Technical Report No. 25-07

Palmer Project Aquatic Studies, 2024

by

Dylan Krull

March 2025

Alaska Department of Fish and Game **Habitat Section**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in reports by Habitat Section and the Divisions of Sport Fish and Commercial Fisheries. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figures or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm
nanometer	nm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
kilowatt	kW
Kilopascal	kPa
Nephelometric Turbidity Unit	NTU
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not detected	N
no data	ND
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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PALMER PROJECT AQUATIC STUDIES, 2024

By

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March 2025

This investigation was fully financed by Constantine Mining, LLC.

Cover: Upper Sarah Creek sample site, photo taken from a helicopter, June 4, 2024.

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ACKNOWLEDGEMENTS

Constantine Mining, LLC., provided financial support for this project. Camp Manager Darsie Culbeck provided logistical support and former Environmental Manager Merlin Benner provided the available water quality and discharge data. Director of Environment and Sustainability Kris Benusa reviewed the report and provided edits.

Alaska Department of Fish and Game Habitat Section Southeast Regional Supervisor Kate Kanouse collaborated on study design and participated in sample collection with Habitat Biologists Erika King and Jesse Lindgren. Habitat Biologist Claire Delbecq verified data entry of all samples, assisted in periphyton analysis, and identified benthic macroinvertebrates. Fish and Wildlife Technician Ruth Roys sorted benthic macroinvertebrates. Habitat Biologist Greg Albrecht provided quality assurance and control of benthic macroinvertebrate identification and reviewed and edited the report. Habitat Section Operations Manager Dr. Al Ott and Kate Kanouse reviewed and edited the report. Thank you all for your contribution.

EXECUTIVE SUMMARY

Constantine Mining, LLC. (Constantine) began exploratory drilling at the Palmer Exploration Project in 2006, located near Haines in Southeast Alaska, and has identified barite, copper, gold, silver, and zinc deposits within the volcanogenic massive sulfide deposit that may support a hard rock mine. Constantine contracted with the Alaska Department of Fish and Game (ADF&G) Habitat Section to study aquatic resources in Glacier Creek, a glacial water body draining the potential mine area. With Constantine, Habitat Section biologists developed a plan to study periphyton, benthic macroinvertebrates, fish, and sediment at two sites in Glacier Creek (2016–2023) with the goal of documenting baseline aquatic productivity and sediment conditions, which will be useful if Constantine moves forward with a project. In 2024, we added three additional sample sites; one on Plateau Creek (a clear water tributary of Glacier Creek) and two on Sarah Creek (a nearby tributary to the Klehini River), to document conditions in water bodies proximal to the project area.

In 2024, we sampled all sites on June 3–4 and June 19–20. Mean chlorophyll *a* density was similar among Middle Glacier Creek and both Sarah Creek sites, while Plateau Creek had the greatest mean density observed on the Palmer Project. Lower Glacier Creek had the lowest observed chlorophyll *a* density of all sites in 2024, and the second lowest observed at the site.

The 2024 mean benthic macroinvertebrate (BMI) densities varied among sites, with Upper Sarah Creek samples containing the highest density. The BMI communities in Glacier Creek were dominated by Diptera: Chironomidae insects; which are generally fast colonizers, easily adapt to changing habitats, and can exercise more than one feeding strategy (Entrekin et al. 2007). The BMI community composition at both Sarah Creek sites and Plateau Creek contained a larger portion of Ephemeroptera and Plecoptera insects; as expected given the differences in water quality, bedload transport, and other factors contributing to aquatic productivity.

We captured and retained 42 fish throughout the five sites, which were analyzed for whole body concentrations of arsenic, cadmium, copper, lead, mercury, silver, selenium, and zinc. Mean concentrations were within the ranges observed in whole body fish samples collected from previous efforts at the Palmer Project and reference and mineral exploration sites elsewhere in Alaska (Legere and Timothy 2016).

We sampled fine sediment at each site for aluminum, arsenic, cadmium, copper, iron, lead, mercury, selenium, silver, and zinc. Mean element concentrations were generally similar among sites and within the ranges previously observed at the Glacier Creek sites. The cadmium, copper, and zinc concentrations at most sites were near or above the lower threshold for freshwater sediment guidelines suggested by Buchman (2008).

INTRODUCTION

The Palmer Exploration Project is in the Porcupine Mining District about 55 km northwest of Haines by air in the southeastern extent of the Saint Elias Mountains near the U.S./Canada border (Figure 1). At the site, placer gold mining in Glacier Creek and its tributaries occurred during the 20th century. In 1969, local prospector Merrill Palmer discovered base-metal sulfides and barite that initiated exploration drill programs by several different companies in the following years, including Constantine beginning in 2006 (Constantine 2015) which the American Pacific Mining Corp. acquired in 2022.

The Palmer Prospect consists of two primary deposits: the Palmer Deposit on the south wall of the mountainside on the west side of the valley and the AG Deposit at the head of the valley under the Saksaia Glacier (Figure 1). The project is located on the same volcanogenic massive sulfide belt as Greens Creek Mine on Admiralty Island, about 100 air miles south. Constantine has identified barite, copper, gold, silver, and zinc as potential mineable resources (Constantine 2015). From 2014–2018, Constantine constructed a 6.73 km single lane gravel road to support mineral exploration on the mountainside in the Glacier Creek valley while conducting exploration activities which continued through 2024.

Tetra Tech (2013) and ADF&G biologists documented[a] Dolly Varden in Glacier Creek and three tributaries. In 2016, Constantine contracted with the ADF&G Habitat Section to conduct baseline studies in Glacier Creek. Following review of Constantine's water quality data, Habitat biologists developed a study plan to investigate and document aquatic resources in Glacier Creek. Methods and sampling design are similar to aquatic sampling programs at the Greens Creek Mine (Lindgren 2025) and Kensington Gold Mine (Timothy and Kanouse 2014), neighboring underground hard rock mines in Southeast Alaska. The study plan includes sampling periphyton, benthic macroinvertebrates, sediment, and fish—aquatic resources influenced by water and sediment quality through natural processes—to provide baseline information on aquatic productivity in Glacier Creek. We conducted these studies in spring 2016–2024; sampling results from previous years are presented in Kanouse and Legere (2016), Legere and Kanouse (2017–2018), and Krull (2019–2023). In addition, in 2024, we added three new sites in two streams that may be subject to development as part of the project, in Sarah Creek and Plateau Creek; sites Lower and Upper Sarah Creek and Plateau Creek.

PURPOSE

The purpose of this investigation and technical report is to document the baseline condition, abundance, and composition of biological communities and sediments in Glacier Creek and two nearby streams, Sarah and Plateau Creeks, that may be changed by development of the Palmer Project.

[a] Matthew Kern, Habitat Biologist, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Division of Habitat. Memorandum: Glacier Creek investigation trip report; dated 6/26/2014. Unpublished document, can be obtained from the Southeast Regional Supervisor, ADF&G Habitat Section, 802 3rd St, Douglas, AK.

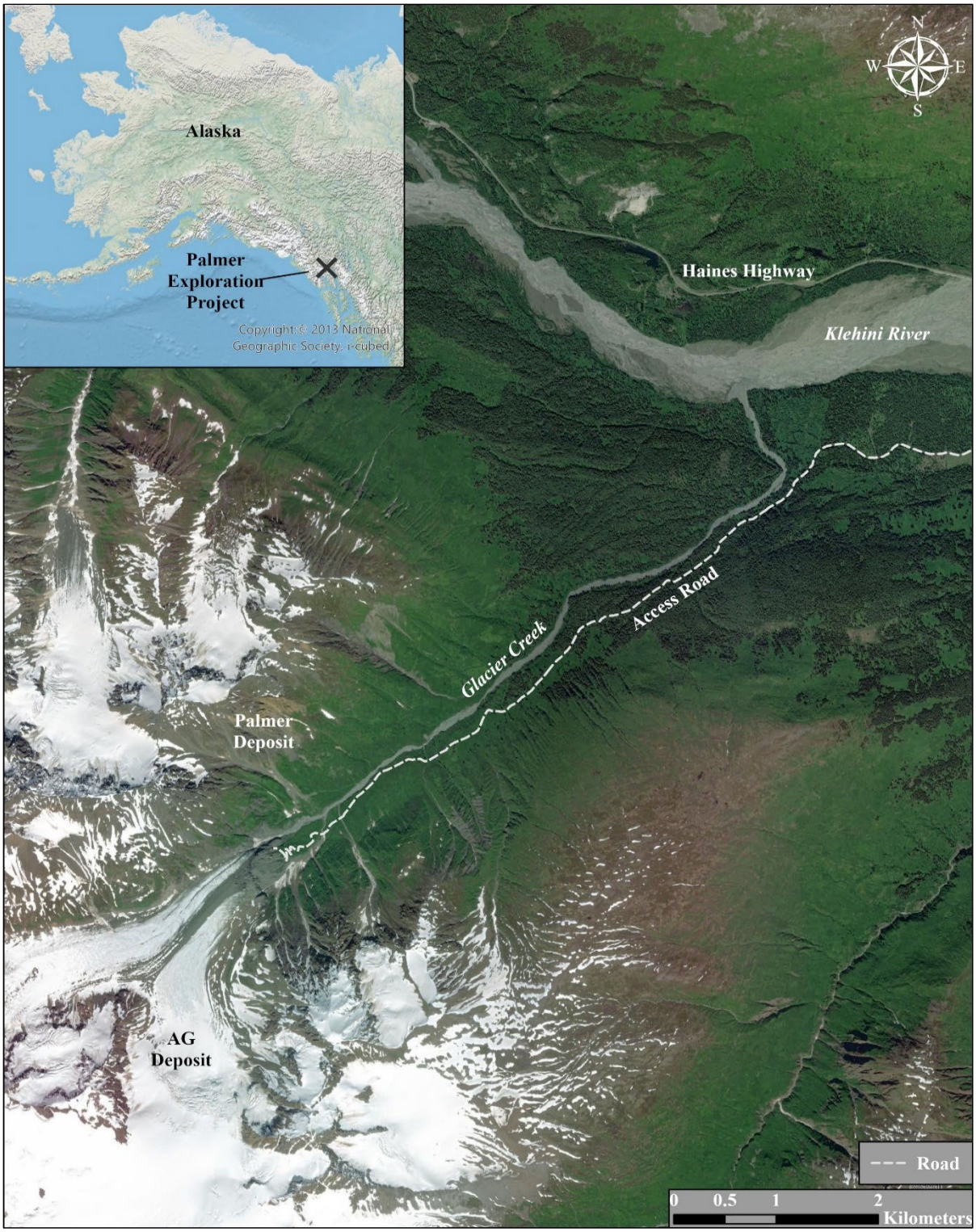

Figure 1.–Palmer Exploration Project area map.

STUDY AREAS

Glacier Creek

Glacier Creek is about 7.5 km long, drains a 39 km^2 watershed between its headwaters at the Saksaia Glacier and confluence with the Klehini River[b]. It contributes about 5% of the total Klehini River drainage area, measured from the former U.S. Geological Survey gage at the Klehini River bridge—about 20 km downstream of the prospect.[c]

Continuous discharge data do not exist for Glacier Creek; however, Integral Consulting, Inc.[d] estimated mean Glacier Creek discharge between May and September at 150 ft^3/s based on the relative size of Glacier Creek and Klehini River drainage areas. Field staff measured discharge opportunistically from 2015–2018 between June and September ranging 57–471 ft^3/s, with the lowest discharge measured during September. During winter, spring, and fall of 2019 and 2020, Constantine staff collected discharge measurements, 3.36–71.66 ft^3/s, about 2 km upstream of the Middle Glacier Creek sampling site (A. Cairns, former Environmental Manager, Constantine, Vancouver, personal communication).

Constantine's 2008–2014 and 2017–2023 Glacier Creek year-round basic water quality data documents total suspended solids ranging less than 3 mg/L to 2,470 mg/L, turbidity ranging 0.03–2,760 NTU, and pH ranging 6.59–8.33 (DOI 2016; A. Cairns, former Environmental Manager, Constantine, Vancouver, personal communication).

The lower 1 km of Glacier Creek (ADF&G Stream No. 115-32-10250-2077-3151) provides habitat for coho salmon *Oncorhynchus kisutch*, cutthroat trout *O. clarkii*, and Dolly Varden *Salvelinus malma* (Giefer and Graziano 2024). We captured Dolly Varden throughout Glacier Creek while sampling fish from 2016 to 2024 during aquatic biomonitoring; we also captured adult cutthroat trout and one rainbow trout in Lower Glacier Creek, near the Glacier Creek bridge.

Additionally, since 2019 we surveyed Lower Glacier Creek for adult fish presence in fall after water levels drop and clarity increases, observing in total three adult coho salmon within the cataloged reach and several adult Dolly Varden upstream of the Glacier Creek bridge.[e]

In 2018, we captured Dolly Varden 0.1 km upstream of the Christmas Creek confluence,[f] a nonglacial tributary located 4.5 km upstream of the Glacier Creek confluence with the Klehini

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[b] ADF&G Stream No. 115-32-10250-2077; cataloged for coho, chum, Chinook, pink, and sockeye salmon, cutthroat trout, and Dolly Varden.

[c] Marcia Greenblatt and Alice Conovitz, Integral Consulting, to Darwin Green, Constantine North. Memorandum: Klehini River and Glacier Creek hydrologic data summary; dated 2/24/2016. Unpublished document, can be obtained from Constantine North, Inc., 800 W. Pender St. Ste. 320, Vancouver, BC, Canada.

[d] Marcia Greenblatt and Alice Conovitz, Integral Consulting, to Darwin Green and Allegra Cairns, Constantine North. Memorandum: Klehini River and Glacier Creek hydrologic data summary–fall 2016 update; dated 12/19/2016. Unpublished document, can be obtained from Constantine North, Inc., 800 W. Pender St. Ste. 320, Vancouver, BC, Canada.

[e] Dylan Krull, Habitat Biologist, to Kate Kanouse, Southeast Regional Supervisor, ADF&G Habitat Section. Memorandum: 2024 Glacier Creek Fish Survey; dated 4/4/2025. Unpublished document, can be obtained from the Southeast Regional Supervisor, ADF&G Habitat Section, 802 3rd St, Douglas, AK.

[f] Previously miscalculated and reported as 0.6 km upstream of the Christmas Creek confluence.

River that supports resident Dolly Varden. Later in 2018, we sampled near the upper extent of Glacier Creek and captured no fish.[g]

We completed aquatic biomonitoring sampling at two locations in Glacier Creek: Lower Glacier Creek and Middle Glacier Creek (Figure 2). Site locations have been relatively similar since we began sampling in 2016. Fish sampling reach size varied due to fish abundance.

Sarah Creek

Sarah Creek[h] is about 6.4 km long, drains a 10.4 km^2 watershed between its headwaters at an unnamed glacier east of the Little Jarvis Glacier and flows down a steep south facing slope where it joins the Klehini River floodplain (DOI 2016). While Sarah Creek is glacially fed in part, it runs clearer than neighboring glacial streams. The stream is accessible to anadromous fish for 1.85 km where the channel flows in the historical Klehini River floodplain, the main channel then turns uphill away from the floodplain to a cascade barrier that exceeds 39% gradient for 135 ft.[i] Upstream of the barrier, the stream supports resident Dolly Varden for at least 1.7 km; the full upstream extent of resident fish in Sarah Creek has not been investigated. Published water quality and discharge data do not exist for Sarah Creek.

We completed aquatic biomonitoring sampling at two locations in Sarah Creek for the first time in 2024: Lower Sarah Creek and Upper Sarah Creek which are both within the reach accessible by anadromous fish and within the historical Klehini River floodplain (Figure 2).

Plateau Creek

Plateau Creek[j] originates from an unnamed mountainside on the east-facing slope of the Glacier Creek valley and flows through a moderate gradient plateau from about 457 m to 365 m elevation over 1.6 km (5.75% grade on average). At around 365 m elevation the gradient steepens to approximately 17% for 0.8 km then maintains 3–5% gradient channel parallel to Glacier Creek for 480 m until its confluence. There is little information about Plateau Creek discharge and water quality; Constantine's consultant Integral Consulting measured streamflow in Plateau Creek near the aquatic biomonitoring site on August 7, 2015 (0.25 ft^3/s) and on July 1, 2016 (0.52 ft^3/s).[c]

For the first time, in 2024 we completed aquatic biomonitoring sampling at one location in the lower reach of Plateau Creek which is accessible by anadromous fish (Figure 2).

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[g] Dylan Krull, Habitat Biologist, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Division of Habitat. Memorandum: Waterfall and Hangover Creeks fish investigations; dated 10/22/2018. Unpublished document, can be obtained from the Southeast Regional Supervisor, ADF&G Habitat Section, 802 3rd St, Douglas, AK.

[h] ADF&G Stream No. 115-32-10250-2077-3159; cataloged for coho salmon.

[i] Gordan Willson-Naranjo, Habitat Biologist, to Jackie Timothy, Southeast Regional Supervisor, Sarah Creek Survey Haines, dated May 5, 2015.

[j] ADF&G Stream No. 115-32-10250-2077-3151-4010; cataloged for coho salmon, cutthroat trout, and Dolly Varden.

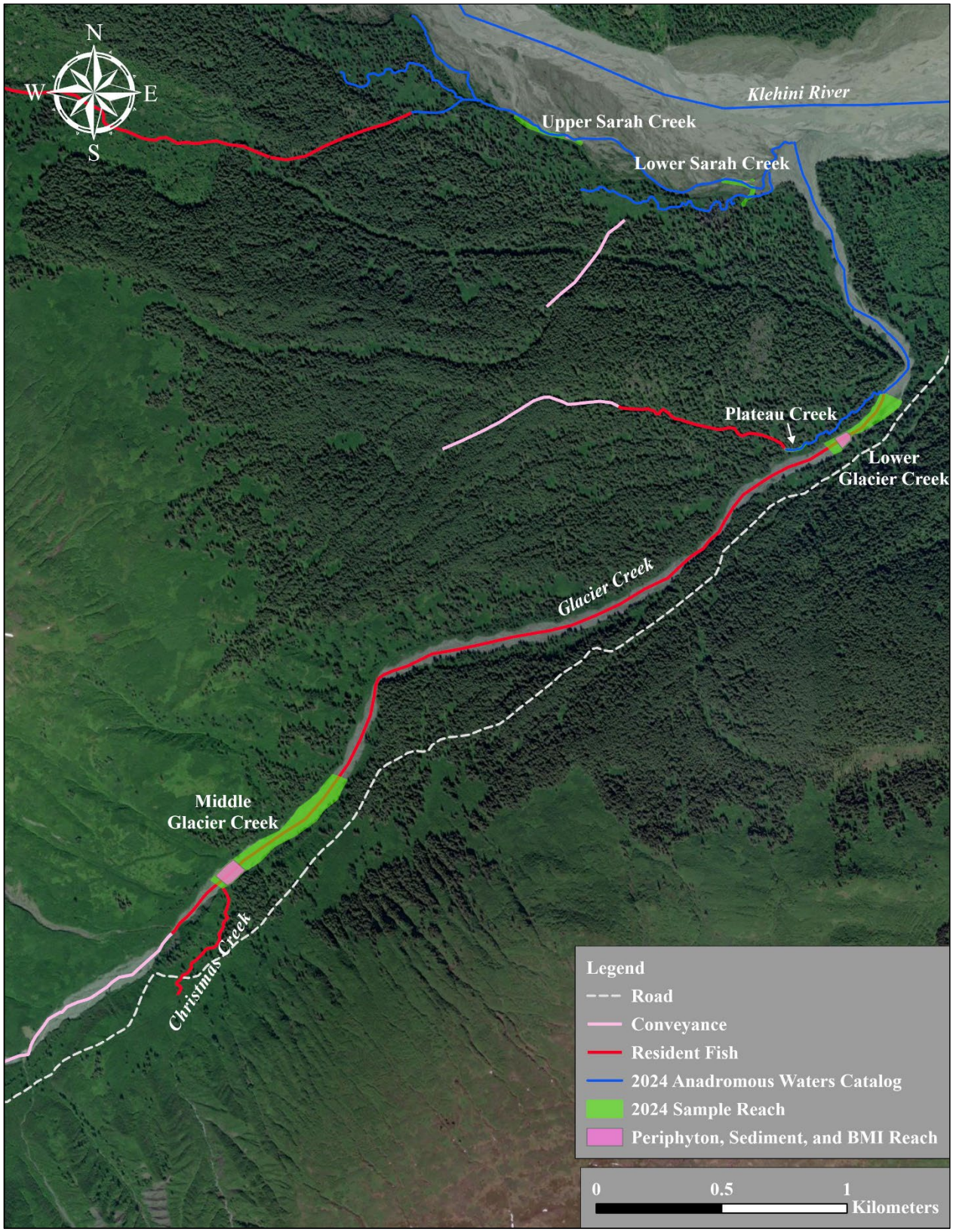

Figure 2.–Palmer Project sample site map.

Lower Glacier Creek Site

The Lower Glacier Creek Site is located at the Glacier Creek bridge near 230 m elevation, about 1.5 km upstream of the Klehini River (Table 1; Figures 3, 8). We accessed the site from the bridge crossing at the end of Porcupine Road.

Table 1.–2024 Lower Glacier Creek waypoints.

	Latitude	Longitude
Upper extent	59.4170	-136.3031
Lower extent	59.4187	-136.2982

Lower Glacier Creek is classified as a medium glacial outwash channel, which exhibits high rates of aggradation and scour resulting in active channels that move throughout the floodplain (Paustian 2010). In late 2023, the Department of Natural Resources Division of Forestry installed a bridge over Glacier Creek at the historic bridge location to facilitate the Baby Brown Timber Sale and provide public access.[k] Comparing stream characteristics of the Lower Glacier Creek sample site 2016–2024, we observed different main channel courses and channel braids each year. During sampling in 2024, upstream of the bridge most of the flow was confined to a main channel which flowed on the river left side of the floodplain. Downstream of the bridge, the channel split into two braids, with one braid flowing along the river left bank with overhanging alders and the other flowing into the sediment basin excavated during bridge construction and then continued down the middle of the floodplain. Streambed gradient ranges 3–6% and the substrate is composed of cobble, gravel, sand, and silt.

In 2024, we collected periphyton, benthic macroinvertebrate, fish, and sediment samples in a 300 m reach of the dominant channel braid on river right and along the main channel margin upstream of the bridge. Due to improper sample preservation during shipping to Juneau,[l] on June 19, we returned and collected ten periphyton samples and ten fish samples using minnow traps baited with disinfected salmon eggs and a backpack electrofisher.

Figure 3.–Lower Glacier Creek, looking upstream from lower extent of the sampling reach.

[k] Dylan Krull, Habitat Biologist, to Kate Kanouse, Southeast Regional Supervisor, ADF&G Habitat Section. Memorandum: Glacier Creek bridge installation; dated 12/29/2023. Unpublished document, can be obtained from the Southeast Regional Supervisor, ADF&G Habitat Section, 802 3rd St, Douglas, AK.

[l] Samples were shipped without ice packs and not stored in the freezer by the air carrier; two weeks later we resampled all five sites for periphyton and fish samples.

Middle Glacier Creek Site

The Middle Glacier Creek Site is located near 350 m elevation, about 4.5 km upstream of the Klehini River (Table 2; Figures 4, 10). We accessed the site by helicopter.

Table 2.–2024 Middle Glacier Creek waypoints.

	Latitude	Longitude
Upper extent	59.4005	-136.3448
Lower extent	59.4045	-136.3365

Middle Glacier Creek is characterized as a transitional zone between a cirque channel and a medium glacial outwash channel; both classifications are within the glacial outwash process group and contain high sediment loads causing lateral channel migration and stream braiding (Paustian 2010). Streambed gradient ranges 4–8% and the substrate is composed of cobble, gravel, sand, and silt, resulting in large amounts of bedload movement. We observe different main channel courses and channel braids each year at Middle Glacier Creek, a common trait in both channel classifications glacial outwash channels. In 2024, the main channel flowed largely in the center of the floodplain and then to the river left side of the floodplain. Christmas Creek flowed into the main channel after flowing about 50 m in the Glacier Creek floodplain.

On June 4, 2024, we collected periphyton, benthic macroinvertebrate, and sediment samples in channel braids and along the main channel margin near the Christmas Creek confluence and electrofished throughout the 648 m sample reach from the Christmas Creek confluence downstream; a much larger site than other years due to a lack of pools, back eddies and fish habitat features. On June 19, we returned and collected ten periphyton samples and used a backpack electrofisher to collect fish samples.

Figure 4.–Aerial view of the Middle Glacier Creek sampling site.

Lower Sarah Creek Site

The Lower Sarah Creek Site is located about 50 m upstream of the confluence with the Klehini River and Glacier Creek[m] (Table 3; Figures 5, 9). We accessed the site by helicopter.

Table 3.–Lower Sarah Creek waypoints.

	Latitude	Longitude
Upper Extent	59.4180	-136.3005
Lower Extent	59.4184	-136.2997

Lower Sarah Creek is characterized as a small floodplain channel (Paustian 2010). Within the sample reach, stream gradients range 1–2 % and the substrate is composed of gravel underlain with sand. While on site, we observed Glacier Creek flowing to the west of the large gravel delta where the creek flows into the Klehini River floodplain, intercepting Sarah Creek just downstream of our sampling reach.

At the upper extent of the sample reach, an unnamed stream[n] enters Sarah Creek from the south. This stream contains a beaver pond complex just upstream of the confluence with Sarah Creek. Based on potential mine development plans, it is possible that the headwaters of this stream will be near infrastructure (Constantine North Inc. 2024). About 500 ft upstream of the sampling reach, Sarah Creek braids into two distinct channels; the southern channel intercepts Stream No. 115-32-10250-2077-3155, where we focused our sampling efforts.

We collected benthic macroinvertebrate and sediment samples on June 4, 2024, all within the southern braid. On June 19, we returned and collected ten periphyton samples and set minnow traps baited with disinfected salmon eggs, focusing on the southern braid and within Stream No. 115-32-10250-2077-3155. We returned the next day, pulled the traps and attempted to collect the remaining samples using a backpack electrofisher; we were unable to capture ten fish within the desired size range.

Figure 5.–Southern braid, facing downstream.

[m] In some years Glacier Creek flows into Sarah Creek before both joining the Klehini River; other years they flow into the Klehini River individually.

[n] ADF&G Stream No. 115-32-10250-2077-3155; cataloged for coho salmon.

Upper Sarah Creek Site

The Upper Sarah Creek Site is located about 800 m upstream of the Lower Sarah Creek site near the portion of the stream that flows from the forest to the Klehini River floodplain (Table 4; Figures 6, 9). We accessed the site by helicopter.

Table 4.–Upper Sarah Creek waypoints.

	Latitude	Longitude
Upper Extent	59.4283	-136.3261
Lower Extent	59.4277	-136.3210

Like the Lower Sarah Creek Site, the Upper Sarah Creek Site is characterized as a small floodplain channel (Paustian 2010). Within the sample reach, stream gradients were 1–3% and the substrate was composed of gravel underlain with sand. We chose this site due to the proximity of the Lower Sarah Creek site and its location above potential project development influences, and its similarity in reach characteristics to the Lower Sarah Creek Site.

We collected benthic macroinvertebrate and sediment samples on June 4, 2024. On June 19, we returned and collected ten periphyton samples, deployed minnow traps, and collected remaining fish samples the following day and captured remaining fish samples using a backpack electrofisher.

Figure 6.–Aerial view of Upper Sarah Creek sample site, facing downstream.

Plateau Creek Site

The Plateau Creek Site is located about 450 m upstream of the confluence with the Glacier Creek (Table 5; Figures 7, 8). We accessed the site from the Glacier Creek bridge.

Table 5.–Plateau Creek waypoints.

	Latitude	Longitude
Upper Extent	59.4176	-136.3120
Lower Extent	59.4177	-136.3025

The sampling site on Plateau Creek is classified as a small flood plain channel; the reach is situated at the infliction point between the small flood plain channel and a small moderate gradient channel (Paustian 2010). Within the sample reach, stream gradients were 2–5% and the substrate was composed of gravel underlain with sand; wood was common throughout the reach and resulted in the formation of pools and riffles. We sampled this reach due to its stability on the landscape; about 40 m from the upstream extent of the reach, the stream flows within about 5 m from the active Glacier Creek floodplain which may erode and abandon the downstream channel.

We completed aquatic biomonitoring sampling at both sites on June 4, 2024. On June 19, we returned and collected ten periphyton samples and captured fish with a backpack electrofisher. All periphyton, benthic macroinvertebrate, and sediment samples we collected were within the upper 40 m of the sampling reach.

Figure 7.–Upper extent of sampling reach, facing downstream.

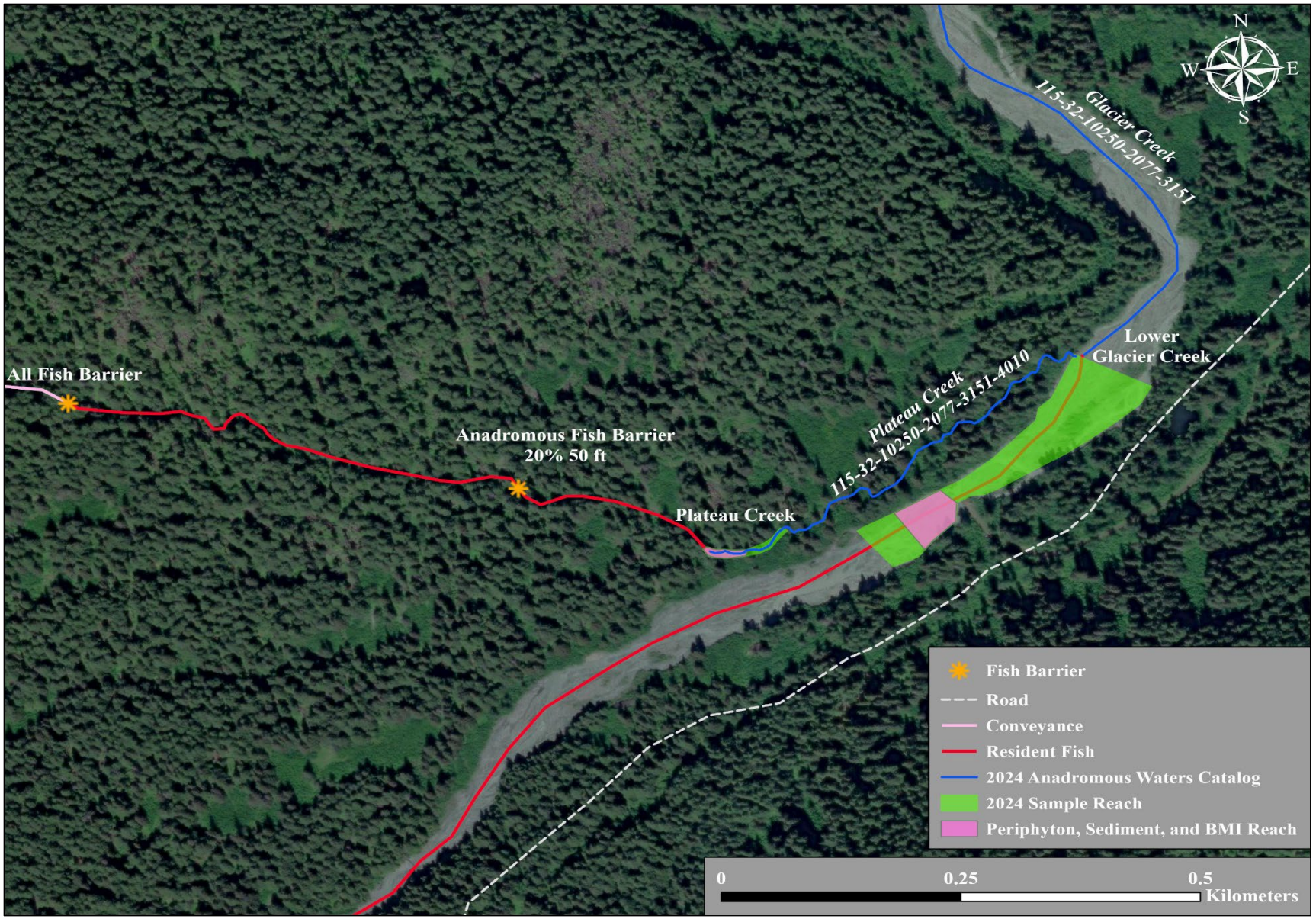

Figure 8.–Lower Glacier Creek and Plateau Creek sites map.

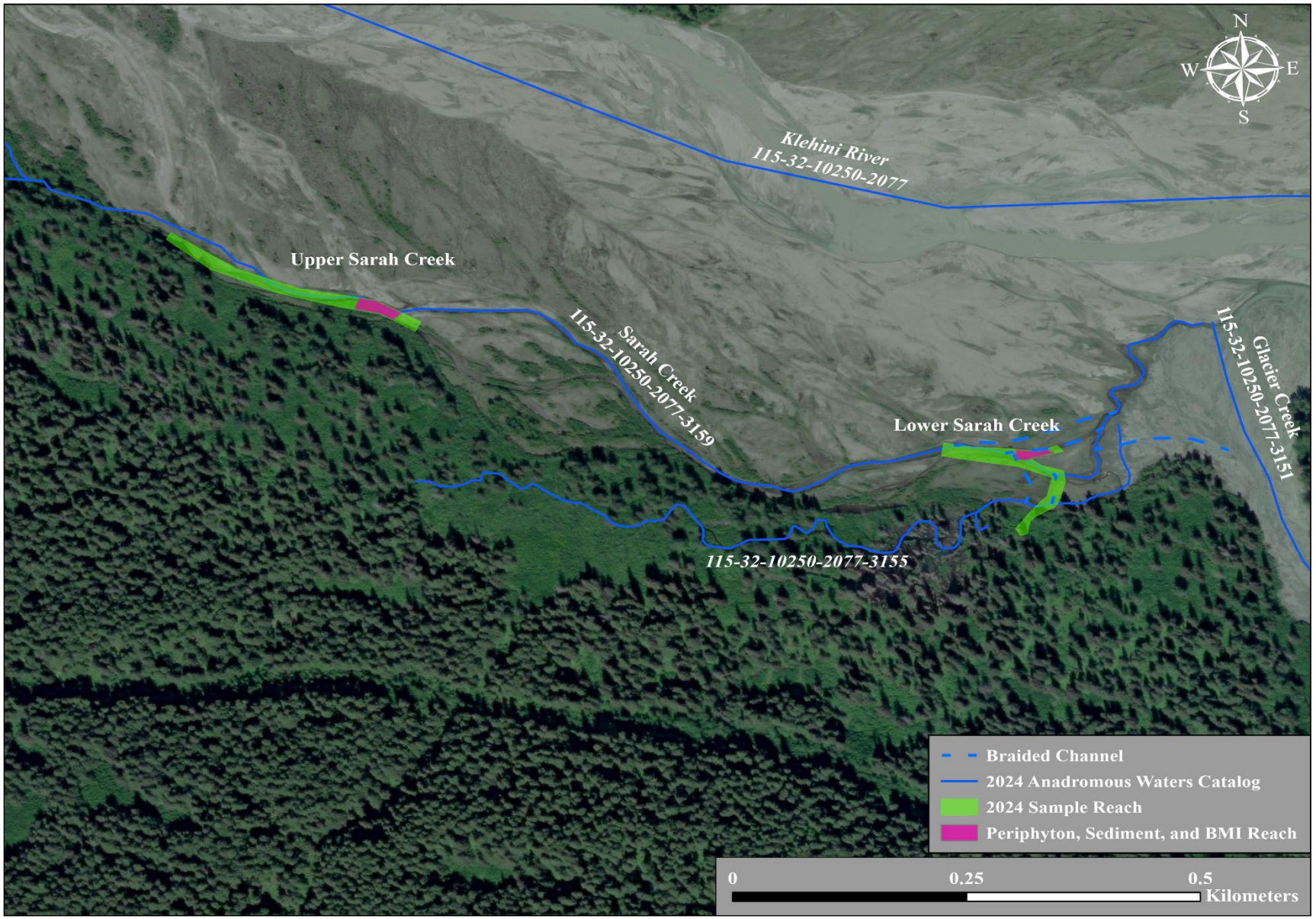

Figure 9.–Lower and Upper Sarah Creek sites map.

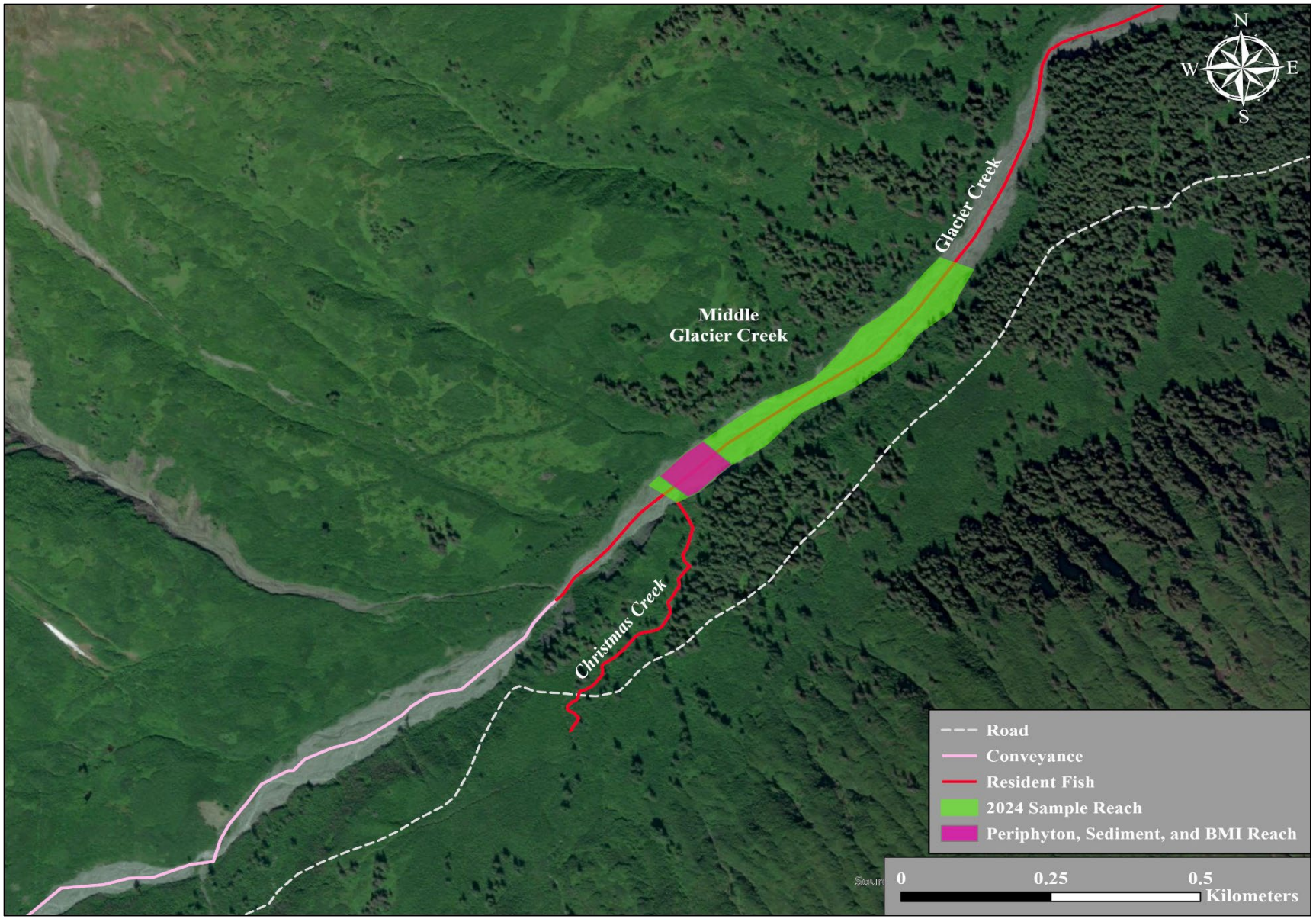

Figure 10.–Middle Glacier Creek Site map.

AQUATIC STUDIES

We completed the following studies at Lower Glacier Creek, Middle Glacier Creek, Lower Sarah Creek, Upper Sarah Creek, and Plateau Creek.

Chlorophyll Density and Composition

Periphyton is composed of primary producing organisms, such as algae, cyanobacteria, heterotrophic microbes, and detritus attached to the submerged surfaces of aquatic ecosystems. Algal density and community structure are influenced by water and sediment characteristics through physical, chemical, and biological factors, and disturbances that change throughout the year (Barbour et al. 1999).

Periphyton was collected at all sites to estimate algal density and community composition at each site, using concentrations of chlorophylls *a*, *b*, and *c.* The concentration of chlorophyll-*a* (Chl-*a*) pigment in periphyton samples provides an estimate of active algal biomass (density), while concentrations of chlorophyll-*b* (Chl-*b*) and chlorophyll-*c* (Chl-*c*) pigments estimate the composition of algal organisms present, such as green algae that produce Chl-*b*, and diatoms and brown algae that produce Chl-*c*. The chlorophyll data are used to document baseline primary productivity (e.g., live algal biomass).

Benthic Macroinvertebrate Density and Community Composition

Benthic macroinvertebrates classified in the orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies), collectively known as EPT taxa, have complex life cycles and include genera sensitive to changes in water and sediment quality (Barbour et al. 1999). These organisms are secondary producers, feed on periphyton and other macroinvertebrates, and provide a food source for fish.

Fish Condition and Whole Body Element Concentrations

Element bioavailability and bioaccumulation depends on physical and chemical factors and interactions among biological communities (Tchounwou et al. 2012). Resident fish samples were analyzed for whole body concentrations of silver (Ag), arsenic (As), cadmium (Cd), copper (Cu), mercury (Hg), lead (Pb), selenium (Se), and zinc (Zn) to document baseline concentrations and variability. These elements were selected based on Constantine's Glacier Creek water sample data and potential target elements identified in the ore body.

Sediment Composition and Element Concentrations

Sediment element concentrations are influenced by a variety of factors, such as geochemical composition and weathering within the watershed, sediment grain size, organic content, and development/disturbance (Tchounwou et al. 2012). Subsequently, sediment element concentrations influence aquatic productivity, and heavy metals in sediments can decrease BMI taxa richness and alter the composition of BMI communities (Qu et al. 2010). Fine sediments were sampled at all sample sites for total concentrations of Ag, aluminum (Al), As, Cd, Cu, iron (Fe), Hg, Pb, Se, and Zn to document baseline conditions and variability. These elements were selected based on Constantine's Glacier Creek water sample data and potential target elements identified in the ore body.

METHODS

We review data sets annually to ensure accuracy and consistency with modifications to methods; corrections and updates are reported in the document and appendices. The most recent technical report presents the current data sets and should be used to analyze data from previous years.

WATER QUALITY

Basic water quality data were collected with a YSI Pro 2030 and a Hach 2100P Portable Turbidimeter; both instruments were calibrated per the manufacturer's instructions prior to sampling. Data are provided in Appendix A.

PERIPHYTON: CHLOROPHYLL DENSITY AND COMPOSITION

Sample Collection and Analysis

Sampling methods are adapted from Barbour et al. (1999). Ten smooth, flat, undisturbed, and perennially wetted rocks were collected from submerged cobble in riffle habitats in less than 0.45 m water depth at each sample site, and submerged in the creek in the same orientation they were collected. To collect a sample from each rock, a 5 × 5 cm square of high-density foam was held on the sample area; the area around the foam was scrubbed with a toothbrush to remove algae and other organisms outside the sample area. The rock was rinsed by submerging it in the stream while holding the foam in place; the toothbrush also was rinsed in the stream, and between samples.

A 47 mm diameter Type A/E 1 μm glass fiber filter was placed into a Nalgene® filter receptacle attached to a vacuum pump with a gauge. The foam square was removed and the underside of the foam and the sample area were gently scrubbed in a circular pattern with the toothbrush into the filter receptacle. Stream water in a wash bottle was used to rinse loosened periphyton from the foam, sample area of the rock, toothbrush, and the inside of the filter receptacle onto the filter. The toothbrush was rinsed inside the receptacle, and the sample area was scrubbed a second time and the rinse cycle was repeated. With most of the water pumped through the filter, maintaining pressure less than 34 kPa, a few drops[o] of saturated magnesium carbonate solution was added to the filter[p] before the sample was pumped dry. The glass fiber filter was removed from the receptacle, folded in half with the sample inside, and wrapped in a white coffee filter for additional moisture absorption. The samples were placed in a sealed, labeled plastic bag with desiccant and stored in a light-proof cooler containing frozen icepacks during transportation; samples were stored in a -20°C freezer in the ADF&G Douglas laboratory until processing.[q]

U.S. Environmental Protection Agency (EPA; 1997) protocol was followed for chlorophyll extraction and measurement, determining instrument and estimated detection limits, and data analysis.[r] Samples were removed from the freezer, cut into small pieces, and placed into individual 15 mL screw cap centrifuge tubes containing 10 mL of 90% buffered acetone. The centrifuge tubes were capped and shaken to ensure complete submersion of the sample. Secured in a vial rack

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[o] This measurement is not exact as the amount of water and $MgCO_3$ used to create a saturated solution varies and does not affect sample integrity; supernatant solution was used to avoid $MgCO_3$ solids.

[p] To prevent acidification and conversion of chlorophyll to phaeophytin.

[q] Periphyton and fish samples collected on June 3–4 were accidently shipped without ice packs and were discarded, resulting in the need to return to the site on June 19–20.

[r] Deviations from EPA (1997) include sample storage longer than 3.5 weeks, and cutting sample filters to reduce acetone exposure for laboratory staff (as opposed to homogenization).

covered with aluminum foil, to reduce the potential for light exposure, the samples were stored in a refrigerator for 12–24 hours to allow for saturation and chlorophyll extraction.

In a dimly-lit laboratory, we removed the samples from the refrigerator and centrifuged for 20 min at 500 relative centrifugal force. Prior to sample measurement, two cuvettes containing 90% buffered acetone were placed into a Shimadzu UV-1800 spectrophotometer to calibrate absorbance of the solvent at wavelengths 664 nm, 647 nm, 630 nm, and 750 nm. Each sample supernatant was decanted into an individual cuvette and absorbance was measured at each wavelength. Each sample was treated with 80 µL of 0.1 N hydrochloric acid for 90 seconds to convert the chlorophyll to phaeophytin, and absorbance was measured at wavelengths 665 nm and 750 nm. To minimize stray light and improve resolution, sample cuvettes were cleaned with a nonabrasive wipe prior to placement in the spectrophotometer.

Trichromatic equations were used to estimate Chl-*a*, Chl-*b*, and Chl-*c* concentrations, correcting for turbidity using the 750 nm absorbance value (APHA 2012, EPA 1997). Chl-*a* concentrations were corrected when phaeophytin was detected. When Chl-*a* was not detected in a sample, the concentration is reported as the spectrophotometer estimated detection limits and the values for Chl-*b* or Chl-*c* are excluded. When Chl-*a* exceeds the upper detection limit, the value is reported at the upper detection limit and the Chl-*b* or Chl-*c* are reported as calculated. The 2024 estimated detection limits for Chl-*a* concentration were 0.22 mg/m^2 and 27.37 mg/m^2. Additional information on periphyton methods and calculations can be found in Bradley (2017).

Data Presentation

For each site and by year, mean densities of Chl-*a*, Chl-*b*, and Chl-*c* are presented in a table. Chl-*a* sample densities and mean proportions of Chl-*a,* Chl-*b,* and Chl-*c* are presented in figures. A comparison of mean densities of Chl-*a* among sites is also presented in a figure. The 2016–2024 sample data are provided in Appendix B.

BENTHIC MACROINVERTEBRATE DENSITY AND COMMUNITY COMPOSITION

Sample Collection and Analysis

Six BMI samples were collected from each site using a Surber stream bottom sampler in riffles and runs with gravel and cobble substrate and varying flow velocities—habitats that support greater BMI densities and taxonomic richness (Barbour et al. 1999). Other habitat types (e.g., pools) were excluded to reduce data variability.

The Surber stream bottom sampler has a 0.093 m^2 sample area and material is captured in a 200 mL cod end, constructed with 300 µm mesh net. After securing the frame on the streambed with the opening facing upstream, rocks within the sample area were scoured with a scrub brush; gravel, sand, and silt were disturbed to about 10 cm depth to dislodge macroinvertebrates into the net. If the contents of the sample exceeded the capacity of the cod end, the sample was discarded and repeated at a new location. The net was rinsed in the stream to ensure all organisms drifted into the cod end, and each sample was transferred from the cod end to a labeled 500 mL plastic bottle. Samples were preserved in 95% ethanol at a ratio of three parts ethanol to one part sample.

We used an elutriator system with a 300 µm sieve to sort macroinvertebrates from debris[s] and identified organisms to the lowest practical taxonomic level[t] using Merritt and Cummins (1996) and Stewart and Oswood (2006). For quality control, other staff verifyied benthic macroinvertebrate enumeration for three sample results (more than 10% of the total number of samples).

The BMI density (per m^2) was calculated for each sample by dividing the number of macroinvertebrates by 0.093 m^2—the Surber sampling area. Mean density was estimated for each site by calculating the mean density among the six samples. Taxa richness is reported as the number of taxonomic groups identified to the lowest practical level; terrestrial[u] organisms were excluded from all calculations.

Data Presentation

For each site and by year, a table is presented summarizing mean BMI density, total taxa, total EPT taxa, percent EPT insects, and percent Chironomidae insects. BMI densities and community composition are illustrated in figures and BMI density and taxa richness data comparisons among sites are also presented. The 2024 sample data and the 2016–2024 data summaries are provided in Appendix C.

RESIDENT FISH CONDITION

Age, sex, season, maturation, diet, stomach contents, fat reserve, and muscular development affect fish condition. Length and weight data were used to assess fish condition—an index of fish health.

Sample Collection and Analysis

Wearing nitrile gloves, we recorded sample fish FL to the nearest 1 mm and weight to the nearest 0.1 g. Fulton's condition factor (K) was calculated using the equation given in Anderson and Neumann (1996), where the weight (W) of each fish is divided by the cubed length (L), and the product multiplied by 100,000:

$$K = \frac{W}{L^3} \times 100{,}000$$

Data Presentation

For each site the mean fish condition factor of fish samples are presented and compared among sites; 2016–2024 data are provided in Appendix D.

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[s] Gordon Willson-Naranjo and Greg Albrecht, Habitat Biologists, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Division of Habitat. Memorandum: Benthic macroinvertebrate elutriation trials amendment; dated 12/17/2013. Unpublished document can be obtained from the ADF&G Habitat Section, 802 3rd St, Douglas, AK.

[t] Insects of the orders Ephemeroptera, Plecoptera, Trichoptera, and Diptera to genus, except nonbiting midges to family Chironomidae, and all others to class or order. Damaged and degraded organisms that cannot be identified are not reported.

[u] Including adult terrestrial insects of the orders Ephemeroptera, Plecoptera, Trichoptera, and Diptera.

RESIDENT FISH ELEMENT CONCENTRATIONS

Sample Collection and Analysis

Fish were collected using a Smithroot LR-24 backpack electrofisher.[v,w] The target size range for sample retention of whole-body fish was 85–130 mm FL, similar to other methods used in Southeast Alaska (Timothy and Kanouse 2014, Legere and Timothy 2016, Lindgren 2025). A 85 mm fish provides the minimum weight requirement for laboratory testing, while a 130 mm fish is 2–3 years old and young enough to reasonably conclude it is resident due to sampling timing and location—about 60 km upriver from Chilkat Inlet.

Due to general scarcity of fish at both Glacier Creek sample sites, all fish captured were retained as samples regardless of size between 2016 and 2019; the sampling reach extent also was contingent on capture efforts each year. In 2020, we discontinued submitting composite samples of two smaller fish due to dilution needed to process samples at the lab resulting in greater method reporting limits. In some years, we retained larger fish to obtain a minimum of five samples per site.

Wearing nitrile gloves, each fish was placed in an individually labeled plastic bag. During transport, samples were stored in a cooler with frozen icepacks and in a freezer while onsite. At the ADF&G Douglas laboratory, FL and weight were measured in the sample bags, correcting for bag weight. Samples were stored in a -20ºC freezer in the lab until shipped to the lab for analysis.

Samples were shipped to the Alaska Department of Environmental Conservation Environmental Health Laboratory in Anchorage, AK, in a cooler with frozen icepacks via overnight freight, maintaining written chain of custody documentation.[x] The lab measured total concentrations of Ag, As, Cd, Cu, Hg, Pb, Se, and Zn in each sample on a wet-weight basis, following EPA (1998) method 7473 for Hg, American Public Health Association (1992) method 2540 G for solids, and EPA (1998) method 6020A[y] for the other elements. Wet-weight data was converted to dry-weight basis by dividing by precent solids and divided by 100:

$$\text{Dry weight} = \text{wet weight} / (\text{precent solids}/100)$$

The laboratory provided Tier IV quality control information including results for sample duplicates, matrix spikes, standard reference materials, and blanks.

Data Presentation

For each site and by year, fish whole body element concentrations are presented in a figure; comparisons of element concentrations data among sites are also presented. A table with the raw data, presenting the mean value for duplicate sample results and 2024 laboratory report are provided in Appendix D.

To avoid misrepresenting sample results below method reporting limits as whole body element concentrations data, element concentrations undetected are illustrated as an empty circle (◦) at the method reporting limit, while measured element concentrations are illustrated as a solid circle (•).

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[v] In 2016 and 2019, baited minnow traps also were used to capture fish in Lower Glacier Creek.

[w] In 2017, 2018, 2020, and 2024 only six samples were retained from Middle Glacier Creek; in 2022 only one sample; in 2021 and 2023 only five samples and were retained due to scarcity of fish.

[x] In previous years, we sent samples to ALS in Kelso, WA which used EPA (2002) method 1631E for Hg.

[y] In 2016, 2018, and 2019, the same lab used EPA method 200.8 (EPA 1994).

SEDIMENT ELEMENT CONCENTRATIONS

Sample Collection and Analysis

Wearing nitrile gloves, five samples of submerged sand and silt were collected within actively flowing channels. For each sample, the top 4 cm of sediment was retained in glass jars provided by the laboratory for element analyses and plastic bags for particle size analyses. Samples were stored in a cooler with frozen icepacks in the field and in a camp refrigerator. On June 26, 2024, Constantine staff transported the sediment samples in coolers with ice packs via a courier to ALS Environmental in Whitehorse, Yukon.

ALS Environmental measured total Ag, Al, As, Cd, Cu, Fe, Hg, Pb, Se, and Zn concentrations on a dry-weight basis using methods listed in Table 6.[z] The laboratory provided quality control results for laboratory controls and blanks. Total organic carbon and acid volatile sulfide were not analyzed in 2024, which was a laboratory mistake.

Table 6.–2024 sediment tests, analytes, and methods.

Test Description	Analyte	Method
Particle size distribution	Particle size determination	ASTM D6913-17 (mod)/SSIR-51 Method 3.2.1
Mercury in soil by CVAAS	Hg	EPA 200.2 / 1631 Appendix (mod)
Metals in soil by CRC ICPMS	Ag, Al, As, Cd, Cu, Fe, Pb, Se, and Zn	EPA 6020B (mod)

Data Presentation

For each site and by year, sediment element concentrations data are presented in a figure; mean values are reported when sample duplicate data are available. Consistent with the whole body fish element concentration data presentations, sediment element concentrations undetected are illustrated as an empty circle (◦) at the method reporting limit and a solid circle (•) for measured element concentrations.

The data are compared with the threshold effects concentrations (TEC) and the probable effects concentrations (PEC) for inorganics in freshwater sediment guidelines developed by the National Oceanic and Atmospheric Administration (Buchman 2008). The guidelines are based on results of controlled laboratory bioassays, where element concentrations below the TECs rarely affect aquatic life survival and growth, and element concentrations above the PECs can affect aquatic life survival and growth.

Sediment element concentration data are also compared among sites and presented as a figure. Appendix E contains the 2016–2024 composition and raw element data in a table and the 2024 laboratory reports.

[z] The 2016 Glacier Creek sediment samples were processed by an ALS Environmental lab in Kelso, WA. In 2017–2024, Constantine sent the sediment samples to a different ALS lab in Whitehorse; though methods used by each lab were different, the results are comparable. The parameters analyzed were different between labs; data comparisons between years are presented where applicable.

