of the terms on the front and backside of this Agreement.	enter into this d backside of t	Agreement v his Agreeme	vith Fremont Analyt nt.	ical on behalf of the Client named al	I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.	🗆 2 Day
Relinquished (Signature)	Aclum 1	Brand	Date/Time	Received (Signature)	BHADN Stone	9/14/23 15:52
Relinquished (Signature)	Print Name	1	Date/Time	Received (Signature)	Print Name	Date/Time



3600 Fremont Ave. N. Seattle, WA 98103 T: (206) 352-3790 F: (206) 352-7178 info@fremontanalytical.com

Tetra Tech, Inc. Shannon Brattebo 2003 Western Ave Suite 700 Seattle, WA 98121

RE: Waughop Lake Alum Work Order Number: 2310163

October 18, 2023

Attention Shannon Brattebo:

Fremont Analytical, Inc. received 1 sample(s) on 10/11/2023 for the analyses presented in the following report.

Total Sulfide by SM 4500-S2-D

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes Project Manager

DoD-ELAP Accreditation #79636 by PJLA, ISO/IEC 17025:2017 and QSM 5.3 for Environmental Testing ORELAP Certification: WA 100009 (NELAP Recognized) for Environmental Testing Washington State Department of Ecology Accredited for Environmental Testing, Lab ID C910



CLIENT: Project: Work Order:	Tetra Tech, Inc. Waughop Lake Alum 2310163	Work Order S	ample Summary
Lab Sample ID	•	Date/Time Collected	Date/Time Received
2310163-001	Mid-Lake 1 m	10/11/2023 12:00 AM	10/11/2023 1:39 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned



Case Narrative

WO#: **2310163** Date: **10/18/2023**

CLIENT:Tetra Tech, Inc.Project:Waughop Lake Alum

I. SAMPLE RECEIPT:

Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:

Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms



WO#: **2310163** Date Reported: **10/18/2023**

Qualifiers:

- * Associated LCS is outside of control limits
- B Analyte detected in the associated Method Blank
- D Dilution was required
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- I Analyte with an internal standard that does not meet established acceptance criteria
- J Analyte detected below Reporting Limit
- N Tentatively Identified Compound (TIC)
- Q Analyte with an initial or continuing calibration that does not meet established acceptance criteria
- S Spike recovery outside accepted recovery limits
- ND Not detected at the Method Detection Limit
- R High relative percent difference observed

Acronyms:

%Rec - Percent Recoverv **CCB** - Continued Calibration Blank CCV - Continued Calibration Verification **DF** - Dilution Factor **DUP - Sample Duplicate** HEM - Hexane Extractable Material ICV - Initial Calibration Verification LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate MCL - Maximum Contaminant Level MB or MBLANK - Method Blank MDL - Method Detection Limit MS/MSD - Matrix Spike / Matrix Spike Duplicate PDS - Post Digestion Spike Ref Val - Reference Value **REP - Sample Replicate RL** - Reporting Limit **RPD** - Relative Percent Difference **SD** - Serial Dilution SGT - Silica Gel Treatment SPK - Spike Surr - Surrogate



Analytical Report

Work Order: 2310163 Date Reported: 10/18/2023

Client: Tetra Tech, Inc.			С	ollection	n Date: 10	0/11/2	023
Project: Waughop Lake Alum Lab ID: 2310163-001 Client Sample ID: Mid-Lake 1 m			N	latrix: W	/ater		
Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
Total Sulfide by SM 4500-S2-D				Batch	ID: R871	81	Analyst: FG
Sulfide	ND	0.0500	0.0138		mg/L	1	10/17/23 11:00:00



Work Order: CLIENT: Project:	2310163 Tetra Tech, Waughop L										SUMMA Sulfide by		
Sample ID: MB-R8	37181	SampType	: MBLK			Units: mg/L		Prep Date	10/17/2	023	RunNo: 87	181	
Client ID: MBLK	W	Batch ID:	R87181					Analysis Date	10/17/2	023	SeqNo: 18	19888	
Analyte		l	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit H	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			ND	0.0500									
Sample ID: LCS-R	87181	SampType	E LCS			Units: mg/L		Prep Date	10/17/2	023	RunNo: 87	181	
Client ID: LCSW		Batch ID:	R87181					Analysis Date	10/17/2	023	SeqNo: 18	19889	
Analyte		l	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit H	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.188	0.0500	0.2000	0	93.9	80	120				
Sample ID: 231016	63-001ADUP	SampType	: DUP			Units: mg/L		Prep Date	10/17/2	023	RunNo: 87	181	
Client ID: Mid-La	ake 1 m	Batch ID:	R87181					Analysis Date	10/17/2	023	SeqNo: 18	19891	
Analyte		I	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit H	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			ND	0.0500						0	0	20	
Sample ID: 231016	63-001AMS	SampType	e: MS			Units: mg/L		Prep Date	10/17/2	023	RunNo: 87	181	
Client ID: Mid-La	ake 1 m	Batch ID:	R87181					Analysis Date	10/17/2	023	SeqNo: 18	19892	
Analyte		l	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit H	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.192	0.0500	0.2000	0	96.2	80	120				
Sample ID: 231016	63-001AMSD	SampType	: MSD			Units: mg/L		Prep Date	10/17/2	023	RunNo: 87	181	
Client ID: Mid-La	ake 1 m	Batch ID:	R87181					Analysis Date	10/17/2	023	SeqNo: 18	19893	
Analyte		l	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit H	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.198	0.0500	0.2000	0	99.1	80	120	0.1924	2.97	20	



Sample Log-In Check List

Client Name: TETRAS	Work Order Num	ber: 2310163	
Logged by: Morgan Wilson	Date Received:	10/11/202	23 1:39:00 PM
Chain of Custody			
1. Is Chain of Custody complete?	Yes 🖌	No 🗌	Not Present
2. How was the sample delivered?	<u>Client</u>		
Log In			
 Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact) 	Yes	No 🗌	Not Present
4. Was an attempt made to cool the samples?	Yes	No 🗹	
l	<u>Jnknown prior to rec</u>	ceipt.	
5. Were all items received at a temperature of >2°C to 6°C *	Yes	No 🗌	NA 🗹
6. Sample(s) in proper container(s)?	Yes 🖌	No 🗌	
 Sufficient sample volume for indicated test(s)? 	Yes 🖌	No 🗌	
8. Are samples properly preserved?	Yes 🖌	No 🗌	
9. Was preservative added to bottles?	Yes	No 🗹	NA 🗌
10. Is there headspace in the VOA vials?	Yes	No 🗌	NA 🖌
11. Did all samples containers arrive in good condition(unbroken)?	Yes 🗹		
12. Does paperwork match bottle labels?	Yes 🗹		
13. Are matrices correctly identified on Chain of Custody?	Yes 🖌	No 🗌	
14. Is it clear what analyses were requested?	Yes 🖌	No 🗌	
15. Were all hold times (except field parameters, pH e.g.) able to be met?	Yes 🗹	No 🗌	
<u>Special Handling (if applicable)</u>			
16. Was client notified of all discrepancies with this order?	Yes	No 🗌	NA 🗹
Person Notified: Da	te:		
By Whom: Via		none 🗌 Fax	In Person
Regarding:			
Client Instructions:			
P			
17. Additional remarks:			

Item Information

Item #	Temp ⁰C
Sample	14.5

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

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Min Koffler 10/11/23 1339	N'in th	Received (Signature) x 7 4	1539	Date/Time		Brynt	Adam A		July J	Relinquished (Signature) × UUUm	Rel
L T	l above, that I have v	alf of the Client name	ical on beha	emont Analyt	ent with Fr ement.	uis Agreem f this Agre	enter into th d backside o	thorized to the front and	at I am au terms on t	I represent that I am authorized to enter into this Agreement wit to each of the terms on the front and backside of this Agreement	
3 Day Same Day		Nitrate+Nitrite	Fluoride	O-Phosphate	Bromide	Sulfate	Chloride	Nitrite	Nitrate	***Anions (Circle):	:
se sr sn Ti Ti V Zn 🛛 🕅 Standard 🗌 Next Day	Mg Mn Mo Na Ni Pb Sb	Co Cr Cu Fe Hg K Mg	Be Ca Cd	Ag Al As B Ba	Individual:	ts TAL	Priority Pollutants	RCRA-8 P	MTCA-5	**Metals (Circle): MTCA-5	:
torm Water, WW = Waste Water Turn-around Time:	GW = Ground Water, SW = Storm Water,	DW = Drinking Water, GW	W = Water,	P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water,	oil, SD = Sedin	roduct, S = S	O = Other, P = P		Q = Aqueous	*Matrix: A = Air, AQ = Aqueous, B = Bulk,	**
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	X				W	23	10/11/	1 300	Bottom	Mid-Lake Bottom	2
					W				ш	Mid-Lake 1 m	1
Comments		ANT CONCEPTION		A CC	Sample Type # of (Matrix)* Cont.	Sample Time	Sample Date			Sample Name	\$
	111					.com	etratech	ittebo@t	10n.bra	Email(s): shannon.brattebo@tetratech.com	5
Disposal: Samples will be disposed in 30 days unless otherwise requested. Retain volume (specify above) Return to client	1 Tech	Report To (PM): Shannon Brattebo, Tetra Tech	hannon	port To (PM): S	Re			555	-728-96	Telephone: 206-728-9655	Te
Lakewood, WA 98499-5027	WA	Location: Waughop Lake, Lakewood, WA	ghop La	_{cation:} Wau	Б		27	WA 9812	eattle, \	city, State, Zip: Seattle, WA 98121	Q
253-983-7725 6000 Main St SW				Collected by:	G	0	Suite 700	rn Ave. (Weste	Address: 2003 Western Ave. Suite	A
Attn: Weston Ott wott@citvoflakewood.us		9045	-RCE-T3	Project No: 100-RCE-T39045	Pr			٦C.	「ech, Ir	client: Tetra Tech, Inc.	Q
Special Remarks: Bill to City of Lakewood		ake Alum	aughop La	Project Name: Waughop Lake Alum	Pr		Awbawo	An Allignie Technical Group Company	Allignie Teci		
Laboratory Project No (internal): 23/0/63	of: 1	Page: 1		Date:		Tel: 206-352-3790					_
Laboratory Services Agreement	ø	Custody Record	9f	Chain	Ave N.	3600 Fremont Ave N	36	Eromont	Ď		



3600 Fremont Ave. N. Seattle, WA 98103 T: (206) 352-3790 F: (206) 352-7178 info@fremontanalytical.com

Tetra Tech, Inc. Shannon Brattebo 2003 Western Ave Suite 700 Seattle, WA 98121

RE: Waughop Lake Alum Work Order Number: 2312294

December 19, 2023

Attention Shannon Brattebo:

Fremont Analytical, Inc. received 2 sample(s) on 12/12/2023 for the analyses presented in the following report.

Total Sulfide by SM 4500-S2-D

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes Project Manager

DoD-ELAP Accreditation #79636 by PJLA, ISO/IEC 17025:2017 and QSM 5.3 for Environmental Testing ORELAP Certification: WA 100009 (NELAP Recognized) for Environmental Testing Washington State Department of Ecology Accredited for Environmental Testing, Lab ID C910



CLIENT: Project: Work Order:	Tetra Tech, Inc. Waughop Lake Alum 2312294	Work Order S	Sample Summary
Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2312294-001	Mid-Lake 1 m	12/12/2023 10:18 AM	12/12/2023 1:56 PM
2312294-002	Mid-Lake Bottom	12/12/2023 10:25 AM	12/12/2023 1:56 PM



Case Narrative

WO#: **2312294** Date: **12/19/2023**

CLIENT:Tetra Tech, Inc.Project:Waughop Lake Alum

I. SAMPLE RECEIPT:

Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:

Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms



WO#: 2312294 Date Reported: 12/19/2023

Qualifiers:

- * Associated LCS is outside of control limits
- B Analyte detected in the associated Method Blank
- D Dilution was required
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- I Analyte with an internal standard that does not meet established acceptance criteria
- J Analyte detected below Reporting Limit
- N Tentatively Identified Compound (TIC)
- Q Analyte with an initial or continuing calibration that does not meet established acceptance criteria
- S Spike recovery outside accepted recovery limits
- ND Not detected at the Method Detection Limit
- R High relative percent difference observed

Acronyms:

%Rec - Percent Recoverv **CCB** - Continued Calibration Blank CCV - Continued Calibration Verification **DF** - Dilution Factor **DUP - Sample Duplicate** HEM - Hexane Extractable Material ICV - Initial Calibration Verification LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate MCL - Maximum Contaminant Level MB or MBLANK - Method Blank MDL - Method Detection Limit MS/MSD - Matrix Spike / Matrix Spike Duplicate PDS - Post Digestion Spike Ref Val - Reference Value **REP - Sample Replicate RL** - Reporting Limit **RPD** - Relative Percent Difference **SD** - Serial Dilution SGT - Silica Gel Treatment SPK - Spike Surr - Surrogate



Work Order: 2312294 Date Reported: 12/19/2023

Client: Tetra Tech, Inc.			С	ollectio	n Date: 1	2/12/2	2023 10:18:00 AM
Project: Waughop Lake Alum Lab ID: 2312294-001 Client Sample ID: Mid-Lake 1 m			N	latrix: V	Vater		
Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
Total Sulfide by SM 4500-S2-D				Batch	1D: R884	128	Analyst: AM
Sulfide	0.0336	0.0500	0.0138	J	mg/L	1	12/19/23 10:01:31
Client: Tetra Tech, Inc.			С	ollectio	n Date: 1	2/12/2	2023 10:25:00 AM
Project: Waughop Lake Alum Lab ID: 2312294-002 Client Sample ID: Mid-Lake Bottom			N	latrix: ∨	Vater		
Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed
Total Sulfide by SM 4500-S2-D				Batch	n ID: R884	128	Analyst: AM
Sulfide	0.0383	0.0500	0.0138	J	mg/L	1	12/19/23 10:01:31





	2312294									QC S	SUMMAI		PORT
CLIENT:	Tetra Tech,	Inc.									Sulfide by		
Project:	Waughop La	ake Alum								Total	Sunde by	y 3111 450	0-32-0
Sample ID: CCB-R8	8428	SampType	CCB			Units: mg/L		Prep Dat	te: 12/19/2	2023	RunNo: 884	428	
Client ID: CCB		Batch ID:	R88428					Analysis Dat	te: 12/19/2	2023	SeqNo: 184	46585	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			ND	0.0500									
Sample ID: LCS-R8	8428	SampType	E LCS			Units: mg/L		Prep Dat	te: 12/19/2	2023	RunNo: 884	428	
Client ID: LCSW		Batch ID:	R88428					Analysis Dat	te: 12/19/2	2023	SeqNo: 184	46586	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.163	0.0500	0.2000	0	81.7	80	120				
Sample ID: 2312338	3-001FDUP	SampType	: DUP			Units: mg/L		Prep Dat	te: 12/19/2	2023	RunNo: 884	428	
Client ID: BATCH		Batch ID:	R88428					Analysis Dat	te: 12/19/2	2023	SeqNo: 184	47024	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide		().0359	0.0500						0.02900	21.4	20	J
Sample ID: 2312338	3-001FMS	SampType	e: MS			Units: mg/L		Prep Dat	te: 12/19/2	2023	RunNo: 884	428	
Client ID: BATCH		Batch ID:	R88428					Analysis Dat	te: 12/19/2	2023	SeqNo: 184	47025	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.210	0.0500	0.2000	0.02900	90.4	80	120				
Sample ID: 2312338	3-001FMSD	SampType	e: MSD			Units: mg/L		Prep Dat	te: 12/19/2	2023	RunNo: 884	428	
Client ID: BATCH		Batch ID:	R88428					Analysis Dat	te: 12/19/2	2023	SeqNo: 184	47026	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.205	0.0500	0.2000	0.02900	88.1	80	120	0.2098	2.23	20	



Sample Log-In Check List

Client Name:	TETRAS	Work Order Numb	per: 2312294	
Logged by:	Lyann Rivera	Date Received:	12/12/2023	3 1:56:00 PM
Chain of Cust	ody			
1. Is Chain of C	ustody complete?	Yes 🖌	No 🗌	Not Present
2. How was the	sample delivered?	<u>Client</u>		
<u>Log In</u>				
	s present on shipping container/cooler? ments for Custody Seals not intact)	Yes	No 🗌	Not Present
4. Was an attem	npt made to cool the samples?	Yes	No 🔽	NA 🗌
	Un	<u>known Prior to Re</u>	eceipt	
5. Were all item	s received at a temperature of >2°C to 6°C *	Yes	No 🗌	NA 🗹
6 Sample(s) in	proper container(s)?	Yes 🖌	No 🗌	
-	nple volume for indicated test(s)?	Yes 🗹		
	properly preserved?	Yes 🔽		
-	ative added to bottles?	Yes	No 🔽	
9 . The processe				
10. Is there head	space in the VOA vials?	Yes	No 🗌	NA 🗹
11. Did all sample	es containers arrive in good condition(unbroken)?	Yes 🔽	No 🗌	
12. Does paperwo	ork match bottle labels?	Yes 🗹	No 🗌	
13 Are matrices	correctly identified on Chain of Custody?	Yes 🖌	No 🗌	
	it analyses were requested?	Yes 🖌	No 🗌	
	times (except field parameters, pH e.g.) able to	Yes 🖌	No 🗌	
	<u>ling (if applicable)</u>			
16. Was client n	otified of all discrepancies with this order?	Yes	No 🗌	NA 🖌
Person	Notified: Date			
By Who		' <u> </u>	none 🗌 Fax 🛛	In Person
Regard	-			
-	nstructions:			
	p			
Additional re	marks.			

Item Information

Item #	Temp ⁰C
Sample	10.5

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

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Print Name Date/Time	1	1355 x	2/12/23	myant !	5	x Ulm Brd
verified Client's agreement	to each of the terms on the front and backside of this Agreement.	III DE LA	Date/Time	his Agreement.	Print Name	to each of the terms on the front and backside of this Agreement. Relinquished (Signature) Print Name
3 Day Same Day	Nitrate+Nitrite	Fluoride Nitra	Fromont Anolat	Agreement with	ed to enter into this	I represent that I am authoriz
Sb Se Sr Sn Ti Tl V Zn 🛛 🛛 Standard 🗌 Next Day	Mg Mn Mo Na Ni Pb		3	Sulfate Bromide	te Chloride	Nitrate
SW = Storm Water, WW = Waste Water Turn-around Time:	GW = Ground Water,	w = water, DW = D		A - 201	-8 Priority Pollutante 1): MTCA-5
				- <u>c</u>		Matrix: A = Air, AO = Aqueous B = Bulk
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				M 5201	12/12/23	2 MID-Lake Bottom
			-	M 9101	12/12/23	1 INIO-LANG I III
S Comments		6 10		-	_	Mid-Lake 1 m
			# of	Sample Time (Matrix)*	Sample Date	Sample Name
				com	po@tetratech.	Email(s): shannon.brattebo@tetratech.com
Disposal: Samples will be disposed in 30 days unless otherwise requested. Retain volume (specify above) Return to client	Report To (PM): Shannon Brattebo, Tetra Tech	Shannon Bratte	Report To (PM):			Telephone: 206-728-9655
Lakewood, WA 98499-5027	akewood, WA	Location: Waughop Lake, Lakewood, WA	Location: Wa	*****	98121	city, state, Zip: Seattle, WA 98121
253-983-7725			Collected by:		Ave. Suite 700	Address: 2003 Western Ave. Suite 700
Attn: Weston Ott		Project No: 100-RCE-T39045	Project No: 10			client: Tetra Tech, Inc.
Special Remarks:	шm	Vaughop Lake Alı	Project Name:		Group Company	An Alliance Technical Group Company
Laboratory Project No (internal): 23/229			Date:	Tel: 206-352-3790		
Laboratory Services Agreement	8	Chain of Custody Record	Cha	3600 Fremont Ave N. Seattle, WA 98103	ω	
Services oject No (internal): ks: ks:	y Record &	Chain of Custod	A P	600 Fremont Ave N. Seattle, WA 98103 Tel: 206-352-3790	3600 T	



3600 Fremont Ave. N. Seattle, WA 98103 T: (206) 352-3790 F: (206) 352-7178 info@fremontanalytical.com

Tetra Tech, Inc. Shannon Brattebo 2003 Western Ave Suite 700 Seattle, WA 98121

RE: Waughop Lake Alum Work Order Number: 2403233

March 18, 2024

Attention Shannon Brattebo:

Fremont Analytical, Inc. received 2 sample(s) on 3/13/2024 for the analyses presented in the following report.

