

Fish and Fish Habitat Investigations at Kensington Gold Mine

By Greg Albrecht



February 2018

Alaska Department of Fish and Game

Division of Habitat



Symbols and Abbreviations

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Weights and measures (metric)		General		Measures (fisheries)	
centimeter	cm	Alaska Administrative		fork length	FL
deciliter	dL	Code	AAC	mid-eye-to-fork	MEF
gram	g	all commonly accepted		mid-eye-to-tail fork	METF
hectare	ha	abbreviations	e.g., Mr., Mrs., AM, PM, etc.	standard length	SL
kilogram	kg			total length	TL
kilometer	km	all commonly accepted			
liter	L	professional titles	e.g., Dr., Ph.D., R.N., etc.	Mathematics, statistics <i>all standard mathematical signs, symbols and abbreviations</i>	
meter	m	at	@		
milliliter	mL	compass directions:			
millimeter	mm	east	E	alternate hypothesis	H _A
		north	N	base of natural logarithm	e
		south	S	catch per unit effort	CPUE
		west	W	coefficient of variation	CV
		copyright	©	common test statistics	(F, t, χ^2 , etc.)
		corporate suffixes:		confidence interval	CI
		Company	Co.	correlation coefficient	
		Corporation	Corp.	(multiple)	R
		Incorporated	Inc.	correlation coefficient	
		Limited	Ltd.	(simple)	r
		District of Columbia	D.C.	covariance	cov
		et alii (and others)	et al.	degree (angular)	°
		et cetera (and so forth)	etc.	degrees of freedom	df
		exempli gratia		expected value	E
		(for example)	e.g.	greater than	>
		Federal Information		greater than or equal to	≥
		Code	FIC	harvest per unit effort	HPUE
		id est (that is)	i.e.	less than	<
		latitude or longitude	lat. or long.	less than or equal to	≤
		monetary symbols		logarithm (natural)	ln
		(U.S.)	\$, ¢	logarithm (base 10)	log
		months (tables and		logarithm (specify base)	log ₂ , etc.
		figures): first three		minute (angular)	'
		letters	Jan,...,Dec	not significant	NS
		registered trademark	®	null hypothesis	H ₀
		trademark	™	percent	%
		United States		probability	P
		(adjective)	U.S.	probability of a type I error	
		United States of		(rejection of the null	
		America (noun)	USA	hypothesis when true)	α
		U.S.C.	United States	probability of a type II error	
			Code	(acceptance of the null	
		U.S. state	use two-letter	hypothesis when false)	β
			abbreviations	second (angular)	"
			(e.g., AK, WA)	standard deviation	SD
				standard error	SE
				variance	
				population	Var
				sample	var
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	pH				
(negative log of)					
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

TECHNICAL REPORT NO. 17-12

**FISH AND FISH HABITAT INVESTIGATIONS AT KENSINGTON GOLD
MINE**

By

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February 2018

This investigation was fully financed by Coeur Alaska, Inc.

Cover: Spectacle Lakes, Lions Head Mountain, and the Lace River.

Technical Reports are available through the Alaska State Library, Alaska Resources Library and Information Services (ARLIS) and on the Internet: http://www.adfg.alaska.gov/index.cfm?adfg=habitat_publications.main. This publication has undergone editorial and peer review.

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This document should be cited as:

Albrecht, G. 2018. Fish and fish habitat investigations at Kensington Gold Mine. Alaska Department of Fish and Game, Technical Report No. 17-12, Douglas, AK.

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ACKNOWLEDGEMENTS

Coeur Alaska, Inc. provided financial support and Kensington Gold Mine environmental staff Kevin Eppers, Pete Strow, Ryan Bailey, Collin Wigfield-Gorka, and Kelsey Stockert provided logistical support, and discharge and water quality data.

Many Division of Habitat staff contributed to this report. Habitat Biologists Johnny Zutz, Nicole Legere, Evan Fritz, and Dylan Krull assisted with data collection, and Habitat Biologist Kate Kanouse developed the study design, verified data entry, and reviewed and edited the report. Southeast Regional Supervisor Jackie Timothy prepared the executive summary and reviewed and edited the report, Operations Manager Dr. Al Ott reviewed and edited the report, and Ms. Legere prepared the report for publication.

EXECUTIVE SUMMARY

Recent exploration at Coeur Alaska Inc.'s Kensington Gold Mine has focused on upgrading and expanding the high grade Jualin deposit which is separate from the Kensington deposit. Kensington deposit expansion and nearby Jualin development will potentially extend the life of the Kensington Gold Mine. Therefore, Coeur Alaska Inc. is exploring the feasibility of a tailings treatment facility dam raise to increase impoundment storage capacity. This would result in a water elevation increase flooding Upper Slate Lake and its tributaries at closure.

Alaska Department of Fish and Game Division of Habitat Biologist Greg Albrecht and his colleagues documented water quality and flow, sediment size and function, fish presence and passage, and habitat condition in and around water bodies draining to Upper Slate Lake and Spectacle Creek. In this report, Mr. Albrecht documents existing landscape and water body condition, illustrates how habitats will change after flooding, and recommends options for habitat improvements and enhancements in Upper Slate Creek, South Creek, Fat Rat Creek, the Spectacle Lakes, and Spectacle Creek, to offset habitat losses in Upper Slate Lake and Upper Slate Creek.

Division of Habitat tailings treatment facility habitability studies (Willson-Naranjo and Kanouse 2016) confirm Dolly Varden char rearing habitat will be plentiful at closure. Clearly, the limiting factor for the perpetuation of the species will be spawning habitat availability. So while Mr. Albrecht provides many options for habitat restoration to be considered by review participants during environmental analysis of company proposals, the Division of Habitat prefers strategies to increase spawning habitat availability and improve fish passage in accordance with our authorities.

Specifically, we recommend Coeur Alaska Inc. mitigate Slate Creek spawning habitat losses by constructing deltas for spawning fish in Slate Creek and South Creek, replacing the perched South Creek road crossing culvert with a structure designed to pass fish, and rerouting Fat Rat Creek into South Creek. While Spectacle Creek drains to the Lace River instead of Upper Slate Lake, we recommend replacing the perched Spectacle Creek Jualin Road crossing smooth-wall culvert^a with a structure designed to pass fish.

The Division of Habitat appreciates the opportunity Coeur Alaska Inc. provided us to conduct this study during the project design stage. We look forward to continuing to work with the company and other agencies during project development, review, permitting, and monitoring.

^a Currently blocking fish passage into 110 m of upstream fish habitat, of which 23 m provides spawning habitat.

INTRODUCTION

The Kensington Gold Mine is a remote underground mine located 72 km north of Juneau in the Tongass National Forest. Coeur Alaska, Inc. (Coeur) owns and operates the mine, which began production on June 24, 2010 with an estimated mine life of 10 years. The mine operates a mill onsite and uses two ball crushers and a froth-floatation system that relies on chemical collectors and frothing agents to separate the gold-bearing minerals from the barren rock. Tailings are disposed as slurry from the mill to the tailings treatment facility (TTF), formerly known as Lower Slate Lake, and submerged at least 2.7 m (Figure 1; Coeur 2005). The TTF impoundment, built in three stages, increases the storage capacity of the natural basin to accommodate disposal of about 4.5 million tons of tailings. The stage III impoundment will be 25.9 m high with a final crest elevation at 225.5 m and a water surface elevation of 223.1 m (Coeur 2005).

Coeur is exploring the feasibility of a fourth dam raise that would bring the final water elevation to 234.1 m at closure, backwatering Upper Slate Lake (current elevation 225.6 m) and its tributaries to that elevation. Following review of Coeur's prefeasibility study results^b, Division of Habitat biologists developed a plan to investigate aquatic resources in water bodies within and upstream of the proposed Upper Slate Lake flood elevation, and water quality in the TTF. The study plan included sampling water and sediments and documenting fish and fish habitat to assess potential impacts from flooding and identify potential mitigation opportunities.

PURPOSE

The purpose of this investigation and technical report is to document fish use and fish habitat conditions in water bodies that would be permanently flooded by a stage IV TTF dam raise.

AQUATIC STUDIES

Between August 30 and November 2, 2017, we assessed Dolly Varden char *Salvelinus malma* habitats in Upper Slate and South Creeks above and below the potential new lake elevation created by a TTF stage IV dam raise. We documented fish presence, fish habitat, select elements in surface water and stream sediment, stream discharge, and investigated potential modifications to nearby water bodies including the Spectacle Lakes, as mitigation for Dolly Varden char spawning habitat lost to flooding (Figures 2–4; Tables 1, 2).

^b As presented by Coeur staff at the April 12, 2017 agency meeting regarding potential future tailings management facility and waste rock storage modifications.

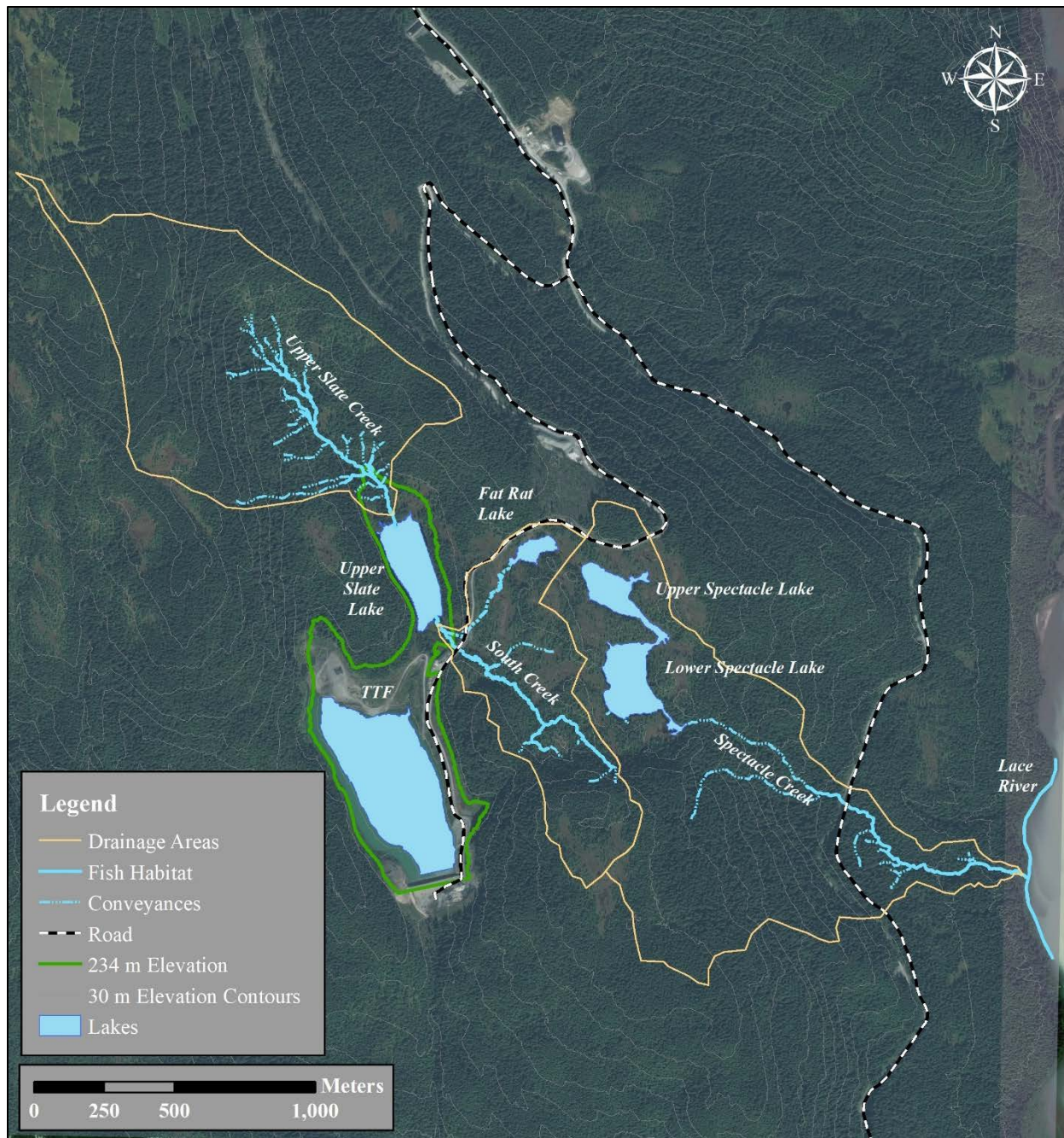


Figure 1.—Water bodies near the TTF.

Source: Elevation contours in all maps are based on 2016 City and Borough of Juneau (CBJ) light detection and ranging (LIDAR) data.

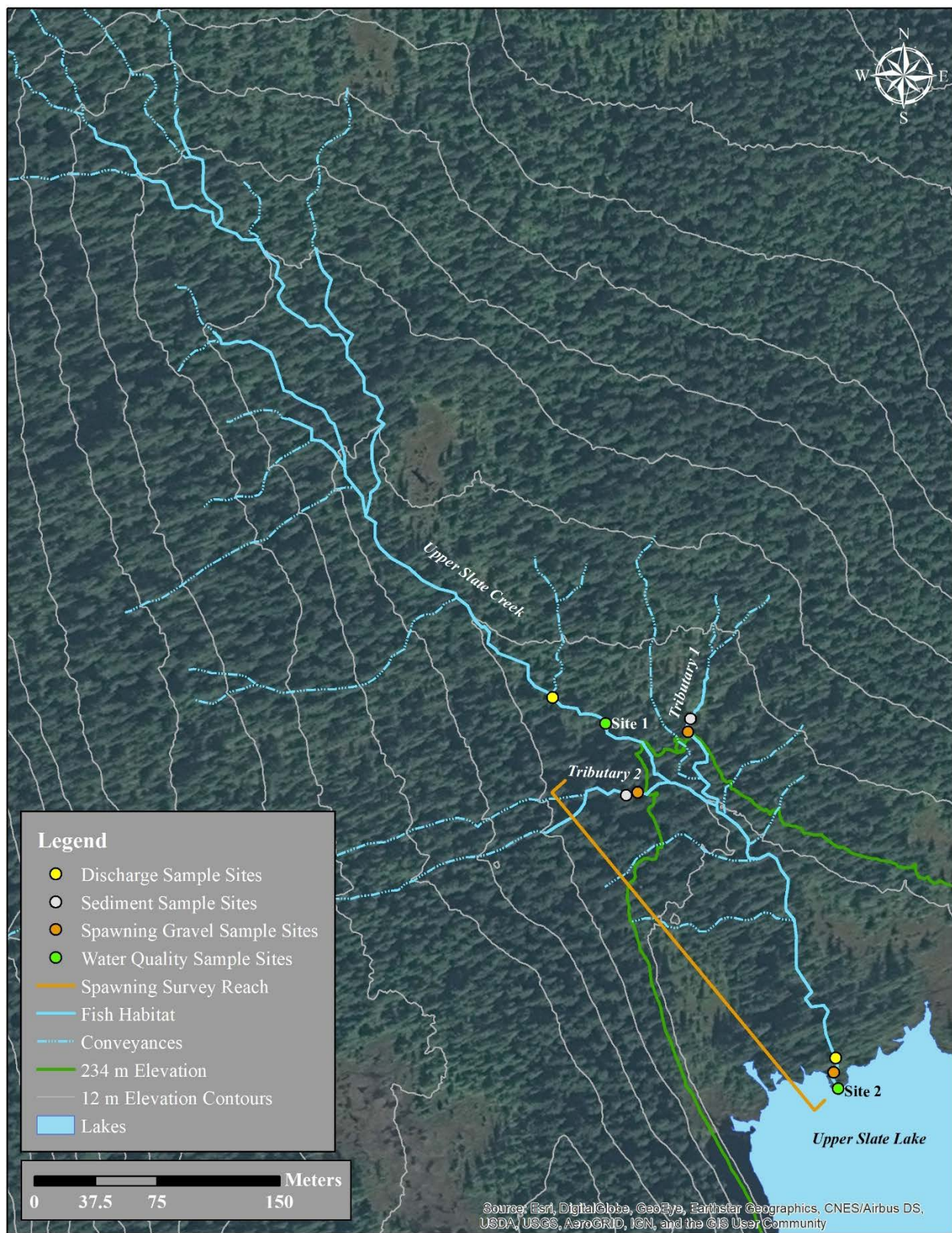


Figure 2.—Upper Slate Creek aquatic studies.



Figure 3.—South Creek and TTF aquatic studies.

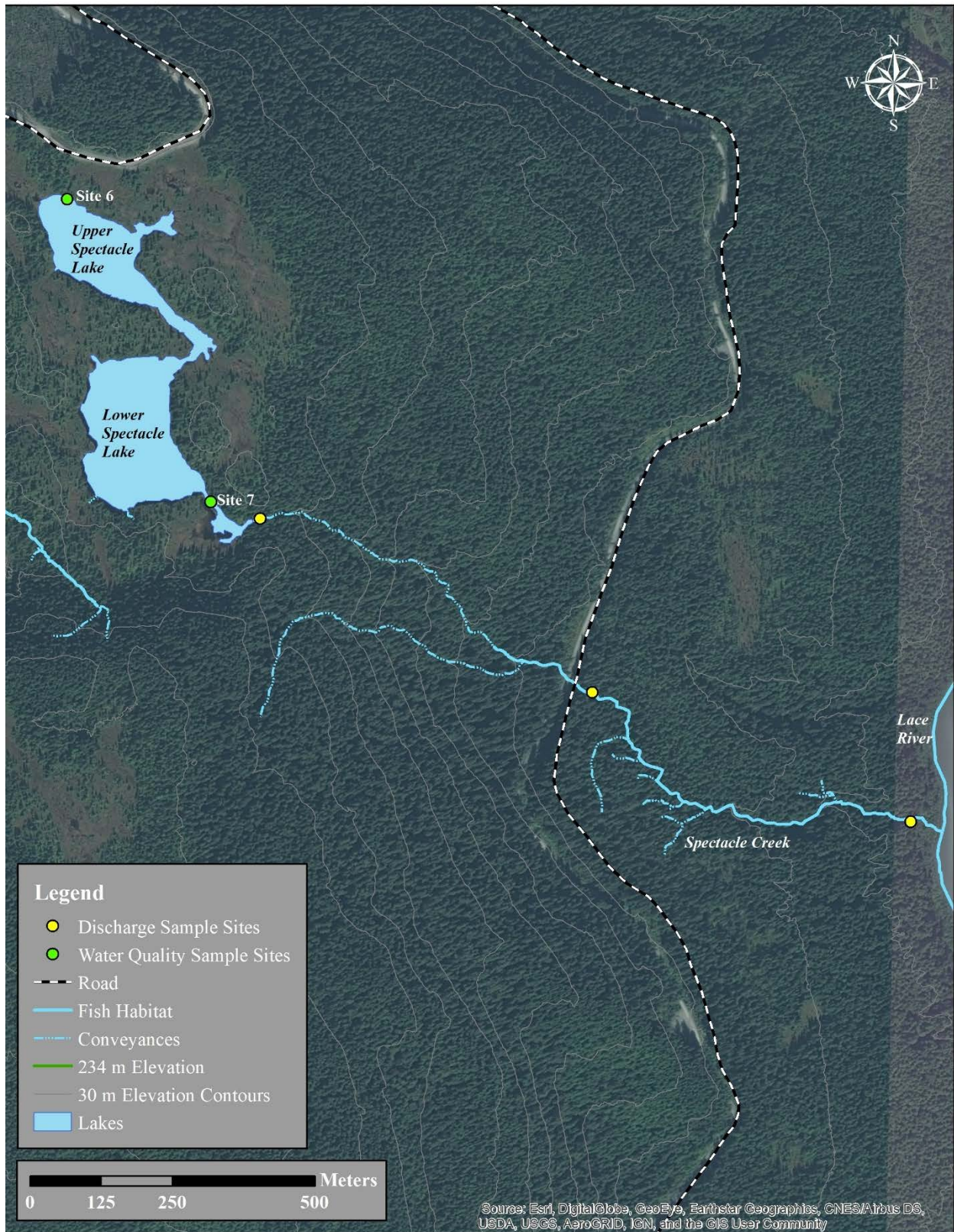


Figure 4.—Spectacle Lakes and Spectacle Creek aquatic studies.

Table 1.—TTF stage IV aquatic studies 2017 sampling schedule.

Aquatic study	Upper Slate Creek	South Creek	Upper Spectacle Lake	Lower Spectacle Lake	Spectacle Creek	TTF
Water quality ^a	August	August	August	August	---	August
	September	September	September	September	---	September
	October	October	October	October	---	October
	November	November	November	November	---	November
Discharge ^a	September	September	---	---	September	---
	October	October	---	---	October	---
	November	November	---	---	November	---
Fish habitat surveys	September	September	September	September	September	---
Fish presence surveys	September	September	September	September	September	---
Fish spawning surveys	September	September	---	---	---	---
	October	October	---	---	---	---
	November	November	---	---	---	---
Spawning gravel	September	September	---	---	---	---
Sediment metals concentrations	September	September	---	---	---	---
Habitat investigations	September	September	September	September	September	---
	October	October	October	October	October	---
	November	November	November	November	November	---

^a With assistance from Coeur staff.

Table 2.–Sample site waypoints by drainage.

Location	Sample Site	Latitude	Longitude
Upper Slate Creek	Upstream discharge	58.8206	-135.0445
	Flooded reach discharge	58.8188	-135.0415
	Upstream spawning gravel (Tributary 2)	58.8201	-135.0435
	Upstream spawning gravel (Tributary 1)	58.8204	-135.0430
	Flooded reach spawning gravel	58.8185	-135.0414
	Sediment metals Site 1 (Tributary 2)	58.8201	-135.0435
	Sediment metals Site 2 (Tributary 1)	58.8204	-135.0430
	Water quality Site 1	58.8205	-135.0439
	Water quality Site 2	58.8185	-135.0414
South Creek	Upstream discharge	58.8145	-135.0370
	Flooded reach discharge	58.8153	-135.0384
	Upstream spawning gravel	58.8144	-135.0370
	Flooded reach spawning gravel	58.8154	-135.0385
	Sediment metals Site 1	58.8144	-135.0369
	Sediment metals Site 2	58.8144	-135.0366
	Water quality Site 3	58.8146	-135.0372
Spectacle Creek and Lakes	Discharge at lake outlet	58.8124	-135.0229
	Discharge at road	58.8098	-135.0127
	Discharge near Lace River mouth	58.8078	-135.0030
	Water quality Site 6	58.8174	-135.0290
	Water quality Site 7	58.8127	-135.0244
Tailings Treatment Facility	Water quality Site 4	58.8125	-135.0420
	Water quality Site 5	58.8115	-135.0394

STUDY AREA

Upper Slate Creek

Upper Slate Creek (Figures 1, 5) originates in the mountains northwest of Upper Slate Lake, drains a 0.91 km² area between 226 and 707 m elevation, and is predominantly forested with peat bogs comprising less than 10% of the area.^c Upper Slate Creek enters Upper Slate Lake from the north and is upstream of mine development and operations. Dolly Varden char and threespine stickleback *Gasterosteus aculeatus* use Upper Slate Lake and Dolly Varden char are present in the creek (Willson-Naranjo and Kanouse 2016).

^c Elevations and drainage areas estimated using ArcGIS software and 2016 City and Borough of Juneau LIDAR data and aerial imagery.



Figure 5.–Upper Slate Creek downstream of the potential flood elevation.

South Creek

South Creek originates in the hillside east of the TTF and drains a 0.41 km² area between 226 and 365 m elevation (Figures 1, 6). The drainage is about 40% forest and 60% peat bog, including Fat Rat Lake. The system enters Upper Slate Lake from the southeast after passing under the TTF access road through twin perched 46 cm culverts that prevent upstream fish migration. During our 2017 studies, we discovered Dolly Varden char use South Creek upstream and downstream of the TTF access road.



Figure 6.–South Creek upstream of the flood elevation.

Spectacle Lakes and Spectacle Creek

Upper and Lower Spectacle Lakes are fed by rainfall captured in the lakes and surrounding peat bog (Figures 1, 7). The two lakes, connected by a slough, lie at the same elevation and do not have defined inlet streams. The lake outlet, Spectacle Creek, drains from the southeast corner of Lower Spectacle Lake and flows east for about 1.3 km to its confluence with the Lace River. The Spectacle Lakes and Spectacle Creek drainage area encompass about 1.08 km² between 6 and 363 m elevation, of which about 81% is forested, 11% is peat bog, and 8% is lake. We confirmed

fish are not present in the Spectacle Lakes (Kline 2005); in Spectacle Creek, we documented Dolly Varden char and cutthroat trout *Oncorhynchus clarkii* in the lower 930 m and observed salmon redds at the confluence with the Lace River.



Figure 7.—Lower Spectacle Lake.

Tailings Treatment Facility

The TTF, formerly Lower Slate Lake, is an isolated facility impounded by an earthen dam (Figure 8). Mine tailings are deposited in the facility as slurry and submerged at least 2.7 m. Mid Lake Slate Creek previously connected Upper and Lower Slate Lakes and is diverted around the facility in a pipeline to East Fork Slate Creek during mining. Dolly Varden char and threespine stickleback inhabited Lower Slate Lake prior to facility construction, and threespine stickleback remain. Dolly Varden char persisted in the TTF until 2010, and did not survive as spawning habitat is not present (Willson-Naranjo and Kanouse 2016).



Figure 8.—Tailings treatment facility.

METHODS

WATER QUALITY

We sampled water in stream reaches above and below the potential flood elevation in Upper Slate and South Creeks to evaluate and compare water quality in existing and remaining fish habitat following flooding. We sampled water in Upper and Lower Spectacle Lakes to collect baseline data for potential future fish habitat mitigation, and we sampled water in the TTF to document water quality during mining and provide information on potential water quality changes from flooding Upper Slate Lake.^d

Sample Collection and Analysis

Coeur staff collected grab water samples using methods described in their Quality Assurance and Protection Plan (Golder 2017) and sent samples to the ALS Environmental laboratory in Kelso, WA for analyses of the receiving water monitoring parameters listed in Coeur's 2017 APDES Permit No. AK0050571 (Table 3), including the elements aluminum (Al), cadmium (Cd), copper (Cu), iron (Fe) lead (Pb), mercury (Hg), manganese (Mn), nickel (Ni), selenium (Se), and zinc (Zn). Coeur staff measured pH, conductivity ($\mu\text{S}/\text{cm}$), temperature ($^{\circ}\text{C}$), and dissolved oxygen (mg/L) with in-house field and laboratory equipment calibrated on-site per the manufacturer's instructions.

Data Presentation

For each water body, we present results in tables comparing water quality parameters to applicable Alaska Department of Environmental Conservation standards (A. Nakanishi, Technical Engineer, Alaska Department of Environmental Conservation, Anchorage, personal communication; ADEC 2008). Laboratory reports are in Appendix A.

^d The mine reclamation and closure plan (KCHE 2013), which does not include a stage IV dam raise, requires water quality to meet Alaska Department of Environmental Standards (ADEC 2008) prior to flooding the TTF and discharging untreated water to East Fork Slate Creek.

Table 3.–Water quality tests, parameters, and methods.

Test Description	Parameter	Method
Determination of turbidity by nephelometry	Turbidity	EPA 180.1
Determination of inorganic anions by ion chromatography	Chloride, nitrate as N, sulfate	EPA 300
Color in water by visual comparison method	Color	SM 2120 B
Total dissolved solids dried at 180°C	Total dissolved solids	SM 2540 C
Total suspended solids dried at 103-105°C	Total suspended solids	SM 2540 D
Chlorine by DPD	Chlorine	SM 4500-Cl G
Ammonia by automated phenate	Ammonia as Nitrogen	SM 4500-NH3 G
Mercury in water by oxidation, purge and trap, and cold vapor atomic fluorescence spectrometry	Hg	EPA 1631 E
Determination of metals and trace elements in water and wastes by inductively coupled plasma-atomic emission spectrometry	Hardness as CaCO3	EPA 200.7/SM 2340 B
Determination of trace elements in waters and wastes by inductively coupled plasma-mass spectrometry	Al, Cd, Cu, Pb, Mg, Ni, Se, Zn	EPA 200.8
Determination of metals and trace elements in water and wastes by inductively coupled plasma-atomic emission spectrometry	Fe	EPA 200.7

DISCHARGE

We measured discharge in stream reaches above and below the potential flood elevation in Upper Slate and South Creeks to evaluate and compare flow before and after flooding. We measured discharge in Spectacle Creek to assess possible effects to fish and fish habitat from stream diversion as a potential future fish habitat mitigation.

Sample Collection and Analysis

We surveyed where streamflow was confined to one channel, and usually where the stream bottom elevation and stream flow were continuous across the channel. We measured stream depth (d), width (w), and velocity (v) to determine discharge^e in ft³/s using a Global Flow Probe FP101 flow meter at 60% of the total depth in equidistant subsections, and a tape measure strung tightly and perpendicular to the stream channel. We collected additional measurements where we observed changes in the stream bottom elevation and changes in water velocity.

We attempted to record at least 20 measurements, except when stream width and depth were insufficient, and calculated discharge (Q) using the equation described in Platts et al. (1983),

$$Q = \sum_{i=1}^n (w_{i+1} - w_i) \left(\frac{d_i + d_{i+1}}{2} \right) \left(\frac{v_i + v_{i+1}}{2} \right)$$

^e We present discharge data in Imperial units for convention.

Data Presentation

For each water body, we present discharge results in a table by site. Field measurement data are in Appendix B.

DOLLY VARDEN CHAR HABITAT

We documented Dolly Varden char rearing and spawning habitats above and below the potential flood elevation in Upper Slate and South Creeks to evaluate and compare existing and remaining habitats following flooding. We documented habitats in Spectacle Lakes and Spectacle Creek to evaluate whether the lakes could support fish and possible effects to fish and fish habitat in Spectacle Creek from stream diversion as a potential future mitigation.

Sample Collection and Analysis

Beginning at the stream mouth, two biologists walked upstream measuring gradient (%) with a clinometer and linear distance (m) of Dolly Varden char rearing and spawning habitat using a tape measure in 50 m reaches. We compared field gradient measurements with CBJ's 2016 LIDAR data using ArcGIS software. In general, we identified rearing habitat by evidence of perennial stream flows and stream gradients less than 25%. Additional considerations were fish presence, pool depth, the amount of vegetation present in the channel, and the location within the watershed. Stream reaches that did not meet these criteria were considered conveyances.

We assumed gravel patches predominately composed of particles having diameters less than 3 cm were suitable spawning habitat for Slate Lakes fish,^f and we visually identified the patches using a gravelometer. We used a non-survey grade GPS to mark waypoints and locate the potential flood elevation on each creek based on CBJ's 2016 LIDAR data using ArcGIS software.

Data presentation

For each water body, we present rearing and spawning habitat lengths and proportions in a table, and illustrate these habitats in a figure. Field notes by location and detailed maps are in Appendix C.

FISH PRESENCE AND SPAWNING ACTIVITY

We sampled fish above and below the potential flood elevation in Upper Slate and South Creeks, and in Spectacle Lakes and Spectacle Creek to document fish presence and distribution. In Upper Slate and South Creeks, we also surveyed spawning Dolly Varden char to document spawning locations and timing.

Sample Collection and Analysis

To document fish presence, we used a Smith Root LR-24 backpack electrofisher to opportunistically sample streams, beginning at the mouth and fishing upstream in pools, under cut banks, and around woody debris. In lakes, we set 6.4 mm mesh minnow traps baited with disinfected salmon eggs around the east shore for 19 h. For each fish captured, we recorded the

^f Based on Kitano and Shimazaki (1995) observations of spawning Dolly Varden char 132–231 mm FL and the relationship of salmonid length and median spawning gravel size reported by Kondolf and Wolman (1993). Previous Dolly Varden char studies in the Upper Slate Lake suggest fish are sexually mature around 151 mm TL (Aquatic Science Inc. 2011b) and grow to a maximum size of about 305 mm TL (Kline 2005).