RESULTS

LOWER GLACIER CREEK SITE

We sampled Lower Glacier Creek on June 3, 2024, and collected BMI samples and measured basic water quality at 1740 hours (Table 7). We collected periphyton and fish samples on June 19, 2024.

Table 7.–Lower Glacier Creek water quality data.

Sample Date	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	Turbidity (NTU)	pH
6/3/2024	6.1	10.6	238.6	29.8	ND

Periphyton: Chlorophyll Density and Composition

The Lower Glacier Creek mean Chl-*a* density was 0.50 mg/m^2, the second lowest mean density recorded at this site (Table 8; Figure 11). The samples contained about 87% Chl-*a*, 13% Chl-*c*, and 0% Chl-*b* (Figure 12). Chl-*b* was not detected in any samples.

Table 8.–Lower Glacier Creek mean chlorophylls *a*, *b*, and *c* densities.

Sample Date	Chl-*a* (mg/m^2)	Chl-*b* (mg/m^2)	Chl-*c* (mg/m^2)
6/7/2016	2.27 ± 1.07	0.00	0.35
6/8/2017	1.73 ± 0.89	0.00	0.26
5/30/2018	1.25 ± 1.09	0.02	0.24
6/6/2019	0.43 ± 0.56	0.01	0.04
6/3/2020	3.91 ± 3.03	0.00	0.47
6/16/2021	0.77 ± 0.83	0.02	0.24
6/13/2022	1.85 ± 1.63	0.00	0.39
6/7/2023	5.51 ± 1.75	0.00	0.69
6/19/2024	0.50 ± 0.55	0.00	0.06

Note: Chl-*a* mean density ± 1 SD.

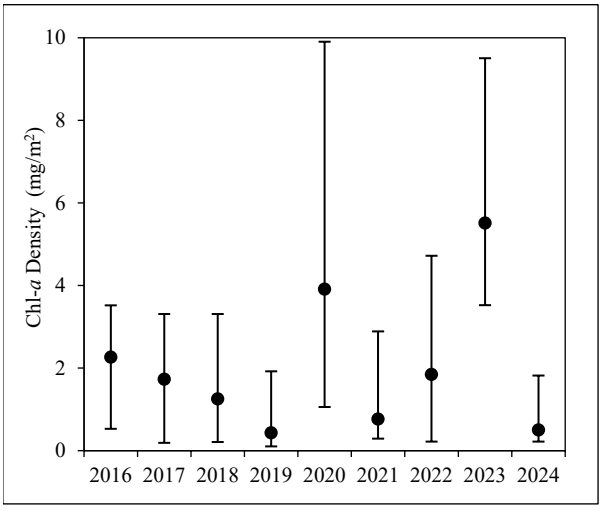

Figure 11.–Lower Glacier Creek chlorophyll *a* densities.

Note: Minimum, mean, and maximum values shown.

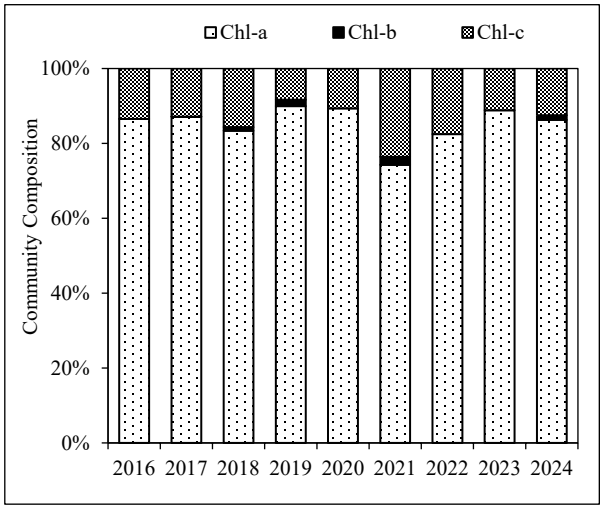

Figure 12.–Lower Glacier Creek mean proportions of chlorophylls *a*, *b*, and *c*.

Benthic Macroinvertebrate Density and Community Composition

Among the 2024 Lower Glacier Creek BMI samples, we identified 27 taxa and estimated mean density at 1,208 BMI/m^2, of which 30% were EPT insects (Table 9; Figures 13, 14). Like previous years, the dominant taxon was Diptera: Chironomidae, representing 67% of the samples.

Table 9.–Lower Glacier Creek benthic macroinvertebrate data summaries.

	6/7/2016	6/8/2017	5/30/2018	6/6/2019	6/3/2020	6/16/2021	6/13/2022	6/7/2023	6/3/2024
Mean BMI density (per m^2)	995	2,136	217	473	754	396	1,136	3,462	1,208
Total BMI taxa	17	30	16	12	25	26	30	12	27
Number of EPT taxa	9	13	10	5	12	12	14	9	11
Proportion of EPT insects	10%	17%	69%	30%	19%	27%	21%	15%	30%
Proportion of Chironomidae insects	85%	78%	26%	67%	74%	58%	71%	85%	67%

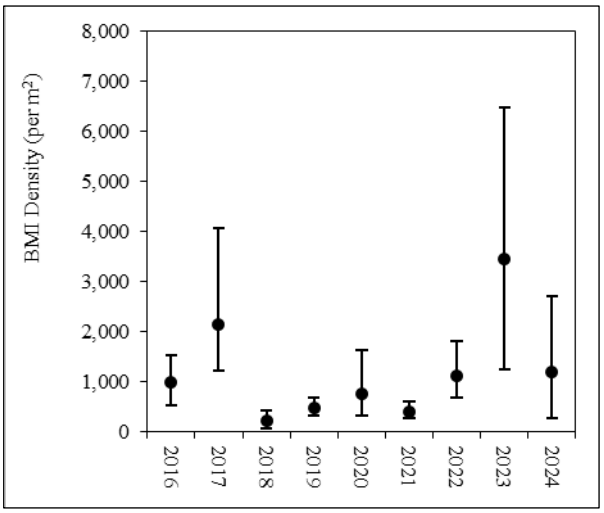

Figure 13.–Lower Glacier Creek benthic macroinvertebrate densities.

Note: Minimum, mean, and maximum values shown.

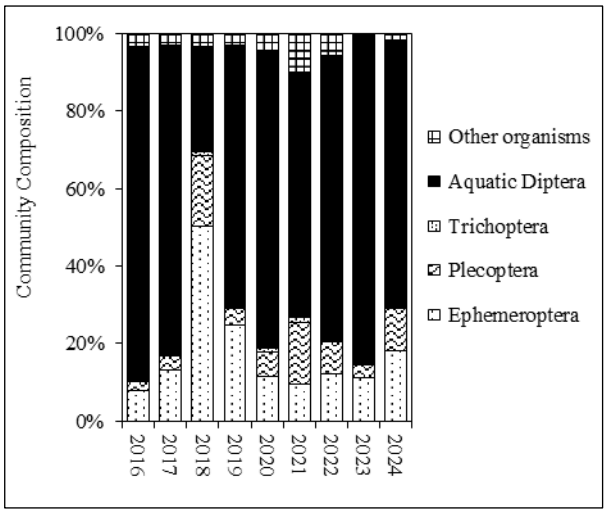

Figure 14.–Lower Glacier Creek mean benthic macroinvertebrate community compositions.

Resident Fish Condition and Element Concentrations

Of the ten individual whole body Dolly Varden (78–136 mm) samples we retained from Lower Glacier Creek in 2024, mean fish condition was 1.2. We captured several juvenile cutthroat trout (40–100 mm FL) throughout our sampling efforts. Among the Lower Glacier Creek whole body Dolly Varden samples in 2024 element concentrations were generally within the ranges of values previously observed (Figure 15).

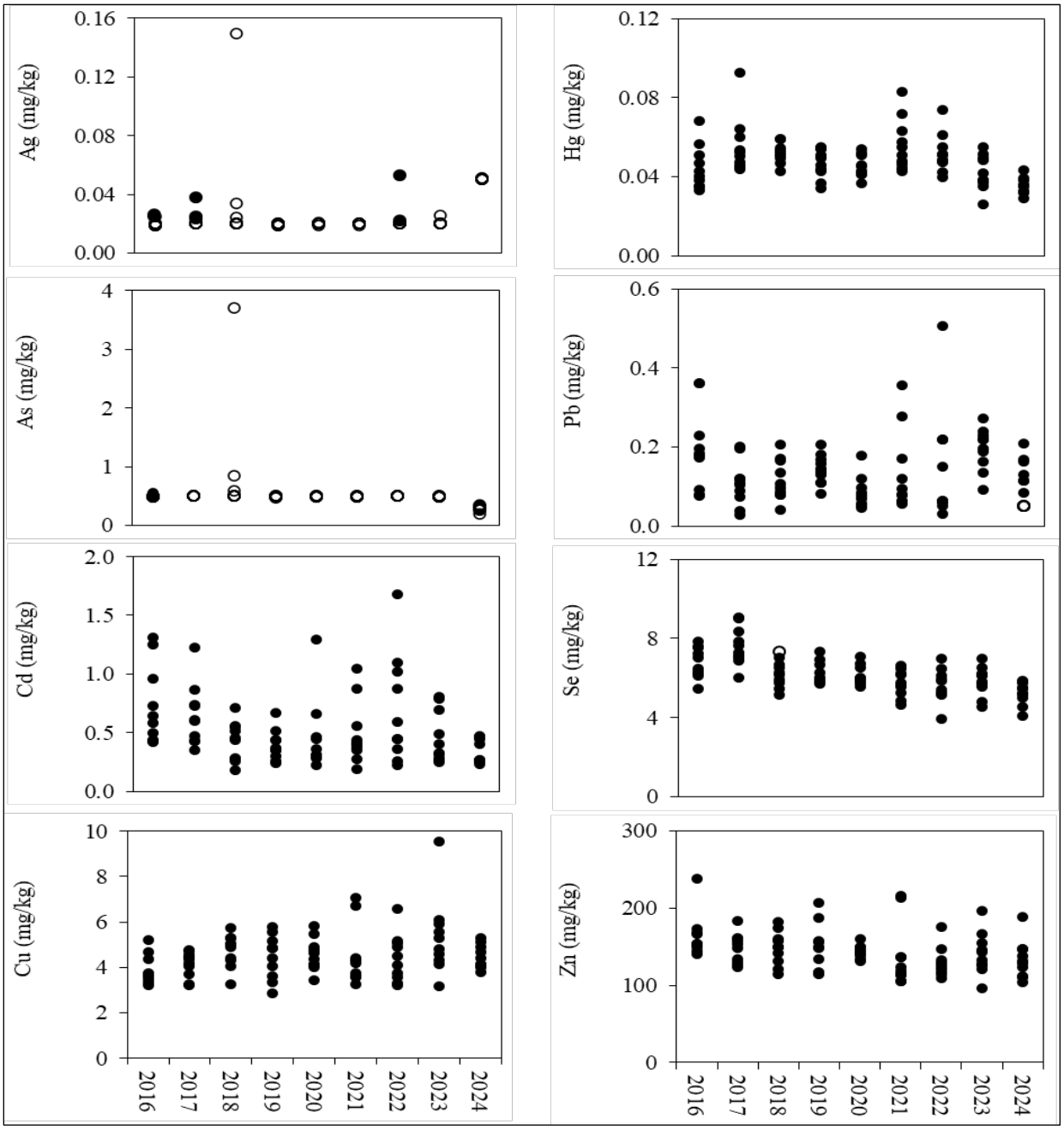

Figure 15.–Lower Glacier Creek whole body Dolly Varden element concentrations.
Note: Element concentrations undetected (o) are presented at the method reporting limit.

Sediment Composition and Element Concentrations

The 2024 Lower Glacier Creek sediment samples included particle sizes less than 9.5 mm, with the majority under 1 mm. The predominant elements were Fe and Al, and the 2024 element concentrations generally were like the 2016–2023 results (Figure 16).

We evaluated the 2024 sediment sample element concentration data against the guidelines for freshwater sediments published in Buchman (2008) and—like the 2016–2023 results—we found Cd, Cu, and Zn concentrations near or above the TEC values, and As, Hg, and Pb concentrations below the TEC values.

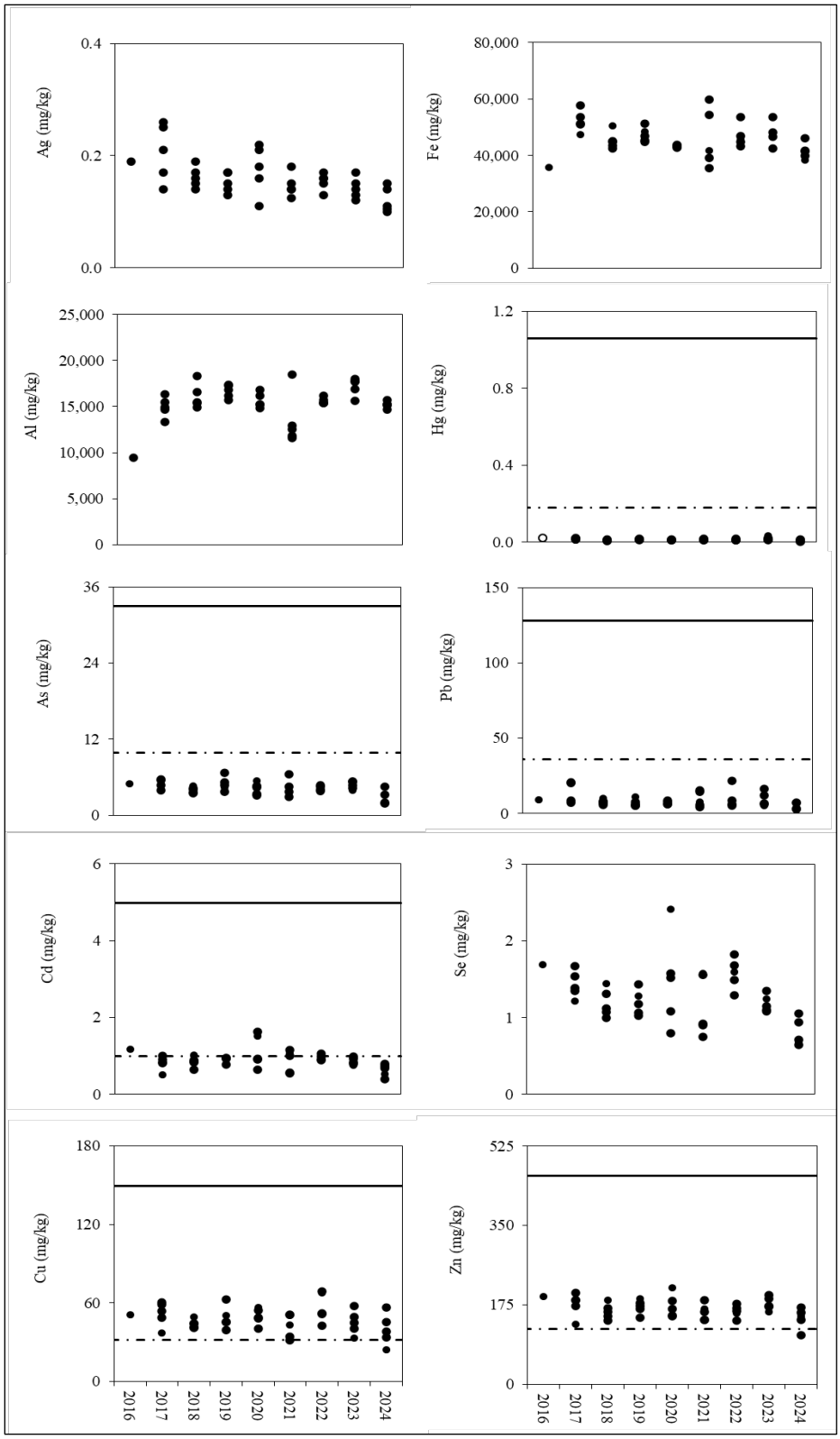

Figure 16.–Lower Glacier Creek sediment element concentrations.

Note: Element concentrations undetected (o) are presented at the method reporting limit. The dashed line represents the TEC and the solid line represents the PEC for freshwater sediments (Buchman 2008); guidelines are not published for Ag, Al, Fe, or Se.

MIDDLE GLACIER CREEK SITE

We sampled Middle Glacier Creek on June 3, 2024, and collected BMI samples and measured basic water quality at 1518 hours (Table 10). We collected periphyton and fish samples on June 19, 2024.

Table 10.–Middle Glacier Creek water quality data.

Sample Date	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	Turbidity (NTU)	pH
6/3/2024	3.9	12.8	ND	31.6	ND

Periphyton: Chlorophyll Density and Composition

The 2024 Middle Glacier Creek mean Chl-*a* density was 3.70 mg/m^2, the second highest mean density measured at this site (Table 11; Figure 17). As in previous years, the samples contained about 89% Chl-*a* and 11% Chl-*c*; Chl-*b* was not detected in any samples (Figure 18).

Table 11.–Middle Glacier Creek mean chlorophylls *a*, *b*, and *c* densities.

Sample Date	Chl-*a* (mg/m^2)	Chl-*b* (mg/m^2)	Chl-*c* (mg/m^2)
6/8/2016	1.50 ± 1.18	0.00	0.25
6/9/2017	0.81 ± 0.45	0.00	0.10
5/31/2018	1.76 ± 0.79	0.00	0.29
6/7/2019	0.33 ± 0.24	0.01	0.04
6/2/2020	1.19 ± 0.89	0.01	0.16
6/15/2021	2.03 ± 2.38	0.00	0.25
6/14/2022	0.97 ± 0.92	0.00	0.27
6/6/2023	4.26 ± 1.85	0.00	0.58
6/19/2024	3.70 ± 2.81	0.00	0.44

Note: Chl-*a* mean density ± 1 SD.

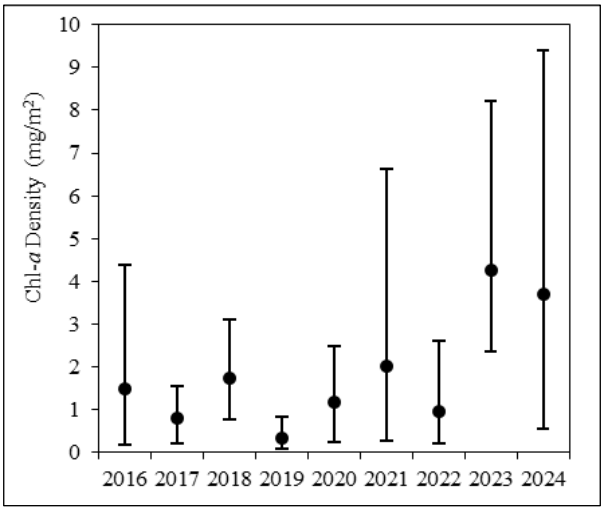

Figure 17.–Middle Glacier Creek chlorophyll *a* densities.

Note: Minimum, mean, and maximum values shown.

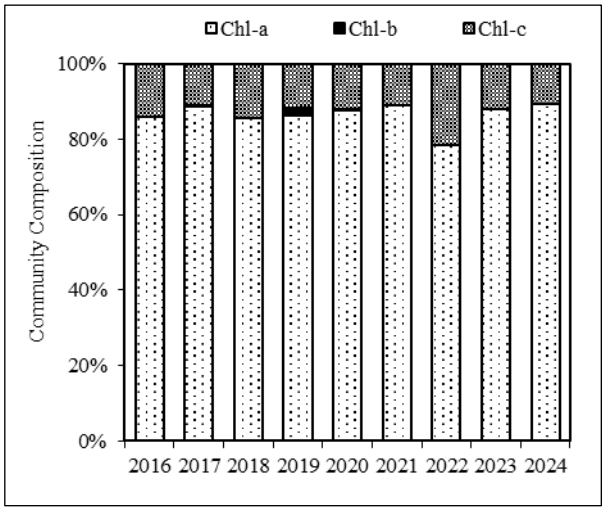

Figure 18.–Middle Glacier Creek mean proportions of chlorophylls *a*, *b*, and *c*.

Benthic Macroinvertebrate Density and Community Composition

Among the 2024 Middle Glacier Creek BMI samples, we identified 12 taxa and estimate mean density at 1,400 BMI/m^2, of which 8% were EPT insects (Table 12; Figures 19, 20). As in previous years, the dominant taxon was Diptera: Chironomidae, representing 88% of the samples.

Table 12.–Middle Glacier Creek benthic macroinvertebrate data summaries.

	6/8/2016	6/9/2017	5/31/2018	6/7/2019	6/2/2020	6/15/2021	6/14/2022	6/6/2023	6/3/2024
Mean BMI density (per m^2)	2,299	593	504	215	754	842	1,192	1,220	1,400
Total BMI taxa	22	14	12	11	25	27	25	17	12
Number of EPT taxa	12	6	5	8	13	11	13	10	6
Proportion of EPT insects	13%	12%	9%	28%	24%	33%	12%	29%	8%
Proportion of Chironomidae insects	85%	82%	87%	68%	69%	57%	79%	70%	88%

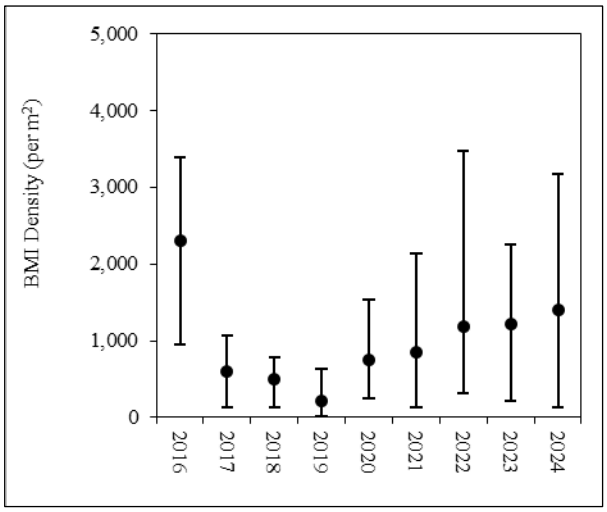

Figure 19.–Middle Glacier Creek benthic macroinvertebrate densities.

Note: Minimum, mean, and maximum values shown.

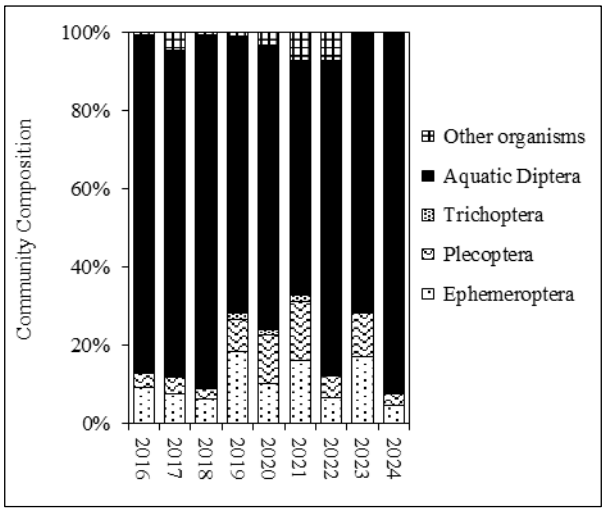

Figure 20.–Middle Glacier Creek mean benthic macroinvertebrate community compositions.

Resident Fish Condition and Element Concentrations

We retained six Dolly Varden (76–140 mm) for whole body element analyses from Middle Glacier Creek in 2024, and mean fish condition was 1.2. We were unable to capture additional fish within the sample size range, and we did not capture other fish species. The 2024 whole body Dolly Varden element concentrations were within the range of concentrations observed in 2016–2023 (Figure 21).

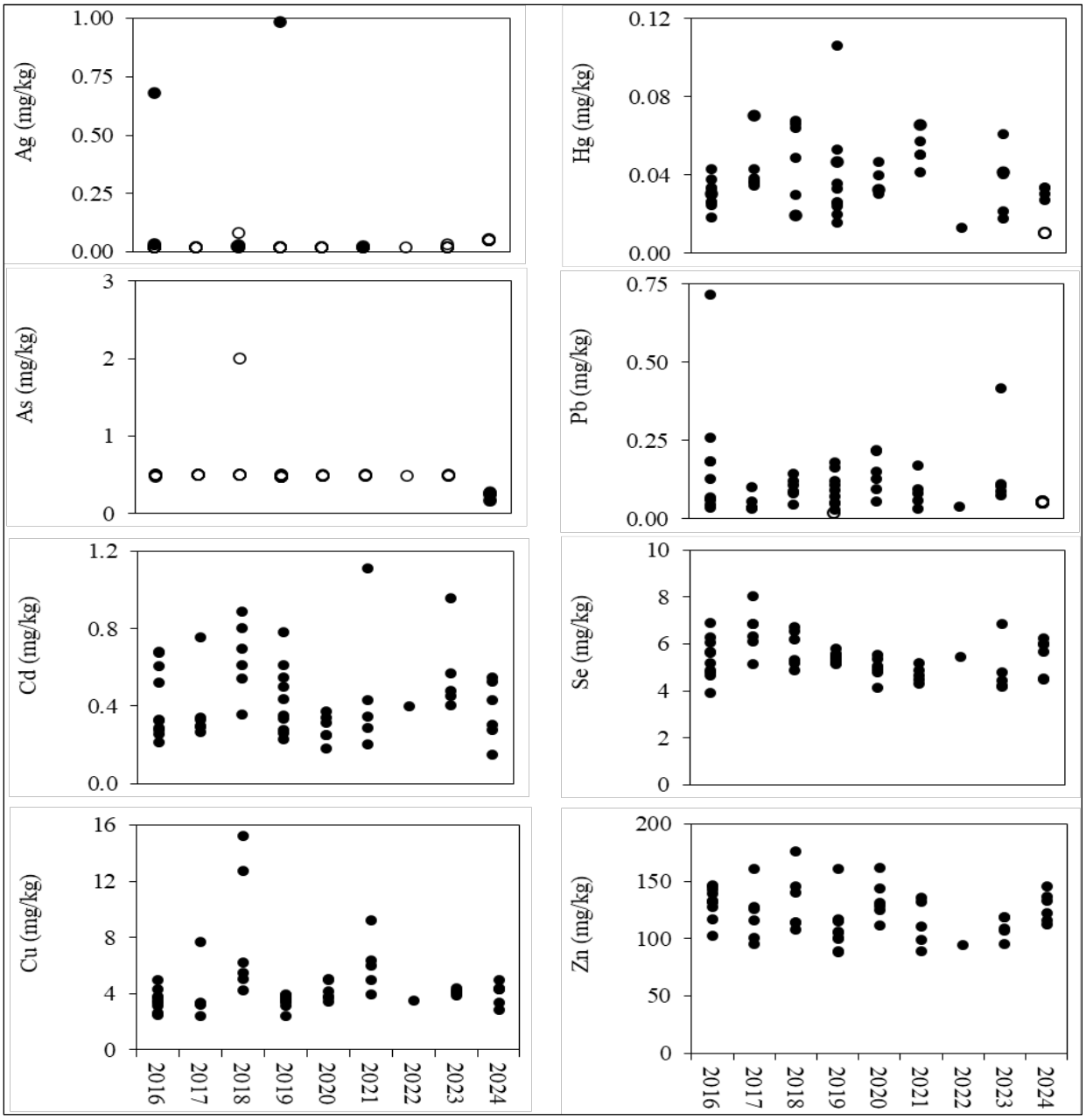

Figure 21.–Middle Glacier Creek whole body Dolly Varden element concentrations.
Note: Element concentrations undetected (o) are presented at the method reporting limit.

Sediment Composition and Element Concentrations

The 2024 Middle Glacier Creek sediment samples largely included particle sizes less than 9.5 mm with the majority under 1 mm. The predominant elements were Fe and Al, and the 2024 element concentrations generally were similar to the 2016–2023 results; however, Se concentrations were lower and less variable compared to prior sample years (Figure 22).

We evaluated the 2024 sediment sample element concentration data against the guidelines for freshwater sediments published in Buchman (2008) and—like the 2016–2023 results—we found Cd, Cu, and Zn concentrations near or above the TEC values, and As, Hg, and Pb concentrations below the TEC values.

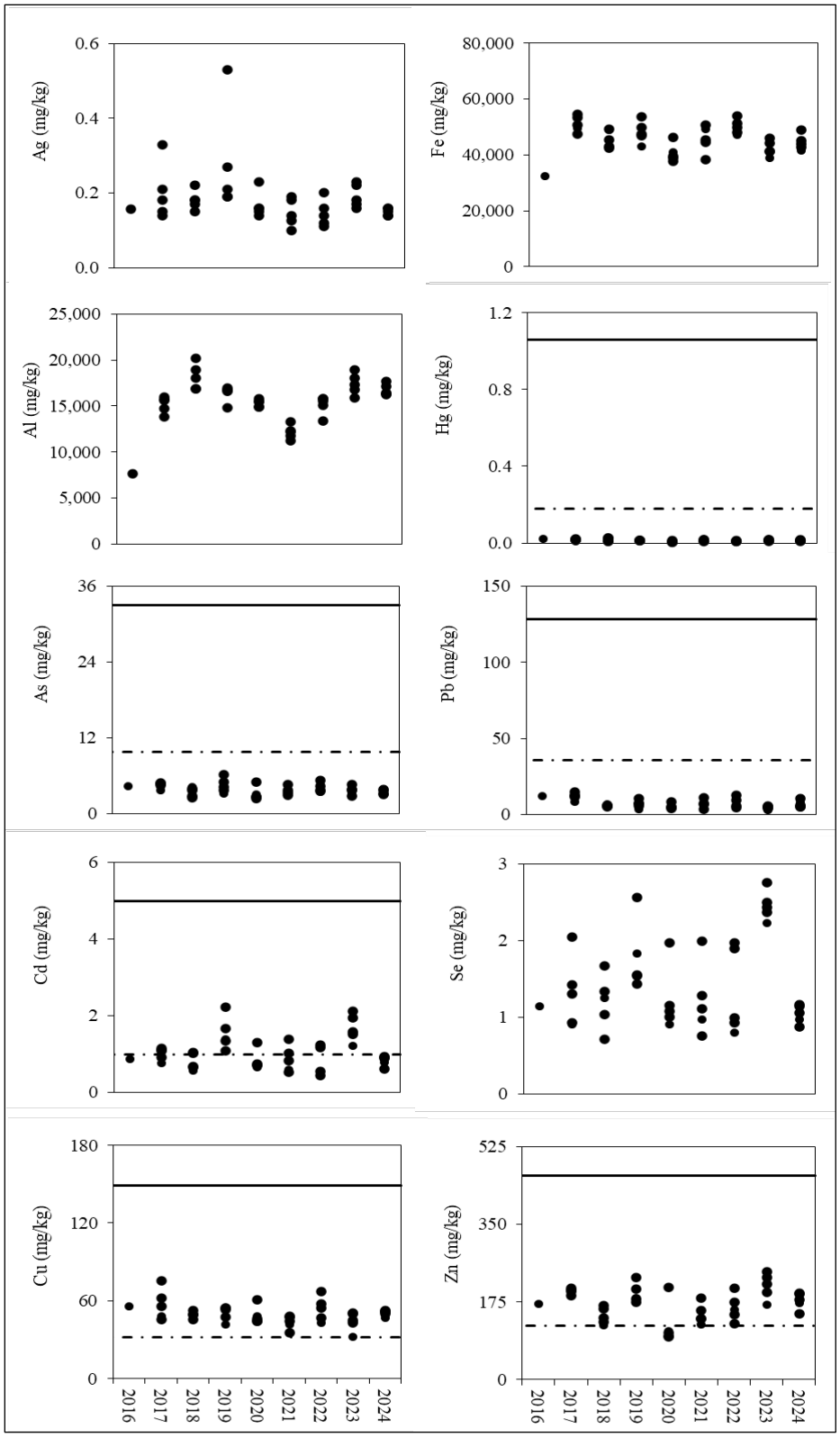

Figure 22.–Middle Glacier Creek sediment element concentrations.

Note: Element concentrations undetected (o) are presented at the method reporting limit. The dashed line represents the TEC and the solid line represents the PEC for freshwater sediments (Buchman 2008); guidelines are not published for Ag, Al, Fe, or Se.

LOWER SARAH CREEK SITE

We sampled Lower Sarah Creek on June 4, 2024, and collected BMI samples and measured basic water quality at 1220 hours (Table 13). We collected periphyton and fish samples on June 19, 2024.

Table 13.–Lower Sarah Creek water quality data.

Sample Date	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	Turbidity (NTU)	pH
6/4/2024	5.2	12.0	216.2	10.1	ND

Periphyton: Chlorophyll Density and Composition

The 2024 Lower Sarah Creek mean Chl-*a* density was 3.68 mg/m^2 (Table 14; Figures 23, 24). The samples contained about 91% Chl-*a*, 9% Chl-*c*, and 0% Chl-*b* (Figure 20). Chl-*b* was not detected in any sample.

Table 14.–Lower Sarah Creek mean chlorophylls *a*, *b*, and *c* densities.

Sample Date	Chl-*a* (mg/m^2)	Chl-*b* (mg/m^2)	Chl-*c* (mg/m^2)
6/19/2024	3.68 ± 3.37	0.00	0.36

Note: Chl-*a* mean density ± 1 SD.

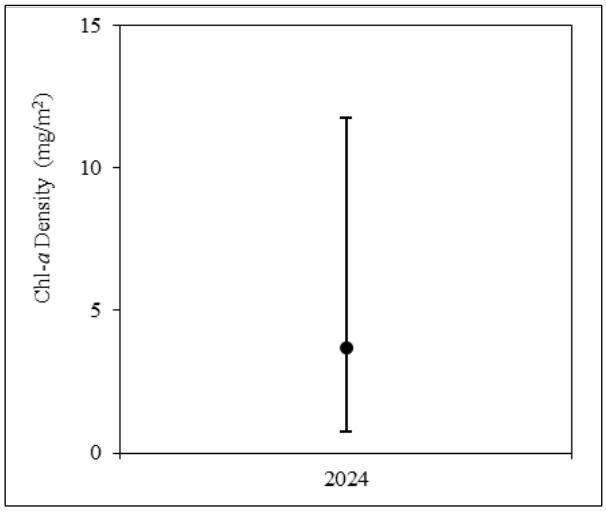

Figure 23.–Lower Sarah Creek chlorophyll *a* densities.

Note: Minimum, mean, and maximum values shown.

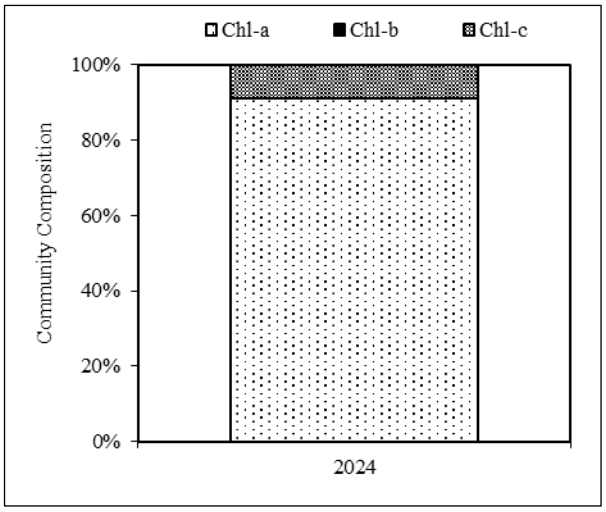

Figure 24.–Lower Sarah Creek mean proportions of chlorophylls *a*, *b*, and *c*.

Benthic Macroinvertebrate Density and Community Composition

Among the 2024 Lower Sarah Creek BMI samples, we identified 26 taxa and estimated mean density at 579 BMI/m^2, of which 50% were EPT insects (Table 15; Figures 25, 26). The dominant taxa were Ephemeroptera: *Baetis*, representing 33% and Diptera: Chironomidae, representing 25% of the samples.

Table 15.–Lower Sarah Creek benthic macroinvertebrate data summaries.

	6/4/2024
Mean BMI density (per m^2)	579
Total BMI taxa	26
Number of EPT taxa	13
Proportion of EPT insects	50%
Proportion of Chironomidae insects	25%

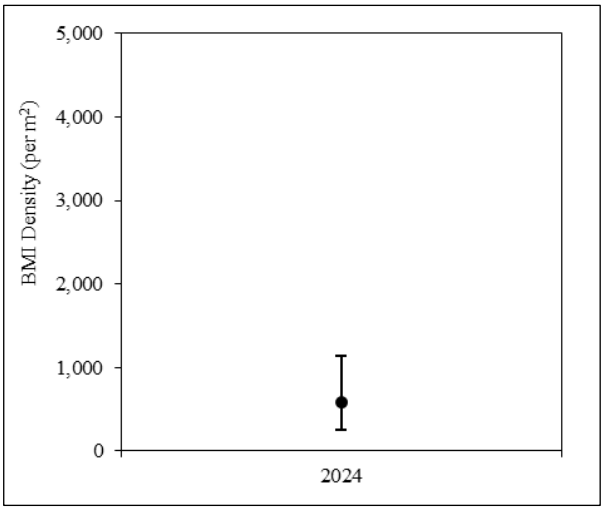

Figure 25.–Lower Sarah Creek benthic macroinvertebrate densities.

Note: Minimum, mean, and maximum values shown.

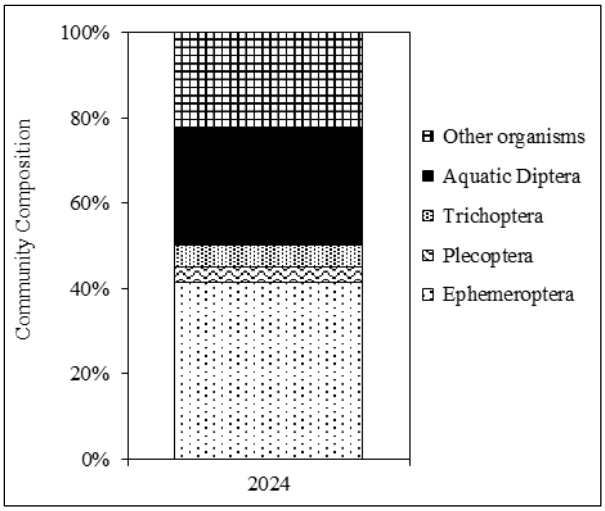

Figure 26.–Lower Sarah Creek mean benthic macroinvertebrate community compositions.

Resident Fish Condition and Element Concentrations

Due to fish scarcity within the desired size range, we only retained five Dolly Varden and one juvenile coho salmon within the size range. A second sampling event yielded no additional fish within the target size range. Of the five whole body Dolly Varden (75–97 mm) samples and the one coho salmon (82 mm) sample we retained from Lower Sarah Creek in 2024, mean fish condition was 1.2 for both Dolly Varden and coho salmon. We captured several young-of-year juvenile coho salmon throughout our sampling efforts that were too small to retain. Element concentrations are presented in Figure 27.

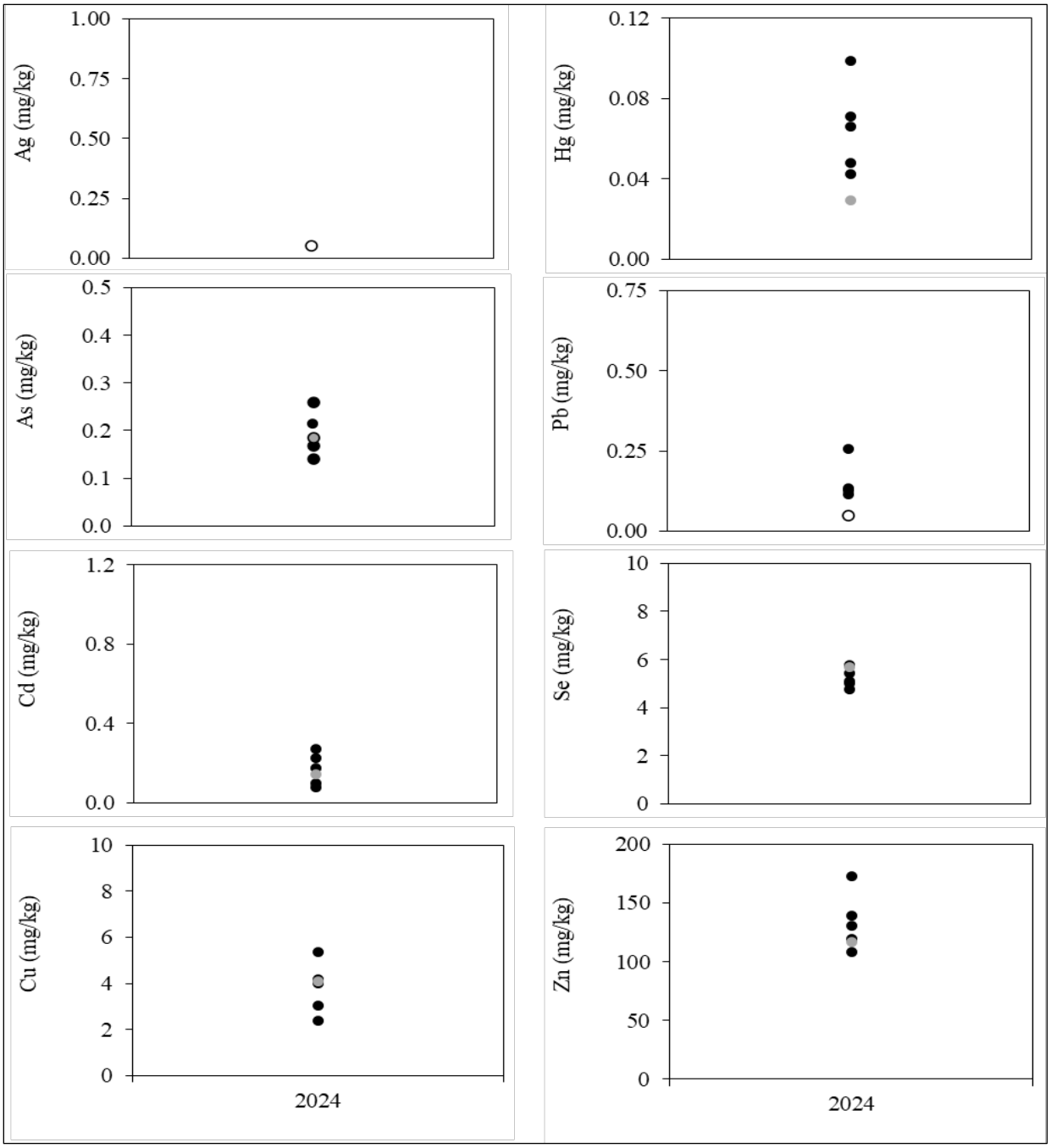

Figure 27.–Lower Sarah Creek whole body fish element concentrations.
Note: Element concentrations undetected (o) are presented at the method reporting limit.
Note: Element concentrations of juvenile coho salmon are represented by gray points.

Sediment Composition and Element Concentrations

The 2024 Lower Sarah Creek sediment samples included particle sizes less than 4.75 mm with the majority under 1 mm. The predominant elements were Fe and Al (Figure 28).

We evaluated the 2024 sediment sample element concentration data against the guidelines for freshwater sediments published in Buchman (2008) and we found Cd, Cu, and Zn concentrations near or above the TEC values, and As, Hg, and Pb concentrations below the TEC values.

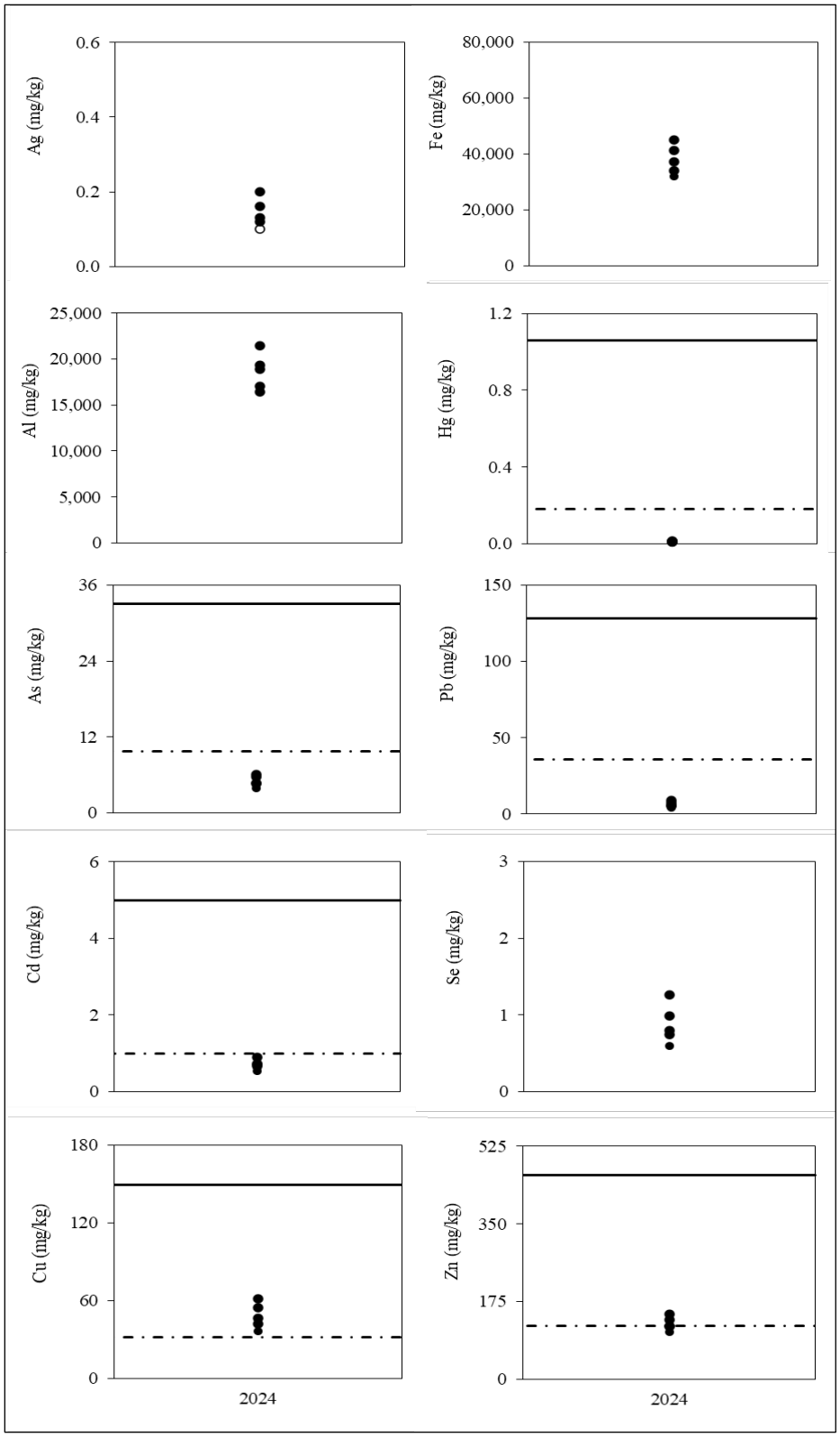

Figure 28.–Lower Sarah Creek sediment element concentrations.

Note: Element concentrations undetected (o) are presented at the method reporting limit. The dashed line represents the TEC and the solid line represents the PEC for freshwater sediments (Buchman 2008); guidelines are not published for Ag, Al, Fe, or Se.

UPPER SARAH CREEK SITE

We sampled Upper Sarah Creek on June 4, 2024, and collected BMI samples and measured basic water quality at 1330 hours (Table 16). We collected periphyton and fish samples on June 19, 2024.

Table 16.–Lower Sarah Creek water quality data.

Sample Date	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	Turbidity (NTU)	pH
6/4/2024	5.1	13.3	213	17.6	ND

Periphyton: Chlorophyll Density and Composition

The 2024 Upper Sarah Creek mean Chl-*a* density was 4.12 mg/m^2 (Table 17; Figure 29). The samples contained about 90% Chl-*a*, 10% Chl-*c*, and <1% Chl-*b* (Figure 30). Chl-*b* was detected in 1 sample.

Table 17.–Upper Sarah Creek mean chlorophylls *a*, *b*, and *c* densities.

Sample Date	Chl-*a* (mg/m^2)	Chl-*b* (mg/m^2)	Chl-*c* (mg/m^2)
6/19/2024	4.12 ± 2.45	0.01	0.45

Note: Chl-*a* mean density ± 1 SD.

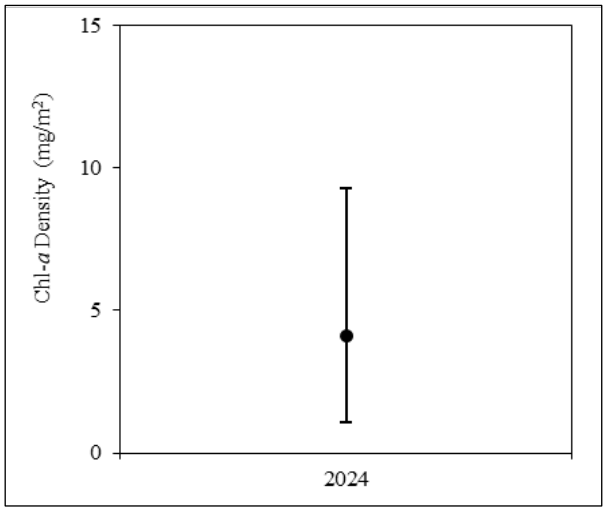

Figure 29.–Upper Sarah Creek chlorophyll *a* densities.

Note: Minimum, mean, and maximum values shown.

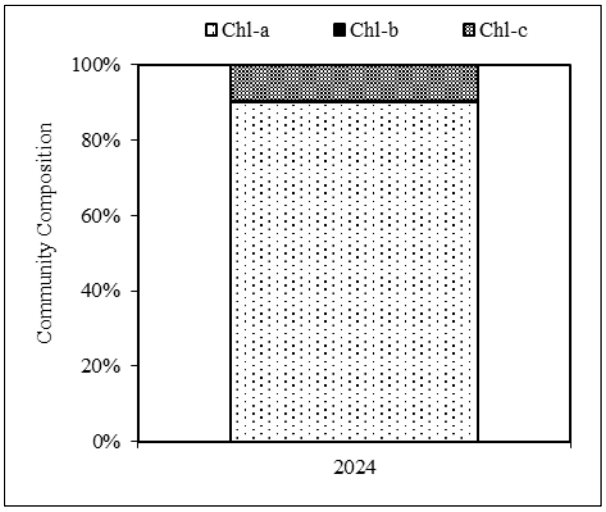

Figure 30.–Upper Sarah Creek mean proportions of chlorophylls *a*, *b*, and *c*.

Benthic Macroinvertebrate Density and Community Composition

Among the 2024 Upper Sarah Creek BMI samples, we identified 30 taxa and estimated mean density at 1,565 BMI/m^2, of which 75% were EPT insects (Table 18; Figures 31, 32). The dominant taxon was Ephemeroptera: *Baetis*, representing 55% of the samples.

Table 18.–Upper Sarah Creek benthic macroinvertebrate data summaries.

	6/4/2024
Mean BMI density (per m^2)	1,565
Total BMI taxa	30
Number of EPT taxa	16
Proportion of EPT insects	75%
Proportion of Chironomidae insects	13%

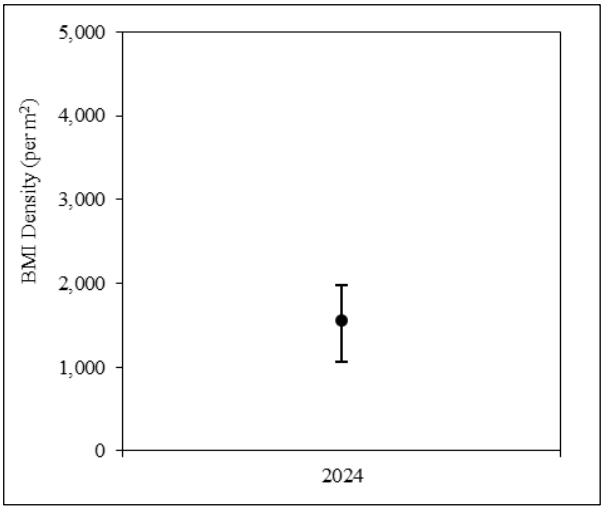

Figure 31.–Upper Sarah Creek benthic macroinvertebrate densities.

Note: Minimum, mean, and maximum values shown.

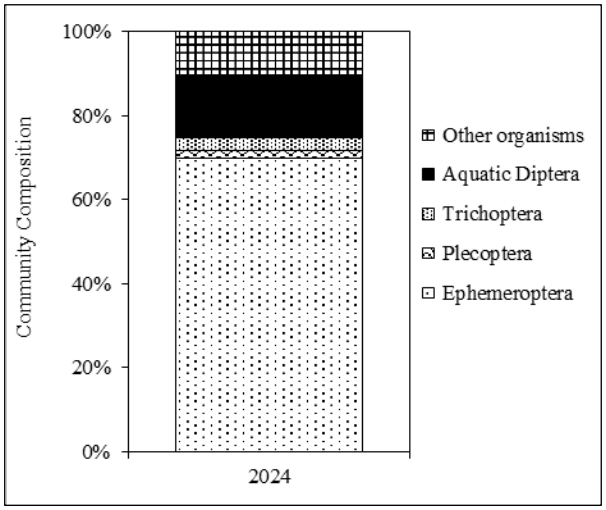

Figure 32.–Upper Sarah Creek mean benthic macroinvertebrate community compositions.

Resident Fish Condition and Element Concentrations

Of the ten whole body Dolly Varden (80–125 mm) samples we retained from Upper Sarah Creek in 2024, mean fish condition was 1.0. Of the elements, Se and Zn showed higher variability between samples than other elements (Figure 33).

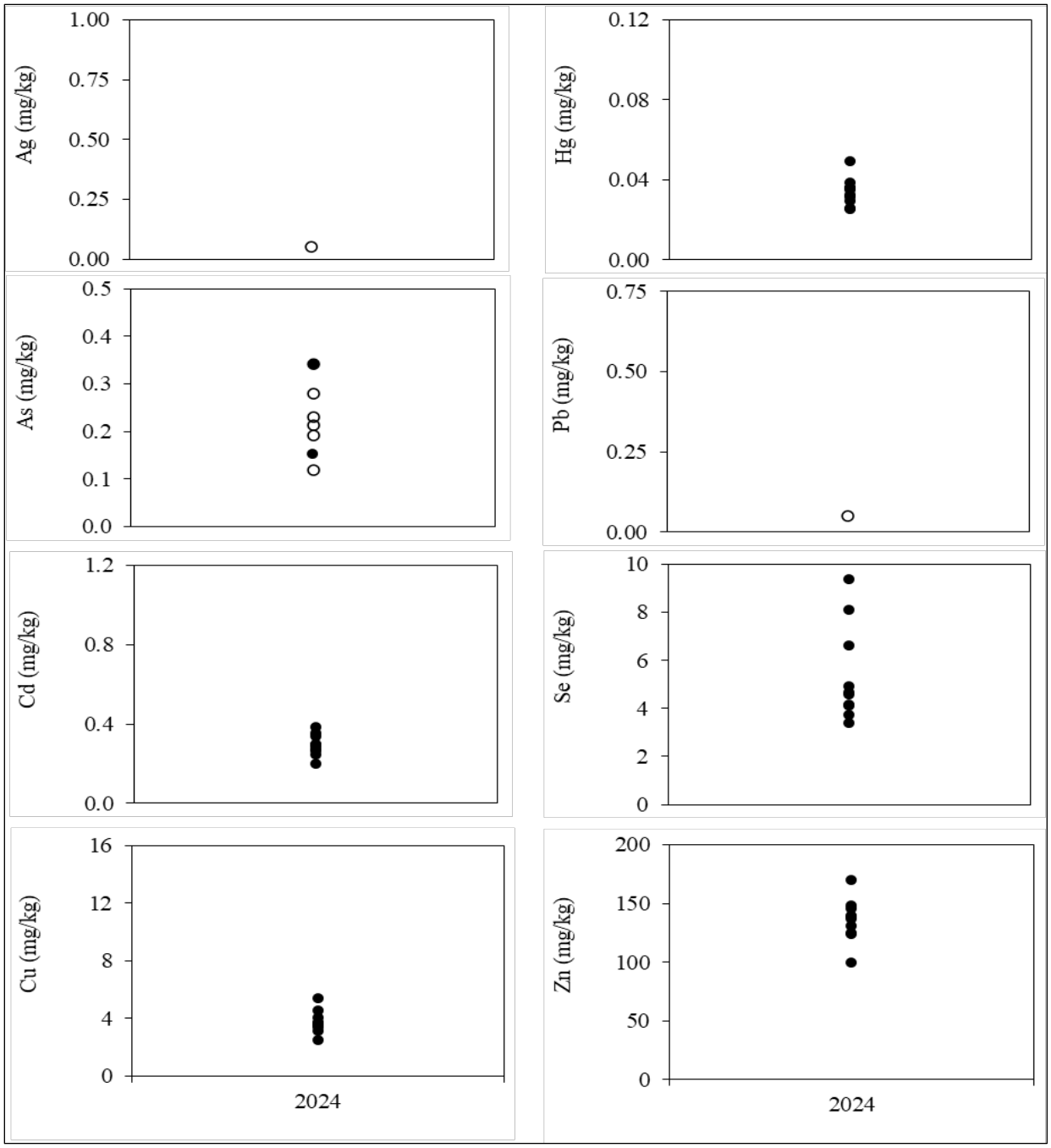

Figure 33.–Upper Sarah Creek whole body Dolly Varden element concentrations.
Note: Element concentrations undetected (o) are presented at the method reporting limit.