Total Sulfide by SM 4500-S2-D

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Brianna Barnes Project Manager

DoD-ELAP Accreditation #79636 by PJLA, ISO/IEC 17025:2017 and QSM 5.4 for Environmental Testing ORELAP Certification: WA 100009 (NELAP Recognized) for Environmental Testing Washington State Department of Ecology Accredited for Environmental Testing, Lab ID C910

Original



CLIENT: Project: Work Order:	Tetra Tech, Inc. Waughop Lake Alum 2403233	Work Order Sample Summary					
Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received				
2403233-001	Mid-Lake 1 m	03/13/2024 10:00 AM	03/13/2024 1:43 PM				
2403233-002	Mid-Lake Bottom	03/13/2024 10:10 AM	03/13/2024 1:43 PM				

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned



Case Narrative

WO#: **2403233** Date: **3/18/2024**

CLIENT:Tetra Tech, Inc.Project:Waughop Lake Alum

I. SAMPLE RECEIPT:

Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:

Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms



 WO#:
 2403233

 Date Reported:
 3/18/2024

Qualifiers:

- * Associated LCS is outside of control limits
- B Analyte detected in the associated Method Blank
- D Dilution was required
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- I Analyte with an internal standard that does not meet established acceptance criteria
- J Analyte detected below Reporting Limit
- N Tentatively Identified Compound (TIC)
- Q Analyte with an initial or continuing calibration that does not meet established acceptance criteria
- S Spike recovery outside accepted recovery limits
- ND Not detected at the Method Detection Limit
- R High relative percent difference observed

Acronyms:

%Rec - Percent Recoverv CCB - Continued Calibration Blank CCV - Continued Calibration Verification **DF** - Dilution Factor **DUP - Sample Duplicate** HEM - Hexane Extractable Material ICV - Initial Calibration Verification LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate MCL - Maximum Contaminant Level MB or MBLANK - Method Blank MDL - Method Detection Limit MS/MSD - Matrix Spike / Matrix Spike Duplicate PDS - Post Digestion Spike Ref Val - Reference Value **REP - Sample Replicate RL** - Reporting Limit **RPD** - Relative Percent Difference **SD** - Serial Dilution SGT - Silica Gel Treatment SPK - Spike Surr - Surrogate



Analytical Report

 Work Order:
 2403233

 Date Reported:
 3/18/2024

Client: Tetra Tech, Inc.	Collection Date: 3/13/2024 10:00:00 AM							
Project: Waughop Lake Alum Lab ID: 2403233-001 Client Sample ID: Mid-Lake 1 m			N	latrix: V	Vater			
Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed	
Total Sulfide by SM 4500-S2-D				Batch	n ID: R902	250	Analyst: SLL	
Sulfide	0.0232	0.0500	0.0138	J	mg/L	1	03/15/24 11:41:09	
Client: Tetra Tech, Inc.			С	ollectio	n Date: 3,	/13/20	024 10:10:00 AM	
Client: Tetra Tech, Inc. Project: Waughop Lake Alum Lab ID: 2403233-002 Client Sample ID: Mid-Lake Bottom				ollectio		/13/20	024 10:10:00 AM	
Project:Waughop Lake AlumLab ID:2403233-002	Result	RL				/13/20 DF	024 10:10:00 AM Date Analyzed	
Project: Waughop Lake AlumLab ID: 2403233-002Client Sample ID: Mid-Lake Bottom	Result	RL	N	latrix: ∨ Qual	Vater	DF		



Work Order:	2403233									QCS	SUMMA	RY REF	PORT
CLIENT:	Tetra Tech,	Inc.									Sulfide b		
Project:	Waughop L	ake Alum								Total	Sunde b	y 5111 450	0-32-D
Sample ID: MB-R90	0250	SampType	e: MBLK			Units: mg/L		Prep Da	te: 3/15/20)24	RunNo: 90	250	
Client ID: MBLKV	v	Batch ID:	R90250					Analysis Da	te: 3/15/20)24	SeqNo: 18	82557	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			ND	0.0500									
Sample ID: LCS-RS	90250	SampType	e: LCS			Units: mg/L		Prep Da	te: 3/15/20)24	RunNo: 902	250	
Client ID: LCSW		Batch ID:	R90250					Analysis Da	te: 3/15/20)24	SeqNo: 18	82558	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.181	0.0500	0.2000	0	90.4	80	120				
Sample ID: 240315	1-004HDUP	SampType	e: DUP			Units: mg/L		Prep Da	te: 3/15/20)24	RunNo: 90	250	
Client ID: BATCH	l	Batch ID:	R90250					Analysis Da	te: 3/15/20)24	SeqNo: 18	82560	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide		(0.0151	0.0500						0	200	20	J
Sample ID: 240315	1-004HMS	SampType	e: MS			Units: mg/L		Prep Da	te: 3/15/20)24	RunNo: 90	250	
Client ID: BATCH	l	Batch ID:	R90250					Analysis Da	te: 3/15/20)24	SeqNo: 18	82561	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.206	0.0500	0.2000	0	103	80	120				
Sample ID: 240315	1-004HMSD	SampType	e: MSD			Units: mg/L		Prep Da	te: 3/15/20)24	RunNo: 902	250	
Client ID: BATCH	l	Batch ID:	R90250					Analysis Da	te: 3/15/20)24	SeqNo: 18	82562	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.213	0.0500	0.2000	0	107	80	120	0.2063	3.31	20	



Sample Log-In Check List

Client Name: TETRAS	Work Order Numb	per: 2403233	
Logged by: Morgan Wilson	Date Received:	3/13/2024	1:43:00 PM
Chain of Custody			
1. Is Chain of Custody complete?	Yes 🖌	No	Not Present
2 How was the sample delivered?	Client		
<u>Log In</u>			
 Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact) 	Yes	No 🗌	Not Present
4. Was an attempt made to cool the samples?	Yes	No 🔽	NA 🗌
U	<u>nknown prior to rec</u>	ceipt.	
5. Were all items received at a temperature of $>2^{\circ}C$ to $6^{\circ}C$ *	Yes	No 🗌	NA 🗹
6. Sample(s) in proper container(s)?	Yes 🗸	No 🗌	
	Yes 🔽		
7. Sufficient sample volume for indicated test(s)?8. Are samples properly preserved?	Yes 🗹		
9. Was preservative added to bottles?	Yes	No 🗹	NA 🗌
9. Was preservative added to bolites:			
10. Is there headspace in the VOA vials?	Yes	No 🗌	NA 🗹
11. Did all samples containers arrive in good condition(unbroken)?	Yes 🗹	No 🗌	
12. Does paperwork match bottle labels?	Yes 🗹	No 🗌	
13. Are matrices correctly identified on Chain of Custody?	Yes 🖌	No 🗌	
14. Is it clear what analyses were requested?	Yes 🖌	No 🗌	
15. Were all hold times (except field parameters, pH e.g.) able to be met?	Yes 🖌	No 🗌	
<u>Special Handling (if applicable)</u>			
16. Was client notified of all discrepancies with this order?	Yes	No 🗌	NA 🗹
Person Notified: Date	ə:		
By Whom: Via:	·	none 🗌 Fax	In Person
Regarding:		- <u> </u>	
Client Instructions:			
17. Additional remarks:			

Item Information

Item #	Temp ⁰C
Sample	11.9

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

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家自日のろう	3	3600 Fremont Ave N.	Chain of Custody Record & Lat	Laboratory Services Agreement
	-	Seattle, WA 98103 Tel: 206-352-3790	Date: 3/13/24 Page: 1 of: 1	Laboratory Project No (internal): 2403233
An Alliance Technical Group Company	and a state		Vaughop Lake Alurr	Bill to City of Lakewood
client: Tetra Tech, Inc.			Project No: 100-RCE-T39045	Attn: Weston Ott wott@cityoflakewood.us
Address: 2003 Western Ave. Suite 700	Suite 700		Collected by:	253-983-7725 6000 Main St. SW
city, state, zip: Seattle, WA 98121	21		Location: Waughop Lake, Lakewood, WA	Lakewood, WA 98499-5027
Telephone: 206-728-9655			Report To (PM): Shannon Brattebo, Tetra Tech	Disposal: Samples will be disposed in 30 days unless otherwise requested. Retain volume (specify above) Return to client
Email(s): shannon.brattebo@tetratech.com	etratech.cor	п		
			Constants Constants	
Sample Name	Sample Sample Date Time	ample Type Time (Matrix)*	# of	Comments
1 Mid-Lake 1 m	3/13/24 1000			X
2 Mid-Lake Bottom	3/13/24 1010	10 W		X
3				
4 11 1 1		/		
1/1/10				
6				
7 // 1	X			
8	1			
9				
10 2/13/2A 3	A			
*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product,	= Other, P = Product	S = Soil,	SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water,	WW = Waste Water Turn-around
**Metals (Circle): MTCA-5 RCRA-8 P	Priority Pollutants	TAL Individual:	Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni	Pb Sb Se Sr Sn Ti Ti V Zn
***Anions (Circle): Nitrate Nitrite	Chloride Sul	Sulfate Bromide	de O-Phosphate Fluoride Nitrate+Nitrite	🗆 3 Day 🗌 Same Day
I represent that I am authorized to enter into this Agreement wit to each of the terms on the front and backside of this Agreement	enter into this Ag d backside of this	greement with Agreement.	I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.	ave verified Client's agreement
× Ullin Ann	Adm Bry	Am	1342 Received (Signature) x 2 2 BU	Ballard
Relinquished (Signatore) x	Print Name		Date/Time Keceived (Signature)	



3600 Fremont Ave N Seattle, WA 98103 T: (206) 352-3790 F: (206) 352-7178 info@fremontanalytical.com

Tetra Tech, Inc. Shannon Brattebo 2003 Western Ave Suite 700 Seattle, WA 98121

RE: Waughlop Lake Alum, 100-RCE-T39045 Work Order Number: 2406500

July 02, 2024

Attention Shannon Brattebo:

Fremont Analytical, Inc, an Alliance Technical Group company, received 2 sample(s) on 6/27/2024 for the analyses presented in the following report.

Total Sulfide by SM 4500-S2-D

All analyses were performed according to our accredited Quality Assurance program. Please contact the laboratory if you should have any questions about the results.

Please note, while the appearance of our logo and branding will update, our commitment to accuracy, speed, and customer service remain values celebrated and shared by Alliance Technical Group. Thank you for the opportunity to serve you.

Sincerely,

Brianna Barnes Project Manager

DoD-ELAP Accreditation #79636 by PJLA, ISO/IEC 17025:2017 and QSM 5.4 for Environmental Testing ORELAP Certification: WA 100009 (NELAP Recognized) for Environmental Testing Washington State Department of Ecology Accredited for Environmental Testing, Lab ID C910



Original

www.fremontanalytical.com

Date: 07/02/2024



CLIENT: Project: Work Order:	Tetra Tech, Inc. Waughlop Lake Alum 2406500	Work Order S	Sample Summary
Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2406500-001 2406500-002	Mid-Lake 1 m Mid-Lake Bottom	06/27/2024 10:45 AM 06/27/2024 11:00 AM	06/27/2024 2:25 PM 06/27/2024 2:25 PM



Case Narrative

WO#: **2406500** Date: **7/2/2024**

CLIENT:Tetra Tech, Inc.Project:Waughlop Lake Alum

I. SAMPLE RECEIPT:

Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:

Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms



WO#: **2406500** Date Reported: **7/2/2024**

Qualifiers:

- * Associated LCS is outside of control limits
- B Analyte detected in the associated Method Blank
- D Dilution was required
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- I Analyte with an internal standard that does not meet established acceptance criteria
- J Analyte detected below Reporting Limit
- N Tentatively Identified Compound (TIC)
- Q Analyte with an initial or continuing calibration that does not meet established acceptance criteria
- S Spike recovery outside accepted recovery limits
- ND Not detected at the Method Detection Limit
- R High relative percent difference observed

Acronyms:

%Rec - Percent Recoverv **CCB** - Continued Calibration Blank **CCV** - Continued Calibration Verification **DF** - Dilution Factor **DUP - Sample Duplicate** HEM - Hexane Extractable Material ICV - Initial Calibration Verification LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate MCL - Maximum Contaminant Level MB or MBLANK - Method Blank MDL - Method Detection Limit MS/MSD - Matrix Spike / Matrix Spike Duplicate PDS - Post Digestion Spike Ref Val - Reference Value **REP - Sample Replicate RL** - Reporting Limit **RPD** - Relative Percent Difference **SD** - Serial Dilution SGT - Silica Gel Treatment SPK - Spike

Surr - Surrogate



Analytical Report

 Work Order:
 2406500

 Date Reported:
 7/2/2024

Client: Tetra Tech, Inc.	Collection Date: 6/27/2024 10:45:00 AM									
Project: Waughlop Lake Alum Lab ID: 2406500-001 Client Sample ID: Mid-Lake 1 m			N	latrix: ∨	Vater					
Analyses	Result	RL	MDL	Qual	Units	DF	Date Analyzed			
Total Sulfide by SM 4500-S2-D				Batch	1D: R927	755	Analyst: JH			
Sulfide	0.0508	0.0500	0.0138		mg/L	1	07/01/24 10:10:59			
Client: Tetra Tech, Inc.			с	ollectio	n Date: 6	/27/20	024 11:00:00 AM			
Project: Waughlop Lake Alum Lab ID: 2406500-002				ollection		/27/20	024 11:00:00 AM			
Project: Waughlop Lake Alum	Result	RL				/27/2(DF	024 11:00:00 AM Date Analyzed			
Project: Waughlop Lake Alum Lab ID: 2406500-002 Client Sample ID: Mid-Lake Bottom		RL	N	latrix: ∀ Qual	Vater	DF				



CLIENT:	2406500 Tetra Tech, Waughlop La										SUMMA Sulfide by		
Sample ID: MB-R92	• •	SampType	e: MBLK			Units: mg/L		Prep Da	te: 7/1/202	4	RunNo: 92 7	755	
Client ID: MBLKW		Batch ID:				g		Analysis Da			SeqNo: 193		
Analyte			Result	RL	SPK value	SPK Ref Val	%REC			RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			ND	0.0500									
Sample ID: LCS-R9	2755	SampType	e: LCS			Units: mg/L		Prep Da	te: 7/1/202	4	RunNo: 927	755	
Client ID: LCSW		Batch ID:	R92755					Analysis Da	te: 7/1/202	4	SeqNo: 193	35778	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.185	0.0500	0.2000	0	92.4	80	120				
Sample ID: 2406500	0-001AMS	SampType	e: MS			Units: mg/L		Prep Da	te: 7/1/202	4	RunNo: 927	755	
Client ID: Mid-Lak	æ 1 m	Batch ID:	R92755					Analysis Da	te: 7/1/202	4	SeqNo: 193	35780	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.256	0.0500	0.2000	0.05076	102	80	120				
Sample ID: 2406500	0-001AMSD	SampType	e: MSD			Units: mg/L		Prep Da	te: 7/1/202	4	RunNo: 927	755	
Client ID: Mid-Lak	æ 1 m	Batch ID:	R92755					Analysis Da	te: 7/1/202	4	SeqNo: 193	35781	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.282	0.0500	0.2000	0.05076	116	80	120	0.2557	9.71	20	
Sample ID: 2406500	-001ADUP	SampType	e: DUP			Units: mg/L		Prep Da	te: 7/1/202	4	RunNo: 927	755	
Client ID: Mid-Lak	æ 1 m	Batch ID:	R92755					Analysis Da	te: 7/1/202	4	SeqNo: 193	35782	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide		(0.0595	0.0500						0.05076	15.8	20	



Sample Log-In Check List

Client Name: TETRAS	Work Order Numb	per: 2406500	
Logged by: Morgan Wilson	Date Received:	6/27/2024	2:25:00 PM
Chain of Custody			
1. Is Chain of Custody complete?	Yes 🖌	No 🗌	Not Present
2. How was the sample delivered?	<u>Client</u>		
Log In			
 Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact) 	Yes	No 🗌	Not Present
4. Was an attempt made to cool the samples?	Yes	No 🗹	
L	<u>Jnknown prior to rec</u>	ceipt.	
5. Were all items received at a temperature of $>2^{\circ}C$ to $6^{\circ}C$ *	Yes	No 🗌	NA 🗹
6. Sample(s) in proper container(s)?	Yes 🗸	No 🗌	
 7 Sufficient sample volume for indicated test(s)? 	Yes 🔽		
8. Are samples properly preserved?	Yes 🗹		
9. Was preservative added to bottles?	Yes	No 🔽	NA 🗌
10. Is there headspace in the VOA vials?	Yes	No 🗌	NA 🗹
11. Did all samples containers arrive in good condition(unbroken)?	Yes 🗹	No 🗌	
12. Does paperwork match bottle labels?	Yes 🖌	No	
13. Are matrices correctly identified on Chain of Custody?	Yes 🗸	No 🗌	
14. Is it clear what analyses were requested?	Yes 🖌	No 🗌	
15. Were all hold times (except field parameters, pH e.g.) able to be met?	Yes 🖌	No 🗌	
Special Handling (if applicable)			
16. Was client notified of all discrepancies with this order?	Yes	No 🗌	NA 🔽
	to:		
	te:		
By Whom: Via	a: eMail Pr	ione 🔄 Fax	In Person
Regarding: Client Instructions:			
17. Additional remarks:			

Item Information

Item #	Temp ⁰C
Sample	17.4

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

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	3	3600 Fremont Ave N.		Chain of Custody Record	Custody	Record	& Labor	Laboratory Services Agreement	es Agreem	ent
		Seattle, WA 98103 Tel: 206-352-3790	Date:		Pa	Page: 1		Laboratory Project No (internal):	1: 240650C	A
An Alliance Technicol Group Company	Company		Project N	Project Name: Waughop Lake Alum	Lake Alum			Special Remarks: Bill to City of Lakewood		
dient: Tetra Tech, Inc.			Project N	Project No: 100-RCE-T39045	39045			Attn: Weston Ott	7	
Address: 2003 Western Ave. Suite 700	Suite 700		Collected by:	d by:				253-983-7725	74.43	
city, state, zip: Seattle, WA 98121	21		Location	_{Location:} Waughop Lake, Lakewood, WA	ake, Lakev	vood, WA		Lakewood, WA 98499-5027	99-5027	
Telephone: 206-728-9655			Report T	Report To (PM): Shannon Brattebo, Tetra Tech	n Brattebo	, Tetra Tec		Disposal: Samples will be disposed in 30 days unless otherwise requested Retain volume (specify above) Return to client	ed in 30 days unless otherwise re-	vise requested.
Email(s): shannon.brattebo@tetratech.com	tetratech.	com								
		Sample		10000000000000000000000000000000000000						
Mid-1 ako 1 m	N /2 / 4		7	$-k^{2}$	-K				Comments	
, Mid-Lake Bottom	N/2 21/24		1-1				\times			
ω										
4										
S										
6		-								
7										
00										
9										
10										
*Matrix: A = Air, AQ = Aqueous, B = Bulk, O) = Other, P = Prc	O = Other, P = Product, S = Soil, SD = Sediment,		SL = Solid, W = Water, DW = Drinking Water,	DW = Drinking W		GW = Ground Water, SW = Storm Water,	n Water, WW = Waste Water	Turn-around Time:	nd Time:
**Metals (Circle): MTCA-5 RCRA-8	Priority Pollutants	TAL	Individual: Ag Al	Al As B Ba Be Ca Cd Co	Co Cr Cu Fe Hg K	g K Mg Mn Mo Na	Na Ni Pb Sb Se	sr Sn Ti Tl V Zn	X Standard	Next Day
***Anions (Circle): Nitrate Nitrite	Chloride	Sulfate Bro	Bromide O-I	O-Phosphate Fluoride	de Nitrate+Nitrite	trite				
I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.	enter into thi d backside of	s Agreement w this Agreemer	ith Fremon ıt.	t Analytical on bel	half of the Clie	it named above	, that I have ver	ified Client's agreement	2 Day	(specify)
× aller Kignature)	Print Nagre	Bryan	Date/Time	2474	Received (Signature)	(Lure)	Un then	- Maller	Date/Time	425
Relinquished (Signature) X	Print Name	1	Date/Time		Received (Signature) ×	ture)	Print Name		Date/Time	
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APPENDIX D: PCD ANNUAL DATA REPORTS & 2024 LABORATORY DATA REPORTS



City of Lakewood Volunteer Lake Monitoring Program 2021 Season Report

Introduction

The City of Lakewood initiated a volunteer lake monitoring program in 2000 with the goals of promoting lake stewardship through citizen participation in the monitoring program, and to provide water quality data to assist in tracking and better understanding of conditions of American, Gravelly, Louise, Carp, Steilacoom (added in 2004), and Waughop (added in 2011) lakes and make appropriate management decisions. Carp Lake and Steilacoom Lake no longer participate in the volunteer lake program.