GPS location (WGS84 datum), species (Pollard et al. 1997), FL (mm), and signs of spawning coloration, including orange spots and enhanced fin color contrast.

To document spawning fish, beginning at the stream mouth two biologists wearing polarized sunglasses walked upstream searching for spawning Dolly Varden char and potential redds, using a GoPro Hero 3[®] with an attached dive light to improve visibility.

Data presentation

We present spatial capture data in a figure. Fish captures by location and detailed maps are in Appendix C.

DOLLY VARDEN CHAR SPAWNING SUBSTRATE

We sampled Dolly Varden char spawning gravel above and below the potential flood elevation in Upper Slate and South Creeks to evaluate and compare the quality of spawning habitat remaining after flooding.

Sample Collection and Analysis

We sampled spawning gravel in riffles and pool tails using a McNeil sampler with a 15 cm diameter core and 25 cm core depth, targeting gravel patches with particles measuring less than 3 cm and taking 4 samples from each site. We pushed the McNeil sampler into the substrate to about 15 cm depth,[§] transferred the sediments to a bucket and wet-sieved each sample onsite using sieve sizes 50, 25, 19, 12.5, 6.3, 2.36, 0.43, and 0.15 mm and measured the contents of each sieve to the nearest 25 mL by the volume of water displaced in 1 L plastic beakers. We transferred the fines that passed through the 0.15 mm sieve to Imhoff cones, allowed 10 min settling time, and measured the sediment volume to the nearest 1 mL using the Imhoff cone gradations.

For the fines that passed through the 0.15 mm sieve, we converted sediment wet weights to dry weights using standards identified by Zollinger (1981). For all other sediments, we converted wet weights to dry weights using a correction factor derived from Shirazi et al. (1981), assuming a gravel density of 2.6 g/cm³ (Aquatic Science Inc. 2011a, Kanouse and Zutz 2017). We calculated the geometric mean particle size (d_g) using methods developed by Lotspeich and Everest (1981), where the midpoint diameter of particles retained in each sieve (d) are raised to a power equal to the decimal fraction of volume retained by that sieve (w), and multiplied the products of each sieve size to obtain the final product,

$$d_g = d_1^{w_1} \times d_2^{w_2} \times d_3^{w_3} \dots d_n^{w_n}$$

Data Presentation

For each site, we present a table of the geometric mean particle size (GMPS) by reach, and include the raw data and photos of sample sites in Appendix D.

[§] Six cm deeper than the maximum reported redd depth for fish less than 231 mm FL (Kitano and Shimazaki 1995).

SEDIMENT COMPOSITION

We sampled fine sediment in tributaries to Upper Slate Creek above the potential flood elevation, and in South Creek above and below the potential flood elevation, for analytical composition and concentrations of select elements to compare with sediment data collected 2011–2016 near the mouth of Upper Slate Creek.

Sample Collection and Analysis

Wearing latex gloves, we opportunistically sampled sand and silt from the stream bottom at 2 sites in each water body within actively flowing channels. We collected the top 4 cm of material in 3 laboratory-supplied glass jars, and stored the samples in a cooler with frozen ice packs during transport. We added 5–10 mL of zinc acetate to one sample jar provided for sulfide analyses at each site to preserve sulfide in the sample per laboratory staff instruction (S. Samy, Kelso Laboratory Senior Project Manager, ALS Environmental, Kelso, WA, personal communication).

We stored the samples overnight in an ADF&G Douglas laboratory refrigerator until shipment in a cooler with frozen icepacks via overnight freight, maintaining written chain of custody forms, to an ALS Environmental laboratory in Kelso, WA for analyses of the parameters listed in Coeur’s 2017 APDES Permit No. AK0050571 (Table 4). ALS Environmental measured particle size and other parameters on a dry-weight basis, and provided Tier II quality assurance and quality control information, including results for matrix spikes, sample blanks, and sample duplicates.

Table 4.–Sediment tests, analytes, and methods.

Test Description	Analyte	Method
Standard test method for particle-size analysis of soils	Particle size determination	ASTM D422
Puget Sound Estuary Program sediment total organic carbon	Total organic carbon	PSEP TOC
Total solids on liquids, modified for solids	Total solids	EPA 160.3 Modified
Puget Sound Estuary Program sediment sulfide	Total sulfide	PSEP Sulfide
Total volatile solids, modified for solids	Total volatile solids	EPA 160.4 Modified
Mercury in solid or semisolid waste	Hg	EPA 7471B
Determination of trace elements in waters and wastes by ICP/MS	Ag, Al, As, Cd, Cr, Cu, Ni, Pb, Se, Zn	EPA 200.8

Data Presentation

For each site, we present total solids, total volatile solids, total organic solids, and total sulfides data in a table, and element concentrations in figures comparing data collected near the mouth of Upper Slate Creek 2011–2016 (Kanouse and Zutz 2017). We also compare the element concentration data with the Screening Quick Reference Tables for inorganics in freshwater sediment guidelines developed by the National Oceanic and Atmospheric Administration (Buchman 2008), specifically the threshold effects concentrations (TEC) and the probable effects concentrations (PEC). The guidelines are based on results of controlled laboratory bioassays, wherein element concentrations below the TEC rarely affect aquatic life survival and growth, and element concentrations above the PEC can affect aquatic life survival and growth. Laboratory reports are in Appendix E.

HABITAT INVESTIGATIONS

We investigated opportunities for increasing Dolly Varden char habitat connectivity and spawning area as possible mitigation for spawning habitat losses due to flooding of Upper Slate Lake and its tributaries. We measured distances (m), elevations (m), and discharges (ft^3/s) where appropriate in the field, and confirmed distance and elevation measurements with CBJ's 2016 LIDAR data using ArcGIS software.

Data Presentation

We present a narrative and map for the areas we investigated. Detailed topographic maps are in Appendix F.

RESULTS AND DISCUSSION

UPPER SLATE CREEK

Water Quality

Coeur staff sampled water above (Site 1) and below (Site 2) the potential flood elevation in Upper Slate Creek once per month August–November (Table 5). The data were similar among sites each sampling event, and many parameters and elements were not detected.

Table 5.—Upper Slate Creek water quality data.

Parameter	8/30/2017		9/20/2017		10/10/2017		11/7/2017		Standard
	Site 1	Site 2	Site 1	Site 2	Site 1	Site 2	Site 1	Site 2	
Conductivity (µS/cm)	79.3	79.1	98.9	98.9	91.9	90.5	95.5	96.8	---
Dissolved oxygen (mg/L)	12.27	12.17	11.72	11.67	11.86	11.7	13.42	13.47	---
pH (s.u.)	7.55	7.51	7.83	7.75	7.7	7.3	7.58	7.41	---
Temperature (°C)	7.8	7.9	7.2	7.2	5.4	5.4	2.4	2.4	---
Ammonia as nitrogen (mg/L)	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	---
Chloride (mg/L)	1.3	1.3	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	---
Chlorine (mg/L)	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	---
Color (color units)	70.0	70	30.0	30.0	20.0	25.0	15.0	15.0	---
Hardness as CaCO ₃ (mg/L)	61.6	58.9	79.7	81.9	79.5	79.4	87.6	86.5	12.4
Nitrate as nitrogen (mg/L)	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.10	---
Solids, total dissolved (mg/L)	96	105	96	96	94	97	91	91	---
Solids, total suspended (mg/L)	< 5.0	< 5.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	---
Sulfate (mg/L)	2.58	2.52	3.31	3.17	2.97	2.83	3.40	3.29	---
Turbidity (NTU)	0.34	0.35	0.28	0.27	0.673	0.33	0.340	0.19	---
Al, total (µg/L)	96.5	93.3	42.0	44.4	45.6	45.7	28.2	24.2	87
Cd, total (µg/L)	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	---
Cu, total (µg/L)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	---
Fe, total (µg/L)	160	158	79	87	73	77	56	50	1,000
Hg, total (ng/L)	1.9	1.7	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	1.2
Mn, total (µg/L)	9.0	9.1	6.9	7.6	5.8	5.6	4.2	4.1	50
Ni, total (µg/L)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	---
Pb, total (µg/L)	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	---
Se, total (µg/L)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	---
Zn, total (µg/L)	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	---

Note: Concentrations undetected are reported as less than method reporting limit.

Discharge

We measured stream discharge at sites above and below the potential flood elevation, and estimate discharges ranged 2.1–11.5 ft³/s within the proposed flooded reach (Table 6). We observed 6 tributaries entering the creek between the flooded and upstream measurement sites (Figure 2). Given discharge measurements at each site on 9/8/2017, these tributaries along with groundwater contribute about 17% of the total discharge measured at the flooded reach site; based on this relationship, the estimated discharge range at the upstream site during our sampling period would have been 1.8–9.6 ft³/s.

Table 6.—Upper Slate Creek discharge measurements.

Date	Discharge (ft ³ /s)	
	Flooded reach	Upstream reach
09/08/17	11.5	9.6
09/21/17	2.1	1.8 ^a
10/10/17	2.6	2.2 ^a
11/02/17	2.9 ^b	3.2

^a Measurements where total discharge could not be captured due to loss of flow into deposits of coarse bed load following a flood event several days prior.

^b Estimated value based on the September 8, 2017 relationship.

Dolly Varden Char Habitat

We documented 1,360 m of Dolly Varden char habitat in the main stem and tributaries of Upper Slate Creek, of which 340 m occurs below the potential flood elevation (Table 7; Figure 9; Appendix C). We documented 84 m of spawning habitat below the potential flood elevation and 65 m of spawning habitat throughout the remaining 1,020 m, most of which was fragmented at the upper end of fish habitat. Since we used a non-survey-grade GPS to locate the 234 m flood elevation in the field, the exact amount of spawning habitat that will remain after flooding is unknown.

The largest accumulations of spawning gravel occurred in the low gradient delta at the mouth of the stream and generally had the greatest water depth over potential spawning sites. Stream gradient increased up the valley and was generally too steep in the main stem to retain spawning gravel above the lower 25 m, except at pool tails and immediately upstream of log jams. Upstream of the delta, gradients were generally greater than 5% with cobble substrate. Mean stream width was 1.9 m below the potential flood elevation, and 0.9 m near the upper extent of fish habitat. About 420 m upstream from the mouth in a bedrock chute, we observed a 3.3 m long, 1 m tall step falls with a 18% mean gradient that may be difficult for resident Dolly Varden char to pass upstream during high flow (Figure 10; waypoint 112).

With 56% of the spawning habitat occurring below the potential flood elevation and the majority of the remaining habitat fragmented, of marginal quality, and mostly upstream of the bedrock step falls, additional spawning habitat will be needed to support the lake population after flooding.

Table 7.—Upper Slate Creek rearing and spawning habitat summary.

Habitat	Total (m)	Flooded reach		Upstream reach	
		Length (m)	%	Length (m)	%
Rearing	1,360	340	25	1,020	75
Spawning	149	84	56	65	44

Note: Total rearing habitat includes spawning habitat.

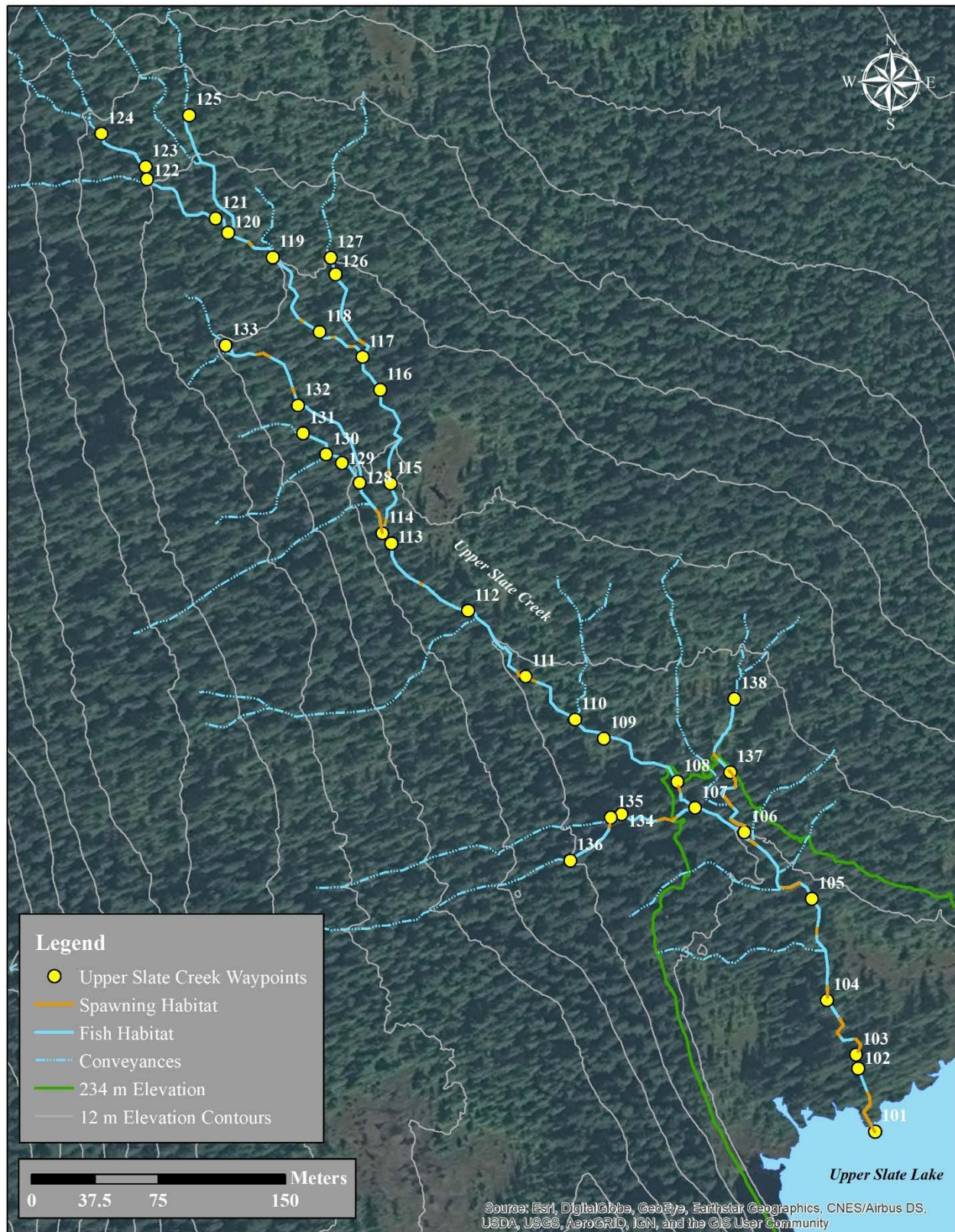


Figure 9.—Upper Slate Creek Dolly Varden char habitat.



Figure 10.—Bedrock step falls at waypoint 112.

Fish Presence and Spawning Activity

On September 8, we captured 13 Dolly Varden char (40–175 mm) in the 340 m of habitat below the potential flood elevation and 11 Dolly Varden char (35–140 mm) in the 1,020 m upstream (Figure 11). Of the fish captured, 1 fish exhibited mild spawning coloration (Figure 12).

On four occasions we surveyed all spawning habitat in the main stem and tributaries within the first 250 m of Upper Slate Creek and did not observe spawning Dolly Varden char or redds. Upstream of this point, spawning habitat was sparse and better suited for smaller fish, which are difficult to detect. Our failure to detect spawning fish may have been due to Dolly Varden char tendency to abandon redds following spawning (Kitano and Shimazaki 1995), shy nature of the species, and poor visibility in tannic and turbid water.

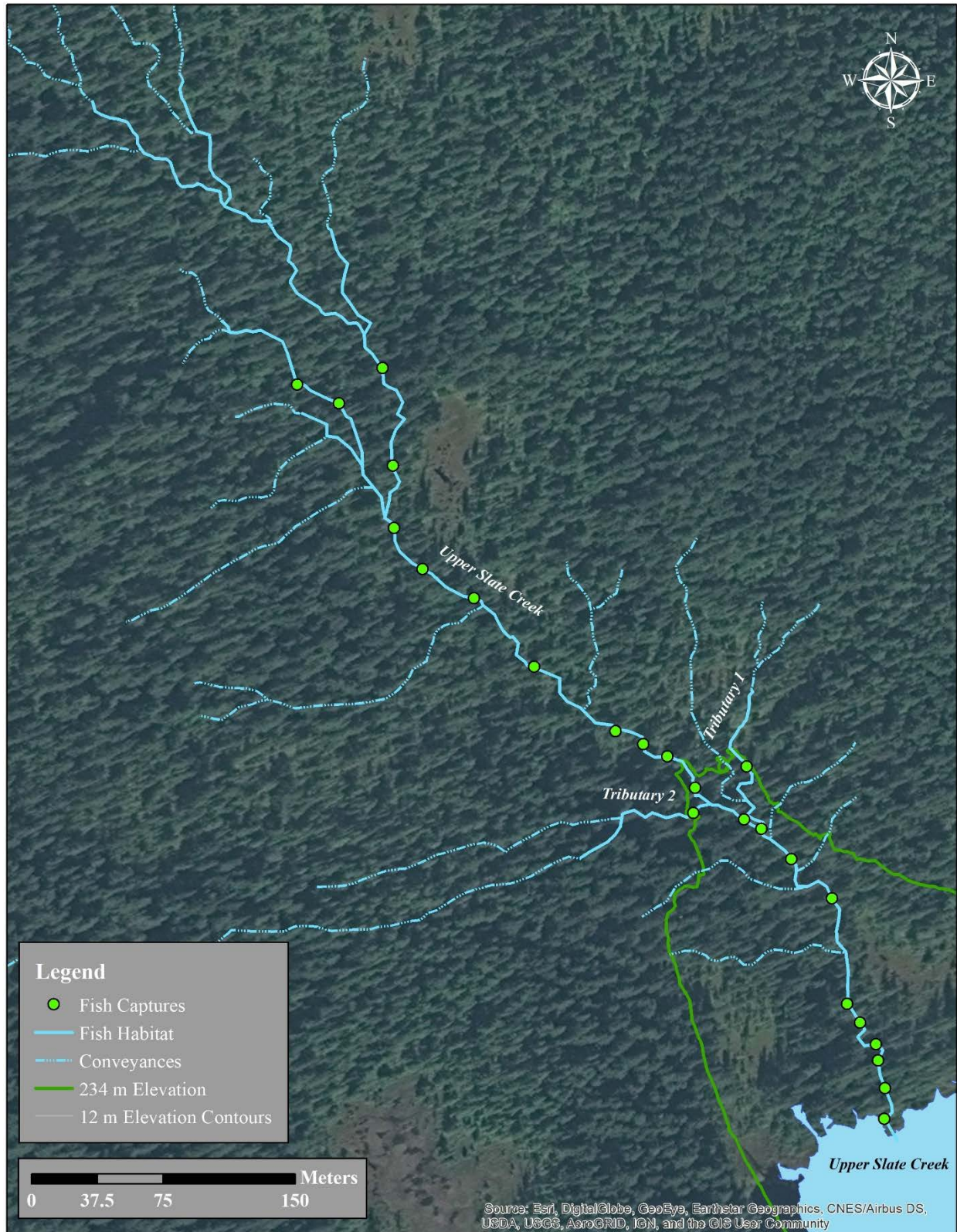


Figure 11.—Upper Slate Creek fish captures.



Figure 12.–175 mm Dolly Varden char.

Dolly Varden Char Spawning Substrate

We observed a larger GMPS in the potential flooded reach where spawning beds were more prevalent and easily located than upstream where spawning substrate quality and quantity was limited. Though we identified 65 m of spawning habitat above the potential flooded reach, 58 m occurred upstream of the step falls, which may limit fish migration during high flows. Spawning habitat upstream of the falls was fragmented and generally marginal quality due to shallow stream depth.

Upstream of the potential flood elevation,^h we observed 1 m of sand spawning substrate in Tributary 1, and at least 6 m of gravel spawning substrate with a layer of cobble about 8 cm below the bed surface in Tributary 2. We found the GMPS was smaller among the Tributary 1 samples than the Tributary 2 samples (Table 8), due to the nature of Tributaries 1 and 2; Tributary 1 is a low gradient, wetland-fed stream while Tributary 2 has a higher gradient and the substrate is colluvial. The Tributary 2 GMPS was similar to the Upper Slate Creek potential flooded reach GMPS. Stream depth at these sites was shallower than main stem spawning gravel locations and could limit use by larger fish.

Table 8.–Upper Slate Creek geometric mean particle sizes.

Parameter	Flooded Reach	Upstream (Tributary 1)	Upstream (Tributary 2)	All upstream samples
GMPS (mm)	6.8	3.6 ^a	6.2 ^b	4.9

^a Samples 3 and 4.

^b Samples 1 and 2.

^h We used LIDAR data, ArcGIS software, and a non-survey-grade GPS to locate the 234 m flood elevation in the field. Available spawning habitat, especially in Tributary 1 where gradient is low, will depend on the true flood location.

Sediment Composition

In the main channel above the potential flood elevation, we did not find fine sediment deposits of sufficient quantity to collect sediment samples for laboratory analyses. Therefore, we collected 1 sample each from Tributaries 1 and 2, both above the potential flood elevation.

Site 1 was located in Tributary 2 where coarse rock and colluvium have eroded from a steep hillside, while Site 2 was located in wetland-fed Tributary 1 with substrate dominated by sand, silt, and organics. Total volatile solids and all sediment element concentrations were greater at Site 1 than Site 2, and sulfides were not detected at either site (Table 9; Figure 13). The Site 1 and Site 2 samples generally contained more clay and silt than samples from the flooded reach 2011–2016.

All Site 1 element concentrations were within or greater than the range of values observed 2011–2016 in the potential flooded reach, while all Site 2 element concentrations were lower; Hg and Se were not detected at Site 2. Site 1 concentrations of As, Cd, Cr, Cu, Ni, and Zn exceeded TEC guidelines (Buchman 2008).

Table 9.—Upper Slate Creek sediment composition.

	Site 1	Site 2
Particle Size (%)		
Clay	6.0	4.7
Silt	17.8	2.1
Sand	56.1	53.1
Coarse material (> 2 mm)	20.1	40.0
Total solids (%)	66.6	73.1
Total volatile solids (%)	5.2	3.3
Total sulfides (mg/kg)	< 2.9	< 2.5
Total organic carbon (%)	1.07	0.951

Note: Sulfides were undetected at the method reporting limit.

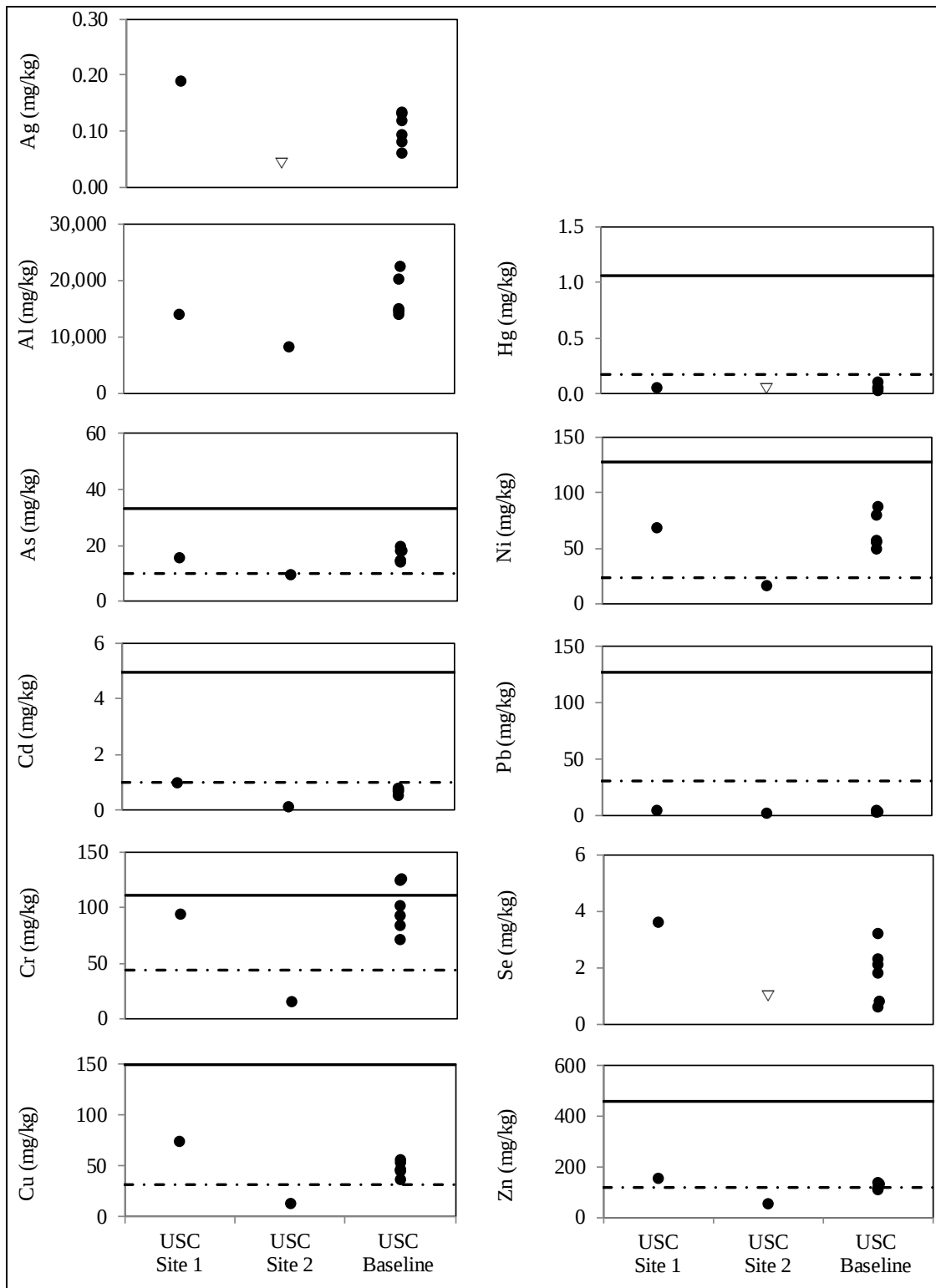


Figure 13.–Upper Slate Creek sediment element concentrations.

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, and Se; elements undetected (▽) are presented at the method reporting limit.

Source: USC baseline data in Kanouse and Zutz (2017).

SOUTH CREEK

Water Quality

Coeur staff sampled water above the potential flood elevation at one location in South Creek (Site 3) September–November once per month, and once in Fat Rat Creek in August by accident (Figure 3). Element concentrations decreased over time in South Creek, and many were not detected (Table 10; Appendix A).

Table 10.—South Creek water quality data, August–November.

	8/30/2017	9/20/2017	10/12/2017	11/7/2017	Standard
Parameter	Fat Rat Cr.	Site 3	Site 3	Site 3	
Conductivity (µS/cm)	49.9	15.7	15.1	15.2	---
Dissolved oxygen (mg/L)	10.77	11.38	12.25	13.80	---
pH (s.u.)	7.74	6.63	7.90	7.29	---
Temperature (°C)	12.1	8.5	3.8	0.6	---
Ammonia as nitrogen (mg/L)	< 0.10	< 0.10	< 0.10	< 0.10	---
Chloride (mg/L)	< 1.0	< 2.0	< 2.0	< 2.0	---
Chlorine (mg/L)	< 0.050	< 0.050	< 0.050	< 0.050	---
Color (color units)	140	140	90	80	---
Hardness as CaCO ₃ (mg/L)	25.6	12.7	12.2	12.2	12.4
Nitrate as nitrogen (mg/L)	< 0.10	< 0.10	< 0.10	< 0.10	---
Solids, total dissolved (mg/L)	42	44	19.0	27	---
Solids, total suspended (mg/L)	< 5.0	< 4.0	< 4.0	< 4.0	---
Sulfate (mg/L)	4.55	0.42	0.57	0.60	---
Turbidity (NTU)	0.61	0.36	0.42	0.35	---
Al, total (µg/L)	131	197	160	119	87
Cd, total (µg/L)	< 0.020	< 0.020	< 0.020	< 0.020	---
Cu, total (µg/L)	< 1.0	< 1.0	< 1.0	< 1.0	---
Fe, total (µg/L)	265	488	348	309	1,000
Hg, total (ng/L)	2.8	2.8	1.1	1.6	1.2
Mn, total (µg/L)	25.3	38.7	28.7	22.2	50
Ni, total (µg/L)	< 1.0	< 1.0	< 1.0	< 1.0	---
Pb, total (µg/L)	< 0.16	< 0.16	< 0.16	< 0.16	---
Se, total (µg/L)	< 1.0	< 1.0	< 1.0	< 1.0	---
Zn, total (µg/L)	< 2.5	< 2.5	< 2.5	< 2.5	---

Note: Concentrations undetected are reported as less than method reporting limit.

Discharge

We measured stream discharge at sites above and below the potential flood elevation and estimate discharge ranged 0.13–1.13 ft³/s in the upstream reach (Figure 3; Table 11). We observed a single tributary from Fat Rat Lake entering South Creek between the potential flooded and upstream measurement sites. Given discharge measurements at each site on 9/7/2017 and 11/2/2017, this tributary along with groundwater contributes about 40.5% of the total discharge measured at the flooded reach site; based on this relationship, the estimated discharge range at the flooded reach site during our sampling period would have been 0.2–2.0 ft³/s.

Table 11.–South Creek discharge measurements.

Date	Discharge (ft ³ /s)	
	Flooded reach	Upstream reach
09/07/17	2.0	1.1
09/21/17	0.3 ^a	0.2
10/11/17	0.3 ^a	0.2
11/02/17	0.2	0.1

^a Estimate based on mean relationships observed on September 7 and November 11, 2017.

Dolly Varden Char Habitat

We documented 1,242 m of Dolly Varden char habitat in the main stem and tributaries of South Creek, of which 150 m occurs below the potential flood elevation (Table 12; Figure 14; Appendix C). We documented 54 m of spawning habitat below the potential flood elevation, and 229 m of spawning habitat throughout the remaining 1,092 m of habitat upstream.

The creek forms a 1.3 m wide, organic-bottom channel that is about 1 m deep at its confluence with Upper Slate Lake. Upstream of the confluence, the channel is less than 1 m deep with sand and gravel substrate for about 60 m where gradient increases near the TTF access road. Upstream of the road culverts, which are barriers for upstream fish migration, the creek meanders with a 0.9 m mean width, 2–5% gradient, and sand, gravel, and cobble substrate. About 800 m upstream from the mouth, the creek forks in two equal channels originating from the hillside southeast of Spectacle Lakes. Though the reach above the potential flood elevation provides spawning habitat, shallow water depths may limit use by larger individuals documented in the Slate Lakes (Kline 2005).

Table 12.–South Creek rearing and spawning habitat summary.

Habitat	Total length (m)	Flooded reach		Upstream reach	
		Length (m)	%	Length (m)	%
Rearing	1,242	150	12	1,092	88
Spawning	283	54	19	229	81

Note: Rearing habitat includes spawning habitat.

Fish Presence and Spawning Activity

On September 5, we captured 10 Dolly Varden char (30–175 mm) within the 150 m reach below the potential flood elevation and 35 Dolly Varden char (45–140 mm) in the 1,092 m upstream of the TTF access road (Figure 15). The 175 mm fish captured below the potential flood elevation (Figure 16) and a 130 mm fish captured above both exhibited spawning coloration.