Sediment Composition and Element Concentrations

The 2024 Upper Sarah Creek sediment samples included particle sizes less than 9.5 mm with the majority under 1 mm. The predominant elements were Fe and Al, (Figure 34).

We evaluated the 2024 sediment sample element concentration data against the guidelines for freshwater sediments published in Buchman (2008) and we found Cd, Cu, and Zn concentrations near or above the TEC values, and As, Hg, and Pb concentrations below the TEC values.

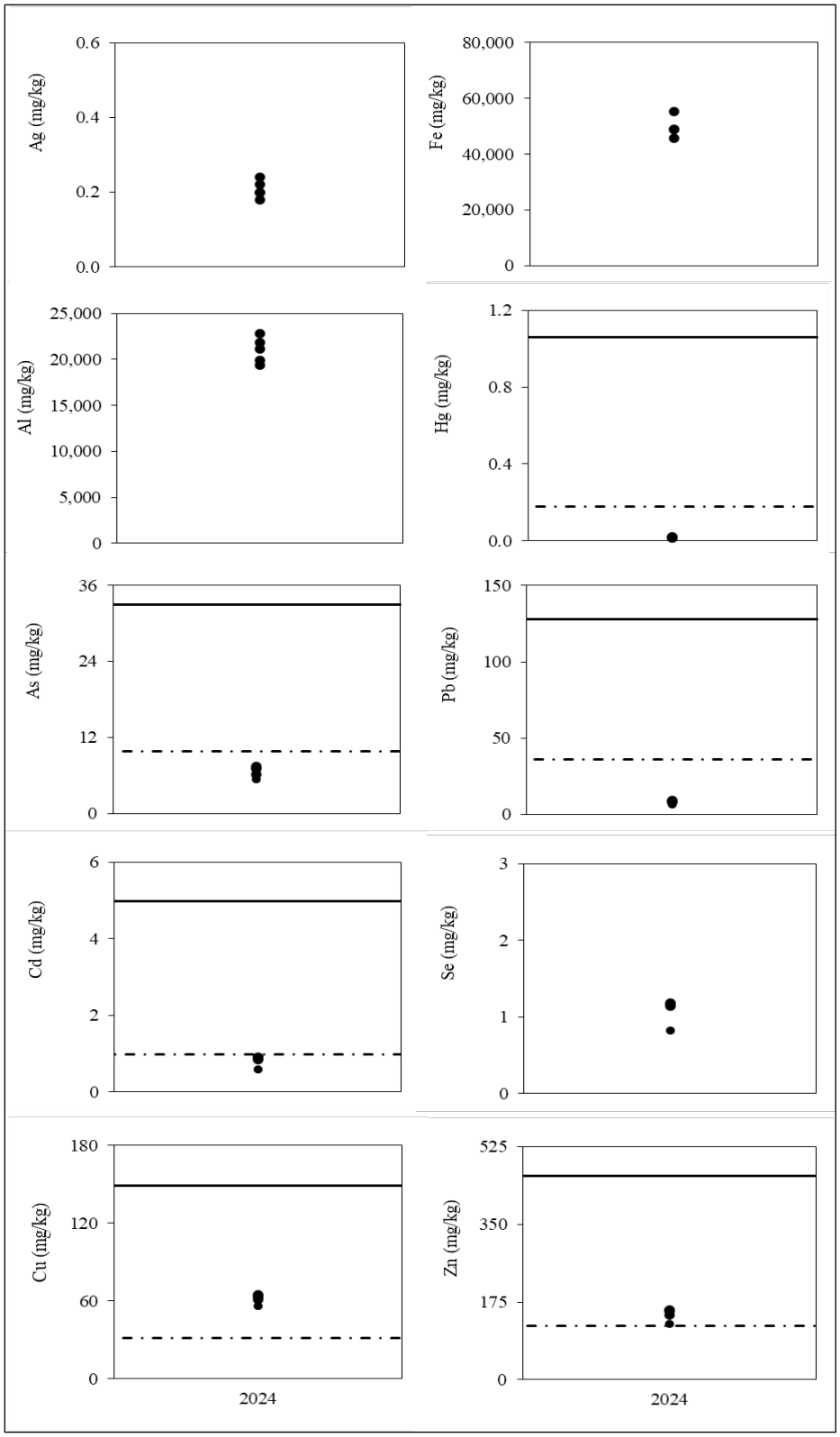

Figure 34.–Upper Sarah Creek sediment element concentrations.

Note: Element concentrations undetected (o) are presented at the method reporting limit. The dashed line represents the TEC and the solid line represents the PEC for freshwater sediments (Buchman 2008); guidelines are not published for Ag, Al, Fe, or Se.

PLATEAU CREEK SITE

We sampled Plateau Creek on June 4, 2024, and collected BMI samples and measured basic water quality at 1000 hours (Table 19). We collected periphyton and fish samples on June 19, 2024.

Table 19.–Plateau Creek water quality data.

Sample Date	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	Turbidity (NTU)	pH
6/4/2024	3.8	11.7	117	3.09	ND

Periphyton: Chlorophyll Density and Composition

The 2024 Plateau Creek mean Chl-*a* density was 18.70 mg/m^2 (Table 20; Figure 35). The samples contained about 81% Chl-*a*, 19% Chl-*c*, and 0% Chl-*b* (Figure 36). Chl-*b* was not detected in any of the samples.

Table 20.–Plateau Creek mean chlorophylls *a*, *b*, and *c* densities.

Sample Date	Chl-*a* (mg/m^2)	Chl-*b* (mg/m^2)	Chl-*c* (mg/m^2)
6/19/2024	18.70 ± 8.55	0.00	4.38

Note: Chl-*a* mean density ± 1 SD.

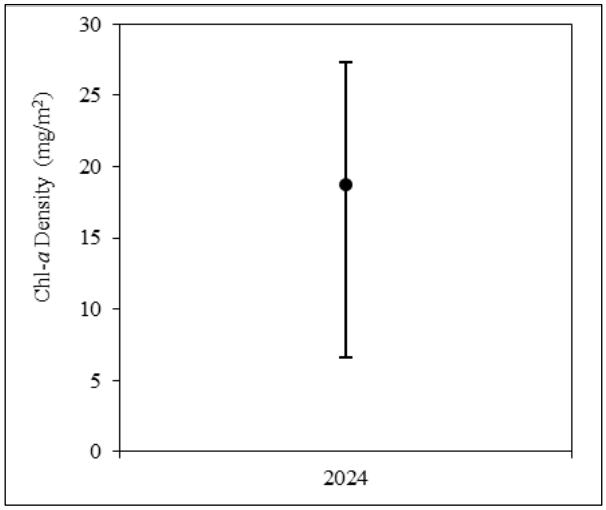

Figure 35.–Plateau Creek chlorophyll *a* densities.

Note: Minimum, mean, and maximum values shown.

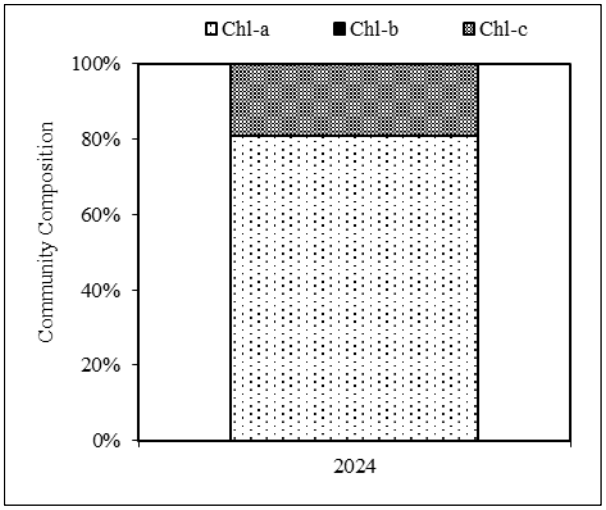

Figure 36.–Plateau Creek mean proportions of chlorophylls *a*, *b*, and *c*.

Benthic Macroinvertebrate Density and Community Composition

Among the 2024 Plateau Creek BMI samples, we identified 25 taxa and estimated mean density at 934 BMI/m^2, of which 60% were EPT insects (Table 21; Figures 37, 38). The dominant taxa were Diptera: Chironomidae, representing 31% and Ephemeroptera: *Baetis*, representing 23% of the samples.

Table 21.–Plateau Creek benthic macroinvertebrate data summaries.

	6/4/2024
Mean BMI density (per m^2)	934
Total BMI taxa	25
Number of EPT taxa	14
Proportion of EPT insects	60%
Proportion of Chironomidae insects	31%

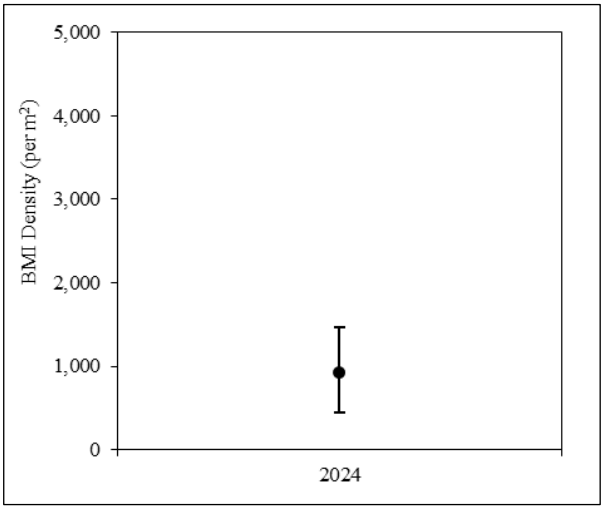

Figure 37.–Plateau Creek benthic macroinvertebrate densities.

Note: Minimum, mean, and maximum values shown.

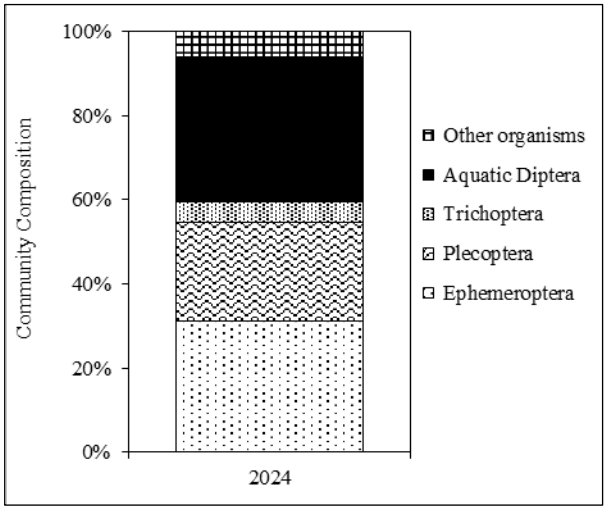

Figure 38.–Plateau Creek mean benthic macroinvertebrate community compositions.

Resident Fish Condition and Element Concentrations

Of the ten whole body fish retained at Plateau Creek, seven were cutthroat trout (94–113 mm) and three were Dolly Varden (90–120), mean fish condition was 1.0 for both cutthroat trout and Dolly Varden. Cd, and Hg showed higher variability between samples than other elements (Figure 39).

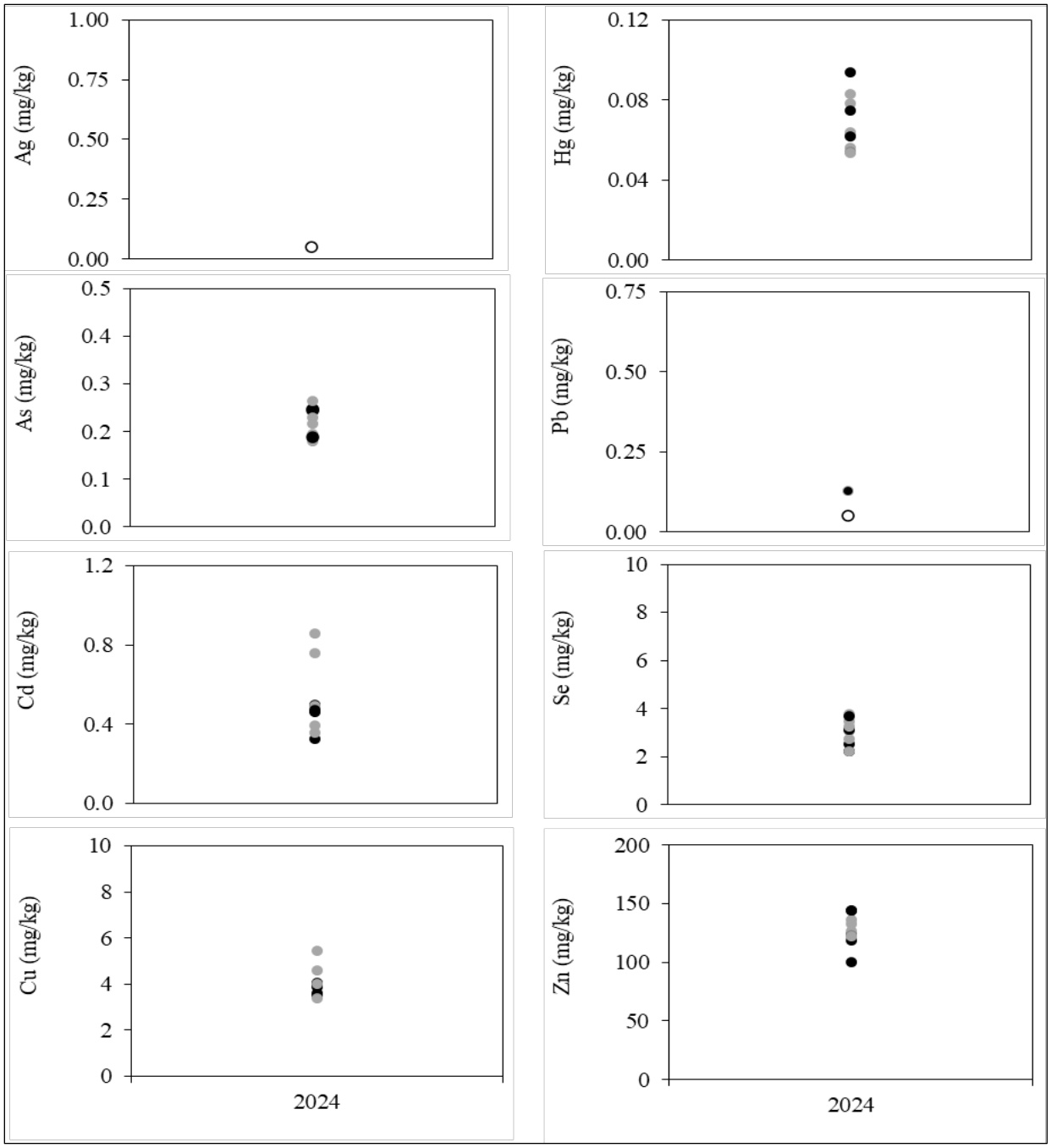

Figure 39.–Plateau Creek whole body fish element concentrations.
Note: Element concentrations undetected (o) are presented at the method reporting limit.
Note: Element concentrations of juvenile cutthroat trout are represented by gray points.

Sediment Composition and Element Concentrations

The 2024 Plateau Creek sediment samples included particle sizes less than 9.5 mm with the majority under 1 mm. The predominant elements were Fe and Al (Figure 40).

We evaluated the 2024 sediment sample element concentration data against the guidelines for freshwater sediments published in Buchman (2008) and we found Cd, Cu, and Zn concentrations near or above the TEC values, and As, Hg, and Pb concentrations below the TEC values.

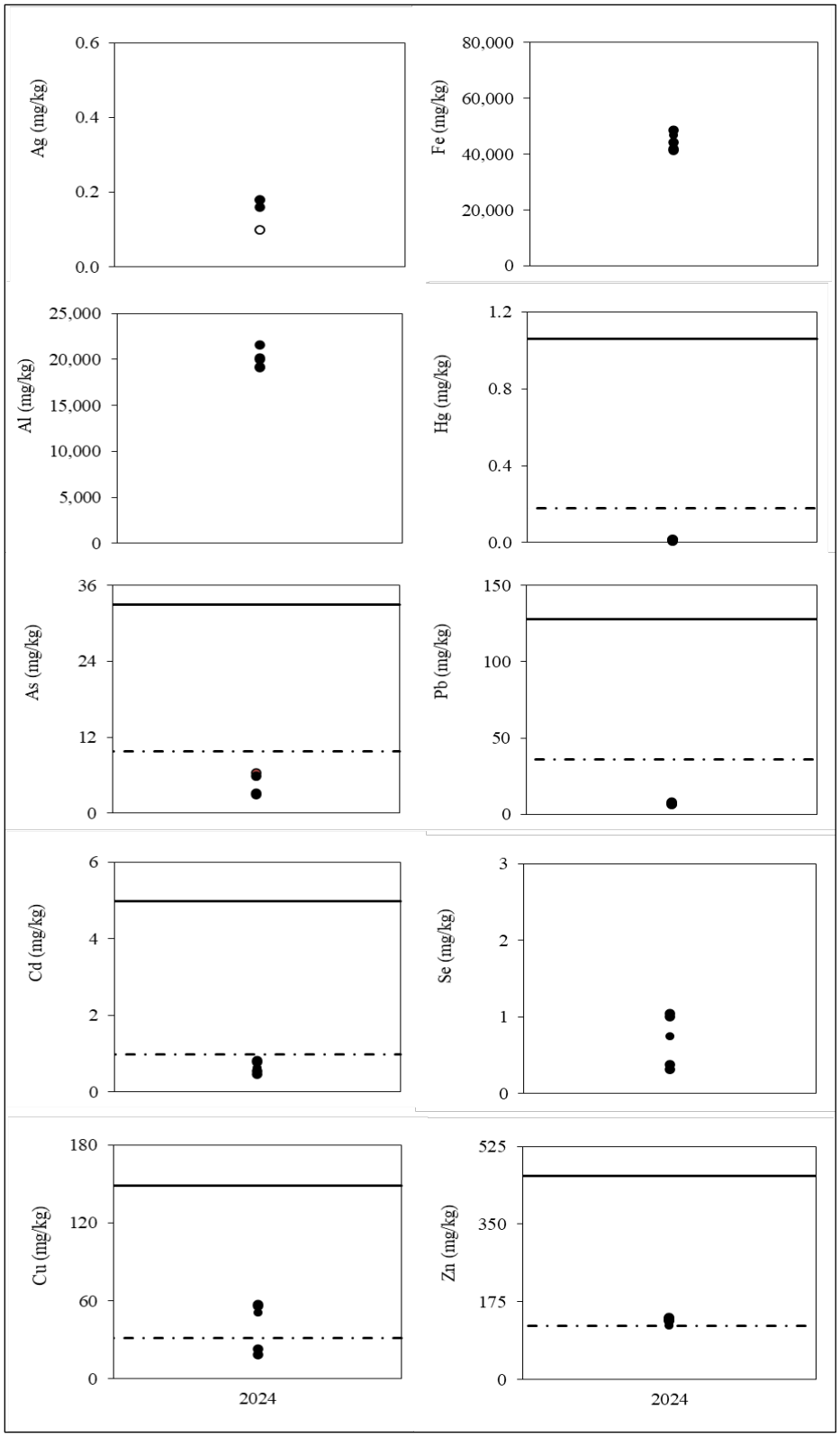

Figure 40.–Plateau Creek sediment element concentrations.

Note: Element concentrations undetected (o) are presented at the method reporting limit. The dashed line represents the TEC and the solid line represents the PEC for freshwater sediments (Buchman 2008); guidelines are not published for Ag, Al, Fe, or Se.

COMPARISONS AMONG SITES

Periphyton: Chlorophyll Density and Composition

Plateau Creek had the highest mean Chl-*a* density among sites, and the highest mean density compared to all sites in 2024 (Figure 41). Middle Glacier Creek, and Lower and Upper Sarah Creek have similar mean periphyton densities, all higher than Lower Glacier Creek.

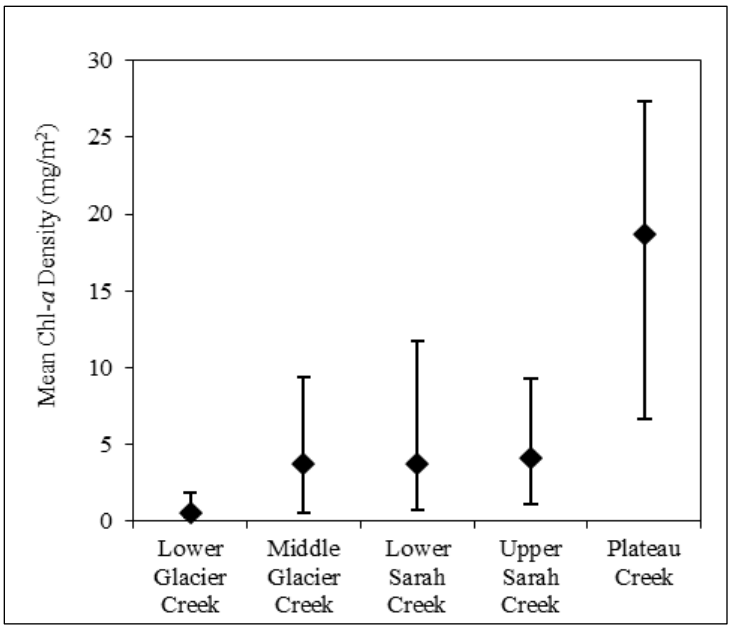

Figure 41.–Mean Palmer Project chlorophyll-*a* densities.
Note: Minimum, mean, and maximum values shown.

Benthic Macroinvertebrate Density and Community Composition

In 2024, BMI density was similar between Lower and Middle Glacier Creek, however the composition of Lower Glacier Creek samples was more diverse than Middle Glacier Creek. Mean BMI density at Upper Sarah Creek was more than twice the BMI density at Lower Sarah Creek, and community composition was generally similar. Plateau Creek mean BMI density was the second lowest among sites, and community composition was similar to both Sarah Creek sites (Table 22; Figure 42).

Table 22.–2024 benthic macroinvertebrate data.

	Lower Glacier Creek	Middle Glacier Creek	Lower Sarah Creek	Upper Sarah Creek	Plateau Creek
Mean BMI density (per m^2)	1,208	1,400	579	1,565	934
Total BMI taxa	27	12	26	30	25
Number of EPT taxa	11	6	13	16	14
% EPT	30%	8%	50%	75%	60%

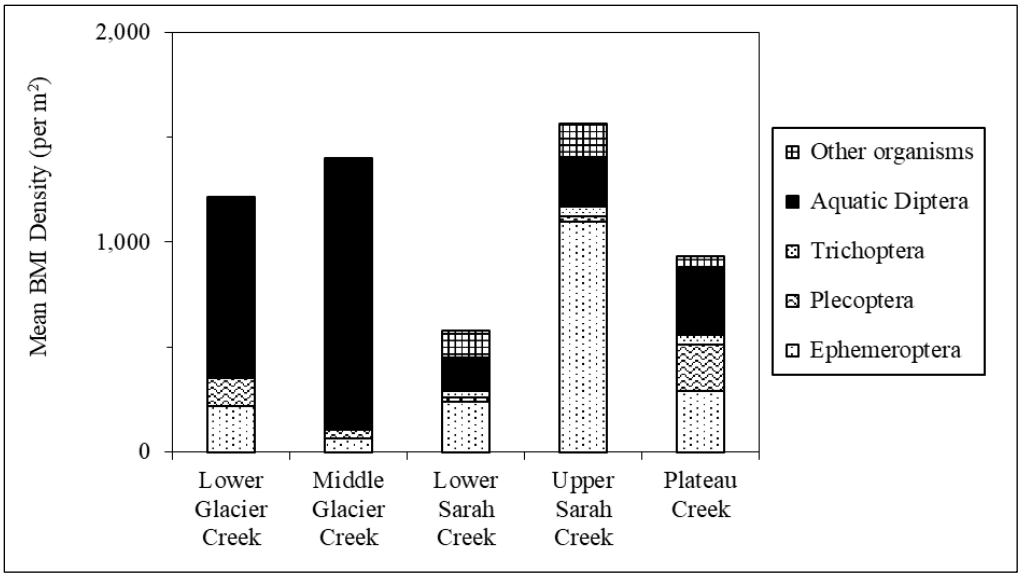

Figure 42.–Palmer Project Plateau Creek mean benthic macroinvertebrate community compositions.

Resident Fish Condition and Element Concentrations

Mean fish condition among the 2024 samples was similar at Lower and Middle Glacier Creek and Lower Sarah Creek, and condition was slightly lower at both Upper Sarah Creek and Plateau Creek; even so, the results suggest healthy fish (Table 23) and they are similar to 2016–2023 results for Glacier Creek and other fish condition data collected in Southeast Alaska (Lindgren 2025).

Table 23.–2024 Palmer Project mean fish sample condition.

Site	Condition
Lower Glacier Creek	1.2
Middle Glacier Creek	1.2
Lower Sarah Creek	1.2
Upper Sarah Creek	1.0
Plateau Creek	1.0

When we combined the fish element concentrations data for the 2024 Palmer Project by site, mean element concentrations were generally similar among sites (Figure 44). Mean Ag and As concentrations were low and similar at all sites, as those elements are often not detected. Plateau Creek samples contained the highest mean Hg and lowest mean Se concentrations; and Lower Sarah Creek samples contained the lowest mean Cd concentration. All element concentrations were within the ranges observed in whole body Dolly Varden samples collected from reference and exploration sites elsewhere in Alaska (Legere and Timothy 2016).

Mean element concentrations in fish samples between Lower Sarah Creek and Upper Sarah Creek varied with Lower Sarah Creek samples containing higher Hg and Pb compared to Upper Sarah Creek. In contrast, Upper Sarah Creek samples contained the higher Se concentrations and were more variable than Lower Sarah Creek samples.

Mean Dolly Varden element concentrations at Glacier Creek sites were generally similar, with the exceptions of higher Hg, Se, and Zn concentrations at Lower Glacier Creek compared to Middle Glacier Creek.

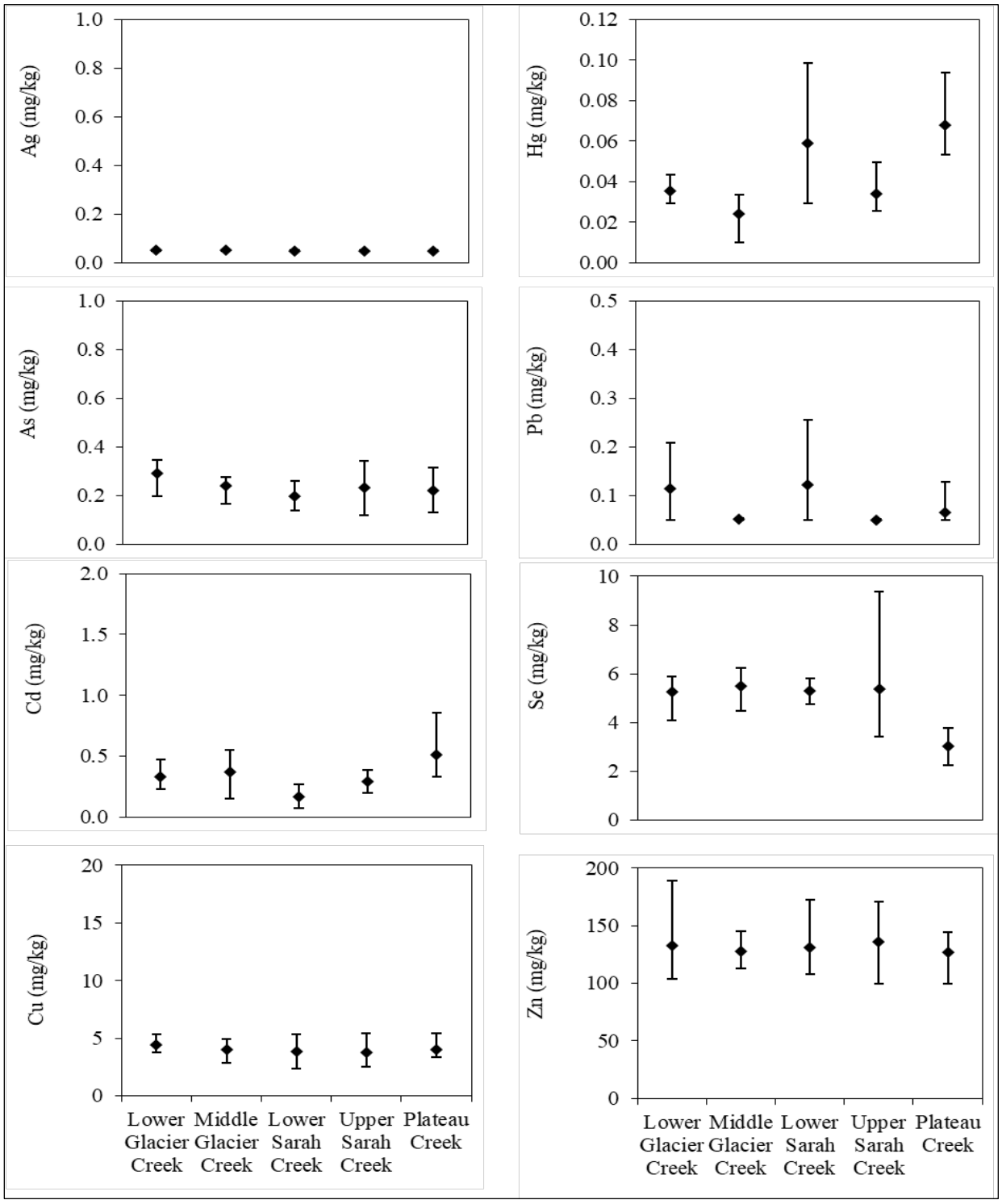

Figure 43.–Palmer Project whole body fish element concentrations, 2024.

Note: Mean (♦), minimum, and maximum concentrations presented; element concentrations not detected are included at the method reporting limit.

Sediment Composition and Element Concentrations

The 2024 Palmer Project sediment samples were largely composed of sand and silt and mean element concentrations were generally similar at Glacier Creek sites 2016–2023 (Figure 45). In general, Upper Sarah Creek had higher concentrations for most elements compared to Lower Sarah Creek. Plateau Creek sediment element concentrations were mostly like Lower Sarah Creek. The Glacier Creek sites showed the highest variability for most elements.

We evaluated the element concentration data against the guidelines for freshwater sediments published in Buchman (2008) and found mean sediment concentrations of Cu and Zn above the TEC values at all sites; Cd concentrations near the TEC at both Glacier Creek sites and below at all other sites; and As, Hg, and Pb concentrations below the TEC values at all sites (Figure 45). Guidelines are not published for Ag, Al, Fe, or Se.

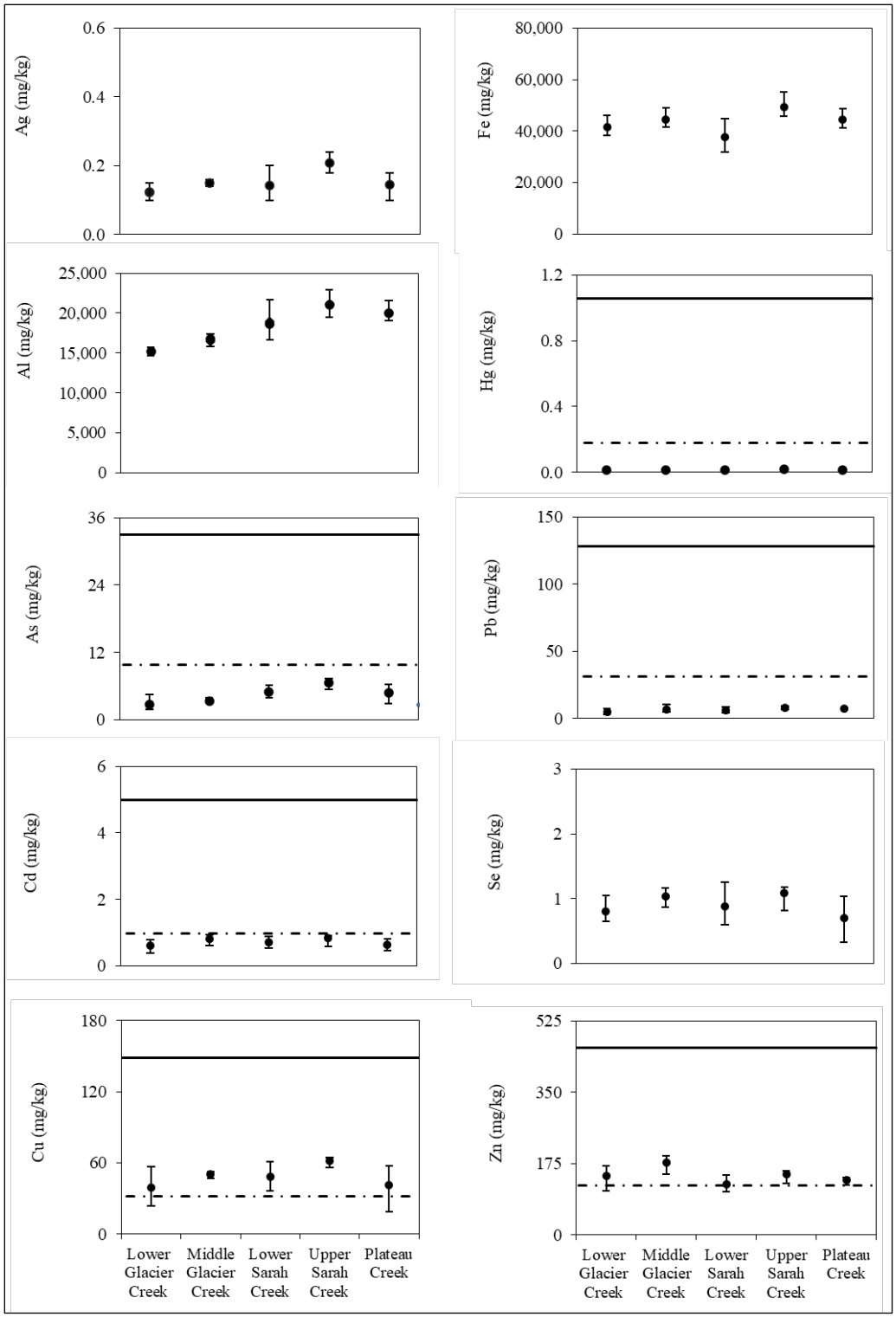

Figure 44.–Palmer Project sediment element concentrations, 2024.

Note: Mean (●), minimum, and maximum concentrations presented; element concentrations not detected are included at the at the method reporting limit.

Note: The dashed line represents the TEC and the solid line represents the PEC for freshwater sediments (Buchman 2008); guidelines are not published for Ag, Al, Fe, or Se.

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APPENDIX A: WATER QUALITY DATA

Appendix A.1.–Lower Glacier Creek water quality data, 2016–2024.

Sample Date	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	Turbidity (NTU)	pH
6/7/2016	3.3	12.6	115	126	6[a]
6/8/2017	6.5	13.6	129	306	8.32
5/30/2018	5.8	10.8	161	17	8.15[b]
6/6/2019	6.6	12.4	133.6	11	6.76[c]
6/3/2020	5.74	12.02	233	17	7.85
6/16/2021	5.12	ND	207	ND	8.20
6/13/2022	4.06	10.86	215	52	8.10
6/7/2023	4.94	14.89	229	24.6	8.09
6/3/2024	6.1	10.6	238.6	29.8	ND

[a] We used a colorpHast pH indicator strip with 0.5 unit sensitivity.
[b] Taken by Allegra Cairns on 6/2/2018.
[c] Taken by Allegra Cairns on 6/8/2019.

Appendix A.2.–Middle Glacier Creek water quality data, 2016–2024.

Sample Date	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	Turbidity (NTU)	pH
6/8/2016	3.1	14.1	129	57	6[a]
6/9/2017	3.1	16.7	113	> 1000	8.38
5/31/2018	4.1	11.3	182	16	ND
6/7/2019	4.0	18.0	126	94	ND
6/2/2020	3.44	13.3	246	23	8.14
6/15/2021	2.59	ND	197	ND	7.98
6/14/2022	3.72	13.11	251	60	8.11
6/6/2023	4.01	14.22	258	42.6	8.09
6/3/2024	3.9	12.8	ND	31.6	ND

[a] We used a colorpHast pH indicator strip with 0.5 unit sensitivity.

Appendix A.3.–Lower Sarah Creek water quality data, 2024.

Sample Date	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	Turbidity (NTU)	pH
6/4/2024	5.2	12.0	216.2	10.1	ND

Appendix A.4.–Upper Sarah Creek water quality data, 2024.

Sample Date	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	Turbidity (NTU)	pH
6/4/2024	5.1	13.3	213	17.6	ND

Appendix A.5.–Plateau Creek water quality data, 2024.

Sample Date	Temperature (°C)	Dissolved Oxygen (mg/L)	Conductivity (µS/cm)	Turbidity (NTU)	pH
6/4/2024	3.8	11.7	117	3.09	ND

APPENDIX B: CHLOROPHYLL DATA

Appendix B.1.–Lower Glacier Creek chlorophylls *a*, *b*, and *c* densities, 2016–2024.

	6/7/2016			6/8/2017			5/30/2018		
mg/m²	Chl-*a*	Chl-*b*	Chl-*c*	Chl-*a*	Chl-*b*	Chl-*c*	Chl-*a*	Chl-*b*	Chl-*c*
	3.35	0.00	0.47	1.50	0.00	0.17	0.21	0.00	0.08
	3.31	0.00	0.51	1.28	0.00	0.25	1.23	0.00	0.20
	2.56	0.00	0.45	2.89	0.00	0.30	3.31	0.00	0.51
	1.28	0.00	0.29	1.82	0.00	0.20	0.53	0.00	0.08
	3.10	0.00	0.38	1.92	0.00	0.25	0.53	0.00	0.07
	1.97	0.00	0.29	3.31	0.00	0.46	0.96	0.00	0.22
	0.53	0.00	0.11	1.92	0.00	0.24	3.10	0.00	0.53
	2.03	0.00	0.30	**0.19**	ND	ND	1.28	0.00	0.24
	3.52	0.00	0.63	1.39	0.00	0.21	0.43	0.15	0.27
	1.01	0.00	0.09	1.09	0.00	0.22	0.96	0.00	0.15
Mean	2.27	0.00	0.35	1.73	0.00	0.26	1.25	0.02	0.24
Minimum	0.53	0.00	0.09	0.19	0.00	0.17	0.21	0.00	0.07
Maximum	3.52	0.00	0.63	3.31	0.00	0.46	3.31	0.15	0.53

Note: Bold value is the spectrophotometer estimated detection limit, Chl-*a* not detected.

	6/6/2019			6/3/2020			6/16/2021		
mg/m²	Chl-*a*	Chl-*b*	Chl-*c*	Chl-*a*	Chl-*b*	Chl-*c*	Chl-*a*	Chl-*b*	Chl-*c*
	0.43	0.00	0.03	5.23	0.00	0.58	**0.29**	ND	ND
	0.10	ND	ND	6.19	0.00	0.86	0.63	0.06	0.24
	0.53	0.00	0.00	3.66	0.00	0.52	0.36	0.05	0.15
	0.14	0.00	0.00	2.20	0.00	0.23	**0.29**	ND	ND
	0.22	0.05	0.00	1.06	0.00	0.09	2.89	0.00	0.50
	0.10	ND	ND	1.34	0.00	0.11	1.39	0.00	0.32
	0.11	0.01	0.05	1.06	0.00	0.09	**0.29**	ND	ND
	1.92	0.00	0.18	9.90	0.00	1.10	0.32	0.02	0.14
	0.64	0.00	0.01	1.65	0.00	0.20	0.92	0.00	0.11
	0.10	ND	ND	6.84	0.00	0.89	**0.29**	ND	ND
Mean	0.43	0.01	0.04	3.91	0.00	0.47	0.77	0.02	0.24
Minimum	0.10	0.00	0.00	1.06	0.00	0.09	0.29	0.00	0.11
Maximum	1.92	0.05	0.18	9.90	0.00	1.10	2.89	0.06	0.50

Note: Bold value is the spectrophotometer estimated detection limit, Chl-*a* not detected.

Appendix B.1.–Continued.

	6/13/2022			6/7/2023			6/19/2024		
mg/m²	Chl-*a*	Chl-*b*	Chl-*c*	Chl-*a*	Chl-*b*	Chl-*c*	Chl-*a*	Chl-*b*	Chl-*c*
	1.17	0.00	0.19	5.32	0.00	0.73	**0.22**	0.00	0.00
	0.55	0.00	0.12	4.40	0.00	0.52	**0.22**	0.00	0.00
	4.72	0.00	0.81	4.91	0.00	0.69	**0.22**	0.00	0.00
	1.64	0.00	0.34	3.76	0.00	0.51	0.96	0.00	0.17
	0.22	ND	ND	9.51	0.00	0.82	**0.22**	0.00	0.00
	0.22	ND	ND	6.84	0.00	1.01	1.82	0.00	0.30
	3.80	0.00	0.70	4.81	0.00	0.60	ND	ND	ND
	2.78	0.00	0.53	6.30	0.00	0.75	0.43	0.00	0.07
	2.98	0.00	0.45	5.78	0.00	0.80	**0.22**	0.00	0.00
	0.37	0.00	0.00	3.52	0.00	0.50	**0.22**	0.00	0.00
Mean	1.85	0.00	0.39	5.51	0.00	0.69	0.50	0.00	0.06
Minimum	0.22	0.00	0.00	3.52	0.00	0.50	0.22	0.00	0.00
Maximum	4.72	0.00	0.81	9.51	0.00	1.01	1.82	0.00	0.30

Note: Bold value is the spectrophotometer estimated detection limit, Chl-*a* not detected.

Appendix B.2.–Middle Glacier Creek chlorophylls *a*, *b*, and *c* densities, 2016–2024.

	6/8/2016			6/9/2017			5/31/2018		
mg/m²	Chl-*a*	Chl-*b*	Chl-*c*	Chl-*a*	Chl-*b*	Chl-*c*	Chl-*a*	Chl-*b*	Chl-*c*
	1.82	0.00	0.30	0.96	0.00	0.15	1.50	0.00	0.20
	4.38	0.00	0.75	0.75	0.00	0.15	1.92	0.00	0.27
	0.96	0.00	0.10	1.38	0.00	0.08	2.24	0.00	0.41
	1.60	0.00	0.26	1.56	0.00	0.22	2.78	0.00	0.44
	0.19	ND	ND	0.43	0.00	0.00	3.10	0.00	0.51
	1.17	0.00	0.13	0.75	0.00	0.05	0.96	0.00	0.14
	0.96	0.00	0.15	0.50	0.00	0.03	0.78	0.00	0.16
	1.82	0.00	0.27	1.17	0.00	0.23	1.60	0.00	0.25
	0.28	0.00	0.00	0.21	0.02	0.10	1.82	0.00	0.35
	1.82	0.00	0.27	0.43	0.00	0.02	0.85	0.00	0.20
Mean	1.50	0.00	0.25	0.81	0.00	0.10	1.76	0.00	0.29
Minimum	0.19	0.00	0.00	0.21	0.00	0.00	0.78	0.00	0.14
Maximum	4.38	0.00	0.75	1.56	0.02	0.23	3.10	0.00	0.51

Note: Bold value is the spectrophotometer estimated detection limit, Chl-*a* not detected.

Appendix B.2.–Continued.

	6/7/2019			6/2/2020			6/15/2021		
mg/m²	Chl-*a*	Chl-*b*	Chl-*c*	Chl-*a*	Chl-*b*	Chl-*c*	Chl-*a*	Chl-*b*	Chl-*c*
	0.83	0.00	0.05	**0.25**	ND	ND	6.19	0.00	0.70
	0.18	0.00	0.04	2.43	0.00	0.33	0.64	0.00	0.10
	0.55	0.00	0.02	1.70	0.00	0.17	1.11	0.00	0.08
	0.10	ND	ND	0.28	0.00	0.03	0.85	0.00	0.01
	0.21	0.00	0.02	0.73	0.00	0.07	1.19	0.00	0.13
	0.14	0.01	0.05	0.55	0.00	0.02	2.34	0.00	0.28
	0.18	0.06	0.11	0.96	0.00	0.10	0.64	0.03	0.13
	0.21	0.00	0.00	0.50	0.06	0.20	0.43	0.00	0.00
	0.53	0.00	0.02	2.48	0.00	0.32	**0.29**	ND	ND
	0.32	0.00	0.09	2.06	0.00	0.25	6.62	0.00	0.84
Mean	0.33	0.01	0.04	1.19	0.01	0.16	2.03	0.00	0.25
Minimum	0.10	0.00	0.00	0.25	0.00	0.02	0.29	0.00	0.00
Maximum	0.83	0.06	0.11	2.48	0.06	0.33	6.62	0.03	0.84

Note: Bold value is the spectrophotometer estimated detection limit, Chl-*a* not detected.

	6/14/2022			6/6/2023			6/19/2024		
mg/m²	Chl-*a*	Chl-*b*	Chl-*c*	Chl-*a*	Chl-*b*	Chl-*c*	Chl-*a*	Chl-*b*	Chl-*c*
	0.22	ND	ND	5.45	0.00	0.74	0.55	0.00	0.12
	1.92	0.00	0.28	3.76	0.00	0.54	2.46	0.00	0.36
	0.64	0.00	0.11	8.22	0.00	1.13	1.92	0.00	0.25
	2.62	0.00	0.30	2.39	0.00	0.37	6.41	0.00	0.56
	0.22	ND	ND	5.83	0.00	0.79	2.14	0.00	0.28
	0.22	ND	ND	4.68	0.00	0.65	4.27	0.00	0.57
	0.22	ND	ND	2.75	0.00	0.35	9.40	0.00	1.10
	0.22	ND	ND	4.13	0.00	0.53	0.96	0.00	0.16
	1.69	0.00	0.33	2.35	0.00	0.31	6.09	0.00	0.72
	1.71	0.00	0.31	3.03	0.00	0.35	2.78	0.00	0.31
Mean	0.97	0.00	0.27	4.26	0.00	0.58	3.70	0.00	0.44
Minimum	0.22	0.00	0.00	0.22	0.00	0.00	2.00	3.00	4.00
Maximum	2.62	0.00	0.33	8.22	0.00	1.13	9.40	0.00	1.10

Note: Bold value is the spectrophotometer estimated detection limit, Chl-*a* not detected.

Appendix B.3.–Lower Sarah Creek chlorophylls *a*, *b*, and *c* densities, 2024.

	6/19/2024		
mg/m²	Chl-*a*	Chl-*b*	Chl-*c*
	2.03	0.00	0.23
	1.07	0.00	0.14
	3.20	0.00	0.42
	0.75	0.00	0.15
	5.98	0.00	0.39
	2.24	0.00	0.23
	2.46	0.00	0.24
	11.75	0.00	1.06
	1.50	0.00	0.21
	5.87	0.00	0.52
Mean	3.68	0.00	0.36
Minimum	0.75	0.00	0.14
Maximum	11.75	0.00	1.06

Appendix B.4.–Upper Sarah Creek chlorophylls *a*, *b*, and *c* densities, 2024.

	6/19/2024		
mg/m²	Chl-*a*	Chl-*b*	Chl-*c*
	9.29	0.12	0.74
	4.81	0.00	0.62
	6.19	0.00	0.64
	2.46	0.00	0.26
	4.38	0.00	0.55
	1.17	0.00	0.10
	3.42	0.00	0.42
	3.42	0.00	0.36
	1.07	0.00	0.10
	5.02	0.00	0.69
Mean	4.12	0.01	0.45
Minimum	1.07	0.00	0.10
Maximum	9.29	0.12	0.74

Appendix B.5.–Plateau Creek chlorophylls *a*, *b*, and *c* densities, 2024.

	6/19/2024		
mg/m²	Chl-*a*	Chl-*b*	Chl-*c*
	27.37	0.00	9.99
	15.91	0.00	2.59
	10.25	0.00	3.49
	27.37	0.00	8.66
	27.37	0.00	5.76
	10.68	0.00	1.67
	6.62	0.00	0.97
	27.37	0.00	4.69
	22.64	0.00	4.36
	11.43	0.00	1.65
Mean	18.70	0.00	4.38
Minimum	6.62	0.00	0.97
Maximum	27.37	0.00	9.99

Note: Bold value is the spectrophotometer estimated detection limit.

APPENDIX C: BENTHIC MACROINVERTEBRATE DATA

Appendix C.1.–Lower Glacier Creek benthic macroinvertebrate sample data, 2024.

				Sample Number						
Class or Subclass	Order	Family	Genus	1	2	3	4	5	6	**Total**
Insecta	Ephemeroptera	Baetidae	*Baetis*	10	31	36	4	0	9	**90**
		Ephemerellidae	*Drunella*	1	2	2	1	0	1	**7**
		Heptageniidae	*Cinygmula*	2	2	1	0	0	2	**7**
			Epeorus	1	3	3	0	1	1	**9**
			Rhithrogena	1	0	0	3	1	4	**9**
	Plecoptera	Chloroperlidae	*Suwallia*	2	9	4	3	0	9	**27**
		Nemouridae	*Shipsa*	3	14	6	0	0	7	**30**
			Zapada	1	4	8	0	0	2	**15**
		Taeniopterygidae	*Taeniopteryx*	1	1	1	0	0	0	**3**
	Trichoptera	Limnephilidae	*Apatania*		1	0	0	0	0	**1**
		Rhyacophilidae	*Rhyacophila*		1	0	0	0	0	**1**
	Diptera	Ceratopogonidae	*Ceratopogon*	0	0	0	1	0	0	**1**
		Chironomidae	unidentified	40	67	187	56	24	77	**451**
		Dixidae	unidentified	0	0	0	0	0	1	**1**
		Empididae	*Clinocera*	0	0	0	0	0	1	**1**
		Limoniidae	*Gonomyodes*	0	2	1	0	0	1	**4**
		Simuliidae	*Prosimulium*	0	0	0	1	0	0	**1**
			Simulium	0	0	1	0	0	0	**1**
			Antocha	0	0	0	1	0	0	**1**
		Tipulidae	*Molophilus*	1	0	0	0	0	0	**1**
			Tipula	2	0	0	0	0	0	**2**
	Lepidoptera	Crambidae	unidentified	0	1	0	1	0	0	**2**
Arachnida (mites)	unidentified	unidentified	unidentified	1	0	0	1	0	0	**2**
Entognatha	Collembola	unidentified	unidentified	1	0	0	0	1	0	**2**
Gastropoda	unidentified	unidentified	unidentified	0	0	1	0	0	0	**1**
Oligochaeta	unidentified	unidentified	unidentified	1	1	0	0	0	1	**3**
Ostracoda	unidentified	unidentified	unidentified	0	0	0	1	0	0	**1**
Arachnida (spiders)	unidentified	unidentified	unidentified	0	0	0	1	0	0	**1**
Misc Terrestrial	unidentified	unidentified	unidentified	4	6	9	8	1	15	**43**
			Total Aquatic Organisms	**68**	**139**	**251**	**73**	**27**	**116**	**675**

Appendix C.2.–Lower Glacier Creek benthic macroinvertebrate data summaries, 2016–2024.

	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total BMI taxa	17	30	16	12	25	26	30	12	27
Number of EPT taxa	9	13	10	5	12	12	14	9	11
Total counts									
Ephemeroptera	44	158	61	65	49	21	77	214	122
Plecoptera	13	41	22	12	26	35	52	66	75
Trichoptera	1	3	1	1	4	3	3	1	2
Aquatic Diptera	478	955	33	178	322	140	467	1,643	464
Other organisms	19	35	4	8	20	22	35	8	11
% Ephemeroptera	7.9%	13.3%	50.4%	24.6%	11.6%	9.5%	12.2%	11.1%	18.1%
% Plecoptera	2.3%	3.4%	18.2%	4.5%	6.2%	15.8%	8.1%	3.4%	11.1%
% Trichoptera	0.2%	0.3%	0.8%	0.4%	1.0%	1.4%	0.5%	0.1%	0.3%
% Aquatic Diptera	86.1%	80.1%	27.3%	67.4%	76.5%	63.3%	73.8%	85.0%	68.8%
% Other organisms	3.0%	2.9%	3.0%	3.0%	4.8%	10.0%	5.5%	0.4%	1.6%
% EPT	10.0%	17.0%	69.4%	29.5%	18.8%	26.7%	20.7%	14.5%	29.5%
% Chironomidae	85.0%	78.4%	26.4%	67.0%	74.1%	58.4%	70.9%	85.0%	66.9%
Total aquatic invertebrates	555	1,192	121	264	421	221	634	1,932	674
Total terrestrial invertebrates	17	18	13	17	4	29	23	19	43
Total invertebrates	572	1,210	134	281	425	250	657	1,951	717
% Sample aquatic	97.0%	98.5%	90.3%	94.0%	99.1%	88.4%	96.5%	99.0%	94.0%
% Sample terrestrial	3.0%	1.5%	0.0%	6.0%	0.9%	11.6%	3.5%	1.0%	6.0%
Total sample area (m^2)	0.558	0.558	0.558	0.558	0.558	0.558	0.558	0.558	0.558
Mean BMI density (per m^2)	995	2,136	217	473	754	396	1,136	3,462	1,208
±1 SD	373	1,015	151	148	463	150	439	2322	843

Appendix C.3.–Middle Glacier Creek benthic macroinvertebrate sample data, 2024.

				Sample Number						
Class or Subclass	Order	Family	Genus	1	2	3	4	5	6	**Total**
Insecta	Ephemeroptera	Baetidae	*Baetis*	0	4	3	12	6	12	**37**
	Plecoptera	Chloroperlidae	*Suwallia*	1	0	1	2	0	1	**5**
		Nemouridae	*Podmosta*	0	2	0	0	0	0	**2**
			Shipsa	0	1	0	9	3	1	**14**
			Zapada	0	0	0	0	1	0	**1**
	Trichoptera	Rhyacophilidae	*Rhyacophila*	0	1	0	0	1	0	**2**
	Diptera	Chironomidae	unidentified	10	57	19	265	155	179	**685**
		Empididae	*Oreogeton*	0	0	1	0	0	0	**1**
		Limoniidae	*Gonomyodes*	0	0	0	6	21	2	**29**
		Tipulidae	*Molophilus*	0	0	0	0	0	2	**2**
Arachnida (mites)	unidentified	unidentified	unidentified	1	0	0	0	0	0	**1**
Entognatha	Collembola	unidentified	unidentified	0	1	0	1	0	0	**2**
Misc. Terrestrial	unidentified	unidentified	unidentified	0	0	0	1	1	1	**3**
			Total Aquatic Organisms	**12**	**66**	**24**	**295**	**187**	**197**	**781**

Appendix C.4.–Middle Glacier Creek benthic macroinvertebrate data summaries, 2016–2024.