While conditions may vary from year to year, long-term data collection is the key to tracking trends in water quality over time. This report summarizes the data collected during the 2021 lake monitoring season on American, Gravelly, Louise and Waughop lakes.

Lake Descriptions

The monitored lakes vary in size and depth – American Lake is the largest at 1,100 acres and 90 feet at maximum depth, Gravelly Lake is 160 acres and 55 feet maximum depth, Lake Louise is 39 acres and 35 feet at maximum depth, and Waughop Lake at 33 acres and 14 feet at maximum depth. These lakes are in the Chambers-Clover Watershed within the city limits of Lakewood.

Eleven volunteers participated in the 2021 monitoring program and contributed a total of 111 hours of volunteer time.

Sampling Program

Water chemistry and physical characteristics of lakes vary both seasonally and with depth. Lake volunteers record observations and collect physical data (secchi depth, lake stage, weather conditions); record temperature and dissolved oxygen profile measurements; and measure pH on a monthly basis beginning in May and ending in late October with an additional late fall/early winter session conducted on American and Gravelly Lakes. This year the final October session on Louise and the additional late fall/early winter session on Gravelly were not completed due to rough weather conditions.

Samples for pH measurement were collected from one meter (shallow sample) below the surface of the lakes at each monitoring session. Three times during the monitoring season (May, August, October) an additional sample for pH measurement was collected at one meter above the lake bottom (deep sample) from American, Gravelly, and Louise lakes; Waughop is a shallow, well-mixed lake and no additional deep sample was collected. Monitoring data for 2021 can be found in Table 1 at the end of the report.

In Spring 2021, American Lake volunteers received training and a loan of equipment from Washington Fish and Wildlife Department to conduct additional monitoring for invasive mussel presence in American Lake. They deployed an artificial substrate at American Lake Park boat launch. Each month they completed a plankton tow to collect a sample and photographed the substrate to submit to WDFW for determination of presence or absence of invasive mussels.

Additional monitoring was conducted on Waughop to track post alum treatment conditions. This added sampling included monthly sample collection for lab analysis for total phosphorus, soluble reactive phosphorus, total nitrogen, chlorophyll *a*, and phaeophytin *a*. Three times during the season (May, Aug, Oct) additional samples were collected for analysis for sulfate, alkalinity, and total aluminum. Observations of algal scum and aquatic plant coverage were also recorded at 6 locations around the lake. The results of this additional monitoring can be found in Table 2 at the end of the report.

Dissolved Oxygen and Water Temperature Profiles

Dissolved oxygen and temperature are important attributes of a lake ecosystem and both are critically important to determining the types of aquatic life found in lakes. The amount of oxygen dissolved in water is affected by the water temperature – all other factors being equal, cold water holds more oxygen than warm water. The amount of dissolved oxygen present in water will determine where in the lake plants and animals can live.

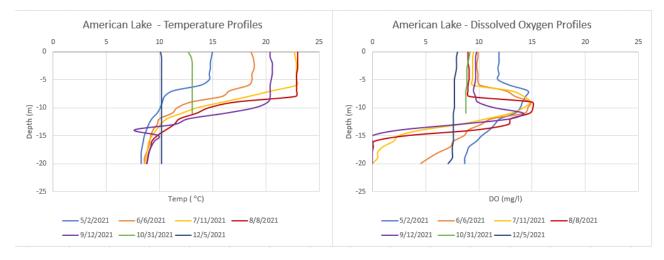
With the onset of warmer weather in spring and early summer, deep lakes will begin to separate into a warmer, low-density layer at the surface, known as the epilimnion, and a cooler, high-density layer at the bottom, known as the hypolimnion. Between the epilimnion and the hypolimnion is a layer of rapidly changing temperature called the thermocline. This process is called thermal stratification. Once this condition is fully developed in deeper lakes, usually in summer, there is no vertical mixing of the upper and lower layers because of their density differences. Shallower lakes may also separate into these layers although the layers may not remain separate throughout the entire summer. These shallower lakes will mix on windy or stormy days.

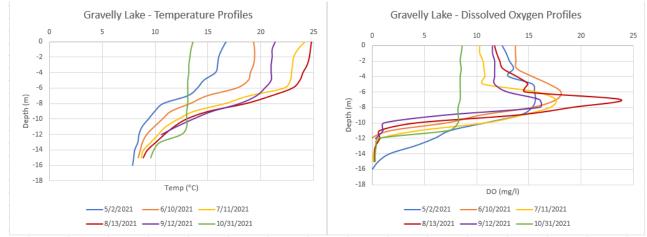
With the arrival of cooler weather in the fall, the thermal stratification begins to break down and the shallow and deep layers of water begin to mix vertically once again. This phenomenon is usually called turnover.

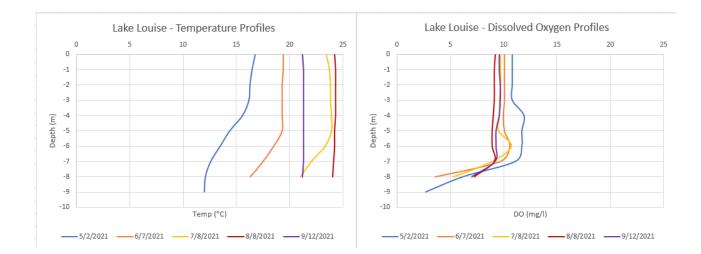
The 2021 temperature profiles for American and Gravelly Lakes indicate that stratification was well underway in May and remained strongly stratified until turnover in the fall. Lake Louise shows very little thermal stratification in May, June and July, and no stratification August and September. Waughop Lake did not show any stratification in 2021.

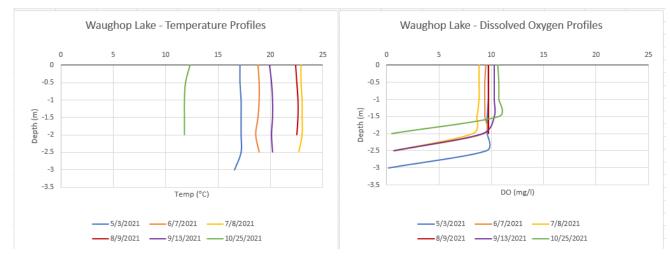
Like temperature profiles, dissolved oxygen levels vary with depth and over time. The upper layer of water (epilimnion) has abundant oxygen as a result of the diffusion of oxygen from the atmosphere and the presence of algae that produce oxygen as a byproduct of photosynthesis. Meanwhile, as spring and summer progresses oxygen levels decline in the lower layer (hypolimnion). This is the result of decomposition of organic matter that settles into that layer, no diffusion of oxygen from the atmosphere, and not enough sunlight to support oxygen-producing plant life. These low oxygen conditions will remain until the lake mixes again at the time of fall turnover. These conditions occur even though the general rule is cold water can hold more dissolved oxygen than warm water.

The 2021 dissolved oxygen profiles for American and Gravelly Lakes are similar to their temperature profiles showing stratification in May and remaining stratified until after the fall turn-over. Both lakes also showed a mid-depth increase in oxygen due to the presence of algae undergoing photosynthesis at that depth. Dissolved oxygen profiles for Louise displayed a decline in oxygen near the lake bottom May through September. The dissolved oxygen profiles for Waughop while like its temperature profiles, did show a decrease in oxygen levels every month except in August. Individual lake temperature and dissolved oxygen profiles are displayed below in Figure 1.









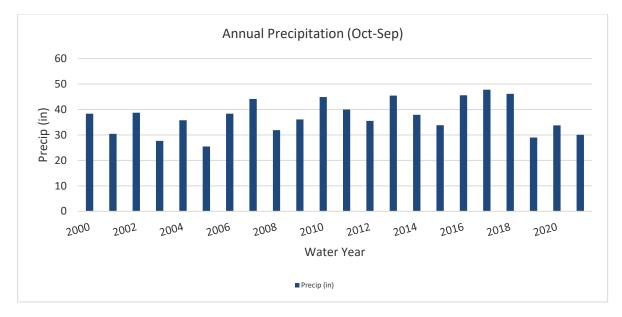


Lake Stage

Lake stage, water surface level in the lake, varies seasonally and year to year. While precipitation and evaporation are the main causes of fluctuating lake levels, water levels are also affected by watershed area, land uses in the watershed, vegetation types and cover, presence of wetlands, geology, surface and subterranean hydrology, and type of outflow structure (if present). The source, amount, and composition of the water flowing into a lake also impact the water quality of that lake.

Lake monitors recorded lake stage from staff gauges (calibrated in feet) located on American, Gravelly, Louise, and Waughop each sampling session. The staff gauges on American, Gravelly, and Louise have been surveyed so that elevation above sea level is known. While there is a gauge on Waughop, its actual elevation with respect to sea level is unknown; therefore, the data presented for that lake reflects relative changes only.

The lakes showed a typical lake stage fluctuation pattern of declining through the summer to a seasonal low in fall. Precipitation data is collected for the Lakewood area at Joint Base Lewis-McChord, and total recorded precipitation for water year (Oct-Sept) 2021 was 30.06 inches. Annual precipitation since 2000 is displayed in Figure 2 below for comparison. Lake stage data was collected May through October for Waughop, American, and Gravelly lakes with an additional reading in December for American Lake. Lake stage data for Lake Louise were collected May through September for Louise. Recorded lake stage this year fluctuated 2.6 feet in American Lake, 3.48 feet in Gravelly Lake, 1.50 feet in Louise Lake, and 2.24 feet in Waughop. The individual lake level graphs can be found in Appendix 1 at the end of the report.



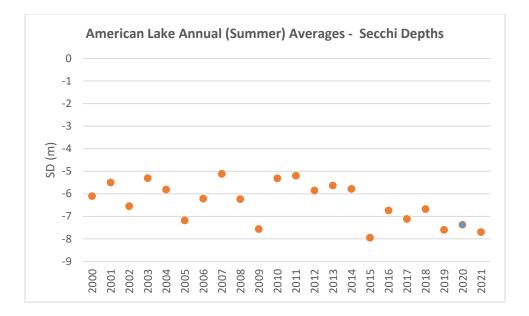


Water Transparency

Water transparency is measured with an eight-inch diameter, black and white secchi disk and is traditionally reported as secchi depth, in meters (1 meter = 3.3 feet). Transparency is influenced by several factors such as dissolved substances, algae, and sediment particles. Transparency readings can also be affected by waves, wind, and glare at the water surface. Deeper secchi depth readings indicate clearer water (more transparent) while shallower secchi depth readings indicate more turbid water. Clear water allows more light to penetrate deeper into the lake, allowing photosynthesis in aquatic plants and algae to occur; this leads to higher levels of dissolved oxygen during the day. A decrease in transparency is often seen with an increase in algal density, or an influx of sediment and detritus due to a major storm event in the watershed. Secchi depth is used primarily as an approximate indicator of algal abundance.

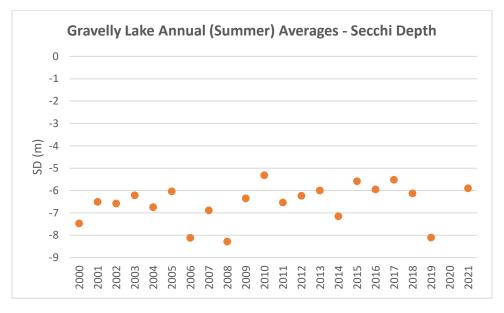
Secchi depth measurements in 2021 for American Lake ranged from 6.25 meters to 8.9 meters with greater transparency occurring mid-summer. The summer averages for secchi depths in American Lake over all the years of data collection are shown below in Figure 3.

Note: The 2020 secchi depth average was calculated with only 4 monthly readings for American, Louise, and Waughop lakes while in previous years 7-8 monthly readings were used to calculate the averages. Lake monitoring was not conducted in Gravelly Lake in 2020 due to COVID restrictions.



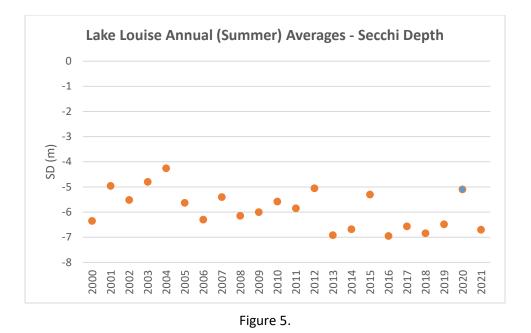


Secchi depth measurements in Gravelly Lake varied from 3.0 meters to 8.0 meters with greater transparency occurring in the fall. Summer averages for secchi depths in Gravelly Lake are displayed below in Figure 4.

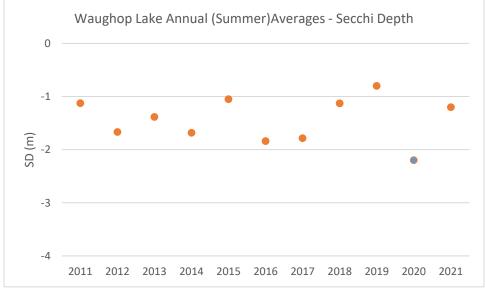




Secchi depth measurements in Lake Louise ranged from 4.5 meters to 9.5 meters with greater transparency occurring earlier in the season. Summer averages for secchi depths in Lake Louise are displayed below in Figure 5.



Waughop Lake, the shallowest lake, had secchi depths that varied from 0.9 meters to 1.5 meters. Transparency was greatest in June, and lowest in October. Summer averages for secchi depth in Waughop Lake are found below in Figure. 6.



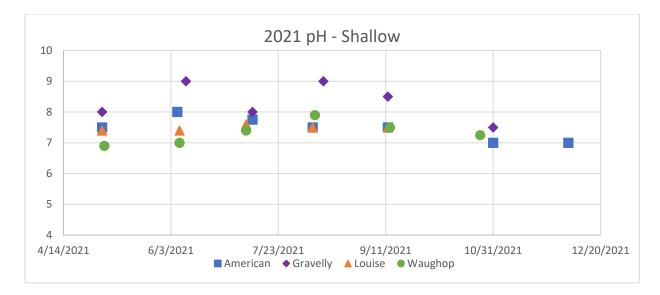


Graphs of secchi depths for all years in the lakes are displayed in Appendix 1 at the end of the report.

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pH is a measure of the hydrogen ion concentrations in water and indicates whether water is acidic, basic, or neutral. The pH scale goes from 0 to 14 with 7 being neutral. pH above 7 is considered basic and pH below 7 is considered neutral. The pH scale is logarithmic, meaning that a change of one whole number on the scale is a tenfold change in acidity. pH determines the solubility and biological availability of chemical constituents such as nutrients and heavy metals in the water.

Volunteers measured pH levels at one-meter below the surface each month and at depth (one-meter above the bottom) in May, August, and October. An additional pH measurement (shallow and deep) was collected in American and Gravelly Lakes after the fall turnover. Results of the shallow pH measurement for the lakes varied from near neutral to basic (in Gravelly lake) (pH range = 6.6 to 9.0), see Figure 6 below. The pH levels for Waughop were not as high (basic) as seen in previous years. The deeper pH results ranged from near neutral to more acidic (pH range = 7.5 to 6.2). At the time of the fall turnover in American Lake there was no difference between shallow and deep pH results. pH results for the lakes are in Table 1.





Graphs of pH results for all the years of collection can be found in Appendix 1.

Algae

For the last several years the Tacoma Pierce County Health Department has not routinely monitored algae in Lakewood. However, they do encourage lake homeowners to report suspected toxic algae blooms to Washington State Department of Ecology. While there were no reported algal toxin levels exceeding state guidelines for these lakes in 2021, cyanobacteria bloom presence was noted in American and Waughop Lakes in fall.

Summary

Lake monitor volunteers collected data monthly May through October for Waughop, American, and Gravelly lakes; with one final monitoring session in December for American Lake. Data was collected monthly for Lake Louise May through September. The data are summarized as follows:

• Temperature and dissolved oxygen stratification were already established in American and Gravelly lakes in May at the time of the first monitoring session. Lake Louise showed very little

thermal stratification in May, June, and July and none in August and September. Waughop did not thermally stratify; however, the dissolved oxygen profiles showed low oxygen levels at depth during all months except August.

- Precipitation in 2021 was lower than 2020; and lake levels were similar to 2019 and 2020 levels.
- Secchi depths were generally shallower (cloudier water) as the season progressed into fall, except for Gravelly Lake which had its deepest secchi depths occurring in October.
- Shallow pH in the lakes ranged from 6.9 to 9.0 pH units. Deep pH results for American, Gravelly, and Louise lakes ranged from 6.0 to 7.4 pH units. pH in Waughop was similar to 2020 pH results.

Lake conditions vary from year to year with the change in seasons, weather patterns, and climate conditions. Long-term lake monitoring helps us to understand how our lakes are doing and if they are degrading over time. Additional graphs displaying the data collected for the lakes for all monitored years are in Appendix 1.

Recommendations

Lakes reflect their watershed. They receive water, dissolved substances carried in water, and sediment from its watershed. Lakes also receive particulates and gases from the atmosphere, and energy from the sun and wind. The condition of a lake at any one time is determined by what is already in the lake, and by what is coming into the lake – attesting to the fact that lakes are complex ecosystems.

Lake management is a complicated job that takes the combined efforts of local government, community groups, individuals, and landowners. To be effective lake management is a long-term commitment and investment.

Many lakes suffer from too many nutrients (phosphorus and nitrogen), entering a lake with stormwater, soil erosion, or groundwater from the surrounding watershed. When it rains nutrients wash into ditches and down storm drains eventually ending up in the lake. This can lead to problems such as excessive aquatic plant growth, nuisance and/or toxic algae blooms, lower water clarity, stressed fish and wildlife, and lower property values.

Here are some voluntary actions that can be taken to protect the health of the lake:

- Avoid fertilizer. If you do fertilize choose phosphorus-free products.
- Scoop pet waste, bag it and toss it in the trash.
- Divert runoff from roofs and driveways into stable vegetated areas.
- If you have a septic system, schedule routine inspections.
- Cover bare soil area with mulch or plants.
- Fix eroding areas in the yard, driveway, and parking areas.
- Maintain existing natural shorelines these areas provide additional wildlife benefits for birds, turtles, frogs and other aquatic life.

• If you are a boater or angler prevent the spread of aquatic invasive species in your lake using the Clean/Drain/Dry method recommended by Washington State Department of Fish & Wildlife. Check here for more information: <u>https://wdfw.wa.gov/ais/youcanhelp.html</u>.

Table 1. Lakewood Lake Data 2021

Lake	Date	Time	Site Depth (m)	Secchi Depth (m)	Air Temp (C)	Water Temp (°C) Top	Dissolved Oxygen (mg/l) Top	Water Temp (°C) Bottom	Dissolved Oxygen (mg/l) Bottom	Lake Level (ft.)	Suspended Algae	рН (1 m)	pH (deep)	Comments/Obse
	5/2/2021	10:45 AM	26.5	-7.25	20.6	15	11.9	8.3	8.7	232	light, small cellular in the water column	7.5	7	Wind cond: light, light cond: strong fishing, 1 swimm
	6/6/2021	10:30am	25.8	-6.25	12.6	18.6	9.9	8.6	4.5	231.6	none	8		Wind cond: light cond: overcast. N
	7/11/2021	10:00 AM	24	-8.2	24.6	22.7	9.5	8.6	0	231	Light, very clear	7.75		Wind cond: light light cond: overc swimmers/wade
	8/8/2021	10:00 AM	22	-8.9	27.6	23	9	8.8	0	230.2	Light, water column	7.5	6.5	Wind cond: Light cond: ripples; lig swimmer/wader
American	9/12/2021	10:30 AM	26	-8.5	18.6	20.4	9.8	8.8	0	229.4	Light, tiny scattered balls in water column	7.5		Wind cond: calm light cond: overc lake use not note level was below
	10/31/2021	11:00am	27	-7.7	11.6	12.7	9.2	13.1*	8.8*	230	light, clumpy, in water column	7	6	Wind cond: calm cond: strong sun season. 70+ gulls swimmers/wade
	12/5/2021	10:15am	26.5	-7	3.9	10.1	8	10.2	7.1	230.3	chunky HAB blobs over surface, heavy in water column & surface	7	7	Wind cond: light, light cond: bright coots, eagle. 3 bo broken column, a cyanobacteria.

servations

ht; weather: partly cloudy; water surface: ripples; ong sunlight. No water odor. 7 boats, 10 people nmer/wader.

ht, SSW; weather: rain; water surface: ripples; Light t. No water odor. 2 swimmers. Eagles, swallows

ht; weather: overcast; water surface cond: ripples; ercast. No water odor. 10boats, 14 people fishing, 2 ders. Osprey.

ght, SSW; weather: partly cloudy; water surface light cond: hazy sunlight. No water odor; 2 boats, 1 ler.