On four occasions we walked two reaches in the lower 310 m of South Creek and did not observe spawning Dolly Varden char or redds. Upstream of this point, spawning habitat was sparse and better suited for smaller fish, which are difficult to detect. Our failure to detect spawning fish may have been due to Dolly Varden char tendency to abandon redds following spawning (Kitano and Shimazaki 1995), shy nature of the species, and poor visibility in tannic and turbid water.

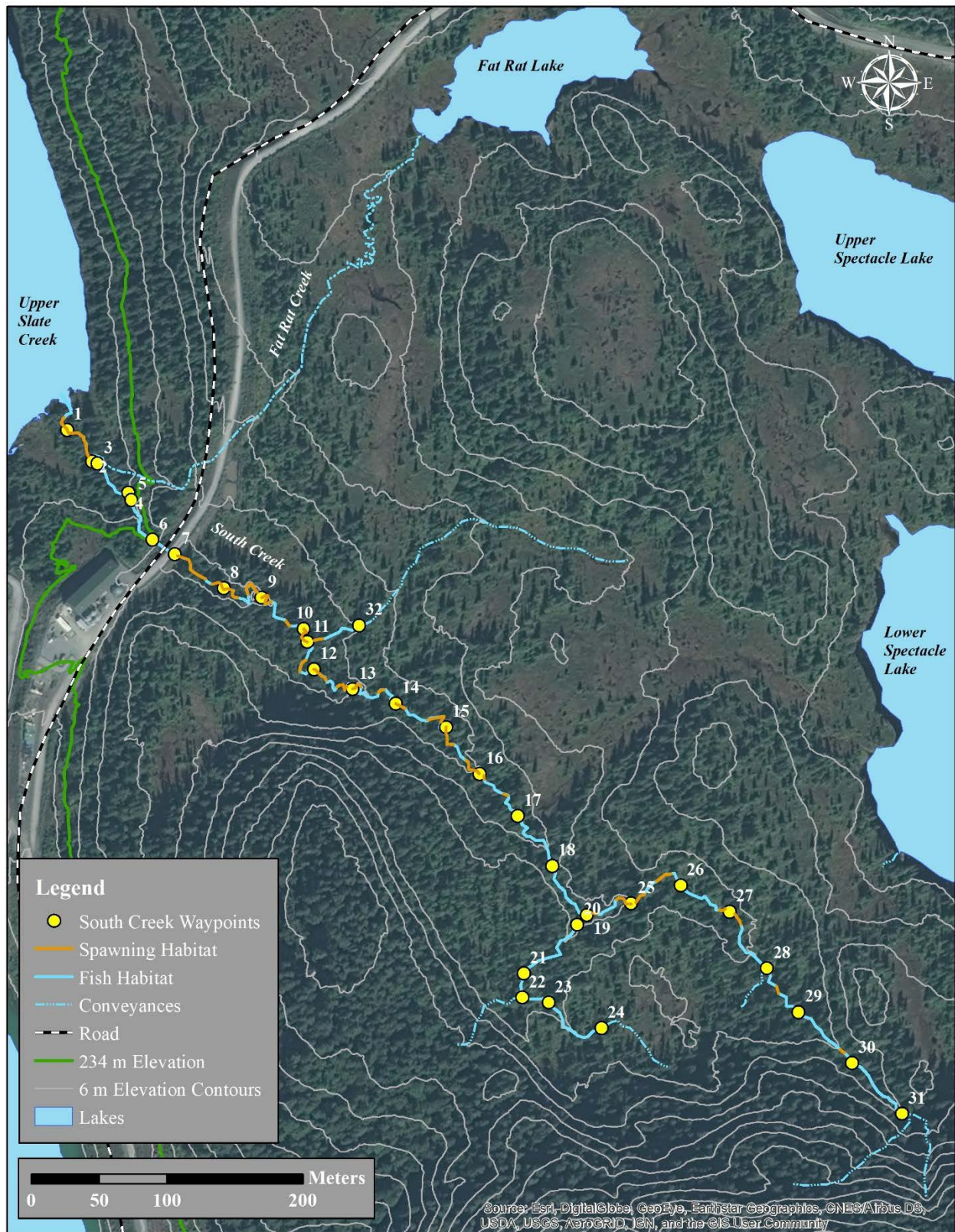


Figure 14.—South Creek Dolly Varden char habitat.



Figure 15.—South Creek Dolly Varden char captures.



Figure 16.–175 mm Dolly Varden char exhibiting spawning coloration.

Dolly Varden Char Spawning Substrate

We collected samples from above and below the potential flood elevation in the main channel of South Creek and observed a similar GMPS at both locations (Table 13). Both GMPS values were similar to the GMPS at the mouth of Upper Slate Creek.

Table 13.–South Creek geometric mean particle sizes.

Parameter	Flooded Reach	Upstream Reach
GMPS (mm)	6.2	6.0

Sediment Composition

We sampled sediment from 2 sites with similar stream characteristics above the potential flood elevation in the South Creek main stem (Figure 3). Total volatile solids and organic carbon were greater at Site 1 than Site 2, and sulfides were not detected at either site (Table 14). Like the Upper Slate Creek tributary sediment samples, the South Creek Site 1 and Site 2 samples contained more clay and silt than observed in many of the flooded reach samples 2011–2016.

All element concentrations were similar among the Site 1 and Site 2 samples, except As was greater at Site 1 (Table 14; Figure 17). Ag and Se were not detected at either site. All element concentrations were less than or within the range of values observed 2011–2016 in the Upper Slate Creek potential flooded reach. As concentrations exceeded the PEC at Site 1 and TEC at Site 2, while all other concentrations were below the guidelines (Buchman 2008).

Table 14.–South Creek sediment composition parameters.

	Site 1	Site 2
Particle Size (%)		
Clay	4.1	5.2
Silt	6.0	1.5
Sand	78.6	63.7
Coarse material (> 2 mm)	11.3	29.6
Total solids (%)	68.1	80.2
Total volatile solids (%)	3.7	3.0
Total sulfides (mg/kg)	< 2.8	< 2.2
Total organic carbon (%)	0.768	0.47

Note: Sulfides were undetected at the method reporting limit.

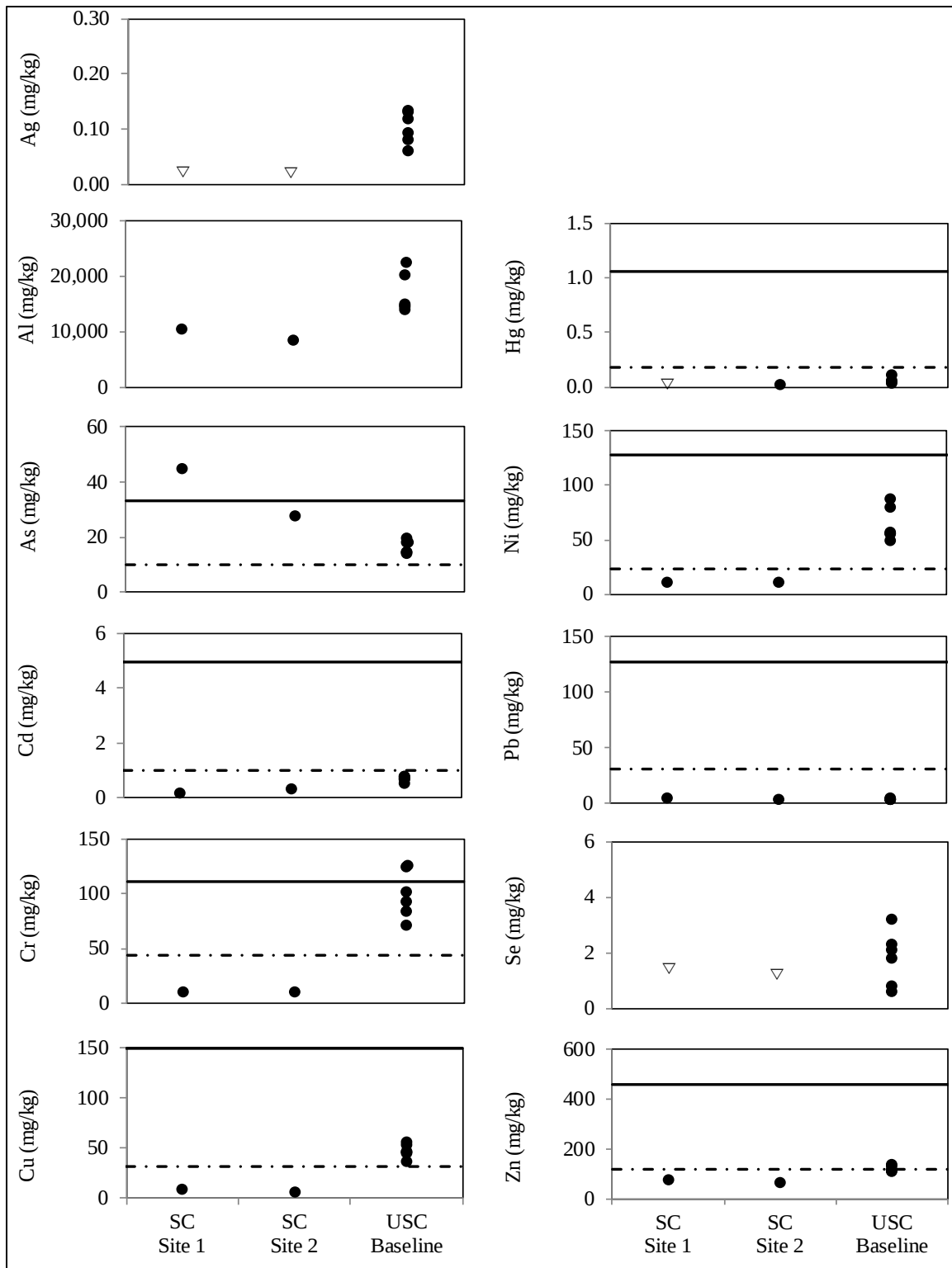


Figure 17.– South Creek sediment element concentrations.

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, and Se; elements undetected (▽) are presented at the method reporting limit.

Source: USC baseline data in Kanouse and Zutz (2017).

SPECTACLE CREEK AND LAKES

Water Quality

Coeur staff sampled water in Upper (Site 6) and Lower (Site 7) Spectacle Lakes once per month August–November (Figure 4). Several element concentrations increased over time at both sites, while others were not detected (Table 15).

Though fish do not occur in the Spectacle Lakes and dissolved oxygen and pH profiles differ from those documented in Slate Lakes, the Spectacle Lakes may provide rearing habitat for resident fish, if access was created. Kline (2005) found the Spectacle Lakes became depleted of oxygen below 3–6 m seasonally and had a pH range of 5.5–6.8 as compared to the Slate Lakes which were oxygenated to a depth of 9–12 m and ranged 6.6–7.8 pH.

Table 15.–Spectacle Lakes water quality data, August–November.

Parameter	8/30/2017		9/21/2017		10/12/2017		11/7/2017		Standard
	Site 6	Site 7	Site 6	Site 7	Site 6	Site 7	Site 6	Site 7	
Conductivity (µS/cm)	22.5	16.6	14.6	19.4	23.7	15.3	19.1	14.9	---
Dissolved oxygen (mg/L)	8.03	10.25	7.37	6.41	7.54	8.19	9.20	7.64	---
pH (s.u.)	7.13	7.57	7.29	7.06	7.28	7.62	6.96	7.21	---
Temperature (°C)	13.5	13.4	12.2	12.3	8.5	8.1	1.2	1.5	---
Ammonia as nitrogen (mg/L)	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	---
Chloride (mg/L)	< 1.0	< 1.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	---
Chlorine (mg/L)	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	---
Color (color units)	80	70.0	90	80	90	90	80	90	---
Hardness as CaCO ₃ (mg/L)	15.2	11.2	13.4	10.6	17.1	11.5	18.4	12.7	12.4
Nitrate as nitrogen (mg/L)	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	---
Solids, total dissolved (mg/L)	20	15	43	37	23.5	26.0	35	20	---
Solids, total suspended (mg/L)	< 5.0	< 5.0	7.6	4.0	< 4.0	< 4.0	51.6	< 4.0	---
Sulfate (mg/L)	2.91	2.30	0.90	0.39	1.29	0.49	3.87	0.58	---
Turbidity (NTU)	0.46	0.59	3.22	1.22	0.76	0.53	13.0	2.29	---
Al, total (µg/L)	49.7	64.1	62.1	101	64.9	80.3	170	77.1	87
Cd, total (µg/L)	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	---
Cu, total (µg/L)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	---
Fe, total (µg/L)	165	132	178	189	274	214	1590	501	1,000
Hg, total (ng/L)	1.5	1.5	2.2	2.2	2.2	2.4	2.7	1.5	1.2
Mn, total (µg/L)	4.7	6.2	6.6	9.0	38.6	14.2	142	32.4	50
Ni, total (µg/L)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	---
Pb, total (µg/L)	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	0.28	< 0.16	---
Se, total (µg/L)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	---
Zn, total (µg/L)	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	---

Note: Concentrations undetected are reported as less than method reporting limit.

Discharge

We measured Spectacle Creek discharge at the Lower Spectacle Lake outlet, where the stream crosses the Jualin Road, and near the mouth at the Lace River (Figure 4; Table 16). Discharges ranged 0.3–0.6 ft³/s at the lake outlet during our sampling period. We observed 1 tributary between the lake outlet and the road, and 5 tributaries between the road and the mouth. Based on measurements taken at all sites on the same day, we found lake discharge comprises on average 75% of the discharge present at the road and 23% of the discharge present at the mouth. Based on these relationships, the estimated discharge expected at the road and the mouth during our sampling period would have been 0.37–0.80 ft³/s and 1.29–2.58 ft³/s.

Table 16.–Spectacle Creek discharge measurements.

Date	Discharge (ft ³ /s)		
	Lake outlet	Road	Mouth
09/21/17	0.30	0.44	1.29
10/11/17	0.60	0.80 ^a	2.58 ^a
11/02/17	0.30	0.37	1.29 ^a

^a Values are estimates based on the relationships observed on September 21 and November 2, 2017.

Fish Presence and Habitat

Spectacle Creek originates at the southeast corner of Lower Spectacle Lake and flows down a bedrock chute for 540 m at an average gradient of 30%.ⁱ Gradient decreases to about 5% through 110 m of fish habitat upstream of the Jualin Road, though no fish are present as the road culvert^j blocks upstream fish passage (Figure 18). Below the road, the stream meanders at 3–5% gradient for 460 m then enters a 130 m canyon with several fish migration barriers before the final 230 m reach, which is characterized by cobble and boulder step pools and 3–15% gradient.

Though we did not find a barrier to upstream fish migration in the lower 230 m of the creek, we captured resident fish and no anadromous fish. During our single survey on September 21, we observed salmon redds in the Lace River near the Spectacle Creek confluence, but none in the 5 m of spawning gravel present at the Spectacle Creek mouth. We electrofished the creek and captured 30 cutthroat trout (40–170 mm; Figure 19) downstream of the canyon reach. Between the canyon reach and Jualin Road we captured 3 cutthroat trout (65–130 mm) and 3 Dolly Varden char (105–140 mm; Figure 20).

In Upper and Lower Spectacle Lake minnow traps we captured predacious diving beetles *Coleoptera* sp. and no fish (Figure 21). We observed seeps entering both lakes that would not provide Dolly Varden char rearing or spawning habitat and an outlet channel with less than 1 m of sandy substrate prior to its cascade down the hillside. We observed aging beaver dams at the outlet and no fresh sign of beaver activity on the lakes. These observations are consistent with those reported by Kline (2005).

ⁱ We used spatial data collected during the survey and ArcGIS software to approximate distances and gradients since we did not survey the Spectacle Creek drainage in 50 m reaches measured with a tape.

^j 1.2 m diameter, 12 m long, smooth-wall culvert at 6% gradient and backwatered 3 m during low flow.

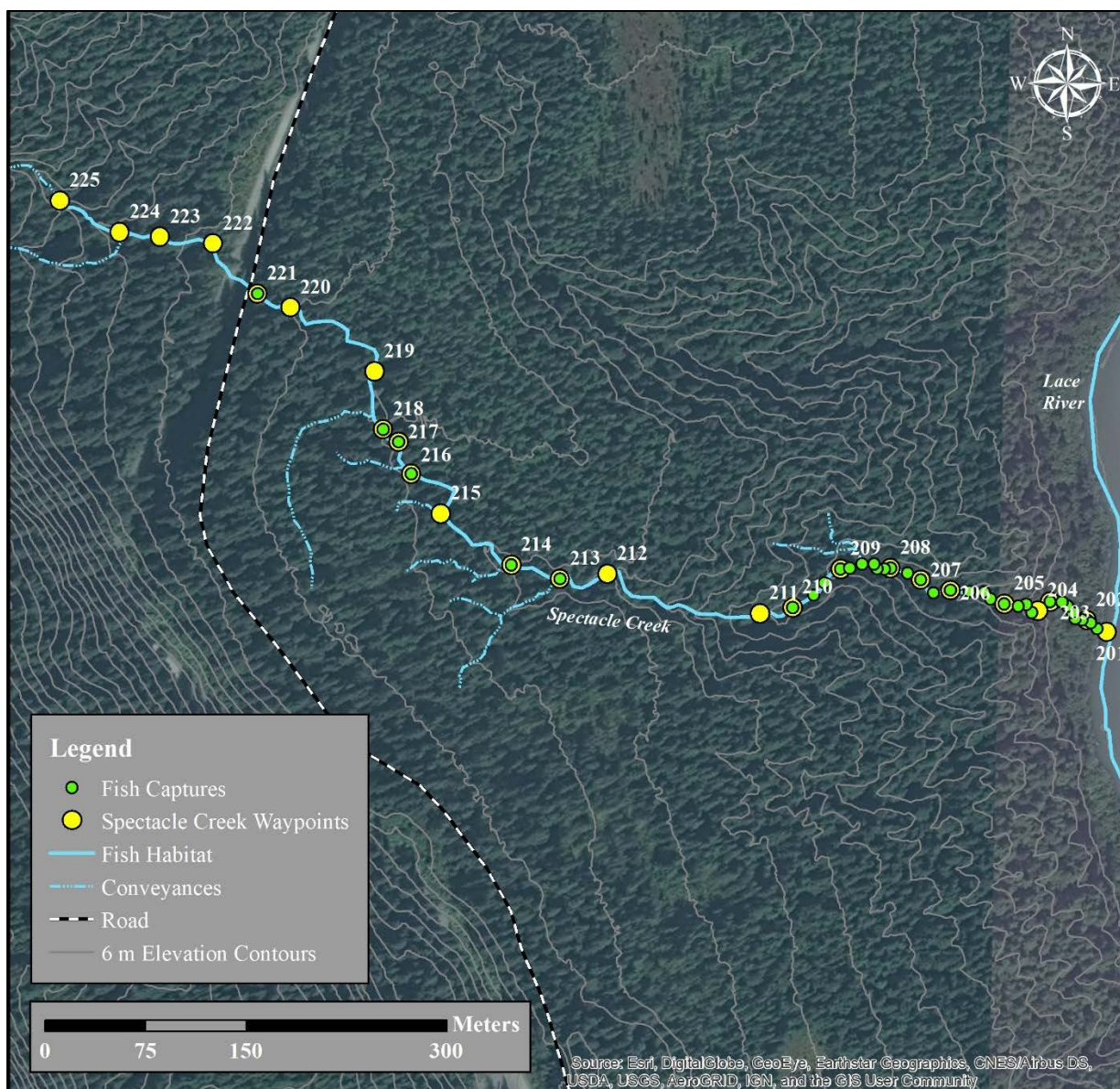


Figure 18.—Spectacle Creek fish captures.



Figure 19.—115 mm cutthroat trout.



Figure 20.—110 mm Dolly Varden char.

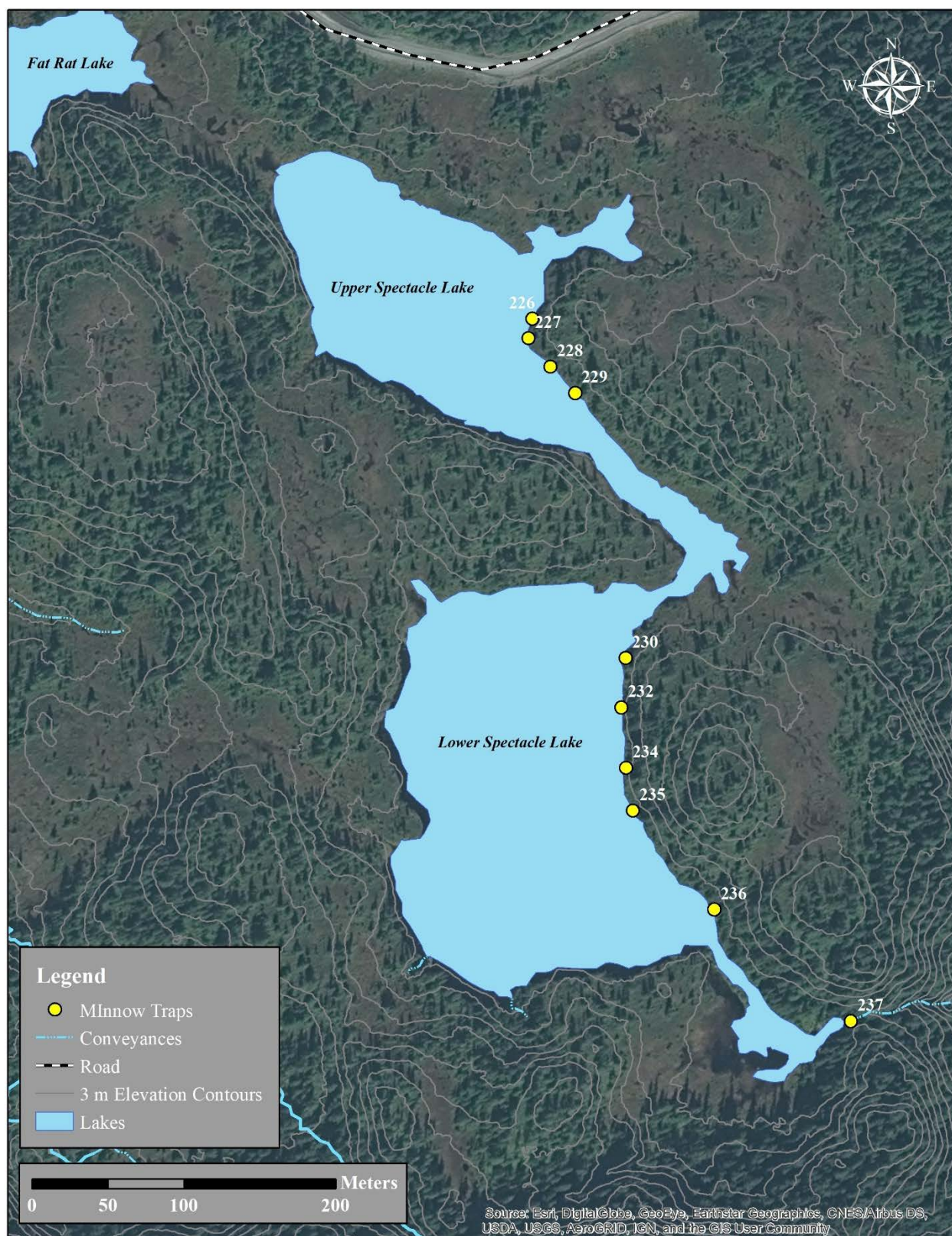


Figure 21.—Spectacle Lakes trapping locations.

TAILINGS TREATMENT FACILITY

Water Quality

Coeur Staff sampled water at 2 locations (Sites 4 and 5) in the TTF once per month August–November (Figure 4). We observed no consistent trends in concentrations of elements over time (Table 17; Appendix A).

Table 17.—TTF water quality data, August–November.

Parameter	8/30/2017		9/20/2017		10/12/2017		11/7/2017		Standard
	Site 4	Site 5	Site 4	Site 5	Site 4	Site 5	Site 4	Site 5	
Conductivity (µS/cm)	794	803	731	729	652	656	576	581	---
Dissolved oxygen (mg/L)	8.78	9.00	9.18	7.12	8.07	7.46	9.98	9.93	---
pH (s.u.)	7.42	7.26	7.75	7.6	7.88	7.91	6.97	6.55	---
Temperature (°C)	14.4	14.7	14.4	14.1	10.1	10.1	4.8	5.1	---
Ammonia as nitrogen (mg/L)	2.71	2.67	2.51	2.46	2.17	2.39	2.22	2.22	---
Chloride (mg/L)	7.1	7.0	6.6	6.5	6.3	6.7	6.5	6.6	---
Chlorine (mg/L)	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	---
Color (color units)	< 5.0	< 5.0	5.0	5.0	5.0	10.0	< 5.0	< 5.0	---
Hardness as CaCO ₃ (mg/L)	416	411	428	406	398	429	397	400	12.4
Nitrate as nitrogen (mg/L)	8.64	8.48	7.91	7.64	7.32	7.86	7.85	7.93	---
Solids, total dissolved (mg/L)	725	720	704	690	657	689	663	655	---
Solids, total suspended (mg/L)	6.5	5.5	13.8	12.8	8.6	6.4	9.2	8.8	---
Sulfate (mg/L)	454	440	425	417	402	408	368	381	---
Turbidity (NTU)	5.77	3.96	7.48	3.01	5.59	4.60	7.33	6.78	---
Al, total (µg/L)	107	108	352	95.7	103	168	106	120	87
Cd, total (µg/L)	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	< 0.020	0.022	---
Cu, total (µg/L)	< 1.0	< 1.0	3.5	1.0	1.1	< 1.0	< 1.0	< 1.0	---
Fe, total (µg/L)	121	111	854	108	172	197	200	244	1,000
Hg, total (ng/L)	< 1.0	1.0	2.8	2.1	2.2	1.4	< 1.0	< 1.0	1.2
Mn, total (µg/L)	148	148	198	211	176	200	164	192	50
Ni, total (µg/L)	1.1	1.0	1.7	1.2	<1.0	1.1	< 1.0	1.1	---
Pb, total (µg/L)	< 0.16	< 0.16	0.36	< 0.16	< 0.16	< 0.16	< 0.16	< 0.16	---
Se, total (µg/L)	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	---
Zn, total (µg/L)	< 2.5	< 2.5	3.4	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	---

Note: Concentrations undetected are reported as less than method reporting limit.

HABITAT MITIGATION OPPORTUNITIES

Upper Slate Creek Delta

The delta at the mouth of Upper Slate Creek is a deposition zone that provides high quality Dolly Varden char spawning habitat in the stream and on the subaqueous delta (Figure 22). Constructing a similar delta at the potential new stream mouth, after flooding, could replace the submerged habitat. Conceptually, the delta could be constructed with alluvium and gravel from the stream before flooding and be about 2,000 m² with a maximum fill depth of about 2.3 m. Constructing the delta so the new Upper Slate Lake water level joins the main stem and Tributaries 1 and 2 separately would create 3 independent deposition zones and maximize the area of lake shore and creek spawning habitat created. Depending on channel design, a delta of this size could provide 100–150 m of spawning habitat divided among the three tributaries.

South Creek Delta

The South Creek delta differs geomorphically from the Upper Slate Creek delta due to the creek's reduced capacity to transport bed load. Subsequently, South Creek empties into the lake in a narrow channel that transitions from a shallow sand and gravel bottom to a deep organic bottom with no subaqueous delta. Constructing a low gradient bench at the new stream mouth, before flooding, could replace the submerged habitat (Figure 23). Conceptually, this feature could be constructed with alluvium and gravel from the stream before flooding and be about 2,000 m² in size with a maximum fill depth of about 7 m.

Constructing the delta so the new Upper Slate Lake water level joins with South Creek and Fat Rat Creek separately would create 2 channels smaller than the existing single channel. Spawning habitat value may be maximized by first diverting Fat Rat Creek into South Creek, discussed below, to maintain a wider and deeper single channel through the delta. Depending on channel design, a delta of this size could provide 50–100 m of spawning habitat.

South Creek Culvert Replacement

Replacing the twin smooth-wall 46 cm culverts under the TTF access road with a structure that provides upstream Dolly Varden char passage would restore fish access to 1,092 m of habitat upstream of the TTF access road that was blocked at construction (Figure 24).

Fat Rat Creek Culvert Replacement

Replacing the twin 46 cm smooth-walled culverts on Fat Rat Creek with a structure that provides fish passage would provide little benefit to fish. The 370 m of stream above the TTF access road provides marginal rearing habitat due to low stream flow, a paucity of pools, and mean gradients greater than 20% beginning at its confluence with South Creek and continuing for at least 80 m upstream of the road (Figure 24).

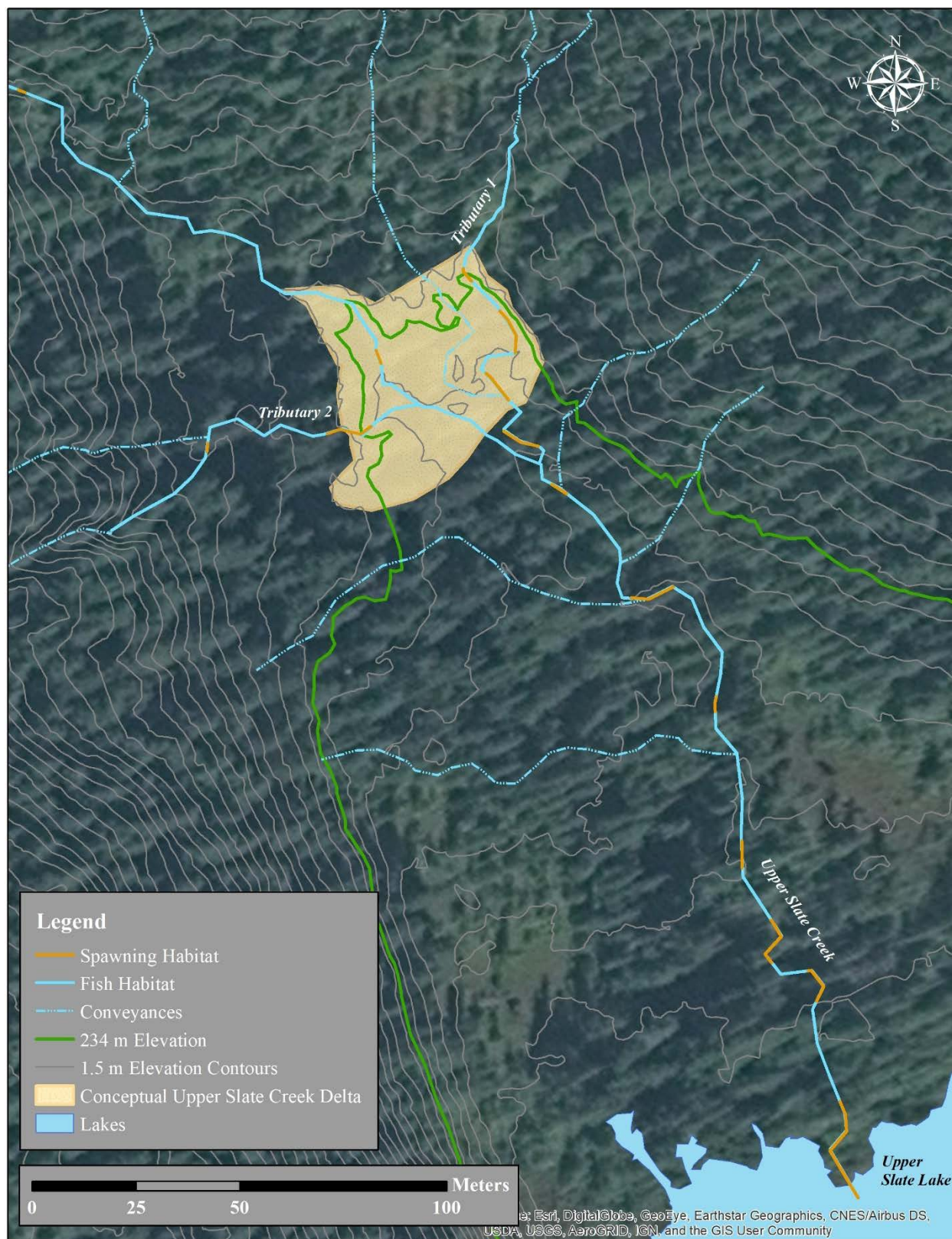


Figure 22.—Conceptual Upper Slate Creek delta.