	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total BMI taxa	22	14	12	11	25	27	25	17	12
Number of EPT taxa	12	6	5	8	13	11	13	10	6
Total counts									
Ephemeroptera	119	25	18	22	43	76	45	116	37
Plecoptera	45	14	7	10	52	70	35	77	22
Trichoptera	4	1	0	2	6	8	3	2	2
Aquatic Diptera	1,107	276	254	85	306	282	534	484	717
Other organisms	8	15	2	1	14	34	48	2	3
% Ephemeroptera	9.3%	7.6%	6.4%	18.3%	10.2%	16.2%	6.8%	17.0%	4.7%
% Plecoptera	3.5%	4.2%	2.5%	8.3%	12.4%	14.9%	5.3%	11.3%	2.8%
% Trichoptera	0.3%	0.3%	0.0%	1.7%	1.4%	1.7%	0.5%	0.3%	0.3%
% Aquatic Diptera	86.3%	83.4%	90.4%	70.8%	72.7%	60.0%	80.3%	71.1%	91.8%
% Other organisms	1.0%	4.5%	0.7%	0.8%	3.3%	7.2%	7.2%	0.3%	0.4%
% EPT	13.0%	12.1%	8.9%	28.3%	24.0%	32.8%	12.5%	28.6%	7.8%
% Chironomidae	85.0%	82.5%	87.2%	68.3%	68.6%	56.6%	78.8%	69.6%	87.7%
Total aquatic invertebrates	1,283	331	281	120	421	470	665	681	781
Total terrestrial invertebrates	19	7	1	4	7	13	59	12	2
Total invertebrates	1,302	338	282	124	428	483	724	693	783
% Sample aquatic	98.5%	97.9%	99.6%	96.8%	98.4%	97.3%	91.9%	98.3%	99.7%
% Sample terrestrial	1.5%	2.1%	0.4%	3.2%	1.6%	2.7%	8.1%	1.7%	0.26%
Total sample area (m^2)	0.558	0.558	0.558	0.558	0.558	0.558	0.558	0.558	0.558
Mean BMI density (per m^2)	2,299	593	504	215	754	842	1,192	1,220	1,400
±1 SD	976	392	249	249	484	743	1,261	743	1,219

Appendix C.5.–Lower Sarah Creek benthic macroinvertebrate sample data, 2024.

				Sample Number						
Class or Subclass	Order	Family	Genus	1	2	3	4	5	6	**Total**
Insecta	Ephemeroptera	Baetidae	*Baetis*	10	11	39	14	15	18	**107**
		Ephemerellidae	*Drunella*	1	5	5	2	1	5	**19**
		Heptageniidae	*Cinygmula*	0	0	4	0	0	1	**5**
			Epeorus	0	0	1	0	0	0	**1**
			Rhithrogena	0	1	1	0	0	0	**2**
	Plecoptera	Capniidae	*Capnia*	0	0	0	0	0	1	**1**
		Chloroperlidae	*Suwallia*	0	0	2	0	0	0	**2**
		Leuctridae	*Despaxia*	0	1	2	0	0	0	**3**
		Nemouridae	*Ostrocerca*	0	0	0	0	2	0	**2**
			Zapada	0	0	1	1	2	0	**4**
	Trichoptera	Glossosomatidae	*Glossosoma*	0	1	0	0	0	0	**1**
		Limnephilidae	*Moselyana*	3	3	0	1	3	1	**11**
		Rhyacophilidae	*Rhyacophila*	1	1	0	0	0	2	**4**
	Diptera	Chironomidae	unidentified	6	10	27	15	8	16	**82**
		Empididae	*Chelifera*	0	0	0	0	2	0	**2**
			Oreogeton	0	1	1	1	0	0	**3**
		Simuliidae	*Prosimulium*	0	2	0	0	0	0	**2**
		Tipulidae	*Hexatoma*	0	1	0	0	0	0	**1**
	Lepidoptera	Crambidae	unidentified	0	0	1	0	0	1	**2**
Arachnida (mites)	unidentified	unidentified	unidentified	1	4	0	1	1	1	**8**
Entognatha	Collembola	unidentified	unidentified	2	4	7	5	8	8	**34**
Gastropoda	unidentified	unidentified	unidentified	0	0	0	0	1	0	**1**
Nematoda	unidentified	unidentified	unidentified	0	0	1	0	0	0	**1**
Oligochaeta	unidentified	unidentified	unidentified	0	0	11	3	3	2	**19**
Ostracoda	unidentified	unidentified	unidentified	0	0	3	0	2	1	**6**
Juvenile fish	unidentified	unidentified	unidentified	0	1	0	0	0	0	**1**
Misc. Terrestrial	unidentified	unidentified	unidentified	2	6	7	2	3	7	**27**
			Total Aquatic Organisms	**24**	**46**	**106**	**43**	**48**	**57**	**324**

Appendix C.6.–Lower Sarah Creek benthic macroinvertebrate sample summaries, 2024.

	2024
Total BMI taxa	26
Number of EPT taxa	13
Total counts	
Ephemeroptera	134
Plecoptera	12
Trichoptera	16
Aquatic Diptera	90
Other organisms	71
% Ephemeroptera	41.5%
% Plecoptera	3.7%
% Trichoptera	5.0%
% Aquatic Diptera	27.9%
% Other organisms	22.0%
% EPT	50.2%
% Chironomidae	25.4%
Total aquatic invertebrates	323
Total terrestrial invertebrates	27
Total invertebrates	350
% Sample aquatic	92.3%
% Sample terrestrial	7.7%
Total sample area (m^2)	0.558
Mean BMI density (per m^2)	579
±1 SD	298

Appendix C.7.–Upper Sarah Creek benthic macroinvertebrate sample data, 2024.

				Sample Number						
Class or Subclass	Order	Family	Genus	1	2	3	4	5	6	**Total**
Insecta	Ephemeroptera	Baetidae	*Baetis*	78	98	42	90	66	110	**484**
		Ephemerellidae	*Drunella*	18	13	9	14	3	12	**69**
		Heptageniidae	*Cinygmula*	3	9	3	3	1	6	**25**
			Epeorus	2	1	0	2	4	0	**9**
			Rhithrogena	4	11	1	3	3	2	**24**
	Plecoptera	Capniidae	*Capnia*	1	0	1	0	0	0	**2**
		Chloroperlidae	*Suwallia*	0	1	0	1	1	0	**3**
		Nemouridae	*Podmosta*	0	1	2	1	0	0	**4**
			Shipsa	0	0	1	0	0	0	**1**
			Zapada	3	1	1	0	0	0	**5**
		Taeniopterygidae	*Taeniopteryx*	0	1	0	0	0	0	**1**
	Trichoptera	Hydropsychidae	*Arctopsyche*	0	0	1	0	0	0	**1**
		Limnephilidae	*Chyranda*	1	0	0	0	0	0	**1**
			Ecclisomyia	1	0	0	0	0	0	**1**
			Moselyana	1	1	1	0	2	1	**6**
		Rhyacophilidae	*Rhyacophila*	5	4	2	2	1	2	**16**
	Diptera	Ceratopogonidae	*Atrichepogon*	*0*	1	0	0	0	0	**1**
		Chironomidae	unidentified	29	22	7	14	16	24	**112**
		Deuterophlebiidae	*Deuterophlebia*	0	0	1	0	0	0	**1**
		Empididae	*Chelifera*	0	2	3	0	0	3	**8**
			Clinocera	1	0	0	0	0	0	**1**
		Simuliidae	*Prosimulium*	5	1	0	0	0	2	**8**
		Tipulidae	*Dicranota*	0	0	0	0	1	0	**1**
	Lepidoptera	Crambidae	unidentified	1	0	0	0	0	0	**1**
Arachnida (mites)	unidentified	unidentified	unidentified	0	1	0	0	1	4	**6**
Entognatha	Collembola	unidentified	unidentified	13	2	3	2	1	1	**22**
Gastropoda	unidentified	unidentified	unidentified	0	1	0	0	0	0	**1**
Nematoda	unidentified	unidentified	unidentified	0	1	0	0	0	0	**1**
Oligochaeta	unidentified	unidentified	unidentified	14	1	14	3	0	17	**49**
Ostracoda	unidentified	unidentified	unidentified	0	2	6	0	0	0	**8**
Juvenile fish	unidentified	unidentified	unidentified	0	0	0	1	0	0	**1**
Arachnida (spiders)	unidentified	unidentified	unidentified	0	0	0	1	0	0	**1**
Misc. Terrestrial	unidentified	unidentified	unidentified	4	2	3	1	2	4	**16**
			Total Aquatic Organisms	**180**	**175**	**98**	**136**	**100**	**184**	**873**

Appendix C.8.–Upper Sarah Creek benthic macroinvertebrate sample summaries, 2024.

	2024
Total BMI taxa	30
Number of EPT taxa	16
Total counts	
Ephemeroptera	611
Plecoptera	16
Trichoptera	25
Aquatic Diptera	132
Other organisms	89
% Ephemeroptera	70.0%
% Plecoptera	1.8%
% Trichoptera	2.9%
% Aquatic Diptera	15.1%
% Other organisms	10.2%
% EPT	74.7%
% Chironomidae	12.8%
Total aquatic invertebrates	873
Total terrestrial invertebrates	16
Total invertebrates	889
% Sample aquatic	98.2%
% Sample terrestrial	1.8%
Total sample area (m^2)	0.558
Mean BMI density (per m^2)	1,565
±1 SD	427

Appendix C.9.–Plateau Creek benthic macroinvertebrate sample data, 2024.

				Sample Number						
Class or Subclass	Order	Family	Genus	1	2	3	4	5	6	**Total**
Insecta	Ephemeroptera	Baetidae	*Baetis*	6	21	17	24	12	38	**118**
		Ephemerellidae	*Drunella*	0	1	2	1	1	6	**11**
		Heptageniidae	*Cinygmula*	2	1	3	1	4	1	**12**
			Epeorus	0	1	1	2	0	1	**5**
			Rhithrogena	3	0	0	3	1	1	**8**
		Leptophlebiidae	*Paraleptophlebia*	0	0	3	4	0	1	**8**
	Plecoptera	Capniidae	*Capnia*	9	4	17	32	7	18	**87**
		Chloroperlidae	*Suwallia*	3	2	2	9	2	5	**23**
		Nemouridae	*Nemoura*	1	0	0	0	0	1	**2**
			Zapada	0	2	6	1	0	2	**11**
	Trichoptera	Brachycentridae	*Micrasema*	0	1	1	0	0	4	**6**
		Glossosomatidae	*Glossosoma*	2	1	0	0	0	2	**5**
		Hydropsychidae	*Hydropsyche*	0	0	0	1	0	0	**1**
		Rhyacophilidae	*Rhyacophila*	0	2	2	4	0	5	**13**
	Diptera	Ceratopogonidae	*Probezzia*	0	0	1	0	0	0	**1**
		Chironomidae	unidentified	15	16	35	39	24	35	**164**
		Dixidae	unidentified	0	0	0	2	0	0	**2**
		Empididae	*Oreogeton*	0	0	2	2	1	0	**5**
		Simuliidae	*Prosimulium*	0	0	1	0	0	4	**5**
		Tipulidae	*Dicranota*	0	0	0	1	0	1	**2**
Arachnida (mites)	unidentified	unidentified	unidentified	0	0	2	1	0	2	**5**
Entognatha	Collembola	unidentified	unidentified	0	1	3	6	0	1	**11**
Gastropoda	unidentified	unidentified	unidentified	0	0	1	0	0	0	**1**
Nematoda	unidentified	unidentified	unidentified	0	0	0	0	0	0	**0**
Oligochaeta	unidentified	unidentified	unidentified	0	0	5	2	0	1	**8**
Ostracoda	unidentified	unidentified	unidentified	0	0	2	1	1	3	**7**
Arachnida (spiders)	unidentified	unidentified	unidentified	0	0	0	1	1	0	**2**
Misc. Terrestrial	unidentified	unidentified	unidentified	1	0	2	2	2	1	**8**
			Total Aquatic Organisms	**41**	**53**	**106**	**136**	**53**	**132**	**521**

Appendix C.10.–Plateau Creek benthic macroinvertebrate sample summaries, 2024.

	2024
Total BMI taxa	25
Number of EPT taxa	14
Total counts	
Ephemeroptera	162
Plecoptera	123
Trichoptera	25
Aquatic Diptera	179
Other organisms	32
% Ephemeroptera	31.1%
% Plecoptera	23.6%
% Trichoptera	4.8%
% Aquatic Diptera	34.4%
% Other organisms	6.1%
% EPT	59.5%
% Chironomidae	31.5%
Total aquatic invertebrates	521
Total terrestrial invertebrates	8
Total invertebrates	529
% Sample aquatic	1
% Sample terrestrial	0
Total sample area (m^2)	0.558
Mean BMI density (per m^2)	934
±1 SD	462

APPENDIX D: RESIDENT FISH DATA AND LABORATORY REPORT

Appendix D.1.–Lower Glacier Creek whole body fish element concentrations, 2016–2024.

Sample Date	Species	Length (mm)	Weight (g)	Condition (*K*)	Ag (mg/kg)	As (mg/kg)	Cd (mg/kg)	Cu (mg/kg)	Hg (mg/kg)	Pb (mg/kg)	Se (mg/kg)	Zn (mg/kg)
6/7/2016	DV	108	12.7	1.0	<0.019	<0.48	0.429	3.55	0.0466	0.076	7.23	153
6/7/2016	DV	68	4.8	1.5	<0.020	<0.50	0.501	3.75	0.0330	0.182	7.60	173
6/7/2016	DV	112	17.7	1.3	0.025	<0.48	1.310	3.63	0.0567	0.230	5.48	145
6/7/2016	DV	105	15.9	1.4	<0.019	<0.48	0.585	3.23	0.0509	0.078	7.56	150
6/7/2016	DV	113	14.3	1.0	<0.020	0.50	0.420	3.42	0.0427	0.177	6.21	154
6/7/2016	DV	94	10.8	1.3	<0.019	0.52	0.441	4.35	0.0381	0.195	7.83	167
6/7/2016	DV	109	14.6	1.1	0.026	<0.50	1.250	5.20	0.0683	0.362	6.46	238
6/7/2016	DV	97	11.2	1.2	<0.019	<0.49	0.641	3.71	0.0401	0.172	6.11	154
6/8/2016	DV	93	9.5	1.2	<0.020	<0.49	0.960	3.32	0.0349	0.091	7.04	141
6/8/2016	DV	73	4.7	1.2	0.025	0.54	0.730	4.67	0.0353	0.360	6.31	168
6/8/2017	DV	133	29.1	1.2	0.023	<0.50	0.727	4.47	0.0599	0.109	6.00	184
6/8/2017	DV	113	15.7	1.1	<0.020	<0.50	0.426	3.69	0.0505	0.027	7.01	148
6/8/2017	DV	105	12.6	1.1	<0.020	<0.50	0.601	3.23	0.0523	0.038	7.16	134
6/8/2017	DV	90	9.2	1.3	0.038	<0.50	1.230	3.24	0.0473	0.088	8.33	123
6/8/2017	DV	106	12.8	1.1	<0.020	<0.50	0.606	4.06	0.0532	0.104	9.09	153
6/8/2017	DV	175	60.5	1.1	<0.020	<0.50	0.355	4.71	0.0924	0.119	6.90	162
6/8/2017	DV	75	5.7	1.4	<0.020	<0.50	0.429	4.77	0.0438	0.202	7.86	157
6/8/2017	DV	110	17.3	1.3	0.025	<0.50	0.736	4.35	0.0446	0.074	9.03	126
6/8/2017	DV	59, 118[a]	20.2	ND	<0.020	<0.50	0.472	4.20	0.0456	0.119	7.30	160
6/8/2017	DV	102, 70[a]	15.6	ND	<0.020	<0.50	0.865	4.55	0.0642	0.196	7.62	130
5/30/2018	DV	112	12.3	0.9	<0.020	<0.50	0.183	3.26	0.0511	0.042	5.14	114
5/30/2018	DV	66, 65[a]	4.7	ND	<0.034	<0.84	0.458	5.30	0.0467	0.098	5.90	142
5/30/2018	DV	109	15.1	1.2	<0.020	<0.50	0.257	4.34	0.0592	0.080	6.70	121
5/30/2018	DV	103	11.6	1.1	<0.020	<0.50	0.272	4.05	0.0426	0.108	7.04	132
5/30/2018	DV	78, 65[a]	7.0	ND	<0.020	<0.50	0.545	5.03	0.0589	0.136	6.19	182
5/30/2018	DV	97	7.8	0.9	<0.020	<0.50	0.558	5.04	0.0529	0.165	6.25	160
5/30/2018	DV	61, 63[a]	4.1	ND	<0.15	<3.7	0.710	5.29	0.0511	0.170	7.30	158
5/30/2018	DV	92	6.5	0.8	<0.020	<0.50	0.512	5.74	0.0545	0.207	5.47	175
5/30/2018	DV	81	4.5	0.8	<0.024	<0.59	0.440	4.43	0.0496	0.080	6.50	150
5/30/2018	DV	106	12.2	1.0	<0.020	<0.50	0.284	4.91	0.0530	0.087	5.76	149

a Composite sample of two fish.

-continued-

Appendix D.1.–Continued.

Sample Date	Species	Length (mm)	Weight (g)	Condition (*K*)	Ag (mg/kg)	As (mg/kg)	Cd (mg/kg)	Cu (mg/kg)	Hg (mg/kg)	Pb (mg/kg)	Se (mg/kg)	Zn (mg/kg)
6/6/2019	DV	122	22.9	1.3	<0.020	<0.50	0.237	4.07	0.0546	0.110	5.83	158
6/6/2019	DV	124	22.7	1.2	<0.019	<0.48	0.349	3.63	0.0440	0.082	5.87	117
6/6/2019	DV	155	42.5	1.1	<0.020	<0.50	0.514	5.79	0.0510	0.180	6.27	207
6/6/2019	DV	97	12.3	1.3	<0.020	<0.50	0.372	5.58	0.0341	0.137	7.32	156
6/6/2019	DV	121	20.8	1.2	<0.020	<0.49	0.353	2.87	0.0496	0.144	5.82	116
6/6/2019	DV	106	15.0	1.3	<0.019	<0.47	0.259	4.42	0.0540	0.168	6.95	134
6/6/2019	DV	105	13.6	1.2	<0.020	<0.49	0.300	3.37	0.0368	0.109	5.95	115
6/6/2019	DV	117	19.7	1.2	<0.020	<0.50	0.665	4.86	0.0428	0.206	6.02	150
6/6/2019	DV	141	27.1	1.0	<0.019	<0.48	0.440	4.87	0.0457	0.158	6.68	148
6/6/2019	DV	126	25.5	1.3	<0.020	<0.50	0.442	5.18	0.0549	0.129	5.69	188
6/3/2020	DV	115	14.8	1.0	<0.020	<0.49	0.223	4.15	0.0517	0.053	5.92	149
6/3/2020	DV	98	11.2	1.2	<0.020	<0.50	0.657	4.10	0.0412	0.051	5.55	134
6/3/2020	DV	110	15.4	1.2	<0.020	<0.50	0.29	4.03	0.0425	0.076	5.72	160
6/3/2020	DV	99	11.9	1.2	<0.020	<0.49	0.446	4.77	0.0455	0.178	6.75	132
6/3/2020	DV	123	19.9	1.1	<0.019	<0.49	0.467	4.91	0.0458	0.055	5.82	139
6/3/2020	DV	113	14.7	1.0	0.021	<0.49	1.29	5.81	0.0429	0.120	6.50	144
6/3/2020	DV	107	14.0	1.1	<0.020	<0.50	0.309	4.36	0.0412	0.069	5.95	141
6/3/2020	DV	113	15.8	1.1	<0.020	<0.50	0.312	5.49	0.0509	0.085	5.95	143
6/3/2020	DV	112	15.6	1.1	<0.020	<0.50	0.359	3.43	0.0369	0.045	7.10	150
6/3/2020	DV	122	18.3	1.0	<0.020	<0.50	0.286	4.62	0.0537	0.097	6.00	146
6/16/2021	DV	113	13.5	0.9	<0.020	<0.49	1.05	6.69	0.0630	0.278	6.49	214
6/16/2021	DV	110	14.9	1.1	<0.020	<0.49	0.873	7.06	0.0476	0.357	5.57	216
6/16/2021	DV	142	30.6	1.1	<0.020	<0.49	0.404	4.17	0.0829	0.120	6.17	136
6/16/2021	DV	100	13.2	1.3	<0.020	<0.50	0.413	3.63	0.0551	0.094	5.68	124
6/16/2021	DV	103	14.2	1.3	<0.019	<0.49	0.375	3.76	0.0465	0.055	5.78	115
6/16/2021	DV	137	33.3	1.3	<0.020	<0.49	0.188	3.27	0.0573	0.078	4.66	119
6/16/2021	DV	138	27.9	1.1	<0.020	<0.50	0.556	4.41	0.0720	0.080	6.21	136
6/16/2021	DV	123	21.8	1.2	<0.020	<0.50	0.276	3.56	0.0430	0.063	6.64	106
6/16/2021	DV	149	34.9	1.1	<0.020	<0.50	0.351	4.34	0.0509	0.062	5.26	113
6/16/2021	DV	128	23.3	1.1	<0.020	<0.50	0.434	4.31	0.0443	0.170	4.85	105
6/13/2022	DV	133	35.5	1.5	<0.020	<0.50	0.447	4.08	0.0511	0.064	3.95	109
6/13/2022	DV	148	40.0	1.2	<0.020	<0.50	0.227	3.76	0.0737	0.031	5.14	133
6/13/2022	DV	93	9.2	1.1	<0.020	<0.50	0.360	3.31	0.0513	0.062	5.88	127
6/13/2022	DV	144	36.4	1.2	<0.020	<0.50	0.443	4.88	0.0482	0.052	5.18	121
6/13/2022	DV	113	17.3	1.2	<0.020	<0.50	0.595	3.55	0.0424	0.063	5.40	117
6/13/2022	DV	107	17.5	1.4	<0.020	<0.50	1.680	4.48	0.0473	0.220	5.89	124
6/13/2022	DV	100	13.2	1.3	0.053	<0.50	0.876	6.58	0.0551	0.507	6.99	176
6/13/2022	DV	115	16.5	1.1	<0.020	<0.50	0.254	3.20	0.0612	0.060	5.27	115
6/13/2022	DV	107	16.0	1.3	<0.020	<0.50	1.020	5.07	0.0397	0.220	6.47	129
6/13/2022	DV	102	13.3	1.3	0.022	<0.50	1.100	5.17	0.0479	0.150	6.13	147

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Appendix D.1.–Continued.

Sample Date	Species	Length (mm)	Weight (g)	Condition (*K*)	Ag (mg/kg)	As (mg/kg)	Cd (mg/kg)	Cu (mg/kg)	Hg (mg/kg)	Pb (mg/kg)	Se (mg/kg)	Zn (mg/kg)
6/7/2023	DV	130	27.9	1.3	<0.020	<0.49	0.281	4.59	0.0350	0.092	4.52	95.8
6/7/2023	DV	104	14.0	1.2	<0.020	<0.50	0.323	4.82	0.0516	0.188	5.72	133
6/7/2023	DV	136	29.5	1.2	<0.020	<0.49	0.252	3.19	0.0382	0.136	6.96	121
6/7/2023	DV	106	13.1	1.1	<0.020	<0.49	0.400	5.57	0.0415	0.273	5.55	197
6/7/2023	DV	105	13.8	1.2	<0.020	<0.50	0.270	9.55	0.0259	0.218	6.20	127
6/7/2023	DV	103	9.8	0.9	<0.020	<0.49	0.319	4.16	0.0382	0.162	6.17	126
6/7/2023	DV	115	14.9	1.0	<0.020	<0.49	0.806	4.31	0.0483	0.228	6.13	146
6/7/2023	DV	98	10.6	1.1	0.026	<0.49	0.791	5.31	0.0496	0.240	5.79	143
6/7/2023	DV	112	17.6	1.3	<0.020	<0.50	0.487	5.91	0.0374	0.196	6.53	167
6/7/2023	DV	94	8.1	1.0	<0.020	<0.50	0.695	6.11	0.0548	0.220	4.81	155
6/20/2024	DV	118	18.8	1.1	<0.051	0.31	0.233	4.13	0.0355	0.115	5.52	147
6/20/2024	DV	105	14.9	1.3	<0.051	0.29	0.265	3.99	0.0292	0.129	5.77	104
6/20/2024	DV	96	10.1	1.1	<0.051	0.20	0.270	3.78	0.0352	<0.051	5.02	124
6/20/2024	DV	122	18.7	1.0	<0.051	0.35	0.462	5.30	0.0321	0.209	5.47	189
6/20/2024	DV	85	7.8	1.3	<0.051	0.34	0.474	4.06	0.0357	0.116	5.82	138
6/20/2024	DV	111	16.9	1.2	<0.051	0.31	0.270	4.65	0.0380	0.164	5.88	147
6/20/2024	DV	108	15.7	1.2	<0.051	0.28	0.259	4.41	0.0322	<0.051	5.22	111
6/20/2024	DV	78	6.8	1.4	<0.051	0.32	0.447	5.13	0.0434	0.168	4.07	132
6/20/2024	DV	128	23.1	1.1	<0.051	0.26	0.402	4.89	0.0326	0.084	5.23	128
6/20/2024	DV	136	30.5	1.2	<0.051	0.26	0.254	4.09	0.0393	<0.051	4.55	112

Appendix D.2.–Middle Glacier Creek whole body fish element concentrations, 2016–2024.

Sample Date	Species	Length (mm)	Weight (g)	Condition (*K*)	Ag (mg/kg)	As (mg/kg)	Cd (mg/kg)	Cu (mg/kg)	Hg (mg/kg)	Pb (mg/kg)	Se (mg/kg)	Zn (mg/kg)
6/8/2016	DV	150	36.0	1.1	0.031	<0.48	0.605	3.37	0.0429	0.069	5.66	143
6/8/2016	DV	108	15.9	1.3	<0.020	<0.50	0.327	4.33	0.0337	0.183	6.91	147
6/8/2016	DV	123	26.5	1.4	<0.020	<0.50	0.683	3.83	0.0301	0.717	5.64	117
6/8/2016	DV	73	5.2	1.3	<0.020	<0.49	0.288	4.99	0.0260	0.128	3.94	128
6/8/2016	DV	180	66.7	1.1	<0.020	<0.50	0.329	3.11	0.0376	0.061	5.17	132
6/8/2016	DV	77	6.0	1.3	<0.020	<0.50	0.215	3.53	0.0259	0.259	4.80	146
6/8/2016	DV	83	7.8	1.4	<0.020	<0.50	0.280	3.75	0.0247	0.182	6.05	132
6/8/2016	DV	146	31.5	1.0	<0.020	<0.50	0.521	2.50	0.0299	0.062	4.90	103
6/8/2016	DV	83	7.0	1.2	<0.020	<0.50	0.678	2.56	0.0328	0.046	4.66	139
6/8/2016	DV	70	5.0	1.5	0.682	<0.50	0.257	2.63	0.0184	0.036	6.29	133
6/9/2017	DV	154	45.5	1.2	<0.020	<0.50	0.267	3.29	0.0364	0.036	5.14	116
6/9/2017	DV	130	24.3	1.1	<0.020	<0.50	0.333	3.23	0.0343	0.056	6.86	95
6/9/2017	DV	210	115.0	1.2	<0.020	<0.50	0.758	7.67	0.0701	0.031	6.34	161
6/9/2017	DV	141	34.7	1.2	<0.020	<0.50	0.291	3.33	0.0430	0.037	8.02	126
6/9/2017	DV	131	24.3	1.1	<0.020	<0.50	0.299	3.26	0.0385	0.100	6.10	128
6/9/2017	DV	90	7.4	1.0	<0.020	<0.50	0.343	2.40	0.0361	0.034	6.86	101
5/31/2018	DV	171	55.9	1.1	<0.020	<0.50	0.696	15.20	0.0641	0.080	6.56	176
5/31/2018	DV	138	28.3	1.1	<0.020	<0.50	0.541	6.22	0.0659	0.044	5.30	114
5/31/2018	DV	58, 57[a]	4.2	ND	<0.082	<2.0	0.357	4.25	0.0191	0.087	4.90	114
5/31/2018	DV	188	76.2	1.1	0.027	<0.50	0.889	12.70	0.0487	0.143	6.22	140
5/31/2018	DV	175	58.1	1.1	<0.020	<0.50	0.612	5.47	0.0296	0.107	5.20	108
5/31/2018	DV	100	11.2	1.1	0.029	<0.50	0.802	5.07	0.0676	0.122	6.72	146
6/7/2019	DV	65, 65[a]	8.3	ND	<0.020	<0.50	0.501	3.89	0.0157	0.053	5.81	117
6/7/2019	DV	72, 70[a]	10.2	ND	<0.020	<0.50	0.615	3.91	0.0241	0.073	5.30	101
6/7/2019	DV	141	36.9	1.3	<0.019	<0.48	0.354	3.16	0.0468	<0.019	5.46	116
6/7/2019	DV	185	88.4	1.4	<0.020	<0.49	0.785	3.42	0.1060	0.050	5.16	161
6/7/2019	DV	67, 69[a]	8.6	ND	<0.020	<0.50	0.438	3.55	0.0199	0.109	5.60	105
6/7/2019	DV	166	47.4	1.0	<0.019	<0.48	0.280	3.73	0.0528	0.091	5.47	115
6/7/2019	DV	87	8.7	1.3	<0.019	<0.48	0.231	2.39	0.0260	0.028	5.54	89
6/7/2019	DV	100	14.9	1.5	<0.020	<0.49	0.260	3.41	0.0356	0.163	5.43	100
6/7/2019	DV	75, 77[a]	11.6	ND	0.984	<0.48	0.337	3.94	0.0254	0.179	5.18	106
6/7/2019	DV	75, 75[a]	8.4	ND	<0.019	<0.48	0.547	3.68	0.0331	0.120	5.25	89

a Composite sample of two fish.

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Appendix D.2.–Continued.

Sample Date	Species	Length (mm)	Weight (g)	Condition (*K*)	Ag (mg/kg)	As (mg/kg)	Cd (mg/kg)	Cu (mg/kg)	Hg (mg/kg)	Pb (mg/kg)	Se (mg/kg)	Zn (mg/kg)
6/2/2020	DV	141	30.3	1.1	<0.019	<0.49	0.251	3.45	0.0465	0.054	5.38	162
6/2/2020	DV	142	35.4	1.2	<0.020	<0.50	0.182	3.73	0.0396	0.127	4.12	125
6/2/2020	DV	118	20.1	1.2	<0.020	<0.49	0.344	4.97	0.0327	0.219	5.04	131
6/2/2020	DV	108	14.4	1.1	<0.020	<0.49	0.373	5.07	0.0326	0.216	4.81	144
6/2/2020	DV	119	18.4	1.1	<0.020	<0.49	0.314	4.19	0.0302	0.094	5.55	112
6/2/2020	DV	111	14.6	1.1	<0.019	<0.49	0.249	3.79	0.0326	0.151	4.94	129
6/15/2021	DV	140	37.2	1.4	0.022	<0.50	1.11	9.25	0.0503	0.170	5.21	132
6/15/2021	DV	148	51.0	1.6	<0.020	<0.50	0.431	4.95	0.0505	0.080	4.30	99
6/15/2021	DV	158	48.2	1.2	<0.020	<0.49	0.348	6.37	0.0656	0.057	4.87	136
6/15/2021	DV	163	54.0	1.2	<0.020	<0.49	0.204	3.95	0.0416	0.031	4.50	89
6/15/2021	DV	135	32.8	1.3	<0.020	<0.49	0.286	5.99	0.0574	0.095	4.68	111
6/14/2022	DV	95	10.0	1.2	<0.020	<0.49	0.400	3.5	0.0132	0.038	5.44	94
6/6/2023	DV	153	47.2	1.3	0.021	<0.50	0.485	4.20	0.0402	0.110	4.8	119
6/6/2023	DV	105	17.9	1.5	<0.020	<0.49	0.453	3.99	0.0215	0.104	4.24	107
6/6/2023	DV	148	43.0	1.3	0.022	<0.50	0.958	3.85	0.0416	0.076	4.18	95
6/6/2023	DV	144	33.7	1.1	0.031	<0.49	0.569	4.16	0.0610	0.416	4.46	109
6/6/2023	DV	95	9.9	1.2	<0.020	<0.49	0.406	4.39	0.0178	0.087	6.87	119
6/20/2024	DV	140	37.8	1.4	<0.053	0.28	0.529	4.96	0.0336	<0.053	6.25	113
6/20/2024	DV	122	22.5	1.2	<0.051	0.26	0.548	4.40	<0.0100	<0.051	5.97	137
6/20/2024	DV	105	12.9	1.1	<0.051	0.27	0.429	4.33	<0.0100	<0.051	6.01	123
6/20/2024	DV	76	5.6	1.3	<0.053	0.24	0.277	3.38	0.0305	<0.053	4.47	133
6/20/2024	DV	81	5.6	1.1	<0.050	0.24	0.307	4.32	0.0271	<0.050	5.68	145
6/20/2024	DV	93	9.1	1.1	<0.053	0.17	0.148	2.88	0.0335	<0.053	4.55	116

Appendix D.3.–Lower Sarah Creek whole body fish element concentrations, 2024.

Sample Date	Species	Length (mm)	Weight (g)	Condition (*K*)	Ag (mg/kg)	As (mg/kg)	Cd (mg/kg)	Cu (mg/kg)	Hg (mg/kg)	Pb (mg/kg)	Se (mg/kg)	Zn (mg/kg)
6/20/2024	CO	82	6.6	1.2	<0.051	0.19	0.144	4.10	0.02924	<0.051	5.68	117
6/20/2024	DV	97	9.2	1.0	<0.051	0.14	0.270	3.06	0.04231	0.256	5.00	173
6/20/2024	DV	94	11.3	1.4	<0.051	0.26	0.224	4.20	0.0711	0.116	5.46	120
6/20/2024	DV	90	9.8	1.3	<0.050	0.17	0.076	2.39	0.06626	<0.050	4.76	108
6/20/2024	DV	75	4.8	1.1	<0.050	0.21	0.175	5.35	0.04781	0.1329	5.79	131
6/20/2024	DV	76	5.0	1.1	<0.050	0.21	0.100	3.99	0.09867	0.1283	5.09	139

Appendix D.4.–Upper Sarah Creek whole body fish element concentrations, 2024.

Sample Date	Species	Length (mm)	Weight (g)	Condition (*K*)	Ag (mg/kg)	As (mg/kg)	Cd (mg/kg)	Cu (mg/kg)	Hg (mg/kg)	Pb (mg/kg)	Se (mg/kg)	Zn (mg/kg)
6/20/2024	DV	110	13.1	1.0	<0.050	0.12	0.352	3.68	0.03276	<0.050	8.10	131
6/20/2024	DV	111	15.5	1.1	<0.051	0.28	0.297	3.45	0.02926	<0.051	4.59	148
6/20/2024	DV	99	8.3	0.9	<0.050	0.21	0.265	3.54	0.03151	<0.050	9.37	145
6/20/2024	DV	88	6.9	1.0	<0.051	0.23	0.271	3.69	0.03592	<0.051	4.16	100
6/20/2024	DV	103	9.7	0.9	<0.050	0.29	0.245	4.10	0.02576	<0.050	3.41	124
6/20/2024	DV	84	5.6	0.9	<0.050	0.21	0.385	4.58	0.03611	<0.050	4.68	138
6/20/2024	DV	125	24.1	1.2	<0.051	0.19	0.340	5.44	0.04956	<0.051	3.72	140
6/20/2024	DV	86	7.7	1.2	<0.051	0.29	0.300	3.16	0.03482	<0.051	4.91	137
6/20/2024	DV	80	6.0	1.2	<0.051	0.34	0.198	2.53	0.02546	<0.051	4.10	124
6/20/2024	DV	108	12.2	1.0	<0.051	0.15	0.288	3.47	0.03864	<0.051	6.64	170

Appendix D.5.–Plateau Creek whole body fish element concentrations, 2024.

Sample Date	Species	Length (mm)	Weight (g)	Condition (*K*)	Ag (mg/kg)	As (mg/kg)	Cd (mg/kg)	Cu (mg/kg)	Hg (mg/kg)	Pb (mg/kg)	Se (mg/kg)	Zn (mg/kg)
6/19/2024	DV	120	17.4	1.0	<0.051	0.25	0.328	3.50	0.07468	0.127	2.51	144
6/19/2024	DV	90	6.1	0.8	<0.050	0.24	0.500	4.05	0.0615	<0.050	3.66	144
6/19/2024	CT	99	9.9	1.0	<0.050	0.23	0.459	3.96	0.0536	<0.050	2.72	132
6/19/2024	CT	104	10.4	0.9	<0.051	0.22	0.756	4.57	0.0560	<0.051	3.12	136
6/19/2024	CT	85	5.5	0.9	<0.051	0.32	0.491	3.62	0.05405	0.12748	3.23	124
6/19/2024	CT	100	10.1	1.0	<0.051	0.13	0.356	3.38	0.06211	<0.051	3.45	127
6/19/2024	CT	113	15.0	1.0	<0.051	0.19	0.465	3.99	0.06372	<0.051	3.08	123
6/19/2024	DV	91	7.3	1.0	<0.051	0.19	0.474	3.89	0.0939	<0.051	2.23	100
6/19/2024	CT	94	7.6	0.9	<0.051	0.18	0.393	4.02	0.0783	<0.051	2.22	119
6/19/2024	CT	110	12.5	0.9	<0.050	0.26	0.859	5.45	0.08273	<0.050	3.78	122

ANALYTICAL REPORT

Alaska State Environmental Health Laboratory
5251 Dr. Martin Luther King Jr. A ue
Anchorage, AK 99507
www.dec.alaska.gov/eh/lab

Work Order Number: 2410018
Project Name: Palmer Project at Haines

For:

Constantine
PO Box 315
Haines, AK 99827

Attn: Kris Benusa

Patryce D. McKinney
Chief, Environmental Health Laboratory
patryce.mckinney@alaska.gov

Report Date: 12/24/2024

The results in this report apply to the samples analyzed in acc rdance with the sample submission form. This analytical report must be reproduced in its entirety. This report has been electronically signed and authorized by the signatory.

Sample Summary

Client: Constantine
Project: Palmer Project at Haines

Work Order: 2410018
Report Date: 12/24/2024 12:07

Lab Sample ID	Client Sample ID	Cooler	T mp C	Collected	Received
2410018-01	LGC 1	Default Cooler	2.3	20/24 8:00 am	10/4/24 8:00 am
2410018-02	LGC 2	Default Cooler	2.3	20/24 8:00 am	10/4/24 8:00 am
2410018-03	LGC 3	Default Cooler	2.3	20/24 8:00 am	10/4/24 8:00 am
2410018-04	LGC 4	Default Cooler	2.3	20/24 8:00 am	10/4/24 8:00 am
2410018-05	LGC 5	Default Cooler	2.3	20/24 8:00 am	10/4/24 8:00 am
2410018-06	LGC 6	Default Cooler	2.3	20/24 8:00 am	10/4/24 8:00 am
2410018-07	LGC 7	Default Cooler	2.3	20/24 8:00 am	10/4/24 8:00 am
2410018-08	LGC 8	Default Cooler	2.3	20/24 8:00 am	10/4/24 8:00 am
2410018-09	LGC 9	Default Cooler	2.3	20/24 8:00 am	10/4/24 8:00 am
2410018-10	LGC 10	Default Cooler	2.3	20/24 8:00 am	10/4/24 8:00 am
2410018-11	PLAT 1	Default Cooler	2.3	19/24 8:00 pm	10/4/24 8:00 am
2410018-12	PLAT 2	Default Cooler	2.3	19/24 8:00 pm	10/4/24 8:00 am
2410018-13	PLAT 3	Default Cooler	2.3	19/24 8:00 pm	10/4/24 8:00 am
2410018-14	PLAT 4	Default Cooler	2.3	19/24 8:00 pm	10/4/24 8:00 am
2410018-15	PLAT 5	Default Cooler	2.3	19/24 8:00 pm	10/4/24 8:00 am
2410018-16	PLAT	Default Cooler	2.3	19/24 8:00 pm	10/4/24 8:00 am
2410018-17	PLAT 7	Default Cooler	2.3	19/24 8:00 pm	10/4/24 8:00 am
2410018-18	PLAT 8	Default Cooler	2.3	19/24 8:00 pm	10/4/24 8:00 am
2410018-19	PLAT 9	Default Cooler	2.3	19/24 8:00 pm	10/4/24 8:00 am
2410018-20	PLAT 10	Default Cooler	2.3	19/24 8:00 pm	10/4/24 8:00 am

Alaska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

The results in this re rt apply to the samples analyzed in acc ordance with the chain of custody document. This analytical report must be repr duced in its entirety.

Methods

All samples were analyzed and conform with the following methods unless otherwise specified in the Case Narrative:

*** DEFAULT SPECIFIC METHOD ***
Fish prep
SM 2540 G
SW 3051A/6020A
SW 7473

Case Narrative

SM 2540 for total solids has a hold time of 7 days. These sample arrived outside of holdtime and are flagged HT-REC.

Samples in the batch where there zinc was found in the associated blank and in the sample are flagged with B. The sample results are more than 30 times the blank, therefore no impact on data usability.

Notes and Definitions

J	Detected but below the Reporting Limit: therefore, result is an estimated concentration
HT-REC	The sample arrival time caused Hold Time limit to be exceeded.
B-01	Analyte is found in the associated blank as well as in the sample. However, the value in the blank is less than 5% of the value in the sample, therefore no impact on data usability.
B	Analyte is found in the associated blank as well as in the sample.

Alaska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

The results in this re rt apply to the samples analyzed in acc ordance with the chain of custody document. This analytical report must be repr duced in its entirety.

Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: LGC 1
Lab Sample ID: 2410018-01
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0808**	.0508	0.0113	g/kg	1	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
admium	**0.0603**	.0508	0.0165	g/kg	"	"	"	"	"	
opper	**1.07**	.0508	0.0174	g/kg	"	"	"	"	"	
Lead	**0.0298**	.0508	.0221	g/kg	"	"	"	"	"	J
Mer ury	**0.00920**	.010	.0 480	g/kg	"	24J017	09-Oct-24	09-Oct-24	SW 7473	J
Selenium	**1.43**	.0508	0.0 722	g/kg	"	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
Silver	ND	.0508	0.0344	g/kg	"	"	"	"	"	
Zinc	**38.0**	.508	0.147	g/kg	"	"	"	"	"	
Solids	**25.9**	.10		% by weight	1	B24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-REC

Alaska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: LGC 2
Lab Sample ID: 2410018-02
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0741**	.0506	0.0112	g/kg	1	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
admium	**0.0671**	.0506	0.0164	g/kg	"	"	"	"	"	
opper	**1.01**	.0506	0.0173	g/kg	"	"	"	"	"	
Lead	**0.0326**	.0506	.0219	g/kg	"	"	"	"	"	J
Mer ury	**0.00740**	.010	.0 480	g/kg	"	24J017	09-Oct-24	09-Oct-24	SW 7473	J
Selenium	**1.46**	.0506	0.0 718	g/kg	"	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
Silver	ND	.0506	0.0342	g/kg	"	"	"	"	"	
Zinc	**26.2**	.506	0.147	g/kg	"	"	"	"	"	
Solids	**25.3**	.10		% by weight	1	B24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-REC

Alaska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: LGC 3
Lab Sample ID: 2410018-03
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0486**	.0509	0.0113	g/kg	1	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	J
Cadmium	**0.0667**	.0509	.0165	g/kg	"	"	"	"	"	
Copper	**0.933**	0.0509	.0174	g/kg	"	"	"	"	"	
Lead	ND	0.0509	.0221	g/kg	"	"	"	"	"	
Mer ury	**0.00870**	.010	0.0 480	g/kg	"	24J017	9-Oct-24	9-Oct-24	SW 7473	J
Selenium	**1.24**	.0509	.0 723	g/kg	"	B24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0509	.0344	g/kg	"	"	"	"	"	
Zinc	**30.6**	.509	.148	g/kg	"	"	"	"	"	
% Solids	**24.7**	0.10		% by weight	1	24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-RE C

Alaska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: LGC 4
Lab Sample ID: 2410018-04
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0809**	.0509	0.0113	g/kg	1	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
admium	**0.108**	.0509	0.0165	g/kg	"	"	"	"	"	
opper	**1.24**	.0509	0.0174	g/kg	"	"	"	"	"	
Lead	**0.0490**	.0509	.0221	g/kg	"	"	"	"	"	J
Mer ury	**0.00750**	.010	.0 480	g/kg	"	24J017	09-Oct-24	09-Oct-24	SW 7473	J
Selenium	**1.28**	.0509	0.0 723	g/kg	"	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
Silver	ND	.0509	0.0344	g/kg	"	"	"	"	"	
Zinc	**44.3**	.509	0.148	g/kg	"	"	"	"	"	
Solids	**23.4**	.10		% by weight	1	B24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-REC

Alaska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: LGC 5
Lab Sample ID: 2410018-05
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0844**	.0504	0.0112	g/kg	1	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
admium	**0.118**	.0504	0.0163	g/kg	"	"	"	"	"	
opper	**1.01**	.0504	0.0172	g/kg	"	"	"	"	"	
Lead	**0.0288**	.0504	.0219	g/kg	"	"	"	"	"	J
Mer ury	**0.00890**	.010	.0 480	g/kg	"	24J017	09-Oct-24	09-Oct-24	SW 7473	J
Selenium	**1.45**	.0504	0.0 716	g/kg	"	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
Silver	ND	.0504	0.0341	g/kg	"	"	"	"	"	
Zinc	**34.3**	.504	0.146	g/kg	"	"	"	"	"	
Solids	**24.9**	.10		% by weight	1	B24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-REC

Alaska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: LGC 6
Lab Sample ID: 2410018-06
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0750**	.0510	0.0113	g/kg	1	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
admium	**0.0661**	.0510	.0165	g/kg	"	"	"	"	"	
opper	**1.14**	.0510	.0174	g/kg	"	"	"	"	"	
Lead	**0.0401**	.0510	.0221	g/kg	"	"	"	"	"	J
Mer ury	**0.00930**	.010	.0 480	g/kg	"	24J017	09-Oct-24	09-Oct-24	SW 7473	J
Selenium	**1.44**	.0510	.0 724	g/kg	"	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
Silver	ND	.0510	.0345	g/kg	"	"	"	"	"	
Zinc	**6.0**	.510	.148	g/kg	"	"	"	"	"	
Solids	**24.5**	.10		% by weight	1	B24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-REC

Alaska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: LGC 7
Lab Sample ID: 2410018-07
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0680**	.0508	0.0113	g/kg	1	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
Cadmium	**0.0634**	0.0508	.0165	g/kg	"	"	"	"	"	
Copper	**1.08**	0.0508	.0174	g/kg	"	"	"	"	"	
Lead	ND	0.0508	.0221	g/kg	"	"	"	"	"	
Mer ury	**0.00790**	.010	0.0 480	g/kg	"	24J017	9-Oct-24	9-Oct-24	SW 7473	J
Selenium	**1.28**	.0508	.0 722	g/kg	"	B24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0508	.0344	g/kg	"	"	"	"	"	
Zinc	**27.1**	.508	.147	g/kg	"	"	"	"	"	
% Solids	**24.5**	0.10		% by weight	1	24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-REC

Alaska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: LGC 8
Lab Sample ID: 2410018-08
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0722**	.0507	0.0113	g/kg	1	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
admium	**0.102**	.0507	0.0164	g/kg	"	"	"	"	"	
opper	**1.17**	.0507	0.0173	g/kg	"	"	"	"	"	
Lead	**0.0383**	.0507	.0220	g/kg	"	"	"	"	"	J
Mer ury	**0.00990**	.010	.0 480	g/kg	"	24J017	09-Oct-24	09-Oct-24	SW 7473	J
Selenium	**0.928**	.0507	0.0 720	g/kg	"	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
Silver	ND	.0507	0.0343	g/kg	"	"	"	"	"	
Zinc	**30.1**	.507	0.147	g/kg	"	"	"	"	"	
Solids	**22.8**	.10		% by weight	1	B24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-REC

Alaska State Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: LGC 9
Lab Sample ID: 2410018-09
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0686**	.0505	0.0112	g/kg	1	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
admium	**0.106**	.0505	0.0163	g/kg	"	"	"	"	"	
opper	**1.29**	.0505	0.0173	g/kg	"	"	"	"	"	
Lead	**0.0223**	.0505	.0219	g/kg	"	"	"	"	"	J
Mer ury	**0.00860**	.010	.0 480	g/kg	"	24J017	09-Oct-24	09-Oct-24	SW 7473	J
Selenium	**1.38**	.0505	0.0 716	g/kg	"	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
Silver	ND	.0505	0.0341	g/kg	"	"	"	"	"	
Zinc	**3.9**	.505	0.146	g/kg	"	"	"	"	"	
Solids	**26.4**	.10		% by weight	1	B24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-REC

Alaska State Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: LGC 10
Lab Sample ID: 2410018-10
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0678**	.0505	0.0112	g/kg	1	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
Cadmium	**0.0653**	0.0505	.0164	g/kg	"	"	"	"	"	
Copper	**1.05**	0.0505	.0173	g/kg	"	"	"	"	"	
Lead	ND	0.0505	.0219	g/kg	"	"	"	"	"	
Mer ury	**0.0101**	.010	0.0 480	g/kg	"	24J017	9-Oct-24	9-Oct-24	SW 7473	
Selenium	**1.17**	.0505	.0 717	g/kg	"	B24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0505	.0341	g/kg	"	"	"	"	"	
Zinc	**28.8**	.505	.146	g/kg	"	"	"	"	"	
% Solids	**25.7**	0.10		% by weight	1	24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-REC

Alaska State Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: PLAT 1
Lab Sample ID: 2410018-11
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0584**	.0509	0.0113	g/kg	1	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
admium	**0.0778**	.0509	0.0165	g/kg	"	"	"	"	"	
opper	**0.830**	.0509	0.0174	g/kg	"	"	"	"	"	
Lead	**0.0302**	.0509	.0221	g/kg	"	"	"	"	"	J
Mer ury	**0.0177**	.010	.0 480	g/kg	"	24J017	09-Oct-24	09-Oct-24	SW 7473	
Selenium	**0.595**	.0509	0.0 723	g/kg	"	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
Silver	ND	.0509	0.0344	g/kg	"	"	"	"	"	
Zinc	**34.2**	.509	0.148	g/kg	"	"	"	"	"	
Solids	**23.7**	.10		% by weight	1	B24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-REC

Alaska State Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: PLAT 2
Lab Sample ID: 2410018-12
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0552**	.0504	0.0112	g/kg	1	24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
Cadmium	**0.113**	0.0504	.0163	g/kg	"	"	"	"	"	
Copper	**0.915**	0.0504	.0172	g/kg	"	"	"	"	"	
Lead	ND	0.0504	.0219	g/kg	"	"	"	"	"	
Mer ury	**0.0139**	.010	0.0 480	g/kg	"	24J017	9-Oct-24	9-Oct-24	SW 7473	
Selenium	**0.828**	.0504	.0 715	g/kg	"	B24J095	28-Oct-24	14-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0504	.0341	g/kg	"	"	"	"	"	
Zinc	**32.6**	.504	.146	g/kg	"	"	"	"	"	
% Solids	**22.6**	0.10		% by weight	1	24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-RE C

Alaska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: PLAT 3
Lab Sample ID: 2410018-13
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0511**	.0502	0.0111	g/kg	1	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
Cadmium	**0.102**	0.0502	.0163	g/kg	"	"	"	"	"	
Copper	**0.880**	0.0502	.0172	g/kg	"	"	"	"	"	
Lead	ND	0.0502	.0218	g/kg	"	"	"	"	"	
Mer ury	**0.0119**	.010	0.0 480	g/kg	"	24J017	9-Oct-24	9-Oct-24	SW 7473	
Selenium	**0.604**	.0502	.0 713	g/kg	"	B24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0502	.0339	g/kg	"	"	"	"	"	
Zinc	**29.4**	.502	.146	g/kg	"	"	"	"	"	
% Solids	**22.2**	0.10		% by weight	1	24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-REC

Alaska State Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: PLAT 4
Lab Sample ID: 2410018-14
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0505**	.0505	0.0112	g/kg	1	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
Cadmium	**0.177**	0.0505	.0164	g/kg	"	"	"	"	"	
Copper	**1.07**	0.0505	.0173	g/kg	"	"	"	"	"	
Lead	ND	0.0505	.0219	g/kg	"	"	"	"	"	
Mer ury	**0.0131**	.010	0.0 480	g/kg	"	24J017	9-Oct-24	9-Oct-24	SW 7473	
Selenium	**0.730**	.0505	.0 717	g/kg	"	B24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0505	.0341	g/kg	"	"	"	"	"	
Zinc	**31.8**	.505	.146	g/kg	"	"	"	"	"	
% Solids	**23.4**	0.10		% by weight	1	24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-REC

Alaska State Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: PLAT 5
Lab Sample ID: 2410018-15
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0701**	.0509	0.0113	g/kg	1	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
admium	**0.109**	.0509	0.0165	g/kg	"	"	"	"	"	
opper	**0.803**	.0509	0.0174	g/kg	"	"	"	"	"	
Lead	**0.0283**	.0509	.0221	g/kg	"	"	"	"	"	J
Mer ury	**0.0120**	.010	.0 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	
Selenium	**0.718**	.0509	0.0 723	g/kg	"	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
Silver	ND	.0509	0.0344	g/kg	"	"	"	"	"	
Zinc	**27.6**	.509	0.148	g/kg	"	"	"	"	"	
Solids	**22.2**	.10		% by weight	1	B24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-REC

Alaska State Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: PLAT 6
Lab Sample ID: 2410018-16
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0300**	.0508	0.0113	g/kg	1	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	J
Cadmium	**0.0809**	.0508	.0165	g/kg	"	"	"	"	"	
Copper	**0.767**	0.0508	.0174	g/kg	"	"	"	"	"	
Lead	ND	0.0508	.0220	g/kg	"	"	"	"	"	
Mer ury	**0.0141**	.010	0.0 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	
Selenium	**0.784**	.0508	.0 721	g/kg	"	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0508	.0343	g/kg	"	"	"	"	"	
Zinc	**28.8**	.508	.147	g/kg	"	"	"	"	"	
% Solids	**22.7**	0.10		% by weight	1	24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-REC

Alaska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: PLAT 7
Lab Sample ID: 2410018-17
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0438**	.0508	0.0113	g/kg	1	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	J
Cadmium	**0.105**	.0508	.0164	g/kg	"	"	"	"	"	
Copper	**0.902**	0.0508	.0174	g/kg	"	"	"	"	"	
Lead	ND	0.0508	.0220	g/kg	"	"	"	"	"	
Mer ury	**0.0144**	.010	0.0 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	
Selenium	**0.697**	.0508	.0 721	g/kg	"	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0508	.0343	g/kg	"	"	"	"	"	
Zinc	**27.8**	.508	.147	g/kg	"	"	"	"	"	
% Solids	**22.6**	0.10		% by weight	1	24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-RE C

Alaska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: PLAT 8
Lab Sample ID: 2410018-18
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0399**	.0506	0.0112	g/kg	1	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	J
Cadmium	**0.101**	.0506	.0164	g/kg	"	"	"	"	"	
Copper	**0.828**	0.0506	.0173	g/kg	"	"	"	"	"	
Lead	ND	0.0506	.0220	g/kg	"	"	"	"	"	
Mer ury	**0.0200**	.010	0.0 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	
Selenium	**0.476**	.0506	.0 719	g/kg	"	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0506	.0342	g/kg	"	"	"	"	"	
Zinc	**21.3**	.506	.147	g/kg	"	"	"	"	"	
% Solids	**21.3**	0.10		% by weight	1	24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-REC

Alaska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: PLAT 9
Lab Sample ID: 2410018-19
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0382**	.0508	0.0113	g/kg	1	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	J
Cadmium	**0.0833**	.0508	.0165	g/kg	"	"	"	"	"	
Copper	**0.852**	0.0508	.0174	g/kg	"	"	"	"	"	
Lead	ND	0.0508	.0220	g/kg	"	"	"	"	"	
Mer ury	**0.0166**	.010	0.0 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	
Selenium	**0.471**	.0508	.0 721	g/kg	"	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0508	.0343	g/kg	"	"	"	"	"	
Zinc	**25.2**	.508	.147	g/kg	"	"	"	"	"	
% Solids	**21.2**	0.10		% by weight	1	24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-REC