Im; weaterh: overcast; water surface cond: ripples; ercast. Water odor not noted; geese; recreational oted. Air temp correction factor is 0.6 not 6. Lake w bottom of gauge (230') and was estimated.

m; weather: clear; water surface cond: calm; light unlight. Rotten egg odor noticed for first time this Ils, eagles, mud hens. 5 boats, 4 fishing, 0 ders. *Meter battery died at 11 meters.

ht, N; weather: overcast; water surface cond: calm;
ght cloud conditions. No water odor. Waterfowl:
boats; 3 people fishing. Air thermometer had a
n, air temperature from cell phone. Lots of floating

Lake	Date	Time	Site Depth (m)	Secchi Depth (m)	Air Temp (C)	Water Temp (°C) Top	Dissolved Oxygen (mg/l) Top	Water Temp (°C) Bottom	Dissolved Oxygen (mg/l) Bottom	Lake Level (ft.)	Suspended Algae	pH (1 m)	pH (deep)	Comments/Observa
	5/2/2021	4:26PM	16.6	-6.1	18.0	16.7	12.4	7.9	0.2	5.48	None	8		Wind cond: light, WI ripples; light cond: s paddle board). No w
	6/10/2021	2:34pm	16.0	-3.0	19.0	19.3	13.7	8.4	-2.4	4.80	None	9		Wind cond: light/stro water surface cond: overcast. No water o
elly	7/11/2021	3:28PM	16.2	-7.8	25.0	24.2	10.3	8.7	0.1	4.22	Light, small dots in water column	8		Wind cond: calm; we cond:strong sunlight swimmer/wader
Gravelly	8/13/2021	10:15 AM	16.0	-5.0	29.0	24.8	11.7	8.9	0.2	3.40	light, spots	9		Wind cond: calm; we cond: calm; light cor boats, 0 fishing, 0 sy
	9/12/2021	3:55 PM	14.3	-5.6	21.0	21.4	11.5	10.6	0.3	2.25	Light, small spots in water column	8.5		Wind cond: light; we ripples; light cond: s geese. No boats, fis
	10/31/2021	3:30pm	15.8	-8.0	18.0	13.6	8.6	9.6	0.3	2.00	none	7.5	6.5	Wind cond: breezy; light cond: strong su fishing, 0 swimming.

vations

WNW; weather: clear; water surface cond: : strong sunlight. 3 ducks; 3 boats (2 kayaks, 1 o water odor

strong, SW; weather: partly cloudy, rain, storm; nd: ripples, small waves: light: strong sunlight, er odor. 1 boat. 3 geese.

weather: clear; water surface cond: calm; Light ght. No water odor. Eagle. 4 boats, 0 fishing, 1

weather: clear, haze (smoke); water surface cond: hazy sunlight. No water odor. 0 waterfowl; 0 swimmers/waders. Clover Creek is dry.

weather: partly cloudy; water surface cond: d: strong sunlight. No water odor. Waterfowl - 1, fishing or waders/swimmers.

y; weather: clear; water surface cond: ripples; sunlight. No water odor; 8 ducks; 3 boats, 0 ng/wading.

Lake	Date	Time	Site Depth (m)	Secchi Depth (m)	Air Temp (C)	Water Temp (°C) Top	Dissolved Oxygen (mg/l) Top	Water Temp (°C) Bottom	Dissolved Oxygen (mg/l) Bottom	Lake Level (ft.)	Suspended Algae	pH (1 m)	pH (deep)	Comments/Observa
	5/2/2021	1:00PM	9.5	-9.5	23.1	16.8	10.8	12	2.7	-0.92	None	7.4	6.5	Wind cond: light, N cond: ripples; light Waterfowl - mallar Monitor noted that secchi disk was on t
	6/7/2021	11:15 AM	9.4	-6.7	16.6	19.4	10.1	16.3	3.6	-1.12	Light, small specks	7.4		Wind cond: light, S; ripples; light cond: boats, fishing, swim
Louise	7/8/2021	11:20am	9.2	-7.8	18.6	23.4	9.7	21	5.3	-1.38	None	7.6		Wind cond: light, N ripples; light cond: eagle. 2 boats, 2 pe
	8/8/2021	1:30 PM	9.1	-5.2	23.6	24.2	9.2	24	7.2	-1.92	Moderate, big flakes in the water column	7.5	7.4	Wind cond: breezy, cond: ripples; light odor. No boats, fish
	9/12/2021	12:55Pm	8.7	-4.5	19.4	21.2	9.6	21.2	7	-2.42	Light, very light algae in spite of low SD	7.5		Wind cond: light, N cond: ripples; Light odor. 0 waterfowl;

rvations

, NW; weather: partly cloudy; water surface ht cond: strong sunlight. No water odor. lard with clutch of 7; 3 boats, 5 people fishing. hat he had never seen the water so clear on the bottom.

, S; weather: partly cloudy; water surface: d: bright cloud conditions. No water odor. No vimming/wading.

, NW; weather: overcast; water surface cond: d: overcast. No water odor. 4 geese, bald people fishing, 1 swimmer/wader.

ezy, SE; weather: partly cloudy; water surf ht cond: bright cloud conditions. No water fishing, or waders/swimmers.

, NE; weather: partly cloudy; water surface ght cond: bright cloud conditions. No water wl; No boats, fishing, or waders/swimmers. .

Lake	Date	Time	Site Depth (m)	Secchi Depth (m)	Air Temp (C)	Water Temp (°C) Top	Dissolved Oxygen (mg/l) Top	Water Temp (°C) Bottom	Dissolved Oxygen (mg/l) Bottom	Lake Level (ft.)	Suspended Algae	рН (1 m)	pH (surface)	Comments/Observa
	5/3/2021	9:15am	3.2	-1.1	13.5	17.1	9.7	16.6	2.7	5.8	small dots, moderate, brown in color	6.9	7	Wind cond: light, S ripples; light condit families of geese w swimming/wading.
	6/7/2021	9:08am	2.9	-1.5	16.1	18.8	9.5	18.9	0.8	5.32	heavy, cloud-like	7	7	Wind conditons - lig surface - ripples; lig odor; waterfowl - 2 0 boats; 8 people fi
	7/8/2021	8:56 AM	3	-1.1	17.6	22.9	8.8	22.7	0.7	4.76	substantial cloudiness	7.4	7.5	Wind cond: calm; w ripples; light condit egg odor. ~40 gees swimmers/waders.
Waughop	8/9/2021	9:06 AM	2.5	-1.3	21.6	22.4	9.7	22.5	9.7	4.08	heavy, cloudy, murky	7.9	8	Wind cond: calm; w calm; light cond: br Waterfowl - 5, gees swimmers/waders.
	9/13/2021	9:07am	2.3	-1.3	16.2	19.9	10.3	20.2	0.7	3.56	little dots plus pea- sized globules (new)	7.5		Wind cond: calm; w light cond: overcast kingfisher, heron, 4 swimmers/waders. north and east side I noticed it when ch looked a lot thicker west side by the co
	10/25/2021	10:10 AM	2.4	-0.9	13.1	12.3	10.6	11.8	0.5	3.57	Heavy amount of small dots	7.25	7.25	Wind cond: breezy, ripples; light cond: 0 boats, 0 fishing; 0

rvations

, SW; Weather: overcast; water surface cond: ditions: overcast. No odor. 5 mallards, 3 with young, 0 boats, 0 fishing, 0 ng.

light, SW; weather - partly cloudy; water
light conditions - strong sunlight. No water
2 mallards, geese - 3 pairs with ~ 20 goslings.
e fishing; no swimmers/waders.

; weather: overcast; water surface cond: ditions: overcast. Water odor - slight rotten ese, mallard. 0 boats; 1 person fishing; no rs.

; weather: partly cloudy; water surface cond: bright cloud conditions. No water odor. eese, mallard and youg; no boats, 2 fishing, no rs.

; weather: overcast; water surface cond: calm; ast. No water odor. Waterfowl - 2 mallards, a, 4 sandpiper or plover. No boats, fishing, or rs. The turbidity of the algae was worse on the des, more than just from wind blowing effect. checking the staff gauge, that the water just ker than in the shallower areas over on the college.

zy, S; weather: overcast; water surface cond: d: bright cloud cond. No water odor. 6 ducks. ;; 0 swimmers/waders.

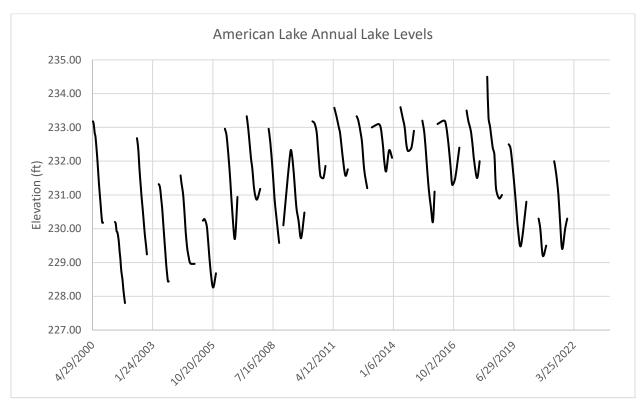
Date	Time	Site Depth (m)	Secchi Depth (m)	Air Temp (C)	Water Temp (°C) Top	Dissolved Oxygen (mg/l) Top	Water Temp (°C) Bottom	Dissolved Oxygen (mg/l) Bottom	Lake Level (ft.)	Suspended Algae	pH (1 m)	pH (surface)	TP (mg/l)	SRP (mg/l)	TN (mg/l)	Chla (ug/l)	Phaeo a(ug/l)	Sulfate (mg/l)	Alkalinity (mg CaCO3/l)	Total Aluminum (mg/l)
										small dots,										
										moderate,										
F /2 /2 02 4	0.45			40.5		0.7	16.6		- 0	brown in	6.0	7	0.007	0.004	0.405	-	4 7	22.4	45.0	0.000
5/3/2021	9:15am	3.2	-1.1	13.5	17.1	9.7	16.6	2.7	5.8	color	6.9	/	0.037	0.001	0.425	5	1.7	22.1	15.8	0.363
c /7 /2024	0.00	2.0	4 5	10.1	10.0	0.5	10.0	0.0	F 22	heavy,	7	7	0.026	0.000	0.442	0	4 7			
6/7/2021	9:08am	2.9	-1.5	16.1	18.8	9.5	18.9	0.8	5.32	cloud-like	7	/	0.026	0.002	0.442	8	1.7			
7/0/2024	8:56	2		47.0	22.0		22.7	0.7	4.70	substantial	7.4	7 5	0.000	0.000	0.050		0.0			
7/8/2021	AM	3	-1.1	17.6	22.9	8.8	22.7	0.7	4.76	cloudiness	7.4	7.5	0.032	0.002	0.956	9.8	0.8			
										heavy,										
	9:06									cloudy,		_								
8/9/2021	AM	2.5	-1.3	21.6	22.4	9.7	22.5	9.7	4.08	murky	7.9	8	0.044	<0.001	0.78	6.5	0.9	133	23	0.579
										little dots										
										plus pea-										
										sized										
										globules										
9/13/2021	9:07am	2.3	-1.3	16.2	19.9	10.3	20.2	0.7	3.56	(new)	7.5		0.026	<0.001	0.206	5.1	2.8			
										Heavy										
	10:10									amount of										
10/25/2021	AM	2.4	-0.9	13.1	12.3	10.6	11.8	0.5	3.57	small dots	7.25	7.25	0.042	0.001	0.961	33	9.1	111	38.7	0.317

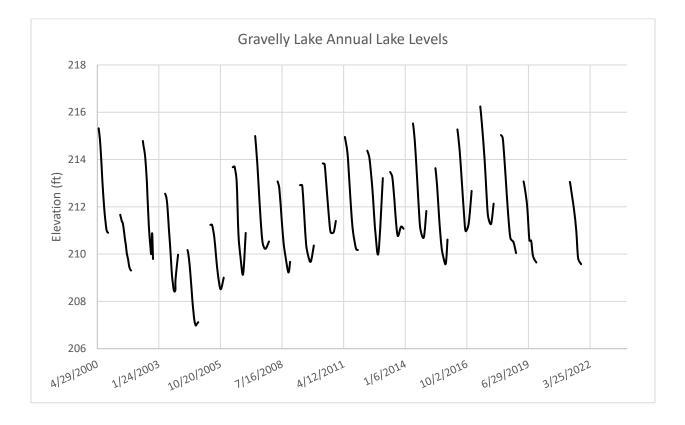
Table 2. Waughop Lake Additional Monitoring Results

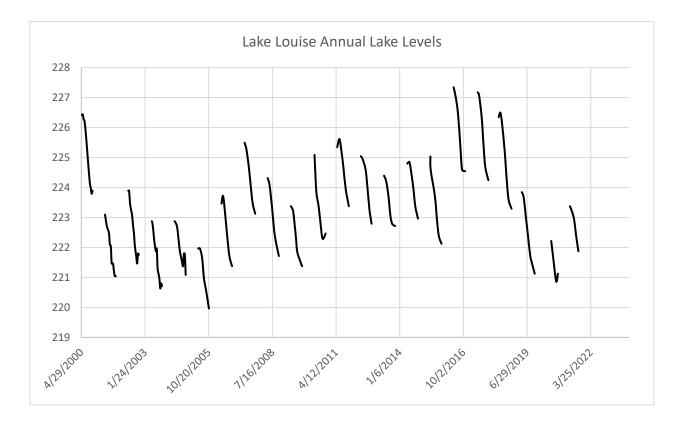


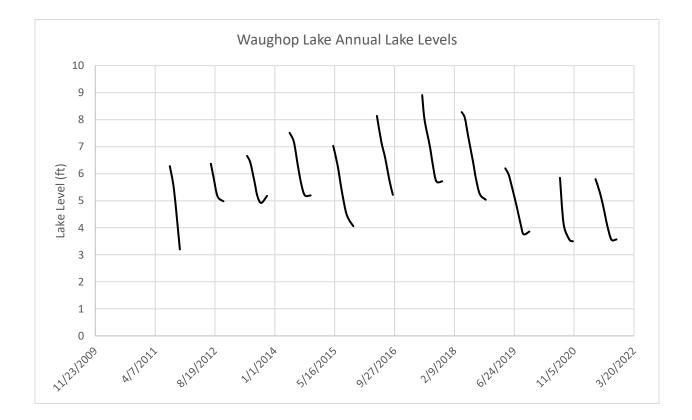
Shoreline Observations											
	5/3/2021	6/7/2021	7/8/2021	8/9/2021	9/13/2021	10/25/2021					
Site 1 (beach for boats)	No scum; 0% bottom coverage by plants	No scum, white foam; 0% bottom coverage by plants	No algae scum; 0% bottom coverage by plants	No algae scum, some bits of foam. 0% bottom coverage by aquatic plants	No surface algal scum; brown algae coating the lake bottom. 0% plant coverage on bottom	No algal scum; 0% plant coverage on bottom					
Site 2: SE corner	No scum; 0% bottom coverage by plants	No scum. 0% bottom coverage by plants	No algae scum; 0% bottom coverage by plants	Some algae scum; 0% bottom coverage by aquatic plants	No surface algal scum; brown algae coating the lake bottom. 0% plant coverage on bottom	No algal scum; algae on lake bottom. 0% plant coverage of bottom					
Site 3: South by trash can	No scum; 10% pads coverage - spatterdock, cattail	No scum. Brown sediment. 50% bottom coverage with spatterdock	No algae scum; 60% bottom coverage with spatterdock on west side of area; cattails present too	Some algae scum present, brown algae on lake bottom; 70 % bottom coverage on west side of area with spatterdock	No surface algal scum; brown algae coating the lake bottom. 70% plant coverage on bottom - spatterdock now out of water due to lake receding.	No algal scum; algae on lake bottom. 0% plant coverage on bottom.					
Site 4: Dock	No scum; too cloudy to see any plants in water	No scum, brown and green algae growing on bottom close to shore. Probable Ludwigia palustris (water purslane) close to shore; 80% spatterdock coverage out from dock	No algae scum; 85% bottom coverage- spatterdock out from dock	Water has receded about 40' from the dock; 85% coverage where water is present with spatterdock.	Water has receded to far from dock.	Water receded from dock. No algal scum present. 80% spatterdock where water receded.					
Site 5: By college outfall	No scum; 5% plant coverage; spatterdock	No scum, algae on bottom. 2% probable Ludwigia palustris (water purslane), 40% spatterdock	No algae scum; couldn't clearly see bottom; 50 % bottom coverage - spatterdock out from shore edge	Water has receded here too. Brown algae on lake bottom; 50% bottom coverage with spatterdock	No surface algal scum; brown algae coating the lake bottom. 60% bottom coverage - spatterdock.	No algal scum; other scum present - vegetative debris. Water partially receded. 60% spatterdock coverage.					
Site 6: N. fishing spot	White bubbles present; 0% bottom coverage	No scum; foam present. 0% bottom plant coverage	No algae scum, looked like pollen on water; 0% plant coverage	No algae scum, 0% plant coverage	No surface algal scum; brown algae coating the lake bottom. 0% coverage	No algal scum; 0% plant coverage on bottom.					