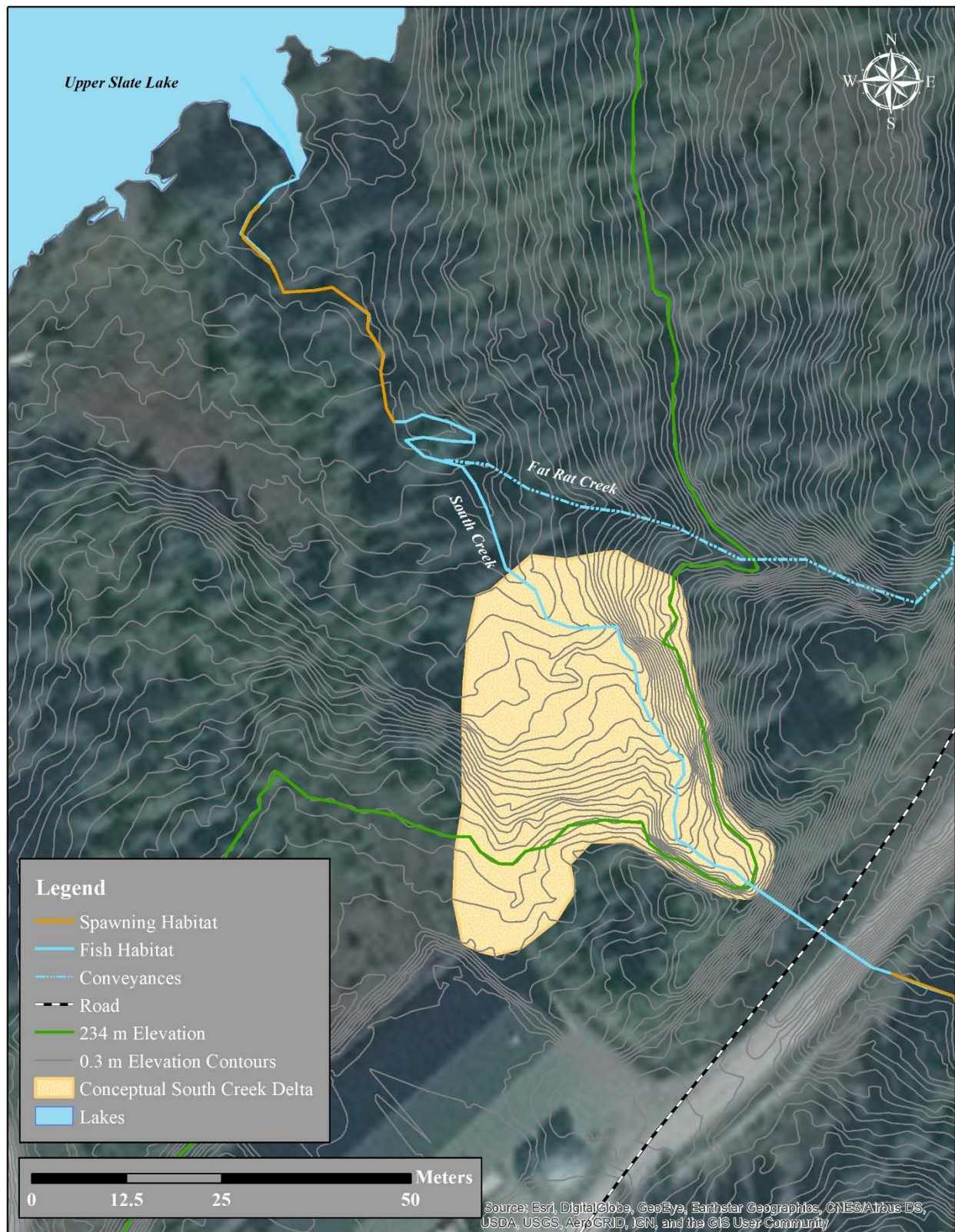


Figure 23.—Conceptual South Creek delta.

Fat Rat Creek Reroute

Fat Rat Creek is fed by groundwater and overflow from Fat Rat Lake during heavy rain (Figure 24; Appendix F). It contributes about 41% of the total discharge measured at the mouth of South Creek. Rerouting the creek to join South Creek upstream of the flooded reach would create a wider and deeper channel at the new stream mouth and improve spawning habitat in the downstream 1–3% gradient reach by increasing water depth for larger spawning fish.

Based on field observations and LIDAR data, the creek could be intercepted 220 m upstream of the TTF access road and rerouted to enter South Creek at either 120 or 170 m upstream of the road. The reroute would require constructing a 130 m channel through a 2 m tall saddle, continuing down a natural valley and joining existing drainages to South Creek about 120 m upstream of the culvert, or into Tributary 2 which joins South Creek 170 m upstream of the road. Rerouting Fat Rat Creek to Tributary 2 would benefit fish by increasing flow over 95 additional m of fish habitat in South Creek and Tributary 2, though earthwork would be required to direct flow beyond the natural depression.

Spectacle Creek Reroute

Alternative 1

Diverting Spectacle Creek to South Creek could be accomplished by constructing^k a 140 m channel through the saddle on the southwest corner of Lower Spectacle Lake that rises about 12 m above the lake surface (Figure 24; Appendix F).

Diverting Spectacle Creek would more than double the fall^l discharge in South Creek. In the short term, there would be increased bank and bed scour as the channel adjusts, with a potential long term result being a deeper creek capable of recruiting and transporting larger substrate downstream. Increased water depth may improve rearing fish capacity and provide more spawning habitat for larger lake fish that may otherwise avoid the creek due to shallow depths, contingent on providing fish passage across the road. Though it is difficult to speculate how the additional flow would affect the 215 m of spawning habitat currently available, average gradients are low such that we can expect similar patterns of scour and deposition. The channel could be constructed to create access to the Spectacle Lakes; though Kline (2005) documented oxygen and pH levels differing from the Slate Lakes, it is possible Spectacle Lakes could provide additional fish rearing habitat.

The effect of removing 23% of the flow from Spectacle Creek would be dewatering^m 273 m of resident fish habitatⁿ upstream of the first major tributary with a lessening effect over the next 230 m downstream as 5 tributaries, comprising the remaining 77% of flow in the drainage, enter upstream of the canyon reach (Figures 4, 25).

^k Which may require geotechnical testing for acid-generating rock.

^l Due to our fall sampling period, we have no data to assess relative seasonal flow contribution.

^m Discharge measurements indicate 25% of the flow measured downstream of the road enters the creek from tributaries or groundwater upstream of that point, though no flowing sources were identified during surveys and discharge measurements.

ⁿ Of the 273 m of habitat in this reach, 87 m of rearing only and 23 m of rearing and spawning habitat occur upstream of the road culvert, and 140 m of rearing only and 23 m of rearing and spawning habitat occur downstream of the road culvert.

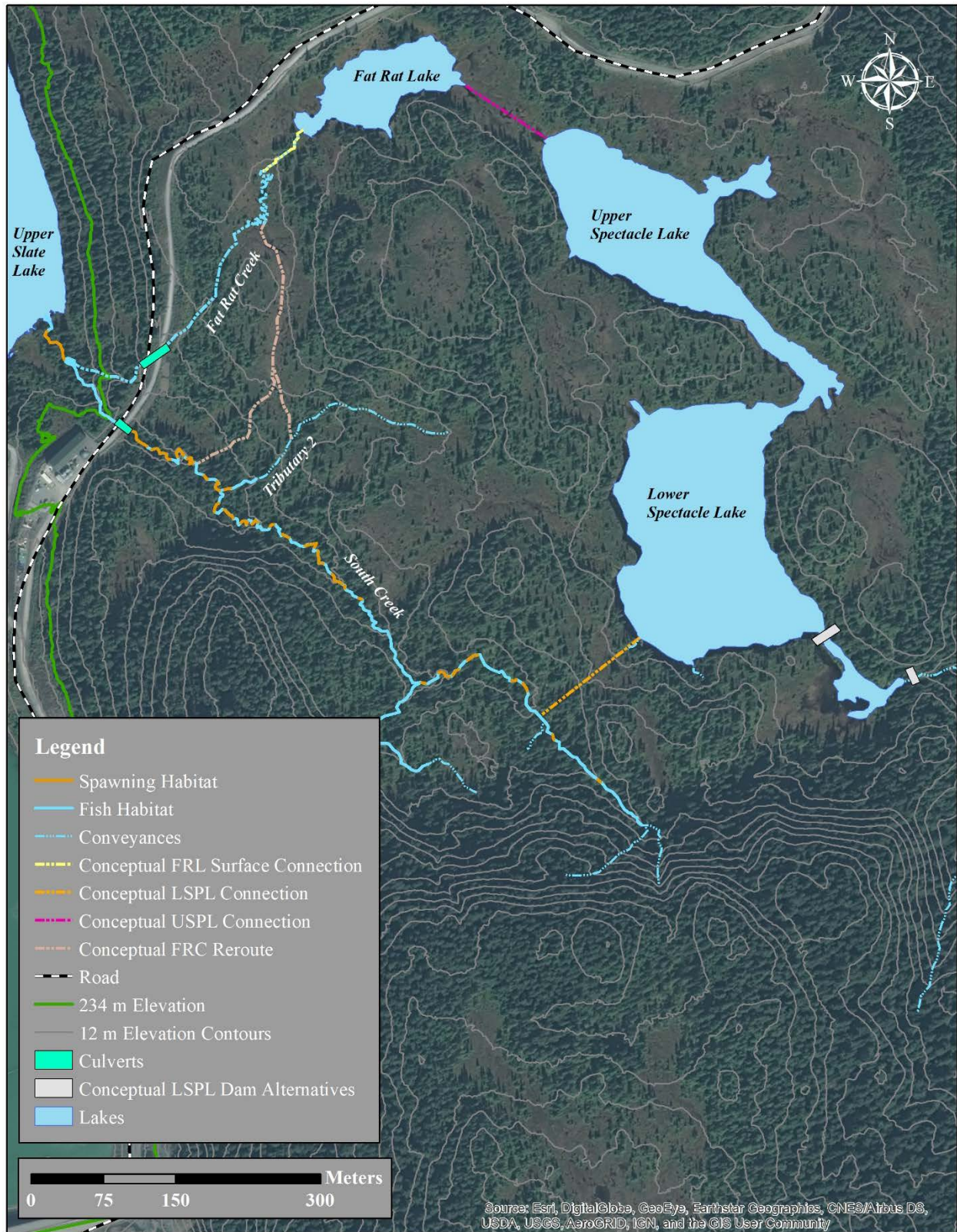


Figure 24.—South Creek habitat improvement opportunities.

We observed 1 Dolly Varden char in the 163 m reach below the road that would be dewatered, and no fish upstream of the road due to a culvert that prevents upstream fish passage. We observed 23 m of spawning habitat upstream of the road and 23 m within 163 m below the road. Downstream of the canyon reach, where we observed greater fish density and 5 m of spawning gravel potentially available to anadromous fish, 77% of the stream flow would remain^o and support fish and fish habitat. Should this potential diversion opportunity be investigated further, year-round flow contributions should be measured and consideration must be given to the potential effect of beaver activity in Spectacle Lakes. A dam at one of two points in the existing Spectacle Creek outlet channel may need to be constructed to dissuade beaver influence (Figure 24).

Alternative 2

Diverting Spectacle Creek to South Creek could also be accomplished by constructing a 100 m channel from the northwest corner of Upper Spectacle Lake through a 2 m tall saddle and into Fat Rat Lake (Figure 24, Appendix F). According to LIDAR data, Fat Rat Lake is 0.6 m higher in elevation than the Spectacle Lakes. To achieve diversion, the outlet of Fat Rat Lake would need to be lowered at least 0.6 m. Depending on channel construction, upstream access by fish to the lakes could be created.

In contrast to the diversion from Lower Spectacle Creek, this option would only increase discharge in the lower 120–215 m of South Creek and would result in reduced depth and area of Fat Rat Lake. Similar consideration of beaver activity would apply.

Spectacle Creek Culvert

Replacing the Spectacle Creek Culvert would restore access to 110 m of rearing and spawning fish habitat eliminated during Jualin Road construction (Figure 25). Though backwatered at the outlet, this 12 m long, 1.2 m diameter smooth-wall culvert has a 6% gradient and does not afford upstream fish passage. Replacing the culvert with one designed to pass fish would restore access to 110 m of resident fish habitat upstream, including 23 m of spawning habitat. However, if Spectacle Creek is diverted to South Creek, low stream flow would not support fish and fish habitat upstream of the culvert, eliminating the opportunity.

^o Assuming the flow relationship we observed in fall is similar year-round.

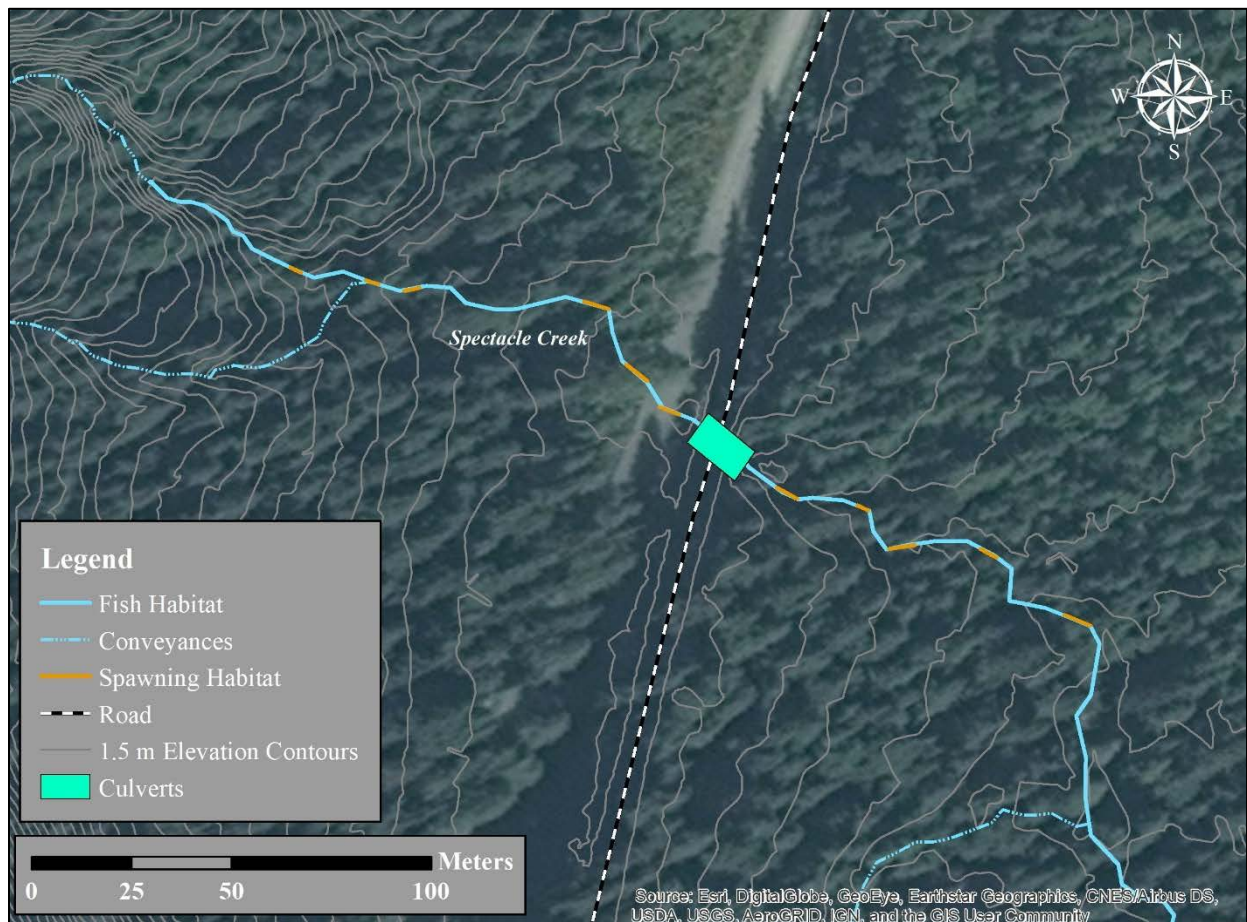


Figure 25.—Spectacle Creek culvert and surrounding spawning habitat.

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APPENDIX A: WATER QUALITY LAB REPORTS



ALS Environmental
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September 18, 2017

Analytical Report for Service Request No: K1709179

Peter Strow
Coeur Alaska, Inc.
3031 Clinton Drive, Suite 202
Juneau, AK 99801

RE: TTF Fish Resource Investigations

Dear Peter,

Enclosed are the results of the sample(s) submitted to our laboratory August 31, 2017
For your reference, these analyses have been assigned our service request number **K1709179**.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Mark Harris

Mark Harris
Project Manager



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Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated value.
- U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
- DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.
- H The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

- # The control limit criteria is not applicable. See case narrative.
- J The result is an estimated value.
- E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See case narrative.
- S The reported value was determined by the Method of Standard Additions (MSA).
- U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
- DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- + The correlation coefficient for the MSA is less than 0.995.
- Q See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- A A tentatively identified compound, a suspected aldo- condensation product.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
- D The reported result is from a dilution.
- E The result is an estimated value.
- J The result is an estimated value.
- N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
- P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
- U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
- DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

- F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
- L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
- H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
- O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
- Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
- Z The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses



Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/capproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsys/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certific/lab/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L14-51
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pilabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon - DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.alsglobal.com or at the accreditation bodies web site.

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/analyte is offered by that state.

Case Narrative

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577- 7222 Fax (360)636- 1068
www.alsglobal.com

ALS ENVIRONMENTAL



Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request No.: K1709179
Date Received: 08/31/17

Case Narrative

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), and Matrix/Duplicate Matrix Spike (MS/DMS).

Sample Receipt

Seven water samples were received for analysis at ALS Environmental on 08/31/17. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4°C upon receipt at the laboratory.

General Chemistry Parameters

Chloride by EPA Method 300.0:

The matrix spike recovery for sample Batch QC was outside control criteria because of suspected matrix interference. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control. No further corrective action was taken.

Total Suspended Solids by Standard Method 2540 D:

The Relative Percent Difference (RPD) criterion for the replicate analysis in sample Site 5 was not applicable because the analyte concentration was not significantly greater than the Method Reporting Limit (MRL). Analytical values derived from measurements close to the detection limit are not subject to the same accuracy and precision criteria as results derived from measurements higher on the calibration range for the method.

No other anomalies associated with the analysis of these samples were observed.

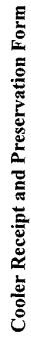
Total and Dissolved Metals

No anomalies associated with the analysis of these samples were observed.

Chain of Custody

Approved by Nee D. Duff

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com



Client: Cover Alaska Service Request **K17**
Received: 8/3/17 Opened: 8/3/17 By: KM Unloaded: 8/3/17 By: 8/3/17

USPS	Fed Ex	UPS	DHL	PDX	Courier	Hand Delivered
Samples were received via? Samples were received in: (circle) Were custody seals on coolers? If present, were custody seals intact?	(Cooler) NA Y Y	Box N N N	Envelope Other 1 Side	If yes, how many and where? If present, were they signed and dated?	NA	Y

[illegible]

1. Packing material: Inserts Baggies Bubble Wrap Gel Packs Wet Ice Dry Ice Sleeves

Were custody papers properly filled out (ink, signed, etc.)?

Were samples received in good condition (temperature, unbroken)? Indicate in the table below.

If applicable, tissue samples were received:

Were all sample labels complete (i.e. analysis, preservation, etc.)?

. Did all sample labels and tags agree with custody papers? Indicate major discrepancies in the table on page 2.

Were appropriate bottles/containers and volumes received for the tests indicated?

2. Were the pH-preserved bottles (see SMO GEN SOP) received at the appropriate pH? Indicate in the table below

! Were VOA vials received without headspace? Indicate in the table below:

l. were VOA vials received

[illegible][illegible]

ates, Discrepancies, & Resolutions:

SHORT HOLD TIME

7/25/16

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Page 10 of 87

CHAIN OF CUSTODY/TRANSMITTAL RECORD

COEUR
ALASKA
KENSINGTON GOLD MINE

[illegible]

U:\ENV\8.0 EPA\8.1 NPDES 05\8.1.11 Forms\Forms\Chains of Custody

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ALS Group USA, Corp.
d/b/a ALS Environmental
Analytical Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 180.1
Prep Method: None

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Units: NTU
Basis: NA

Turbidity

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1709179-001	0.34	0.10	1	08/31/17 12:00	
Site 2	K1709179-002	0.35	0.10	1	08/31/17 12:00	
Site 3	K1709179-003	0.61	0.10	1	08/31/17 12:00	
Site 4	K1709179-004	5.77	0.10	1	08/31/17 12:00	
Site 5	K1709179-005	3.96	0.10	1	08/31/17 12:00	
Site 6	K1709179-006	0.46	0.10	1	08/31/17 12:00	
Site 7	K1709179-007	0.59	0.10	1	08/31/17 12:00	
Method Blank	K1709179-MB1	ND U	0.10	1	08/31/17 12:00	

General Chemistry

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577- 7222 Fax (360)636- 1068
www.alsglobal.com

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Date Analyzed: 08/31/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Site 1
Lab Code: K1709179-001

Units: NTU
Basis: NA

Duplicate Sample

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1709179-001DUP Result	Average	RPD	RPD Limit
Turbidity	180.1	0.10	0.34	0.34	0.340	<1	20

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Analyzed: 08/31/17
Date Extracted: NA

Lab Control Sample Summary
Turbidity

Analysis Method: 180.1
Prep Method: None

Units: NTU
Basis: NA
Analysis Lot: 560073

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1709179-LCS1	5.91	6.51	91	90-110

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:17-0000435410 rev 00

Superset Reference:17-0000435410 rev 00

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: Method

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Units: mg/L
Basis: NA

Chloride

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Site 1	K1709179-001	1.3	1.0	1	09/01/17 17:05	9/1/17	
Site 2	K1709179-002	1.3	1.0	1	09/01/17 17:16	9/1/17	
Site 3	K1709179-003	ND U	1.0	1	09/01/17 17:26	9/1/17	
Site 4	K1709179-004	7.1	5.0	5	08/31/17 20:34	8/31/17	
Site 5	K1709179-005	7.0	5.0	5	08/31/17 21:15	8/31/17	
Site 6	K1709179-006	ND U	1.0	1	09/01/17 17:46	9/1/17	
Site 7	K1709179-007	ND U	1.0	1	09/01/17 17:56	9/1/17	
Method Blank	K1709179-MB1	ND U	1.0	1	08/31/17 10:32	8/31/17	
Method Blank	K1709179-MB2	ND U	1.0	1	09/01/17 09:26	9/1/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: Method

Service Request: K1709179
Date Collected: NA
Date Received: NA
Units: mg/L
Basis: NA

**Replicate Sample Summary
Chloride**

Sample Name	Lab Code	MRL	Sample Result	Duplicate Result	Average	RPD Limit	RPD	Date Analyzed
Batch QC	K1709188-002DUP	2.0	1.26	ND U	1.27	<1	<1	08/31/17
Batch QC	K1709193-003DUP	2.0	1.81	ND U	1.80	<1	<1	08/31/17
Batch QC	K1709232-002DUP	1.0	ND U	ND U	NC	NC	NC	09/01/17
Batch QC	KQ1712866-01DUP	2.0	ND U	ND U	NC	NC	NC	09/01/17

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Results flagged with a pound (#) indicate the control criteria is not applicable.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1709179
Date Collected: N/A
Date Received: N/A
Date Analyzed: 08/31/17
Date Extracted: 08/31/17

Service Request: K1709179
Date Collected: N/A
Date Received: N/A
Date Analyzed: 09/1/17
Date Extracted: 09/1/17

Duplicate Matrix Spike Summary
Chloride

Sample Name:	Batch QC	Units:	mg/L
Lab Code:	K1709188-002	Basis:	NA
Analysis Method:	300.0		
Prep Method:	Method		
Matrix Spike			
K1709188-002MS			
Sample Result	1.26	Result	8.8
Analyte Name	Chloride	Amount	8.0
		% Rec	94
		% Rec Limits	90-110
		RPD	<1
		Limit	20

Duplicate Matrix Spike Summary
Chloride

Sample Name:	Batch QC	Units:	mg/L
Lab Code:	K1709232-002	Basis:	NA
Analysis Method:	300.0		
Prep Method:	Method		
Matrix Spike			
K1709232-002MS			
Sample Result	NDU	Result	3.8
Analyte Name	Chloride	Amount	4.0
		% Rec	96
		% Rec Limits	90-110
		RPD	<1
		Limit	20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1709179
Date Collected: N/A
Date Received: N/A
Date Analyzed: 08/31/17
Date Extracted: 08/31/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1709179
Date Collected: N/A
Date Received: N/A
Date Analyzed: 09/1/17
Date Extracted: 09/1/17

Duplicate Matrix Spike Summary
Chloride

Sample Name:	Batch QC	Units:	mg/L
Lab Code:	K1709193-003	Basis:	NA
Analysis Method:	300.0		
Prep Method:	Method		
Matrix Spike K1709193-003MS			
Sample Result	1.81	Result	9.3
Analyte Name	Chloride	Amount	8.0
		% Rec	94
		% Rec Limits	90-110
		RPD	<1
		Limit	20

Duplicate Matrix Spike Summary
Chloride

Sample Name:	Batch QC	Units:	mg/L
Lab Code:	KQ1712686-01	Basis:	NA
Analysis Method:	300.0		
Prep Method:	Method		
Matrix Spike KQ1712686-01MS			
Sample Result	NDU	Result	11.0
Analyte Name	Chloride	Amount	10.0
		% Rec	110
		% Rec Limits	90-110
		RPD	1
		Limit	20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Analyzed: 08/31/17
Date Extracted: 08/31/17

Lab Control Sample Summary
Chloride

Analysis Method: 300.0
Prep Method: Method
Units: mg/L
Basis: NA
Analysis Lot: 560851

Sample Name Lab Control Sample	Lab Code K1709179-LCS1	Result 4.9	Spike Amount 5.0	% Rec 99	% Rec Limits 90-110
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Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Analyzed: 09/01/17
Date Extracted: 09/01/17

Lab Control Sample Summary
Chloride

Analysis Method: 300.0
Prep Method: Method
Units: mg/L
Basis: NA
Analysis Lot: 560305

Sample Name Lab Control Sample	Lab Code K1709179-LCS2	Result 4.9	Spike Amount 5.0	% Rec 99	% Rec Limits 90-110
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Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: Method

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Units: mg/L
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: Method
Service Request: K1709179
Date Collected: NA
Date Received: NA
Units: mg/L
Basis: NA

Nitrate as Nitrogen

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Site 1	K1709179-001	ND U	0.10	2	08/31/17 19:43	8/31/17	
Site 2	K1709179-002	ND U	0.10	2	08/31/17 20:14	8/31/17	
Site 3	K1709179-003	ND U	0.10	2	08/31/17 20:24	8/31/17	
Site 4	K1709179-004	8.64	0.25	5	08/31/17 20:34	8/31/17	
Site 5	K1709179-005	8.48	0.25	5	08/31/17 21:15	8/31/17	
Site 6	K1709179-006	ND U	0.10	2	08/31/17 21:25	8/31/17	
Site 7	K1709179-007	ND U	0.10	2	08/31/17 20:45	8/31/17	
Method Blank	K1709179-MB1	ND U	0.050	1	08/31/17 10:32	8/31/17	

Replicate Sample Summary
Nitrate as Nitrogen

Sample Name	Lab Code	MRL	Sample Result	Duplicate Result	Average	RPD Limit	Date Analyzed
Batch QC	K1709188-002DUP	0.10	ND U	ND U	NC	20	08/31/17
Batch QC	K1709193-003DUP	0.10	0.32	0.32	0.316	<1	08/31/17

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:17-0000435410 rev 00

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1709179
Date Collected: N/A
Date Received: N/A
Date Analyzed: 08/31/17
Date Extracted: 08/31/17

Duplicate Matrix Spike Summary
Nitrate as Nitrogen

Sample Name:	Batch QC	Units:	mg/L
Lab Code:	K1709188-002	Basis:	NA
Analysis Method:	300.0		
Prep Method:	Method		
Matrix Spike K1709188-002MS			
Analyte Name	Sample	Spike	% Rec
Nitrate as Nitrogen	Result	Amount	Limits
	ND U	8.44	106
		8.48	90-110
			RPD
			Limit
			20

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Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:17-0000435410 rev 00

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1709179
Date Collected: N/A
Date Received: N/A
Date Analyzed: 08/31/17
Date Extracted: 08/31/17

Duplicate Matrix Spike Summary
Nitrate as Nitrogen

Sample Name:	Batch QC	Units:	mg/L
Lab Code:	K1709193-003	Basis:	NA
Analysis Method:	300.0		
Prep Method:	Method		
Matrix Spike K1709193-003MS			
Analyte Name	Sample	Spike	% Rec
Nitrate as Nitrogen	Result	Amount	Limits
	0.32	8.74	106
		8.78	90-110
			RPD
			Limit
			20

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Results flagged with a pound (#) indicate the control criteria is not applicable.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:17-0000435410 rev 00

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Analyzed: 08/31/17
Date Extracted: 08/31/17

Lab Control Sample Summary
Nitrate as Nitrogen

Analysis Method: 300.0
Prep Method: Method

Units: mg/L
Basis: NA
Analysis Lot: 560851

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1709179-LCS1	2.36	2.50	95	90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: Method

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Units: mg/L
Basis: NA

Sulfate

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Site 1	K1709179-001	2.58	0.20	2	08/31/17 19:43	8/31/17	
Site 2	K1709179-002	2.52	0.20	2	08/31/17 20:14	8/31/17	
Site 3	K1709179-003	4.55	0.20	2	08/31/17 20:24	8/31/17	
Site 4	K1709179-004	454	10	100	09/01/17 17:36	9/1/17	
Site 5	K1709179-005	440	10	100	08/31/17 20:55	8/31/17	
Site 6	K1709179-006	2.91	0.20	2	08/31/17 21:25	8/31/17	
Site 7	K1709179-007	2.30	0.20	2	08/31/17 20:45	8/31/17	
Method Blank	K1709179-MB1	ND U	0.10	1	08/31/17 10:32	8/31/17	
Method Blank	K1709179-MB2	ND U	0.10	1	09/01/17 09:26	9/1/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Analyzed: 08/31/17
Date Extracted: 08/31/17

Lab Control Sample Summary
Sulfate

Analysis Method: 300.0
Prep Method: Method
Units: mg/L
Basis: NA
Analysis Lot: 560851