Alaska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410018**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:07**

Client Sample ID: PLAT 10
Lab Sample ID: 2410018-20
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0578**	.0503	0.0112	g/kg	1	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
Cadmium	**0.189**	0.0503	.0163	g/kg	"	"	"	"	"	
Copper	**1.20**	0.0503	.0172	g/kg	"	"	"	"	"	
Lead	ND	0.0503	.0218	g/kg	"	"	"	"	"	
Mer ury	**0.0182**	.010	0.0 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	
Selenium	**0.831**	.0503	.0 714	g/kg	"	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0503	.0340	g/kg	"	"	"	"	"	
Zinc	**26.9**	.503	.146	g/kg	"	"	"	"	"	
% Solids	**22.0**	0.10		% by weight	1	24J098	19-Nov-24	20-Nov-24	SM 2540 G	HT-REC

Alaska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B24J017 - EPA 7473										
Blank (B24J017-BLK1)				Prepared & Analyzed: 09-Oct-24						
Mercury	ND	0.010	g/kg							
Blank (B24J017-BLK2)				Prepared & Analyzed: 09-Oct-24						
Mercury	ND	0.010	g/kg							
Blank (B24J017-BLK3)				Prepared & Analyzed: 09-Oct-24						
Mercury	ND	0.010	g/kg							
Blank (B24J017-BLK4)				Prepared & Analyzed: 09-Oct-24						
Mercury	ND	0.010	g/kg							
Blank (B24J017-BLK5)				Prepared & Analyzed: 09-Oct-24						
Mercury	ND	0.010	g/kg							
Duplicate (B24J017-DUP1)	**Source: 2408112-03**			Prepared & Analyzed: 09-Oct-24						
Mercury	.0 720	.010	g/kg		.0 750			4	20	J
Duplicate (B24J017-DUP2)	**Sour e: 2410018-09**			Prepared & Analyzed: 09-Oct-24						
Mercury	.0 860	.010	g/kg		.0 860				20	J
MRL heck (B24J017-MRL1)				Prepared & Analyzed: 09-Oct-24						
Mercury	.0 760	.010	g/kg	.010 11		76	70-130			J
Matrix Spike (B24J017-MS1)	**Source: 2408112-03**			Prepared & Analyzed: 09-Oct-24						
Mercury	.267	0.010	g/kg	.24174	0.0 750	107	71-124			
Matrix Spike Dup (B24J017-MSD1)	**Source: 2408112-03**			Prepared & Analyzed: 09-Oct-24						
Mercury	.276	0.010	g/kg	.24713	0.0 750	109	71-124	3	20	

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B24J017 - EPA 7473										
Reference (B24J017-SRM1)				Prepared & Analyzed: 09-Oct-24						
Mercury	.30	.010	g/kg	.3160		95	90-11			
Reference (B24J017-SRM2)				Prepared & Analyzed: 09-Oct-24						
Mercury	.333	0.010	g/kg	.3160		105	90-11			
Reference (B24J017-SRM3)				Prepared & Analyzed: 09-Oct-24						
Mercury	.296	0.010	g/kg	.3160		94	80-120			
Reference (B24J017-SRM4)				Prepared & Analyzed: 09-Oct-24						
Mercury	.327	0.010	g/kg	.3160		103	80-120			
Reference (B24J017-SRM5)				Prepared & Analyzed: 09-Oct-24						
Mercury	.292	0.010	g/kg	.3160		92	80-120			
Reference (B24J017-SRM6)				Prepared & Analyzed: 09-Oct-24						
Mercury	.335	0.010	g/kg	.3160		106	80-120			
Reference (B24J017-SRM7)				Prepared & Analyzed: 09-Oct-24						
Mercury	.296	0.010	g/kg	.3160		94	80-120			
Reference (B24J017-SRM8)				Prepared & Analyzed: 09-Oct-24						
Mercury	.329	0.010	g/kg	.3160		104	80-120			
Batch B24J042 - EPA 7473										
Blank (B24J042-BLK1)				Prepared & Analyzed: 10-Oct-24						
Mercury	ND	0.010	g/kg							

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B24J042 - EPA 7473										
Blank (B24J042-BLK2)				Prepared & Analyzed: 10-Oct-24						
Mercury	ND	0.010	g/kg							
Blank (B24J042-BLK3)				Prepared & Analyzed: 10-Oct-24						
Mercury	ND	0.010	g/kg							
Blank (B24J042-BLK4)				Prepared & Analyzed: 10-Oct-24						
Mercury	ND	0.010	g/kg							
Blank (B24J042-BLK5)				Prepared & Analyzed: 10-Oct-24						
Mercury	ND	0.010	g/kg							
Duplicate (B24J042-DUP1)	**Sour e: 2410018-17**			Prepared & Analyzed: 10-Oct-24						
Mercury	.0143	0.010	g/kg		.0144			.7	20	
Duplicate (B24J042-DUP2)	**Sour e: 2410019-03**			Prepared & Analyzed: 10-Oct-24						
Mercury	.0 760	.010	g/kg		.0 750			1	20	J
MRL heck (B24J042-MRL1)				Prepared & Analyzed: 10-Oct-24						
Mercury	.0 780	.010	g/kg	.010 11		78	70-130			J
Matrix Spike (B24J042-MS1)	**Sour e: 2410018-17**			Prepared & Analyzed: 10-Oct-24						
Mercury	.271	0.010	g/kg	.24256	0.0144	106	71-124			
Matrix Spike Dup (B24J042-MSD1)	**Sour e: 2410018-17**			Prepared & Analyzed: 10-Oct-24						
Mercury	.282	0.010	g/kg	.24836	0.0144	108	71-124	4	20	
Reference (B24J042-SRM1)				Prepared & Analyzed: 10-Oct-24						
Mercury	.292	0.010	g/kg	.3160		92	90-110			

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B24J042 - EPA 7473										
Reference (B24J042-SRM2)				Prepared & Analyzed: 10-Oct-24						
Mercury	.333	0.010	g/kg	.3160		106	90-11			
Reference (B24J042-SRM3)				Prepared & Analyzed: 10-Oct-24						
Mercury	.297	0.010	g/kg	.3160		94	80-120			
Reference (B24J042-SRM4)				Prepared & Analyzed: 10-Oct-24						
Mercury	.329	0.010	g/kg	.3160		104	80-120			
Reference (B24J042-SRM5)				Prepared & Analyzed: 10-Oct-24						
Mercury	.290	.010	g/kg	.3160		92	80-120			
Reference (B24J042-SRM6)				Prepared & Analyzed: 10-Oct-24						
Mercury	.329	0.010	g/kg	.3160		104	80-120			
Reference (B24J042-SRM7)				Prepared & Analyzed: 10-Oct-24						
Mercury	.297	0.010	g/kg	.3160		94	80-120			
Reference (B24J042-SRM8)				Prepared & Analyzed: 10-Oct-24						
Mercury	.323	0.010	g/kg	.3160		102	80-120			
Batch B24J095 - SW 3051										
Blank (B24J095-BLK1)				Prepared: 28-Oct-24 Analyzed: 14-Nov-24						
Arsenic	ND	0.050	g/kg							
Cadmium	ND	.050	"							
Copper	ND	.050	"							
Lead	ND	.050	"							
Selenium	ND	.050	"							
Silver	ND	.050	"							
Zinc	0.516	.50	"							-01

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B24J095 - SW 3051										
LCS (B24J095-BS1)				Prepared: 28-Oct-24 Analyzed: 14-Nov-24						
Arsenic	9.57	0.050	g/kg	10.0		96	80-120			
Cadmium	9.57	0.050	"	10.0		96	80-120			
Copper	9.69	0.050	"	10.0		97	80-120			
Lead	9.75	0.050	"	10.0		98	80-120			
Selenium	9.36	0.050	"	10.0		94	80-120			
Silver	9.70	.050	"	10.0		97	80-120			
Zinc	192	0.50	"	199.81		96	80-120			
LCS Dup (B24J095-BSD1)				Prepared: 28-Oct-24 Analyzed: 14-Nov-24						
Arsenic	9.76	0.050	g/kg	10.0		98	80-120	2	20	
Cadmium	9.79	0.050	"	10.0		98	80-120	2	20	
Copper	9.87	0.050	"	10.0		99	80-120	2	20	
Lead	9.88	0.050	"	10.0		99	80-120	1	20	
Selenium	9.53	0.050	"	10.0		95	80-120	2	20	
Silver	9.88	0.050	"	10.0		99	80-120	2	20	
Zinc	196	0.50	"	199.81		98	80-120	2	20	
MRL heck (B24J095-MRL1)				Prepared: 28-Oct-24 Analyzed: 14-Nov-24						
Arsenic	.0453	0.050	g/kg	0.050 24		91	70-130			J
Cadmium	.0484	0.050	"	0.050 24		97	70-130			J
Copper	.0536	0.050	"	0.050 24		107	70-130			
Lead	.0489	0.050	"	0.050 24		98	70-130			J
Selenium	.0463	0.050	"	0.050 24		93	70-130			J
Silver	.0519	0.050	"	0.050 24		104	70-130			
Zinc	1.0	.50	"	.99908		10	70-130			
Matrix Spike (B24J095-MS1)	**Sour e: 2410018-04**			Prepared: 28-Oct-24 Analyzed: 14-Nov-24						
Arsenic	10.4	0.0507	g/kg	10.142	0.0809	102	75-125			
Cadmium	10.0	.0507	"	10.142	0.108	97	75-125			
Copper	11.0	.0507	"	10.142	1.24	97	75-125			
Lead	9.74	0.0507	"	10.142	0.0490	96	75-125			
Selenium	12.1	0.0507	"	10.142	1.28	107	75-125			
Silver	9.84	0.0507	"	10.142	ND	97	75-125			
Zinc	237	0.507	"	202.65	44.3	95	75-125			

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B24J095 - SW 3051										
Matrix Spike Dup (B24J095-MSD1)	**Sour e: 2410018-04**			Prepared: 28-Oct-24 Analyzed: 14-Nov-24						
Arsenic	11.0	.0506	g/kg	10.119	0.0809	108	75-125	6	20	
Cadmium	10.2	0.0506	"	10.119	0.108	10	75-125	2	20	
Copper	11.2	0.0506	"	10.119	1.24	98	75-125	1	20	
Lead	9.92	0.0506	"	10.119	0.0490	98	75-125	2	20	
Selenium	13.2	0.0506	"	10.119	1.28	118	75-125	8	20	
Silver	10.0	.0506	"	10.119	ND	99	75-125	2	20	
Zinc	240	.506	"	202.20	44.3	97	75-125	1	20	
Batch B24J096 - SW 3051										
Blank (B24J096-BLK1)				Prepared: 29-Oct-24 Analyzed: 15-Nov-24						
Arsenic	ND	0.050	g/kg							
Cadmium	ND	.050	"							
Copper	ND	.050	"							
Lead	ND	.050	"							
Selenium	ND	.050	"							
Silver	ND	.050	"							
Zinc	ND	.50	"							
LCS (B24J096-BS1)				Prepared: 29-Oct-24 Analyzed: 15-Nov-24						
Arsenic	9.94	0.050	g/kg	10.0		99	80-120			
Cadmium	9.86	.050	"	10.0		99	80-120			
Copper	10.0	.050	"	10.0		10	80-120			
Lead	10.2	.050	"	10.0		102	80-120			
Selenium	9.74	.050	"	10.0		97	80-120			
Silver	9.86	.050	"	10.0		99	80-120			
Zinc	197	.50	"	199.81		99	80-120			

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B24J096 - SW 3051										
LCS Dup (B24J096-BSD1)				Prepared: 29-Oct-24 Analyzed: 15-Nov-24						
Arsenic	9.88	0.050	g/kg	10.0		99	80-120	.5	20	
Cadmium	9.95	0.050	"	10.0		99	80-120	.9	20	
Copper	10.1	0.050	"	10.0		101	80-120	.4	20	
Lead	10.2	0.050	"	10.0		102	80-120	.5	20	
Selenium	9.65	0.050	"	10.0		96	80-120	1	20	
Silver	9.94	0.050	"	10.0		99	80-120	.9	20	
Zinc	197	0.50	"	199.81		99	80-120	.2	20	
MRL heck (B24J096-MRL1)				Prepared: 29-Oct-24 Analyzed: 15-Nov-24						
Arsenic	.0468	0.050	g/kg	0.050 24		94	70-130			J
Cadmium	.0502	0.050	"	0.050 24		10	70-130			
Copper	.0515	0.050	"	0.050 24		103	70-130			
Lead	.0501	0.050	"	0.050 24		10	70-130			
Selenium	.0474	0.050	"	0.050 24		95	70-130			J
Silver	.0512	0.050	"	0.050 24		102	70-130			
Zinc	1.01	0.50	"	.99908		101	70-130			
Matrix Spike (B24J096-MS1)	**Sour e: 2410018-20**			Prepared: 29-Oct-24 Analyzed: 15-Nov-24						
Arsenic	11.0	.0510	g/kg	10.192	0.0578	107	75-125			
Cadmium	10.4	0.0510	"	10.192	0.189	10	75-125			
Copper	11.1	0.0510	"	10.192	1.20	97	75-125			
Lead	10.1	0.0510	"	10.192	ND	99	75-125			
Selenium	12.5	0.0510	"	10.192	0.831	115	75-125			
Silver	10.0	.0510	"	10.192	ND	98	75-125			
Zinc	228	0.510	"	203.64	26.9	99	75-125			
Matrix Spike Dup (B24J096-MSD1)	**Sour e: 2410018-20**			Prepared: 29-Oct-24 Analyzed: 15-Nov-24						
Arsenic	10.5	0.0507	g/kg	10.146	0.0578	103	75-125	4	20	
Cadmium	10.3	0.0507	"	10.146	0.189	10	75-125	1	20	
Copper	10.9	0.0507	"	10.146	1.20	95	75-125	2	20	
Lead	9.92	0.0507	"	10.146	ND	98	75-125	2	20	
Selenium	11.6	0.0507	"	10.146	0.831	106	75-125	7	20	
Silver	9.97	0.0507	"	10.146	ND	98	75-125	.5	20	
Zinc	224	0.507	"	202.73	26.9	97	75-125	2	20	

Classical Chemistry Parameters - Quality Control

Alaska State Environmental Health Laboratory

Work Order: 2410018

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B24J098 - % Solids										
Blank (B24J098-BLK1)				Prepared: 19-Nov-24 Analyzed: 20-Nov-24						
% Solids	ND	0.10	% by weight							
Blank (B24J098-BLK2)				Prepared: 19-Nov-24 Analyzed: 20-Nov-24						
% Solids	ND	0.10	% by weight							
Duplicate (B24J098-DUP1)	**Sour e: 2410018-10**			Prepared: 19-Nov-24 Analyzed: 20-Nov-24						
% Solids	25.5	0.10	% by weight		25.7			.7	20	
Duplicate (B24J098-DUP2)	**Sour e: 2410018-09**			Prepared: 19-Nov-24 Analyzed: 20-Nov-24						
% Solids	26.1	0.10	% by weight		26.4			1	20	

Alaska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

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Buzby-Rynders, Danika M (DEC)

From: Krull, Dylan P (DFG)
Sent: Thursday, October 3, 2024 2:18 PM
To: DEC EH - Lab - Shipping Receiving
Subject: ADF&G Fish Samples

Hello,

I am heading to the airport to ship the samples via goldstreak.

Date shipped
- 10/3/2024

Your name and contact telephone number
- Dylan Krull (907) 465-6160 or Kate Kanouse (907) 465-4290

Number of pieces (coolers, boxes, etc.)
- 1 blue cooler

Content of shipment
- 42 individual bagged juvenile fish

Time of sample collection
- 6/19-6/20/2024

Test(s) requested
- 6020 Ag, As, Cd, Cu, Pb, Se, Zn
- 7473 Hg
- %solid (if sufficient volume)

Freight carrier
- Alaska Airlines

The waybill number (or other carrier tracking number)
- TBD

Flight number, if available
- TBD

Date and time expected for arrival in Anchorage
- TBD

I will add more information after I send the samples

Thank you!

Dylan Krull
Habitat Biologist III
ADF&G–Habitat
Juneau, AK
907-465-6160

WO# 24100018

Client: Constantine			Tissue			Sample Stats					Prep		Jars										Comments					WO
Project: Palmer Project at Haines																												
Notes: Metals are the priority, % solid only if sufficient volume			Submitted As	Tissue Processed	Individuals	Composite-all as one (small items)	Length	Weight	Sex	Otoliths	Standard	Organic	Axys (Organic Prep Required)	Biopsy Punch/Plug (P)	Composite (C)	Extra	Fatty acid	Gamma	Metals	Nutrients	PFAS (Organic Prep Required)	Reference	6020 Ag, As, Cd, Cu, Pb, Se, Zn	7473 Hg	%solid (if sufficient volume)			Notes	
(Max 20 per page) Sample	(Required) Sample Date / Time																											
LGC 1	6/19	0800	W	W	X						X								X				X	X	X			-01
LGC 2			W	W	X						X								X				X	X	X			-02
LGC 3			W	W	X						X								X				X	X	X			-03
LGC 4			W	W	X						X								X				X	X	X			-04
LGC 5			W	W	X						X								X				X	X	X			-05
LGC 6			W	W	X						X								X				X	X	X			-06
LGC 7			W	W	X						X								X				X	X	X			-07
LGC 8			W	W	X						X								X				X	X	X			-08
LGC 9			W	W	X						X								X				X	X	X			-09
LGC 10			W	W	X						X								X				X	X	X			-10
PLAT 1	6/19	2000	W	W	X						X								X				X	X	X			-11
PLAT 2			W	W	X						X								X				X	X	X			-12
PLAT 3			W	W	X						X								X				X	X	X			-13
PLAT 4			W	W	X						X								X				X	X	X			-14
PLAT 5			W	W	X						X								X				X	X	X			-15
PLAT 6			W	W	X						X								X				X	X	X			-16
PLAT 7			W	W	X						X								X				X	X	X			-17
PLAT 8			W	W	X						X								X				X	X	X			-18
PLAT 9			W	W	X						X								X				X	X	X			-19
PLAT 10			W	W	X						X								X				X	X	X			-20

NOTES: W=Whole Body, F=Fillet, R=Roast, G=Gonads, K=Kidney, L=Liver, P=Plugs, C=Composite

Collected (Sampled) By: Dylan Krull
Submitted by: Dylan Krull
Submitted Date/Time: 10/3/24 1400
Received by:
Received Date/Time: 10/4/24 0800

State of Alaska
Department of Environmental Conservation
Fish Tissue Monitoring Program
5251 Dr MLK Jr. Ave
Anchorage, AK 99507

027 | JNU | 34786113

Freezer

027-34786113

Shipper's Name and Address

DYLAN KRULL ADFG HABITAT SECTION

8230 ASPEN AVE
JUNEAU AK
US 99801 9074656160

Shipper's Account Number

Not negotiable

Air Waybill

Issued by ALASKA AIRLINES
***

Copies 1,2 and 3 of this Air Waybill are originals and have the same validity

Consignee's Name and Address

ADEC EH LAB KATE KANOUSE

HFPU
ANCHORAGE AK
US 00000 9073758231

AMS

Consignee's Account Number

It is agreed that the goods described herein are accepted in apparent good order and condition (except as noted) for carriage SUBJECT TO THE CONDITIONS OF CONTRACT ON THE REVERSE HEREOF.ALL GOODS MAY BE CARRIED BY ANY OTHER MEANS INCLUDING ROAD OR ANY OTHER CARRIER UNLESS SPECIFIC CONTRARY INSTRUCTIONS ARE GIVEN HEREON BY THE SHIPPER AND SHIPPER AGREES THAT THE SHIPMENT MAY BE CARRIED VIA INTERMEDIATE STOPPING PLACES WHICH THE CARRIER DEEMS APPROPRIATE THE SHIPPER'S ATTENTION IS DRAWN TO THE NOTICE CONCERNING CARRIER'S LIMITATION OF LIABILITY.Shipper may increase such limitation of liability by declaring a higher value for carriage and paying a supplemental charge if required.

Issuing Carrier's Agent Name and City

ASQXGUEST

SEATTLE

Accounting Information

Agents IATA Code

9999999

Account No.

Airport of Departure (Addr. of First Carrier) and Requested Routing

JUNEAU - JUNEAU INTL.

Reference Number

Optional Shipping Informati

To	By First Carrier	Routing and Destination	to	by	to	by
ANC	AS					

Currency	ChgsCode	WT/ Val PPD	WT/ Val COLL	Other PPD	Other COLL	Declared Value for Carriage	Declared Value for Customs
USD		X		X		NVD	NCV

Airport of Destination

ANCHORAGE - TED S

Requested Flight/Date

AS 0067/03-Oct /

Amount of Insurance

XXX

INSURANCE - If carrier offers insurance and such insurance is requested in accordance with conditions on reverse hereof indicate amount to be insured in figures in box marked "Amount o

Handling Information

OSI-UNKNOWN SHIPPER STATE OF ALASKA ONLY

SCI

No.of Pieces RCP	Gross Weight	K lb	Rate Class	Commodity Item No.	Chargeable Weight	Rate / Charge	Total	Nature and Quantity of Goods (incl. Dimensions or Volume)
1	11.00	L	M		11.00	57.00	57.00	fish samples DIMS(INH)12.0x10.0x9.0/1
1	11.00						57.00	

Prepaid	Weight Charge	Collect
	57.00	

Valuation Charge

Tax

4.34

Total other Charges Due Age

Total other Charges Due Carrier

12.50

Other Charges

XBC12.5PP

Shipper certifies that the particulars on the face hereof are correct and that insofar as any part of the consignment contains dangerous goods such part is properly described by name and is in proper condition for carriage by air according to the applicable Dangerous Goods Regulations.

Signature of Shipper or his Agent

Total Prepaid	Total Collect
73.84	

Currency Conversion Rates	cc charges in Dest. Currency

Executed on (Date)	at (Place)	Signature of Issuing Carrier or its Agent
03-OCT-2024	JNU	1019446

For Carrier Use only at Destination	Charges at Destination	Total Collect Charges

027-34786113

ADEC EHL Sample Receipt Checklist

(form SC-11, rev 01/11/2024)
.Environmental Health Laboratory
5251 Dr. MLK Jr. Ave., Anchorage, AK 99507
(907) 375-8200

WO #: 2410018 **# of Samples:** 20

Client: ADFG Sample Matrix: Fish Tissue

COC Seals:

- [ ] On Shipping Container — Intact? Y/N
- [ ] On Sample Packaging — Intact? Y/N
- [x] None

Received via:

- [ ] USPS
- [ ] UPS
- [ ] FedEx
- [ ] Delivered by Client/Client Courier
- [x] Courier *Shipper:* AKAIR
- [ ] Other

Shipment Tracking # 027-3478 6113

Sample Temperature @ Receipt: 2.3 °C

Thermometer ID (circle one): A19E080, calibration due 12/29/2024
Other: _____

Shipping Container Type:

- [ ] Box
- [x] Cooler
- [ ] Envelope
- [ ] Hand Carry
- [ ] Styro-Box
- [ ] Other _____

Sample Packaging Type:

- [x] Plastic/Ziploc Bag
- [ ] Plastic/Glass Vial/Jar
- [ ] Whirl Pak Bag
- [ ] Vacuum Packaging
- [ ] Commercial Packaging
- [ ] Blood Tubes
- [ ] Other _____

Refrigerant:

- [ ] Dry Ice
- [x] Gel/Ice Pack
- [ ] Water Ice
- [ ] Other _____
- [ ] None
- Notes: _____

Sample(s) and Sample Containers:

Intact?	Y	[x]	N	[ ]	Properly Preserved?	Y	[x]	N	[ ]
Correct Type?	Y	[x]	N	[ ]	Meets Temp Requirements?	Y	[x]	N	[ ]
IDs/Times/Dates Match Form?	Y	[x]	N	[ ]	Adequate Amount for Tests?	Y	[x]	N	[ ]

Sample Submission Form:

Sample Submission Form Complete?	Y	[x]	N	[ ]	
Client Contacted Regarding Incomplete Data?	N	[x]	Y	[ ]	*Provide details below in "Comments" section.*

Comments: Collection year missing from submission form. Please see attached for clarification. PBR 10/4/24

ANALYTICAL REPORT

Alaska State Environmental Health Laboratory
5251 Dr. Martin Luther King Jr. A ue
Anchorage, AK 99507
www.dec.alaska.gov/eh/lab

Work Order Number: 2410019
Project Name: Palmer Project at Haines

For:

Constantine
PO Box 315
Haines, AK 99827

Attn: Kris Benusa

Patryce D. McKinney
Chief, Environmental Health Laboratory
patryce.mckinney@alaska.gov

Report Date: 12/24/2024

The results in this report apply to the samples analyzed in acc rdance with the sample submission form. This analytical report must be reproduced in its entirety. This report has been electronically signed and authorized by the signatory.

Sample Summary

Client: Constantine
Project: Palmer Project at Haines

Work Order: 2410019
Report Date: 12/24/2024 12:32

Lab Sample ID	Client Sample ID	Cooler	T mp C	Collected	Received
2410019-01	USAR 1	Default Cooler	2.3	20/24 12:00 pm	10/4/24 8:00 am
2410019-02	USAR 2	Default Cooler	2.3	20/24 12:00 pm	10/4/24 8:00 am
2410019-03	USAR 3	Default Cooler	2.3	20/24 12:00 pm	10/4/24 8:00 am
2410019-04	USAR 4	Default Cooler	2.3	20/24 12:00 pm	10/4/24 8:00 am
2410019-05	USAR 5	Default Cooler	2.3	20/24 12:00 pm	10/4/24 8:00 am
2410019-06	USAR 6	Default Cooler	2.3	20/24 12:00 pm	10/4/24 8:00 am
2410019-07	USAR 7	Default Cooler	2.3	20/24 12:00 pm	10/4/24 8:00 am
2410019-08	USAR 8	Default Cooler	2.3	20/24 12:00 pm	10/4/24 8:00 am
2410019-09	USAR 9	Default Cooler	2.3	20/24 12:00 pm	10/4/24 8:00 am
2410019-10	USAR 10	Default Cooler	2.3	20/24 12:00 pm	10/4/24 8:00 am
2410019-11	LSAR 1	Default Cooler	2.3	6/20/24 11:00 am	10/4/24 8:00 am
2410019-12	LSAR 2	Default Cooler	2.3	6/20/24 11:00 am	10/4/24 8:00 am
2410019-13	LSAR 3	Default Cooler	2.3	6/20/24 11:00 am	10/4/24 8:00 am
2410019-14	LSAR 4	Default Cooler	2.3	6/20/24 11:00 am	10/4/24 8:00 am
2410019-15	LSAR 5	Default Cooler	2.3	6/20/24 11:00 am	10/4/24 8:00 am
2410019-16	LSAR 6	Default Cooler	2.3	6/20/24 11:00 am	10/4/24 8:00 am
2410019-17	MGC 1	Default Cooler	2.3	6/20/24 11:00 am	10/4/24 8:00 am
2410019-18	MGC 2	Default Cooler	2.3	6/20/24 11:00 am	10/4/24 8:00 am
2410019-19	MGC 3	Default Cooler	2.3	6/20/24 11:00 am	10/4/24 8:00 am
2410019-20	MGC 4	Default Cooler	2.3	6/20/24 11:00 am	10/4/24 8:00 am
2410019-21	MGC 5	Default Cooler	2.3	6/20/24 11:00 am	10/4/24 8:00 am
2410019-22	MGC 6	Default Cooler	2.3	6/20/24 11:00 am	10/4/24 8:00 am

laska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

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Methods

All samples were analyzed and conform with the following methods unless otherwise specified in the Case Narrative:

*** DEF UL T SPECIFIC METHOD ***
Fish prep
SM 2540 G
SW 3051A/6020A
SW 7473

Case Narrative

SM 2540 for total solids has a hold time of 7 days. These sample arrived outside of holdtime and are flagged HT-REC.

Notes and Definitions

J	Detected but below the Reporting Limit: therefore, result is an estimated concentration
HT-REC	The sample arrival time caused Hold Time limit to be exceeded.

Patryce D. McKinney, Chief, Environmental Health Laboratory

Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: USAR 1
Lab Sample ID: 2410019-01
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0274**	.0504	0.0112	g/kg	1	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	J
Cadmium	**0.0816**	.0504	.0163	g/kg	"	"	"	"	"	
Copper	**0.853**	0.0504	.0172	g/kg	"	"	"	"	"	
Lead	ND	0.0504	.0219	g/kg	"	"	"	"	"	
Mer ury	**0.00760**	.010	0. 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	J
Selenium	**1.88**	.0504	. 716	g/kg	"	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0504	.0341	g/kg	"	"	"	"	"	
Zinc	**30.3**	.504	.146	g/kg	"	"	"	"	"	
% Solids	**23.2**	0.10		% by weight	1	24K088	3-Dec-24	4-Dec-24	SM 2540 G	HT-REC

laska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: USAR 2
Lab Sample ID: 2410019-02
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0641**	.0508	0.0113	g/kg	1	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
Cadmium	**0.0679**	0.0508	.0165	g/kg	"	"	"	"	"	
Copper	**0.791**	0.0508	.0174	g/kg	"	"	"	"	"	
Lead	ND	0.0508	.0221	g/kg	"	"	"	"	"	
Mer ury	**0.00670**	.010	0. 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	J
Selenium	**1.05**	.0508	. 722	g/kg	"	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0508	.0344	g/kg	"	"	"	"	"	
Zinc	**33.9**	.508	.147	g/kg	"	"	"	"	"	
% Solids	**22.9**	0.10		% by weight	1	24K088	3-Dec-24	4-Dec-24	SM 2540 G	HT-REC

laska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

The results in this re rt apply to the samples analyzed in acc ordance with the chain of custody document. This analytical report must be repr duced in its entirety.

Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: USAR 3
Lab Sample ID: 2410019-03
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0508**	.0502	0.0111	g/kg	1	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
Cadmium	**0.0630**	0.0502	.0162	g/kg	"	"	"	"	"	
Copper	**0.842**	0.0502	.0172	g/kg	"	"	"	"	"	
Lead	ND	0.0502	.0218	g/kg	"	"	"	"	"	
Mer ury	**0.00750**	.010	0. 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	J
Selenium	**2.23**	.0502	. 712	g/kg	"	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0502	.0339	g/kg	"	"	"	"	"	
Zinc	**34.6**	.502	.145	g/kg	"	"	"	"	"	
% Solids	**23.8**	0.10		% by weight	1	24K088	3-Dec-24	4-Dec-24	SM 2540 G	HT-REC

laska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

The results in this re rt apply to the samples analyzed in acc ordance with the chain of custody document. This analytical report must be repr duced in its entirety.

Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: USAR 4
Lab Sample ID: 2410019-04
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0562**	.0505	0.0112	g/kg	1	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
Cadmium	**0.0664**	0.0505	.0164	g/kg	"	"	"	"	"	
Copper	**0.904**	0.0505	.0173	g/kg	"	"	"	"	"	
Lead	ND	0.0505	.0219	g/kg	"	"	"	"	"	
Mer ury	**0.00880**	.010	0. 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	J
Selenium	**1.02**	.0505	. 717	g/kg	"	24J096	29-Oct-24	15-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0505	.0342	g/kg	"	"	"	"	"	
Zinc	**24.5**	.505	.147	g/kg	"	"	"	"	"	
% Solids	**24.5**	0.10		% by weight	1	24K088	3-Dec-24	4-Dec-24	SM 2540 G	HT-REC

laska State Environmental Health Laboratory

The results in this re rt apply to the samples analyzed in acc ordance with the chain of custody document. This analytical report must be repr duced in its entirety.

Patryce D. McKinney, Chief, Environmental Health Laboratory

Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: USAR 5
Lab Sample ID: 2410019-05
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0656**	.0503	0.0112	g/kg	1	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	
Cadmium	**0.0560**	0.0503	.0163	g/kg	"	"	"	"	"	
Copper	**0.938**	0.0503	.0172	g/kg	"	"	"	"	"	
Lead	ND	0.0503	.0218	g/kg	"	"	"	"	"	
Mer ury	**0.00590**	.010	0. 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	J
Selenium	**0.782**	.0503	. 715	g/kg	"	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0503	.0340	g/kg	"	"	"	"	"	
Zinc	**28.5**	.503	.146	g/kg	"	"	"	"	"	
% Solids	**22.9**	0.10		% by weight	1	24K088	3-Dec-24	4-Dec-24	SM 2540 G	HT-REC

laska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

The results in this re rt apply to the samples analyzed in acc ordance with the chain of custody document. This analytical report must be repr duced in its entirety.

Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: USAR 6
Lab Sample ID: 2410019-06
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0459**	.0503	0.0112	g/kg	1	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	J
Cadmium	**0.0832**	.0503	.0163	g/kg	"	"	"	"	"	
Copper	**0.9 0**	0.0503	.0172	g/kg	"	"	"	"	"	
Lead	ND	0.0503	.0218	g/kg	"	"	"	"	"	
Mer ury	**0.00780**	.010	0. 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	J
Selenium	**1.01**	.0503	. 714	g/kg	"	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0503	.0340	g/kg	"	"	"	"	"	
Zinc	**29.9**	.503	.146	g/kg	"	"	"	"	"	
% Solids	**21.6**	0.10		% by weight	1	24K088	3-Dec-24	4-Dec-24	SM 2540 G	HT-REC

laska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: USAR 7
Lab Sample ID: 2410019-07
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0438**	.0507	0.0113	g/kg	1	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	J
Cadmium	**0.0776**	.0507	.0164	g/kg	"	"	"	"	"	
Copper	**1.24**	0.0507	.0173	g/kg	"	"	"	"	"	
Lead	ND	0.0507	.0220	g/kg	"	"	"	"	"	
Mer ury	**0.0113**	.010	0. 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	
Selenium	**0.848**	.0507	. 720	g/kg	"	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0507	.0343	g/kg	"	"	"	"	"	
Zinc	**31.9**	.507	.147	g/kg	"	"	"	"	"	
% Solids	**22.8**	0.10		% by weight	1	24K088	3-Dec-24	4-Dec-24	SM 2540 G	HT-REC

laska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

The results in this re rt apply to the samples analyzed in acc ordance with the chain of custody document. This analytical report must be repr duced in its entirety.

Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: USAR 8
Lab Sample ID: 2410019-08
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0648**	.0506	0.0112	g/kg	1	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	
Cadmium	**0.0671**	0.0506	.0164	g/kg	"	"	"	"	"	
Copper	**0.708**	0.0506	.0173	g/kg	"	"	"	"	"	
Lead	ND	0.0506	.0220	g/kg	"	"	"	"	"	
Mer ury	**0.00780**	.010	0. 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	J
Selenium	**1.10**	.0506	. 718	g/kg	"	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0506	.0342	g/kg	"	"	"	"	"	
Zinc	**30.6**	.506	.147	g/kg	"	"	"	"	"	
% Solids	**22.4**	0.10		% by weight	1	24K088	3-Dec-24	4-Dec-24	SM 2540 G	HT-REC

laska State Environmental Health Laboratory

Patryce D. McKinney, Chief, Environmental Health Laboratory

The results in this re rt apply to the samples analyzed in acc ordance with the chain of custody document. This analytical report must be repr duced in its entirety.

Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: USAR 9
Lab Sample ID: 2410019-09
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0738**	.0509	0.0113	g/kg	1	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	
Cadmium	**0.0427**	0.0509	.0165	g/kg	"	"	"	"	"	J
Copper	**0.546**	.0509	.0174	g/kg	"	"	"	"	"	
Lead	ND	0.0509	.0221	g/kg	"	"	"	"	"	
Mer ury	**0.00550**	.010	0. 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	J
Selenium	**0.885**	.0509	. 723	g/kg	"	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0509	.0344	g/kg	"	"	"	"	"	
Zinc	**26.8**	.509	.148	g/kg	"	"	"	"	"	
% Solids	**21.6**	0.10		% by weight	1	24K088	3-Dec-24	4-Dec-24	SM 2540 G	HT-REC

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Patryce D. McKinney, Chief, Environmental Health Laboratory

Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: USAR 10
Lab Sample ID: 2410019-10
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0336**	.0505	0.0112	g/kg	1	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	J
Cadmium	**0.0634**	.0505	.0164	g/kg	"	"	"	"	"	
Copper	**0.763**	0.0505	.0173	g/kg	"	"	"	"	"	
Lead	ND	0.0505	.0219	g/kg	"	"	"	"	"	
Mer ury	**0.00850**	.010	0. 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	J
Selenium	**1.46**	.0505	. 717	g/kg	"	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0505	.0341	g/kg	"	"	"	"	"	
Zinc	**37.5**	.505	.146	g/kg	"	"	"	"	"	
% Solids	**22.0**	0.10		% by weight	1	24K088	3-Dec-24	4-Dec-24	SM 2540 G	HT-REC

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Patryce D. McKinney, Chief, Environmental Health Laboratory

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Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: LSAR 1
Lab Sample ID: 2410019-11
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0438**	.0507	0.0113	g/kg	1	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	J
Cadmium	**0.0340**	.0507	.0164	g/kg	"	"	"	"	"	J
Copper	**0.967**	.0507	.0174	g/kg	"	"	"	"	"	
Lead	ND	0.0507	.0220	g/kg	"	"	"	"	"	
Mer ury	**0.00690**	.010	0. 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	J
Selenium	**1.34**	.0507	. 721	g/kg	"	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0507	.0343	g/kg	"	"	"	"	"	
Zinc	**27.6**	.507	.147	g/kg	"	"	"	"	"	
% Solids	**23.6**	0.10		% by weight	1	24K088	3-Dec-24	4-Dec-24	SM 2540 G	HT-REC

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Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: LSAR 2
Lab Sample ID: 2410019-12
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0326**	.0509	0.0113	g/kg	1	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	J
Cadmium	**0.0631**	.0509	0.0165	g/kg	"	"	"	"	"	
Copper	**0.716**	.0509	0.0174	g/kg	"	"	"	"	"	
Lead	**0.0600**	.0509	0.0221	g/kg	"	"	"	"	"	
Mer ury	**0.009 0**	.010	. 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	J
Selenium	**1.17**	.0509	0. 722	g/kg	"	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	
Silver	ND	.0509	0.0344	g/kg	"	"	"	"	"	
Zinc	**40.4**	.509	0.148	g/kg	"	"	"	"	"	
% Solids	**23.4**	.10		% by weight	1	24K088	03-Dec-24	04-Dec-24	SM 2540 G	HT-REC

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Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: LSAR 3
Lab Sample ID: 2410019-13
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0565**	.0505	0.0112	g/kg	1	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	
Cadmium	**0.0488**	.0505	.0164	g/kg	"	"	"	"	"	J
Copper	**0.916**	.0505	0.0173	g/kg	"	"	"	"	"	
Lead	**0.0252**	.0505	.0219	g/kg	"	"	"	"	"	J
Mer ury	**0.0155**	.010	. 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	
Selenium	**1.19**	.0505	0. 717	g/kg	"	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	
Silver	ND	.0505	0.0341	g/kg	"	"	"	"	"	
Zinc	**26.1**	.505	0.146	g/kg	"	"	"	"	"	
% Solids	**21.8**	.10		% by weight	1	24K088	03-Dec-24	04-Dec-24	SM 2540 G	HT-REC

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Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: LSAR 4
Lab Sample ID: 2410019-14
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0413**	.0504	0.0112	g/kg	1	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	J
Cadmium	**0.0187**	.0504	.0163	g/kg	"	"	"	"	"	J
Copper	**0.587**	.0504	.0172	g/kg	"	"	"	"	"	
Lead	ND	0.0504	.0219	g/kg	"	"	"	"	"	
Mer ury	**0.0163**	.010	0. 480	g/kg	"	24J042	10-Oct-24	10-Oct-24	SW 7473	
Selenium	**1.17**	.0504	. 715	g/kg	"	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	
Silver	ND	0.0504	.0341	g/kg	"	"	"	"	"	
Zinc	**26.6**	.504	.146	g/kg	"	"	"	"	"	
% Solids	**24.6**	0.10		% by weight	1	24K088	3-Dec-24	4-Dec-24	SM 2540 G	HT-RE C

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Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: LSAR 5
Lab Sample ID: 2410019-15
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0487**	.0503	0.0112	g/kg	1	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	J
Cadmium	**0.0400**	.0503	.0163	g/kg	"	"	"	"	"	J
Copper	**1.22**	.0503	0.0172	g/kg	"	"	"	"	"	
Lead	**0.0303**	.0503	.0218	g/kg	"	"	"	"	"	J
Mer ury	**0.0109**	.010	. 480	g/kg	"	24J087	24-Oct-24	24-Oct-24	SW 7473	
Selenium	**1.32**	.0503	0. 715	g/kg	"	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	
Silver	ND	.0503	0.0340	g/kg	"	"	"	"	"	
Zinc	**29.8**	.503	0.146	g/kg	"	"	"	"	"	
% Solids	**22.8**	.10		% by weight	1	24K088	03-Dec-24	04-Dec-24	SM 2540 G	HT-REC

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Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: LSAR 6
Lab Sample ID: 2410019-16
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0481**	.0501	0.0111	g/kg	1	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	J
Cadmium	**0.0226**	.0501	.0162	g/kg	"	"	"	"	"	J
Copper	**0.901**	.0501	0.0171	g/kg	"	"	"	"	"	
Lead	**0.0290**	.0501	.0217	g/kg	"	"	"	"	"	J
Mer ury	**0.0223**	.010	. 480	g/kg	"	24J087	24-Oct-24	24-Oct-24	SW 7473	
Selenium	**1.15**	.0501	0. 712	g/kg	"	24J10	30-Oct-24	18-Nov-24	SW 3051A/6020 A	
Silver	ND	.0501	0.0339	g/kg	"	"	"	"	"	
Zinc	**31.4**	.501	0.145	g/kg	"	"	"	"	"	
% Solids	**22.6**	.10		% by weight	1	24K088	03-Dec-24	04-Dec-24	SM 2540 G	HT-REC

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Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: MGC 1
Lab Sample ID: 2410019-17
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0772**	.0534	0.0119	g/kg	1	24K059	21-Nov-24	5-Dec-24	SW 3051A/6020 A	
Cadmium	**0.148**	0.0534	.0173	g/kg	"	"	"	"	"	
Copper	**1.39**	0.0534	.0183	g/kg	"	"	"	"	"	
Lead	ND	0.0534	.0232	g/kg	"	"	"	"	"	
Mer ury	**0.00940**	.010	0. 480	g/kg	"	24J087	24-Oct-24	24-Oct-24	SW 7473	J
Selenium	**1.75**	.0534	. 758	g/kg	"	24K059	21-Nov-24	5-Dec-24	SW 3051A/6020 A	
Silver	ND	0.0534	.0361	g/kg	"	"	"	"	"	
Zinc	**31.5**	.534	.155	g/kg	"	"	"	"	"	
% Solids	**28.0**	0.10		% by weight	1	24K088	3-Dec-24	4-Dec-24	SM 2540 G	HT-REC

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Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: MGC 2
Lab Sample ID: 2410019-18
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0640**	.0513	0.0114	g/kg	1	24K059	21-Nov-24	5-Dec-24	SW 3051A/6020 A	
Cadmium	**0.136**	0.0513	.0166	g/kg	"	"	"	"	"	
Copper	**1.09**	0.0513	.0175	g/kg	"	"	"	"	"	
Lead	ND	0.0513	.0222	g/kg	"	"	"	"	"	
Mercury	ND	.010	. 480	g/kg	"	24J087	24-Oct-24	24-Oct-24	SW 7473	
Selenium	**1.48**	.0513	0. 728	g/kg	"	24K059	21-Nov-24	5-Dec-24	SW 3051A/6020 A	
Silver	ND	0.0513	.0347	g/kg	"	"	"	"	"	
Zinc	**33.9**	.513	.149	g/kg	"	"	"	"	"	
% Solids	**24.8**	0.10		% by weight	1	24K088	3-Dec-24	4-Dec-24	SM 2540 G	HT-REC

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Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: MGC 3
Lab Sample ID: 2410019-19
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0619**	.0512	0.0114	g/kg	1	24K059	21-Nov-24	5-Dec-24	SW 3051A/6020 A	
Cadmium	**0.100**	0.0512	.0166	g/kg	"	"	"	"	"	
Copper	**1.01**	0.0512	.0175	g/kg	"	"	"	"	"	
Lead	ND	0.0512	.0222	g/kg	"	"	"	"	"	
Mercury	ND	.010	. 480	g/kg	"	24J087	24-Oct-24	24-Oct-24	SW 7473	
Selenium	**1.40**	.0512	0. 727	g/kg	"	24K059	21-Nov-24	5-Dec-24	SW 3051A/6020 A	
Silver	ND	0.0512	.0346	g/kg	"	"	"	"	"	
Zinc	**28.6**	.512	.148	g/kg	"	"	"	"	"	
% Solids	**23.3**	0.10		% by weight	1	24K088	3-Dec-24	4-Dec-24	SM 2540 G	HT-REC

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Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: MGC 4
Lab Sample ID: 2410019-20
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0553**	.0527	0.0117	g/kg	1	24K059	21-Nov-24	5-Dec-24	SW 3051A/6020 A	
Cadmium	**0.0626**	0.0527	.0171	g/kg	"	"	"	"	"	
Copper	**0.763**	0.0527	.0180	g/kg	"	"	"	"	"	
Lead	ND	0.0527	.0229	g/kg	"	"	"	"	"	
Mer ury	**0.00690**	.010	0. 480	g/kg	"	24J087	24-Oct-24	24-Oct-24	SW 7473	J
Selenium	**1.01**	.0527	. 748	g/kg	"	24K059	21-Nov-24	5-Dec-24	SW 3051A/6020 A	
Silver	ND	0.0527	.0356	g/kg	"	"	"	"	"	
Zinc	**30.1**	.527	.153	g/kg	"	"	"	"	"	
% Solids	**22.6**	0.10		% by weight	1	24K088	3-Dec-24	4-Dec-24	SM 2540 G	HT-REC

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Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: MGC 5
Lab Sample ID: 2410019-21
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0577**	.0502	0.0111	g/kg	1	24K059	21-Nov-24	5-Dec-24	SW 3051A/6020 A	
Cadmium	**0.0724**	0.0502	.0163	g/kg	"	"	"	"	"	
Copper	**1.02**	0.0502	.0172	g/kg	"	"	"	"	"	
Lead	ND	0.0502	.0218	g/kg	"	"	"	"	"	
Mer ury	**0.00640**	.010	0. 480	g/kg	"	24J087	24-Oct-24	24-Oct-24	SW 7473	J
Selenium	**1.34**	.0502	. 713	g/kg	"	24K059	21-Nov-24	5-Dec-24	SW 3051A/6020 A	
Silver	ND	0.0502	.0339	g/kg	"	"	"	"	"	
Zinc	**34.3**	.502	.146	g/kg	"	"	"	"	"	
% Solids	**23.6**	0.10		% by weight	1	24K089	10-Dec-24	11-Dec-24	SM 2540 G	HT-REC

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Analytical Data

Client: Constantine **Work Order: 2410019**
Project: Palmer Project at Haines **Report Date: 12/24/24 12:32**

Client Sample ID: MGC 6
Lab Sample ID: 2410019-22
Sampled By: Dylan Krull

Analyte	Result	Reporting Limit	Detection Limit	Units	Dilution	tch	Prepared	Analyzed	Method	Notes
Arsenic	**0.0400**	.0532	0.0118	g/kg	1	24K059	21-Nov-24	5-Dec-24	SW 3051A/6020 A	J
Cadmium	**0.0357**	.0532	.0172	g/kg	"	"	"	"	"	J
Copper	**0.696**	.0532	.0182	g/kg	"	"	"	"	"	
Lead	ND	0.0532	.0231	g/kg	"	"	"	"	"	
Mer ury	**0.00810**	.010	0. 480	g/kg	"	24J087	24-Oct-24	24-Oct-24	SW 7473	J
Selenium	**1.10**	.0532	. 756	g/kg	"	24K059	21-Nov-24	5-Dec-24	SW 3051A/6020 A	
Silver	ND	0.0532	.0360	g/kg	"	"	"	"	"	
Zinc	**28.0**	.532	.154	g/kg	"	"	"	"	"	
% Solids	**24.2**	0.10		% by weight	1	24K089	10-Dec-24	11-Dec-24	SM 2540 G	HT-REC

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B24J042 - EPA 7473										
Blank (B24J042-BLK1)				Prepared & Analyzed: 10-Oct-24						
Mercury	ND	0.010	g/kg							
Blank (B24J042-BLK2)				Prepared & Analyzed: 10-Oct-24						
Mercury	ND	0.010	g/kg							
Blank (B24J042-BLK3)				Prepared & Analyzed: 10-Oct-24						
Mercury	ND	0.010	g/kg							
Blank (B24J042-BLK4)				Prepared & Analyzed: 10-Oct-24						
Mercury	ND	0.010	g/kg							
Blank (B24J042-BLK5)				Prepared & Analyzed: 10-Oct-24						
Mercury	ND	0.010	g/kg							
Duplicate (B24J042-DUP1)	**Sour e: 2410018-17**			Prepared & Analyzed: 10-Oct-24						
Mercury	.0143	.010	g/kg		.0144			.7	20	
Duplicate (B24J042-DUP2)	**Sour : 2410019-03**			Prepared & Analyzed: 10-Oct-24						
Mercury	. 760	.010	g/kg		. 750			1	20	J
MRL Check (B24J042-MRL1)				Prepared & Analyzed: 10-Oct-24						
Mercury	. 780	.010	g/kg	.010 11		78	70-130			J
Matrix Spike (B24J042-MS1)	**Sour e: 2410018-17**			Prepared & Analyzed: 10-Oct-24						
Mercury	.271	.010	g/kg	.24256	0.0144	106	71-124			
Matrix Spike Dup (B24J042-MSD1)	**Sour e: 2410018-17**			Prepared & Analyzed: 10-Oct-24						
Mercury	.282	.010	g/kg	.24836	0.0144	108	71-124	4	20	

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Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B24J042 - EPA 7473										
Refer (B24J042-SRM1)				Prepared & Analyzed: 10-Oct-24						
Mercury	.292	0.010	g/kg	.3160		92	90-11			
Refer (B24J042-SRM2)				Prepared & Analyzed: 10-Oct-24						
Mercury	.333	0.010	g/kg	.3160		106	90-11			
Refer (B24J042-SRM3)				Prepared & Analyzed: 10-Oct-24						
Mercury	.297	0.010	g/kg	.3160		94	80-120			
Refer (B24J042-SRM4)				Prepared & Analyzed: 10-Oct-24						
Mercury	.329	0.010	g/kg	.3160		104	80-120			
Refer (B24J042-SRM5)				Prepared & Analyzed: 10-Oct-24						
Mercury	.290	.010	g/kg	.3160		92	80-120			
Refer (B24J042-SRM6)				Prepared & Analyzed: 10-Oct-24						
Mercury	.329	0.010	g/kg	.3160		104	80-120			
Refer (B24J042-SRM7)				Prepared & Analyzed: 10-Oct-24						
Mercury	.297	0.010	g/kg	.3160		94	80-120			
Refer (B24J042-SRM8)				Prepared & Analyzed: 10-Oct-24						
Mercury	.323	0.010	g/kg	.3160		102	80-120			
Batch B24J087 - EPA 7473										
Blank (B24J087-BLK1)				Prepared & Analyzed: 24-Oct-24						
Mercury	ND	0.010	g/kg							

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B24J087 - EPA 7473										
Blank (B24J087-BLK2)				Prepared & Analyzed: 24-Oct-24						
Mercury	ND	0.010	g/kg							
Blank (B24J087-BLK3)				Prepared & Analyzed: 24-Oct-24						
Mercury	ND	0.010	g/kg							
Blank (B24J087-BLK4)				Prepared & Analyzed: 24-Oct-24						
Mercury	ND	0.010	g/kg							
Blank (B24J087-BLK5)				Prepared & Analyzed: 24-Oct-24						
Mercury	ND	0.010	g/kg							
Duplicate (B24J087-DUP1)		**Sour : 2410008-04**		Prepared & Analyzed: 24-Oct-24						
Mercury	.020	.010	g/kg		.0169			17	20	
Duplicate (B24J087-DUP2)		**Sour e: 2410019-17**		Prepared & Analyzed: 24-Oct-24						
Mercury	.0103	.010	g/kg		. 940			9	20	
MRL Check (B24J087-MRL1)				Prepared & Analyzed: 24-Oct-24						
Mercury	. 730	.010	g/kg	.010 21		73	70-130			J
Matrix Spike (B24J087-MS1)		**Sour e: 2410008-05**		Prepared & Analyzed: 24-Oct-24						
Mercury	.285	.010	g/kg	.24519	0.0195	108	71-124			
Matrix Spike Dup (B24J087-MSD1)		**Sour e: 2410008-05**		Prepared & Analyzed: 24-Oct-24						
Mercury	.291	.010	g/kg	.24725	0.0195	11	71-124	2	20	
Refer (B24J087-SRM1)				Prepared & Analyzed: 24-Oct-24						
Mercury	.294	0.010	g/kg	.3160		93	90-110			

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B24J087 - EPA 7473										
Refer (B24J087-SRM2)				Prepared & Analyzed: 24-Oct-24						
Mercury	.332	0.010	g/kg	.3160		105	90-11			
Refer (B24J087-SRM3)				Prepared & Analyzed: 24-Oct-24						
Mercury	.301	0.010	g/kg	.3160		95	80-120			
Refer (B24J087-SRM4)				Prepared & Analyzed: 24-Oct-24						
Mercury	.334	0.010	g/kg	.3160		106	80-120			
Refer (B24J087-SRM5)				Prepared & Analyzed: 24-Oct-24						
Mercury	.303	0.010	g/kg	.3160		96	80-120			
Refer (B24J087-SRM6)				Prepared & Analyzed: 24-Oct-24						
Mercury	.334	0.010	g/kg	.3160		106	80-120			
Refer (B24J087-SRM7)				Prepared & Analyzed: 24-Oct-24						
Mercury	.295	0.010	g/kg	.3160		93	80-120			
Refer (B24J087-SRM8)				Prepared & Analyzed: 24-Oct-24						
Mercury	.325	0.010	g/kg	.3160		103	80-120			
Batch B24J096 - SW 3051										
Blank (B24J096-BLK1)				Prepared: 29-Oct-24 Analyzed: 15-Nov-24						
Arsenic	ND	0.050	g/kg							
Cadmium	ND	.050	"							
Copper	ND	.050	"							
Lead	ND	.050	"							
Selenium	ND	.050	"							
Silver	ND	.050	"							
Zinc	ND	.50	"							

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B24J096 - SW 3051										
LCS (B24J096-BS1)				Prepared: 29-Oct-24 Analyzed: 15-Nov-24						
Arsenic	9.94	0.050	g/kg	10.		99	80-120			
Cadmium	9.86	.050	"	10.		99	80-120			
Copper	10.	.050	"	10.		10	80-120			
Lead	10.2	.050	"	10.		102	80-120			
Selenium	9.74	.050	"	10.		97	80-120			
Silver	9.86	.050	"	10.		99	80-120			
Zinc	197	.50	"	199.81		99	80-120			
LCS Dup (B24J096-BSD1)				Prepared: 29-Oct-24 Analyzed: 15-Nov-24						
Arsenic	9.88	0.050	g/kg	10.		99	80-120	.5	20	
Cadmium	9.95	.050	"	10.		99	80-120	.9	20	
Copper	10.1	.050	"	10.		101	80-120	.4	20	
Lead	10.2	.050	"	10.		102	80-120	.5	20	
Selenium	9.65	.050	"	10.		96	80-120	1	20	
Silver	9.94	.050	"	10.		99	80-120	.9	20	
Zinc	197	.50	"	199.81		99	80-120	.2	20	
MRL Check (B24J096-MRL1)				Prepared: 29-Oct-24 Analyzed: 15-Nov-24						
Arsenic	.0468	0.050	g/kg	0.050 24		94	70-130			J
Cadmium	.0502	0.050	"	0.050 24		10	70-130			
Copper	.0515	0.050	"	0.050 24		103	70-130			
Lead	.0501	0.050	"	0.050 24		10	70-130			
Selenium	.0474	0.050	"	0.050 24		95	70-130			J
Silver	.0512	0.050	"	0.050 24		102	70-130			
Zinc	1.01	0.50	"	.99908		101	70-130			
Matrix Spike (B24J096-MS1)	**Sour : 2410018-20**			Prepared: 29-Oct-24 Analyzed: 15-Nov-24						
Arsenic	11.0	.0510	g/kg	10.192	0.0578	107	75-125			
Cadmium	10.4	0.0510	"	10.192	0.189	10	75-125			
Copper	11.1	0.0510	"	10.192	1.20	97	75-125			
Lead	10.1	0.0510	"	10.192	ND	99	75-125			
Selenium	12.5	0.0510	"	10.192	0.831	115	75-125			
Silver	10.	.0510	"	10.192	ND	98	75-125			
Zinc	228	0.510	"	203.64	26.9	99	75-125			