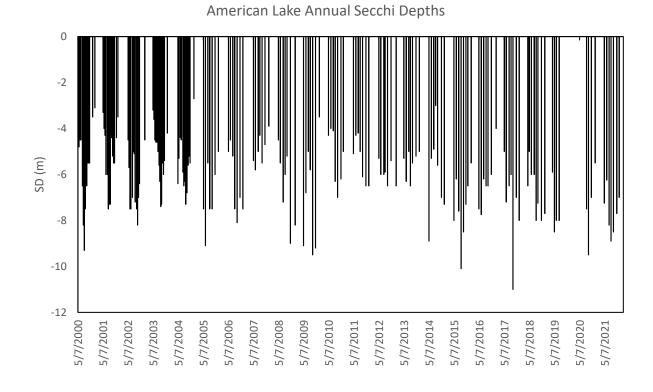
Appendix 1. Lake Data



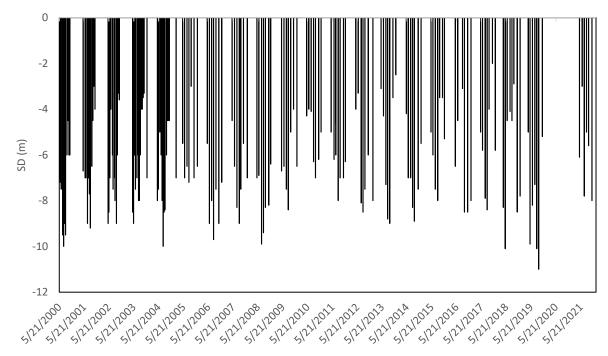


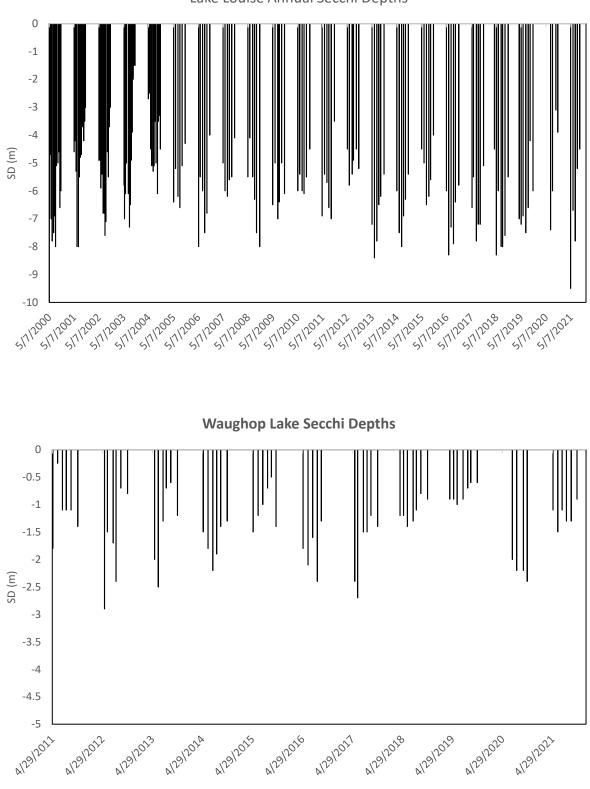




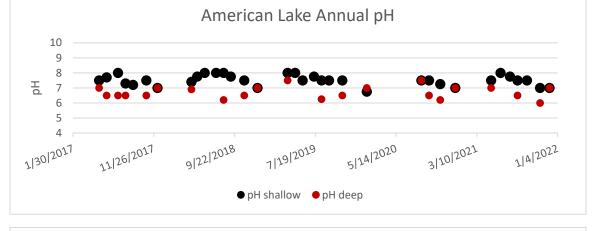


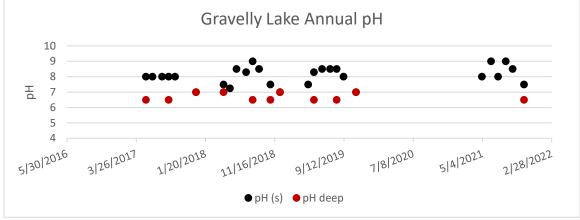
Gravelly Lake Annual Secchi Depths

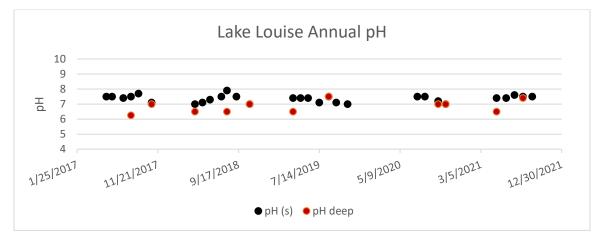


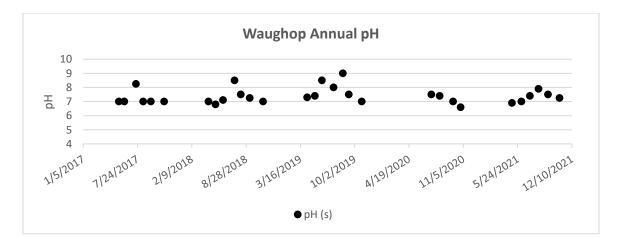


Lake Louise Annual Secchi Depths







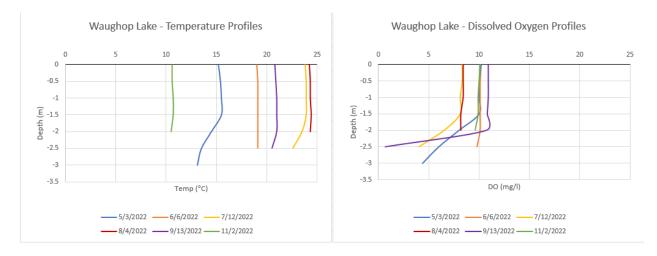


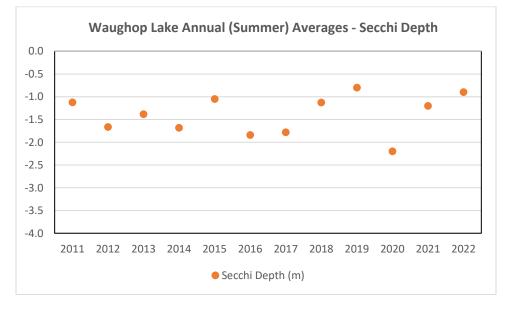


City of Lakewood

Waughop Lake Monitoring Program

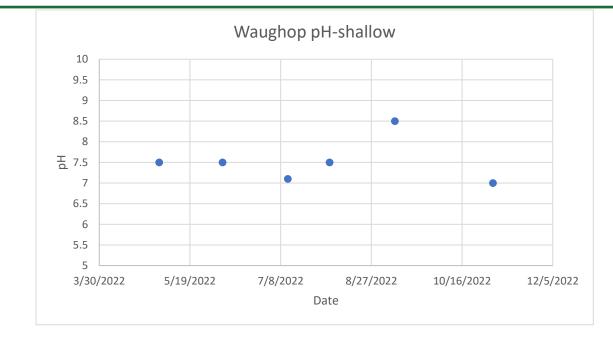
During the 2022 Waughop monitoring season, 2 volunteers participated in lake monitoring with a total of 36 volunteer hours.







308 West Stewart Avenue P.O. Box 1057 Puyallup, WA 98371 www.piercecd.org 253.845.9770 Toll Free: 866.845.9485





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Shoreline Observations



Location	Algae scum presence/% aquatic plant coverage										
Date		June	July	August	September	October					
Site 1: Beach for	47.170887,										
boats	-122.561897	None	None	None	Yes	No					
	47.169195,										
Site 2: SE corner	-122.562447	None	None	Yes	Yes	Yes					
Site 3: South by	47.168922,					Yes/20%					
trash can	-122.563195	None/ 40%	None/ 50%	None/ 35%	Yes/33%	Spatterdock					
	47.168762,					Yes/85%					
Site 4: Dock	-122.565413	None/ 60%	yes/ 85%	Yes/ 90%	Yes/90%	Spatterdock					
Site 5: By college	47.171458,					Yes/65%					
outfall	-122.567353	None/ 30%	none/ 70%	Yes/ 40%	Yes/70%	Spatterdock					
Site 6: N. fishing	47.172233,										
spot	-122.563545	none	none	Yes	Yes	Yes					

Conserving the Natural Resources of Pierce County Since 1949



308 West Stewart Avenue P.O. Box 1057 Puyallup, WA 98371 www.piercecd.org 253.845.9770 Toll Free: 866.845.9485

Raw Data:

Date	Time	Site Depth (m)	Secchi Depth (m)	Air Temp (°C)	Water Temp (°C) Top	Dissolved Oxygen (mg/I) Top	Water Temp (°C) Bottom	Dissolved Oxygen (mg/l) Bottom	Lake Level (ft.)	Suspended Algae
	9:26									Substantial
5/2/2022	AM	4	0.6	11.8	15.2	10.2	12.7	0.6	7.5	algae bloom
	9:10									Substantial
6/6/2022	AM	3.7	1.1	14.3	19	10.1	18	0.7	7.25	algae bloom
										Very soupy, a
										few small dots
	9:20									but mostly well
7/12/2022	AM	3.1	1.1	25.4	23.8	8.3	22.6	4	6.72	dissolved
	9:12									
8/4/2022	AM	3.3	0.9	22.3	24.2	8.4	24.3	7.8	6.12	Heavy
	9:26									
9/9/2022	AM	2.9	0.6	19.7	20.8	10.9	20.5	0.7	5.35	
										Substantial
11/2/2022	9:40	2.9	1.2	8.7	10.6	10.1	10.8	3.3	4.75	algae bloom



Date	рН (1m)	pH (surface)	TP (mg/l)	SRP (mg/l)	TN (mg/l)	Chla (ug/l)	Phaeo a (ug/l)	Sulfate (mg/l)	Alkalinity (mg CaCO3/l)	Total Aluminum (mg/l)
5/2/2022	7.5		0.039	0.002	1.15	23	9.1	51.2	37.5	0.286
6/6/2022	7.5	7.5	0.03	<0.001	0.709	7.6	3.3			
7/12/2022	7.1		0.29	<0.001	1.06	5.9	2			
8/4/2022	7.5		0.042	<0.001	0.851	12	6.2	45.2	47.6	0.415
9/9/2022	8.5		0.056	0.002	0.853	22	7.1			
11/2/2022	7		0.04	<0.001	1.11	13	6.1	41.7	58.2	0.177

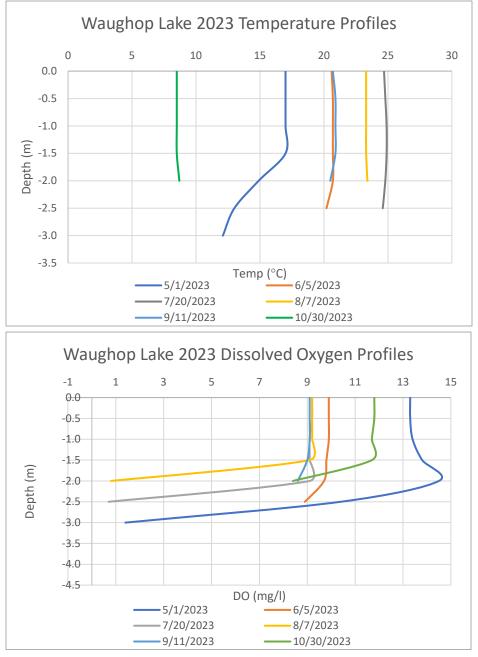
If you have additional questions, reach out to Belinda Paterno at <u>belindap@piercecd.org</u>.



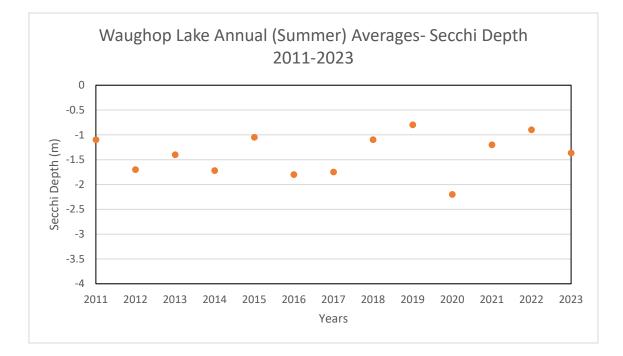
City of Lakewood

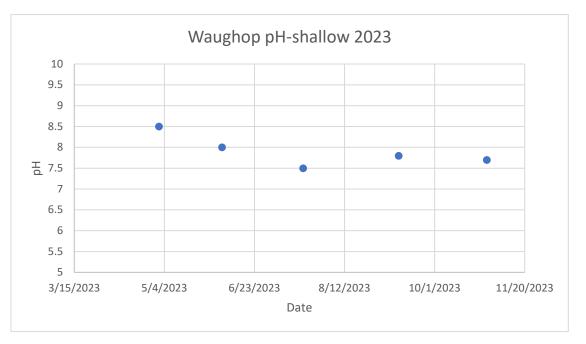
Waughop Lake Monitoring Program

During the 2023 Waughop monitoring season, 3 volunteers participated in lake monitoring with a total of 21 volunteer hours.









Conserving the Natural Resources of Pierce County Since 1949



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Shoreline Observations



Location		Algae scu	um presence,	/% aquatic pla	nt coverage	
Date		June	July	August	September	October
Site 1: Beach for	47.170887,					
boats	-122.561897	None	None	Yes	None	None
Site 2: SE corner	47.169195,					
Site 2. SE corrier	-122.562447	None	None	None	None	None
Cite 2. Courth has	47.168922,					Water too
Site 3: South by	-122.563195					far receded
trash can		None/ 20%	None/ 20%	None/ 20%	None/15%	/30%
	47.168762,				Water too	Water too
Site 4: Dock	-122.565413				far receded	far receded
		Yes/ 45%	None/ 85%	None/ 85%	/80%	/80%
Site 5: By college	47.171458,					
outfall	-122.567353	None/ 35%	None/ 90%	None/ 90%	No/40%	None/45%
Site 6: N. fishing	47.172233,					
spot	-122.563545	None	None	Yes	No	None

Conserving the Natural Resources of Pierce County Since 1949



Date	Time	Site Depth (m)	Secchi Depth (m)	Air Temp (C)	Water Temp (°C) Top	Dissolved Oxygen (mg/l) Top	Water Temp (°C) Bottom	Dissolved Oxygen (mg/l) Bottom	Lake Level (ft.)	Suspended Algae
5/1/2023	9:30 AM	3.5	0.6	13.2	17	13.3	12.1	1.4	5.84	Substantial
6/5/2023	9:00 AM	3	0.9	17.3	20.6	9.9	20.2	8.9	5.26	Substantial
7/20/2023	9:00 AM	2.8	2	21.9	24.7	9.2	24.6	0.7	5.26	Moderate to heavy
8/7/2023	9:50 AM	2.6	1.9	20.5	23.3	9.2	23.4	0.8	3.9	Moderate
9/11/2023	9:47 AM	2.5	1.9	25.2	20.7	9.1	20.5	8.6	3.8	Substantial
10/30/2023	9:39 AM	2.5	0.9	8.6	8.5	11.8	8.7	8.4	3.46	Moderate

Raw Data

Conserving the Natural Resources of Pierce County Since 1949



Date	рН (1 m)	pH (surface)	TP (mg/l)	SRP (mg/l)	TN (mg/l)	Chla (ug/l)	Phaeo a(ug/l)	Sulfate (mg/l)	Alkalinity (mg CaCO3/I)	Total Aluminum (mg/l)
5/1/2023	8.5		0.041	<0.001	0.931	19	9.3	25.3	48.7	0.499
6/5/2023	8		0.033	0.002	0.941	8	4			
7/20/2023	7.5		0.017	<0.001	0.619	3.6	2.9			
8/7/2023		7.6	0.025	<0.001	0.987	5.3	3.8	110	38.4	0.919
9/11/2023	7.8	7.9	0.026	<0.001	0.81	7.7	3.1			
10/30/2023	7.7	7.6	0.039	0.001	0.965	14	4.1	102	34.6	0.949

If you have additional questions, reach out to Bryan Mohlman at Bryanm@piercecd.org.



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1747583	PAGE	E 1
REPORT DATE:	06/07/24		
DATE SAMPLED:	05/06/24	DATE RECEIVED:	05/07/24
FINAL REPORT, LABORATORY ANA	ALYSIS OF SELECTED PARA	METERS ON WATER	
SAMPLES FROM PIERCE CONSERV	ATION DISTRICT		

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

	TOTAL-P	SRP	DOC	TOTAL-N	ALKALINITY	pH
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	
Waughop 1m	0.050	0.007	22.9	0.843	26.9	7.50

	TOTAL ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a	CONDUCTIVITY
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)	(umhos/cm)
Waughop 1m	0.4110	3.99	57.2	23	6.1	229

	CALCIUM	MAGNESIUM	POTASSIUM	HARDNESS	HCO3	CO3
SAMPLE ID	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
Waughop 1m	6.04	0.953	2.88	19.0	25.6	<1.00



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1747583	PAC	GE 2
REPORT DATE:	06/07/24		
DATE SAMPLED:	05/06/24	DATE RECEIVED:	05/07/24
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECT	ED PARAMETERS ON WATER	
SAMPLES FROM PIERCE CON	SERVATION DISTRICT		

QA/QC DATA

	TOTALD	CDD	DOG	TOTALN		
QC PARAMETER	TOTAL-P	SRP	DOC	TOTAL-N	ALKALINITY	pH
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	
METHOD	SM20 4500PF	SM20 4500PF	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	05/13/24	05/08/24	05/20/24	05/13/24	05/14/24	05/06/24
DETECTION LIMIT	0.002	0.001	0.250	0.050	1.00	0.10
DUPLICATE						
	,			Г		
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	
ORIGINAL	0.004	0.005	3.97	0.186	116	
DUPLICATE	0.004	0.005	4.05	0.179	116	
RPD	0.92%	2.45%	2.17%	3.84%	0.22%	NA
SPIKE SAMPLE						
				1		
SAMPLE ID	BATCH	BATCH	BATCH	BATCH		
SAMI LE ID	BAICII	DATCH	BATCH	BAICII		
ORIGINAL	0.004	0.005	3.97	0.186		
SPIKED SAMPLE	0.052	0.026	8.48	1.14		
				1.14		
SPIKE ADDED	0.050	0.020	4.50	1.14		
SPIKE ADDED % RECOVERY	0.050 96.69%				NA	NA
		0.020	4.50	1.00	NA	NA
		0.020	4.50	1.00	NA	NA
% RECOVERY		0.020	4.50	1.00	NA	NA
% RECOVERY		0.020	4.50	1.00	NA 100	NA
% RECOVERY QC CHECK	96.69%	0.020 107.99%	4.50 100.29%	1.00 95.40%		NA
% RECOVERY QC CHECK FOUND	96.69%	0.020 107.99% 0.036	4.50 100.29% 3.80	1.00 95.40%	100	NA
% RECOVERY QC CHECK FOUND TRUE	96.69% 0.097 0.094	0.020 107.99% 0.036 0.039	4.50 100.29% 3.80 4.00	1.00 95.40%	100 100	

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1747583	PA	PAGE 3			
REPORT DATE:	06/07/24					
DATE SAMPLED:	05/06/24	DATE RECEIVED:	05/07/24			
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECTEI	D PARAMETERS ON WATER				
SAMPLES FROM PIERCE CON	SERVATION DISTRICT					

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a	CONDUCTIVITY
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)	(umhos/cm)
METHOD	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H	EPA 120.1
DATE ANALYZED	05/08/24	05/20/24	05/31/24	05/30/24	05/30/24	06/04/24
DETECTION LIMIT	0.0030	0.50	1.00	0.1	0.1	0.10
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	Waughop 1m
ORIGINAL	0.0583	2.84	9570	2.7	7.0	229
DUPLICATE	0.0567	2.84	9720	2.7	7.0	234
RPD	2.91%	0.00%	1.56%	0.00%	0.00%	2.16%
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH			
ORIGINAL	0.0583	2.84				
SPIKED SAMPLE	0.5782	13.0				
SPIKE ADDED	0.5000	10.0				
% RECOVERY	103.97%	101.95%	OR	NA	NA	NA
QC CHECK						
FOUND	0.5433	30.7	9.86			1414
TRUE	0.5000	30.0	10.0			1413
% RECOVERY	108.65%	102.33%	98.60%	NA	NA	100.07%
BLANK	< 0.0030	< 0.50	<1.00	NA	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE

NA = NOT APPLICABLE OR NOT AVAILABLE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1747583	PA	PAGE 4				
REPORT DATE:	06/07/24						
DATE SAMPLED:	05/06/24	DATE RECEIVED:	05/07/24				
FINAL REPORT, LABORATOR	Y ANALYSIS OF SELECTE	D PARAMETERS ON WATER					
SAMPLES FROM PIERCE CON	SAMPLES FROM PIERCE CONSERVATION DISTRICT						

QA/QC DATA

QC PARAMETER	CALCIUM	MAGNESIUM	POTASSIUM	HARDNESS	HCO3	CO3
	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	05/11/24	05/11/24	05/11/24	05/11/24	05/14/24	05/14/24
DETECTION LIMIT	0.100	0.100	0.500	0.700	1.00	1.00
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	29.4	6.48	2.27	100		
DUPLICATE	29.6	6.54	2.26	101		
RPD	0.87%	0.82%	0.14%	0.86%	NA	NA
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH			
ORIGINAL	29.4	6.48	2.27			
SPIKED SAMPLE	40.4	17.1	13.1			
SPIKE ADDED	10.0	10.0	10.0			
% RECOVERY	110.90%	106.32%	108.64%	NA	NA	NA
QC CHECK						
FOUND	10.5	10.5	10.7	69.3		
TRUE	10.0	10.0	10.0	66.2		
% RECOVERY	105.19%	104.55%	107.42%	104.79%	NA	NA
		•				
BLANK	< 0.100	< 0.100	< 0.500	< 0.700	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

amen Hademoh" 11

Damien Gadomski, PhD Laboratory Manager



3600 Fremont Ave N Seattle, WA 98103 T: (206) 352-3790 F: (206) 352-7178 info@fremontanalytical.com

City of Lakewood Bryan Mohlman 6000 Main St. Lakewood, WA 98499

RE: Waughop Lake Sampling, Work Order Number: 2405116

May 14, 2024

Attention Bryan Mohlman:

Fremont Analytical, Inc, an Alliance Technical Group company, received 2 sample(s) on 5/7/2024 for the analyses presented in the following report.

Total Sulfide by SM 4500-S2-D

All analyses were performed according to our accredited Quality Assurance program. Please contact the laboratory if you should have any questions about the results.