Sample Name Lab Control Sample
Lab Code K1709179-LCS1
Result 5.13
Spike Amount 5.00
% Rec 103
% Rec Limits 90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Analyzed: 09/01/17
Date Extracted: 09/01/17

Lab Control Sample Summary
Sulfate

Analysis Method: 300.0
Prep Method: Method
Units: mg/L
Basis: NA
Analysis Lot: 560305

Sample Name Lab Control Sample
Lab Code K1709179-LCS2
Result 5.18
Spike Amount 5.00
% Rec 104
% Rec Limits 90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2120 B
Prep Method: None

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Units: ColorUnits
Basis: NA

Color

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1709179-001	70.0	5.0	1	08/31/17 13:42	
Site 2	K1709179-002	70	10	2	08/31/17 13:45	
Site 3	K1709179-003	140	5.0	1	08/31/17 13:55	
Site 4	K1709179-004	ND U	5.0	1	08/31/17 14:03	
Site 5	K1709179-005	ND U	5.0	1	08/31/17 14:08	
Site 6	K1709179-006	80	10	2	08/31/17 14:32	
Site 7	K1709179-007	70.0	5.0	1	08/31/17 14:48	
Method Blank	K1709179-MB1	ND U	5.0	1	08/31/17 13:38	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Date Analyzed: 08/31/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Site 1
Lab Code: K1709179-001

Units: ColorUnits
Basis: NA

Analyte Name	Analysis Method	MRL	Sample Result	Average	RPD	RPD Limit
Color	SM 2120 B	5.0	70.0	70.0	<1	20
			Duplicate Sample K1709179-001DUP Result	70.0		

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Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Analyzed: 08/31/17
Date Extracted: NA

Lab Control Sample Summary
Color

Analysis Method: SM 2120 B
Prep Method: None

Units: Color/Units
Basis: NA
Analysis Lot: 560007

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1709179-LCS1	15.0	15.0	100	85-115

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2540 C
Prep Method: None

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Units: mg/L
Basis: NA

Solids, Total Dissolved

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1709179-001	95	10	1	09/05/17 20:45	
Site 2	K1709179-002	105	10	1	09/05/17 20:45	
Site 3	K1709179-003	42	10	1	09/06/17 19:45	
Site 4	K1709179-004	715	10	1	09/06/17 19:45	
Site 5	K1709179-005	720	10	1	09/06/17 19:45	
Site 6	K1709179-006	20	10	1	09/06/17 19:45	
Site 7	K1709179-007	15	10	1	09/06/17 19:45	
Method Blank	K1709179-MB2	ND U	10	1	09/05/17 20:45	
Method Blank	K1709179-MB5	ND U	10	1	09/06/17 19:45	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2540 C
Prep Method: None

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17

Units: mg/L
Basis: NA

Replicate Sample Summary
Solids, Total Dissolved

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Batch QC	K1709144-002DUP	10	430	420	425	2	10	09/05/17
Site 1	K1709179-001DUP	10	95	97	96.0	2	10	09/05/17
Site 4	K1709179-004DUP	10	715	735	725	3	10	09/06/17
Batch QC	K1709232-001DUP	10	1240	1260	1250	2	10	09/06/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2540 C
Prep Method: None

Service Request: K1709179
Date Analyzed: 09/05/17
Date Extracted: NA

Units: mg/L
Basis: NA
Analysis Lot: 560404

Lab Control Sample Summary
Solids, Total Dissolved

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1709179-LCS1	1640	1640	100	85-115

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Printed 9/15/2017 5:15:29 PM

Superset Reference:17-0000435410 rev 00

Printed 9/15/2017 5:15:29 PM

Superset Reference:17-0000435410 rev 00

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Analyzed: 09/06/17
Date Extracted: NA

Lab Control Sample Summary
Solids, Total Dissolved

Analysis Method: SM 2540 C
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 560600

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1709179-LCS2	1610	1640	98	85-115

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2540 D
Prep Method: None

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Units: mg/L
Basis: NA

Solids, Total Suspended (TSS)

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1709179-001	ND U	5.0	1	09/06/17 17:30	
Site 2	K1709179-002	ND U	5.0	1	09/06/17 17:30	
Site 3	K1709179-003	ND U	5.0	1	09/06/17 17:30	
Site 4	K1709179-004	6.5	5.0	1	09/06/17 17:30	
Site 5	K1709179-005	6.0	5.0	1	09/06/17 17:30	
Site 6	K1709179-006	ND U	5.0	1	09/06/17 17:30	
Site 7	K1709179-007	ND U	5.0	1	09/06/17 17:30	
Method Blank	K1709179-MB2	ND U	4.0	1	09/06/17 17:30	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Date Analyzed: 09/06/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Site 5
Lab Code: K1709179-005

Units: mg/L
Basis: NA

Duplicate
Sample

K1709179-
005DUP

Analyte Name	Analysis Method	MRL	Sample Result	Average	RPD	RPD Limit
Solids, Total Suspended (TSS)	SM 2540 D	5.0	6.0	5.50	18 *	10

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Analyzed: 09/06/17
Date Extracted: NA

Lab Control Sample Summary
Solids, Total Suspended (TSS)

Analysis Method: SM 2540 D
Prep Method: None
Units: mg/L
Basis: NA
Analysis Lot: 560599

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1709179-LCS1	402	429	94	85-115

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Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Printed 9/15/2017 5:15:29 PM

Superset Reference:17-0000435410 rev 00

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 4500-Cl G
Prep Method: None

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Units: mg/L
Basis: NA

Chlorine, Total Residual

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1709179-001	ND U	0.050	1	08/31/17 12:25	H
Site 2	K1709179-002	ND U	0.050	1	08/31/17 12:25	H
Site 3	K1709179-003	ND U	0.050	1	08/31/17 12:25	H
Site 4	K1709179-004	ND U	0.050	1	08/31/17 12:25	H
Site 5	K1709179-005	ND U	0.050	1	08/31/17 12:25	H
Site 6	K1709179-006	ND U	0.050	1	08/31/17 12:25	H
Site 7	K1709179-007	ND U	0.050	1	08/31/17 12:25	H
Method Blank	K1709179-MB1	ND U	0.050	1	08/31/17 12:25	
Method Blank	K1709179-MB2	ND U	0.050	1	08/31/17 12:25	
Method Blank	K1709179-MB3	ND U	0.050	1	08/31/17 12:25	
Method Blank	K1709179-MB4	ND U	0.050	1	08/31/17 12:25	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Date Analyzed: 08/31/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Site 1
Lab Code: K1709179-001

Units: mg/L
Basis: NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1709179-001DUP Result	Average	RPD	RPD Limit
Chlorine, Total Residual	SM 4500-Cl G	0.050	ND U	ND U	NC	NC	20

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Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Collected: 08/30/17
Date Analyzed: 08/31/17
Date Extracted: 08/31/17
NA

Matrix Spike Summary
Chlorine, Total Residual

Sample Name: Site 1
Lab Code: K1709179-001
Analysis Method: SM 4500-Cl G
Prep Method: None

Units: mg/L
Basis: NA

Matrix Spike
K1709179-001MS

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Chlorine, Total Residual	ND U	0.960	1.00	96	21-141

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Analyzed: 08/31/17
Date Extracted: NA

Lab Control Sample Summary
Chlorine, Total Residual

Analysis Method: SM 4500-Cl G
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 560077

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1709179-LCS1	1.04	1.00	104	78-116
Lab Control Sample	K1709179-LCS2	1.00	1.00	100	78-116
Lab Control Sample	K1709179-LCS3	0.970	1.00	97	78-116
Lab Control Sample	K1709179-LCS4	0.990	1.00	99	78-116

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 4500-NH3 G
Prep Method: Method

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Units: mg/L
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 4500-NH3 G
Prep Method: Method
Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Units: mg/L
Basis: NA

Ammonia as Nitrogen

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Site 1	K1709179-001	ND U	0.10	1	09/13/17 16:30	9/13/17	
Site 2	K1709179-002	ND U	0.10	1	09/13/17 16:30	9/13/17	
Site 3	K1709179-003	ND U	0.10	1	09/13/17 16:30	9/13/17	
Site 4	K1709179-004	2.71	0.10	1	09/13/17 16:30	9/13/17	
Site 5	K1709179-005	2.67	0.10	1	09/13/17 16:30	9/13/17	
Site 6	K1709179-006	ND U	0.10	1	09/13/17 16:30	9/13/17	
Site 7	K1709179-007	ND U	0.10	1	09/13/17 16:30	9/13/17	
Method Blank	K1709179-MB1	ND U	0.10	1	09/13/17 16:30	9/13/17	

Replicate Sample Summary
Ammonia as Nitrogen

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD Limit	Date Analyzed
Batch QC	K1709093-001DUP	0.10	0.23	0.24	0.236	6	09/13/17
Site 1	K1709179-001DUP	0.10	ND U	ND U	NC	20	09/13/17

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Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1709179
Date Collected: N/A
Date Received: N/A
Date Analyzed: 09/13/17
Date Extracted: 09/13/17

Duplicate Matrix Spike Summary
Ammonia as Nitrogen

Sample Name: Batch QC
Lab Code: K1709093-001
Analysis Method: SM 4500-NH3 G
Prep Method: Method
Units: mg/L
Basis: NA
Matrix Spike
K1709093-001MS

Sample	Result	Amount	% Rec	% Rec	RPD
Result	Amount	% Rec	Limit	Limit	Limit
0.23	2.23	2.00	100	90-112	<1
					20

Duplicate Matrix Spike
K1709093-001DMS

Spike	Amount	% Rec	% Rec	RPD
Amount	% Rec	Limit	Limit	Limit
2.00	2.22	100	90-112	<1
				20

Analyte Name
Ammonia as Nitrogen

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Date Analyzed: 09/13/17
Date Extracted: 09/13/17

Duplicate Matrix Spike Summary
Ammonia as Nitrogen

Sample Name: Site 1
Lab Code: K1709179-001
Analysis Method: SM 4500-NH3 G
Prep Method: Method
Units: mg/L
Basis: NA
Matrix Spike
K1709179-001MS

Sample	Result	Amount	% Rec	% Rec	RPD
Result	Amount	% Rec	Limit	Limit	Limit
ND U	2.03	2.00	101	90-112	<1
					20

Duplicate Matrix Spike
K1709179-001DMS

Spike	Amount	% Rec	% Rec	RPD
Amount	% Rec	Limit	Limit	Limit
2.00	2.01	100	90-112	<1
				20

Analyte Name
Ammonia as Nitrogen

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Analyzed: 09/13/17
Date Extracted: 09/13/17

Lab Control Sample Summary
Ammonia as Nitrogen

Analysis Method: SM 4500-NH3 G
Prep Method: Method

Units: mg/L
Basis: NA
Analysis Lot: 561581

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1709179-LCS1	9.47	10.2	93	90-112

Metals

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 1
Lab Code: K1709179-001

Service Request: K1709179
Date Collected: 08/30/17 15:00
Date Received: 08/31/17 09:10
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 1
Lab Code: K1709179-001

Service Request: K1709179
Date Collected: 08/30/17 15:00
Date Received: 08/31/17 09:10
Basis: NA

Total Recoverable Metals

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	96.4	ug/L	1.0	1	09/07/17 08:23	09/06/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/07/17 08:23	09/06/17	
Copper	200.8	ND U	ug/L	1.0	1	09/07/17 08:23	09/06/17	
Iron	200.7	162	ug/L	50	1	09/11/17 11:32	09/06/17	
Lead	200.8	ND U	ug/L	0.16	1	09/07/17 08:23	09/06/17	
Manganese	200.8	8.9	ug/L	1.0	1	09/07/17 08:23	09/06/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/07/17 08:23	09/06/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/07/17 08:23	09/06/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/07/17 08:23	09/06/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	90.0	ug/L	1.0	1	09/07/17 09:15	09/06/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/07/17 09:15	09/06/17	
Copper	200.8	ND U	ug/L	1.0	1	09/07/17 09:15	09/06/17	
Iron	200.7	134	ug/L	50	1	09/11/17 12:08	09/06/17	
Lead	200.8	ND U	ug/L	0.16	1	09/07/17 09:15	09/06/17	
Manganese	200.8	6.6	ug/L	1.0	1	09/07/17 09:15	09/06/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/07/17 09:15	09/06/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/07/17 09:15	09/06/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/07/17 09:15	09/06/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 2
Lab Code: K1709179-002

Service Request: K1709179
Date Collected: 08/30/17 15:10
Date Received: 08/31/17 09:10
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 2
Lab Code: K1709179-002

Service Request: K1709179
Date Collected: 08/30/17 15:10
Date Received: 08/31/17 09:10
Basis: NA

Total Recoverable Metals

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	94.0	ug/L	1.0	1	09/07/17 08:35	09/06/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/07/17 08:35	09/06/17	
Copper	200.8	ND U	ug/L	1.0	1	09/07/17 08:35	09/06/17	
Iron	200.7	158	ug/L	50	1	09/11/17 11:40	09/06/17	
Lead	200.8	ND U	ug/L	0.16	1	09/07/17 08:35	09/06/17	
Manganese	200.8	9.2	ug/L	1.0	1	09/07/17 08:35	09/06/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/07/17 08:35	09/06/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/07/17 08:35	09/06/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/07/17 08:35	09/06/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	86.4	ug/L	1.0	1	09/07/17 09:19	09/06/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/07/17 09:19	09/06/17	
Copper	200.8	ND U	ug/L	1.0	1	09/07/17 09:19	09/06/17	
Iron	200.7	138	ug/L	50	1	09/11/17 12:11	09/06/17	
Lead	200.8	ND U	ug/L	0.16	1	09/07/17 09:19	09/06/17	
Manganese	200.8	6.6	ug/L	1.0	1	09/07/17 09:19	09/06/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/07/17 09:19	09/06/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/07/17 09:19	09/06/17	
Zinc	200.8	2.5	ug/L	2.5	1	09/07/17 09:19	09/06/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 3
Lab Code: K1709179-003

Service Request: K1709179
Date Collected: 08/30/17 15:30
Date Received: 08/31/17 09:10
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 3
Lab Code: K1709179-003

Service Request: K1709179
Date Collected: 08/30/17 15:30
Date Received: 08/31/17 09:10
Basis: NA

Total Recoverable Metals

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	131	ug/L	1.0	1	09/07/17 08:47	09/06/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/07/17 08:47	09/06/17	
Copper	200.8	ND U	ug/L	1.0	1	09/07/17 08:47	09/06/17	
Iron	200.7	265	ug/L	50	1	09/11/17 11:47	09/06/17	
Lead	200.8	ND U	ug/L	0.16	1	09/07/17 08:47	09/06/17	
Manganese	200.8	25.3	ug/L	1.0	1	09/07/17 08:47	09/06/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/07/17 08:47	09/06/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/07/17 08:47	09/06/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/07/17 08:47	09/06/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	127	ug/L	1.0	1	09/07/17 09:23	09/06/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/07/17 09:23	09/06/17	
Copper	200.8	ND U	ug/L	1.0	1	09/07/17 09:23	09/06/17	
Iron	200.7	239	ug/L	50	1	09/11/17 12:13	09/06/17	
Lead	200.8	ND U	ug/L	0.16	1	09/07/17 09:23	09/06/17	
Manganese	200.8	9.9	ug/L	1.0	1	09/07/17 09:23	09/06/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/07/17 09:23	09/06/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/07/17 09:23	09/06/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/07/17 09:23	09/06/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 4
Lab Code: K1709179-004

Service Request: K1709179
Date Collected: 08/30/17 15:45
Date Received: 08/31/17 09:10
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 4
Lab Code: K1709179-004

Service Request: K1709179
Date Collected: 08/30/17 15:45
Date Received: 08/31/17 09:10
Basis: NA

Total Recoverable Metals

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	107	ug/L	1.0	1	09/07/17 08:51	09/06/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/07/17 08:51	09/06/17	
Copper	200.8	ND U	ug/L	1.0	1	09/07/17 08:51	09/06/17	
Iron	200.7	121	ug/L	50	1	09/11/17 11:58	09/06/17	
Lead	200.8	ND U	ug/L	0.16	1	09/07/17 08:51	09/06/17	
Manganese	200.8	148	ug/L	1.0	1	09/07/17 08:51	09/06/17	
Nickel	200.8	1.1	ug/L	1.0	1	09/07/17 08:51	09/06/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/07/17 08:51	09/06/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/07/17 08:51	09/06/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	57.5	ug/L	1.0	1	09/07/17 09:27	09/06/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/07/17 09:27	09/06/17	
Copper	200.8	ND U	ug/L	1.0	1	09/07/17 09:27	09/06/17	
Iron	200.7	ND U	ug/L	50	1	09/11/17 12:16	09/06/17	
Lead	200.8	ND U	ug/L	0.16	1	09/07/17 09:27	09/06/17	
Manganese	200.8	133	ug/L	1.0	1	09/07/17 09:27	09/06/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/07/17 09:27	09/06/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/07/17 09:27	09/06/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/07/17 09:27	09/06/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 5
Lab Code: K1709179-005

Service Request: K1709179
Date Collected: 08/30/17 15:50
Date Received: 08/31/17 09:10
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 5
Lab Code: K1709179-005

Service Request: K1709179
Date Collected: 08/30/17 15:50
Date Received: 08/31/17 09:10
Basis: NA

Total Recoverable Metals

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	108	ug/L	1.0	1	09/07/17 09:03	09/06/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/07/17 09:03	09/06/17	
Copper	200.8	ND U	ug/L	1.0	1	09/07/17 09:03	09/06/17	
Iron	200.7	111	ug/L	50	1	09/11/17 12:00	09/06/17	
Lead	200.8	ND U	ug/L	0.16	1	09/07/17 09:03	09/06/17	
Manganese	200.8	148	ug/L	1.0	1	09/07/17 09:03	09/06/17	
Nickel	200.8	1.0	ug/L	1.0	1	09/07/17 09:03	09/06/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/07/17 09:03	09/06/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/07/17 09:03	09/06/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	55.4	ug/L	1.0	1	09/07/17 09:30	09/06/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/07/17 09:30	09/06/17	
Copper	200.8	ND U	ug/L	1.0	1	09/07/17 09:30	09/06/17	
Iron	200.7	ND U	ug/L	50	1	09/11/17 12:18	09/06/17	
Lead	200.8	ND U	ug/L	0.16	1	09/07/17 09:30	09/06/17	
Manganese	200.8	127	ug/L	1.0	1	09/07/17 09:30	09/06/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/07/17 09:30	09/06/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/07/17 09:30	09/06/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/07/17 09:30	09/06/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 6
Lab Code: K1709179-006

Service Request: K1709179
Date Collected: 08/30/17 16:00
Date Received: 08/31/17 09:10
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 6
Lab Code: K1709179-006

Service Request: K1709179
Date Collected: 08/30/17 16:00
Date Received: 08/31/17 09:10
Basis: NA

Total Recoverable Metals

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	49.7	ug/L	1.0	1	09/07/17 09:07	09/06/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/07/17 09:07	09/06/17	
Copper	200.8	ND U	ug/L	1.0	1	09/07/17 09:07	09/06/17	
Iron	200.7	165	ug/L	50	1	09/11/17 12:03	09/06/17	
Lead	200.8	ND U	ug/L	0.16	1	09/07/17 09:07	09/06/17	
Manganese	200.8	4.7	ug/L	1.0	1	09/07/17 09:07	09/06/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/07/17 09:07	09/06/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/07/17 09:07	09/06/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/07/17 09:07	09/06/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	48.0	ug/L	1.0	1	09/07/17 09:34	09/06/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/07/17 09:34	09/06/17	
Copper	200.8	ND U	ug/L	1.0	1	09/07/17 09:34	09/06/17	
Iron	200.7	124	ug/L	50	1	09/11/17 12:21	09/06/17	
Lead	200.8	ND U	ug/L	0.16	1	09/07/17 09:34	09/06/17	
Manganese	200.8	3.0	ug/L	1.0	1	09/07/17 09:34	09/06/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/07/17 09:34	09/06/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/07/17 09:34	09/06/17	
Zinc	200.8	2.8	ug/L	2.5	1	09/07/17 09:34	09/06/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 7
Lab Code: K1709179-007

Service Request: K1709179
Date Collected: 08/30/17 16:20
Date Received: 08/31/17 09:10
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 7
Lab Code: K1709179-007

Service Request: K1709179
Date Collected: 08/30/17 16:20
Date Received: 08/31/17 09:10
Basis: NA

Total Recoverable Metals

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	64.1	ug/L	1.0	1	09/07/17 09:11	09/06/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/07/17 09:11	09/06/17	
Copper	200.8	ND U	ug/L	1.0	1	09/07/17 09:11	09/06/17	
Iron	200.7	132	ug/L	50	1	09/11/17 12:05	09/06/17	
Lead	200.8	ND U	ug/L	0.16	1	09/07/17 09:11	09/06/17	
Manganese	200.8	6.2	ug/L	1.0	1	09/07/17 09:11	09/06/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/07/17 09:11	09/06/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/07/17 09:11	09/06/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/07/17 09:11	09/06/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	56.8	ug/L	1.0	1	09/07/17 09:38	09/06/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/07/17 09:38	09/06/17	
Copper	200.8	ND U	ug/L	1.0	1	09/07/17 09:38	09/06/17	
Iron	200.7	87	ug/L	50	1	09/11/17 12:43	09/06/17	
Lead	200.8	ND U	ug/L	0.16	1	09/07/17 09:38	09/06/17	
Manganese	200.8	5.0	ug/L	1.0	1	09/07/17 09:38	09/06/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/07/17 09:38	09/06/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/07/17 09:38	09/06/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/07/17 09:38	09/06/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Method Blank
Lab Code: KQ1712615-01

Service Request: K1709179
Date Collected: NA
Date Received: NA
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Method Blank
Lab Code: KQ1712616-01

Service Request: K1709179
Date Collected: NA
Date Received: NA
Basis: NA

Total Recoverable Metals

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
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Iron	200.7	ND U	ug/L	50	1	09/11/17 11:27	09/06/17	
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Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
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Aluminum	200.8	ND U	ug/L	1.0	1	09/07/17 08:15	09/06/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/07/17 08:15	09/06/17	
Copper	200.8	ND U	ug/L	1.0	1	09/07/17 08:15	09/06/17	
Lead	200.8	ND U	ug/L	0.16	1	09/07/17 08:15	09/06/17	
Manganese	200.8	ND U	ug/L	1.0	1	09/07/17 08:15	09/06/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/07/17 08:15	09/06/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/07/17 08:15	09/06/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/07/17 08:15	09/06/17	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Date Analyzed: 09/11/17

Replicate Sample Summary
Total Recoverable Metals

Sample Name: Site 1
Lab Code: K1709179-001

Units: ug/L
Basis: NA

Analyte Name	MRL	Sample Result	Duplicate Sample Result	Average	RPD	RPD Limit
Iron	50	162	158	160	3	20

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Date Analyzed: 09/11/17

Replicate Sample Summary
Total Recoverable Metals

Sample Name: Site 2
Lab Code: K1709179-002

Units: ug/L
Basis: NA

Analyte Name	MRL	Sample Result	Duplicate Sample Result	Average	RPD	RPD Limit
Iron	50	158	157	158	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.
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Superset Reference:

ALS Group USA, Corp.
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QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Date Analyzed: 09/07/17

Replicate Sample Summary
Total Recoverable Metals

Sample Name: Site 1
Lab Code: K1709179-001

Units: ug/L
Basis: NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample Result	KQ1712616-03	Average	RPD	RPD Limit
Aluminum	200.8	1.0	96.4	96.5	ND U	96.5	<1	20
Cadmium	200.8	0.020	ND U	ND U	ND U	NC	NC	20
Copper	200.8	1.0	ND U	ND U	ND U	NC	NC	20
Lead	200.8	0.16	ND U	ND U	ND U	NC	NC	20
Manganese	200.8	1.0	8.9	9.1	9.1	9.0	2	20
Nickel	200.8	1.0	ND U	ND U	ND U	NC	NC	20
Selenium	200.8	1.0	ND U	ND U	ND U	NC	NC	20
Zinc	200.8	2.5	ND U	ND U	ND U	NC	NC	20

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Date Analyzed: 09/07/17

Replicate Sample Summary
Total Recoverable Metals

Sample Name: Site 2
Lab Code: K1709179-002

Units: ug/L
Basis: NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample Result	KQ1712616-05	Average	RPD	RPD Limit
Aluminum	200.8	1.0	94.0	92.6	ND U	93.3	2	20
Cadmium	200.8	0.020	ND U	ND U	ND U	NC	NC	20
Copper	200.8	1.0	ND U	ND U	ND U	NC	NC	20
Lead	200.8	0.16	ND U	ND U	ND U	NC	NC	20
Manganese	200.8	1.0	9.2	9.0	9.1	9.1	2	20
Nickel	200.8	1.0	ND U	ND U	ND U	NC	NC	20
Selenium	200.8	1.0	ND U	ND U	ND U	ND	-	20
Zinc	200.8	2.5	ND U	ND U	ND U	NC	NC	20

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Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:

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Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:

Client:	Coeur Alaska, Inc.			Service Request:	K1709179
Project:	TTF Fish Resource Investigations			Date Collected:	08/30/17
Sample Matrix:	Water			Date Received:	08/31/17
				Date Analyzed:	09/11/17
				Date Extracted:	09/6/17
Matrix Spike Summary					
Total Recoverable Metals					
Sample Name:	Site 1			Units:	ug/L
Lab Code:	K1709179-001			Basis:	NA
Analysis Method:	200.7				
Prep Method:	EPA CLP-METALS ILM04.0				
Matrix Spike					
	KQ1712615-04				
Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Iron	162	1200	1000	104	70-130

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.
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Superset Reference:

Client: Coeur Alaska, Inc.		Service Request: K1709179	
Project: TTF Fish Resource Investigations		Date Collected: 08/30/17	
Sample Matrix: Water		Date Received: 08/31/17	
		Date Analyzed: 09/11/17	
		Date Extracted: 09/6/17	
Matrix Spike Summary			
Total Recoverable Metals			
Sample Name:	Site 2	Units:	ug/L
Lab Code:	K1709179-002	Basis:	NA
Analysis Method:	200.7		
Prep Method:	EPA CLP-METALS ILM04.0		
Matrix Spike			
KQ1712615-06			
Analyte Name	Sample Result	Spike Amount	% Rec
Iron	158	1000	103
			% Rec Limits
			70-130

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.
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Superset Reference:

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Date Analyzed: 09/7/17
Date Extracted: 09/6/17

Matrix Spike Summary
Total Recoverable Metals

Sample Name: Site 1
Lab Code: K1709179-001
Analysis Method: 200.8
Prep Method: EPA CLP-METALS ILM04.0
Units: ug/L
Basis: NA

Matrix Spike
KQ1712616-04

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	96.4	195	100	99	70-130
Cadmium	ND U	26.2	25.0	105	70-130
Copper	ND U	13.1	12.5	104	70-130
Lead	ND U	51.2	50.0	102	70-130
Manganese	8.9	34.9	25.0	104	70-130
Nickel	ND U	25.0	25.0	100	70-130
Selenium	ND U	52.1	50.0	104	70-130
Zinc	ND U	25.8	25.0	103	70-130

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Date Analyzed: 09/7/17
Date Extracted: 09/6/17

Matrix Spike Summary
Total Recoverable Metals

Sample Name: Site 2
Lab Code: K1709179-002
Analysis Method: 200.8
Prep Method: EPA CLP-METALS ILM04.0
Units: ug/L
Basis: NA

Matrix Spike
KQ1712616-06

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	94.0	196	100	102	70-130
Cadmium	ND U	27.1	25.0	109	70-130
Copper	ND U	13.7	12.5	109	70-130
Lead	ND U	52.8	50.0	106	70-130
Manganese	9.2	35.7	25.0	106	70-130
Nickel	ND U	25.2	25.0	101	70-130
Selenium	ND U	53.8	50.0	108	70-130
Zinc	ND U	26.8	25.0	107	70-130

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Analyzed: 09/11/17

Service Request: K1709179
Date Analyzed: 09/07/17

Lab Control Sample Summary
Total Recoverable Metals

Units:ug/L
Basis:NA

Lab Control Sample
KQ1712615-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
--------------	-------------------	--------	--------------	-------	--------------

Iron

200.7

2480

2500

99

85-115

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Lab Control Sample Summary
Total Recoverable Metals

Units:ug/L
Basis:NA

Lab Control Sample
KQ1712616-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
--------------	-------------------	--------	--------------	-------	--------------

Aluminum

200.8

104

100

104

85-115

Cadmium

200.8

26.3

25.0

105

85-115

Copper

200.8

12.7

12.5

102

85-115

Lead

200.8

51.5

50.0

103

85-115

Manganese

200.8

25.8

25.0

103

85-115

Nickel

200.8

25.2

25.0

101

85-115

Selenium

200.8

51.7

50.0

103

85-115

Zinc

200.8

25.5

25.0

102

85-115

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17

Client:
Project:
Sample Matrix:

Coeur Alaska, Inc.
TTF Fish Resource Investigations
Water

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Date Extracted: 08/31/17
Date Analyzed: 09/01/17

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Matrix Spike/Duplicate Matrix Spike Summary

Total Metals

Sample Name:
Lab Code:
Test Notes:

Site 1
K1709179-001MS,

K1709179-001MSD

Units: ng/L
Basis: NA

Sample Name	Lab Code	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	
						Result	Notes
Site 1	K1709179-001	1.0	1	08/31/17	09/01/17	1.9	
Site 2	K1709179-002	1.0	1	08/31/17	09/01/17	1.7	
Site 3	K1709179-003	1.0	1	08/31/17	09/01/17	2.8	
Site 4	K1709179-004	1.0	1	08/31/17	09/01/17	ND	
Site 5	K1709179-005	1.0	1	08/31/17	09/01/17	1.0	
Site 6	K1709179-006	1.0	1	08/31/17	09/01/17	1.5	
Site 7	K1709179-007	1.0	1	08/31/17	09/01/17	1.5	
Method Blank 1	K1709179-MB1	1.0	1	08/31/17	09/01/17	ND	
Method Blank 2	K1709179-MB2	1.0	1	08/31/17	09/01/17	ND	
Method Blank 3	K1709179-MB3	1.0	1	08/31/17	09/01/17	ND	

Percent Recovery					
Analyte	Prep Method	Analysis Method	Spike Level		Relative Percent
			MRL	DMS	
Mercury	METHOD	1631E	1.0	50	7
			1.0	50	
			1.9	44.6	
			85	80	
			71-125		

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
LCS Matrix: Water
Service Request: K1709179
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 09/01/17

Ongoing Precision and Recovery (OPR) Sample Summary

Total Metals

Sample Name: Ongoing Precision and Recovery (Initial)
Units: ng/L
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Percent Recovery	ALS	
					Percent Recovery	Result Notes
Mercury	METHOD	1631E	5.00	101	77-123	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
LCS Matrix: Water
Service Request: K1709179
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 09/01/17

Ongoing Precision and Recovery (OPR) Sample Summary

Total Metals

Sample Name: Ongoing Precision and Recovery (Final)
Units: ng/L
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Percent Recovery	ALS	
					Percent Recovery	Result Notes
Mercury	METHOD	1631E	5.00	93	77-123	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
LCS Matrix: Water

Service Request: K1709179
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 09/01/17

Quality Control Sample (QCS) Summary
Total Metals

Sample Name: Quality Control Sample

Units: ng/L
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Percent Recovery	ALS	
					Percent Recovery	Acceptance Limits
Mercury	METHOD	1631E	5.00	100	77-123	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Date Extracted: 09/06/17
Date Analyzed: 09/11/17

Hardness, as CaCO3
EPA Method 200.7/ SM Method 2340B
Units: mg/L (ppm)

Sample Name	Lab Code	MRL	Result
Site 1	K1709179-001	1.0	62.5
Site 2	K1709179-002	1.0	58.9
Site 3	K1709179-003	1.0	25.6
Site 4	K1709179-004	1.0	416
Site 5	K1709179-005	1.0	411
Site 6	K1709179-006	1.0	15.2
Site 7	K1709179-007	1.0	11.2
Method Blank	KQ1712615-01	1.0	ND

ALS Group USA, Corp.
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QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1709179
Date Collected: 08/30/17
Date Received: 08/31/17
Date Extracted: 09/06/17
Date Analyzed: 09/11/17

Duplicate Summary
Metals
Units: mg/L (ppm)

Sample Name: Site 1
Lab Code: K1709179-001DUP

Analyte	Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Hardness, as CaCO3	200.7/SM 2340B	1.0	62.5	60.7	61.6	3



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October 19, 2017

Analytical Report for Service Request No: K1710067

Peter Strow
Coeur Alaska, Inc.
3031 Clinton Drive, Suite 202
Juneau, AK 99801

RE: TTF Fish Resource Investigations

Dear Peter,

Enclosed are the results of the sample(s) submitted to our laboratory September 21, 2017
For your reference, these analyses have been assigned our service request number **K1710067**.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3376. You may also contact me via email at Mark.Harris@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Mark Harris

Mark Harris
Project Manager



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Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated value.
- U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
- DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.
- H The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

- # The control limit criteria is not applicable. See case narrative.
- J The result is an estimated value.
- E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See case narrative.
- S The reported value was determined by the Method of Standard Additions (MSA).
- U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
- DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- + The correlation coefficient for the MSA is less than 0.995.
- Q See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

- * The result is an outlier. See case narrative.
 - # The control limit criteria is not applicable. See case narrative.
 - A A tentatively identified compound, a suspected aldo- condensation product.
 - B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
 - C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
 - D The reported result is from a dilution.
 - E The result is an estimated value.
 - J The result is an estimated value.
 - N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
 - P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
 - U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
 - DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
 - i The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
 - X See case narrative.
 - Q See case narrative. One or more quality control criteria was outside the limits.
- Additional Petroleum Hydrocarbon Specific Qualifiers**
- F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
 - L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
 - H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
 - O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
 - Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
 - Z The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses



Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csappraisal.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ03339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsys/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certificat/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L14-51
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pilabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon - DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.alsglobal.com or at the accreditation bodies web site.