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B24J096 - SW 3051										
Matrix Spike Dup (B24J096-MSD1)	**Sour e: 2410018-20**			Prepared: 29-Oct-24 Analyzed: 15-Nov-24						
Arsenic	10.5	.0507	g/kg	10.146	0.0578	103	75-125	4	20	
Cadmium	10.3	.0507	"	10.146	0.189	10	75-125	1	20	
Copper	10.9	.0507	"	10.146	1.20	95	75-125	2	20	
Lead	9.92	.0507	"	10.146	ND	98	75-125	2	20	
Selenium	11.6	.0507	"	10.146	0.831	106	75-125	7	20	
Silver	9.97	.0507	"	10.146	ND	98	75-125	.5	20	
Zinc	224	.507	"	202.73	26.9	97	75-125	2	20	
Batch B24J100 - SW 3051										
Blank (B24J100-BLK1)				Prepared: 30-Oct-24 Analyzed: 18-Nov-24						
Arsenic	ND	0.050	g/kg							
Cadmium	ND	.050	"							
Copper	ND	.050	"							
Lead	ND	.050	"							
Selenium	ND	.050	"							
Silver	ND	.050	"							
Zinc	ND	.50	"							
LCS (B24J100-BS1)				Prepared: 30-Oct-24 Analyzed: 18-Nov-24						
Arsenic	9.89	0.050	g/kg	10.		99	80-120			
Cadmium	9.67	.050	"	10.		97	80-120			
Copper	9.88	.050	"	10.		99	80-120			
Lead	10.	.050	"	10.		10	80-120			
Selenium	9.76	.050	"	10.		98	80-120			
Silver	9.74	.050	"	10.		97	80-120			
Zinc	198	.50	"	199.81		99	80-120			

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B24J100 - SW 3051										
LCS Dup (B24J100-BSD1)				Prepared: 30-Oct-24 Analyzed: 18-Nov-24						
Arsenic	10.	.050	g/kg	10.		10	80-120	1	20	
Cadmium	9.87	0.050	"	10.		99	80-120	2	20	
Copper	9.97	0.050	"	10.		10	80-120	1	20	
Lead	10.	.050	"	10.		10	80-120	.02	20	
Selenium	9.75	0.050	"	10.		98	80-120	.08	20	
Silver	9.93	0.050	"	10.		99	80-120	2	20	
Zinc	201	0.50	"	199.81		101	80-120	2	20	
MRL Check (B24J100-MRL1)				Prepared: 30-Oct-24 Analyzed: 18-Nov-24						
Arsenic	.0479	0.050	g/kg	0.050 24		96	70-130			J
Cadmium	.0492	0.050	"	0.050 24		98	70-130			J
Copper	.0545	0.050	"	0.050 24		109	70-130			
Lead	.0497	0.050	"	0.050 24		99	70-130			J
Selenium	.0489	0.050	"	0.050 24		98	70-130			J
Silver	.0504	0.050	"	0.050 24		101	70-130			
Zinc	1.06	0.50	"	.99908		106	70-130			
Matrix Spike (B24J100-MS1)	**Sour : 2410019-10**			Prepared: 30-Oct-24 Analyzed: 18-Nov-24						
Arsenic	10.9	0.0509	g/kg	10.177	0.0336	106	75-125			
Cadmium	10.3	0.0509	"	10.177	0.0634	10	75-125			
Copper	10.8	0.0509	"	10.177	0.763	98	75-125			
Lead	10.1	0.0509	"	10.177	ND	99	75-125			
Selenium	12.5	0.0509	"	10.177	1.46	109	75-125			
Silver	10.1	0.0509	"	10.177	ND	99	75-125			
Zinc	246	0.509	"	203.35	37.5	103	75-125			
Matrix Spike Dup (B24J100-MSD1)	**Sour : 2410019-10**			Prepared: 30-Oct-24 Analyzed: 18-Nov-24						
Arsenic	10.8	0.0510	g/kg	10.192	0.0336	106	75-125	.7	20	
Cadmium	10.3	0.0510	"	10.192	0.0634	10	75-125	.05	20	
Copper	10.7	0.0510	"	10.192	0.763	97	75-125	.7	20	
Lead	10.2	0.0510	"	10.192	ND	10	75-125	.8	20	
Selenium	12.5	0.0510	"	10.192	1.46	108	75-125	.4	20	
Silver	10.	.0510	"	10.192	ND	98	75-125	.2	20	
Zinc	245	0.510	"	203.64	37.5	102	75-125	.6	20	

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B24K059 - SW 3051										
Blank (B24K059-BLK1)				Prepared: 21-Nov-24 Analyzed: 05-Dec-24						
Arsenic	ND	0.050	g/kg							
Cadmium	ND	0.050	"							
Copper	ND	0.050	"							
Lead	ND	0.050	"							
Selenium	ND	0.050	"							
Silver	ND	0.050	"							
Zinc	ND	0.50	"							
LCS (B24K059-BS1)				Prepared: 21-Nov-24 Analyzed: 05-Dec-24						
Arsenic	9.95	0.050	g/kg	10.		99	80-120			
Cadmium	9.90	.050	"	10.		99	80-120			
Copper	9.94	0.050	"	10.		99	80-120			
Lead	10.5	0.050	"	10.		105	80-120			
Selenium	10.2	0.050	"	10.		102	80-120			
Silver	10.2	0.050	"	10.		102	80-120			
Zinc	192	0.50	"	199.43		96	80-120			
LCS Dup (B24K059-BSD1)				Prepared: 21-Nov-24 Analyzed: 05-Dec-24						
Arsenic	9.95	0.050	g/kg	10.		99	80-120	.03	20	
Cadmium	9.82	0.050	"	10.		98	80-120	.8	20	
Copper	9.99	0.050	"	10.		10	80-120	.5	20	
Lead	10.5	0.050	"	10.		105	80-120	.6	20	
Selenium	9.69	0.050	"	10.		97	80-120	6	20	
Silver	10.1	0.050	"	10.		101	80-120	1	20	
Zinc	192	0.50	"	199.43		96	80-120	.03	20	
MRL Check (B24K059-MRL1)				Prepared: 21-Nov-24 Analyzed: 05-Dec-24						
Arsenic	.0503	0.050	g/kg	0.050 24		101	70-130			
Cadmium	.0516	0.050	"	0.050 24		103	70-130			
Copper	.0544	0.050	"	0.050 24		109	70-130			
Lead	.0539	0.050	"	0.050 24		108	70-130			
Selenium	.0526	0.050	"	0.050 24		105	70-130			
Silver	.0524	0.050	"	0.050 24		105	70-130			
Zinc	.988	0.50	"	0.99908		99	70-130			

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B24K059 - SW 3051										
Matrix Spike (B24K059-MS1)	**Sour : 2410019-17**			Prepared: 21-Nov-24		Analyzed: 05-Dec-24				
Arsenic	11.9	0.0521	g/kg	10.421	0.0772	113	75-125			
Cadmium	10.9	0.0521	"	10.421	0.148	103	75-125			
Copper	11.8	0.0521	"	10.421	1.39	10	75-125			
Lead	11.3	0.0521	"	10.421	ND	108	75-125			
Selenium	14.1	0.0521	"	10.421	1.75	119	75-125			
Silver	10.3	0.0521	"	10.421	ND	99	75-125			
Zinc	241	0.521	"	207.83	31.5	101	75-125			
Matrix Spike Dup (B24K059-MSD1)	**Sour : 2410019-17**			Prepared: 21-Nov-24		Analyzed: 05-Dec-24				
Arsenic	11.9	0.0513	g/kg	10.259	0.0772	115	75-125	.04	20	
Cadmium	10.9	0.0513	"	10.259	0.148	105	75-125	.2	20	
Copper	11.7	0.0513	"	10.259	1.39	101	75-125	.7	20	
Lead	11.3	0.0513	"	10.259	ND	11	75-125	.3	20	
Selenium	14.3	0.0513	"	10.259	1.75	122	75-125	.8	20	
Silver	10.3	0.0513	"	10.259	ND	101	75-125	.3	20	
Zinc	244	0.513	"	204.59	31.5	104	75-125	1	20	

Classical Chemistry Parameters - Quality Control

Alaska State Enviro mental Health Laboratory

Work Order: 2410019

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B24K088 - % Solids										
Blank (B24K088-BLK1)				Prepared: 03-Dec-24 Analyzed: 04-Dec-24						
% Solids	ND	0.10	% by weight							
Blank (B24K088-BLK2)				Prepared: 03-Dec-24 Analyzed: 04-Dec-24						
% Solids	ND	0.10	% by weight							
Duplicate (B24K088-DUP1)	**Sour e: 2410019-07**			Prepared: 03-Dec-24 Analyzed: 04-Dec-24						
% Solids	23.2	.10	% by weight		22.8			2	20	
Duplicate (B24K088-DUP2)	**Sour e: 2410019-17**			Prepared: 03-Dec-24 Analyzed: 04-Dec-24						
% Solids	27.9	.10	% by weight		28.			.3	20	
Batch B24K089 - % Solids										
Blank (B24K089-BLK1)				Prepared: 10-Dec-24 Analyzed: 11-Dec-24						
% Solids	ND	0.10	% by weight							
Blank (B24K089-BLK2)				Prepared: 10-Dec-24 Analyzed: 11-Dec-24						
% Solids	ND	0.10	% by weight							
Duplicate (B24K089-DUP1)	**Source: 2411011-07**			Prepared: 10-Dec-24 Analyzed: 11-Dec-24						
% Solids	84.2	.10	% by weight		83.6			.6	20	
Duplicate (B24K089-DUP2)	**Source: 2411011-09**			Prepared: 10-Dec-24 Analyzed: 11-Dec-24						
% Solids	84.4	.10	% by weight		85.5			1	20	

Buzby-Rynders, Danika M (DEC)

From: Krull, Dylan P (DFG)
Sent: Thursday, October 3, 2024 2:18 PM
To: DEC EH - Lab - Shipping Receiving
Subject: ADF&G Fish Samples

Hello,

I am heading to the airport to ship the samples via goldstreak.

Date shipped
- 10/3/2024

Your name and contact telephone number
- Dylan Krull (907) 465-6160 or Kate Kanouse (907) 465-4290

Number of pieces (coolers, boxes, etc.)
- 1 blue cooler

Content of shipment
- 42 individual bagged juvenile fish

Time of sample collection
- 6/19-6/20/2024

Test(s) requested
- 6020 Ag, As, Cd, Cu, Pb, Se, Zn
- 7473 Hg
- %solid (if sufficient volume)

Freight carrier
- Alaska Airlines

The waybill number (or other carrier tracking number)
- TBD

Flight number, if available
- TBD

Date and time expected for arrival in Anchorage
- TBD

I will add more information after I send the samples

Thank you!

Dylan Krull
Habitat Biologist III
ADF&G–Habitat
Juneau, AK
907-465-6160

WO#24100191

Client: Constantine

Project: Palmer Project at Haines

Notes: Metals are the priority, % solid only if sufficient volume

(Max 20 per page) Sample	(Required) Sample Date	Time	Tissue: Submitted As	Tissue: Tissue Processed	Individuals	Composite-all as one (small items)	Sample Stats: Length	Weight	Sex	Otoliths	Prep: Standard	Organic	Jars: Axys (Organic Prep Required)	Biopsy Punch/Plug (P)	Composite (C)	Extra	Fatty acid	Gamma	Metals	Nutrients	PFAS (Organic Prep Required)	Reference	Comments: 6020 Ag, As, Cd, Cu, Pb, Se, Zn	7473 Hg	%solid (if sufficient volume)			Notes	WO
USAR 1	6/20	1200	W	W	X						X								X				X	X	X				-01
USAR 2			W	W	X						X								X				X	X	X				-02
USAR 3			W	W	X						X								X				X	X	X				-03
USAR 4			W	W	X						X								X				X	X	X				-04
USAR 5			W	W	X						X								X				X	X	X				-05
USAR 6			W	W	X						X								X				X	X	X				-06
USAR 7			W	W	X						X								X				X	X	X				-07
USAR 8			W	W	X						X								X				X	X	X				-08
USAR 9			W	W	X						X								X				X	X	X				-09
USAR 10			W	W	X						X								X				X	X	X				-10
LSAR 1	6/20	1100	W	W	X						X								X				X	X	X				-11
LSAR 2			W	W	X						X								X				X	X	X				-12
LSAR 3			W	W	X						X								X				X	X	X				-13
LSAR 4			W	W	X						X								X				X	X	X				-14
LSAR 5			W	W	X						X								X				X	X	X				-15
LSAR 6			W	W	X						X								X				X	X	X				-16
MGC 1			W	W	X						X								X				X	X	X				-17
MGC 2			W	W	X						X								X				X	X	X				-18
MGC 3			W	W	X						X								X				X	X	X				-19
MGC 4			W	W	X						X								X				X	X	X				-20

NOTES: W=Whole Body, F=Fillet, R=Roast, G=Gonads, K=Kidney, L=Liver, P=Plugs, C=Composite

Collected (Sampled) By: Dylan Krull
Submitted by: Dylan Krull
Submitted Date/Time: 10/3/24 1400
Received by:
Received Date/Time: 10/4/24 @ 0800

State of Alaska
Department of Environmental Conservation
Fish Tissue Monitoring Program
5251 Dr MLK Jr. Ave
Anchorage, AK 99507

Issue Date: 9/19/24

WO# 24I0019

Client: Constantine

Project: Palmer Project at Haines

Notes: Metals are the priority, % solid only if sufficient volume

(Max 20 per page) Sample	(Required) Sample Date	Time	Tissue: Submitted As	Tissue: Tissue Processed	Individuals	Composite-all as one (small items)	Sample Stats: Length	Weight	Sex	Otoliths	Prep: Standard	Organic	Jars: Axys (Organic Prep Required)	Biopsy Punch/Plug (P)	Composite (C)	Extra	Fatty acid	Gamma	Metals	Nutrients	PFAS (Organic Prep Required)	Reference	Comments: 6020 Ag, As, Cd, Cu, Pb, Se, Zn	7473 Hg	%solid (if sufficient volume)			Notes	WO
MGC 5	6/20	1100	W	W	X						X								X				X	X	X				-01 -21
MGC 6	6/20	1100	W	W	X						X								X				X	X	X			①	-02 -22
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																													-20

NOTES: W=Whole Body, F=Fillet, R=Roast, G=Gonads, K=Kidney, L=Liver, P=Plugs, C=Composite

Collected (Sampled) By: Dylan Krull
Submitted by: Dylan Krull
Submitted Date/Time: 10/3/24 1400
Received by: [signature]
Received Date/Time: 10/4/24 0850

① BBR 10/4/24

State of Alaska
Department of Environmental Conservation
Fish Tissue Monitoring Program
5251 Dr MLK Jr. Ave
Anchorage, AK 99507

ADEC EHL Sample Receipt Checklist

(form SC-11, rev 01/11/2024)
.Environmental Health Laboratory
5251 Dr. MLK Jr. Ave., Anchorage, AK 99507
(907) 375-8200

WO #: 24100019 # of Samples: 22
Client: ADFG Sample Matrix: Fish Tissue

COC Seals:
- [ ] On Shipping Container — Intact? Y/N
- [ ] On Sample Packaging — Intact? Y/N
- [x] None

Received via:
- [ ] USPS
- [ ] UPS
- [ ] FedEx
- [ ] Delivered by Client/Client Courier
- [x] Courier *Shipper:* AKAIR
- [ ] Other

Shipment Tracking # 027-3478 6113

Sample Temperature @ Receipt: 2.3 °C

Thermometer ID (circle one): A19E080, calibration due 12/29/2024
Other: _____

Shipping Container Type:
- [ ] Box
- [x] Cooler
- [ ] Envelope
- [ ] Hand Carry
- [ ] Styro-Box
- [ ] Other _____

Sample Packaging Type:
- [x] Plastic/Ziploc Bag
- [ ] Plastic/Glass Vial/Jar
- [ ] Whirl Pak Bag
- [ ] Vacuum Packaging
- [ ] Commercial Packaging
- [ ] Blood Tubes
- [ ] Other _____

Refrigerant:
- [ ] Dry Ice
- [x] Gel/Ice Pack
- [ ] Water Ice
- [ ] Other _____
- [ ] None
Notes: _____

Sample(s) and Sample Containers:

Intact?	Y [x]	N [ ]	Properly Preserved?	Y [x]	N [ ]
Correct Type?	Y [x]	N [ ]	Meets Temp Requirements?	Y [x]	N [ ]
IDs/Times/Dates Match Form?	Y [x]	N [ ]	Adequate Amount for Tests?	Y [x]	N [ ]

Sample Submission Form:

Sample Submission Form Complete? Y [x] N [ ]
Client Contacted Regarding Incomplete Data? N [x] Y [ ] *Provide details below in "Comments" section.*

Comments: Collection year missing from submission form. Please see attached for clarification. DBR 10/4/24

027 | JNU | 34786113

Freezer

027-34786113

Shipper's Name and Address

DYLAN KRULL ADFG HABITAT SECTION

8230 ASPEN AVE
JUNEAU AK
US 99801 9074656160

Shipper's Account Number

Not negotiable

Air Waybill

Issued by ALASKA AIRLINES
***

Copies 1,2 and 3 of this Air Waybill are originals and have the same validity

Consignee's Name and Address

ADEC EH LAB KATE KANOUSE

HFPU
ANCHORAGE AK
US 00000 9073758231

AMS

Consignee's Account Number

It is agreed that the goods described herein are accepted in apparent good order and condition (except as noted) for carriage SUBJECT TO THE CONDITIONS OF CONTRACT ON THE REVERSE HEREOF. ALL GOODS MAY BE CARRIED BY ANY OTHER MEANS INCLUDING ROAD OR ANY OTHER CARRIER UNLESS SPECIFIC CONTRARY INSTRUCTIONS ARE GIVEN HEREON BY THE SHIPPER AND SHIPPER AGREES THAT THE SHIPMENT MAY BE CARRIED VIA INTERMEDIATE STOPPING PLACES WHICH THE CARRIER DEEMS APPROPRIATE. THE SHIPPER'S ATTENTION IS DRAWN TO THE NOTICE CONCERNING CARRIER'S LIMITATION OF LIABILITY. Shipper may increase such limitation of liability by declaring a higher value for carriage and paying a supplemental charge if required.

Issuing Carrier's Agent Name and City

ASQXGUEST

SEATTLE

Accounting Information

Agents IATA Code: 9999999

Account No.:

Airport of Departure (Addr. of First Carrier) and Requested Routing

JUNEAU - JUNEAU INTL.

Reference Number

Optional Shipping Informati

To	By First Carrier	Routing and Destination	to	by	to	by	Currency	ChgsCode	WT/Val PPD	WT/Val COLL	Other PPD	Other COLL	Declared Value for Carriage	Declared Value for Customs
ANC	AS						USD		X		X		NVD	NCV

Airport of Destination	Requested Flight/Date		Amount of Insurance	INSURANCE - If carrier offers insurance and such insurance is requested in accordance with conditions on reverse hereof indicate amount to be insured in figures in box marked "Amount o
ANCHORAGE - TED S	AS 0067/03-Oct	/	XXX	

Handling Information

OSI-UNKNOWN SHIPPER STATE OF ALASKA ONLY

SCI

No.of Pieces RCP	Gross Weight	K lb	Rate Class	Commodity Item No.	Chargeable Weight	Rate / Charge	Total	Nature and Quantity of Goods (incl. Dimensions or Volume)
1	11.00	L	M		11.00	57.00	57.00	fish samples DIMS(INH)12.0x10.0x9.0/1
1	11.00						57.00	

Prepaid	Weight Charge	Collect
	57.00	

Valuation Charge

Tax: 4.34

Total other Charges Due Age

Total other Charges Due Carrier: 12.50

Other Charges: XBC12.5PP

Shipper certifies that the particulars on the face hereof are correct and that insofar as any part of the consignment contains dangerous goods such part is properly described by name and is in proper condition for carriage by air according to the applicable Dangerous Goods Regulations.

Signature of Shipper or his Agent

Total Prepaid	Total Collect
73.84	

Currency Conversion Rates	cc charges in Dest. Currency

Executed on (Date)	at (Place)	Signature of Issuing Carrier or its Agent
03-OCT-2024	JNU	1019446

For Carrier Use only at Destination	Charges at Destination	Total Collect Charges

027-34786113

APPENDIX E: SEDIMENT DATA AND LABORATORY REPORT

Appendix E.1.–Lower Glacier Creek sediment compositions, 2016–2024.

	Particle Size Data						
Sample Date	% Clay	% Silt	% Sand	% Course Material (> 2 mm)	% Total Solids	% Total Organic Carbon	Acid Volatile Sulfide (mg/kg)
6/7/2016	4.00	29.17	66.83	0.00	78.6	0.274	ND
6/9/2017	1.98	26.67	71.07	0.29	82.3	<0.16	<0.20
6/9/2017	1.60	39.31	58.97	0.14	73.3	<0.17	<0.20
6/9/2017	0.65	18.35	81.01	0.00	73.9	0.20	<0.20
6/9/2017	1.33	27.75	70.31	0.62	77.8	0.25	<0.20
6/9/2017	0.38	3.16	95.57	0.62	76.3	<0.16	<0.20
5/30/2018	1.16	14.01	84.73	0.10	74.7	0.25	<0.20
5/30/2018	1.93	44.25	50.12	3.72	77.7	0.29	0.63
5/30/2018	2.04	41.78	56.19	0.00	78.0	<0.27	<0.20
5/30/2018	1.05	9.59	85.04	4.32	79.1	<0.20	<0.20
5/30/2018	1.44	16.08	81.88	4.32	78.6	<0.20	<0.20
6/6/2019	0.29	10.14	89.32	0.00	83.1	0.29	<0.20
6/7/2019	0.25	6.83	92.63	0.00	78.2	0.25	<0.20
6/8/2019	0.25	8.49	91.16	0.00	74.6	0.250	<0.20
6/9/2019	0.31	17.90	81.35	0.00	75.7	0.310	<0.20
6/10/2019	0.32	8.51	90.95	0.00	80.1	0.320	<0.20
6/3/2020	1.79	29.84	68.36	0.00	77.9	0.498	<0.20
6/3/2020	2.35	31.30	64.96	1.38	72.4	0.336	<0.20
6/3/2020	1.48	20.59	77.93	0.00	79.6	0.444	<0.20
6/3/2020	1.97	24.20	73.78	0.07	83.1	0.203	<0.20
6/3/2020	1.77	28.87	69.10	0.07	77.8	0.370	<0.20
6/16/2021	2.20	14.50	83.30	0.00	71.8	0.440	<5.0
6/16/2021	3.40	30.10	66.50	0.00	76.9	0.418	<5.0
6/16/2021	4.20	33.90	61.80	0.10	79.6	0.185	<5.0
6/16/2021	2.20	29.40	68.40	0.00	81.2	0.195	<5.0
6/16/2021	4.00	2.70	88.60	4.70	80.0	0.269	<5.0
6/13/2022	1.00	16.00	83.00	0.00	80.2	0.345	<5.0
6/13/2022	1.00	26.40	72.40	0.20	78.1	0.347	<5.0
6/13/2022	1.20	18.20	80.10	0.50	80.6	0.299	<5.0
6/13/2022	1.00	10.20	85.80	3.00	82.2	0.369	<5.0
6/13/2022	1.00	7.10	91.90	0.00	80.9	0.361	<5.0
6/7/2023	1.00	8.70	89.50	0.80	76.6	0.278	<5.0
6/7/2023	1.00	10.60	88.40	0.00	80.2	0.242	<5.0
6/7/2023	1.00	13.70	83.60	1.70	76.8	0.283	<5.0
6/7/2023	1.40	7.00	91.10	0.50	75.8	0.315	<5.0
6/7/2023	1.00	10.60	87.70	0.70	77.3	0.204	<5.0

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Appendix E.1.–Continued.

Sample Date	Particle Size Data						
	% Clay	% Silt	% Sand	% Course Material (> 2 mm)	% Total Solids	% Total Organic Carbon	Acid Volatile Sulfide (mg/kg)
6/3/2024	1.00	8.40	80.70	9.90	ND	ND	ND
6/3/2024	1.20	10.10	86.10	2.60	ND	ND	ND
6/3/2024	1.00	17.40	80.70	0.90	ND	ND	ND
6/3/2024	1.40	20.60	69.30	8.70	ND	ND	ND
6/3/2024	1.00	14.80	79.10	5.10	ND	ND	ND

Appendix E.2.–Lower Glacier Creek sediment element concentrations, 2016–2024.

Sample	Concentration (mg/kg dry weight)									
Date	Ag	Al	As	Cd	Cu	Fe	Hg	Pb	Se	Zn
6/7/2016	0.19	9,460	4.98	1.17	51.1	35,700	<0.020	9.06	1.69	193
6/9/2017	0.14	15,500	3.91	0.510	37.0	47,300	0.0120	7.90	1.22	133
6/9/2017	0.25	16,300	5.68	0.910	58.5	57,800	0.0194	20.60	1.35	202
6/9/2017	0.26	14,700	5.49	1.01	53.6	51,100	0.0204	8.49	1.67	186
6/9/2017	0.21	14,900	4.66	0.821	60.1	53,600	0.0144	20.10	1.39	173
6/9/2017	0.17	13,300	3.94	0.818	48.9	51,400	0.0135	7.03	1.54	186
5/30/2018	0.19	18,300	4.65	1.02	49.3	50,400	0.0125	9.84	1.44	185
5/30/2018	0.14	16,600	4.08	0.880	44.4	42,600	0.0079	5.88	1.07	150
5/30/2018	0.17	14,900	3.60	0.858	44.1	43,600	0.0119	6.58	1.31	160
5/30/2018	0.16	15,400	4.27	0.835	41.6	45,100	0.0142	8.11	1.12	168
5/30/2018	0.15	15,500	3.46	0.639	40.7	44,900	0.0092	7.53	1.00	141
6/6/2019	0.17	17,300	4.32	0.950	50.4	48,400	0.0172	10.90	1.28	189
6/6/2019	0.17	16,800	6.70	0.950	62.4	51,400	0.0131	6.23	1.43	173
6/6/2019	0.13	17,400	5.15	0.937	39.3	46,900	0.0174	7.50	1.18	179
6/6/2019	0.15	16,200	3.68	0.934	45.3	45,400	0.0156	5.23	1.06	166
6/6/2019	0.14	15,700	4.72	0.771	45.2	44,900	0.0111	4.99	1.03	146
6/3/2020	0.22	15,200	5.44	1.520	56.3	43,200	0.0125	7.14	2.41	213
6/3/2020	0.16	16,200	3.35	0.904	48.0	42,800	0.0109	6.08	1.08	166
6/3/2020	0.18	16,800	4.33	1.630	48.4	43,700	0.0164	8.49	1.58	184
6/3/2020	0.11	14,800	3.14	0.640	40.1	43,400	0.0103	5.98	0.8	152
6/3/2020	0.21	15,200	4.61	0.924	54.3	43,000	0.0097	7.57	1.52	150
6/16/2021	0.18	11,800	4.48	1.070	43.1	41,600	0.0161	7.41	1.58	166
6/16/2021	0.14	12,500	4.48	1.150	31.6	39,000	0.0100	4.26	1.56	160
6/16/2021	0.15	18,500	3.69	0.572	50.7	59,800	0.0192	14.20	0.75	186
6/16/2021	0.14	11,600	6.48	0.540	51.0	54,400	0.0158	15.10	0.92	142
6/16/2021	0.13	12,900	2.85	1.008	33.9	35,550	0.0140	5.54	0.91	142.5
6/13/2022	0.17	15,400	3.89	0.920	67.5	45,500	0.0164	6.90	1.60	156
6/13/2022	0.16	15,700	4.75	0.989	52.2	44,700	0.0109	6.21	1.82	168
6/13/2022	0.15	16,200	4.53	1.050	51.3	53,600	0.0196	8.57	1.68	178
6/13/2022	0.16	15,400	4.04	0.902	42.3	46,800	0.0095	21.70	1.49	161
6/13/2022	0.13	15,400	3.81	0.879	68.5	43,300	0.0098	4.98	1.29	140
6/7/2023	0.12	16,900	3.94	0.758	33.0	42,500	0.0355	5.19	1.24	159
6/7/2023	0.13	15,600	5.34	0.988	40.3	42,600	0.0140	6.26	1.15	189
6/7/2023	0.15	18,000	4.28	0.783	44.5	48,200	0.0120	16.30	1.08	173
6/7/2023	0.14	17,800	4.68	0.839	49.3	46,500	0.0130	6.45	1.10	171
6/7/2023	0.17	17,700	5.34	0.925	57.8	53,600	0.0233	11.80	1.35	196

Appendix E.2.–Continued.

Sample	Concentration (mg/kg dry weight)									
Date	Ag	Al	As	Cd	Cu	Fe	Hg	Pb	Se	Zn
6/3/2024	0.11	15,150	2.02	0.526	24.1	38,250	0.0132	3.35	0.68	150
6/3/2024	<0.10	15,700	1.93	0.401	38.2	41,700	<0.0050	2.86	0.65	108
6/3/2024	0.11	14,700	3.18	0.675	45.3	41,400	0.0118	7.14	0.71	158
6/3/2024	0.14	15,200	4.52	0.735	56.5	46,000	0.0152	6.97	1.05	169
6/3/2024	0.15	15,200	1.88	0.790	33.7	39,800	0.0094	3.38	0.94	142

Appendix E.3.–Middle Glacier Creek sediment compositions, 2016–2024.

	Particle Size Data						
Sample Date	% Clay	% Silt	% Sand	% Course Material (> 2 mm)	% Total Solids	% Total Organic Carbon	Acid Volatile Sulfide (mg/kg)
6/8/2016	4.06	31.18	64.76	0.00	80.50	0.491	ND
6/9/2017	0.66	11.07	83.97	4.30	82.50	<0.16	<0.20
6/9/2017	0.59	16.12	80.79	2.51	80.30	<0.17	<0.20
6/9/2017	1.21	28.37	70.36	0.05	76.10	<0.19	0.30
6/9/2017	2.30	48.51	49.19	0.00	74.80	0.27	<0.20
6/9/2017	2.62	45.51	51.89	0.00	74.70	<0.19	<0.20
5/31/2018	1.62	33.75	63.45	1.19	83.80	<0.28	0.40
5/31/2018	1.65	26.48	71.45	0.41	80.10	<0.29	<0.20
5/31/2018	1.21	10.73	74.57	13.49	77.70	<0.25	<0.20
5/31/2018	1.56	25.93	71.89	0.62	75.00	<0.27	<0.20
5/31/2018	1.56	15.69	80.82	1.94	71.40	0.37	<0.20
6/6/2019	0.49	10.58	84.23	4.68	83.40	0.44	<0.20
6/6/2019	1.51	21.39	77.09	0.00	84.10	0.30	<0.20
6/6/2019	0.52	9.97	89.51	0.00	82.90	0.37	<0.20
6/6/2019	1.14	25.86	73.00	0.00	78.60	0.58	<0.20
6/6/2019	0.56	13.64	85.80	0.00	76.20	0.56	<0.20
6/2/2020	2.33	39.96	57.09	0.62	75.60	0.26	<0.20
6/2/2020	2.37	35.95	61.67	0.00	73.00	0.36	<0.20
6/2/2020	2.60	37.46	59.93	0.00	80.30	0.40	<0.20
6/2/2020	2.84	42.50	54.30	0.36	71.60	0.42	<0.20
6/2/2020	2.72	36.99	60.30	0.00	78.30	0.31	<0.20
6/15/2021	3.40	28.70	67.90	0.00	77.70	0.172	<5.0
6/15/2021	3.80	4.90	90.90	0.40	80.80	0.257	<5.0
6/15/2021	4.60	31.80	59.50	4.10	76.80	0.317	<5.0
6/15/2021	2.20	18.60	78.60	0.60	81.50	0.193	<5.0
6/15/2021	2.20	32.90	64.90	0.00	80.40	0.320	<5.0
6/14/2022	1.00	10.60	88.20	0.20	79.80	0.242	<5.0
6/14/2022	0.00	5.00	94.00	1.00	81.80	0.165	<5.0
6/14/2022	1.00	8.00	90.00	1.00	83.50	0.143	<5.0
6/14/2022	1.00	23.00	76.00	1.00	78.10	0.408	<5.0
6/14/2022	1.00	13.30	85.60	0.10	80.20	0.321	<5.0
6/6/2023	1.00	8.70	85.00	5.30	79.60	0.646	<5.0
6/6/2023	1.00	10.50	85.90	2.60	77.00	0.604	<5.0
6/6/2023	1.00	10.80	86.40	1.80	76.60	0.816	<5.0
6/6/2023	1.00	14.80	82.30	1.90	78.20	0.570	<5.0
6/6/2023	1.00	13.40	84.10	1.50	78.60	0.489	<5.0

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Appendix E.3.–Continued.

Sample Date	Particle Size Data				% Total Solids	% Total Organic Carbon	Acid Volatile Sulfide (mg/kg)
	% Clay	% Silt	% Sand	% Course Material (> 2 mm)			
6/3/2024	2.80	28.80	59.60	8.80	ND	ND	ND
6/3/2024	1.80	24.60	69.80	3.80	ND	ND	ND
6/3/2024	2.30	30.00	66.20	1.50	ND	ND	ND
6/3/2024	1.00	12.80	85.70	0.50	ND	ND	ND
6/3/2024	2.90	38.90	56.70	1.50	ND	ND	ND

Appendix E.4.–Middle Glacier Creek sediment element concentrations, 2016–2024.

Sample	Concentration (mg/kg dry weight)									
Date	Ag	Al	As	Cd	Cu	Fe	Hg	Pb	Se	Zn
6/8/2016	0.16	7,650	4.33	0.871	55.8	32,400	<0.0200	12.00	1.14	170
6/9/2017	0.14	15,700	3.68	0.758	48.1	49,400	0.0094	8.67	0.90	190
6/9/2017	0.15	13,800	4.76	0.902	45.5	53,400	0.0179	14.80	0.93	203
6/9/2017	0.33	14,700	4.88	1.110	75.6	54,500	0.0161	12.50	2.05	189
6/9/2017	0.18	16,000	4.47	1.140	55.7	47,500	0.0210	12.30	1.30	205
6/9/2017	0.21	15,600	4.73	1.070	62.1	50,800	0.0181	11.90	1.42	199
5/31/2018	0.18	18,000	4.17	0.564	47.4	49,000	0.0072	6.89	1.25	122
5/31/2018	0.22	16,900	3.95	1.030	49.6	45,400	0.0260	5.48	1.67	167
5/31/2018	0.18	20,200	2.80	0.675	49.1	49,200	0.0079	5.49	1.03	139
5/31/2018	0.15	18,900	2.48	0.645	45.6	42,500	0.0093	5.24	0.71	129
5/31/2018	0.17	16,900	3.74	1.020	52.8	43,000	0.0118	5.99	1.34	160
6/7/2019	0.19	14,800	3.20	1.380	41.6	43,000	0.0133	3.76	1.83	189
6/7/2019	0.19	16,600	4.97	1.070	53.5	53,600	0.0140	7.40	1.54	174
6/7/2019	0.21	16,800	3.74	1.330	54.2	49,800	0.0128	5.45	1.43	230
6/7/2019	0.53	16,700	4.19	2.220	47.6	47,500	0.0150	10.40	1.55	181
6/7/2019	0.27	17,000	6.14	1.670	54.6	47,000	0.0150	7.45	2.56	204
6/2/2020	0.14	14,900	3.10	0.646	48.2	41,000	0.0122	5.04	0.91	110
6/2/2020	0.15	14,900	2.36	0.687	44.5	37,800	0.0060	4.69	1.00	97
6/2/2020	0.16	15,500	2.71	0.726	44.4	38,800	0.0072	5.24	1.15	106
6/2/2020	0.23	15,400	4.99	1.300	60.7	46,400	0.0137	8.36	1.97	208
6/2/2020	0.16	15,800	2.66	0.716	46.5	39,600	0.0058	3.84	1.08	99
6/15/2021	0.13	13,300	3.01	0.594	42.1	49,300	0.0105	7.62	0.97	124
6/15/2021	0.10	11,200	2.95	0.818	35.4	38,300	0.0106	3.44	1.11	138
6/15/2021	0.19	12,200	3.70	1.020	44.4	45,400	0.0167	6.53	1.28	156
6/15/2021	0.14	12,300	3.31	0.516	47.9	50,800	0.0156	11.10	0.75	137
6/15/2021	0.18	11,800	4.55	1.380	47.3	44,400	0.0190	7.11	1.99	183
6/14/2022	0.12	13,400	3.46	0.552	43.3	47,300	0.0130	4.90	0.80	158
6/14/2022	0.14	15,500	3.55	0.427	46.9	51,400	0.0071	12.80	0.93	126
6/14/2022	0.11	15,800	3.72	0.542	57.4	54,000	0.0098	4.46	0.99	146
6/14/2022	0.20	15,800	5.31	1.230	67.0	49,900	0.0151	9.32	1.97	205
6/14/2022	0.16	15,100	4.39	1.170	54.4	48,000	0.0103	5.50	1.89	174
6/6/2023	0.16	15,900	3.14	1.210	32.4	38,900	0.0122	2.74	2.23	168
6/6/2023	0.23	17,300	3.82	2.110	50.1	41,400	0.0118	3.90	2.43	230
6/6/2023	0.22	16,800	4.64	1.950	44.8	41,200	0.0163	5.40	2.76	243
6/6/2023	0.18	18,000	3.66	1.580	50.7	44,100	0.0163	5.85	2.50	215
6/6/2023	0.17	18,900	2.77	1.500	43.2	46,000	0.0096	4.60	2.37	197

-continued-

Appendix E.4.–Continued.

Sample	Concentration (mg/kg dry weight)									
Date	Ag	Al	As	Cd	Cu	Fe	Hg	Pb	Se	Zn
6/3/2024	0.15	16,400	2.98	0.782	47.0	41,500	0.0132	7.77	0.97	172
6/3/2024	0.14	16,300	3.23	0.910	52.7	45,200	0.0138	6.11	1.06	180
6/3/2024	0.16	17,700	3.87	0.880	51.6	48,900	0.0160	10.60	1.16	193
6/3/2024	0.16	17,100	3.72	0.934	50.0	43,800	0.0119	5.10	1.14	194
6/3/2024	0.14	16,200	3.06	0.617	52.2	42,800	0.0101	5.26	0.87	148

Appendix E.5.–Lower Sarah Creek sediment compositions, 2024.

	Particle Size Data						
Sample Date	% Clay	% Silt	% Sand	% Course Material (> 2 mm)	% Total Solids	% Total Organic Carbon	Acid Volatile Sulfide (mg/kg)
6/4/2024	1.10	7.30	89.40	2.20	ND	ND	ND
6/4/2024	1.00	4.80	93.10	1.10	ND	ND	ND
6/4/2024	3.10	31.20	65.00	0.70	ND	ND	ND
6/4/2024	2.80	43.80	53.30	0.10	ND	ND	ND
6/4/2024	1.40	13.30	77.50	7.80	ND	ND	ND

Appendix E.6.–Lower Sarah Creek sediment element concentrations, 2024.

Sample	Concentration (mg/kg dry weight)									
Date	Ag	Al	As	Cd	Cu	Fe	Hg	Pb	Se	Zn
6/4/2024	<0.10	16,400	3.90	0.540	36.2	31,900	0.0081	4.22	0.60	106
6/4/2024	0.12	17,000	4.71	0.706	41.9	33,800	0.0118	5.46	0.74	119
6/4/2024	0.20	21,400	5.70	0.896	61.3	44,900	0.0162	8.83	1.26	147
6/4/2024	0.16	19,300	6.10	0.732	54.6	41,300	0.0151	7.38	0.99	134
6/4/2024	0.13	18,900	4.72	0.671	46.5	37,100	0.0118	5.51	0.80	120

Appendix E.7.–Upper Sarah Creek sediment compositions, 2024.

	Particle Size Data						
Sample Date	% Clay	% Silt	% Sand	% Course Material (> 2 mm)	% Total Solids	% Total Organic Carbon	Acid Volatile Sulfide (mg/kg)
6/4/2024	4.60	41.90	52.00	1.50	ND	ND	ND
6/4/2024	6.70	52.00	40.00	1.30	ND	ND	ND
6/4/2024	3.70	50.70	45.60	0.00	ND	ND	ND
6/4/2024	4.90	42.50	52.60	0.00	ND	ND	ND
6/4/2024	4.70	47.90	47.40	0.00	ND	ND	ND

Appendix E.8.–Upper Sarah Creek sediment element concentrations, 2024.

Sample	Concentration (mg/kg dry weight)									
Date	Ag	Al	As	Cd	Cu	Fe	Hg	Pb	Se	Zn
6/4/2024	0.18	19,050	5.55	0.587	52.9	48,000	0.0115	6.47	0.80	126
6/4/2024	0.20	22,800	7.21	0.837	61.3	55,200	0.0173	8.83	1.14	157
6/4/2024	0.22	19,900	6.20	0.894	64.0	45,700	0.0193	8.11	1.17	145
6/4/2024	0.20	21,800	7.41	0.910	64.8	48,900	0.0186	8.12	1.15	157
6/4/2024	0.24	21,100	7.10	0.915	63.2	48,900	0.0203	9.29	1.18	155

Appendix E.9.–Plateau Creek sediment compositions, 2024.

	Particle Size Data						
Sample Date	% Clay	% Silt	% Sand	% Course Material (> 2 mm)	% Total Solids	% Total Organic Carbon	Acid Volatile Sulfide (mg/kg)
6/4/2024	3.20	26.60	60.90	9.30	ND	ND	ND
6/4/2024	1.70	11.70	64.00	22.60	ND	ND	ND
6/4/2024	1.90	14.30	78.80	5.00	ND	ND	ND
6/4/2024	1.50	7.60	84.80	6.10	ND	ND	ND
6/4/2024	1.00	2.60	82.60	13.80	ND	ND	ND

Appendix E.10.–Plateau Creek sediment element concentrations, 2024.

Sample	Concentration (mg/kg dry weight)									
Date	Ag	Al	As	Cd	Cu	Fe	Hg	Pb	Se	Zn
6/4/2024	0.16	20,000	5.82	0.628	50.9	46,800	0.0102	6.74	0.75	122
6/4/2024	0.18	21,600	6.34	0.770	57.4	48,600	0.0150	8.29	1.00	141
6/4/2024	0.18	20,200	5.88	0.827	55.9	42,000	0.0151	7.67	1.04	133
6/4/2024	**<0.10**	19,200	2.94	0.458	23.1	44,100	0.0086	6.58	0.38	139
6/4/2024	**<0.10**	19,100	3.17	0.552	18.8	41,200	0.0065	6.72	0.32	133

CERTIFICATE OF ANALYSIS

Work Order	: **VA24B5139**	e	of 6
Client	**Constantine North Inc.**	Laboratory	ALS Environmental - Vancouver
Contact	Environmental Scientist Merlin Benner	Ac ount Manager	Ian Chen
Address	Suite 320 - 800 West Pender St. Vancouver BC Canada V6C 2V6	Address	8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	907 766 2057	Telephone	+1 604 253 4188
roject	ADFG Palmer Project	Date Samples Received	26-Jun-2024 08:45
PO	----	Date Analysis Commenced	02-Jul-2024
C-O-C number	----	Issue Date	08-Jul-2024 15:04
Sampler	----		
Site			
Quote number	VA22-CONI100-001 (Q62329)		
No. of samples received	0		
No. of samples analysed	0		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate ttachments: Quality Control Report, QC Interpretive report to ssist with Quality Review nd Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*aboratory Department*
Hedy Lai	Team Leader - Inorganics	Sask Soils, Saskatoon, Saskatchewan
Janice Leung	Supervisor - Organics Instrumentation	Organics, Burn by, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbi
Sam Silveira	Analyst	Metals, Burnaby, British Columbia

neral Comments

The nalytical methods used by ALS re developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, nd Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for pplicable references nd methodology summaries. Reference methods m y incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances
LOR: Limit of Reporting (detection limit).

Unit	*Description*
-	no units
%	percent
mg/kg	milligrams per kilogram
pH units	pH units

<: less than.

>: greater than.

Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not oc ur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis s a check on recovery.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical Results

Sub-Matrix: **oil**
(Matrix: **oil/Solid**)

Analyte	CAS Number	Method/Lab	OR	Unit	Client sample ID	2024 LGC S1	2024 LGC S2	2024 LGC S3	2024 LGC S4	2024 LGC S5
					Client sampling date / time	03-Jun-2024 6:30	03-Jun-2024 6:30	03-Jun-2024 6:30	03-Jun-2024 6:30	03-Jun-2024 6:30
						VA24B5139-001	VA24B5139-002	VA24B5139-003	VA24B5139-004	VA24B5139-005
						Result	Result	Result	Result	Result
Physical Tests										
pH (1:2 soil:water)	----	E108/VA	0.10	pH units		8.66	8.61	8.63	8.55	8.47
Particle Size										
Grain size curve	----	E185A/SK	-	-		See Attached	See Attached	See Attached	See Attached	See Attached
Percent Passing										
Passing (9.5mm)	----	E181/SK	.0	%		98.5	00	00	98.2	98.7
Passing (4.75mm)	----	E181/SK	.0	%		95.5	00	00	96.6	96.5
Passing (19mm)	----	E181/SK	.0	%		00	00	00	00	00
Passing (25.4mm)	----	E181/SK	.0	%		00	00	00	00	00
Passing (38.1mm)	----	E181/SK	.0	%		00	00	00	00	00
Passing (50.8mm)	----	E181/SK	.0	%		00	00	00	00	00
Passing (76.2mm)	----	E181/SK	.0	%		00	00	00	00	00
Passing (1.0mm)	----	E182/SK	.0	%		82.1	89.1	94.6	85.8	91.4
Passing (0.841mm)	----	E182/SK	.0	%		74.9	80.4	88.9	84.0	86.9
Passing (0.50mm)	----	E182/SK	.0	%		59.5	61.6	76.8	80.2	77.3
Passing (0.420mm)	----	E182/SK	.0	%		50.4	51.6	68.6	75.3	68.5
Passing (0.250mm)	----	E182/SK	.0	%		31.0	30.2	51.3	64.9	49.8
Passing (0.149mm)	----	E182/SK	.0	%		8.3	9.3	34.9	42.5	31.7
Passing (0.125mm)	----	E182/SK	.0	%		5.3	6.8	31.0	37.2	27.4
Passing (0.075mm)	----	E182/SK	.0	%		9.4	.3	8.4	22.0	5.8
Passing (0.063mm)	----	E182/SK	.0	%		8.0	9.9	5.4	8.3	3.0
Passing (0.05mm)	----	E182/SK	.0	%		6.4	8.5	2.1	4.4	0.0
Passing (0.0312mm)	----	E184/SK	.0	%		3.9	5.2	6.9	8.5	5.8
Passing (0.020mm)	----	E184/SK	.0	%		2.5	3.2	3.8	5.0	3.4
Passing (0.005mm)	----	E184/SK	.0	%		<1.0	.2	<1.0	.4	.0
Passing (0.004mm)	----	E184/SK	.0	%		<1.0	.1	<1.0	.2	<1.0
Passing (0.002mm)	----	E184/SK	.0	%		<1.0	<1.0	<1.0	<1.0	<1.0
Passing (2.0mm)	----	E181/SK	.0	%		90.1	97.4	99.1	91.3	94.9
Metals										

Analytical Results

Sub-Matrix: **oil**
(Matrix: **oil/Solid**)

Analyte	CAS Number	Method/Lab	OR	Unit	Client sample ID	2024 LGC S1	2024 LGC S2	2024 LGC S3	2024 LGC S4	2024 LGC S5
					Client sampling date / time	03-Jun-2024 6:30	03-Jun-2024 6:30	03-Jun-2024 6:30	03-Jun-2024 6:30	03-Jun-2024 6:30
						VA24B5139-001	VA24B5139-002	VA24B5139-003	VA24B5139-004	VA24B5139-005
						Result	Result	Result	Result	Result
Metals										
Aluminum	7429-90-5	E440/VA	50	mg/kg		5200	5700	4700	5200	5200
Arsenic	7440-38-2	E440/VA	0.10	mg/kg		2.07	.93	3.18	4.52	.88
Cadmium	7440-43-9	E440/VA	0.020	mg/kg		0.519	0.401	0.675	0.735	0.790
Copper	7440-50-8	E440/VA	0.50	mg/kg		23.7	38.2	45.3	56.5	33.7
Iron	7439-89-6	E440/VA	50	mg/kg		39500	41700	41400	46000	39800
ead	7439-92-1	E440/VA	0.50	mg/kg		3.28	2.86	7.14	6.97	3.38
Mercury	7439-97-6	E510/VA	0.0050	mg/kg		0.0112	<0.0050	0.0118	0.0152	0.0094
elenium	7782-49-2	E440/VA	0.20	mg/kg		0.63	0.65	0.71	.05	0.94
ilver	7440-22-4	E440/VA	0.10	mg/kg		0.11	<0.10	0.11	0.14	0.15
Zinc	7440-66-6	E440/VA	2.0	mg/kg		32	08	58	69	42

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Ac reditation section for an explanation of analyte accreditations.

Analytical Results

Sub-Matrix: **oil**
(Matrix: **oil/Solid**)

Analyte	CAS Number	Method/Lab	OR	Unit	Client sample ID	2024 MGC S1	2024 MGC S2	2024 MGC S3	2024 MGC S4	2024 MGC S5
					Client sampling date / time	03-Jun-2024 3:10	03-Jun-2024 3:10	03-Jun-2024 3:10	03-Jun-2024 3:10	03-Jun-2024 3:10
						VA24B5139-006	VA24B5139-007	VA24B5139-008	VA24B5139-009	VA24B5139-010
						Result	Result	Result	Result	Result
Physical Tests										
pH (1:2 soil:water)	----	E108/VA	0.10	pH units		8.38	8.47	8.41	8.46	8.45
Particle Size										
Grain size curve	----	E185A/SK	-	-		See Attached	See Attached	See Attached	See Attached	See Attached
Percent Passing										
Passing (9.5mm)	----	E181/SK	.0	%		99.4	99.2	00	00	00
Passing (4.75mm)	----	E181/SK	.0	%		98.5	98.1	99.8	99.9	99.8
Passing (19mm)	----	E181/SK	.0	%		00	00	00	00	00
Passing (25.4mm)	----	E181/SK	.0	%		00	00	00	00	00
Passing (38.1mm)	----	E181/SK	.0	%		00	00	00	00	00
Passing (50.8mm)	----	E181/SK	.0	%		00	00	00	00	00
Passing (76.2mm)	----	E181/SK	.0	%		00	00	00	00	00
Passing (1.0mm)	----	E182/SK	.0	%		80.0	93.5	92.0	98.4	96.0
Passing (0.841mm)	----	E182/SK	.0	%		75.9	90.6	89.5	96.9	94.4
Passing (0.50mm)	----	E182/SK	.0	%		67.2	84.5	84.1	93.6	90.9
Passing (0.420mm)	----	E182/SK	.0	%		63.0	78.9	80.4	83.4	86.5
Passing (0.250mm)	----	E182/SK	.0	%		54.1	66.9	72.5	61.8	77.2
Passing (0.149mm)	----	E182/SK	.0	%		44.6	47.5	54.3	32.4	61.6
Passing (0.125mm)	----	E182/SK	.0	%		42.3	42.9	50.0	25.4	58.0
Passing (0.075mm)	----	E182/SK	.0	%		31.6	26.4	32.3	3.8	41.8
Passing (0.063mm)	----	E182/SK	.0	%		29.1	22.5	28.1	.1	38.0
Passing (0.05mm)	----	E182/SK	.0	%		26.3	8.2	23.5	8.0	33.8
Passing (0.0312mm)	----	E184/SK	.0	%		6.0	0.7	3.9	4.9	9.8
Passing (0.020mm)	----	E184/SK	.0	%		9.8	6.2	8.2	3.0	.5
Passing (0.005mm)	----	E184/SK	.0	%		2.8	.8	2.3	.0	2.9
Passing (0.004mm)	----	E184/SK	.0	%		2.4	.6	2.0	<1.0	2.5
Passing (0.002mm)	----	E184/SK	.0	%		.6	.2	.4	<1.0	.7
Passing (2.0mm)	----	E181/SK	.0	%		91.2	96.2	98.5	99.5	98.5
Metals										
Aluminum	7429-90-5	E440/VA	50	mg/kg		6400	6300	7700	7100	6200

Analytical Results

Sub-Matrix: **oil**
(Matrix: **oil/Solid**)

Analyte	CAS Number	Method/Lab	OR	Unit	Client sample ID	2024 MGC S1	2024 MGC S2	2024 MGC S3	2024 MGC S4	2024 MGC S5
					Client sampling date / time	03-Jun-2024 3:10	03-Jun-2024 3:10	03-Jun-2024 3:10	03-Jun-2024 3:10	03-Jun-2024 3:10
						VA24B5139-006	VA24B5139-007	VA24B5139-008	VA24B5139-009	VA24B5139-010
						Result	Result	Result	Result	Result
Metals										
Arsenic	7440-38-2	E440/VA	0.10	mg/kg		2.98	3.23	3.87	3.72	3.06
Cadmium	7440-43-9	E440/VA	0.020	mg/kg		0.782	0.910	0.880	0.934	0.617
Copper	7440-50-8	E440/VA	0.50	mg/kg		47.0	52.7	51.6	50.0	52.2
Iron	7439-89-6	E440/VA	50	mg/kg		41500	45200	48900	43800	42800
ead	7439-92-1	E440/VA	0.50	mg/kg		7.77	6.11	0.6	5.10	5.26
Mercury	7439-97-6	E510/VA	0.0050	mg/kg		0.0132	0.0138	0.0160	0.0119	0.0101
elenium	7782-49-2	E440/VA	0.20	mg/kg		0.97	.06	.16	.14	0.87
ilver	7440-22-4	E440/VA	0.10	mg/kg		0.15	0.14	0.16	0.16	0.14
Zinc	7440-66-6	E440/VA	2.0	mg/kg		72	80	93	94	48

Please refer to the General Comments section for an explanation of any result qualifiers detected.

Please refer to the Ac reditation section for an explanation of analyte accreditations.

ALS Canada Ltd.