Please note, while the appearance of our logo and branding will update, our commitment to accuracy, speed, and customer service remain values celebrated and shared by Alliance Technical Group. Thank you for the opportunity to serve you.

Sincerely,

Brianna Barnes Project Manager

CC: Bryan Mohlman Weston Ott

DoD-ELAP Accreditation #79636 by PJLA, ISO/IEC 17025:2017 and QSM 5.4 for Environmental Testing ORELAP Certification: WA 100009 (NELAP Recognized) for Environmental Testing Washington State Department of Ecology Accredited for Environmental Testing, Lab ID C910



Original

www.fremontanalytical.com

Date: 05/14/2024



CLIENT: Project: Work Order:	City of Lakewood Waughop Lake Sampling 2405116	Work Order S	Sample Summary
Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2405116-001	Total Sulfides @ 1 Meter	05/06/2024 10:15 AM	05/07/2024 9:36 AM
2405116-002	Total Sulfides @ 0.5 m from	05/06/2024 10:15 AM	05/07/2024 9:36 AM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned



Case Narrative

WO#: **2405116** Date: **5/14/2024**

CLIENT:City of LakewoodProject:Waughop Lake Sampling

I. SAMPLE RECEIPT:

Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:

Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms



WO#: **2405116** Date Reported: **5/14/2024**

Qualifiers:

- * Flagged value is not within established control limits
- B Analyte detected in the associated Method Blank
- D Dilution was required
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- I Analyte with an internal standard that does not meet established acceptance criteria
- J Analyte detected below Reporting Limit
- N Tentatively Identified Compound (TIC)
- Q Analyte with an initial or continuing calibration that does not meet established acceptance criteria
- S Spike recovery outside accepted recovery limits
- ND Not detected at the Reporting Limit
- R High relative percent difference observed

Acronyms:

%Rec - Percent Recoverv **CCB** - Continued Calibration Blank **CCV** - Continued Calibration Verification **DF** - Dilution Factor **DUP - Sample Duplicate HEM - Hexane Extractable Material** ICV - Initial Calibration Verification LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate MCL - Maximum Contaminant Level MB or MBLANK - Method Blank MDL - Method Detection Limit MS/MSD - Matrix Spike / Matrix Spike Duplicate PDS - Post Digestion Spike Ref Val - Reference Value **REP - Sample Replicate RL** - Reporting Limit **RPD** - Relative Percent Difference **SD** - Serial Dilution SGT - Silica Gel Treatment SPK - Spike Surr - Surrogate



Analytical Report

 Work Order:
 2405116

 Date Reported:
 5/14/2024

CLIENT:City of LakewoodProject:Waughop Lake Samplin	ng								
Lab ID:2405116-001Collection Date:5/6/2024 10:1Client Sample ID:Total Sulfides @ 1 MeterMatrix:Water									
Analyses	Result	RL	Qual	Units	DF	Date Analyzed			
Total Sulfide by SM 4500-S2-D				Batc	h ID: R9	1640 Analyst: SS			
Sulfide	ND	0.0500		mg/L	1	5/13/2024 3:46:48 PM			
Lab ID: 2405116-002 Client Sample ID: Total Sulfides	s @ 0.5 m from	1		Collection Matrix: V		5/6/2024 10:15:00 AM			
Analyses	Result	RL	Qual	Units	DF	Date Analyzed			
Total Sulfide by SM 4500-S2-D				Batc	h ID: R9	1640 Analyst: SS			
Sulfide	ND	0.0500		mg/L	1	5/13/2024 3:46:48 PM			



Work Order: CLIENT: Project:	2405116 City of Lakew Waughop Lak		ng								SUMMAR Sulfide by		
Sample ID: MB-R	91640	SampType	: MBLK			Units: mg/L		Prep Date:	5/13/2024		RunNo: 916	640	
Client ID: MBLK	Ŵ	Batch ID:	R91640					Analysis Date:	5/13/2024		SeqNo: 191	1464	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit Hi	ghLimit RP	D Ref Val	%RPD	RPDLimit	Qual
Sulfide			ND	0.0500									
Sample ID: LCS-R	891640	SampType	E LCS			Units: mg/L		Prep Date:	5/13/2024		RunNo: 916	640	
Client ID: LCSW	1	Batch ID:	R91640					Analysis Date:	5/13/2024		SeqNo: 191	1465	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit Hi	ghLimit RP	D Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.190	0.0500	0.2000	0	94.9	80	120				
Sample ID: 24051	16-001ADUP	SampType	: DUP			Units: mg/L		Prep Date:	5/13/2024		RunNo: 916	640	
Client ID: Total	Sulfides @ 1 Mete	Batch ID:	R91640					Analysis Date:	5/13/2024		SeqNo: 191	1467	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit Hi	ghLimit RP	D Ref Val	%RPD	RPDLimit	Qual
Sulfide			ND	0.0500						0		20	
Sample ID: 24051	16-001AMS	SampType	e: MS			Units: mg/L		Prep Date:	5/13/2024		RunNo: 916	640	
Client ID: Total	Sulfides @ 1 Mete	Batch ID:	R91640					Analysis Date:	5/13/2024		SeqNo: 191	1468	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit Hi	ghLimit RP	D Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.240	0.0500	0.2000	0.04024	99.9	80	120				
Sample ID: 24051	16-001AMSD	SampType	: MSD			Units: mg/L		Prep Date:	5/13/2024		RunNo: 916	640	
Client ID: Total	Sulfides @ 1 Mete	Batch ID:	R91640					Analysis Date:	5/13/2024		SeqNo: 191	1469	
Analyte			Result	RL	SPK value	SPK Ref Val	%REC	LowLimit Hi	ghLimit RP	D Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.247	0.0500	0.2000	0.04024	103	80	120	0.2400	2.72	20	



Work Order: CLIENT: Project:	2405116 City of Lake Waughop L	wood ake Sampling							•	SUMMAI Sulfide by		-
Sample ID: 24052 Client ID: BATCI Analyte		SampType: DUP Batch ID: R91640 Result	RL	SPK value	Units: mg/L SPK Ref Val	%REC	Analysis Da			RunNo: 916 SeqNo: 191 %RPD		Qual
Sulfide		ND	0.0500						0		20	
Sample ID: 24052 Client ID: BATCI Analyte		SampType: MS Batch ID: R91640 Result	RL	SPK value	Units: mg/L SPK Ref Val	%REC	Analysis Da			RunNo: 916 SeqNo: 191 %RPD	-	Qual
Sulfide		0.190	0.0500	0.2000	0.01643	86.7	80	120				



Sample Log-In Check List

Client Name: COL	Work Order Num	per: 2405116	
Logged by: Morgan Wilson	Date Received:		9:36:00 AM
Chain of Custody			
1. Is Chain of Custody complete?	Yes 🖌	No 🗌	Not Present
2. How was the sample delivered?	<u>FedEx</u>		
<u>Log In</u>			
	v 🗆	N 🗆	
 Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact) 	Yes 🗋	No 🗌	Not Present
4. Was an attempt made to cool the samples?	Yes 🖌	No 🗌	
	Yes ✔		
5. Were all items received at a temperature of >2°C to 6°C *	res 💌	No 🗌	
6. Sample(s) in proper container(s)?	Yes 🖌	No 🗌	
 Sufficient sample volume for indicated test(s)? 	Yes 🖌	No 🗌	
8. Are samples properly preserved?	Yes 🖌	No 🗌	
9. Was preservative added to bottles?	Yes	No 🖌	NA 🗌
10. Is there headspace in the VOA vials?	Yes	No 🗌	NA 🔽
11. Did all samples containers arrive in good condition(unbroken)?	Yes 🖌	No 🗌	
12. Does paperwork match bottle labels?	Yes 🖌	No 🗌	
13. Are matrices correctly identified on Chain of Custody?	Yes 🖌	No 🗌	
14. Is it clear what analyses were requested?	Yes 🖌	No 🗌	
15. Were all hold times (except field parameters, pH e.g.) able to be met?	Yes 🖌	No 🗌	
<u>Special Handling (if applicable)</u>			
16. Was client notified of all discrepancies with this order?	Yes	No 🗌	NA 🗹
Person Notified: D	ate:		
	,	none 🗌 Fax	In Person
Regarding:			
Client Instructions:			
17. Additional remarks:			

Item Information

Item #	Temp ⁰C
Sample	5.9

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

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Religquished (Signature) Print Name Date/Time Date/Time Received (Signature) * but the print Name Noh Man 5/6/24 1000 * 14-1/2 Gitter Co. 10500	I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.	***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite	**Metals (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL Individual: Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti TI V Z	*Matrix: A = Air, AQ = Aqueous, B = Buik, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water, WW = Waste Water	10				2 Total Sulfides @ 0.5 m from 05/6/24 10:15/ W 1 X	Sample Name Sample Sa	Email(s): Wott@cityoflakewood.us	Report To (PM): Bryan Mohlman email: bryanm@pierceCD.or	city, State, Zip: Lakewood, WA 98499 Email: Bryant	y: Pierce Conservation District (Graham)	aughop Lake Sampling	Tel: 206-352-3790 Date: 05/6/24 Page: of:	Chain of Custody Record
Gittlin-Cripson 5/7/24 9:36 Print Name Date/Time	🗆 2 Day	3 Day Same Day	Sr Sn Ti						X	1247 124 04 04 04 04 04 04 04 04 04 04 04 04 04		pierceCD.or Retain volume (specify above) Return to client	Email: BryanM@piercecd.org	Please report to Bryan Moniman at	Please send costs to "City of Lakewood"	of: Laboratory Project No (internal): 2405116	& Laboratory Services Agreement



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1748224	PAGE 1							
REPORT DATE:	06/28/24								
DATE SAMPLED:	06/03/24	DATE RECEIVED:	06/04/24						
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER									
SAMPLES FROM PIERCE CONSERVATION DISTRICT									

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

	TOTAL-P	SRP	TOTAL-N	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Waughop 1m	0.037	< 0.001	1.32	4.8	4.5



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1748224	PAC	GE 2			
REPORT DATE:	06/28/24					
DATE SAMPLED:	06/03/24	DATE RECEIVED:	06/04/24			
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER						
SAMPLES FROM PIERCE CONSERVATION DISTRICT						

QA/QC DATA

QC PARAMETER	TOTAL-P	SRP	TOTAL-N	CHLOR_a	PHAEO_a		
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)		
METHOD	SM18 4500PF	SM18 4500PF	SM204500NC	SM1810200H	SM1810200H		
DATE ANALYZED	06/10/24	06/05/24	06/11/24	06/28/24	06/28/24		
DETECTION LIMIT	0.002	0.001	0.050	0.1	0.1		
DUPLICATE							
SAMPLE ID	BATCH	BATCH	BATCH	Waughop 1m	Waughop 1m		
ORIGINAL	0.007	< 0.001	0.351	4.8	4.5		
DUPLICATE	0.006	< 0.001	0.359	4.3	3.8		
RPD	4.98%	NC	2.25%	11.76%	16.87%		
SPIKE SAMPLE							
SAMPLE ID	BATCH	BATCH	BATCH				
ORIGINAL	0.007	< 0.001	0.351				
SPIKED SAMPLE	0.058	0.021	1.41				
SPIKE ADDED	0.050	0.020	1.00				
% RECOVERY	102.83%	105.89%	106.10%	NA	NA		
QC CHECK							
QUUTECK							
FOUND	0.094	0.040	0.443				
TRUE	0.094	0.039	0.469				
% RECOVERY	100.30%	102.56%	94.46%	NA	NA		
					·		
BLANK	< 0.002	< 0.001	< 0.050	NA	NA		

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damien Hodomsh"

Damien Gadomski, PhD Laboratory Manager



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1748959	PAGE 1				
REPORT DATE:	07/19/24					
DATE SAMPLED:	07/01/24	DATE RECEIVED: 07/02/24				
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER						
SAMPLES FROM PIERCE CONSERVATION DISTRICT						

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

	TOTAL-P	SRP	TOTAL-N	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Waughop 1m	0.041	< 0.001	1.07	15	6.7



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1748959	PA	GE 2			
REPORT DATE:	07/19/24					
DATE SAMPLED:	07/01/24	DATE RECEIVED:	07/02/24			
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER						
SAMPLES FROM PIERCE CONSERVATION DISTRICT						

QA/QC DATA

QC PARAMETER	TOTAL-P	SRP	TOTAL-N	CHLOR_a	PHAEO_a
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
METHOD	SM18 4500PF	SM18 4500PF	SM204500NC	SM1810200H	SM1810200H
DATE ANALYZED	07/08/24	07/03/24	07/15/24	07/12/24	07/12/24
DETECTION LIMIT	0.002	0.001	0.050	0.1	0.1
DUPLICATE					
SAMPLE ID	ВАТСН	ВАТСН	ВАТСН	Waughop 1m	Waughop 1m
ORIGINAL	0.004	< 0.001	0.329	15	6.7
DUPLICATE	0.004	< 0.001	0.334	16	8.0
RPD	4.36%	NC	1.51%	6.90%	17.27%
SPIKE SAMPLE					
SAMPLE ID	BATCH	BATCH	BATCH		
ORIGINAL	0.004	< 0.001	0.329		
SPIKED SAMPLE	0.056	0.020	1.24		
SPIKE ADDED	0.050	0.020	1.00		
% RECOVERY	103.14%	100.00%	90.60%	NA	NA
QC CHECK					
FOUND	0.094	0.037	0.479		
TRUE	0.094	0.039	0.469		
% RECOVERY	100.30%	94.87%	102.13%	NA	NA
BLANK	< 0.002	< 0.001	< 0.050	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ORE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION

SUBMITTED BY:

Damien Hodemsh"

Damien Gadomski, PhD Laboratory Manager



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1749807	PA	AGE 1			
REPORT DATE:	09/07/24					
DATE SAMPLED:	08/05/24	DATE RECEIVED:	08/06/24			
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER						
SAMPLES FROM PIERCE CONSERVATION DISTRICT						

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

	TOTAL-P	SRP	DOC	TOTAL-N	ALKALINITY	pH
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	
Waughop 1m	0.056	0.002	11.4	1.21	48.6	7.42

	TOTAL ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a	CONDUCTIVITY
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)	(umhos/cm)
Waughop 1m	0.8476	5.47	50.2	18	6.1	275

	CALCIUM	MAGNESIUM	POTASSIUM	HARDNESS	HCO3	CO3
SAMPLE ID	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
Waughop 1m	8.06	1.18	3.59	25.0	44.7	<1.00



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1749807	PAC	GE 2		
REPORT DATE:	09/07/24				
DATE SAMPLED:	08/05/24	DATE RECEIVED:	08/06/24		
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER					
SAMPLES FROM PIERCE CONSERVATION DISTRICT					

QA/QC DATA

	TOTAL D					
QC PARAMETER	TOTAL-P	SRP	DOC	TOTAL-N	ALKALINITY	pH
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	
METHOD	SM20 4500PF	SM20 4500PF	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	08/12/24	08/07/24	08/26/24	08/13/24	08/08/24	08/07/24
DETECTION LIMIT	0.002	0.001	0.250	0.050	1.00	0.10
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	Waughop 1m	
ORIGINAL	0.006	0.003	0.865	0.269	48.6	
DUPLICATE	0.006	0.002	0.763	0.245	50.1	
RPD	1.09%	3.44%	12.60%	9.34%	3.12%	NA
			1	1		
SAMPLE ID	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	0.006	0.003	0.865	0.269		
SPIKED SAMPLE	0.060	0.024	5.46	1.28		
SPIKE ADDED	0.050	0.020	4.50	1.00		
% RECOVERY	107.58%	105.20%	102.02%	100.80%	NA	NA
QC CHECK						
FOUND	0.095	0.042	4.05	0.449	107	
TRUE	0.094	0.039	4.00	0.469	100	
% RECOVERY	101.06%	106.60%	101.25%	95.74%	107.00%	NA
					· · · ·	
BLANK	< 0.002	< 0.001	< 0.250	< 0.050	NA	NA

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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1749807	PA	GE 3
REPORT DATE:	09/07/24		
DATE SAMPLED:	08/05/24	DATE RECEIVED:	08/06/24
FINAL REPORT, LABORATORY ANAL	YSIS OF SELECTED PARAMET	ERS ON WATER	
SAMPLES FROM PIERCE CONSERVA	TION DISTRICT		

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a	CONDUCTIVITY
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)	(umhos/cm)
METHOD	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H	EPA 120.1
DATE ANALYZED	08/09/24	08/07/24	08/15/24	08/09/24	08/09/24	08/15/24
DETECTION LIMIT	0.0030	0.50	1.00	0.1	0.1	0.10
DUPLICATE						
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.0566	4.83	1.80	6.9	12	613
DUPLICATE	0.0551	4.73	1.84	5.9	13	610
RPD	2.69%	2.20%	2.14%	16.67%	5.41%	0.49%
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH			
ORIGINAL	0.0566	4.83	1.80			
SPIKED SAMPLE	0.5298	15.0	11.8			
SPIKE ADDED	0.5000	10.0	10.0			
% RECOVERY	94.64%	101.95%	100.33%	NA	NA	NA
QC CHECK						
FOUND	0.5156	33.0	18.0			1411
TRUE	0.5000	30.0	20.0			1413
% RECOVERY	103.12%	110.00%	90.00%	NA	NA	99.86%
BLANK	< 0.0030	< 0.50	<1.00	NA	NA	NA

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LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1749807	PA	GE 4	
REPORT DATE:	09/07/24			
DATE SAMPLED:	08/05/24	DATE RECEIVED:	08/06/24	
FINAL REPORT, LABORATORY ANA	LYSIS OF SELECTED PAP	RAMETERS ON WATER		
SAMPLES FROM PIERCE CONSERV	ATION DISTRICT			

QA/QC DATA

CO3) (mgCaCO3/l) EPA 310.1 08/08/24 1.00
EPA 310.1 08/08/24
08/08/24
1.00
NA
NA
NA
NA

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damier Hodemsh"

Damien Gadomski, PhD Laboratory Manager



3600 Fremont Ave N Seattle, WA 98103 T: (206) 352-3790 F: (206) 352-7178 info@fremontanalytical.com

City of Lakewood Bryan Mohlman 6000 Main St Lakewood, WA 98499

RE: Waughop Lake Sampling, Work Order Number: 2408069

August 12, 2024

Attention Bryan Mohlman:

Fremont Analytical, Inc, an Alliance Technical Group company, received 2 sample(s) on 8/6/2024 for the analyses presented in the following report.

Total Sulfide by SM 4500-S2-D

All analyses were performed according to our accredited Quality Assurance program. Please contact the laboratory if you should have any questions about the results.

Please note, while the appearance of our logo and branding will update, our commitment to accuracy, speed, and customer service remain values celebrated and shared by Alliance Technical Group. Thank you for the opportunity to serve you.