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/analyte is offered by that state.

Case Narrative

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ALS ENVIRONMENTAL



Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request No.: K1710067
Date Received: 09/21/17

Case Narrative

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), and Matrix/Duplicate Matrix Spike (MS/DMS).

Sample Receipt

Five water samples were received for analysis at ALS Environmental on 09/21/17. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4°C upon receipt at the laboratory.

General Chemistry Parameters

Nitrate as Nitrogen by EPA Method 300.0:

All samples were received and initially put on the instrument within holding time, but had to be reanalyzed past holding time due to instrument malfunction. The data was flagged to indicate the holding time violation.

No other anomalies associated with the analysis of these samples were observed.

Total and Dissolved Metals

No anomalies associated with the analysis of these samples were observed.

Chain of Custody

Approved by Nae D. O'Neil

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ALS Group USA, Corp.
d/b/a ALS Environmental

Analytical Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 180.1
Prep Method: None
Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17
Units: NTU
Basis: NA

Turbidity

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1710067-001	0.28	0.10	1	09/21/17 11:15	
Site 2	K1710067-002	0.27	0.10	1	09/21/17 11:15	
Site 3	K1710067-003	0.36	0.10	1	09/21/17 11:15	
Site 4	K1710067-004	7.48	0.10	1	09/21/17 11:15	
Site 5	K1710067-005	3.01	0.10	1	09/21/17 11:15	
Method Blank	K1710067-MB1	ND U	0.10	1	09/20/17 16:07	
Method Blank	K1710067-MB2	ND U	0.10	1	09/21/17 11:15	

General Chemistry

ALS Environmental—Kelso Laboratory
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www.alsglobal.com

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 180.1
Prep Method: None
Service Request: K1710067
Date Collected: NA
Date Received: NA
Units: NTU
Basis: NA

Replicate Sample Summary
Turbidity

Sample Name	Lab Code	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Batch QC	K1709983-001DUP	0.10	4.12	4.18	4.15	1	20	09/20/17
Batch QC	K1710001-001DUP	0.10	1.12	1.11	1.12	<1	20	09/20/17
Batch QC	K1710036-001DUP	0.20	63.2	64.0	63.6	1	20	09/21/17
Batch QC	K1710062-004DUP	0.10	5.23	5.14	5.19	2	20	09/21/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 180.1
Prep Method: None
Service Request: K1710067
Date Analyzed: 09/20/17
Date Extracted: NA
Units: NTU
Basis: NA
Analysis Lot: 562742

Lab Control Sample Summary
Turbidity

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710067-LCS1	6.37	6.51	98	90-110
Lab Control Sample	K1710067-LCS2	5.90	6.51	91	90-110

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:17-0000437584 rev 00

Printed 10/17/2017 4:25:51 PM

Superset Reference:17-0000437584 rev 00

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Collected: N/A
Date Received: N/A
Date Analyzed: 09/23/17
Date Extracted: 09/23/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1710067
Date Analyzed: 09/23/17
Date Extracted: 09/23/17

Duplicate Matrix Spike Summary
Chloride

Lab Control Sample Summary
Chloride

Sample Name: Batch QC
Lab Code: K1710183-001
Analysis Method: 300.0
Prep Method: Method

Units: mg/L
Basis: NA

Units: mg/L
Basis: NA
Analysis Lot: 563154

Matrix Spike
K1710183-001MS

Duplicate Matrix Spike
K1710183-001DMS

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits	RPD	Limit
Chloride	4.03	13.7	10.0	96	95-110	1	20

Sample Result	Result	Spike Amount	% Rec	% Rec Limits	RPD	Limit
	13.5	10.0	95	90-110	1	20

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710067-LCS1	4.9	5.0	98	90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: Method

Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17
Units: mg/L
Basis: NA

Nitrate as Nitrogen

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Site 1	K1710067-001	ND U	0.10	2	09/23/17 20:08	9/23/17	**
Site 2	K1710067-002	ND U	0.10	2	09/23/17 20:18	9/23/17	**
Site 3	K1710067-003	ND U	0.10	2	09/23/17 20:49	9/23/17	**
Site 4	K1710067-004	7.91	0.10	2	09/23/17 20:59	9/23/17	**
Site 5	K1710067-005	7.64	0.10	2	09/23/17 21:09	9/23/17	**
Method Blank	K1710067-MB1	ND U	0.050	1	09/23/17 10:50	9/23/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1710067
Date Collected: NA
Date Received: NA
Date Analyzed: 09/23/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Batch QC
Lab Code: K1710183-001

Units: mg/L
Basis: NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1710183-001DUP Result	Average	RPD	RPD Limit
Nitrate as Nitrogen	300.0	0.25	ND U	ND U	NC	NC	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:17-0000437584 rev 00

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Collected: N/A
Date Received: N/A
Date Analyzed: 09/23/17
Date Extracted: 09/23/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1710067
Date Analyzed: 09/23/17
Date Extracted: 09/23/17

Duplicate Matrix Spike Summary
Nitrate as Nitrogen

Lab Control Sample Summary
Nitrate as Nitrogen

Sample Name: Batch QC
Lab Code: K1710183-001
Analysis Method: 300.0
Prep Method: Method

Units: mg/L
Basis: NA

Units: mg/L
Basis: NA
Analysis Lot: 563154

Analyte Name	Sample Result	Matrix Spike		Duplicate Matrix Spike		% Rec		RPD	
		Spike Amount	Result	Spike Amount	Result	% Rec	Limits	RPD	Limit
Nitrate as Nitrogen	ND U	10.0	9.64	10.0	9.61	96	90-110	<1	20

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710067-LCS1	2.27	2.50	91	90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: Method

Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17
Units: mg/L
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: None
Service Request: K1710067
Date Collected: NA
Date Received: NA
Units:mg/L
Basis:NA

Sulfate

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Site 1	K1710067-001	3.31	0.20	2	09/23/17 20:08	9/23/17	
Site 2	K1710067-002	3.17	0.20	2	09/23/17 20:18	9/23/17	
Site 3	K1710067-003	0.42	0.20	2	09/23/17 20:49	9/23/17	
Site 4	K1710067-004	425	10	100	10/10/17 20:30	10/10/17	
Site 5	K1710067-005	417	10	100	10/10/17 20:40	10/10/17	
Method Blank	K1710067-MB1	ND U	0.10	1	09/23/17 10:50	9/23/17	
Method Blank	K1710067-MB2	ND U	0.10	1	10/10/17 13:04	10/10/17	

Replicate Sample Summary
Sulfate

Sample Name	Lab Code	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Batch QC	K1710065-001DUP	0.20	0.42	0.40	0.411	4	20	10/10/17
Batch QC	K1710149-002DUP	5.0	78.4	75.1	76.8	4	20	10/10/17
Batch QC	K1710918-004DUP	0.20	12.1	12.3	12.2	1	20	10/10/17

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Collected: N/A
Date Received: N/A
Date Analyzed: 10/10/17
Date Extracted: 10/10/17

Duplicate Matrix Spike Summary
Sulfate

Sample Name: Batch QC
Lab Code: K1710149-002
Analysis Method: 300.0
Prep Method: None

Units: mg/L
Basis: NA

Matrix Spike
K1710149-002MS

Duplicate Matrix Spike
K1710149-002DMS

Analyte Name	Sample Result	Result	% Rec	% Rec	Spike Amount	% Rec	% Rec	RPD Limit	RPD Limit
Sulfate	78.4	277	99	98	200	275	200	<1	20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Collected: N/A
Date Received: N/A
Date Analyzed: 10/10/17
Date Extracted: 10/10/17

Duplicate Matrix Spike Summary
Sulfate

Sample Name: Batch QC
Lab Code: K1710065-001
Analysis Method: 300.0
Prep Method: None

Units: mg/L
Basis: NA

Matrix Spike
K1710065-001MS

Duplicate Matrix Spike
K1710065-001DMS

Analyte Name	Sample Result	Result	% Rec	% Rec	Spike Amount	% Rec	% Rec	RPD Limit	RPD Limit
Sulfate	0.42	8.57	102	102	8.00	8.58	8.00	<1	20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Collected: N/A
Date Received: N/A
Date Analyzed: 10/10/17
Date Extracted: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1710067
Date Analyzed: 09/23/17
Date Extracted: 09/23/17

Duplicate Matrix Spike Summary
Sulfate

Sample Name: Batch QC
Lab Code: K1710918-004
Analysis Method: 300.0
Prep Method: None

Units: mg/L
Basis: NA

Lab Control Sample Summary
Sulfate

Analysis Method: 300.0
Prep Method: Method

Units: mg/L
Basis: NA
Analysis Lot: 563154

Analyte Name	Sample Result	Matrix Spike		Duplicate Matrix Spike		Spike		% Rec		RPD	
		Result	Amount	Result	Amount	Amount	Amount	% Rec	% Rec	RPD	Limit
Sulfate	12.1	20.5	8.00	20.5	8.00	8.00	8.00	105	105	<1	20

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710067-LCS1	4.89	5.00	98	90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Analyzed: 10/10/17
Date Extracted: 10/10/17

Lab Control Sample Summary
Sulfate

Analysis Method: 300.0
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 565283

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710067-LCS2	4.94	5.00	99	90-110
Lab Control Sample	K1710067-LCS3	4.94	5.00	99	90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2120 B
Prep Method: None

Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17
Units: ColorUnits
Basis: NA

Color

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1710067-001	30.0	5.0	1	09/22/17 13:38	
Site 2	K1710067-002	30.0	5.0	1	09/22/17 13:41	
Site 3	K1710067-003	140	10	2	09/22/17 13:50	
Site 4	K1710067-004	5.0	5.0	1	09/22/17 13:53	
Site 5	K1710067-005	5.0	5.0	1	09/22/17 13:59	
Method Blank	K1710067-MB1	ND U	5.0	1	09/22/17 13:34	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2120 B
Prep Method: None

Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17

Units: Color/Units
Basis: NA

Replicate Sample Summary
Color

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Site 1	K1710067-001DUP	5.0	30.0	30.0	30.0	<1	20	09/22/17
Batch QC	K1710152-001DUP	10	90	90	90.0	<1	20	09/22/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Analyzed: 09/22/17
Date Extracted: NA

Units: Color/Units
Basis: NA
Analysis Lot: 562864

Lab Control Sample Summary
Color

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710067-LCS1	15.0	15.0	100	85-115

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:17-0000437584 rev 00

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Superset Reference:17-0000437584 rev 00

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2540 C
Prep Method: None

Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17
Units: mg/L
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2540 C
Prep Method: None
Service Request: K1710067
Date Collected: NA
Date Received: NA
Units: mg/L
Basis: NA

Solids, Total Dissolved

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1710067-001	96	10	1	09/27/17 22:00	
Site 2	K1710067-002	96	10	1	09/27/17 22:00	
Site 3	K1710067-003	44	10	1	09/27/17 22:00	
Site 4	K1710067-004	704	10	1	09/27/17 22:00	
Site 5	K1710067-005	690	10	1	09/27/17 22:00	
Method Blank	K1710067-MB1	ND U	10	1	09/27/17 22:00	

Replicate Sample Summary
Solids, Total Dissolved

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD Limit	RPD	Date Analyzed
Batch QC	K1710037-001DUP	10	95.2	92	93.6	10	3	09/27/17
Batch QC	K1710072-001DUP	10	595	598	596	10	<1	09/27/17

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Analyzed: 09/27/17
Date Extracted: NA

Lab Control Sample Summary
Solids, Total Dissolved

Analysis Method: SM 2540 C
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 563506

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710067-LCS1	1620	1640	99	85-115

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2540 D
Prep Method: None

Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17
Units: mg/L
Basis: NA

Solids, Total Suspended (TSS)

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1710067-001	ND U	4.0	1	09/27/17 23:30	
Site 2	K1710067-002	ND U	4.0	1	09/27/17 23:30	
Site 3	K1710067-003	ND U	4.0	1	09/27/17 23:30	
Site 4	K1710067-004	13.6	4.0	1	09/27/17 23:30	
Site 5	K1710067-005	12.8	4.0	1	09/27/17 23:30	
Method Blank	K1710067-MB2	ND U	4.0	1	09/27/17 23:30	
Method Blank	K1710067-MB3	ND U	4.0	1	09/27/17 23:30	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2540 D
Prep Method: None

Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17

Units: mg/L
Basis: NA

Replicate Sample Summary
Solids, Total Suspended (TSS)

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Site 1	K1710067-001DUP	4.0	ND U	ND U	NC	NC	10	09/27/17
Site 4	K1710067-004DUP	4.0	13.6	14.0	13.8	3	10	09/27/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Analyzed: 09/27/17
Date Extracted: NA

Lab Control Sample Summary
Solids, Total Suspended (TSS)

Analysis Method: SM 2540 D
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 563514

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710067-LCS1	424	429	99	85-115

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Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Analyzed: 09/27/17
Date Extracted: NA

Lab Control Sample Summary
Solids, Total Suspended (TSS)

Analysis Method: SM 2540 D
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 563515

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710067-LCS2	408	429	95	85-115

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 4500-Cl G
Prep Method: None

Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17
Units: mg/L
Basis: NA

Chlorine, Total Residual

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1710067-001	ND U	0.050	1	09/21/17 12:30	H
Site 2	K1710067-002	ND U	0.050	1	09/21/17 12:30	H
Site 3	K1710067-003	ND U	0.050	1	09/21/17 12:30	H
Site 4	K1710067-004	ND U	0.050	1	09/21/17 12:30	H
Site 5	K1710067-005	ND U	0.050	1	09/21/17 12:30	H
Method Blank	K1710067-MB1	ND U	0.050	1	09/21/17 12:30	
Method Blank	K1710067-MB2	ND U	0.050	1	09/21/17 12:30	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17
Date Analyzed: 09/21/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Site 1
Lab Code: K1710067-001

Units: mg/L
Basis: NA

Sample Name	Analysis Method	MRL	Sample Result	Average	RPD	RPD Limit
Duplicate Sample K1710067-001DUP	SM 4500-Cl G	0.050	ND U	NC	NC	20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17
Date Analyzed: 09/21/17
Date Extracted: NA

Matrix Spike Summary
Chlorine, Total Residual

Sample Name: Site 1
Lab Code: K1710067-001
Analysis Method: SM 4500-Cl G
Prep Method: None

Matrix Spike
K1710067-001MS

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Chlorine, Total Residual	ND U	1.07	1.00	107	21-141

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Analyzed: 09/21/17
Date Extracted: NA

Lab Control Sample Summary
Chlorine, Total Residual

Analysis Method: SM 4500-Cl G
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 562637

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710067-LCS1	1.06	1.00	106	78-116
Lab Control Sample	K1710067-LCS2	1.02	1.00	102	78-116

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 4500-NH3 G
Prep Method: Method

Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17
Units: mg/L
Basis: NA

Ammonia as Nitrogen

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Site 1	K1710067-001	ND U	0.10	1	10/02/17 11:34	10/2/17	
Site 2	K1710067-002	ND U	0.10	1	10/02/17 11:34	10/2/17	
Site 3	K1710067-003	ND U	0.10	1	10/02/17 11:34	10/2/17	
Site 4	K1710067-004	2.51	0.10	1	10/02/17 11:34	10/2/17	
Site 5	K1710067-005	2.46	0.10	1	10/02/17 11:34	10/2/17	
Method Blank	K1710067-MB1	ND U	0.10	1	10/02/17 11:34	10/2/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 4500-NH3 G
Prep Method: Method
Service Request: K1710067
Date Collected: NA
Date Received: NA
Units: mg/L
Basis: NA

Replicate Sample Summary
Ammonia as Nitrogen

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Batch QC	K1709858-001DUP	0.10	ND U	ND U	NC	NC	20	10/02/17
Batch QC	K1709914-001DUP	0.10	0.106	0.10	0.104	3	20	10/02/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1710067
Date Collected: N/A
Date Received: N/A
Date Analyzed: 10/2/17
Date Extracted: 10/2/17

Duplicate Matrix Spike Summary
Ammonia as Nitrogen

Sample Name: Batch QC
Lab Code: K1709858-001
Analysis Method: SM 4500-NH3 G
Prep Method: Method

Units: mg/L
Basis: NA

Analyte Name	Sample Result	Result	Amount	% Rec	% Rec Limits	Spike Amount	% Rec	% Rec Limits	RPD Limit
Ammonia as Nitrogen	ND U	1.99	2.00	99	90-112	2.00	99	90-112	<1
Duplicate Matrix Spike									
K1709858-001DMS									
Matrix Spike									
K1709858-001MS									
Result		1.98							
Amount			2.00						
% Rec				99					
% Rec Limits				90-112					
RPD									20

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Superset Reference:17-0000437584 rev 00



ALS Group USA, Corp.
dha ALS Environmental
Analytical Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 1
Lab Code: K1710067-001

Service Request: K1710067
Date Collected: 09/20/17 16:10
Date Received: 09/21/17 09:40
Basis: NA

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	41.5	ug/L	1.0	1	09/27/17 08:41	09/25/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/27/17 08:41	09/25/17	
Copper	200.8	ND U	ug/L	1.0	1	09/27/17 08:41	09/25/17	
Iron	200.7	81	ug/L	50	1	09/29/17 21:55	09/25/17	
Lead	200.8	ND U	ug/L	0.16	1	09/27/17 08:41	09/25/17	
Manganese	200.8	6.8	ug/L	1.0	1	09/27/17 08:41	09/25/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/27/17 08:41	09/25/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/27/17 08:41	09/25/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/27/17 08:41	09/25/17	

Metals

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 1
Lab Code: K1710067-001

Service Request: K1710067
Date Collected: 09/20/17 16:10
Date Received: 09/21/17 09:40
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 2
Lab Code: K1710067-002

Service Request: K1710067
Date Collected: 09/20/17 16:20
Date Received: 09/21/17 09:40
Basis: NA

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	39.7	ug/L	1.0	1	09/27/17 09:25	09/25/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/27/17 09:25	09/25/17	
Copper	200.8	ND U	ug/L	1.0	1	09/27/17 09:25	09/25/17	
Iron	200.7	67	ug/L	50	1	09/29/17 22:13	09/25/17	
Lead	200.8	ND U	ug/L	0.16	1	09/27/17 09:25	09/25/17	
Manganese	200.8	5.7	ug/L	1.0	1	09/27/17 09:25	09/25/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/27/17 09:25	09/25/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/27/17 09:25	09/25/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/27/17 09:25	09/25/17	

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	44.4	ug/L	1.0	1	09/27/17 08:54	09/25/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/27/17 08:54	09/25/17	
Copper	200.8	ND U	ug/L	1.0	1	09/27/17 08:54	09/25/17	
Iron	200.7	87	ug/L	50	1	09/29/17 22:03	09/25/17	
Lead	200.8	ND U	ug/L	0.16	1	09/27/17 08:54	09/25/17	
Manganese	200.8	7.6	ug/L	1.0	1	09/27/17 08:54	09/25/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/27/17 08:54	09/25/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/27/17 08:54	09/25/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/27/17 08:54	09/25/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 2
Lab Code: K1710067-002

Service Request: K1710067
Date Collected: 09/20/17 16:20
Date Received: 09/21/17 09:40
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 3
Lab Code: K1710067-003

Service Request: K1710067
Date Collected: 09/20/17 14:50
Date Received: 09/21/17 09:40
Basis: NA

Dissolved Metals

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	40.2	ug/L	1.0	1	09/27/17 09:29	09/25/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/27/17 09:29	09/25/17	
Copper	200.8	ND U	ug/L	1.0	1	09/27/17 09:29	09/25/17	
Iron	200.7	66	ug/L	50	1	09/29/17 22:22	09/25/17	
Lead	200.8	ND U	ug/L	0.16	1	09/27/17 09:29	09/25/17	
Manganese	200.8	5.7	ug/L	1.0	1	09/27/17 09:29	09/25/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/27/17 09:29	09/25/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/27/17 09:29	09/25/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/27/17 09:29	09/25/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	197	ug/L	1.0	1	09/27/17 08:58	09/25/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/27/17 08:58	09/25/17	
Copper	200.8	ND U	ug/L	1.0	1	09/27/17 08:58	09/25/17	
Iron	200.7	488	ug/L	50	1	09/29/17 22:05	09/25/17	
Lead	200.8	ND U	ug/L	0.16	1	09/27/17 08:58	09/25/17	
Manganese	200.8	38.7	ug/L	1.0	1	09/27/17 08:58	09/25/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/27/17 08:58	09/25/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/27/17 08:58	09/25/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/27/17 08:58	09/25/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 3
Lab Code: K1710067-003

Service Request: K1710067
Date Collected: 09/20/17 14:50
Date Received: 09/21/17 09:40
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 4
Lab Code: K1710067-004

Service Request: K1710067
Date Collected: 09/20/17 15:40
Date Received: 09/21/17 09:40
Basis: NA

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	196	ug/L	1.0	1	09/27/17 09:33	09/25/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/27/17 09:33	09/25/17	
Copper	200.8	ND U	ug/L	1.0	1	09/27/17 09:33	09/25/17	
Iron	200.7	459	ug/L	50	1	09/29/17 22:25	09/25/17	
Lead	200.8	ND U	ug/L	0.16	1	09/27/17 09:33	09/25/17	
Manganese	200.8	37.1	ug/L	1.0	1	09/27/17 09:33	09/25/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/27/17 09:33	09/25/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/27/17 09:33	09/25/17	
Zinc	200.8	4.8	ug/L	2.5	1	09/27/17 09:33	09/25/17	

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	352	ug/L	1.0	1	09/27/17 09:02	09/25/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/27/17 09:02	09/25/17	
Copper	200.8	3.5	ug/L	1.0	1	09/27/17 09:02	09/25/17	
Iron	200.7	854	ug/L	50	1	09/29/17 22:08	09/25/17	
Lead	200.8	0.36	ug/L	0.16	1	09/27/17 09:02	09/25/17	
Manganese	200.8	198	ug/L	1.0	1	09/27/17 09:02	09/25/17	
Nickel	200.8	1.7	ug/L	1.0	1	09/27/17 09:02	09/25/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/27/17 09:02	09/25/17	
Zinc	200.8	3.4	ug/L	2.5	1	09/27/17 09:02	09/25/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 4
Lab Code: K1710067-004

Service Request: K1710067
Date Collected: 09/20/17 15:40
Date Received: 09/21/17 09:40
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 5
Lab Code: K1710067-005

Service Request: K1710067
Date Collected: 09/20/17 15:20
Date Received: 09/21/17 09:40
Basis: NA

Dissolved Metals

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	46.7	ug/L	1.0	1	09/27/17 09:37	09/25/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/27/17 09:37	09/25/17	
Copper	200.8	ND U	ug/L	1.0	1	09/27/17 09:37	09/25/17	
Iron	200.7	ND U	ug/L	50	1	09/29/17 22:27	09/25/17	
Lead	200.8	ND U	ug/L	0.16	1	09/27/17 09:37	09/25/17	
Manganese	200.8	154	ug/L	1.0	1	09/27/17 09:37	09/25/17	
Nickel	200.8	1.1	ug/L	1.0	1	09/27/17 09:37	09/25/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/27/17 09:37	09/25/17	
Zinc	200.8	2.6	ug/L	2.5	1	09/27/17 09:37	09/25/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	95.7	ug/L	1.0	1	09/27/17 09:06	09/25/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/27/17 09:06	09/25/17	
Copper	200.8	1.0	ug/L	1.0	1	09/27/17 09:06	09/25/17	
Iron	200.7	108	ug/L	50	1	09/29/17 22:10	09/25/17	
Lead	200.8	ND U	ug/L	0.16	1	09/27/17 09:06	09/25/17	
Manganese	200.8	211	ug/L	1.0	1	09/27/17 09:06	09/25/17	
Nickel	200.8	1.2	ug/L	1.0	1	09/27/17 09:06	09/25/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/27/17 09:06	09/25/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/27/17 09:06	09/25/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 5
Lab Code: K1710067-005

Service Request: K1710067
Date Collected: 09/20/17 15:20
Date Received: 09/21/17 09:40
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Method Blank
Lab Code: KQ1713842-01

Service Request: K1710067
Date Collected: NA
Date Received: NA
Basis: NA

Dissolved Metals

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	45.2	ug/L	1.0	1	09/27/17 09:42	09/25/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/27/17 09:42	09/25/17	
Copper	200.8	ND U	ug/L	1.0	1	09/27/17 09:42	09/25/17	
Iron	200.7	ND U	ug/L	50	1	09/29/17 22:30	09/25/17	
Lead	200.8	ND U	ug/L	0.16	1	09/27/17 09:42	09/25/17	
Manganese	200.8	201	ug/L	1.0	1	09/27/17 09:42	09/25/17	
Nickel	200.8	1.1	ug/L	1.0	1	09/27/17 09:42	09/25/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/27/17 09:42	09/25/17	
Zinc	200.8	3.7	ug/L	2.5	1	09/27/17 09:42	09/25/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Iron	200.7	ND U	ug/L	50	1	09/29/17 21:50	09/25/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Method Blank
Lab Code: KQ1713844-01

Service Request: K1710067
Date Collected: NA
Date Received: NA
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17
Date Analyzed: 09/29/17

Replicate Sample Summary
Total Recoverable Metals

Sample Name: Site 1
Lab Code: K1710067-001

Units: ug/L
Basis: NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	RPD	RPD Limit
Iron	200.7	50	81	77	79	5	20

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	ND U	ug/L	1.0	1	09/27/17 08:33	09/25/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/27/17 08:33	09/25/17	
Copper	200.8	ND U	ug/L	1.0	1	09/27/17 08:33	09/25/17	
Lead	200.8	ND U	ug/L	0.16	1	09/27/17 08:33	09/25/17	
Manganese	200.8	ND U	ug/L	1.0	1	09/27/17 08:33	09/25/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/27/17 08:33	09/25/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/27/17 08:33	09/25/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/27/17 08:33	09/25/17	

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17
Date Analyzed: 09/27/17

Replicate Sample Summary
Total Recoverable Metals

Sample Name:	Site 1						Units: ug/L
Lab Code:	K1710067-001						Basis: NA
		Duplicate Sample					
		KQ1713944-03					
Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	RPD	RPD Limit
Aluminum	200.8	1.0	41.5	42.5	42.0	2	20
Cadmium	200.8	0.020	ND U	ND U	ND	-	20
Copper	200.8	1.0	ND U	ND U	NC	NC	20
Lead	200.8	0.16	ND U	ND U	NC	NC	20
Manganese	200.8	1.0	6.8	7.0	6.9	3	20
Nickel	200.8	1.0	ND U	ND U	NC	NC	20
Selenium	200.8	1.0	ND U	ND U	ND	-	20
Zinc	200.8	2.5	ND U	ND U	NC	NC	20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17
Date Analyzed: 09/29/17
Date Extracted: 09/25/17

Matrix Spike Summary
Total Recoverable Metals

Sample Name:	Site 1	Units:	ug/L		
Lab Code:	K1710067-001	Basis:	NA		
Analysis Method:	200.7				
Prep Method:	EPA CLP-METALS ILM04.0				
	Matrix Spike				
	KQ1713842-04				
Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Iron	81	1120	1000	104	70-130

Matrix Spike
KQ1713842-04

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17
Date Analyzed: 09/27/17
Date Extracted: 09/25/17

Matrix Spike Summary
Total Recoverable Metals

Sample Name: Site 1
Lab Code: K1710067-001
Analysis Method: 200.8
Prep Method: EPA CLP-METALS ILM04.0

Units: ug/L
Basis: NA

Matrix Spike
KQ1713844-04

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	41.5	137	100	96	70-130
Cadmium	ND U	25.9	25.0	103	70-130
Copper	ND U	12.5	12.5	100	70-130
Lead	ND U	50.9	50.0	102	70-130
Manganese	6.8	31.9	25.0	100	70-130
Nickel	ND U	24.7	25.0	99	70-130
Selenium	ND U	51.7	50.0	103	70-130
Zinc	ND U	25.0	25.0	100	70-130

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Analyzed: 09/29/17

Lab Control Sample Summary
Total Recoverable Metals

Units:ug/L
Basis:NA

Lab Control Sample
KQ1713842-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Iron	200.7	2540	2500	101	85-115

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Superset Reference:

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Service Request: K1710067
Date Analyzed: 09/27/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Lab Control Sample Summary
Total Recoverable Metals

Units:ug/L
Basis:NA

Lab Control Sample
KQ1713844-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	200.8	100	100	100	85-115
Cadmium	200.8	25.9	25.0	104	85-115
Copper	200.8	12.8	12.5	102	85-115
Lead	200.8	51.3	50.0	103	85-115
Manganese	200.8	25.5	25.0	102	85-115
Nickel	200.8	25.3	25.0	101	85-115
Selenium	200.8	50.0	50.0	100	85-115
Zinc	200.8	25.0	25.0	100	85-115

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Units: ng/L
Basis: NA

Sample Name	Lab Code	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Notes
Site 1	K1710067-001	1.0	1	09/30/17	10/02/17	ND	
Site 2	K1710067-002	1.0	1	09/30/17	10/02/17	ND	
Site 3	K1710067-003	1.0	1	09/30/17	10/02/17	2.8	
Site 4	K1710067-004	1.0	1	09/30/17	10/02/17	2.8	
Site 5	K1710067-005	1.0	1	09/30/17	10/02/17	2.1	
Method Blank 1	K1710067-MB1	1.0	1	09/30/17	10/02/17	ND	
Method Blank 2	K1710067-MB2	1.0	1	09/30/17	10/02/17	ND	
Method Blank 3	K1710067-MB3	1.0	1	09/30/17	10/02/17	ND	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Collected: NA
Date Received: NA
Date Extracted: 09/30/17
Date Analyzed: 10/02/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
LCS Matrix: Water
Service Request: K1710067
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/02/17

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name:
Lab Code:
Test Notes:

Batch QC: K1710271-001MSD

Units: ng/L
Basis: NA

Sample Name: Ongoing Precision and Recovery (Initial)
Test Notes:

Units: ng/L
Basis: NA

Analyte	Prep Method	Analysis Method	Percent Recovery				Spike Result MS	Sample Result MS	Spike Level DMS	MRL	Analysis Method	Prep Method	Relative Percent Difference	Result Notes
			MS	DMS	MS	DMS								
Mercury	METHOD	1631E	1.0	50	50	46.5	ND	47.5	50	1.0	1631E	METHOD	2	

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	4.88	98	77-123	

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
LCS Matrix: Water

Service Request: K1710067
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/02/17

Ongoing Precision and Recovery (OPR) Sample Summary

Total Metals

Sample Name: Ongoing Precision and Recovery (Final)

Units: ng/L
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Percent Recovery	ALS	
					Percent Recovery	Result Notes
Mercury	METHOD	1631E	5.00	4.59	92	77-123

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
LCS Matrix: Water

Service Request: K1710067
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/02/17

Quality Control Sample (QCS) Summary

Total Metals

Sample Name: Quality Control Sample

Units: ng/L
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Percent Recovery	ALS	
					Percent Recovery	Result Notes
Mercury	METHOD	1631E	5.00	4.89	98	77-123

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17
Date Extracted: 09/25/17
Date Analyzed: 09/29/17

Hardness, as CaCO3
EPA Method 200.7/ SM Method 2340B
Units: mg/L (ppm)

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710067
Date Collected: 09/20/17
Date Received: 09/21/17
Date Extracted: 09/25/17
Date Analyzed: 09/29/17

Duplicate Summary
Metals
Units: mg/L (ppm)

Sample Name: Site 1
Lab Code: K1710067-001DUP

Sample Name	Lab Code	MRL	Result	Analyte	Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Site 1	K1710067-001	1.0	79.1	Hardness, as CaCO3	200.7/ SM 2340B	1.0	79.1	80.3	79.7	2
Site 2	K1710067-002	1.0	81.9							
Site 3	K1710067-003	1.0	12.7							
Site 4	K1710067-004	1.0	428							
Site 5	K1710067-005	1.0	406							
Method Blank	KQ1713842-01	1.0	ND							



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October 12, 2017

Analytical Report for Service Request No: K1710152

Peter Strow
Coeur Alaska, Inc.
3031 Clinton Drive, Suite 202
Juneau, AK 99801

RE: TTF Fish Resource Investigations

Dear Peter,

Enclosed are the results of the sample(s) submitted to our laboratory September 22, 2017
For your reference, these analyses have been assigned our service request number **K1710152**.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3376. You may also contact me via email at Mark.Harris@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Mark Harris

Mark Harris
Project Manager

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State Certifications, Accreditations, And Licenses
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Chain of Custody
General Chemistry
Metals

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated value.
- U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
- DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.
- H The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

- # The control limit criteria is not applicable. See case narrative.
- J The result is an estimated value.
- E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See case narrative.
- S The reported value was determined by the Method of Standard Additions (MSA).
- U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
- DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- + The correlation coefficient for the MSA is less than 0.995.
- Q See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

- * The result is an outlier. See case narrative.
 - # The control limit criteria is not applicable. See case narrative.
 - A A tentatively identified compound, a suspected aldol-condensation product.
 - B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
 - C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
 - D The reported result is from a dilution.
 - E The result is an estimated value.
 - J The result is an estimated value.
 - N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
 - P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
 - U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
 - DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
 - i The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
 - X See case narrative.
 - Q See case narrative. One or more quality control criteria was outside the limits.
- Additional Petroleum Hydrocarbon Specific Qualifiers**
- F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
 - L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
 - H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
 - O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
 - Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
 - Z The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses



Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csappraisal.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsys/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certificat/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L14-51
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pilabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon - DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.alsglobal.com or at the accreditation bodies web site.