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QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA24B5139**	Page	: 1 of 14
Client	: **onstantine North Inc.**	aboratory	: ALS Environmental - Vancouver
Contact	: Environmental Scientist Merlin Benner	Account Manager	: Ian Chen
Address	: Suite 320 - 800 West Pender St. Vancouver BC Canada V6C 2V6	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: 907 766 2057	Telephone	: +1 604 253 4188
Project	: ADFG Palmer Project	Date Samples Received	: 26-Jun-2024 08:45
PO	: ----	Issue Date	: 08-Jul-2024 15:18
C-O-C number	: ----		
Sampler	: ----		
Site	:		
Quote number	: VA22-CONI100-001 (Q62329)		
No. of samples received	: 10		
No. of samples analysed	: 10		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality bjectives, provides holding ime details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

PD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international eferences.

ummar y of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This eport summarizes extraction / preparation and analysis times and compares each with ALS ecommended holding times, which a e selected to meet known provincial and /or ederal requirements. n the absence of egulatory hold times, A S establishes ecommendations ased on guidelines published y organizations such as CCME, US EPA, APHA Standard Methods, ASTM, o Environment Canada (where available). Dates and holding times eported elow epresent the irst dates o extraction or analysis. f subsequent tests o dilutions exceeded holding times, qualifiers are added (refer to COA).

f samples a e identified elow as having een analyzed or extracted outside o ecommended holding times, measurement uncertainties may e increased, and this should e taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid** Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / ontainer / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times* Rec	*Holding Times* Actual	*Eval*	*Analysis Date*	*Holding Times* Rec	*Holding Times* Actual	*Eval*
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 2024 LGC S1	E510	03-Jun-2024	02-Jul-2024	28 days	28 days	✓	02-Jul-2024	28 days	28 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 2024 LGC S2	E510	03-Jun-2024	02-Jul-2024	28 days	28 days	✓	02-Jul-2024	28 days	28 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 2024 LGC S3	E510	03-Jun-2024	02-Jul-2024	28 days	28 days	✓	02-Jul-2024	28 days	28 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 2024 LGC S4	E510	03-Jun-2024	02-Jul-2024	28 days	28 days	✓	02-Jul-2024	28 days	28 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 2024 LGC S5	E510	03-Jun-2024	02-Jul-2024	28 days	28 days	✓	02-Jul-2024	28 days	28 days	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 2024 MGC S1	E510	03-Jun-2024	02-Jul-2024	28 days	28 days	✓	02-Jul-2024	28 days	29 days	× EHT
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 2024 MGC S2	E510	03-Jun-2024	02-Jul-2024	28 days	28 days	✓	02-Jul-2024	28 days	29 days	× EHT

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / ontainer / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
2024 MGC S3	E510	03-Jun-2024	02-Jul-2024	28 days	28 days	✓	02-Jul-2024	28 days	29 days	× EHT
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
2024 MGC S4	E510	03-Jun-2024	02-Jul-2024	28 days	28 days	✓	02-Jul-2024	28 days	29 days	× EHT
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap										
2024 MGC S5	E510	03-Jun-2024	02-Jul-2024	28 days	28 days	✓	02-Jul-2024	28 days	29 days	× EHT
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
2024 LGC S1	E440	03-Jun-2024	02-Jul-2024	180 days	29 days	✓	02-Jul-2024	180 days	29 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
2024 LGC S2	E440	03-Jun-2024	02-Jul-2024	180 days	29 days	✓	02-Jul-2024	180 days	29 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
2024 LGC S3	E440	03-Jun-2024	02-Jul-2024	180 days	29 days	✓	02-Jul-2024	180 days	29 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
2024 LGC S4	E440	03-Jun-2024	02-Jul-2024	180 days	29 days	✓	02-Jul-2024	180 days	29 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
2024 LGC S5	E440	03-Jun-2024	02-Jul-2024	180 days	29 days	✓	02-Jul-2024	180 days	29 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
2024 MGC S1	E440	03-Jun-2024	02-Jul-2024	180 days	29 days	✓	02-Jul-2024	180 days	29 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / ontainer / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
2024 MGC S2	E440	03-Jun-2024	02-Jul-2024	180 days	29 days	✓	02-Jul-2024	180 days	29 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
2024 MGC S3	E440	03-Jun-2024	02-Jul-2024	180 days	29 days	✓	02-Jul-2024	180 days	29 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
2024 MGC S4	E440	03-Jun-2024	02-Jul-2024	180 days	29 days	✓	02-Jul-2024	180 days	29 days	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
2024 MGC S5	E440	03-Jun-2024	02-Jul-2024	180 days	29 days	✓	02-Jul-2024	180 days	29 days	✓
Particle Size : Grain Size Report (At achment) Pipet/Sieve Method										
LDPE bag										
2024 LGC S1	E185A	03-Jun-2024	----	----	----		08-Jul-2024	----	----	
Particle Size : Grain Size Report (At achment) Pipet/Sieve Method										
LDPE bag										
2024 LGC S2	E185A	03-Jun-2024	----	----	----		08-Jul-2024	----	----	
Particle Size : Grain Size Report (At achment) Pipet/Sieve Method										
LDPE bag										
2024 LGC S3	E185A	03-Jun-2024	----	----	----		08-Jul-2024	----	----	
Particle Size : Grain Size Report (At achment) Pipet/Sieve Method										
LDPE bag										
2024 LGC S4	E185A	03-Jun-2024	----	----	----		08-Jul-2024	----	----	
Particle Size : Grain Size Report (At achment) Pipet/Sieve Method										
LDPE bag										
2024 LGC S5	E185A	03-Jun-2024	----	----	----		08-Jul-2024	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / ontainer / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Particle Size : Grain Size Report (At achment) Pipet/Sieve Method										
LDPE bag 2024 MGC S1	E185A	03-Jun-2024	----	----	----		08-Jul-2024	----	----	
Particle Size : Grain Size Report (At achment) Pipet/Sieve Method										
LDPE bag 2024 MGC S2	E185A	03-Jun-2024	----	----	----		08-Jul-2024	----	----	
Particle Size : Grain Size Report (At achment) Pipet/Sieve Method										
LDPE bag 2024 MGC S3	E185A	03-Jun-2024	----	----	----		08-Jul-2024	----	----	
Particle Size : Grain Size Report (At achment) Pipet/Sieve Method										
LDPE bag 2024 MGC S4	E185A	03-Jun-2024	----	----	----		08-Jul-2024	----	----	
Particle Size : Grain Size Report (At achment) Pipet/Sieve Method										
LDPE bag 2024 MGC S5	E185A	03-Jun-2024	----	----	----		08-Jul-2024	----	----	
Percent Passing : Particle Size Analysis - Pipet e Method										
LDPE bag 2024 LGC S1	E184	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Pipet e Method										
LDPE bag 2024 LGC S2	E184	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Pipet e Method										
LDPE bag 2024 LGC S3	E184	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Pipet e Method										
LDPE bag 2024 LGC S4	E184	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / ontainer / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Percent Passing : Particle Size Analysis - Pipet e Method										
LDPE bag 2024 LGC S5	E184	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Pipet e Method										
LDPE bag 2024 MGC S1	E184	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Pipet e Method										
LDPE bag 2024 MGC S2	E184	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Pipet e Method										
LDPE bag 2024 MGC S3	E184	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Pipet e Method										
LDPE bag 2024 MGC S4	E184	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Pipet e Method										
LDPE bag 2024 MGC S5	E184	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 2024 LGC S1	E182	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 2024 LGC S2	E182	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 2024 LGC S3	E182	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 2024 LGC S4	E182	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 2024 LGC S5	E182	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 2024 MGC S1	E182	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 2024 MGC S2	E182	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 2024 MGC S3	E182	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 2024 MGC S4	E182	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 2024 MGC S5	E182	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag 2024 LGC S1	E181	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag 2024 LGC S2	E181	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag										
2024 LGC S3	E181	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag										
2024 LGC S4	E181	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag										
2024 LGC S5	E181	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag										
2024 MGC S1	E181	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag										
2024 MGC S2	E181	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag										
2024 MGC S3	E181	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag										
2024 MGC S4	E181	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag										
2024 MGC S5	E181	03-Jun-2024	04-Jul-2024	365 days	31 days	✓	04-Jul-2024	365 days	31 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
2024 LGC S1	E108	03-Jun-2024	02-Jul-2024	30 days	29 days	✓	02-Jul-2024	30 days	29 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / ontainer / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
2024 LGC S2	E108	03-Jun-2024	02-Jul-2024	30 days	29 days	✓	02-Jul-2024	30 days	29 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
2024 LGC S3	E108	03-Jun-2024	02-Jul-2024	30 days	29 days	✓	02-Jul-2024	30 days	29 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
2024 LGC S4	E108	03-Jun-2024	02-Jul-2024	30 days	29 days	✓	02-Jul-2024	30 days	29 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
2024 LGC S5	E108	03-Jun-2024	02-Jul-2024	30 days	29 days	✓	02-Jul-2024	30 days	29 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
2024 MGC S1	E108	03-Jun-2024	02-Jul-2024	30 days	29 days	✓	02-Jul-2024	30 days	29 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
2024 MGC S2	E108	03-Jun-2024	02-Jul-2024	30 days	29 days	✓	02-Jul-2024	30 days	29 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
2024 MGC S3	E108	03-Jun-2024	02-Jul-2024	30 days	29 days	✓	02-Jul-2024	30 days	29 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
2024 MGC S4	E108	03-Jun-2024	02-Jul-2024	30 days	29 days	✓	02-Jul-2024	30 days	29 days	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap										
2024 MGC S5	E108	03-Jun-2024	02-Jul-2024	30 days	29 days	✓	02-Jul-2024	30 days	29 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The ollowing eport summarizes the equency of laboratory QC samples analyzed within the analytical atches (QC lots) in which the submitted samples were processed. The actual equency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			unt		Frequency (%)		
Analy ical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
aboratory Duplicates (DUP)							
Mercury in Soil/Solid by CVAAS	E510	1522647	1	20	5.0	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	1522648	1	20	5.0	5.0	✓
Particle Size Analysis - Pipette Method	E184	1527343	1	1	7.1	5.0	✓
Particle Size Analysis - Sieve <2mm	E182	1527345	1	1	7.1	5.0	✓
pH by Meter (1:2 Soil:Water Extraction)	E108	1522649	1	20	5.0	5.0	✓
aboratory Control Samples (LCS)							
Mercury in Soil/Solid by CVAAS	E510	1522647	2	20	10.0	10.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	1522648	2	20	10.0	10.0	✓
Particle Size Analysis - Pipette Method	E184	1527343	1	1	7.1	5.0	✓
Particle Size Analysis - Sieve <2mm	E182	1527345	1	1	7.1	5.0	✓
Particle Size Analysis - Sieve >2mm	E181	1527344	1	1	7.1	5.0	✓
pH by Meter (1:2 Soil:Water Extraction)	E108	1522649	1	20	5.0	5.0	✓
Method Blanks (MB)							
Mercury in Soil/Solid by CVAAS	E510	1522647	1	20	5.0	5.0	✓
Metals in Soil/Solid by CRC ICPMS	E440	1522648	1	20	5.0	5.0	✓

Methodology References and Summaries

The analytical methods used y A S a e developed using internationally ecognized eference methods (where available), such as those published y US EPA, APHA Standard Methods, ASTM, SO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
pH by Meter (1:2 Soil:Water Extraction)	E108 ALS Environmental - Vancouver	Soil/Solid	BC Lab Manual	pH is determined y potentiometric measurement with a pH electrode at ambient laboratory temperature (normally 20 ± 5°C), and is carried out in accordance with procedures described in the BC ab Manual (prescriptive method). The procedure involves mixing the dried (at <60 ºC) and sieved (10mesh/2mm) sample with ultra pure water at a 1:2 atio of sediment to water. The pH is then measured y a standard pH probe.
Particle Size Analysis - Sieve >2mm	E181 ALS Environmental - Saskatoon	Soil/Solid	ASTM D6913-17 (mod)	Soil samples a e disaggregated and sieved through a 2mm sieve. Material etained on the sieve is then urther sieved through a series o sieves. The amount passing through the sieves is measured gravimetrically.
Particle Size Analysis - Sieve <2mm	E182 ALS Environmental - Saskatoon	Soil/Solid	ASTM D6913-17 (mod)	Soil samples a e disaggregated and sieved through a 2mm sieve. Material passed through the sieve is then urther disaggregated using calgon solution and passed through a series o sieves. The amount passing through the sieves is measured gravimetrically.
Particle Size Analysis - Pipette Method	E184 ALS Environmental - Saskatoon	Soil/Solid	SSIR-51 Method 3.2.1	Soil material is separated om coarse material (>2mm). A specimen is then disaggregated through mixing with Calgon solution. The material is then suspended in solution wherein egular aliquots are taken using a mechanical pipette at specific time intervals. The aliquots are dried and material in suspension determined gravimetrically. The principles o Stokes' aw are applied to determine the amount o material emaining in solution as well as the maximum particle size emaining in solution at the specified time.
Grain Size Report (Attachment) Pipet/Sieve Method	E185A ALS Environmental - Saskatoon	Soil/Solid	SSIR-51 Method 3.2.1	A g ain size curve is a graphical epresentation of the particle sizing o a sample representing the percent passing against the effective particle size.
Metals in Soil/Solid by CRC ICPMS	E440 ALS Environmental - Vancouver	Soil/Solid	EPA 6020B (mod)	This method is intended to liberate metals that may e environmentally available. Samples are dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. Dependent on sample matrix, some metals may e only partially ecovered, including Al, Ba, Be, Cr, Sr, Ti, Tl, V, W, and Zr. Silicate minerals are not solubilized. Volatile orms of sulfur (including sulfide) may not e captured, as they may e lost during sampling, storage, o digestion. This method does not adequately ecover elemental sulfur, and is unsuitable for assessment of elemental sulfur standards or guidelines. Analysis is by Collision/Reaction Cell ICPMS.
Mercury in Soil/Solid by CVAAS	E510 ALS Environmental - Vancouver	Soil/Solid	EPA 200.2/1631 Appendix (mod)	Samples a e dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl, ollowed by CVAAS analysis.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
each 1:2 Soil:Water for pH/EC	EP108 ALS Environmental - Vancouver	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.
Digestion for Metals and Mercury	EP440 ALS Environmental - Vancouver	Soil/Solid	EPA 200.2 (mod)	Samples a e dried, then sieved through a 2 mm sieve, and digested with HNO3 and HCl. This method is intended to liberate metals that may be environmentally available.
Dry and Grind in Soil/Solid <60°C	EPP442 ALS Environmental - Saskatoon	Soil/Solid	Soil Sampling and Methods of Analysis, Carter 2008	A ter emoval of any coarse agments and eservation of wet subsamples a portion of homogenized sample is set in a tray and dried at less than 60°C until dry. The sample is then particle size educed with an automated crusher o mortar and pestle, typically to <2 mm. Further size reduction may be needed for particular tests.

QUALITY CONTROL REPORT

Work Order	: **VA24B5139**	Page	:
Client	: Constantine North Inc.	Laboratory	: ALS Environmental - Vancouver
Contact	: Environmental Scientist Merlin Benner	Account Manager	: Ian Chen
Address	: Suite 320 - 800 West Pender St. Vancouver BC Canada V6C 2V6	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: 907 766 2057	Telephone	: +1 604 253 4188
Project	: ADFG Palmer Project	Date Samples Received	: 26-Jun-2024 08:45
PO	: ----	Date Analysis Commenced	: 02-Jul-2024
C-O-C number	: ----	Issue Date	: 08-Jul-2024 15:03
Sampler	: ----		
Site	:		
Quote number	: VA22-CONI100-001 (Q62329)		
No. of samples received	: 0		
No. of samples analysed	: 0		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*osition*	*aboratory Department*
Hedy Lai	Team Leader - Inorganics	Saskatoon Sask Soils, Saskatoon, Saskatchewan
Janice Leung	Supervisor - Organics Instrumentation	Vancouver Organics, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Vancouver Metals, Burnaby, British Columbia
Sam Silveira	Analyst	Vancouver Metals, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is ptionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure ur high standards quality are met. Each QC result as a known r expected target value, whic is c mpared against predetermined Data Quality Objectives (DQOs) to provide c nfidence in the accuracy associated test results. This report c ntains detailed results r all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) r applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

rkorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), for as an absolute difference limit 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 1522649)											
VA24B5139-001	2024 LGC S1	pH (1:2 soil:water)	----	E108	0.10	pH units	8.66	8.56	.2%	5%	----
Percent Passing (QC Lot: 1527343)											
CG2408976-001	Anonymous	Passing (0.002mm)	----	E184	.0	%	< .0	< .0	0	Diff <2x LOR	----
		Passing (0.004mm)	----	E184	.0	%	< .0	< .0	0	Diff <2x LOR	----
		Passing (0.005mm)	----	E184	.0	%	< .0	< .0	0	Diff <2x LOR	----
		Passing (0.020mm)	----	E184	.0	%	< .0	< .0	0	Diff <2x LOR	----
		Passing (0.0312mm)	----	E184	.0	%	< .0	< .0	0	Diff <2x LOR	----
Percent Passing (QC Lot: 1527345)											
CG2408976-001	Anonymous	Passing (0.05mm)	----	E182	.0	%	.3	.2	0.05	Diff <2x LOR	----
		Passing (0.063mm)	----	E182	.0	%	.5	.4	0.07	Diff <2x LOR	----
		Passing (0.075mm)	----	E182	.0	%	.7	.6	0.09	Diff <2x LOR	----
		Passing (0.125mm)	----	E182	.0	%	2.5	2.3	0.2	Diff <2x LOR	----
		Passing (0.149mm)	----	E182	.0	%	2.8	2.6	0.2	Diff <2x LOR	----
		Passing (0.250mm)	----	E182	.0	%	4.1	3.8	0.3	Diff <2x LOR	----
		Passing (0.420mm)	----	E182	.0	%	.3	6.8	0.5	Diff <2x LOR	----
		Passing (0.50mm)	----	E182	.0	%	8.8	8.2	0.6	Diff <2x LOR	----
		Passing (0.841mm)	----	E182	.0	%	3.2	2.8	0.5	Diff <2x LOR	----
		Passing (1.0mm)	----	E182	.0	%	5.3	4.9	2.57%	5%	----
Metals (QC Lot: 1522647)											
VA24B5139-001	2024 LGC S1	Mercury	439-97-6	E510	0.0050	mg/kg	0.0112	0.0152	0.0040	Diff <2x LOR	----
Metals (QC Lot: 1522648)											
VA24B5139-001	2024 LGC S1	Aluminum	429-90-5	E440	50	mg/kg	5200	5100	0.592%	40%	----
		Arsenic	440-38-2	E440	0.10	mg/kg	2.07	.96	5.46%	30%	----
		Cadmium	440-43-9	E440	0.020	mg/kg	0.519	0.533	2.57%	30%	----
		Copper	440-50-8	E440	0.50	mg/kg	23.7	24.5	3.19%	30%	----
		Iron	439-89-6	E440	50	mg/kg	39500	37000	6.70%	30%	----
		Lead	439-92-1	E440	0.50	mg/kg	3.28	3.41	3.96%	40%	----
		Selenium	82-49-2	E440	0.20	mg/kg	0.63	0.72	0.08	Diff <2x LOR	----
		Silver	440-22-4	E440	0.10	mg/kg	0.11	<0.10	0.01	Diff <2x LOR	----
		Zinc	440-66-6	E440	2.0	mg/kg	32	68	24.1%	30%	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried ut r test samples. Meth d Blank results are used to m nitor and control r potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

naly e	CAS Number	Method	LOR	Unit	Result	Qualifier
Metals (QCLot: 1522647)						
Mercury	439-97-6	E510	0.005	mg/kg	<0.0050	----
Metals (QCLot: 1522648)						
Aluminum	429-90-5	E440	50	mg/kg	<50	----
Arsenic	440-38-2	E440	0.1	mg/kg	<0.10	----
Cadmium	440-43-9	E440	0.02	mg/kg	<0.020	----
Copper	440-50-8	E440	0.5	mg/kg	<0.50	----
Iron	439-89-6	E440	50	mg/kg	<50	----
Lead	439-92-1	E440	0.5	mg/kg	<0.50	----
Selenium	82-49-2	E440	0.2	mg/kg	<0.20	----
Silver	440-22-4	E440	0.1	mg/kg	<0.10	----
Zinc	440-66-6	E440	2	mg/kg	<2.0	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that as been rtified (spiked) with test analytes at known concentration and processed in an identical manner t test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
nalyte	CAS Number	Method	LOR	Unit	Target Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 1522649)									
pH (1:2 soil:water)	----	E108	----	pH units	6 pH units	00	95.0	05	----
Metals (QCLot: 1522647)									
Mercury	439-97-6	E510	0.005	mg/kg	0.1 mg/kg	93.2	80.0	20	----
Metals (QCLot: 1522648)									
Aluminum	429-90-5	E440	50	mg/kg	200 mg/kg	02	80.0	20	----
Arsenic	440-38-2	E440	0.1	mg/kg	00 mg/kg	05	80.0	20	----
Cadmium	440-43-9	E440	0.02	mg/kg	0 mg/kg	00	80.0	20	----
Copper	440-50-8	E440	0.5	mg/kg	25 mg/kg	99.8	80.0	20	----
Iron	439-89-6	E440	50	mg/kg	00 mg/kg	01	80.0	20	----
Lead	439-92-1	E440	0.5	mg/kg	50 mg/kg	03	80.0	20	----
Selenium	82-49-2	E440	0.2	mg/kg	00 mg/kg	00.0	80.0	20	----
Silver	440-22-4	E440	0.1	mg/kg	0 mg/kg	89.1	80.0	20	----
Zinc	440-66-6	E440	2	mg/kg	50 mg/kg	01	80.0	20	----

Reference Material (RM) Report

A Reference Material (RM) is a omogenous material with known and well-established analyte c ncentrations. RMs are processed in an identical manner t test samples, and are used t monitor and control the accuracy and precision a test method r a typical sample matrix. RM results are expressed as percent recovery the target analyte c ncentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory ample ID	Reference Material ID	nalyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Percent Passing (QCLot: 1527343)									
QC-1527343-001	RM	Passing (0.002mm)	----	E184	22.5 %	08	4.1	26	----
QC-1527343-001	RM	Passing (0.004mm)	----	E184	25.1 %	06	6.8	23	----
QC-1527343-001	RM	Passing (0.005mm)	----	E184	26.5 %	06	.9	22	----
QC-1527343-001	RM	Passing (0.020mm)	----	E184	41.8 %	98.1	85.8	4	----
QC-1527343-001	RM	Passing (0.0312mm)	----	E184	45.6 %	02	88.0	2	----
Percent Passing (QCLot: 1527344)									
QC-1527344-001	RM	Passing (19mm)	----	E181	00 %	00	90.0	0	----
QC-1527344-001	RM	Passing (2.0mm)	----	E181	00 %	00	90.0	0	----
QC-1527344-001	RM	Passing (25.4mm)	----	E181	00 %	00	90.0	0	----
QC-1527344-001	RM	Passing (38.1mm)	----	E181	00 %	00	90.0	0	----
QC-1527344-001	RM	Passing (4.75mm)	----	E181	00 %	00	90.0	0	----
QC-1527344-001	RM	Passing (50.8mm)	----	E181	00 %	00	90.0	0	----
QC-1527344-001	RM	Passing (76.2mm)	----	E181	00 %	00	90.0	0	----
QC-1527344-001	RM	Passing (9.5mm)	----	E181	00 %	00	90.0	0	----
Percent Passing (QCLot: 1527345)									
QC-1527345-001	RM	Passing (0.05mm)	----	E182	54.1 %	02	90.0	0	----
QC-1527345-001	RM	Passing (0.063mm)	----	E182	57.1 %	01	90.8	09	----
QC-1527345-001	RM	Passing (0.075mm)	----	E182	60.2 %	99.6	91.4	09	----
QC-1527345-001	RM	Passing (0.125mm)	----	E182	68.2 %	01	92.7	07	----
QC-1527345-001	RM	Passing (0.149mm)	----	E182	2 %	99.2	93.1	07	----
QC-1527345-001	RM	Passing (0.250mm)	----	E182	82.3 %	98.9	94.1	06	----
QC-1527345-001	RM	Passing (0.420mm)	----	E182	89.9 %	97.6	94.6	05	----
QC-1527345-001	RM	Passing (0.50mm)	----	E182	91.2 %	99.5	94.7	05	----
QC-1527345-001	RM	Passing (0.841mm)	----	E182	95.6 %	98.7	94.9	05	----
QC-1527345-001	RM	Passing (1.0mm)	----	E182	96.3 %	99.8	94.9	05	----
Metals (QCLot: 1522647)									
QC-1522647-003	MRCA-21	Mercury	439-97-6	E510	0.068 mg/kg	92.4	0.0	30	----
Metals (QCLot: 1522648)									
QC-1522648-003	MRCA-21	Aluminum	429-90-5	E440	22500 mg/kg	07	0.0	30	----
QC-1522648-003	MRCA-21	Arsenic	440-38-2	E440	21.2 mg/kg	96.8	0.0	30	----
QC-1522648-003	MRCA-21	Cadmium	440-43-9	E440	2.15 mg/kg	99.7	0.0	30	----
QC-1522648-003	MRCA-21	Copper	440-50-8	E440	969 mg/kg	02	0.0	30	----

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory ample ID	Reference Material ID	nalyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Metals (QCLot: 1522648) - continued									
QC-1522648-003	MRCA-21	Iron	439-89-6	E440	32700 mg/kg	98.7	0.0	30	----
QC-1522648-003	MRCA-21	Lead	439-92-1	E440	919 mg/kg	93.0	0.0	30	----
QC-1522648-003	MRCA-21	Selenium	82-49-2	E440	.04 mg/kg	97.0	60.0	40	----
QC-1522648-003	MRCA-21	Silver	440-22-4	E440	8.98 mg/kg	93.4	0.0	30	----
QC-1522648-003	MRCA-21	Zinc	440-66-6	E440	828 mg/kg	98.6	0.0	30	----

CHAIN OF CUSTODY

VA24B5139

SR# _____

ALS Environmental

1317 South 13th Ave., Kelso, WA 98626 | 360.577.7222 | 800.695.7222 | 360.636.1068 (fax)

PAGE 1 OF 1 COC# _____

PROJECT NAME: ADEC Palmer Project
PROJECT NUMBER:
PROJECT MANAGER: Dylan Knill
COMPANY NAME: ADEC
ADDRESS: 802 3rd
CITY/STATE/ZIP: Douglas, AK 24
E-MAIL ADDRESS: dylan.knill@alaska.gov
PHONE #: 1907 465-6160 FAX #:
SAMPLER'S SIGNATURE:

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Particle size	REMARKS
2024LGC51	6/3/24	1630		soil	2	X	
2024LGC52	6/3/24	1630		soil	2	X	
2024LGC53	6/3/24	1630		soil	2	X	
2024LGC54	6/3/24	1630		soil	2	X	
2024LGC55	6/3/24	1630		soil	2	X	
2024MGC51	6/3/24	1310		soil	2	X	
2024MGC52	6/3/24	1310		soil	2	X	
2024MGC53	6/3/24	1310		soil	2	X	
2024MGC54	6/3/24	1310		soil	2	X	
2024MGC55	6/3/24	1310		soil	2	X	

Semivolatile Organics by GC/MS 625☐ 8270☐ SIM PAH☐
Volatile Organics 624☐ 8260☐ 8021☐ BTEX☐
Hydrocarbons (*see below) Gas☐ Diesel☐ Oil☐
Oil & Grease/TRPH 1664 SGT☐ 1664 HEM☐
PCBs Aroclors☐ Congeners☐
Pesticides/Herbicides 608☐ 8081☐ 8141☐ 8151☐
Chlorophenolics - 8151M Tri☐ Tetra☐ PCP☐
Metals, Total or Dissolved (See List below)
Cyanide☐ Hex-Chrom☐
(circle) pH, Cond., Cl, SO4, PO4, F, NO2, NO3, BOD, TSS, TDS, Turb.
(circle) NH3-N, COD, TKN, TOC, DOC, NO2+NO3, T-Phos
TOX 9020☐ AOX 1650☐ 506☐
Alkalinity☐ CO3☐ HCO3☐
Dioxins/Furans 1613☐ 8290☐
Dissolved Gases RSK 175☐ CO2☐ Methane☐ Ethane☐ Ethene☐

Environmental Division
Vancouver
Work Order Reference
VA24B5139

Telephone : +1 604 253 4188

REPORT REQUIREMENTS

- X I. Routine Report: Method Blank, Surrogate, as required
- X II. Report Dup., MS, MSD as required
- ___ III. CLP Like Summary (no raw data)
- X IV. Data Validation Report
- ___ V. EDD

INVOICE INFORMATION

P.O. # _____
Bill To: Merlin Benner
merlin@constantinemetals.com

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 day
X Standard (15 working days)
___ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

Total Metals: (Al) (As) Sb Ba Be B Ca (Cd) Co Cr (Cu) (Fe) (Pb) Mg Mn Mo Ni K (Ag) Na (Se) Sr Tl Sn V (Zn) (Hg)

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER: _____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

send lab report to dylan.knill@alaska.gov, kate.kanouse@alaska.gov & merlin@constantinemetals.com

2

☐ Sample Shipment contains USDA regulated soil samples (check box if applicable)

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: D. Knill	Signature:	Signature:	Signature:
Date/Time: 6/5/24 0900	Date/Time:	Date/Time:	Date/Time: JUNE 20 - 8:45
Printed Name: Dylan Knill	Printed Name:	Printed Name:	Printed Name: ELSOME
Firm: ADEC	Firm:	Firm:	Firm: 0/0

CHAIN OF CUSTODY VA24B5139

ALS Environmental
1317 South 13th Ave., Kelso, WA 98626 | 360.577.7222 | 800.695.7222 | 360.636.1068 (fax)

SR# _____ PAGE 1 OF 1 COC# _____

PROJECT NAME: ADFG Palmer Project
PROJECT NUMBER:
PROJECT MANAGER: Dylan Krull
COMPANY NAME: ADFG
ADDRESS: 802 3rd St
CITY/STATE/ZIP: Douglas, AK 99824
E-MAIL ADDRESS: dylan.krull@alaska.gov
PHONE #: (907) 465-6160 FAX #:
SAMPLER'S SIGNATURE:

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625☐ 8270☐ SIM PAH☐	Volatile Organics 624☐ 8260☐ 8021☐ BTEX☐	Hydrocarbons (*see below) Gas☐ Diesel☐ Oil☐ Oil & Grease/TRPH 1664 SGT☐ 1664 HEM☐	PCBs Aroclors☐ Congeners☐	Pesticides/Herbicides 608☐ 8081☐ 8141☐ 8151☐	Chlorophenolics - 8151M Tri☐ Tetra☐ PCP☐	Metals, Total or Dissolved (See List below)	Cyanide☐ Hex-Chrom☐	(circle) pH, Cond., Cl, SO_4, PO_4, F, NO_2, NO_3, BOD, TSS, TDS, Turb.	(circle) NH_3-N, COD, TKN, TOC, DOC, NO_2+NO_3, T-Phos	TOX 9020☐ AOX 1650☐ 506☐	Alkalinity ☐ CO_3☐ HCO_3☐	Dioxins/Furans 1613☐ 8290☐	Dissolved Gases RSK 175☐ CO_2☐ Methane☐ Ethane☐ Ethene☐	Particle size			REMARKS
2024LGC51	6/3/24	1630		soil	2							X								X				
2024LGC52	6/3/24	1630		soil	2							X								X				
2024LGC53	6/3/24	1630		soil	2							X								X				
2024LGC54	6/3/24	1630		soil	2							X								X				
2024LGC55	6/3/24	1630		soil	2							X								X				
2024MGC51	6/3/24	1310		soil	2							X								X				
2024MGC52	6/3/24	1310		soil	2							X								X				
2024MGC53	6/3/24	1310		soil	2							X								X				
2024MGC54	6/3/24	1310		soil	2							X								X				
2024MGC55	6/3/24	1310		soil	2							X								X				

Environmental Division
Vancouver
Work Order Reference
VA24B5139

Telephone : +1 604 253 4188

REPORT REQUIREMENTS

- X I. Routine Report: Method Blank, Surrogate, as required
- X II. Report Dup., MS, MSD as required
- ___ III. CLP Like Summary (no raw data)
- X IV. Data Validation Report
- ___ V. EDD

INVOICE INFORMATION

P.O. # _____
Bill To: Merlin Benner
merlin@constantinemetals.com

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 day
X Standard (15 working days)
___ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER: _____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:
send lab report to dylan.krull@alaska.gov, kate.kanouse@alaska.gov & merlin@constantinemetals.com

2

☐ Sample Shipment contains USDA regulated soil samples (check box if applicable)

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
D.K. / 6/5/24 0900	Rcvd jc 27Jun2024 1:30 pm		JUNE 26 - 8:45
Signature / Date/Time	5°C (avg 13 coolers) ice PK	Signature / Date/Time	Signature / Date/Time
Dylan Krull / ADFG			ELSOME / 0/0
Printed Name / Firm		Printed Name / Firm	Printed Name / Firm

CERTIFICATE OF ANALYSIS

Work Order	: **VA24B5141**	e	of 6
Client	**Constantine North Inc.**	Laboratory	ALS Environmental - Vancouver
Contact	Allegra Cairns	Ac ount I nager	Mdn CBen
Ahhress	Suite d30 - 600 2 est Penher St. Vancouver 8 C Canaha VWC 3VW	Ahhress	6061 LougBeeh HigBway 8urnaby 8 C Canaha V4A 12 5
Tele9Bone	W0p d35 4563	Tele9Bone	71 W0p 34d p166
Pro-ect	Aj DF Palmer Pro-ect	j te Sam9les Geceiveh	3WRun-303p 06:p4
PJ	----	j te Analysis Commenceh	03-Rul-303p
C-J -C number	----	Mssue j te	06-Rul-303p 14:3W
Sam9ler	----		
Site			
Ouote number	VA33-CJ QM100-001 NDW3d35(		
Qo. of sam9les receiveh	4		
Qo. of sam9les analyseh	4		

TBis re9ort su9ersehes any 9revious re9ortNs(witB tBis reference. Gesults a99ly to tBe sam9leNs(as submitteh. TBis hcument sBall not be re9rohuceh) e, e9t in full.

TBis Certificate of Analysis contains tBe following information

- F eneral Comments
- Analytical Gesults

Ahhitional information 9ertinent to tBis re9ort will be founh in tBe following se9arate attacBments: Ouality Control Ge9ort) OC Mter9retive re9ort to ssist witB Ouality Geview nh Sam9le Gecei9t Qotification NSGQ(.

Signatories

TBis hcument Bas been electronically signeh by tBe autBorixeh signatories below. Electronic signing is conhucteh in accorhance witB z S Dj A 31 CDG rt 11.

Signatories	*Position*	*aboratory Department*
F BaxaleB UBnmirxaei	Analyst	I etals) 8urnaby) 8ritisB Columbia
Hehy Lai	Team Leaher - Morganics	Sask Soils) Saskatoon) SaskatcBewan
R nice Leung	Su9ervisor - J r nics Mnstrumentation	J rganics) 8urnaby) 8ritisB Columbia
Uim Rensen	j e9artment I nager - I etals	I etals) 8urnaby) 8ritisB Columbia
Sam Silveira	Analyst	I etals) 8urnaby) 8ritisB Columbia

neral Comments

TBe nalytical metBohs useh by ALS re hevelo9eh using internationally recognixeh reference metBohs NwBere available() sucB s tBose 9ublisBeh by z S EPA) APHA Stanh rh I etBohs) ASTI) MSJ) Environment Canaha) 8C I J E) nh J ntario I J E. Gefer to tBe ALS Ouality Control Mnter9retive re9ort NDCM for 99licable references nh metBohology summaries. Geference metBohs may incor9orate mohifications to im9rove 9erformance.

2 Bere a re9orteh less tBan N(result is BigBer tBan tBe LJ G) tBis may be hue to 9rimary sam9le e, tract/higestate hilution anh/or insufficient sam9le for nalysis.

2 Bere tBe LJ G of a re9orteh result hiffers from stanharh LJ G) tBis may be hue to BigB moisture content) insufficient sam9le Nehuceh weigBt em9loyeh(or matri, interference.

lease refer to Ouality Control Mnter9retive re9ort NDCM for information regarhing Holhing Time com9liance.

Uey : CAS Qumber: CBemical Abstracts Services number is a uniKue ihentifier assigneh to hiscrete substances
LJ G: Limit of Ge9orting Nhetection limit(.

Unit	*Description*
-	no units
q	9ercent
mg/kg	milligrams 9er kilogram
9H units	9H units

<: less tB n.

% greater tB n.

Surrogate: An analyte tBt is similar in beB vior to target analyteNs() but tBat hoes not oc ur naturally in environmental sam9les. Dor a99licable tests) surrogates are ahheh to sam9les 9rior to analysis as a cBeck on recovery.

Test results re9orteh relate only to tBe sam9les as receiveh by tBe laboratory.

z QLESS J THEG2 MSE STATEj on SGQ or OCMGe9ort) ALL SAI PLES 2 EGE GECENWEj MQ ACCEPTA8LE CJ Qj MTMQ.

Analytical Results

Sub-l tri, : **oil**
(l atri, : **oil/Solid**)

				Client sample ID	2024 LSAR S1	2024 LSAR S2	2024 LSAR S3	2024 LSAR S4	2024 LSAR S5
				Client sampling date / time	0p-Run-303p 00	0p-Run-303p 00	0p-Run-303p 00	0p-Run-303p 00	0p-Run-303p 00
Analyte	*CAS Number*	*Method/Lab*	*OR*	*Unit*	**VA24B5141-001**	**VA24B5141-002**	**VA24B5141-003**	**VA24B5141-004**	**VA24B5141-005**
					Gesult	Gesult	Gesult	Gesult	Gesult
Physical Tests									
pH (1:2 soil:water)	----	E106/VA	0.10	9H units	6.3>	6.00	>.56	>.54	6.13
Particle Size									
Grain size curve	----	E164A/SU	-	-	See AttacBeh	See AttacBeh	See AttacBeh	See AttacBeh	See AttacBeh
Percent Passing									
Passing (9.5mm)	----	E161/SU	.0	q	00	55.0	00	00	00
Passing (4.75mm)	----	E161/SU	.0	q	00	55.0	55.6	00	56.0
Passing (19mm)	----	E161/SU	.0	q	00	55.0	00	00	00
Passing (25.4mm)	----	E161/SU	.0	q	00	00	00	00	00
Passing (38.1mm)	----	E161/SU	.0	q	00	00	00	00	00
Passing (50.8mm)	----	E161/SU	.0	q	00	00	00	00	00
Passing (76.2mm)	----	E161/SU	.0	q	00	00	00	00	00
Passing (1.0mm)	----	E163/SU	.0	q	61.0	5W5	56.p	55.1	6>.1
Passing (0.841mm)	----	E163/SU	.0	q	>d.4	66.5	5>.5	56.>	6p.4
Passing (0.50mm)	----	E163/SU	.0	q	4>.W	>1.6	5W5	5>.5	>6.6
Passing (0.420mm)	----	E163/SU	.0	q	p6.3	44.5	53.d	54.W	>0.>
Passing (0.250mm)	----	E163/SU	.0	q	36.d	33.0	63.4	50.>	4d.p
Passing (0.149mm)	----	E163/SU	.0	q	4.6	.d	4Wd	>0.3	35.4
Passing (0.125mm)	----	E163/SU	.0	q	3.6	6.>	40.1	W4.p	3d.6
Passing (0.075mm)	----	E163/SU	.0	q	6.p	4.6	dp.d	pWW	p.>
Passing (0.063mm)	----	E163/SU	.0	q	>.d	4.1	d0.W	p3.0	3.4
Passing (0.05mm)	----	E163/SU	.0	q	W1	p.p	3Wp	d>.3	0.1
Passing (0.0312mm)	----	E16p/SU	.0	q	p.3	d.0	WW	31.>	WW
Passing (0.020mm)	----	E16p/SU	.0	q	d.0	3.1	0.>	3.4	p.W
Passing (0.005mm)	----	E16p/SU	.0	q	.1	<1.0	d.1	3.6	.p
Passing (0.004mm)	----	E16p/SU	.0	q	<1.0	<1.0	3.W	3.d	.3
Passing (0.002mm)	----	E16p/SU	.0	q	<1.0	<1.0	.W	.p	<1.0
Passing (2.0mm)	----	E161/SU	.0	q	5>.6	56.5	55.d	55.5	53.3
Metals									

Analytical Results

Sub-l tri, : **oil**

(l atri, : **oil/Solid**)

					Client sample ID	**2024 LSAR S1**	**2024 LSAR S2**	**2024 LSAR S3**	**2024 LSAR S4**	**2024 LSAR S5**
					Client sampling date / time	0p-Run-303p 00	0p-Run-303p 00	0p-Run-303p 00	0p-Run-303p 00	0p-Run-303p 00
Analyte	*CAS Number*	*Method/Lab*	*OR*	*Unit*		**VA24B5141-001**	**VA24B5141-002**	**VA24B5141-003**	**VA24B5141-004**	**VA24B5141-005**
						Gesult	Gesult	Gesult	Gesult	Gesult
Metals										
Aluminum	>p35-50-4	Epp0/VA	40	mg/kg		Wp00	1>000	31p00	5d00	6500
Arsenic	>pp0-d6-3	Epp0/VA	0.10	mg/kg		d.50	p.>	4.>0	W10	p.>3
Cadmium	>pp0-pd-5	Epp0/VA	0.030	mg/kg		0.4p0	0.>0W	0.65W	0.>d3	0.W1
Copper	>pp0-40-6	Epp0/VA	0.40	mg/kg		dW3	p1.5	W.d	4p.W	pW4
Iron	>pd5-65-W	Epp0/VA	40	mg/kg		d1500	dd600	pp500	p1d00	d> 00
ead	>pd5-53-1	Epp0/VA	0.40	mg/kg		p.33	4.pW	6.6d	>.d6	4.41
Mercury	>pd5-5>-W	E410/VA	0.0040	mg/kg		0.0061	0.0116	0.01W8	0.0141	0.0116
elenium	>>63-p5-3	Epp0/VA	0.30	mg/kg		0.W0	0.>p	1.3W	0.55	0.60
ilver	>pp0-33-p	Epp0/VA	0.10	mg/kg		<0.10	0.13	0.30	0.1W	0.1d
Zinc	>pp0-WWW	Epp0/VA	3.0	mg/kg		0W	5	p>	dp	30

Please refer to tBe F eneral Comments section for an e, 9lanation of any result Kualifiers hetecteh.

Please refer to tBe Accrehitation section for an e, 9lanation of analyte accrehitations.

Analytical Results

Sub-l tri, : **oil**

(l atri, : **oil/Solid**)

Analyte	CAS Number	Method/Lab	OR	Unit	Client sample ID	2024 USAR S1	2024 USAR S2	2024 USAR S3	2024 USAR S4	2024 USAR S5
					Client sampling date / time	0p-Run-303p d:d0	0p-Run-303p d:d0	0p-Run-303p d:d0	0p-Run-303p d:d0	0p-Run-303p d:d0
						VA24B5141-006	VA24B5141-007	VA24B5141-008	VA24B5141-009	VA24B5141-010
						Gesult	Gesult	Gesult	Gesult	Gesult
Physical Tests										
pH (1:2 soil:water)	----	E106/VA	0.10	9H units		6.33	6.10	6.0p	6.0W	>.5>
Particle Size										
Grain size curve	----	E164A/SU	-	-		See AttacBeh	See AttacBeh	See AttacBeh	See AttacBeh	See AttacBeh
Percent Passing										
Passing (9.5mm)	----	E161/SU	.0	q		00	55.p	00	00	00
Passing (4.75mm)	----	E161/SU	.0	q		55.6	56.5	00	00	00
Passing (19mm)	----	E161/SU	.0	q		00	00	00	00	00
Passing (25.4mm)	----	E161/SU	.0	q		00	00	00	00	00
Passing (38.1mm)	----	E161/SU	.0	q		00	00	00	00	00
Passing (50.8mm)	----	E161/SU	.0	q		00	00	00	00	00
Passing (76.2mm)	----	E161/SU	.0	q		00	00	00	00	00
Passing (1.0mm)	----	E163/SU	.0	q		5>.3	56.4	55.5	55.6	55.6
Passing (0.841mm)	----	E163/SU	.0	q		54.6	56.3	55.>	55.W	55.W
Passing (0.50mm)	----	E163/SU	.0	q		5d.0	5>.W	55.d	55.1	55.1
Passing (0.420mm)	----	E163/SU	.0	q		65.W	54.5	5>.5	5W6	5W6
Passing (0.250mm)	----	E163/SU	.0	q		63.W	53.d	5p.5	51.6	53.0
Passing (0.149mm)	----	E163/SU	.0	q		W*.d	>6.6	>W>	>0.3	>3.d
Passing (0.125mm)	----	E163/SU	.0	q		Wd.>	>4.W	>3.p	W4.0	W*.W
Passing (0.075mm)	----	E163/SU	.0	q		pW4	46.>	4p.p	p>.p	43.W
Passing (0.063mm)	----	E163/SU	.0	q		p3.d	4p.W	40.1	pd.3	p5.0
Passing (0.05mm)	----	E163/SU	.0	q		d>.5	40.3	p4.p	d6.W	p4.3
Passing (0.0312mm)	----	E16p/SU	.0	q		3d.6	d3.1	3WW	3p.d	3>.4
Passing (0.020mm)	----	E16p/SU	.0	q		4.p	31.d	4.4	4.6	1>.0
Passing (0.005mm)	----	E16p/SU	.0	q		p.W	W>	d.>	p.5	p.>
Passing (0.004mm)	----	E16p/SU	.0	q		d.5	4.>	d.1	p.3	p.0
Passing (0.002mm)	----	E16p/SU	.0	q		3.4	d.>	.5	3.6	3.4
Passing (2.0mm)	----	E161/SU	.0	q		56.4	56.>	00	00	00
Metals										
Aluminum	>p35-50-4	Epp0/VA	40	mg/kg		5p00	33600	5500	31600	31100

Analytical Results

Sub-l tri, : **oil**

(l atri, : **oil/Solid**)

					Client sample ID	**2024 USAR S1**	**2024 USAR S2**	**2024 USAR S3**	**2024 USAR S4**	**2024 USAR S5**
					Client sampling date / time	0p-Run-303p d:d0	0p-Run-303p d:d0	0p-Run-303p d:d0	0p-Run-303p d:d0	0p-Run-303p d:d0
Analyte	*CAS Number*	*Method/Lab*	*OR*	*Unit*		**VA24B5141-006**	**VA24B5141-007**	**VA24B5141-008**	**VA24B5141-009**	**VA24B5141-010**
						Gesult	Gesult	Gesult	Gesult	Gesult
Metals										
Arsenic	>pp0-d6-3	Epp0/VA	0.10	mg/kg		4.d4	>.3	W30	>.p	>. 0
Cadmium	>pp0-pd-5	Epp0/VA	0.030	mg/kg		0.465	0.6d>	0.65p	0.510	0.514
Copper	>pp0-40-6	Epp0/VA	0.40	mg/kg		4W3	W.d	Wp.0	Wp.6	Wd.3
Iron	>pd5-65-W	Epp0/VA	40	mg/kg		p6>00	44300	p4>00	p6500	p6500
ead	>pd5-53-1	Epp0/VA	0.40	mg/kg		WW0	6.6d	6.	6.13	5.35
Mercury	>pd5-5>-W	E410/VA	0.0040	mg/kg		0.011W	0.01>d	0.015d	0.016W	0.030d
elenium	>>63-p5-3	Epp0/VA	0.30	mg/kg		0.63	.1p	.1>	.14	.16
ilver	>pp0-33-p	Epp0/VA	0.10	mg/kg		0.16	0.30	0.33	0.30	0.3p
Zinc	>pp0-WWW	Epp0/VA	3.0	mg/kg		3W	4>	p4	4>	44

Please refer to tBe F eneral Comments section for an e, 9lanation of any result Kualifiers hetecteh.

Please refer to tBe Accrehitation section for an e, 9lanation of analyte accrehitations.

Analytical Results

Sub-l tri, : **oil**

(l atri, : **oil/Solid**)

Analyte	CAS Number	Method/Lab	OR	Unit	Client sample ID	2024 PLA S1	2024 PLA S2	2024 PLA S3	2024 PLA S4	2024 PLA S5
					Client sampling date / time	0p-Run-303p 06:p4	0p-Run-303p 06:p4	0p-Run-303p 06:p4	0p-Run-303p 06:p4	0p-Run-303p 06:p4
						VA24B5141-011	VA24B5141-012	VA24B5141-013	VA24B5141-014	VA24B5141-015
						Gesult	Gesult	Gesult	Gesult	Gesult
Physical Tests										
pH (1:2 soil:water)	----	E106/VA	0.10	9H units		6.13	6.0W	6.0d	>.43	>.W4
Particle Size										
Grain size curve	----	E164A/SU	-	-		See AttacBeh	See AttacBeh	See AttacBeh	See AttacBeh	See AttacBeh
Percent Passing										
Passing (9.5mm)	----	E161/SU	.0	q		00	55.6	55.6	5>.p	56.4
Passing (4.75mm)	----	E161/SU	.0	q		55.d	54.6	5>.5	5W1	54.1
Passing (19mm)	----	E161/SU	.0	q		00	00	00	56.d	00
Passing (25.4mm)	----	E161/SU	.0	q		00	00	00	00	00
Passing (38.1mm)	----	E161/SU	.0	q		00	00	00	00	00
Passing (50.8mm)	----	E161/SU	.0	q		00	00	00	00	00
Passing (76.2mm)	----	E161/SU	.0	q		00	00	00	00	00
Passing (1.0mm)	----	E163/SU	.0	q		>5.0	W0.p	63.d	6Wp	W4.1
Passing (0.841mm)	----	E163/SU	.0	q		>d.W	4d.6	>p.W	>W6	43.W
Passing (0.50mm)	----	E163/SU	.0	q		W8.3	d5.>	46.1	4W3	3W0
Passing (0.420mm)	----	E163/SU	.0	q		4W3	dp.1	p5.4	pp.1	5.5
Passing (0.250mm)	----	E163/SU	.0	q		pd.d	33.3	d1.1	6.d	W6
Passing (0.149mm)	----	E163/SU	.0	q		d4.0	1>.3	31.W	3.1	4.0
Passing (0.125mm)	----	E163/SU	.0	q		dd.0	W.0	5.d	0.W	p.W
Passing (0.075mm)	----	E163/SU	.0	q		35.6	d.p	W3	5.1	d.W
Passing (0.063mm)	----	E163/SU	.0	q		35.0	3.>	4.4	6.>	d.p
Passing (0.05mm)	----	E163/SU	.0	q		36.1	3.0	p.>	6.d	d.3
Passing (0.0312mm)	----	E16p/SU	.0	q		1>.3	>.W	5.3	4.4	3.d
Passing (0.020mm)	----	E16p/SU	.0	q		0.W	4.0	4.5	d.5	.>
Passing (0.005mm)	----	E16p/SU	.0	q		d.3	.>	.5	.4	<1.0
Passing (0.004mm)	----	E16p/SU	.0	q		3.6	.4	.>	.p	<1.0
Passing (0.002mm)	----	E16p/SU	.0	q		.5	.1	.3	.0	<1.0
Passing (2.0mm)	----	E161/SU	.0	q		50.>	>>.p	54.0	5d.5	6W3
Metals										
Aluminum	>p35-50-4	Epp0/VA	40	mg/kg		30000	31W00	30300	5300	5100

Analytical Results

Sub-l tri, : **oil**

(l atri, : **oil/Solid**)

					Client sample ID	**2024 PLA S1**	**2024 PLA S2**	**2024 PLA S3**	**2024 PLA S4**	**2024 PLA S5**
					Client sampling date / time	0p-Run-303p 06:p4	0p-Run-303p 06:p4	0p-Run-303p 06:p4	0p-Run-303p 06:p4	0p-Run-303p 06:p4
Analyte	*CAS Number*	*Method/Lab*	*OR*	*Unit*		**VA24B5141-011**	**VA24B5141-012**	**VA24B5141-013**	**VA24B5141-014**	**VA24B5141-015**
						Gesult	Gesult	Gesult	Gesult	Gesult
Metals										
Arsenic	>pp0-d6-3	Epp0/VA	0.10	mg/kg		4.63	Wdp	4.66	3.5p	d.1>
Cadmium	>pp0-pd-5	Epp0/VA	0.030	mg/kg		0.W86	0.>>0	0.63>	0.p46	0.443
Copper	>pp0-40-6	Epp0/VA	0.40	mg/kg		40.5	4>.p	44.5	3d.1	6.6
Iron	>pd5-65-W	Epp0/VA	40	mg/kg		pW600	p6W00	p3000	pp100	p1300
ead	>pd5-53-1	Epp0/VA	0.40	mg/kg		W>p	6.35	>.W>	W46	W>3
Mercury	>pd5-5>-W	E410/VA	0.0040	mg/kg		0.0103	0.0140	0.0141	0.006W	0.00W4
elenium	>>63-p5-3	Epp0/VA	0.30	mg/kg		0.>4	.00	.0p	0.d6	0.d3
ilver	>pp0-33-p	Epp0/VA	0.10	mg/kg		0.1W	0.16	0.16	<0.10	<0.10
Zinc	>pp0-WWW	Epp0/VA	3.0	mg/kg		33	p1	dd	d5	dd

Please refer to tBe F eneral Comments section for an e, 9lanation of any result Kualifiers hetecteh.

Please refer to tBe Accrehitation section for an e, 9lanation of analyte accrehitations.

ALS Canada Ltd.

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QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA24B5141**	Page	: 1 of 14
Client	: **onstantine North Inc.**	aboratory	: ALS Environmental - Vancouver
Contact	: Allegra Cairns	Account Manager	: Ban Cl en
Ahhress	: Suite d32 - 022 8 est Penher StW Vancouver . C Canaha V6C 3V6	Ahhress	: 0201 Lougl eeh Higl way . u naby, . itisl Columbia Canaha V5A 18 9
Telepl one	: 627 d39 5903	Telepl one	: +1 627 35d 7100
Project	: ADFG Palmer Project	Date Samples Receiveh	: 36-Jun-3237 20:75
PO	: ----	Bsue Date	: 20-Jul-3237 15:20
C-O-C number	: ----		
Sampler	: ----		
Site	:		
Quote number	: VA33-CONB122-221 (Q63d39)		
NoWof samples receiveh	: 15		
NoWof samples analyseh	: 15		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality ontrol (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality bjectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

PD: Relative Percent Difference.