Sincerely,

Brianna Barnes Project Manager

DoD-ELAP Accreditation #79636 by PJLA, ISO/IEC 17025:2017 and QSM 5.4 for Environmental Testing ORELAP Certification: WA 100009 (NELAP Recognized) for Environmental Testing Washington State Department of Ecology Accredited for Environmental Testing, Lab ID C910



Original

www.fremontanalytical.com

Date: 08/12/2024



CLIENT:City of LakewoodProject:Waughop Lake SamplingWork Order:2408069		Work Order S	Sample Summary
Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2408069-001	1m Total Sulfides	08/05/2024 9:25 AM	08/06/2024 9:45 AM
2408069-002	0.5 from bot Total Sulfides	08/05/2024 9:30 AM	08/06/2024 9:45 AM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned



Case Narrative

WO#: **2408069** Date: **8/12/2024**

CLIENT:City of LakewoodProject:Waughop Lake Sampling

I. SAMPLE RECEIPT:

Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:

Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms



WO#: **2408069** Date Reported: **8/12/2024**

Qualifiers:

- * Flagged value is not within established control limits
- B Analyte detected in the associated Method Blank
- D Dilution was required
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- I Analyte with an internal standard that does not meet established acceptance criteria
- J Analyte detected below Reporting Limit
- N Tentatively Identified Compound (TIC)
- Q Analyte with an initial or continuing calibration that does not meet established acceptance criteria
- S Spike recovery outside accepted recovery limits
- ND Not detected at the Reporting Limit
- R High relative percent difference observed

Acronyms:

%Rec - Percent Recoverv CCB - Continued Calibration Blank CCV - Continued Calibration Verification **DF** - Dilution Factor **DUP - Sample Duplicate** HEM - Hexane Extractable Material ICV - Initial Calibration Verification LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate MCL - Maximum Contaminant Level MB or MBLANK - Method Blank MDL - Method Detection Limit MS/MSD - Matrix Spike / Matrix Spike Duplicate PDS - Post Digestion Spike Ref Val - Reference Value **REP - Sample Replicate RL** - Reporting Limit **RPD** - Relative Percent Difference **SD** - Serial Dilution SGT - Silica Gel Treatment SPK - Spike Surr - Surrogate



Analytical Report

 Work Order:
 2408069

 Date Reported:
 8/12/2024

CLIENT:City of LakewoodProject:Waughop Lake Samplin	g		
Lab ID: 2408069-001 Client Sample ID: 1m Total Sulfi	des		Collection Date: 8/5/2024 9:25:00 AM Matrix: Water
Analyses	Result	RL Qual	I Units DF Date Analyzed
Total Sulfide by SM 4500-S2-D			Batch ID: R93564 Analyst: SLL
Sulfide	ND	0.0500	mg/L 1 8/12/2024 10:46:05 AM
Lab ID: 2408069-002 Client Sample ID: 0.5 from bot T	otal Sulfides		Collection Date: 8/5/2024 9:30:00 AM Matrix: Water
Analyses	Result	RL Qual	I Units DF Date Analyzed
Total Sulfide by SM 4500-S2-D			Batch ID: R93564 Analyst: SLL
Sulfide	ND	0.0500	mg/L 1 8/12/2024 10:46:05 AM



	2408069									QC S	SUMMAI	RY REF	PORT
	City of Lake									Total	Sulfide by	v SM 450	0-S2-D
Project:	Waughop L	•	•									,	
Sample ID: MB-R93	3564	SampType	: MBLK			Units: mg/L			e: 8/12/202		RunNo: 93	564	
Client ID: MBLKV	V	Batch ID:	R93564					Analysis Date	e: 8/12/202	4	SeqNo: 19	53246	
Analyte		ł	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			ND	0.0500									
Sample ID: LCS-R9	93564	SampType	E LCS			Units: mg/L		Prep Date	e: 8/12/202	4	RunNo: 93	564	
Client ID: LCSW		Batch ID:	R93564					Analysis Date	e: 8/12/202	4	SeqNo: 19	53247	
Analyte		I	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.207	0.0500	0.2000	0	104	80	120				
Sample ID: 240807	6-001CDUP	SampType	e: DUP			Units: mg/L		Prep Date	e: 8/12/202	4	RunNo: 93	564	
Client ID: BATCH		Batch ID:	R93564					Analysis Date	e: 8/12/202	4	SeqNo: 19	53251	
Analyte		I	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.278	0.0500						0.2619	5.98	20	
Sample ID: 240807	6-001CMS	SampType	e: MS			Units: mg/L		Prep Date	e: 8/12/202	4	RunNo: 93	564	
Client ID: BATCH		Batch ID:	R93564					Analysis Date	e: 8/12/202	4	SeqNo: 19	53252	
Analyte		I	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.433	0.0500	0.2000	0.2619	85.7	80	120				
Sample ID: 240807	6-001CMSD	SampType	: MSD			Units: mg/L		Prep Date	e: 8/12/202	4	RunNo: 93	564	
Client ID: BATCH		Batch ID:	R93564					Analysis Date	e: 8/12/202	4	SeqNo: 19	53253	
Analyte		I	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.430	0.0500	0.2000	0.2619	83.8	80	120	0.4333	0.864	20	



Work Order: CLIENT: Project:	2408069 City of Lake Waughop L	wood ake Sampling								SUMMAI Sulfide by		
Sample ID: 24081 Client ID: BATC Analyte		SampType: DUP Batch ID: R93564 Result	RL	SPK value	Units: mg/L SPK Ref Val	%REC	Analysis Dat			RunNo: 935 SeqNo: 195 %RPD		Qual
Sulfide		ND	0.0500	SFR value		/orec	LOWLININ	TiignEiniit	0	///// D	20	Quai
Sample ID: 24081 Client ID: BATC		SampType: MS Batch ID: R93564			Units: mg/L		Prep Dat Analysis Dat	te: 8/12/20 te: 8/12/20		RunNo: 935 SeqNo: 195		
Analyte Sulfide		Result	RL 0.0500	SPK value 0.2000	SPK Ref Val	%REC 86.9	LowLimit 80	HighLimit 120	RPD Ref Val	%RPD	RPDLimit	Qual



Sample Log-In Check List

Client Name: 0	COL	Work Order Numb	per: 2408069	
Logged by: N	Morgan Wilson	Date Received:	8/6/2024 9	9:45:00 AM
Chain of Custo	dy			
1. Is Chain of Cus	-	Yes 🖌	No	Not Present
2. How was the sa		FedEx		
£.				
<u>Log In</u>				
	present on shipping container/cooler? ents for Custody Seals not intact)	Yes	No 🗌	Not Present
4. Was an attempt	t made to cool the samples?	Yes 🖌	No 🗌	
5. Were all items r	received at a temperature of >2°C to 6°C *	Yes 🖌	No 🗌	
6. Sample(s) in pro	oper container(s)?	Yes 🖌	No 🗌	
7. Sufficient samp	le volume for indicated test(s)?	Yes 🖌	No 🗌	
8. Are samples pro	operly preserved?	Yes 🗹	No 🗌	
9. Was preservativ	ve added to bottles?	Yes	No 🔽	NA 🗌
10. Is there headsp	ace in the VOA vials?	Yes	No 🗌	NA 🗹
11. Did all samples	containers arrive in good condition(unbroken)?	Yes 🖌	No 🗌	
12. Does paperwork	k match bottle labels?	Yes 🖌	No 🗌	
13. Are matrices co	prrectly identified on Chain of Custody?	Yes 🖌	No 🗌	
14. Is it clear what a	analyses were requested?	Yes 🖌	No 🗌	
15. Were all hold tir be met?	mes (except field parameters, pH e.g.) able to	Yes 🖌	No 🗌	
<u>Special Handlir</u>	n <u>g (if applicable)</u>			
16. Was client not	ified of all discrepancies with this order?	Yes 🖌	No 🗌	
Person N	lotified: Bryan Mohlman Date	e:	8/6/2024	
By Whom	n: Morgan Wilson Via:	🖌 eMail 🗌 Ph	none 🗌 Fax	In Person
Regardin	g: Run Per Historical - Total Sulfide			
Client Ins	structions: Proceed per Historical			

17. Additional remarks:

Item Information

Item #	Temp ⁰C
Sample	6.0

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

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	Received (Signature) Print	o - Too - Ow	Print Name	Relinquished (Signature)
Print Name Date/Time Date/Time	It Name Date/Time Date/Time On (15 174 Received (Signature) Print	al Mr. Anni	Print Name	Relinquished (Signature)
verified Chent's agreement	I represent that I am authorized to enter into this Agreement with Fremont Analytical on behalf of the Client named above, that I have verified Client's agreement to each of the terms on the front and backside of this Agreement.	is Agreement wi of this Agreement	nd backside o	I represent that I am authorized to enter into this Agreement wit to each of the terms on the front and backside of this Agreement.
D 3 Day O Same Day	ide O-Phosphate Fluoride Nitrate+Ntrite	Sulfate Bromide	Chloride	***Anions (Circle): Nitrate Nitrite
Se Sr Sn Ti TI V Zn 🛛 🛛 Standard 🗌 Next Day	lual: Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se	ts TAL Individual:	Priority Pollutants	**Metals (Circle): MTCA-5 RCRA-8
ro	SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water,	roduct, S = Soil, SD = Sediment,	O = Other, P = Product,	latrix: A = Air, AQ = Aqueous, B = Bulk,
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		9:30 W	08/05/24	2 0.5 from bot Total Sulfides
		N 23:1-	08/05/24	1 1m Total Sulfides
Comments	$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	Sample Sample Time (Matrix)*	Sample Date	Sample Name
		@piercecd.or	ıs; BryanM	Email(s): Wott@cityoflakewood.us; BryanM@piercecd.org
Disposal: Samples will be disposed in 50 days unless otherwise requested. Retain volume (specify above) Return to client	Report To (PM): Bryan Mohlman; BryanM@PierceCD.org	a na de a dan de na de a de a construir e a de a		Telephone: 253-983-7725
	Location: Waughop Lake, Lakewood WA)8371	city. state, zip: Lakewood, WA, 98371
	collected by: Pierce Conservation District			Address: 6000 Main St.
findings to me at BryanM@PierceCD.org	Project No:			client: City of Lakewood
Special Remarks: Please invoice City of Lakewood and report			ampony.	An Alliance Technical Group Compony
Laboratory Project No (internal): 2408069	Date: 08/05/2024 Page: 1 of: 1	Seattle, WA 98103 Tel: 206-352-3790	-	
Laboratory Services Agreement	Chain of Custody Record & Labor	3600 Fremont Ave N.	3	

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Page 1	www.fremontanalytical.com			COC 1 3 - 11 06 20	
	Date/ Time Received (Signature)		Print Name	Relinquished (Signature) x	× T
MANCEBALICUE 8/6 9:45-AM	UB/US 124 × Construction Print	er in Brank	Print Name	Relinquished (Signature)	X 70
erified Client's agreement 2 Day (specify)	alf of the Client named above, that I ha	is Agreement wit f this Agreement	enter into the nd backside of	I represent that I am authorized to enter into this Agreement wit to each of the terms on the front and backside of this Agreement.	
🗆 3 Day 🗌 Same Day	ide O-Phosphate Fluoride Nitrate+Nitrite	Sulfate Bromide	Chloride	***Anions (Circle): Nitrate Nitrite	
Se Sr Sn Ti Tl V Zn 🛛 🖾 Standard 🗌 Next Day	Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb	s TAL Individual:	Priority Pollutants	**Metals (Circle): MTCA-5 RCRA-8	
ro	SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water,	oduct, S = Soil, SD =	= Other, P = Pro	*Matrix: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment;	• 1
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		9:30 W	08/05/24	0.5 from bot Total Sulfides	IN
		M 23:1-	08/05/24	1m Total Sulfides	
Comments	# of 53 54 5	Sample Sample Type Time (Matrix)*	Sample Date	Sample Name	
		@piercecd.or	s; BryanM(Email(s): Wott@cityoflakewood.us; BryanM@piercecd.org	Im
Disposal: Samples will be disposed in 30 days unless otherwise requested. Retain volume (specify above) Return to client	Report To (PM): Bryan Mohlman; BryanM@PierceCD.org			Telephone: 253-983-7725	1
	Location: Waughop Lake, Lakewood WA		8371	city, state, zip: Lakewood, WA, 98371	0
Update per historical & BM -mw 8/6/24	collected by: Pierce Conservation District			Address: 6000 Main St.	1
findings to me at BryanM@PierceCD.org				client: City of Lakewood	0
Special Remarks: Please invoice City of Lakewood and report	t Name: Waughop Lake Sampling		mpony.	An Alliance Technical Group Compony	
Laboratory Project No (Internal): 24/08069	Date: 08/05/2024 Page: 1 of: 1 4	Tel: 206-352-3790			-
Laboratory Services Agreement	Chain of Custody Record & Labora	3600 Fremont Ave N.	36		_



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1750639	PAGE	1
REPORT DATE:	09/28/24		
DATE SAMPLED:	09/09/24	DATE RECEIVED:	09/10/24
FINAL REPORT, LABORATORY ANA	LYSIS OF SELECTED PARAM	METERS ON WATER	
SAMPLES FROM PIERCE CONSERVA	ATION DISTRICT		

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

	TOTAL-P	SRP	TOTAL-N	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Waughop 1m	0.051	0.002	1.22	33	4.9



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1750639	PA	GE 2
REPORT DATE:	09/28/24		
DATE SAMPLED:	09/09/24	DATE RECEIVED:	09/10/24
FINAL REPORT, LABORATORY	ANALYSIS OF SELECTED	PARAMETERS ON WATER	
SAMPLES FROM PIERCE CONS	SERVATION DISTRICT		

QA/QC DATA

QC PARAMETER	TOTAL-P	SRP	TOTAL-N	CHLOR_a	PHAEO_a
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
METHOD	SM18 4500PF	SM18 4500PF	SM204500NC	SM1810200H	SM1810200H
DATE ANALYZED	09/16/24	09/11/24	09/18/24	09/17/24	09/17/24
DETECTION LIMIT	0.002	0.001	0.050	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.006	0.007	0.298	0.7	0.5
DUPLICATE	0.006	0.008	0.304	0.6	0.5
RPD	0.81%	9.77%	1.99%	15.38%	14.29%
SPIKE SAMPLE	ВАТСН	ВАТСН	BATCH		
SAMI EE ID	BATCH	BAICH	BAICH		
ORIGINAL	0.006	0.007	0.298		
SPIKED SAMPLE	0.056	0.026	1.27		
SPIKE ADDED	0.050	0.020	1.00		
% RECOVERY	101.16%	95.98%	97.10%	NA	NA
QC CHECK					
FOUND	0.094	0.039	0.448		
TRUE	0.094	0.039	0.469		
% RECOVERY	100.30%	100.00%	95.52%	NA	NA
BLANK	< 0.002	< 0.001	< 0.050	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damien Hodomsh"

Damien Gadomski, PhD Laboratory Manager



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1751398	PAGE 1					
REPORT DATE:	11/11/24						
DATE SAMPLED:	10/07/24	DATE RECEIVED: 10/08/24					
FINAL REPORT, LABORATORY AN	FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER						
SAMPLES FROM PIERCE CONSERVATION DISTRICT							

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

	TOTAL-P	SRP	TOTAL-N	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Waughop 1m	0.048	0.005	1.26	26	3.0



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1751398	PAGE 2				
REPORT DATE:	11/11/24					
DATE SAMPLED:	10/07/24	DATE RECEIVED:	10/08/24			
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER						
SAMPLES FROM PIERCE CONSERVATION DISTRICT						

QA/QC DATA

QC PARAMETER	TOTAL-P	SRP	TOTAL-N	CHLOR_a	PHAEO_a
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
METHOD	SM18 4500PF	SM18 4500PF	SM204500NC	SM1810200H	SM1810200H
DATE ANALYZED	10/14/24	10/10/24	10/15/24	10/29/24	10/29/24
DETECTION LIMIT	0.002	0.001	0.050	0.1	0.1
DUPLICATE					
SAMPLE ID	BATCH	BATCH	BATCH	BATCH	BATCH
ORIGINAL	0.058	0.002	0.196	44	8.7
DUPLICATE	0.058	0.002	0.197	40	8.5
RPD	0.16%	0.50%	0.51%	8.51%	2.06%
SPIKE SAMPLE	DATOU	DATOU	DATOU		
SAMPLE ID	BATCH	BATCH	BATCH		
ORIGINAL	0.058	0.002	0.196		
SPIKED SAMPLE	0.108	0.022	1.21		
SPIKE ADDED	0.050	0.020	1.00		
% RECOVERY	99.73%	100.92%	101.70%	NA	NA
QC CHECK					
FOUND	0.095	0.040	0.434		
TRUE	0.094	0.039	0.469		
% RECOVERY	101.06%	102.56%	92.54%	NA	NA
BLANK	< 0.002	< 0.001	< 0.050	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damien Hodomsh"

Damien Gadomski, PhD Laboratory Manager



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1752340	PAGE 1				
REPORT DATE:	12/05/24					
DATE SAMPLED:	11/08/24	DATE RECEIVED:	11/08/24			
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER						
SAMPLES FROM PIERCE CONSERVATION DISTRICT						

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

	TOTAL-P	SRP	DOC	TOTAL-N	ALKALINITY	pН
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	
Waughop 1m	0.052	0.002	20.7	1.08	47.2	7.38

	TOTAL ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a	CONDUCTIVITY
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)	(umhos/cm)
Waughop 1m	0.5930	4.62	38.2	49	14	262

	CALCIUM	MAGNESIUM	POTASSIUM	HARDNESS	HCO3	CO3
SAMPLE ID	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
Waughop 1m	6.67	1.11	3.82	21.2	43.1	<1.00



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1752340	PAGE 2				
REPORT DATE:	12/05/24					
DATE SAMPLED:	11/08/24	DATE RECEIVED:	11/08/24			
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER						
SAMPLES FROM PIERCE CONSERVATION DISTRICT						

QA/QC DATA

QC PARAMETER	TOTAL-P	SRP	DOC	TOTAL-N	ALKALINITY	pН
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mgCaCO3/L)	
METHOD	SM20 4500PF	SM20 4500PF	EPA 415.1	SM204500NC	SM20 2320B	EPA 150.1
DATE ANALYZED	11/12/24	11/08/24	11/12/24	11/12/24	11/14/24	11/08/24
DETECTION LIMIT	0.002	0.001	0.250	0.050	1.00	0.10
DUPLICATE						
				1		
SAMPLE ID	BATCH	Waughop 1m	BATCH	BATCH	Waughop 1m	
ORIGINAL	0.002	0.002	<0.250	0.221	47.2	
	0.002	0.002			47.2	
DUPLICATE	0.002	0.002	<0.250	0.235	46.4	
RPD	0.74%	2.04%	NC	6.14%	1.71%	NA
SPIKE SAMPLE						
				1		
SAMPLE ID	BATCH	Waughop 1m	BATCH	BATCH		
		8 1				
ORIGINAL	0.002	0.002	< 0.250	0.221		
SPIKED SAMPLE	0.056	0.021	4.46	1.11		
SPIKE ADDED	0.050	0.020	4.50	1.00		
% RECOVERY	107.56%	95.37%	99.16%	88.71%	NA	NA
QC CHECK						
FOUND	0.094	0.042	3.85	0.468	105	
TRUE	0.094	0.039	4.00	0.469	100	
% RECOVERY	100.00%	106.60%	96.25%	99.79%	105.00%	NA
BLANK	<0.002	< 0.001	< 0.250	< 0.050	NA	NA
BLANK	<0.002	<0.001	<0.230	<0.030	INA	INA

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1752340	PAGE 3				
REPORT DATE:	12/05/24					
DATE SAMPLED:	11/08/24	DATE RECEIVED:	11/08/24			
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER						
SAMPLES FROM PIERCE CONSERVATION DISTRICT						

QA/QC DATA

QC PARAMETER	TOTAL ALUMINUM	CHLORIDE	SULFATE	CHLOR_a	PHAEO_a	CONDUCTIVITY
	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)	(umhos/cm)
METHOD	EPA 200.8	EPA 325.3	EPA 375.4	SM2010200H	SM2010200H	EPA 120.1
DATE ANALYZED	11/13/24	11/18/24	11/13/24	11/13/24	11/13/24	11/18/24
DETECTION LIMIT	0.0030	0.50	1.00	0.1	0.1	0.10
DUPLICATE						
SAMPLE ID	BATCH	BATCH	Waughop 1m	BATCH	BATCH	BATCH
ORIGINAL	< 0.0030	225	38.2	5.3	2.9	1387
DUPLICATE	< 0.0030	228	39.1	5.3	2.9	1381
RPD	NC	0.93%	2.17%	0.00%	0.00%	0.43%
SPIKE SAMPLE					1	
SAMPLE ID	BATCH	BATCH	Waughop 1m			
ORIGINAL	< 0.0030		38.2			
SPIKED SAMPLE	0.5125		77.1			
SPIKE ADDED	0.5000		40.0			
% RECOVERY	102.50%	OR	97.12%	NA	NA	NA
QC CHECK						
FOUND	0.4988	29.2	9.13			1411
TRUE	0.5000	30.0	10.0			1413
% RECOVERY	99.76%	97.33%	91.30%	NA	NA	99.86%
BLANK	< 0.0030	< 0.50	<1.00	NA	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1752340	PAGE 4
REPORT DATE:	12/05/24	
DATE SAMPLED:	11/08/24	DATE RECEIVED: 11/08/24
FINAL REPORT, LABORATORY	ANALYSIS OF SELECTED P	ARAMETERS ON WATER
SAMPLES FROM PIERCE CONSI	ERVATION DISTRICT	

QA/QC DATA

QC PARAMETER	CALCIUM	MAGNESIUM	POTASSIUM	HARDNESS	HCO3	CO3
	(mg/l)	(mg/l)	(mg/l)	(mgCaCO3/l)	(mgCaCO3/l)	(mgCaCO3/l)
METHOD	EPA 200.7	EPA 200.7	EPA 200.7	SM18 2340B	EPA 310.1	EPA 310.1
DATE ANALYZED	11/13/24	11/13/24	11/13/24	11/13/24	11/13/24	11/13/24
DETECTION LIMIT	0.100	0.100	0.500	0.700	1.00	1.00
DUPLICATE						
SAMPLE ID	BATCH	BATCH	BATCH	BATCH		
ORIGINAL	65.2	12.4	2.32	214		
DUPLICATE	65.0	12.3	2.30	213		
RPD	0.32%	0.40%	1.10%	0.34%	NA	NA
SPIKE SAMPLE						
SAMPLE ID	BATCH	BATCH	BATCH			
ORIGINAL	65.2	12.4	2.32			
SPIKED SAMPLE	76.2	23.0	12.9			
SPIKE ADDED	10.0	10.0	10.0			
% RECOVERY	110.11%	106.40%	105.63%	NA	NA	NA
QC CHECK						
FOUND	10.5	10.6	10.5	69.7		
TRUE	10.0	10.0	10.0	66.2		
% RECOVERY	104.52%	105.79%	105.00%	105.31%	NA	NA
BLANK	< 0.100	< 0.100	< 0.500	< 0.700	NA	NA
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RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damier Hodemsh"

Damien Gadomski, PhD Laboratory Manager



3600 Fremont Ave N Seattle, WA 98103 T: (206) 352-3790 F: (206) 352-7178 info@fremontanalytical.com

City of Lakewood Bryan Mohlman 6000 Main St Lakewood, WA 98499

RE: Waughop Lake Sampling, Work Order Number: 2411161

November 15, 2024

Attention Bryan Mohlman:

Fremont Analytical, Inc, an Alliance Technical Group company, received 2 sample(s) on 11/8/2024 for the analyses presented in the following report.