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/analyte is offered by that state.

Case Narrative

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577- 7222 Fax (360)636- 1068
www.alsglobal.com

ALS ENVIRONMENTAL

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request No.: K1710152
Date Received: 09/22/17

Case Narrative

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), Matrix/Duplicate, Matrix Spike (MS/DMS), Laboratory Control Sample (LCS), and Laboratory/Duplicate Laboratory Control Sample (LCS/DLCS).

Sample Receipt

Two water samples were received for analysis at ALS Environmental on 09/22/17. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4°C upon receipt at the laboratory.

General Chemistry Parameters

Chloride, Nitrate as Nitrogen and Sulfate by EPA Method 300.0:

The matrix spike recoveries for sample Batch QC were outside control criteria because of suspected matrix interference. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control. No further corrective action was taken.

Nitrate as Nitrogen and Sulfate by EPA Method 300.0:

The Relative Percent Difference (RPD) criterion for the replicate analysis in sample Batch QC was not applicable because the analyte concentration was not significantly greater than the Method Reporting Limit (MRL). Analytical values derived from measurements close to the detection limit are not subject to the same accuracy and precision criteria as results derived from measurements higher on the calibration range for the method.

Total Suspended Solids by Standard Method 2540 D:

The Relative Percent Difference (RPD) for the replicate analysis in sample Batch QC was outside the normal ALS control limits. The associated QA/QC results (e.g. control sample, method blank, Batch QC) indicate the analysis was in control. No further corrective action was appropriate.

No other anomalies associated with the analysis of these samples were observed.

Total and Dissolved Metals

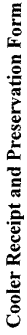
No anomalies associated with the analysis of these samples were observed.

Approved by Nae D. Dant



Chain of Custody

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com



PC MH

DHL **PDX** **Courier** **Hand Delivered**

Envelope Other

If yes, how many and where? 1 front

If present, were they signed and dated?

- | | Inserts | Baggies | Bubble Wrap | Gel Packs | Wet Ice | Dry Ice | Sleeves |
|--|----------------|----------------|--------------------|------------------|----------------|-------------------------|----------------|
| 4. Packing material: | | | | | | | |
| 5. Were custody papers properly filled out (ink, signed, etc.)? | | | | | | | Y |
| 6. Were samples received in good condition (temperature, unbroken)? <i>Indicate in the table below.</i> | | | | | | | Y |
| | | | | | Frozen | Partially Thawed | Thawed |
| 7. Were all sample labels complete (i.e analysis, preservation, etc.)? | | | | | | | Y |
| 8. Did all sample labels and tags agree with custody papers? <i>Indicate major discrepancies in the table on page 2.</i> | | | | | | | Y |
| 9. Were appropriate bottles/containers and volumes received for the tests indicated? | | | | | | | Y |
| 10. Were the pH-preserved bottles (see SMO GEN SOP) received at the appropriate pH? <i>Indicate in the table below</i> | | | | | | | Y |
| 11. Were VOA vials received without headspace? <i>Indicate in the table below.</i> | | | | | | | Y |
| 12. Was C12/Res negative? | | | | | | | Y |

[illegible]

Votes, Discrepancies, & Resolutions:

SHORT HOLD TIME

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ALS

K1710152

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[illegible]

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U:\ENV\8.0 EPA\8.1 NPDES_05\8.1.11 Forms\Forms\Chains of Custody



ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 180.1
Prep Method: None
Service Request: K1710152
Date Collected: 09/21/17
Date Received: 09/22/17
Units: NTU
Basis: NA

Turbidity

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 6	K1710152-001	3.22	0.10	1	09/22/17 14:00	
Site 7	K1710152-002	1.22	0.10	1	09/22/17 14:00	
Method Blank	K1710152-MB1	ND U	0.10	1	09/21/17 18:43	

General Chemistry

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577- 7222 Fax (360)636- 1068
www.alsglobal.com

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 180.1
Prep Method: None

Service Request: K1710152
Date Collected: NA
Date Received: NA

Units: NTU
Basis: NA

Replicate Sample Summary
Turbidity

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Batch QC	K1710079-001DUP	0.10	12.3	13.0	12.7	6	20	09/21/17
Batch QC	K1710149-004DUP	0.10	0.50	0.50	0.499	1	20	09/22/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Analyzed: 09/21/17
Date Extracted: NA

Lab Control Sample Summary
Turbidity

Analysis Method: 180.1
Prep Method: None

Units: NTU
Basis: NA
Analysis Lot: 562880

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710152-LCS1	6.35	6.51	98	90-110

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Superset Reference:17-0000437816 rev 00

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Superset Reference:17-0000437816 rev 00

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: Method

Service Request: K1710152
Date Collected: 09/21/17
Date Received: 09/22/17
Units: mg/L
Basis: NA

Chloride

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Site 6	K1710152-001	ND U	2.0	2	09/22/17 18:11	9/22/17	
Site 7	K1710152-002	ND U	2.0	2	09/22/17 18:21	9/22/17	
Method Blank	K1710152-MB1	ND U	1.0	1	09/22/17 14:34	9/22/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1710152
Date Collected: NA
Date Received: NA
Date Analyzed: 09/22/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Batch QC
Lab Code: KQ1713941-03

Units: mg/L
Basis: NA

Duplicate Sample
KQ1713941-03DUP

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit
Chloride	300.0	2.0	ND U	ND U	NC	NC	20

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Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Collected: N/A
Date Received: N/A
Date Analyzed: 09/22/17
Date Extracted: 09/22/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1710152
Date Analyzed: 09/22/17
Date Extracted: 09/22/17

Duplicate Matrix Spike Summary
Chloride

Sample Name: Batch QC
Lab Code: KQ1713941-03
Analysis Method: 300.0
Prep Method: Method

Units: mg/L
Basis: NA

Matrix Spike
KQ1713941-03MS

Sample	Result
ND U	5.4

Spike	Amount	Result	% Rec
4.0	4.0	5.4	134 *

Duplicate Matrix Spike
KQ1713941-03DMS

Spike	Amount	% Rec	% Rec
4.0	4.0	136 *	90-110

RPD	Limit
1	20

Lab Control Sample Summary
Chloride

Analysis Method: 300.0
Prep Method: Method

Units: mg/L
Basis: NA
Analysis Lot: 563136

Sample Name Lab Control Sample
Lab Code K1710152-LCS1

Result 4.7
Spike Amount 5.0
% Rec 93
% Rec Limits 90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: Method

Service Request: K1710152
Date Collected: 09/21/17
Date Received: 09/22/17
Units: mg/L
Basis: NA

Nitrate as Nitrogen

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Site 6	K1710152-001	ND U	0.10	2	09/22/17 18:11	9/22/17	
Site 7	K1710152-002	ND U	0.10	2	09/22/17 18:21	9/22/17	
Method Blank	K1710152-MB1	ND U	0.050	1	09/22/17 14:34	9/22/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1710152
Date Collected: NA
Date Received: NA
Date Analyzed: 09/22/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Batch QC
Lab Code: K1710125-001
Units: mg/L
Basis: NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1710125-001DUP Result	Average	RPD	RPD Limit
Nitrate as Nitrogen	300.0	0.10	0.26	0.10	0.182	88 *	20

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Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Collected: N/A
Date Analyzed: 09/22/17
Date Extracted: 09/22/17

Duplicate Matrix Spike Summary
Nitrate as Nitrogen

Sample Name: Batch QC
Lab Code: K1710125-001
Analysis Method: 300.0
Prep Method: Method

Units: mg/L
Basis: NA

Matrix Spike		Spike		% Rec	
K1710125-001MS		Amount		Limits	
Sample	Result	Amount	Result	85 *	90-110
0.26	3.65	4.00	3.60		

Duplicate Matrix Spike		Spike		% Rec	
K1710125-001DMS		Amount		Limits	
		4.00	84 *	90-110	
			1		20

RPD Limit

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Analyzed: 09/22/17
Date Extracted: 09/22/17

Lab Control Sample Summary
Nitrate as Nitrogen

Analysis Method: 300.0
Prep Method: Method

Units: mg/L
Basis: NA
Analysis Lot: 563136

Sample Name		Lab Code		Result		Spike		% Rec	
Lab Control Sample		K1710152-LCS1		2.25		Amount		Limits	
						2.50	90		90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: Method

Service Request: K1710152
Date Collected: 09/21/17
Date Received: 09/22/17
Units: mg/L
Basis: NA

Sulfate

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Site 6	K1710152-001	0.90	0.20	2	09/22/17 18:11	9/22/17	
Site 7	K1710152-002	0.39	0.20	2	09/22/17 18:21	9/22/17	
Method Blank	K1710152-MB1	ND U	0.10	1	09/22/17 14:34	9/22/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1710152
Date Collected: NA
Date Received: NA
Date Analyzed: 09/22/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Batch QC
Lab Code: KQ1713941-03

Units: mg/L
Basis: NA

Duplicate Sample
KQ1713941-03DUP

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit
Sulfate	300.0	0.20	1.37	0.57	0.974	82 *	20

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Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Collected: N/A
Date Received: N/A
Date Analyzed: 09/22/17
Date Extracted: 09/22/17

Duplicate Matrix Spike Summary
Sulfate

Sample Name: Batch QC
Lab Code: KQ1713941-03
Analysis Method: 300.0
Prep Method: Method

Units: mg/L
Basis: NA

Matrix Spike
KQ1713941-03MS

Sample Result
1.37

Result
4.27

Spike Amount
4.00

% Rec
73 *

% Rec Limits
90-110

RPD
10

RPD Limit
20

Duplicate Matrix Spike
KQ1713941-03DMS

Spike Amount
4.00

% Rec
84 *

% Rec Limits
90-110

RPD
10

RPD Limit
20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Lab Control Sample Summary
Sulfate

Analysis Method: 300.0
Prep Method: Method

Units: mg/L
Basis: NA
Analysis Lot: 563136

Sample Name
Lab Control Sample

Lab Code
K1710152-LCS1

Result
4.76

Spike Amount
5.00

% Rec
95

% Rec Limits
90-110

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2120 B
Prep Method: None
Service Request: K1710152
Date Collected: 09/21/17
Date Received: 09/22/17
Units: ColorUnits
Basis: NA

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2120 B
Prep Method: None
Service Request: K1710152
Date Collected: 09/21/17
Date Received: 09/22/17
Units: ColorUnits
Basis: NA

Replicate Sample Summary
Color

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 6	K1710152-001	90	10	2	09/22/17 16:05	
Site 7	K1710152-002	80	10	2	09/22/17 16:12	
Method Blank	K1710152-MB1	ND U	5.0	1	09/22/17 13:34	

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD Limit	Date Analyzed
Batch QC	K1710067-001DUP	5.0	30.0	30.0	30.0	<1	09/22/17
Site 6	K1710152-001DUP	10	90	90	90.0	<1	09/22/17

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Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Analyzed: 09/22/17
Date Extracted: NA

Lab Control Sample Summary
Color

Analysis Method: SM 2120 B
Prep Method: None

Units: Color/Units
Basis: NA
Analysis Lot: 562864

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710152-LCS1	15.0	15.0	100	85-115

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2540 C
Prep Method: None

Service Request: K1710152
Date Collected: 09/21/17
Date Received: 09/22/17
Units: mg/L
Basis: NA

Solids, Total Dissolved

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 6	K1710152-001	43	10	1	09/27/17 23:00	
Site 7	K1710152-002	37	10	1	09/27/17 23:00	
Method Blank	K1710152-MB1	ND U	10	1	09/27/17 23:00	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Collected: NA
Date Received: NA
Date Analyzed: 09/27/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Batch QC
Lab Code: K1710149-003

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1710149-003DUP Result	Average	RPD	RPD Limit
Solids, Total Dissolved	SM 2540 C	10	310	313	311	<1	10

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Analyzed: 09/27/17
Date Extracted: NA

Lab Control Sample Summary
Solids, Total Dissolved

Analysis Method: SM 2540 C
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 563512

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710152-LCS1	1630	1640	99	85-115

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Superset Reference:17-0000437816 rev 00

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Superset Reference:17-0000437816 rev 00

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2540 D
Prep Method: None

Service Request: K1710152
Date Collected: 09/21/17
Date Received: 09/22/17
Units: mg/L
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1710152
Date Collected: NA
Date Received: NA
Date Analyzed: 09/28/17

Solids, Total Suspended (TSS)

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Batch QC
Lab Code: K1710341-001

Units: mg/L
Basis: NA

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 6	K1710152-001	7.6	4.0	1	09/28/17 23:30	
Site 7	K1710152-002	4.0	4.0	1	09/28/17 23:30	
Method Blank	K1710152-MB1	ND U	4.0	1	09/28/17 23:30	

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample Result
Solids, Total Suspended (TSS)	SM 2540 D	2.9	34.0	43.4
			Average	38.7
			RPD	24 *
				10

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Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Analyzed: 09/28/17
Date Extracted: NA

Lab Control Sample Summary
Solids, Total Suspended (TSS)

Analysis Method: SM 2540 D
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 563724

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710152-LCS1	408	429	95	85-115

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 4500-Cl G
Prep Method: None

Service Request: K1710152
Date Collected: 09/21/17
Date Received: 09/22/17
Units: mg/L
Basis: NA

Chlorine, Total Residual

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 6	K1710152-001	ND U	0.050	1	09/22/17 14:35	H
Site 7	K1710152-002	ND U	0.050	1	09/22/17 14:35	H
Method Blank	K1710152-MB1	ND U	0.050	1	09/22/17 14:35	
Method Blank	K1710152-MB2	ND U	0.050	1	09/22/17 14:35	
Method Blank	K1710152-MB3	ND U	0.050	1	09/22/17 14:35	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Collected: NA
Date Received: NA
Date Analyzed: 09/22/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Batch QC
Lab Code: K1710149-001

Units: mg/L
Basis: NA

Analyte Name	MRL	Sample Result	Duplicate Sample Result	Average	RPD	RPD Limit
Chlorine, Total Residual	0.050	ND U	ND U	NC	NC	20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Collected: N/A
Date Received: N/A
Date Analyzed: 09/22/17
Date Extracted: NA

Matrix Spike Summary
Chlorine, Total Residual

Units: mg/L
Basis: NA

Sample Name: Batch QC
Lab Code: K1710149-001
Analysis Method: SM 4500-Cl G
Prep Method: None

Matrix Spike
K1710149-001MS

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Chlorine, Total Residual	ND U	1.00	1.00	100	21-141

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Superset Reference:17-0000437816 rev 00

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Analyzed: 09/22/17
Date Extracted: NA

Lab Control Sample Summary
Chlorine, Total Residual

Analysis Method: SM 4500-Cl G
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 562826

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710152-LCS1	1.00	1.00	100	78-116
Lab Control Sample	K1710152-LCS2	0.980	1.00	98	78-116
Lab Control Sample	K1710152-LCS3	0.940	1.00	94	78-116

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 4500-NH3 G
Prep Method: Method

Service Request: K1710152
Date Collected: 09/21/17
Date Received: 09/22/17
Units: mg/L
Basis: NA

Ammonia as Nitrogen

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Site 6	K1710152-001	ND U	0.10	1	10/11/17 10:47	10/11/17	
Site 7	K1710152-002	ND U	0.10	1	10/11/17 10:47	10/11/17	
Method Blank	K1710152-MB1	ND U	0.10	1	10/11/17 10:47	10/11/17	

Client:	Cour Alaska, Inc.	Service Request: K1710152
Project	TTF Fish Resource Investigations	Date Collected: NA
Sample Matrix:	Water	Date Received: NA
Analysis Method:	SM 4500-NH3 G	Units: mg/L
Prep Method:	Method	Basis: NA

Replicate Sample Summary Ammonia as Nitrogen

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD Limit	Date Analyzed
Batch QC	K1709944-001DUP	0.10	1.03	1.03	1.03	<1	10/11/17
Batch QC	K1701479-001DUP	0.10	ND U	ND U	ND	20	10/11/17

Duplicate Matrix Spike Summary

Sample Name:	Batch QC
Lab Code:	K1709944-001
Analysis Method:	SM 4500-NH3 G
Prep Method:	Method

Analyte Name	Sample		Matrix Spike K1709944-001IMS				Duplicate Matrix Spike K1709944-001DMS				RPD	
	Result	Amount	% Rec	Result	Amount	% Rec	Result	Amount	% Rec	Limits	RPD	Limit
Ammonia as Nitrogen	1.03	2.93	95	2.97	2.00	97	90-112	2	20			

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Duplicate Matrix Spike Summary

Units:	mg/L
Basis:	NA

Analyte Name	Sample		Matrix Spike K1709944-001IMS				Duplicate Matrix Spike K1709944-001DMS				RPD	
	Result	Amount	% Rec	Result	Amount	% Rec	Result	Amount	% Rec	Limits	RPD	Limit
Ammonia as Nitrogen	1.03	2.93	95	2.97	2.00	97	90-112	2	20			

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Collected: N/A
Date Received: N/A
Date Analyzed: 10/11/17
Date Extracted: 10/11/17

Duplicate Matrix Spike Summary
Ammonia as Nitrogen

Sample Name: Batch QC
Lab Code: K1710479-001
Analysis Method: SM 4500-NH3 G
Prep Method: Method

Units: mg/L
Basis: NA

Matrix Spike
K1710479-001MS

Analyte Name
Ammonia as Nitrogen

Sample Result
ND U

Spike Amount
2.00

% Rec
100

% Rec Limits
90-112

RPD
3

Limit
20

Duplicate Matrix Spike
K1710479-001DMS

Spike Amount
2.00

% Rec
97

% Rec Limits
90-112

RPD
3

Limit
20

RPD
3

Limit
20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Lab Control Sample Summary
Ammonia as Nitrogen

Analysis Method: SM 4500-NH3 G
Prep Method: Method

Units: mg/L
Basis: NA
Analysis Lot: 565418

Sample Name
Lab Control Sample

Lab Code
K1710152-LCS1

Result
9.67

Spike Amount
10.2

% Rec
95

% Rec Limits
90-112



ALS Group USA, Corp.
dha ALS Environmental
Analytical Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 6
Lab Code: K1710152-001

Service Request: K1710152
Date Collected: 09/21/17 15:35
Date Received: 09/22/17 09:45
Basis: NA

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	62.1	ug/L	1.0	1	09/27/17 11:41	09/25/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/27/17 11:41	09/25/17	
Copper	200.8	ND U	ug/L	1.0	1	09/27/17 11:41	09/25/17	
Iron	200.7	178	ug/L	50	1	09/29/17 16:20	09/25/17	
Lead	200.8	ND U	ug/L	0.16	1	09/27/17 11:41	09/25/17	
Manganese	200.8	6.6	ug/L	1.0	1	09/27/17 11:41	09/25/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/27/17 11:41	09/25/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/27/17 11:41	09/25/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/27/17 11:41	09/25/17	

Metals

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 6
Lab Code: K1710152-001

Service Request: K1710152
Date Collected: 09/21/17 15:35
Date Received: 09/22/17 09:45
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 7
Lab Code: K1710152-002

Service Request: K1710152
Date Collected: 09/21/17 16:00
Date Received: 09/22/17 09:45
Basis: NA

Dissolved Metals

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	60.0	ug/L	1.0	1	09/27/17 11:57	09/25/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/27/17 11:57	09/25/17	
Copper	200.8	ND U	ug/L	1.0	1	09/27/17 11:57	09/25/17	
Iron	200.7	138	ug/L	50	1	09/29/17 16:26	09/25/17	
Lead	200.8	ND U	ug/L	0.16	1	09/27/17 11:57	09/25/17	
Manganese	200.8	4.0	ug/L	1.0	1	09/27/17 11:57	09/25/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/27/17 11:57	09/25/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/27/17 11:57	09/25/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/27/17 11:57	09/25/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	101	ug/L	1.0	1	09/27/17 11:45	09/25/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/27/17 11:45	09/25/17	
Copper	200.8	ND U	ug/L	1.0	1	09/27/17 11:45	09/25/17	
Iron	200.7	189	ug/L	50	1	09/29/17 16:23	09/25/17	
Lead	200.8	ND U	ug/L	0.16	1	09/27/17 11:45	09/25/17	
Manganese	200.8	9.0	ug/L	1.0	1	09/27/17 11:45	09/25/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/27/17 11:45	09/25/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/27/17 11:45	09/25/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/27/17 11:45	09/25/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 7
Lab Code: K1710152-002

Service Request: K1710152
Date Collected: 09/21/17 16:00
Date Received: 09/22/17 09:45
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Method Blank
Lab Code: KQ1713843-01

Service Request: K1710152
Date Collected: NA
Date Received: NA
Basis: NA

Dissolved Metals

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	68.7	ug/L	1.0	1	09/27/17 12:01	09/25/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/27/17 12:01	09/25/17	
Copper	200.8	ND U	ug/L	1.0	1	09/27/17 12:01	09/25/17	
Iron	200.7	98	ug/L	50	1	09/29/17 16:29	09/25/17	
Lead	200.8	ND U	ug/L	0.16	1	09/27/17 12:01	09/25/17	
Manganese	200.8	3.6	ug/L	1.0	1	09/27/17 12:01	09/25/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/27/17 12:01	09/25/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/27/17 12:01	09/25/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/27/17 12:01	09/25/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Iron	200.7	ND U	ug/L	50	1	09/29/17 15:47	09/25/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Method Blank
Lab Code: KQ1713845-01

Service Request: K1710152
Date Collected: NA
Date Received: NA
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1710152
Date Collected: NA
Date Received: NA
Date Analyzed: 09/29/17

Replicate Sample Summary
Total Recoverable Metals

Sample Name: Batch QC
Lab Code: K1709586-001

Units: ug/L
Basis: NA

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	ND U	ug/L	1.0	1	09/27/17 10:45	09/25/17	
Cadmium	200.8	ND U	ug/L	0.020	1	09/27/17 10:45	09/25/17	
Copper	200.8	ND U	ug/L	1.0	1	09/27/17 10:45	09/25/17	
Lead	200.8	ND U	ug/L	0.16	1	09/27/17 10:45	09/25/17	
Manganese	200.8	ND U	ug/L	1.0	1	09/27/17 10:45	09/25/17	
Nickel	200.8	ND U	ug/L	1.0	1	09/27/17 10:45	09/25/17	
Selenium	200.8	ND U	ug/L	1.0	1	09/27/17 10:45	09/25/17	
Zinc	200.8	ND U	ug/L	2.5	1	09/27/17 10:45	09/25/17	

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	RPD	RPD Limit
Iron	200.7	50	106	110	108	4	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Collected: NA
Date Received: NA
Date Analyzed: 09/27/17

Replicate Sample Summary
Total Recoverable Metals

Sample Name: Batch QC
Lab Code: K1710065-001

Units: ug/L
Basis: NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1713845-03 Result	Average	RPD	RPD Limit
Aluminum	200.8	1.0	203	199	201	2	20
Cadmium	200.8	0.020	ND U	ND U	NC	NC	20
Copper	200.8	1.0	ND U	ND U	NC	NC	20
Lead	200.8	0.16	ND U	ND U	NC	NC	20
Manganese	200.8	1.0	38.8	39.0	38.9	<1	20
Nickel	200.8	1.0	ND U	ND U	NC	NC	20
Selenium	200.8	1.0	ND U	ND U	ND	-	20
Zinc	200.8	2.5	ND U	ND U	NC	NC	20

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Collected: N/A
Date Received: N/A
Date Analyzed: 09/29/17
Date Extracted: 09/25/17

Matrix Spike Summary
Total Recoverable Metals

Sample Name: Batch QC
Lab Code: K1709986-001
Analysis Method: 200.7
Prep Method: EPA CLP-METALS ILM04.0

Units: ug/L
Basis: NA

Matrix Spike
KQ1713843-04

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Iron	106	1110	1000	100	70-130

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Collected: N/A
Date Received: N/A
Date Analyzed: 09/27/17
Date Extracted: 09/25/17

Matrix Spike Summary
Total Recoverable Metals

Sample Name: Batch QC
Lab Code: K1710065-001
Analysis Method: 200.8
Prep Method: EPA CLP-METALS ILM04.0

Units: ug/L
Basis: NA

Matrix Spike
KQ1713845-04

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	203	293	100	90	70-130
Cadmium	ND U	27.1	25.0	108	70-130
Copper	ND U	13.4	12.5	107	70-130
Lead	ND U	53.6	50.0	107	70-130
Manganese	38.8	65.1	25.0	105	70-130
Nickel	ND U	26.1	25.0	105	70-130
Selenium	ND U	51.8	50.0	104	70-130
Zinc	ND U	26.7	25.0	107	70-130

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Lab Control Sample Summary
Total Recoverable Metals

Units:ug/L
Basis:NA

Lab Control Sample
KQ1713843-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Iron	200.7	2540	2500	102	85-115

Service Request: K1710152
Date Analyzed: 09/27/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Lab Control Sample Summary
Total Recoverable Metals

Units:ug/L
Basis:NA

Lab Control Sample
KQ1713845-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	200.8	98.1	100	98	85-115
Cadmium	200.8	25.9	25.0	104	85-115
Copper	200.8	12.5	12.5	100	85-115
Lead	200.8	51.6	50.0	103	85-115
Manganese	200.8	25.3	25.0	101	85-115
Nickel	200.8	24.9	25.0	100	85-115
Selenium	200.8	50.4	50.0	101	85-115
Zinc	200.8	25.0	25.0	100	85-115

Service Request: K1710152
Date Collected: 09/21/17
Date Received: 09/22/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Units: ng/L
Basis: NA

Sample Name	Lab Code	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Notes
Site 6	K1710152-001	1.0	1	09/30/17	10/02/17	2.2	
Site 7	K1710152-002	1.0	1	09/30/17	10/02/17	2.2	
Method Blank 1	K1710152-MB1	1.0	1	09/30/17	10/02/17	ND	
Method Blank 2	K1710152-MB2	1.0	1	09/30/17	10/02/17	ND	
Method Blank 3	K1710152-MB3	1.0	1	09/30/17	10/02/17	ND	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Collected: NA
Date Received: NA
Date Extracted: 09/30/17
Date Analyzed: 10/02/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
LCS Matrix: Water
Service Request: K1710152
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/02/17

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name:
Lab Code:
Test Notes:

Batch QC
K1710271-001MS,

K1710271-001MSD

Units: ng/L
Basis: NA

Sample Name: Ongoing Precision and Recovery (Initial)

Test Notes:

Units: ng/L

Basis: NA

Analyte	Percent Recovery											Result Notes
	Prep Method	Analysis Method	Spike Level		Sample Result		Spike Result		ALS Acceptance Limits			
			MRL	MS	DMS	MS	DMS	MS	DMS	DMS	MS	
Mercury	METHOD	1631E	1.0	50	50	ND	47.5	46.5	95	93	71-125	2

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	4.88	98	77-123	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
LCS Matrix: Water

Service Request: K1710152
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/02/17

Ongoing Precision and Recovery (OPR) Sample Summary

Total Metals

Sample Name: Ongoing Precision and Recovery (Final) Units: ng/L
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Percent Recovery	ALS	
					Percent Recovery	Result Notes
Mercury	METHOD	1631E	5.00	4.59	92	77-123

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
LCS Matrix: Water

Service Request: K1710152
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/02/17

Quality Control Sample (QCS) Summary

Total Metals

Sample Name: Quality Control Sample Units: ng/L
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Percent Recovery	ALS	
					Percent Recovery	Result Notes
Mercury	METHOD	1631E	5.00	4.89	98	77-123

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Collected: 09/21/17
Date Received: 09/22/17
Date Extracted: 09/25/17
Date Analyzed: 09/29/17

Hardness, as CaCO3
EPA Method 200.7/ SM Method 2340B
Units: mg/L (ppm)

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1710152
Date Collected: NA
Date Received: NA
Date Extracted: 09/25/17
Date Analyzed: 09/29/17

Duplicate Summary
Metals
Units: mg/L (ppm)

Sample Name	Lab Code	MRL	Result
Site 6	K1710152-001	1.0	13.4
Site 7	K1710152-002	1.0	10.6
Method Blank	KQ1713843-01	1.0	ND

Sample Name: Batch QC
Lab Code: K1709986-001DUP

Analyte	Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Hardness, as CaCO3	200.7/ SM 2340B	1.0	422	421	422	<1



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October 31, 2017

Analytical Report for Service Request No: K1710990

Peter Strow
Coeur Alaska, Inc.
3031 Clinton Drive, Suite 202
Juneau, AK 99801

RE: TTF Fish Resource Investigation

Dear Peter,

Enclosed are the results of the sample(s) submitted to our laboratory October 11, 2017
For your reference, these analyses have been assigned our service request number **K1710990**.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3376. You may also contact me via email at Mark.Harris@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental


Mark Harris
Project Manager



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Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated value.
- U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
- DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.
- H The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

- # The control limit criteria is not applicable. See case narrative.
- J The result is an estimated value.
- E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See case narrative.
- S The reported value was determined by the Method of Standard Additions (MSA).
- U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
- DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- + The correlation coefficient for the MSA is less than 0.995.
- Q See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

- * The result is an outlier. See case narrative.
 - # The control limit criteria is not applicable. See case narrative.
 - A A tentatively identified compound, a suspected aldol-condensation product.
 - B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
 - C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
 - D The reported result is from a dilution.
 - E The result is an estimated value.
 - J The result is an estimated value.
 - N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
 - P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
 - U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
 - DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
 - i The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
 - X See case narrative.
 - Q See case narrative. One or more quality control criteria was outside the limits.
- Additional Petroleum Hydrocarbon Specific Qualifiers**
- F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
 - L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
 - H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
 - O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
 - Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
 - Z The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/capproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsys/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certifc/labs/Pages/ELAP.aspx	2795
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bschw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/qa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon - DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.alsglobal.com or at the accreditation bodies web site.
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/analyte is offered by that state.