Workorder Comments

Holhing times are hisplayeh as "---" if no guihance exists from CCME, Canahian provinces, or broahly recognizeh international eferencesW

ummar y of Outliers

Outliers : Quality Control Samples

- No Metl oh . lank value outliers occurW
- No Duplicate outliers occurW
- No Laboratory Control Sample (LCS) outliers occur
- No Test sample Surrogate recovery outliers existW

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occurW

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holhing Time Outliers existW

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occurW

Analysis Holding Time Compliance

TI is eport summarizes extraction / preparation anh analysis times anh compares eacI witI ALS ecommenheh olhing times, w icI a e selecteh to meet known provincial anh /or eheral requirementsW Bn tI e absence of egulatory olh times, A S establisI es recommenhations aseh on guihelines publisI eh y o ganizations sucI as CCME, US EPA, APHA Stanharh MetI ohs, ASTM, o Environment Canaha (wI e e available)W Dates anh olhing times eporteh elow epresent tI e irst hates of extraction or analysisW Bf subsequent tests o hilutions exceeheh olhing times, qualifiers are ahheh (refer to COA)W

Bf samples a e ihentifieh elow as aving een analyzeh or extracteh outsihe o ecommenheh olhing times, measurement uncertainties may e increaseh, anh tI is s oulh e taken into consiheration wI en interpreting resultsW

8 ere actual sampling hate is not proviheh on tI e cI ain of custohy, tI e hate of receipt witI time at 22:22 is useh for calculation purposesW

8 ere only tI e sample hate witI out time is proviheh on tI e cI ain of custohy, tI e sampling hate at 22:22 is useh for calculation purposesW

Matrix: **Soil/Solid** Evaluation: × = Holhing time exceehance ; ✓ = 8 itI in Holhing Time

Analyte Group : Analytical Method / ontainer / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 3237 LSAR S1	E512	27-Jun-3237	23-Jul-3237	30 hays	30 hays	✓	23-Jul-3237	30 hays	30 hays	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 3237 LSAR S3	E512	27-Jun-3237	23-Jul-3237	30 hays	30 hays	✓	23-Jul-3237	30 hays	30 hays	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 3237 LSAR Sd	E512	27-Jun-3237	23-Jul-3237	30 hays	30 hays	✓	23-Jul-3237	30 hays	30 hays	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 3237 LSAR S7	E512	27-Jun-3237	23-Jul-3237	30 hays	30 hays	✓	23-Jul-3237	30 hays	30 hays	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 3237 LSAR S5	E512	27-Jun-3237	23-Jul-3237	30 hays	30 hays	✓	23-Jul-3237	30 hays	30 hays	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 3237 PLA S1	E512	27-Jun-3237	23-Jul-3237	30 hays	30 hays	✓	23-Jul-3237	30 hays	30 hays	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 3237 PLA S3	E512	27-Jun-3237	23-Jul-3237	30 hays	30 hays	✓	23-Jul-3237	30 hays	30 hays	✓

Matrix: **Soil/Solid**

Evaluation: × = Holhing time exceehance ; ✓ = 8 itl in Holhing Time

Analyte Group : Analytical Method / ontainer / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 3237 PLA Sd	E512	27-Jun-3237	23-Jul-3237	30 hays	30 hays	✓	23-Jul-3237	30 hays	30 hays	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 3237 PLA S7	E512	27-Jun-3237	23-Jul-3237	30 hays	30 hays	✓	23-Jul-3237	30 hays	30 hays	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 3237 PLA S5	E512	27-Jun-3237	23-Jul-3237	30 hays	30 hays	✓	23-Jul-3237	30 hays	30 hays	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 3237 USAR S1	E512	27-Jun-3237	23-Jul-3237	30 hays	30 hays	✓	2d-Jul-3237	30 hays	30 hays	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 3237 USAR S3	E512	27-Jun-3237	23-Jul-3237	30 hays	30 hays	✓	2d-Jul-3237	30 hays	30 hays	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 3237 USAR Sd	E512	27-Jun-3237	23-Jul-3237	30 hays	30 hays	✓	2d-Jul-3237	30 hays	30 hays	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 3237 USAR S7	E512	27-Jun-3237	23-Jul-3237	30 hays	30 hays	✓	2d-Jul-3237	30 hays	30 hays	✓
Metals : Mercury in Soil/Solid by CVAAS										
Glass soil jar/Teflon lined cap 3237 USAR S5	E512	27-Jun-3237	23-Jul-3237	30 hays	30 hays	✓	2d-Jul-3237	30 hays	30 hays	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap 3237 LSAR S1	E772	27-Jun-3237	23-Jul-3237	102 hays	30 hays	✓	23-Jul-3237	102 hays	30 hays	✓

Matrix: **Soil/Solid**

Evaluation: × = Holhing time exceehance ; ✓ = 8 itl in Holhing Time

Analyte Group : Analytical Method / ontainer / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
3237 LSAR S3	E772	27-Jun-3237	23-Jul-3237	102 hays	30 hays	✓	23-Jul-3237	102 hays	30 hays	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
3237 LSAR Sd	E772	27-Jun-3237	23-Jul-3237	102 hays	30 hays	✓	23-Jul-3237	102 hays	30 hays	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
3237 LSAR S7	E772	27-Jun-3237	23-Jul-3237	102 hays	30 hays	✓	23-Jul-3237	102 hays	30 hays	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
3237 LSAR S5	E772	27-Jun-3237	23-Jul-3237	102 hays	30 hays	✓	23-Jul-3237	102 hays	30 hays	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
3237 PLA S1	E772	27-Jun-3237	23-Jul-3237	102 hays	30 hays	✓	23-Jul-3237	102 hays	39 hays	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
3237 PLA S3	E772	27-Jun-3237	23-Jul-3237	102 hays	30 hays	✓	23-Jul-3237	102 hays	39 hays	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
3237 PLA Sd	E772	27-Jun-3237	23-Jul-3237	102 hays	30 hays	✓	23-Jul-3237	102 hays	39 hays	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
3237 PLA S7	E772	27-Jun-3237	23-Jul-3237	102 hays	30 hays	✓	23-Jul-3237	102 hays	39 hays	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap										
3237 PLA S5	E772	27-Jun-3237	23-Jul-3237	102 hays	30 hays	✓	23-Jul-3237	102 hays	39 hays	✓

Matrix: **Soil/Solid**

Evaluation: × = Holhing time exceehance ; ✓ = 8 itl in Holhing Time

Analyte Group : Analytical Method / ontainer / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap 3237 USAR S1	E772	27-Jun-3237	23-Jul-3237	102 hays	30 hays	✓	2d-Jul-3237	102 hays	39 hays	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap 3237 USAR S3	E772	27-Jun-3237	23-Jul-3237	102 hays	30 hays	✓	2d-Jul-3237	102 hays	39 hays	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap 3237 USAR Sd	E772	27-Jun-3237	23-Jul-3237	102 hays	30 hays	✓	2d-Jul-3237	102 hays	39 hays	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap 3237 USAR S7	E772	27-Jun-3237	23-Jul-3237	102 hays	30 hays	✓	2d-Jul-3237	102 hays	39 hays	✓
Metals : Metals in Soil/Solid by CRC ICPMS										
Glass soil jar/Teflon lined cap 3237 USAR S5	E772	27-Jun-3237	23-Jul-3237	102 hays	30 hays	✓	2d-Jul-3237	102 hays	39 hays	✓
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag 3237 LSAR S1	E105A	27-Jun-3237	----	----	----		20-Jul-3237	----	----	
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag 3237 LSAR S3	E105A	27-Jun-3237	----	----	----		20-Jul-3237	----	----	
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag 3237 LSAR Sd	E105A	27-Jun-3237	----	----	----		20-Jul-3237	----	----	
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag 3237 LSAR S7	E105A	27-Jun-3237	----	----	----		20-Jul-3237	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holhing time exceehance ; ✓ = 8 itl in Holhing Time

Analyte Group : Analytical Method / ontainer / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag 3237 LSAR S5	E105A	27-Jun-3237	----	----	----		20-Jul-3237	----	----	
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag 3237 PLA S1	E105A	27-Jun-3237	----	----	----		20-Jul-3237	----	----	
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag 3237 PLA S3	E105A	27-Jun-3237	----	----	----		20-Jul-3237	----	----	
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag 3237 PLA Sd	E105A	27-Jun-3237	----	----	----		20-Jul-3237	----	----	
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag 3237 PLA S7	E105A	27-Jun-3237	----	----	----		20-Jul-3237	----	----	
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag 3237 PLA S5	E105A	27-Jun-3237	----	----	----		20-Jul-3237	----	----	
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag 3237 USAR S1	E105A	27-Jun-3237	----	----	----		20-Jul-3237	----	----	
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag 3237 USAR S3	E105A	27-Jun-3237	----	----	----		20-Jul-3237	----	----	
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag 3237 USAR Sd	E105A	27-Jun-3237	----	----	----		20-Jul-3237	----	----	

Matrix: **Soil/Solid**

Evaluation: × = Holhing time exceehance ; ✓ = 8 itl in Holhing Time

Analyte Group : Analytical Method / ontainer / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times* Rec	*Holding Times* Actual	*Eval*	*Analysis Date*	*Holding Times* Rec	*Holding Times* Actual	*Eval*
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag 3237 USAR S7	E105A	27-Jun-3237	----	----	----		20-Jul-3237	----	----	
Particle Size : Grain Size Report (Attachment) Pipet/Sieve Method										
LDPE bag 3237 USAR S5	E105A	27-Jun-3237	----	----	----		20-Jul-3237	----	----	
Percent Passing : Particle Size Analysis - Pipette Method										
LDPE bag 3237 LSAR S1	E107	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Pipette Method										
LDPE bag 3237 LSAR S3	E107	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Pipette Method										
LDPE bag 3237 LSAR Sd	E107	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Pipette Method										
LDPE bag 3237 LSAR S7	E107	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Pipette Method										
LDPE bag 3237 LSAR S5	E107	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Pipette Method										
LDPE bag 3237 PLA S1	E107	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Pipette Method										
LDPE bag 3237 PLA S3	E107	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓

Matrix: **Soil/Solid**

Evaluation: × = Holhing time exceehance ; ✓ = 8 itl in Holhing Time

Analyte Group : Analytical Method / ontainer / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Percent Passing : Particle Size Analysis - Pipette Method										
LDPE bag 3237 PLA Sd	E107	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Pipette Method										
LDPE bag 3237 PLA S7	E107	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Pipette Method										
LDPE bag 3237 PLA S5	E107	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Pipette Method										
LDPE bag 3237 USAR S1	E107	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Pipette Method										
LDPE bag 3237 USAR S3	E107	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Pipette Method										
LDPE bag 3237 USAR Sd	E107	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Pipette Method										
LDPE bag 3237 USAR S7	E107	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Pipette Method										
LDPE bag 3237 USAR S5	E107	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 3237 LSAR S1	E103	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓

Matrix: **Soil/Solid**

Evaluation: × = Holhing time exceehance ; ✓ = 8 itl in Holhing Time

Analyte Group : Analytical Method / ontainer / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 3237 LSAR S3	E103	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 3237 LSAR Sd	E103	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 3237 LSAR S7	E103	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 3237 LSAR S5	E103	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 3237 PLA S1	E103	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 3237 PLA S3	E103	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 3237 PLA Sd	E103	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 3237 PLA S7	E103	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 3237 PLA S5	E103	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓

Matrix: **Soil/Solid**

Evaluation: × = Holhing time exceehance ; ✓ = 8 itl in Holhing Time

Analyte Group : Analytical Method / ontainer / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 3237 USAR S1	E103	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 3237 USAR S3	E103	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 3237 USAR Sd	E103	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 3237 USAR S7	E103	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve <2mm										
LDPE bag 3237 USAR S5	E103	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag 3237 LSAR S1	E101	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag 3237 LSAR S3	E101	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag 3237 LSAR Sd	E101	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag 3237 LSAR S7	E101	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓

Matrix: **Soil/Solid**

Evaluation: × = Holhing time exceehance ; ✓ = 8 itI in Holhing Time

Analyte Group : Analytical Method / ontainer / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag 3237 LSAR S5	E101	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag 3237 PLA S1	E101	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag 3237 PLA S3	E101	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag 3237 PLA Sd	E101	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag 3237 PLA S7	E101	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag 3237 PLA S5	E101	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag 3237 USAR S1	E101	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag 3237 USAR S3	E101	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag 3237 USAR Sd	E101	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓

Matrix: **Soil/Solid**

Evaluation: × = Holhing time exceehance ; ✓ = 8 itl in Holhing Time

Analyte Group : Analytical Method / ontainer / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag 3237 USAR S7	E101	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Percent Passing : Particle Size Analysis - Sieve >2mm										
LDPE bag 3237 USAR S5	E101	27-Jun-3237	27-Jul-3237	d65 hays	d2 hays	✓	27-Jul-3237	d65 hays	d2 hays	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap 3237 LSAR S1	E120	27-Jun-3237	23-Jul-3237	d2 hays	30 hays	✓	23-Jul-3237	d2 hays	30 hays	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap 3237 LSAR S3	E120	27-Jun-3237	23-Jul-3237	d2 hays	30 hays	✓	23-Jul-3237	d2 hays	30 hays	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap 3237 LSAR Sd	E120	27-Jun-3237	23-Jul-3237	d2 hays	30 hays	✓	23-Jul-3237	d2 hays	30 hays	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap 3237 LSAR S7	E120	27-Jun-3237	23-Jul-3237	d2 hays	30 hays	✓	23-Jul-3237	d2 hays	30 hays	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap 3237 LSAR S5	E120	27-Jun-3237	23-Jul-3237	d2 hays	30 hays	✓	23-Jul-3237	d2 hays	30 hays	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap 3237 PLA S1	E120	27-Jun-3237	23-Jul-3237	d2 hays	30 hays	✓	23-Jul-3237	d2 hays	30 hays	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap 3237 PLA S3	E120	27-Jun-3237	23-Jul-3237	d2 hays	30 hays	✓	23-Jul-3237	d2 hays	30 hays	✓

Matrix: **Soil/Solid**

Evaluation: × = Holhing time exceehance ; ✓ = 8 itl in Holhing Time

Analyte Group : Analytical Method / ontainer / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap 3237 PLA Sd	E120	27-Jun-3237	23-Jul-3237	d2 hays	30 hays	✓	23-Jul-3237	d2 hays	30 hays	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap 3237 PLA S7	E120	27-Jun-3237	23-Jul-3237	d2 hays	30 hays	✓	23-Jul-3237	d2 hays	30 hays	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap 3237 PLA S5	E120	27-Jun-3237	23-Jul-3237	d2 hays	30 hays	✓	23-Jul-3237	d2 hays	30 hays	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap 3237 USAR S1	E120	27-Jun-3237	23-Jul-3237	d2 hays	30 hays	✓	2d-Jul-3237	d2 hays	30 hays	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap 3237 USAR S3	E120	27-Jun-3237	23-Jul-3237	d2 hays	30 hays	✓	2d-Jul-3237	d2 hays	30 hays	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap 3237 USAR Sd	E120	27-Jun-3237	23-Jul-3237	d2 hays	30 hays	✓	2d-Jul-3237	d2 hays	30 hays	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap 3237 USAR S7	E120	27-Jun-3237	23-Jul-3237	d2 hays	30 hays	✓	2d-Jul-3237	d2 hays	30 hays	✓
Physical Tests : pH by Meter (1:2 Soil:Water Extraction)										
Glass soil jar/Teflon lined cap 3237 USAR S5	E120	27-Jun-3237	23-Jul-3237	d2 hays	30 hays	✓	2d-Jul-3237	d2 hays	30 hays	✓

Legend & Qualifier Definitions

RecWHT: ALS recommenheh l olh time (see units)W

Quality Control Parameter Frequency Compliance

TI e ollowing eport summarizes tI e equency of laboratory QC samples analyzeh witI in tI e analytical atcI es (QC lots) in w icI t e submitteh samples were processehW T e actual equency sI oulh be greater tI an or equal to tI e expecteh frequencyW

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			unt		Frequency (%)		
Analy ical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
aboratory Duplicates (DUP)							
Mercury in Soil/Solih by CVAAS	E512	1533674	3	35	0W	5W	✓
Metals in Soil/Solih by CRC BCPMS	E772	153dd22	3	35	0W	5W	✓
Particle Size Analysis - Pipette MetI oh	E107	1534d70	1	16	6W	5W	✓
Particle Size Analysis - Sieve <3mm	E103	1534d74	1	16	6W	5W	✓
pH by Meter (1:3 Soil:8 ater Extraction)	E120	153dd23	3	35	0W	5W	✓
aboratory Control Samples (LCS)							
Mercury in Soil/Solih by CVAAS	E512	1533674	7	35	16W	12W	✓
Metals in Soil/Solih by CRC BCPMS	E772	153dd22	7	35	16W	12W	✓
Particle Size Analysis - Pipette MetI oh	E107	1534d70	1	16	6W	5W	✓
Particle Size Analysis - Sieve <3mm	E103	1534d74	1	16	6W	5W	✓
Particle Size Analysis - Sieve >3mm	E101	1534d76	1	16	6W	5W	✓
pH by Meter (1:3 Soil:8 ater Extraction)	E120	153dd23	3	35	0W	5W	✓
MetI oh . lanks (M.							
Mercury in Soil/Solih by CVAAS	E512	1533674	3	35	0W	5W	✓
Metals in Soil/Solih by CRC BCPMS	E772	153dd22	3	35	0W	5W	✓

Methodology References and Summaries

TI e analytical metI ohs useh y A S a e hevelopeh using internationally ecognizeh eference metI ohs (wI e e available), sucI as t ose publisI eh y US EPA, APHA Stanharh MetI ohs, ASTM, BSO, Environment Canaha, . C MOE, anh Ontario MOEW Reference metI ohs may incorporate mohifications to improve per ormance (inhicateh by "moh")W

Analytical Methods	*Method / Lab*	*Matrix*	*Method Reference*	*Method Descriptions*
pH by Meter (1:3 Soil:8 ater Extraction)	E120 ALS Environmental - Vancouver	Soil/Solih	. C Lab Manual	pH is hetermineh y potentiometric measurement witI a pH electrohe at ambient laboratory temperature (normally 32 ± 5°C), anh is carrieh out in accorhance witI procehures hescribeh in tI e . C ab Manual (prescriptive metI oh)W T e p ocehure involves mixing tI e hrieh (at <62 ºC) anh sieveh (12mesI /3mm) sample witI ultra pure water at a 1:3 atio of sehiment to waterW T e pH is t en measureh y a stanharh pH probeW
Particle Size Analysis - Sieve >3mm	E101 ALS Environmental - Saskatoon	Soil/Solih	ASTM D691d-14 (moh)	Soil samples a e hisaggregateh anh sieveh t ougI a 3mm sieveW Material etaineh on tI e sieve is t en urtI e sieveh t ougI a series o sievesW T e amount passing t ougI tI e sieves is measureh gravimetricallyW
Particle Size Analysis - Sieve <3mm	E103 ALS Environmental - Saskatoon	Soil/Solih	ASTM D691d-14 (moh)	Soil samples a e hisaggregateh anh sieveh t ougI a 3mm sieveW Material passeh tI ougI tI e sieve is t en urtI e hisaggregateh using calgon solution anh passeh tI ougI a series o sievesW T e amount passing t ougI t e sieves is measureh gravimetricallyW
Particle Size Analysis - Pipette MetI oh	E107 ALS Environmental - Saskatoon	Soil/Solih	SSBR-51 MetI oh dW8WW	Soil material is separateh om coarse material (>3mm)W A specimen is t en hisaggregateh tI ougI mixing witI Calgon solutionW T e material is t en suspenheh in solution w e ein egular aliquots are taken using a mecI anical pipette at specific time intervalsW T e aliquots are hrieh anh material in suspension hetermineh g avimetrically \ TI e principles o Stokes' aw are applieh to hetermine tI e amount o material emaining in solution as weII as t e maximum particle size emaining in solution at t e specifieh timeW
Grain Size Report (AttacI ment) Pipet/Sieve MetI oh	E105A ALS Environmental - Saskatoon	Soil/Solih	SSBR-51 MetI oh dW8WW	A g ain size curve is a grapI ical epresentation of t e particle sizing o a sample epresenting tI e percent passing against tI e effective particle sizeW
Metals in Soil/Solih by CRC BCPMS	E772 ALS Environmental - Vancouver	Soil/Solih	EPA 6232. (moh)	TI is metI oh is intenheh to liberate metals t at may e environmentally available \ Samples are hrieh, tI en sieveh tI ougI a 3 mm sieve, anh higesteh witI HNOd anh HClW Depenhent on sample matrix, some metals may e only partially ecovereh, incIuhing AI, . a, . e, C , S , Ti, TI, V, 8 , anh Z W Silicate minerals are not solubilizehW Volatile orms of sulfur (incIuhing sulfihe) may not e captureh, as tI ey may e lost huring sampling, storage, o higestionW T is metI oh hoes not ahequately ecover elemental sulfur, anh is unsuitable for assessment of elemental sulfur stanharhs or guihelinesW Analysis is by Collision/Reaction Cell BCPMSW
Mercury in Soil/Solih by CVAAS	E512 ALS Environmental - Vancouver	Soil/Solih	EPA 322W8/16d1 Appenhix (moh)	Samples are hrieh, t en sieveh tI ougI a 3 mm sieve, anh higesteh witI HNOd anh HCI, olloweh by CVAAS analysisW

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
eacI 1:3 Soil:8 ater for pH/EC	EP120 ALS Environmental - Vancouver	Soil/Solih	. C 8 AP METHOD: PH, ELECTROMETRBC, SOB	TI e procehure involves mixing t e h ieh (at <62°C) anh sieveh (NoW 12 / 3mm) sample witI heionizeh/histilleh water at a 1:3 ratio of sehiment to waterW
Digestion for Metals anh Mercury	EP772 ALS Environmental - Vancouver	Soil/Solih	EPA 322W (moh)	Samples are hrieh, t en sieveh tI ougI a 3 mm sieve, anh higesteh witI HNOd anh HCIW TI is metI oh is intenheh to liberate metals tI at may be environmentally availableW
Dry anh Grinh in Soil/Solih <62°C	EPP773 ALS Environmental - Saskatoon	Soil/Solih	Soil Sampling anh MetI ohs of Analysis, Carter 3220	A ter emoval of any coarse agments anh eservation of wet subsamples a portion of omogenizeh sample is set in a tray anh hrieh at less tI an 62°C until hryWT e sample is tI en particle size ehuceh witI an automateh crusI er o mortar anh pestle, typically to <3 mmWFurtI e size rehuction may be neeheh for particular testsW

ALS Canada Ltd.

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QUALITY CONTROL REPORT

Work Order	: **VA24B5141**	Page	:
Client	: Constantine North Inc.	Laboratory	: ALS Environmental - Vancouver
Contact	: Allegra Cairns	Account Manager	: Ian Chen
ABBress	: Suite d32 - 722 0 est PenBer St. Vancouver 8C CanaBa VWC 3VW	ABBress	: 271 LougheeB 6ighHay 8urnabyw8ritish Columbia CanaBa V, A 10 5
9eleTone	: W2+ d35 , 5 3	9eleTone	: p1 W2+ 3, d +
Pro4ect	: Aj FD Palmer Pro4ect	j ate SamTles GeceiveB	: 3WRun-323+ 27:+,
PJ	: ----	j ate Analysis CommenceB	: 23-Rul-323+
C-J -C number	: ----	Issue j ate	: 27-Rul-323+ , : d
SamTler	: ----		
Site	:		
Ouote number	: VA33-CJ NI122-221 0DW8d35(		
No. of samTles receiveB	: ,		
No. of samTles analyseB	: ,		

9 is reTrt suTerseBes any Trevious reTrtG(Hith this reference. Gesults aTTly to the samTleG(as submitteB. 9his B cument shall not be reTr BuceBwe) ceTt in full.

9 is Ouality Control GeTrt contains the folloHing information:

- Laboratory j uTlicate Q x P(GeTrtUGelative Percent j ifference QGPj (anB j ata Ouality J b4ectives
- Geference Material QGM(GeTrtUGecovery anB j ata Ouality J b4ectives
- MethoB 8lan; QM8(GeTrtUGecovery anB j ata Ouality J b4ectives
- Laboratory Control SamTle QLCS(GeTrtUGecovery anB j ata Ouality J b4ectives

Signatories

9 is B cument has been electronically signeB by the authorikeB signatories beloH. Electronic signing is conBucteB in accorBance Hith x S Fj A 31 CFG Part 11.

Signatories	*osition*	*aboratory Department*
Dhakaleh z hanmirkaei	Analyst	Vancouver Metalsw8urnabyw8ritish Columbia
6 eBy Lai	9eam LeaBer - Inorganics	Sas; atoon Sas; SoilswSas; atoonwSas; atcheHan
Ranice Leung	SuTervisor - J rganics Instrumentation	Vancouver J rganicsw8urnabyw8ritish Columbia
z im Rensen	j eTartment Manager - Metals	Vancouver Metalsw8urnabyw8ritish Columbia
Sam Silveira	Analyst	Vancouver Metalsw8urnabyw8ritish Columbia

General Comments

9 e ALS Ouality Control (0C(reT rt is oTtionally TroviBeB to ALS clients uT n request. ALS test methoBs incluBe comTrehensive OC chec; s Hith every analysis to ensure ur high stanBarBs quality are met. Each OC result as a ; noHn r e) TecteB target valuew Hhich is comTareB against TreBetermineB j ata Ouality J b4ectives (J OJ s(to TroviBe confiBence in the accuracy associateB test results. 9his reT rt c ntains BetaileB results r all OC results aTTlicable to this samTle submission. Please refer to the ALS Ouality Control InterTretation reT rt (0CI(r aTTlicable methoB references anB methoBlogy summaries.

z ey :

Anonymous = Gefers to samTles Hhich are not Tart of this Hor; rBerwbut Hhich formeB Tart of the OC Trocess lot.
CAS Number = Chemical Abstracts Service number is a unique iBentifier assigneB to Biscrete substances.
j OJ = j ata Ouality J b4ective.
LJ G = Limit of GeT rting (Betection limit(.
GPj = Gelative Percent j ifference
# = InBicates a OC result that BiB not meet the ALS j OJ .

rkorder Comments

6 olBing times are BisTlayeB as K--Kif no guiBance e) ists from CCMEwCanaBian Tr vincesw or broaBly recognikeB international references.

Laboratory Duplicate (DUP) Report

A Laboratory j uTlicate Q, x P(is a ranBmly selecteB intralaboratory reTlicate samTle. Laboratory j uTlicates TroviBe information regarBing methoB Trecision anB samTle heterogeneity. ALS j OJ s r Laboratory j uTlicates are e) TresseB as test-sTecific limits r Gelative Percent j ifference QGPj (w r as an absolute Bi erence limit 3 times the LJ G r loH concentration BuTlicates Hithin " +- 2 times the LJ G Qut-off is test-sTecific(.

Sub-Matri) : **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 1522649)											
VA3+8, d5-221	Anonymous	T6 Q3 soil:Hater(	----	E127	2.12	T6 units	.WW	., W	.3~	, ~	----
Physical Tests (QC Lot: 1523302)											
VA3+8, + -22W	323+ x SAG S1	T6 Q3 soil:Hater(	----	E127	2.12	T6 units	.33	.3W	2., ~	, ~	----
Percent Passing (QC Lot: 1527347)											
VA3+8, + -221	323+ LSAG S1	Passing Q2.2, mm(	----	E173	.2	~	W1	%W	.,	j iff <3) LJ G	----
		Passing Q2.2Wdmm(	----	E173	.2	~	%d	.7	.,	j i <3) LJ G	----
		Passing Q2.2%, mm(	----	E173	.2	~	.+	5.5	.W	j i <3) LJ G	----
		Passing Q2.13, mm(	----	E173	.2	~	3.7	+.+	11.%~	1, ~	----
		Passing Q2.1+5mm(	----	E173	.2	~	, .	%W	.2~	, ~	----
		Passing Q2.3, 2mm(	----	E173	.2	~	3 .d	d1.1	5.+ ~	, ~	----
		Passing Q2.+32mm(	----	E173	.2	~	+ .3	, 2.W	+.7+~	, ~	----
		Passing Q2., 2mm(	----	E173	.2	~	, %W	, 5.7	d.%d~	, ~	----
		Passing Q2.7+ mm(	----	E173	.2	~	%d.,	%+.	.%3~	, ~	----
		Passing Q1.2mm(	----	E173	.2	~	.2	.7	.2, ~	, ~	----
Percent Passing (QC Lot: 1527348)											
VA3+8, + -221	323+ LSAG S1	Passing Q2.223mm(	----	E17+	.2	~	< .2	< .2	2	j i <3) LJ G	----
		Passing Q2.22+mm(	----	E17+	.2	~	< .2	.1	2.12	j i <3) LJ G	----
		Passing Q2.22, mm(	----	E17+	.2	~	.1	.d	2.3	j i <3) LJ G	----
		Passing Q2.232mm(	----	E17+	.2	~	d.2	d.W	2.W	j i <3) LJ G	----
		Passing Q2.2d13mm(	----	E17+	.2	~	+.3	, .	.2	j i <3) LJ G	----
Metals (QC Lot: 1522647)											
VA3+8, d5-221	Anonymous	Mercury	%+d5-5%W	E, 2	2.22, 2	mg/; g	2.2113	2.21, 3	2.22+2	j iff <3) LJ G	----
Metals (QC Lot: 1522648)											
VA3+8, d5-221	Anonymous	Aluminum	%+35-52-,	E++2	, 2	mg/; g	, 322	, 22	2., 53~	+2~	----
		Arsenic	%++2-d7-3	E++2	2.12	mg/; g	3.2%	.5W	, .+W+	d2~	----
		CaBmium	%++2-+d-5	E++2	2.232	mg/; g	2., 5	2., dd	3., %~	d2~	----
		C TTer	%++2-, 2-7	E++2	2., 2	mg/; g	3d.%	3+.,	d.15~	d2~	----
		Iron	%+d5-75-W	E++2	, 2	mg/; g	d5, 22	d%222	W%2~	d2~	----
		LeaB	%+d5-53-1	E++2	2., 2	mg/; g	d.37	d.+	d.5W+	+2~	----
		Selenium	%773-+5-3	E++2	2.32	mg/; g	2.Wd	2.%3	2.27	j iff <3) LJ G	----

Sub-Matri) : **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Metals (QC Lot: 1522648) - continued											
VA3+8, d5-221	Anonymous	Silver	%+2-33-+	E++2	2.12	mg/; g	2.11	<2.12	2.21	j iff <3) LJ G	----
		Zinc	%+2-WWW	E++2	3.2	mg/; g	d3	W	3+. ~	d2~	----
Metals (QC Lot: 1523300)											
VA3+8, + -22W	323+ x SAG S1	Aluminum	%+35-52-,	E++2	, 2	mg/; g	15+22	%22	d.7W-	+2~	----
		Arsenic	%+2-d7-3	E++2	2.12	mg/; g	, .d,	, .%W	%+3~	d2~	----
		CaBmium	%+2-+d-5	E++2	2.232	mg/; g	2., 5	2., +	2.%52~	d2~	----
		C TTer	%+2-, 2-7	E++2	2., 2	mg/; g	, W3	+5.,	3.W~	d2~	----
		Iron	%+d5-75-W	E++2	, 2	mg/; g	+ %22	+%d22	d.23~	d2~	----
		LeaB	%+d5-53-1	E++2	2., 2	mg/; g	WW2	Wd+	+.21~	+2~	----
		Selenium	%73-+5-3	E++2	2.32	mg/; g	2.73	2.%	2.2+	j iff <3) LJ G	----
		Silver	%+2-33-+	E++2	2.12	mg/; g	2.17	2.1%	2.21	j i <3) LJ G	----
		Zinc	%+2-WWW	E++2	3.2	mg/; g	3W	3,	2.d, %~	d2~	----
Metals (QC Lot: 1523301)											
VA3+8, + -22W	323+ x SAG S1	Mercury	%+d5-5%W	E, 2	2.22, 2	mg/; g	2.211W	2.211+	2.2221	j i <3) LJ G	----

Method Blank (MB) Report

A MethoB 8lan; is an analyte-free matri) that unBergoes samTle Trocessing iBentical to that carrieB ut r test samTles. Meth B 8lan; results are useB to m nitor anB c ntrol r T tential contamination from the laboratory environment anB reagents. For most testswthe j OJ r MethoB 8lan; s is for the result to be < LJ G.

Sub-Matri) : **Soil/Solid**

naly e	*CAS Number*	*Method*	*LOR*	*Unit*	*Result*	*Qualifier*
Metals (QCLot: 1522647)						
Mercury	%+d5-5%W	E, 2	2.22,	mg/; g	<2.22, 2	----
Metals (QCLot: 1522648)						
Aluminum	%+35-52-,	E++2	, 2	mg/; g	<, 2	----
Arsenic	%+2-d7-3	E++2	2.1	mg/; g	<2.12	----
CaBmium	%+2-+d-5	E++2	2.23	mg/; g	<2.232	----
C TTer	%+2-, 2-7	E++2	2.,	mg/; g	<2., 2	----
Iron	%+d5-75-W	E++2	, 2	mg/; g	<, 2	----
LeaB	%+d5-53-1	E++2	2.,	mg/; g	<2., 2	----
Selenium	%%73-+5-3	E++2	2.3	mg/; g	<2.32	----
Silver	%+2-33-+	E++2	2.1	mg/; g	<2.12	----
Zinc	%+2-WWW	E++2	3	mg/; g	<3.2	----
Metals (QCLot: 1523300)						
Aluminum	%+35-52-,	E++2	, 2	mg/; g	<, 2	----
Arsenic	%+2-d7-3	E++2	2.1	mg/; g	<2.12	----
CaBmium	%+2-+d-5	E++2	2.23	mg/; g	<2.232	----
C TTer	%+2-, 2-7	E++2	2.,	mg/; g	<2., 2	----
Iron	%+d5-75-W	E++2	, 2	mg/; g	<, 2	----
LeaB	%+d5-53-1	E++2	2.,	mg/; g	<2., 2	----
Selenium	%%73-+5-3	E++2	2.3	mg/; g	<2.32	----
Silver	%+2-33-+	E++2	2.1	mg/; g	<2.12	----
Zinc	%+2-WWW	E++2	3	mg/; g	<3.2	----
Metals (QCLot: 1523301)						
Mercury	%+d5-5%W	E, 2	2.22,	mg/; g	<2.22, 2	----

Laboratory Control Sample (LCS) Report

A Laboratory Control SamTle QLCS(is an analyte-free matri) that as been rtifieB QsTi;eB(Hith test analytes at ;noHn concentration anB Tr cesseB in an iBentical manner t test samTles. LCS results are e)TresseB as Tercent recoverywanB are useB to monitor anB control test methoB accuracy anB TrecisionwinBeTenBent of test samTle matri).

Sub-Matri) : **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
nalyte	CAS Number	Method	LOR	Unit	Target Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 1522649)									
T6 Q3 soil:Hater(	----	E127	----	T6 units	WT6 units	22	5, .2	2,	----
Physical Tests (QCLot: 1523302)									
T6 Q3 soil:Hater(	----	E127	----	T6 units	WT6 units	55.d	5, .2	2,	----
Metals (QCLot: 1522647)									
Mercury	%+d5-5%W	E, 2	2.22,	mg/;g	2.1 mg/;g	5d.3	2.2	32	----
Metals (QCLot: 1522648)									
Aluminum	%+35-52-,	E++2	, 2	mg/;g	322 mg/;g	23	2.2	32	----
Arsenic	%++2-d7-3	E++2	2.1	mg/;g	122 mg/;g	2,	2.2	32	----
CaBmium	%++2-+d-5	E++2	2.23	mg/;g	12 mg/;g	22	2.2	32	----
C TTer	%++2-, 2-7	E++2	2.,	mg/;g	3, mg/;g	55.7	2.2	32	----
Iron	%+d5-75-W	E++2	, 2	mg/;g	122 mg/;g	21	2.2	32	----
LeaB	%+d5-53-1	E++2	2.,	mg/;g	, 2 mg/;g	2d	2.2	32	----
Selenium	%%73-+5-3	E++2	2.3	mg/;g	122 mg/;g	22.2	2.2	32	----
Silver	%++2-33-+	E++2	2.	mg/;g	2 mg/;g	5.1	2.2	32	----
Zinc	%++2-WWW	E++2	3	mg/;g	, 2 mg/;g	21	2.2	32	----
Metals (QCLot: 1523300)									
Aluminum	%+35-52-,	E++2	, 2	mg/;g	322 mg/;g	55.d	2.2	32	----
Arsenic	%++2-d7-3	E++2	2.1	mg/;g	122 mg/;g	27	2.2	32	----
CaBmium	%++2-+d-5	E++2	2.23	mg/;g	12 mg/;g	2,	2.2	32	----
C TTer	%++2-, 2-7	E++2	2.,	mg/;g	3, mg/;g	23	2.2	32	----
Iron	%+d5-75-W	E++2	, 2	mg/;g	122 mg/;g	2d	2.2	32	----
LeaB	%+d5-53-1	E++2	2.,	mg/;g	, 2 mg/;g	22	2.2	32	----
Selenium	%%73-+5-3	E++2	2.3	mg/;g	122 mg/;g	2d	2.2	32	----
Silver	%++2-33-+	E++2	2.	mg/;g	2 mg/;g	5, .W	2.2	32	----
Zinc	%++2-WWW	E++2	3	mg/;g	, 2 mg/;g	2+	2.2	32	----
Metals (QCLot: 1523301)									
Mercury	%+d5-5%W	E, 2	2.22,	mg/;g	2.1 mg/;g	2d	2.2	32	----

Reference Material (RM) Report

A Geference Material (GM(is a omogenous material Hith ; noHn anB Hell-establisheB analyte c ncentrations. GMs are Tr cesseB in an iBentical manner t test samTlesw anB are useB to m nitor anB control the accuracy anB Trecision a test methoB r a tyTical samTle matri). GM results are e)TresseB as Tercent recovery the target analyte c ncentration. GM targets may be certifieB target concentrations TroviBeB by the GM suTTlierwr may be ALS long-term mean values Qfor emTirical test methoBs(.

Sub-Matri) :

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory ample ID	Reference Material ID	nalyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Percent Passing (QCLot: 1527346)									
OC-1, 3%d+W221	GM	Passing Q5mm(	----	E171	22 ~	22	52.2	2	----
OC-1, 3%d+W221	GM	Passing Q3.2mm(	----	E171	22 ~	22	52.2	2	----
OC-1, 3%d+W221	GM	Passing Q3, .+mm(	----	E171	22 ~	22	52.2	2	----
OC-1, 3%d+W221	GM	Passing Qd7.1mm(	----	E171	22 ~	22	52.2	2	----
OC-1, 3%d+W221	GM	Passing Q+.%, mm(	----	E171	22 ~	22	52.2	2	----
OC-1, 3%d+W221	GM	Passing Q,2.7mm(	----	E171	22 ~	22	52.2	2	----
OC-1, 3%d+W221	GM	Passing Q%W3mm(	----	E171	22 ~	22	52.2	2	----
OC-1, 3%d+W221	GM	Passing Q5., mm(	----	E171	22 ~	22	52.2	2	----
Percent Passing (QCLot: 1527347)									
OC-1, 3%d+%221	GM	Passing Q2.2, mm(	----	E173	, +.1 ~	21	52.2	2	----
OC-1, 3%d+%221	GM	Passing Q2.2Wdmm(	----	E173	, %1 ~	55.7	52.7	25	----
OC-1, 3%d+%221	GM	Passing Q2.2%, mm(	----	E173	W2.3 ~	57.,	51.+	25	----
OC-1, 3%d+%221	GM	Passing Q2.13, mm(	----	E173	W.3 ~	22	53.%	2%	----
OC-1, 3%d+%221	GM	Passing Q2.1+5mm(	----	E173	%3 ~	57.%	5d.1	2%	----
OC-1, 3%d+%221	GM	Passing Q2.3, 2mm(	----	E173	3.d ~	55.7	5+.1	2W	----
OC-1, 3%d+%221	GM	Passing Q2.+32mm(	----	E173	5.5 ~	57.d	5+.W	2,	----
OC-1, 3%d+%221	GM	Passing Q2., 2mm(	----	E173	51.3 ~	22	5+.%	2,	----
OC-1, 3%d+%221	GM	Passing Q2.7+ mm(	----	E173	5, .W~	55.+	5+.5	2,	----
OC-1, 3%d+%221	GM	Passing Q1.2mm(	----	E173	5Wd ~	22	5+.5	2,	----
Percent Passing (QCLot: 1527348)									
OC-1, 3%d+ -221	GM	Passing Q2.223mm(	----	E17+	33., ~	22	%+.	3W	----
OC-1, 3%d+ -221	GM	Passing Q2.22+mm(	----	E17+	3, .1 ~	22	%W7	3d	----
OC-1, 3%d+ -221	GM	Passing Q2.22, mm(	----	E17+	3W, ~	22	%%5	33	----
OC-1, 3%d+ -221	GM	Passing Q2.232mm(	----	E17+	+ .7 ~	5%W	, .7	+	----
OC-1, 3%d+ -221	GM	Passing Q2.2d13mm(	----	E17+	+, .W~	21	.2	3	----
Metals (QCLot: 1522647)									
OC-1, 33W+%22d	MGCA-31	Mercury	%+d5-5%W	E, 2	2.2W7 mg/; g	53.+	%2.2	d2	----
Metals (QCLot: 1522648)									
OC-1, 33W+7-22d	MGCA-31	Aluminum	%+35-52-,	E++2	33, 22 mg/; g	2%	%2.2	d2	----
OC-1, 33W+7-22d	MGCA-31	Arsenic	%++2-d -3	E++2	31.3 mg/; g	5W7	%2.2	d2	----
OC-1, 33W+7-22d	MGCA-31	CaBmium	%++2-+d-5	E++2	3.1, mg/; g	55.%	%2.2	d2	----
OC-1, 33W+7-22d	MGCA-31	C TTer	%++2-, 2-	E++2	5W5 mg/; g	23	%2.2	d2	----

Sub-Matri) :

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory ample ID	Reference Material ID	nalyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Metals (QCLot: 1522648) - continued									
OC-1, 33W-7-22d	MGCA-31	Iron	%-d5-75-W	E++2	d3%22 mg/; g	57.%	%2.2	d2	----
OC-1, 33W-7-22d	MGCA-31	LeaB	%-d5-53-1	E++2	515 mg/; g	5d.2	%2.2	d2	----
OC-1, 33W-7-22d	MGCA-31	Selenium	%W3-+5-3	E++2	.2+ mg/; g	5%2	W2.2	+2	----
OC-1, 33W-7-22d	MGCA-31	Silver	%-++2-33-+	E++2	7.57 mg/; g	5d.+	%2.2	d2	----
OC-1, 33W-7-22d	MGCA-31	Zinc	%-++2-WWW	E++2	737 mg/; g	57.W	%2.2	d2	----
Metals (QCLot: 1523300)									
OC-1, 3dd22-22d	MGCA-31	Aluminum	%-35-52-,	E++2	33, 22 mg/; g	23	%2.2	d2	----
OC-1, 3dd22-22d	MGCA-31	Arsenic	%-++2-d -3	E++2	31.3 mg/; g	55.7	%2.2	d2	----
OC-1, 3dd22-22d	MGCA-31	CaBmium	%-++2-+d-5	E++2	3.1, mg/; g	5%1	%2.2	d2	----
OC-1, 3dd22-22d	MGCA-31	C TTer	%-++2-, 2-	E++2	5W6 mg/; g	57.%	%2.2	d2	----
OC-1, 3dd22-22d	MGCA-31	Iron	%-d5-75-W	E++2	d3%22 mg/; g	55.1	%2.2	d2	----
OC-1, 3dd22-22d	MGCA-31	LeaB	%-d5-53-1	E++2	515 mg/; g	5+.3	%2.2	d2	----
OC-1, 3dd22-22d	MGCA-31	Selenium	%W3-+5-3	E++2	.2+ mg/; g	.W	W2.2	+2	----
OC-1, 3dd22-22d	MGCA-31	Silver	%-++2-33-+	E++2	7.57 mg/; g	2d	%2.2	d2	----
OC-1, 3dd22-22d	MGCA-31	Zinc	%-++2-WWW	E++2	737 mg/; g	55.%	%2.2	d2	----
Metals (QCLot: 1523301)									
OC-1, 3dd21-22d	MGCA-31	Mercury	%-d5-5%W	E, 2	2.2W7 mg/; g	3	%2.2	d2	----

CHAIN OF CUSTODY

ALS Environmental

1317 South 13th Ave., Kelso, WA 98626 | 360.577.7222 | 800.695.7222 | 360.636.1068 (fax)

SR# _____ PAGE 1 OF 2 COC# _____

PROJECT NAME: ADFG Palmer Project
PROJECT NUMBER:
PROJECT MANAGER: Dylan Knull
COMPANY NAME: ADFG
ADDRESS: 802 3rd St.
CITY/STATE/ZIP: Douglas, AK, 99824
E-MAIL ADDRESS: dylan.knull@alaska.gov
PHONE #: (907) 465 6160 FAX #:
SAMPLER'S SIGNATURE:

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625☐ 8270☐ 8270LL☐ SIM PAH☐	Volatile Organics 624☐ 8260☐ 5021☐ BTEX☐	Hydrocarbons (*see below) Gas☐ Diesel☐ Oil☐	Oil & Grease/TRPH 1664 HEM☐ 1664 SGT☐	PCBs Aroclors☐ Congeners☐	Pesticides/Herbicides 608☐ 8081☐ 8141☐ 8151☐	Chlorophenolics - 8151M Tri☐ Tetra☐ PCP☐	Metals, Total or Dissolved (See List below)	Cyanide☐ Hex-Chrom☐	(circle) pH, Cond., Cl, SO_4, PO_4, F, NO_2, NO_3, BOD, TSS, TDS, Turb.	(circle) NH_3-N, COD, TKN, TOC, DOC, NO_2+NO_3, T-Phos	TOX 9020☐ AOX 1650☐ 506☐	Alkalinity☐ CO_3☐ HCO_3☐	Dioxins/Furans 1613☐ 8290☐	Dissolved Gases CO_2☐ RSK 175☐ Methane☐ Ethane☐ Ethene☐	Particle Size			REMARKS
2024LSARS1	6/4/24	1100		soil	2								X								X				
2024LSARS2	6/4/24	1100		soil	2								X								X				
2024LSARS3	6/4/24	1100		soil	2								X								X				
2024LSARS4	6/4/24	1100		soil	2								X								X				
2024LSARS5	6/4/24	1100		soil	2								X								X				
2024USARS1	6/4/24	1330		soil	2								X								X				
2024USARS2	6/4/24	1330		soil	2								X								X				
2024USARS3	6/4/24	1330		soil	2								X								X				
2024USARS4	6/4/24	1330		soil	2								X								X				
2024USARS5	6/4/24	1330		soil	2								X								X				

Environmental Division
Vancouver
Work Order Reference
VA24B5141

Telephone : +1 604 253 4188

REPORT REQUIREMENTS

- X I. Routine Report: Method Blank, Surrogate, as required
- X II. Report Dup., MS, MSD as required
- ___ III. CLP Like Summary (no raw data)
- X IV. Data Validation Report
- ___ V. EDD

INVOICE INFORMATION

P.O. # _____
Bill To: Merlin Benner merlin@constantinemining.com

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 day
X Standard (15 working days)
___ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

Total Metals: (Al) (As) Sb Ba Be B Ca (Cd) Co Cr (Cu) (Fe) (Pb) Mg Mn Mo Ni K (Ag) Na (Se) Sr Tl Sn V (Zn) (Hg)

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER: _____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

Send lab report to: dylan.knull@alaska.gov & kate.kanouse@alaska.gov & merlin@constantinemetals.com

15

2

☐ Sample Shipment contains USDA regulated soil samples (check box if applicable)

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
D. Knull			
Signature	Signature	Signature	Signature
6/5/24 0900			JUNE 26 - 8:45
Date/Time	Date/Time	Date/Time	Date/Time
Dylan Knull			MSONE
Printed Name	Printed Name	Printed Name	Printed Name
ADFG			10:13:11
Firm	Firm	Firm	Firm

CHAIN OF CUSTODY

ALS Environmental

1317 South 13th Ave., Kelso, WA 98626 | 360.577.7222 | 800.695.7222 | 360.636.1068 (fax)

SR# _____

PAGE 2 OF 2 COC# _____

PROJECT NAME: ADFG Palmer project
PROJECT NUMBER:
PROJECT MANAGER: Dylan Knull
COMPANY NAME: ADFG
ADDRESS: 802 3rd St.
CITY/STATE/ZIP: Douglas, AK, 99824
E-MAIL ADDRESS: dylan.knull@alaska.gov
PHONE #: (907)465-6160 FAX #:
SAMPLER'S SIGNATURE:

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625☐ 8270☐ SIM PAH☐	Volatile Organics 624☐ 8260☐ 8270L☐	Hydrocarbons (*see below) Gas☐ Diesel☐ Oil☐	Oil & Grease/TRPH 1664 HEM☐ 1664 SGT☐	PCBs Aroclors☐ Congeners☐	Pesticides/Herbicides 608☐ 8081☐ 8141☐ 8151☐	Chlorophenolics Tri☐ Tetra☐ PCP☐	Metals, Total or Dissolved (See List below)	Cyanide☐ Hex-Chrom☐	(circle) pH, Cond., Cl, SO4, PO4, F, NO2, NO3, BOD, TSS, TDS, Turb.	(circle) NH3-N, COD, TKN, TOC, DOC, NO2+NO3, T-Phos	TOX 9020☐ AOX 1650☐ 506☐	Alkalinity ☐ CO3 ☐ HCO3 ☐	Dioxins/Furans 1613☐ 8290☐	Dissolved Gases RSK 175☐ CO2☐ Methane☐ Ethane☐ Ethene☐	Particle size		REMARKS
2024 PLA S1	6/4/24	845		soil	2								X								X			
2024 PLA S2	6/4/24	845		soil	2								X								X			
2024 PLA S3	6/4/24	845		soil	2								X								X			
2024 PLA S4	6/4/24	845		soil	2								X								X			
2024 PLA S5	6/4/24	845		soil	2								X								X			
																					X			

REPORT REQUIREMENTS

- X I. Routine Report: Method Blank, Surrogate, as required
- X II. Report Dup., MS, MSD as required
- ___ III. CLP Like Summary (no raw data)
- X IV. Data Validation Report
- ___ V. EDD

INVOICE INFORMATION

P.O. # _____
Bill To: Merlin Berner merlin@constantine mining.com

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 day
X Standard (15 working days)
___ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

Total Metals: (Al) (As) Sb Ba Be B Ca (Cd) Co Cr (Cu) (Fe) (Pb) Mg Mn Mo Ni K (Ag) Na (Se) Sr Tl Sn V (Zn) (Hg)

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER: _____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

send lab report to: dylan.knull@alaska.gov
kate.kanouse@alaska.gov &
merlin@constantinemetals.com

☐ Sample Shipment contains USDA regulated soil samples (check box if applicable)

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
D. Knull / 6/5/24 0900	/	/	/
Signature / Date/Time	Signature / Date/Time	Signature / Date/Time	Signature / Date/Time
Dylan Knull / ADFG	/	/	/
Printed Name / Firm	Printed Name / Firm	Printed Name / Firm	Printed Name / Firm

CHAIN OF CUSTODY

ALS Environmental

1317 South 13th Ave., Kelso, WA 98626 | 360.577.7222 | 800.695.7222 | 360.636.1068 (fax)

SR# _____ PAGE 1 OF 2 COC# _____

PROJECT NAME: ADFG Palmer Project
PROJECT NUMBER:
PROJECT MANAGER: Dylan Knill
COMPANY NAME: ADFG
ADDRESS: 802 3rd St.
CITY/STATE/ZIP: Douglas, AK, 99824
E-MAIL ADDRESS: dylan.knill@alaska.gov
PHONE #: (907) 465 6160 FAX #:
SAMPLER'S SIGNATURE:

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625☐ 8270☐ SIM PAH☐	Volatile Organics 624☐ 8260☐ 8021☐ BTEX☐	Hydrocarbons (*see below) Gas☐ Diesel☐ Oil☐	Oil & Grease/TRPH 1664 HEM☐ 1664 SGT☐	PCBs Aroclors☐ Congeners☐	Pesticides/Herbicides 608☐ 8081☐ 8141☐ 8151☐	Chlorophenolics - 8151M Tri☐ Tetra☐ PCP☐	Metals, Total or Dissolved (See List below)	Cyanide☐ Hex-Chrom☐	(circle) pH, Cond., Cl, SO_4, PO_4, F, NO_2, NO_3, BOD, TSS, TDS, Turb.	(circle) NH_3-N, COD, TKN, TOC, DOC, NO_2+NO_3, T-Phos	TOX 9020☐ AOX 1650☐ 506☐	Alkalinity ☐ CO_3☐ HCO_3☐	Dioxins/Furans 1613☐ 8290☐	Dissolved Gases CO_2☐ RSK 175☐ Methane☐ Ethane☐ Ethene☐	Particle Size			REMARKS
2024LSAR51	6/4/24	1100		Soil	2								X							X				
2024LSAR52	6/4/24	1100		Soil	2								X							X				
2024LSAR53	6/4/24	1100		Soil	2								X							X				
2024LSAR54	6/4/24	1100		Soil	2								X							X				
2024LSAR55	6/4/24	1100		Soil	2								X							X				
2024USAR51	6/4/24	1330		Soil	2								X							X				
2024USAR52	6/4/24	1330		Soil	2								X							X				
2024USAR53	6/4/24	1330		Soil	2								X							X				
2024USAR54	6/4/24	1330		Soil	2								X							X				
2024USAR55	6/4/24	1330		Soil	2								X							X				

Environmental Division
Vancouver
Work Order Reference
VA24B5141

Telephone : +1 604 253 4188

REPORT REQUIREMENTS

- X I. Routine Report: Method Blank, Surrogate, as required
- X II. Report Dup., MS, MSD as required
- ___ III. CLP Like Summary (no raw data)
- X IV. Data Validation Report
- ___ V. EDD

INVOICE INFORMATION

P.O. # _____
Bill To: Merlin Benner merlin@constantinemining.com

TURNAROUND REQUIREMENTS

- ___ 24 hr. ___ 48 hr.
- ___ 5 day
- X Standard (15 working days)
- ___ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

Total Metals: (Al) (As) Sb Ba Be B Ca (Cd) Co Cr (Cu) (Fe) (Pb) Mg Mn Mo Ni K (Ag) Na (Se) Sr Tl Sn V (Zn) (Hg)

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER: _____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:
Send lab report to: dylan.knill@alaska.gov
kate.kanouse@alaska.gov &
merlin@constantinemetals.com

15
2

☐ Sample Shipment contains USDA regulated soil samples (check box if applicable)

RELINQUISHED BY:
D. Knill — 6/5/24 0900
Signature — Date/Time
Dylan Knill — ADFG
Printed Name — Firm

Rcvd jc 27Jun2024 1:30 pm
5 C (avg 13 coolers) ice ok

RELINQUISHED BY:
Signature — Date/Time
Name — Firm

RECEIVED BY:
Signature — JUNE 26 - 8:45
Printed Name — Date/Time 6/0.13.11
Firm

CHAIN OF CUSTODY

ALS Environmental

1317 South 13th Ave., Kelso, WA 98626 | 360.577.7222 | 800.695.7222 | 360.636.1068 (fax)

SR# _____ PAGE 2 OF 2 COC# _____

PROJECT NAME: ADFG Palmer project
PROJECT NUMBER:
PROJECT MANAGER: Dylan Knull
COMPANY NAME: ADFG
ADDRESS: 802 3rd St.
CITY/STATE/ZIP: Douglas, AK, 99824
E-MAIL ADDRESS: dylan.knull@alaska.gov
PHONE #: (907)465-6160 FAX #:
SAMPLER'S SIGNATURE:

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625☐ 8270☐ 8270LL☐ SIM PAH☐	Volatile Organics 624☐ 8260☐ Hydrocarbons (*see below) Gas☐ Diesel☐ Oil☐ BTEX☐	Oil & Grease/TRPH 1664 HEM☐ 1664 SGT☐	PCBs Aroclors☐ Congeners☐	Pesticides/Herbicides 608☐ 8081☐ 8141☐ 8151☐	Chlorophenolics - 8151M Tri☐ Tetra☐ PCP☐	Metals, Total or Dissolved (See List below)	Cyanide☐ Hex-Chrom☐	(circle) pH, Cond., Cl, SO_4, PO_4, F, NO_2, NO_3, BOD, TSS, TDS, Turb.	(circle) NH_3-N, COD, TKN, TOC, DOC, NO_2+NO_3, T-Phos	TOX 9020☐ AOX 1650☐ 506☐	Alkalinity ☐ CO_3☐ HCO_3☐	Dioxins/Furans 1613☐ 8290☐	Dissolved Gases RSK 175☐ CO_2☐ Methane☐ Ethane☐ Ethene☐	Particle size			REMARKS
2024 PLA S1	6/4/24	845		Soil	2							X								X			
2024 PLA S2	6/4/24	845		Soil	2							X								X			
2024 PLA S3	6/4/24	845		Soil	2							X								X			
2024 PLA S4	6/4/24	845		Soil	2							X								X			
2024 PLA S5	6/4/24	845		Soil	2							X								X			

REPORT REQUIREMENTS

- X I. Routine Report: Method Blank, Surrogate, as required
- X II. Report Dup., MS, MSD as required
- ___ III. CLP Like Summary (no raw data)
- X IV. Data Validation Report
- ___ V. EDD

INVOICE INFORMATION

P.O. # _____
Bill To: Merlin Berner merlin@constantine mining.com

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 day
X Standard (15 working days)
___ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

Total Metals: (Al) (As) Sb Ba Be B Ca (Cd) Co Cr (Cu) (Fe) (Pb) Mg Mn Mo Ni K (Ag) Na (Se) Sr Tl Sn V (Zn) (Hg)

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER: _____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

send lab report to: dylan.knull@alaska.gov
kate.kanouse@alaska.gov &
merlin@constantinemetals.com

☐ Sample Shipment contains USDA regulated soil samples (check box if applicable)

RELINQUISHED BY:

D. Knull — 6/5/24 0900
Signature — Date/Time
Dylan Knull — ADFG
Printed Name — Firm

Rcvd jc 27Jun2024 1:30 pm
5°C (avg 13 coolers) ice pk

RELINQUISHED BY:

_____ — Date/Time
Name — Firm

RECEIVED BY:

_____ — Date/Time
Signature
Printed Name — Firm