Total Sulfide by SM 4500-S2-D

All analyses were performed according to our accredited Quality Assurance program. Please contact the laboratory if you should have any questions about the results.

Please note, while the appearance of our logo and branding will update, our commitment to accuracy, speed, and customer service remain values celebrated and shared by Alliance Technical Group. Thank you for the opportunity to serve you.

Sincerely,

Brianna Barnes Project Manager

DoD-ELAP Accreditation #79636 by PJLA, ISO/IEC 17025:2017 and QSM 5.4 for Environmental Testing ORELAP Certification: WA 100009 (NELAP Recognized) for Environmental Testing Washington State Department of Ecology Accredited for Environmental Testing, Lab ID C910



Original

www.fremontanalytical.com

Date: 11/15/2024



CLIENT: Project: Work Order:	City of Lakewood Waughop Lake Sampling 2411161	Work Order S	Sample Summary
Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
2411161-001	1m Total Sulfides	11/08/2024 12:00 AM	11/08/2024 12:19 PM
2411161-002	0.5 from bottom TS	11/08/2024 12:00 AM	11/08/2024 12:19 PM



WO#: **2411161** Date: **11/15/2024**

 CLIENT:
 City of Lakewood

 Project:
 Waughop Lake Sampling

I. SAMPLE RECEIPT:

Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:

Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:

Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Qualifiers & Acronyms



WO#: 2411161 Date Reported: 11/15/2024

Qualifiers:

- * Flagged value is not within established control limits
- B Analyte detected in the associated Method Blank
- D Dilution was required
- E Value above quantitation range
- H Holding times for preparation or analysis exceeded
- I Analyte with an internal standard that does not meet established acceptance criteria
- J Analyte detected below Reporting Limit
- N Tentatively Identified Compound (TIC)
- Q Analyte with an initial or continuing calibration that does not meet established acceptance criteria
- S Spike recovery outside accepted recovery limits
- ND Not detected at the Reporting Limit
- R High relative percent difference observed

Acronyms:

%Rec - Percent Recovery **CCB** - Continued Calibration Blank **CCV** - Continued Calibration Verification **DF** - Dilution Factor **DUP - Sample Duplicate** HEM - Hexane Extractable Material ICV - Initial Calibration Verification LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate MCL - Maximum Contaminant Level MB or MBLANK - Method Blank MDL - Method Detection Limit MS/MSD - Matrix Spike / Matrix Spike Duplicate PDS - Post Digestion Spike Ref Val - Reference Value **REP - Sample Replicate RL** - Reporting Limit **RPD** - Relative Percent Difference SD - Serial Dilution SGT - Silica Gel Treatment SPK - Spike Surr - Surrogate



Analytical Report

 Work Order:
 2411161

 Date Reported:
 11/15/2024

CLIENT:City of LakewoodProject:Waughop Lake Sampling	9						
Lab ID:2411161-001Collection Date:11/8/2024Client Sample ID:1m Total SulfidesMatrix:Water							
Analyses	Result	RL Qual	Units	DF	Date Analyzed		
Total Sulfide by SM 4500-S2-D			Batch	n ID: R9	5602 Analyst: BB		
Sulfide	0.0520	0.0500	mg/L	1	11/11/2024 8:49:51 AM		
Lab ID: 2411161-002 Client Sample ID: 0.5 from bottor	m TS		Collectior Matrix: W		11/8/2024		
Analyses	Result	RL Qual	Units	DF	Date Analyzed		
Total Sulfide by SM 4500-S2-D			Batch	n ID: R9	5602 Analyst: BB		
Sulfide	0.0520	0.0500	mg/L	1	11/11/2024 8:49:51 AM		



Work Order: CLIENT: Project:	2411161 City of Lake Waughop La		ng								SUMMAI Sulfide by		
Sample ID: MB-R9	5602	SampType	BLK			Units: mg/L		Prep Dat	e: 11/11/2	2024	RunNo: 956	602	
Client ID: MBLK	N	Batch ID:	R95602					Analysis Dat	ie: 11/11/2	024	SeqNo: 199	95109	
Analyte		F	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			ND	0.0500									
Sample ID: LCS-R	95602	SampType	: LCS			Units: mg/L		Prep Dat	e: 11/11/2	:024	RunNo: 950	602	
Client ID: LCSW		Batch ID:	R95602					Analysis Dat	ie: 11/11/2	024	SeqNo: 199	95110	
Analyte		F	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.194	0.0500	0.2000	0	96.8	80	120				
Sample ID: 241116	1-001ADUP	SampType	DUP			Units: mg/L		Prep Dat	e: 11/11/2	024	RunNo: 956	602	
Client ID: 1m Tot	al Sulfides	Batch ID:	R95602					Analysis Dat	e: 11/11/2	024	SeqNo: 199	95112	
Analyte		F	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide		0	.0545	0.0500						0.05200	4.67	20	
Sample ID: 241116	1-001AMS	SampType	: MS			Units: mg/L		Prep Dat	e: 11/11/2	:024	RunNo: 950	602	
Client ID: 1m Tot	al Sulfides	Batch ID:	R95602					Analysis Dat	te: 11/11/2	024	SeqNo: 19	95113	
Analyte		F	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.215	0.0500	0.2000	0.05200	81.4	80	120				
Sample ID: 241116	1-001AMSD	SampType	MSD			Units: mg/L		Prep Dat	e: 11/11/2	024	RunNo: 95	602	
Client ID: 1m Tot	al Sulfides	Batch ID:	R95602					Analysis Dat	ie: 11/11/2	024	SeqNo: 199	95114	
Analyte		F	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfide			0.217	0.0500	0.2000	0.05200	82.6	80	120	0.2147	1.15	20	



Sample Log-In Check List

Client Name: COL	Work Order Num	per: 2411161	
Logged by: Morgan Wilson	Date Received:	11/8/2024	12:19:00 PM
Chain of Custody			
1. Is Chain of Custody complete?	Yes 🖌	No 🗌	Not Present
2. How was the sample delivered?	<u>Client</u>		
<u>Log In</u>			
 Custody Seals present on shipping container/cooler? (Refer to comments for Custody Seals not intact) 	Yes 🗌	No 🗌	Not Present 🗹
4. Was an attempt made to cool the samples?	Yes 🖌	No 🗌	
5. Were all items received at a temperature of >2°C to 6°C *	Yes 🖌	No 🗌	
6. Sample(s) in proper container(s)?	Yes 🖌	No 🗌	
7. Sufficient sample volume for indicated test(s)?	Yes 🖌	No 🗌	
8. Are samples properly preserved?	Yes 🖌	No 🗌	
9. Was preservative added to bottles?	Yes	No 🖌	NA 🗌
10. Is there headspace in the VOA vials?	Yes	No 🗌	NA 🗹
11. Did all samples containers arrive in good condition(unbroken)?	Yes 🗹	No 🗌	
12. Does paperwork match bottle labels?	Yes 🗹	No 🗌	
13. Are matrices correctly identified on Chain of Custody?	Yes 🖌	No 🗌	
14. Is it clear what analyses were requested?	Yes 🗹	No 🗌	
15. Were all hold times (except field parameters, pH e.g.) able to be met?	Yes 🗹	No 🗌	
<u>Special Handling (if applicable)</u>			
16. Was client notified of all discrepancies with this order?	Yes	No 🗌	NA 🖌
Person Notified: Date	:		
By Whom: Via:	p	none 🗌 Fax	In Person
Regarding:			
Client Instructions:			
17. Additional remarks:			

Item Information

Item #	Temp ⁰C
Sample	0.2

^{*} Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

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rei: 206-332-3790 rei: 206-332-3790 regiset: Name: Woldshoop, Jokk. Saungliku.g regiset: Name: Woldshoop, Jokk. Saungliku.g regiset: Name: Woldshoop, Jokk. Saungliku.g regiset: Woldshoop, Jokk.g regiset: Woldshoop, J	te/Time	Date/Time 12:18 Received (Signature) Print Name	f this Agreement.	nd backside o Print Name	t represent that t am authorized to to each of the terms on the front ai Relinguished (Signature)
Settle, WA 5833 Date: 11/8/21 Inge: 1 of: 1 Project Name: Woldshop, GAL Saunglikueg S371 Location: Woldshop, GAL Saunglikueg Sample Sample Sample Sample Time Namehrijt Sont. Sample V/K/24 W Sample Sample V/K/24 W Sample Sample V/K/24 W Sample Sample NK Sample Sample Sample NK/24 W Sample Sample NK/24 W Sample Sample NK/24 W Sample Sample Sample Sample Sample Sample NK/24 W Sample Sample Sample Sample Sample Sample Not Sample Sample Sample Sample Sample Sample Sample Sample Sample Sample	3 Day	e O-Phosphate Fluoride Nitrate+Nitrite	Sulfate Brom	Chloride	***Anions (Circle): Nitrate Nitrite
Sattle, NV, 98103 Date: 11 / B/21 Page: 1 ot: 1 Project Name: Wolds/Acp. Ickl. Saunylikueg Project No: Collected by: Pleuce Concer usban USSTI S371 Location: Wolds/Acp. Ickl. Saunylikueg S371 Location: Wolds/Acp. Ickl. Saunylikueg S371 Location: Wolds/Acp. Ickle. Locater usban USFYK-1 S371 Location: Wolds/Acp. Icsle. USFYK-1 Sample Sample </td <td></td> <td>Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Ti V</td> <td>TAL</td> <td>Priority Pollutan</td> <td>MTCA-5 RC</td>		Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Ti V	TAL	Priority Pollutan	MTCA-5 RC
Sattle, WA 98133 Date: 11/8/21 Projet Nume: Wolky Acq. Callected by: Projet Nume: Projet Nume: Wolky Acq. Projet Nume: Wolky Acq. Projet Nume: Proje		W = Water, DW = Drinking Water, GW = Ground Water, SW = Storm Water,	roduct, S = Soil, SD =	0 = Other, P = Pi	*Matrix: A = Air, AQ = Aqueous, B = Bulk, C
Sentie, WA 98133 Date: 11/8/21 Page: 1 ot: 1 roject Nume: MUUL/ADD, IAKL. SAUM/IL/MP, Index Project Nume: MUUL/ADD, IAKL. SAUM/IL/MP, Index 8371 Location: MOUL/ADD, IAKL. SAUM/IL/MP, Index Collected by: Pleuc_L. ConScience3ban. dJ/Shr/21 8371 Location: MOUL/ADD, Iakku. Saum/IL/MP, Index Location: Multiple Saum/IL/MP, Index 8371 Location: MOUL/ADD, Iakku. Saum/IL/MP, Index Location: Multiple Saum/IL/MP, Index 8371 Location: MoulyADD, Iakku. Saum/IL/MP, Index Location: Multiple Saum/IL/MP, Index 8371 Location: Multiple Saum/IL/MP, Index Location: Location: Location: US: Bright Saumic Time Index Saumic Saumic Saumic Sample Sample Sample Saumic Saumic Saumic Saumic V/K/24 W Index Saumic Saumic Saumic Saumic V/K/24 <					
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Seattle, WA 98103 Date: 11/8/24 Project Name: Wolkyboxy Jake: 1 or: 1 Project Name: Wolkyboxy Project Name: Wolkyboxy Jake: Saunglibreg Somple Report To (PM): Ibrugue Molulum aux ; Burugue M(a) Plancy adjag Sample Sample Type attrive Type attrive Matrixy Cont. VB/J2H W VB/J2H W VB/J2H W					
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Seattle, WA 98103 Tel: 206-352-3790 Project Non: Project P			M	11/8/24	I un total sufides
Seattle, WA 98103 Tel: 206-352-3790 Project Name: Wouppage lake Sampling Project No: Project No: Collected by: Pierce Canser worken district collected by: Pierce Canser worken district collected by: Dierce Canser worken district Report To IPMI: Dryun Mohlm an; Bryun Mai Pierce ada US; Bryun Mai Pierce d. Org	Comments			Sample Date	Sample Name
rei: 206-352-3790 Tel: 206-352-3790 Project Name: Woulding lake Sampling Project No: Collected by: Pierce Canser work of 157 rict collected by: Pierce Canser work of 157 rict collected by: Diryun Mahlman; Bryan Ma Pierce da	/		vyan M(w) ple	N. US; K	mail(s): Woltful City of lakewood
seattle, WA 98103 Tel: 206-352-3790 Project Name: Woutshap lake Saungling Project No: collected by: Pierce Canser usatan district Location: Wougnap Lake Lake weed WA	y above) Return to client	: Bryan Mohlman; Bryan Marker ed.og		2S	Telephone: 253-483-7725
Contract Seattle, WA 98103 Tel: 206-352-3790 Date: 11/8/24 Page: 1 of: 1 Contract Contract Moutifrage Lake J Project No: Project No: Collected by: PierCe Conserve Jobs of USArvich				98371	city, state, Zip: Lakewood, WA, 98371
Seattle, WA 98103 Date: 1/8/24 Page: 1 of: 1 International States Project Name: Woutshop Cate Sampling Project No: Project No:	Ĺ			*****	Address: 6006 Main St
Tel: 206-352-3790 Date: 1/8/29 Page: 1 of: 1 Project Name: Woublyon lake Sawylling	rule had . Org				client: City of Lalewood
Seattle, WA 98103 Date: 1/8/24 Page: 1 of: 1	is muche city of t			Campany	An Alliance Technical Graup Company
	ternal): 2411161	Page: 1 of: 1	eattle, WA 98103 Tel: 206-352-3790		
3600 Fremont Ave N.	ces Agreemen	Chain of Custody Record & Laboratory Servi	0 Fremont Ave N.	30	



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

PHONE: (206) 632-2715 FAX: (206) 632-2417

CASE FILE NUMBER:	1752954	PAG	E 1				
REPORT DATE:	12/12/24						
DATE SAMPLED:	12/02/24	DATE RECEIVED:	12/03/24				
FINAL REPORT, LABORATORY ANALYSIS OF SELECTED PARAMETERS ON WATER							
SAMPLES FROM PIERCE CONSERVATION	SAMPLES FROM PIERCE CONSERVATION DISTRICT						

CASE NARRATIVE

One water sample was received by the laboratory in good condition and analyzed according to the chain of custody. No difficulties were encountered in the preparation or analysis of this sample. Sample data follows while QA/QC data is contained on subsequent pages.

SAMPLE DATA

	TOTAL-P	SRP	TOTAL-N	CHLOR_a	PHAEO_a
SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(ug/L)	(ug/L)
Waughop 1m	0.051	< 0.001	1.66	109	7.3



LABORATORY & CONSULTING SERVICES

3927 AURORA AVENUE NORTH, SEATTLE, WA 98103

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CASE FILE NUMBER:	1752954	PAGE 2	
REPORT DATE:	12/12/24		
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FINAL REPORT, LABORATORY	ANALYSIS OF SELECTED PAR	AMETERS ON WATER	
SAMPLES FROM PIERCE CONS	ERVATION DISTRICT		

QA/QC DATA

QC PARAMETER TOTAL-P SRP TOTAL-N CHLOR_a PHAEO_a METHOD SMI18 4500PF SMI8 4500PF SMI8 4500NC SMI810200H Igrad						
METHOD DATE ANALYZED DETECTION LIMIT SM18 4500PF 12/09/24 SM18 4500PF 12/10/24 SM18 10200H 12/11/24 SM1810200H 12/11/24 SM1810200H 12/11/24 DUPLICATE 0.002 0.001 0.050 0.1 0.1 DUPLICATE BATCH BATCH BATCH BATCH BATCH BATCH ORIGINAL DUPLICATE 0.007 <0.001	QC PARAMETER				—	-
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SAMPLE ID BATCH DUT D	DETECTION LIMIT	0.002	0.001	0.050	0.1	0.1
SAMPLE ID BATCH DUT D						
ORIGINAL DUPLICATE RPD 0.007 0.007 <0.001 <0.001 0.207 0.153 111 105 11 9.5 SPIKE SAMPLE 1.59% NC 7.00% 4.94% 14.86% SPIKE SAMPLE BATCH BATCH BATCH BATCH SATCH BATCH ORIGINAL ORIGINAL SPIKE ADDED 0.007 0.007 <0.001 0.020 0.207 1.29 1.486% SPIKE ADDED 0.057 0.050 0.020 1.00 1.29 NA NA QC CHECK FOUND TRUE 0.095 0.094 0.039 0.437 0.437 0.469 NA NA % RECOVERY 101.06% 100.00% 93.18% NA NA	DUPLICATE					
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SAMPLE ID BATCH BATCH BATCH BATCH BATCH ORIGINAL 0.007 <0.001					-	
ORIGINAL 0.007 <0.001 0.207 SPIKED SAMPLE 0.057 0.021 1.29 SPIKE ADDED 0.050 0.020 1.00 % RECOVERY 100.74% 105.00% 108.30% NA QC CHECK	SPIKE SAMPLE					
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ORIGINAL 0.007 <0.001 0.207 SPIKED SAMPLE 0.057 0.021 1.29 SPIKE ADDED 0.050 0.020 1.00 % RECOVERY 100.74% 105.00% 108.30% NA QC CHECK						
SPIKED SAMPLE 0.057 0.021 1.29 SPIKE ADDED 0.050 0.020 1.00 % RECOVERY 100.74% 105.00% 108.30% NA NA QC CHECK	SAMPLE ID	BATCH	BATCH	BATCH		
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SPIKE ADDED 0.050 0.020 1.00 NA NA % RECOVERY 100.74% 105.00% 108.30% NA NA QC CHECK						
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FOUND 0.095 0.039 0.437 TRUE 0.094 0.039 0.469 % RECOVERY 101.06% 100.00% 93.18% NA						
TRUE 0.094 0.039 0.469 % RECOVERY 101.06% 100.00% 93.18% NA NA	QC CHECK					
TRUE 0.094 0.039 0.469 % RECOVERY 101.06% 100.00% 93.18% NA NA						
% RECOVERY 101.06% 100.00% 93.18% NA NA	FOUND	0.095	0.039	0.437		
	TRUE	0.094	0.039	0.469		
	% RECOVERY	101.06%	100.00%	93.18%	NA	NA
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DLAINK \0.002 \0.001 \0.030 NA NA	BLANK	< 0.002	< 0.001	< 0.050	NA	NA

RPD = RELATIVE PERCENT DIFFERENCE. NA = NOT APPLICABLE OR NOT AVAILABLE. NC = NOT CALCULABLE DUE TO ONE OR MORE VALUES BEING BELOW THE DETECTION LIMIT. OR = RECOVERY NOT CALCULABLE DUE TO SPIKE SAMPLE OUT OF RANGE OR SPIKE TOO LOW RELATIVE TO SAMPLE CONCENTRATION.

SUBMITTED BY:

Damien Hodemsh"

Damien Gadomski, PhD Laboratory Manager