Case Narrative

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ALS ENVIRONMENTAL



Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Service Request No.: K1710990
Date Received: 10/11/17

Case Narrative

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), and Matrix/Duplicate Matrix Spike (MS/DMS).

Sample Receipt

Two water samples were received for analysis at ALS Environmental on 10/11/17. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4°C upon receipt at the laboratory.

General Chemistry Parameters

Chloride by EPA Method 300.0:

The matrix spike recoveries for sample Batch QC were outside control criteria because of suspected matrix interference. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control. No further corrective action was taken.

No other anomalies associated with the analysis of these samples were observed.

Total and Dissolved Metals

No anomalies associated with the analysis of these samples were observed.

Approved by Noe D. Diaz

Chain of Custody

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ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Analysis Method: 180.1
Prep Method: None

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Units: NTU
Basis: NA

Turbidity

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1710990-001	0.73	0.10	1	10/11/17 13:30	
Site 2	K1710990-002	0.33	0.10	1	10/11/17 13:30	
Method Blank	K1710990-MB1	ND U	0.10	1	10/11/17 13:30	

General Chemistry

ALS Environmental—Kelso Laboratory
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www.alsglobal.com

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Analysis Method: 180.1
Prep Method: None

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Units: NTU
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Service Request: K1710990
Date Analyzed: 10/11/17
Date Extracted: NA

Lab Control Sample Summary
Turbidity

Analysis Method: 180.1
Prep Method: None
Units: NTU
Basis: NA
Analysis Lot: 565657

Replicate Sample Summary
Turbidity

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD Limit	RPD	Date Analyzed
Batch QC	K1710926-001DUP	0.10	11.3	11.4	11.4	20	<1	10/11/17
Site 1	K1710990-001DUP	0.10	0.73	0.62	0.673	20	17	10/11/17

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710990-LCS1	6.40	6.51	98	90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: None

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Units: mg/L
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: None

Service Request: K1710990
Date Collected: NA
Date Received: NA
Units: mg/L
Basis: NA

Chloride

Replicate Sample Summary
Chloride

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1710990-001	ND U	2.0	2	10/11/17 21:43	
Site 2	K1710990-002	ND U	2.0	2	10/11/17 21:53	
Method Blank	K1710990-MB1	ND U	1.0	1	10/11/17 17:50	

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD Limit	RPD	Date Analyzed
Batch QC	K1710963-001DUP	20	1.6 J	ND U	1.57	20	4	10/11/17
Batch QC	K1710964-003DUP	2.0	0.87	ND U	0.885	20	4	10/11/17

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Service Request: K1710990
Date Collected: N/A
Date Received: N/A
Date Analyzed: 10/11/17
Date Extracted: NA

Duplicate Matrix Spike Summary
Chloride

Sample Name: Batch QC
Lab Code: K1710964-003
Analysis Method: 300.0
Prep Method: None
Units: mg/L
Basis: NA

Analyte Name	Sample Result	Matrix Spike		Duplicate Matrix Spike		% Rec	Limits	RPD	Limit
		Amount	Spike	Amount	Spike				
Chloride	0.87	4.0	4.0	4.2	4.0	85 *	90-110	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Service Request: K1710990
Date Collected: N/A
Date Received: N/A
Date Analyzed: 10/11/17
Date Extracted: NA

Duplicate Matrix Spike Summary
Chloride

Sample Name: Batch QC
Lab Code: K1710963-001
Analysis Method: 300.0
Prep Method: None
Units: mg/L
Basis: NA

Analyte Name	Sample Result	Matrix Spike		Duplicate Matrix Spike		% Rec	Limits	RPD	Limit
		Amount	Spike	Amount	Spike				
Chloride	1.6 J	77	80	74	80	94	90-110	4	20

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Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Analyzed: 10/11/17
Date Extracted: NA

Lab Control Sample Summary
Chloride

Analysis Method: 300.0
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 565640

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710990-LCS1	4.9	5.0	98	90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: None

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Units: mg/L
Basis: NA

Nitrate as Nitrogen

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1710990-001	ND U	0.10	2	10/11/17 21:43	
Site 2	K1710990-002	ND U	0.10	2	10/11/17 21:53	
Method Blank	K1710990-MB1	ND U	0.050	1	10/11/17 17:50	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: None
Service Request: K1710990
Date Collected: NA
Date Received: NA
Units: mg/L
Basis: NA

Replicate Sample Summary
Nitrate as Nitrogen

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Batch QC	K1710963-001DUP	1.0	ND U	ND U	NC	NC	20	10/11/17
Batch QC	K1710964-003DUP	0.10	ND U	ND U	NC	NC	20	10/11/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Service Request: K1710990
Date Collected: N/A
Date Received: N/A
Date Analyzed: 10/11/17
Date Extracted: NA

Duplicate Matrix Spike Summary
Nitrate as Nitrogen

Sample Name: Batch QC
Lab Code: K1710964-003
Analysis Method: 300.0
Prep Method: None

Units: mg/L
Basis: NA

Analyte Name	Sample Result	Result	Matrix Spike	Duplicate Matrix Spike	Spike Amount	% Rec	% Rec Limits	RPD	RPD Limit
Nitrate as Nitrogen	ND U	3.86	K1710964-003MS	K1710964-003DMS	4.00	96	90-110	<1	20
					4.00	97			

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Collected: N/A
Date Received: N/A
Date Analyzed: 10/11/17
Date Extracted: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Service Request: K1710990
Date Analyzed: 10/11/17
Date Extracted: NA

Duplicate Matrix Spike Summary
Nitrate as Nitrogen

Lab Control Sample Summary
Nitrate as Nitrogen

Sample Name: Batch QC
Lab Code: K1710963-001
Analysis Method: 300.0
Prep Method: None

Units: mg/L
Basis: NA

Analysis Method: 300.0
Prep Method: None
Units: mg/L
Basis: NA
Analysis Lot: 565640

Matrix Spike
K1710963-001MS

Duplicate Matrix Spike
K1710963-001DMS

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits	RPD	Limit
Nitrate as Nitrogen	ND U	77.0	80.0	96	97	1	20

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits	RPD	Limit
Nitrate as Nitrogen	ND U	77.9	80.0	97	90-110	1	20

Sample Name Lab Control Sample
Lab Code K1710990-LCS1
Result 2.28
Spike Amount 2.50
% Rec 91
% Rec Limits 90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: None

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Units: mg/L
Basis: NA

Sulfate

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1710990-001	2.94	0.20	2	10/27/17 16:28	
Site 2	K1710990-002	2.83	0.20	2	10/11/17 21:53	
Method Blank	K1710990-MB1	ND U	0.10	1	10/11/17 17:50	
Method Blank	K1710990-MB2	ND U	0.10	1	10/27/17 11:23	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Date Analyzed: 10/27/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Site 1
Lab Code: K1710990-001

Units: mg/L
Basis: NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1710990-001DUP Result	Average	RPD	RPD Limit
Sulfate	300.0	0.20	2.94	2.99	2.97	2	20

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Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Date Analyzed: 10/27/17
Date Extracted: NA

Duplicate Matrix Spike Summary
Sulfate

Sample Name: Site 1
Lab Code: K1710990-001
Analysis Method: 300.0
Prep Method: None

Units: mg/L
Basis: NA

Matrix Spike
K1710990-001MS

Sample Result
2.94

Result
11.0

Spike Amount
8.00

% Rec
101

% Rec Limits
97

RPD
3

RPD Limit
20

Duplicate Matrix Spike
K1710990-001DMS

Spike Amount
8.00

% Rec
97

% Rec Limits
90-110

RPD
3

RPD Limit
20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Analyzed: 10/11/17
Date Extracted: NA

Lab Control Sample Summary
Sulfate

Analysis Method: 300.0
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 565640

Sample Name
Lab Control Sample

Lab Code
K1710990-LCS1

Result
4.92

Spike Amount
5.00

% Rec
98

% Rec Limits
90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Analyzed: 10/27/17
Date Extracted: NA

Lab Control Sample Summary
Sulfate

Analysis Method: 300.0
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 567891

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710990-LCS2	4.89	5.00	98	90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Analysis Method: SM 2120 B
Prep Method: None

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Units: ColorUnits
Basis: NA

Color

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1710990-001	20.0	5.0	1	10/11/17 16:30	
Site 2	K1710990-002	25.0	5.0	1	10/11/17 16:32	
Method Blank	K1710990-MB1	ND U	5.0	1	10/11/17 09:23	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Collected: NA
Date Received: NA
Date Analyzed: 10/11/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Batch QC
Lab Code: K1710910-001

Duplicate Sample K1710910-001DUP			
Analyte Name	Analysis Method	MRL	Sample Result
Color	SM 2120 B	5.0	25.0
Average	RPD	RPD Limit	
25.0	<1	20	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Analyzed: 10/11/17
Date Extracted: NA

Lab Control Sample Summary
Color

Analysis Method: SM 2120 B
Prep Method: None
Units: ColorUnits
Basis: NA
Analysis Lot: 565463

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710990-LCS1	15.0	15.0	100	85-115

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Analysis Method: SM 2540 C
Prep Method: None

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Units: mg/L
Basis: NA

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Analysis Method: SM 2540 C
Prep Method: None
Service Request: K1710990
Date Collected: NA
Date Received: NA
Units: mg/L
Basis: NA

Solids, Total Dissolved

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1710990-001	94	10	1	10/17/17 22:10	
Site 2	K1710990-002	97	10	1	10/17/17 22:10	
Method Blank	K1710990-MB2	ND U	10	1	10/17/17 22:10	

Replicate Sample Summary
Solids, Total Dissolved

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD Limit	Date Analyzed
Batch QC	K1710963-001DUP	10	2130	2110	2120	10	10/17/17
Batch QC	K1710964-003DUP	10	216	214	215	1	10/17/17

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Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Analyzed: 10/17/17
Date Extracted: NA

Lab Control Sample Summary
Solids, Total Dissolved

Analysis Method: SM 2540 C
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 566304

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710990-LCS1	1640	1640	100	85-115

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Analysis Method: SM 2540 D
Prep Method: None

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Units: mg/L
Basis: NA

Solids, Total Suspended (TSS)

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1710990-001	ND U	4.0	1	10/17/17 23:00	
Site 2	K1710990-002	ND U	4.0	1	10/17/17 23:00	
Method Blank	K1710990-MB1	ND U	4.0	1	10/17/17 23:00	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Date Analyzed: 10/17/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Site 2
Lab Code: K1710990-002

Duplicate Sample
K1710990-002DUP

Analyte Name	Analysis Method	MRL	Sample Result	Average	RPD	RPD Limit
Solids, Total Suspended (TSS)	SM 2540 D	4.0	ND U	NC	NC	10

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Lab Control Sample Summary
Solids, Total Suspended (TSS)

Analysis Method: SM 2540 D
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 566305

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710990-LCS1	408	429	95	85-115

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Superset Reference:17-0000440283 rev 00

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Superset Reference:17-0000440283 rev 00

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Analysis Method: SM 4500-Cl G
Prep Method: None

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Units: mg/L
Basis: NA

Chlorine, Total Residual

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1710990-001	ND U	0.050	1	10/12/17 10:45	H
Site 2	K1710990-002	ND U	0.050	1	10/12/17 10:45	H
Method Blank	K1710990-MB1	ND U	0.050	1	10/12/17 10:45	
Method Blank	K1710990-MB2	ND U	0.050	1	10/12/17 10:45	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Date Analyzed: 10/12/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Site 1
Lab Code: K1710990-001

Units: mg/L
Basis: NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1710990-001DUP Result	Average	RPD	RPD Limit
Chlorine, Total Residual	SM 4500-Cl G	0.050	ND U	ND U	NC	NC	20

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Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Date Analyzed: 10/12/17
Date Extracted: NA

Matrix Spike Summary
Chlorine, Total Residual

Sample Name: Site 1
Lab Code: K1710990-001
Analysis Method: SM 4500-Cl G
Prep Method: None

Units: mg/L
Basis: NA

Matrix Spike
K1710990-001MS

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Chlorine, Total Residual	ND U	0.930	1.00	93	21-141

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Analyzed: 10/12/17
Date Extracted: NA

Lab Control Sample Summary
Chlorine, Total Residual

Analysis Method: SM 4500-Cl G
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 565552

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710990-LCS1	1.01	1.00	101	78-116
Lab Control Sample	K1710990-LCS2	0.880	1.00	88	78-116

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Analysis Method: SM 4500-NH3 G
Prep Method: Method

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Units: mg/L
Basis: NA

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Analysis Method: SM 4500-NH3 G
Prep Method: Method
Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Units: mg/L
Basis: NA

Replicate Sample Summary
Ammonia as Nitrogen

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Site 1	K1710990-001	ND U	0.10	1	10/24/17 10:46	10/24/17	
Site 2	K1710990-002	ND U	0.10	1	10/24/17 10:46	10/24/17	
Method Blank	K1710990-MB1	ND U	0.10	1	10/24/17 10:46	10/24/17	

Sample Name	Lab Code	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Batch QC	K1710809-001DUP	0.10	0.455	0.45	0.451	2	20	10/24/17
Batch QC	K1710963-001DUP	0.10	0.090	ND U	0.0840	14	20	10/24/17
Batch QC	K1710964-003DUP	0.10	0.024 J	ND U	NC	NC	20	10/24/17
Site 1	K1710990-001DUP	0.10	ND U	ND U	NC	NC	20	10/24/17

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Superset Reference:17-0000440283 rev 00

Superset Reference:17-0000440283 rev 00

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Service Request: K1710990
Date Collected: N/A
Date Received: N/A
Date Analyzed: 10/24/17
Date Extracted: 10/24/17

Service Request: K1710990
Date Collected: N/A
Date Received: N/A
Date Analyzed: 10/24/17
Date Extracted: 10/24/17

Duplicate Matrix Spike Summary
Ammonia as Nitrogen

Sample Name: Batch QC
Lab Code: K1710809-001
Analysis Method: SM 4500-NH3 G
Prep Method: Method
Units: mg/L
Basis: NA
Matrix Spike
K1710809-001MS
Amount 1.00
Spike 1.00
Result 1.44
Sample Result 0.455
Analyte Name Ammonia as Nitrogen
% Rec 99
% Rec Limits 90-112
RPD Limit 2
RPD 20

Duplicate Matrix Spike Summary
Ammonia as Nitrogen

Sample Name: Batch QC
Lab Code: K1710963-001
Analysis Method: SM 4500-NH3 G
Prep Method: Method
Units: mg/L
Basis: NA
Matrix Spike
K1710963-001DMS
Amount 1.00
Spike 1.00
Result 1.08
Sample Result 0.090
Analyte Name Ammonia as Nitrogen
% Rec 99
% Rec Limits 90-112
RPD Limit 3
RPD 20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Analyzed: 10/24/17
Date Extracted: 10/24/17

Lab Control Sample Summary
Ammonia as Nitrogen

Analysis Method: SM 4500-NH3 G
Prep Method: Method

Units: mg/L
Basis: NA
Analysis Lot: 567437

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1710990-LCS1	9.8	10.2	96	90-112

Metals

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Sample Name: Site 1
Lab Code: K1710990-001

Service Request: K1710990
Date Collected: 10/10/17 15:20
Date Received: 10/11/17 13:30
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Sample Name: Site 1
Lab Code: K1710990-001

Service Request: K1710990
Date Collected: 10/10/17 15:20
Date Received: 10/11/17 13:30
Basis: NA

Total Recoverable Metals

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	45.4	ug/L	1.0	1	10/18/17 11:37	10/17/17	
Cadmium	200.8	ND U	ug/L	0.020	1	10/18/17 11:37	10/17/17	
Copper	200.8	ND U	ug/L	1.0	1	10/18/17 11:37	10/17/17	
Iron	200.7	73	ug/L	50	1	10/20/17 11:07	10/17/17	
Lead	200.8	ND U	ug/L	0.16	1	10/18/17 11:37	10/17/17	
Manganese	200.8	5.9	ug/L	1.0	1	10/18/17 11:37	10/17/17	
Nickel	200.8	ND U	ug/L	1.0	1	10/18/17 11:37	10/17/17	
Selenium	200.8	ND U	ug/L	1.0	1	10/18/17 11:37	10/17/17	
Zinc	200.8	ND U	ug/L	2.5	1	10/18/17 11:37	10/17/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	43.3	ug/L	1.0	1	10/18/17 11:51	10/17/17	
Cadmium	200.8	ND U	ug/L	0.020	1	10/18/17 11:51	10/17/17	
Copper	200.8	ND U	ug/L	1.0	1	10/18/17 11:51	10/17/17	
Iron	200.7	67	ug/L	50	1	10/20/17 11:17	10/17/17	
Lead	200.8	ND U	ug/L	0.16	1	10/18/17 11:51	10/17/17	
Manganese	200.8	4.9	ug/L	1.0	1	10/18/17 11:51	10/17/17	
Nickel	200.8	ND U	ug/L	1.0	1	10/18/17 11:51	10/17/17	
Selenium	200.8	ND U	ug/L	1.0	1	10/18/17 11:51	10/17/17	
Zinc	200.8	3.2	ug/L	2.5	1	10/18/17 11:51	10/17/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Sample Name: Site 2
Lab Code: K1710990-002

Service Request: K1710990
Date Collected: 10/10/17 14:50
Date Received: 10/11/17 13:30
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Sample Name: Site 2
Lab Code: K1710990-002

Service Request: K1710990
Date Collected: 10/10/17 14:50
Date Received: 10/11/17 13:30
Basis: NA

Total Recoverable Metals

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	45.7	ug/L	1.0	1	10/18/17 11:48	10/17/17	
Cadmium	200.8	ND U	ug/L	0.020	1	10/18/17 11:48	10/17/17	
Copper	200.8	ND U	ug/L	1.0	1	10/18/17 11:48	10/17/17	
Iron	200.7	77	ug/L	50	1	10/20/17 11:15	10/17/17	
Lead	200.8	ND U	ug/L	0.16	1	10/18/17 11:48	10/17/17	
Manganese	200.8	5.6	ug/L	1.0	1	10/18/17 11:48	10/17/17	
Nickel	200.8	ND U	ug/L	1.0	1	10/18/17 11:48	10/17/17	
Selenium	200.8	ND U	ug/L	1.0	1	10/18/17 11:48	10/17/17	
Zinc	200.8	ND U	ug/L	2.5	1	10/18/17 11:48	10/17/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	43.9	ug/L	1.0	1	10/18/17 11:55	10/17/17	
Cadmium	200.8	ND U	ug/L	0.020	1	10/18/17 11:55	10/17/17	
Copper	200.8	ND U	ug/L	1.0	1	10/18/17 11:55	10/17/17	
Iron	200.7	69	ug/L	50	1	10/20/17 11:20	10/17/17	
Lead	200.8	ND U	ug/L	0.16	1	10/18/17 11:55	10/17/17	
Manganese	200.8	4.8	ug/L	1.0	1	10/18/17 11:55	10/17/17	
Nickel	200.8	ND U	ug/L	1.0	1	10/18/17 11:55	10/17/17	
Selenium	200.8	ND U	ug/L	1.0	1	10/18/17 11:55	10/17/17	
Zinc	200.8	ND U	ug/L	2.5	1	10/18/17 11:55	10/17/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Sample Name: Method Blank
Lab Code: KQ1715415-01

Service Request: K1710990
Date Collected: NA
Date Received: NA
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Sample Name: Method Blank
Lab Code: KQ1715416-01

Service Request: K1710990
Date Collected: NA
Date Received: NA
Basis: NA

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Iron	200.7	ND U	ug/L	50	1	10/20/17 10:55	10/17/17	

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	ND U	ug/L	1.0	1	10/18/17 11:30	10/17/17	
Cadmium	200.8	ND U	ug/L	0.020	1	10/18/17 11:30	10/17/17	
Copper	200.8	ND U	ug/L	1.0	1	10/18/17 11:30	10/17/17	
Lead	200.8	ND U	ug/L	0.16	1	10/18/17 11:30	10/17/17	
Manganese	200.8	ND U	ug/L	1.0	1	10/18/17 11:30	10/17/17	
Nickel	200.8	ND U	ug/L	1.0	1	10/18/17 11:30	10/17/17	
Selenium	200.8	ND U	ug/L	1.0	1	10/18/17 11:30	10/17/17	
Zinc	200.8	ND U	ug/L	2.5	1	10/18/17 11:30	10/17/17	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Date Analyzed: 10/20/17

Replicate Sample Summary
Total Recoverable Metals

Sample Name: Site 1
Lab Code: K1710990-001
Units: ug/L
Basis: NA
Analysis Method: 200.7
MRL: 50
Average: 73
RPD: <1
RPD Limit: 20

Duplicate Sample
KQ1715415-03

Analyte Name	Sample Result	Duplicate Sample Result
Iron	73	73

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water
Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Date Analyzed: 10/18/17

Replicate Sample Summary
Total Recoverable Metals

Sample Name: Site 1
Lab Code: K1710990-001
Units: ug/L
Basis: NA
Analysis Method: 200.8
MRL: 1.0
Average: 45.6
RPD: <1
RPD Limit: 20

Duplicate Sample
KQ1715416-03

Analyte Name	Sample Result	Duplicate Sample Result
Aluminum	45.4	45.8
Cadmium	ND U	ND U
Copper	ND U	ND U
Lead	ND U	ND U
Manganese	5.9	5.7
Nickel	ND U	ND U
Selenium	ND U	ND U
Zinc	ND U	ND U

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Date Analyzed: 10/20/17
Date Extracted: 10/17/17

Matrix Spike Summary
Total Recoverable Metals

Sample Name: Site 1
Lab Code: K1710990-001
Analysis Method: 200.7
Prep Method: EPA CLP-METALS ILM04.0

Units: ug/L
Basis: NA

Matrix Spike
KQ1715415-04

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Iron	73	1150	1000	108	70-130

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Date Analyzed: 10/18/17
Date Extracted: 10/17/17

Matrix Spike Summary
Total Recoverable Metals

Sample Name: Site 1
Lab Code: K1710990-001
Analysis Method: 200.8
Prep Method: EPA CLP-METALS ILM04.0

Units: ug/L
Basis: NA

Matrix Spike
KQ1715416-04

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	45.4	150	100	105	70-130
Cadmium	ND U	25.5	25.0	102	70-130
Copper	ND U	12.4	12.5	99	70-130
Lead	ND U	50.1	50.0	100	70-130
Manganese	5.9	32.3	25.0	106	70-130
Nickel	ND U	24.3	25.0	97	70-130
Selenium	ND U	52.1	50.0	104	70-130
Zinc	ND U	25.3	25.0	101	70-130

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Analyzed: 10/20/17

Lab Control Sample Summary
Total Recoverable Metals

Units:ug/L
Basis:NA

Lab Control Sample
KQ1715415-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
--------------	-------------------	--------	--------------	-------	--------------

Iron

200.7

2550

2500

102

85-115

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Analyzed: 10/18/17

Lab Control Sample Summary
Total Recoverable Metals

Units:ug/L
Basis:NA

Lab Control Sample
KQ1715416-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
--------------	-------------------	--------	--------------	-------	--------------

Aluminum

200.8

106

100

106

85-115

Cadmium

200.8

25.3

25.0

101

85-115

Copper

200.8

12.2

12.5

97

85-115

Lead

200.8

49.9

50.0

100

85-115

Manganese

200.8

26.2

25.0

105

85-115

Nickel

200.8

23.7

25.0

95

85-115

Selenium

200.8

51.2

50.0

102

85-115

Zinc

200.8

25.1

25.0

100

85-115

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17

Client:
Project:
Sample Matrix:

Coeur Alaska, Inc.
TTF Fish Resource Investigation
Water

Service Request: K1710990
Date Collected: NA
Date Received: NA
Date Extracted: 10/12/17
Date Analyzed: 10/13/17

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Units: ng/L
Basis: NA

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name:
Lab Code:
Test Notes:

Batch QC
K1710913-001MS,

Units: ng/L
Basis: NA

Sample Name	Lab Code	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Site 1	K1710990-001	1.0	1	10/12/17	10/13/17	ND	
Site 2	K1710990-002	1.0	1	10/12/17	10/13/17	ND	
Method Blank 1	K1710990-MB1	1.0	1	10/12/17	10/13/17	ND	
Method Blank 2	K1710990-MB2	1.0	1	10/12/17	10/13/17	ND	
Method Blank 3	K1710990-MB3	1.0	1	10/12/17	10/13/17	ND	

Analyte	Prep Method	Analysis Method	Percent Recovery												Result Notes
			Spike Level				Spike Result				Relative Percent Difference				
			MRL	MS	DMS	MS	MS	DMS	MS	DMS	ALS Acceptance Limits	MS	DMS		
Mercury	METHOD	1631E	1.0	50	50	ND	47.6	47.3	95	95	71-125	<1			

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
LCS Matrix: Water

Service Request: K1710990
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/13/17

Ongoing Precision and Recovery (OPR) Sample Summary

Total Metals

Sample Name: Ongoing Precision and Recovery (Initial) Units: ng/L
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Percent Recovery	ALS	
					Percent Recovery	Result Notes
Mercury	METHOD	1631E	5.00	4.88	98	77-123

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
LCS Matrix: Water

Service Request: K1710990
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/13/17

Ongoing Precision and Recovery (OPR) Sample Summary

Total Metals

Sample Name: Ongoing Precision and Recovery (Final) Units: ng/L
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Percent Recovery	ALS	
					Percent Recovery	Result Notes
Mercury	METHOD	1631E	5.00	4.51	90	77-123

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
LCS Matrix: Water

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Date Extracted: 10/17/17
Date Analyzed: 10/20/17

Sample Name: Quality Control Sample

Sample Matrix: Water

Sample Matrix: Water

Quality Control Sample (QCS) Summary

Sample Name: Quality Control Sample

Units: ng/L
Basis: NA

Hardness, as CaCO3
EPA Method 200.7/ SM Method 2340B
Units: mg/L (ppm)

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Percent Recovery	ALS		Result	Notes
					Percent Recovery	Acceptance Limits		
Mercury	METHOD	1631E	5.00	92	77-123			

Sample Name	Lab Code	MRL	Result
Site 1	K1710990-001	1.0	80.1
Site 2	K1710990-002	1.0	79.4
Method Blank	KQ1715415-01	1.0	ND

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigation
Sample Matrix: Water

Duplicate Summary
Metals
Units: mg/L (ppm)

Sample Name: Site 1
Lab Code: K1710990-001DUP

Analyte	Method	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Hardness, as CaCO ₃	200.7/ SM 2340B	80.1	78.9	79.5	2

Service Request: K1710990
Date Collected: 10/10/17
Date Received: 10/11/17
Date Extracted: 10/17/17
Date Analyzed: 10/20/17



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November 01, 2017

Analytical Report for Service Request No: K1711129

Peter Strow
Coeur Alaska, Inc.
3031 Clinton Drive, Suite 202
Juneau, AK 99801

RE: TTF Fish Resource Investigations

Dear Peter,

Enclosed are the results of the sample(s) submitted to our laboratory October 13, 2017
For your reference, these analyses have been assigned our service request number **K1711129**.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3376. You may also contact me via email at Mark.Harris@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Mark D. Harris

Mark Harris
Project Manager



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Acronyms

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Metals

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated value.
- U DOD-QSM 4.2 definition: Analyte was not detected ("Non-detected") at or above the MRL/MDL.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.
- H The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

- # The control limit criteria is not applicable. See case narrative.
- J The result is an estimated value.
- E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See case narrative.
- S The reported value was determined by the Method of Standard Additions (MSA).
- U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
- W DOD-QSM 4.2 definition: Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- + The correlation coefficient for the MSA is less than 0.995.
- Q See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- A A tentatively identified compound, a suspected aldol-condensation product.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
- D The reported result is from a dilution.
- E The result is an estimated value.
- J The result is an estimated value.
- N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
- P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
- U DOD-QSM 4.2 definition: Analyte was not detected ("Non-detected") at or above the MRL/MDL.
- The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
- The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

- F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
- L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
- H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
- O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
- Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
- Z The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/capproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsvs/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certific/lab/Pages/ELAP.aspx	2795
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsthw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA 005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	
North Carolina DEQ		605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon - DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water	-
Kelso Laboratory Website	www.alsglobal.com	NA
Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.alsglobal.com or at the accreditation bodies web site. Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/analyte is offered by that state.		



RIGHT SOLUTIONS | RIGHT PARTNER

U:\ENV\8.0 EPA\8.1 NPDES_05\8.1.11 Forms\Forms\Chains of Custody

K141129

ALS

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[illegible]



Cooler Receipt and Preservation Form

Client Cowik Alaska Service Request K17 1129 PC MH
Received: 10/13/17 By: AK Unloaded: 10/13/17 By: LR

1. Samples were received via? USPS Ex UPS DHL PDX Courier Hand Delivered
2. Samples were received in: (circle) Cooler Box Envelope Other NA
3. Were custody seals on coolers? NA Y N If yes, how many and where? 1FB
If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp Blank	Corrected Temp Blank	Thermometer ID	Corr. Factor	Cooler/COC ID	Tracking Number	NA	Filed
1.2	1.3	3.8	3.9	10.1		NA	027JN618000512		

4. Packing material: Inserts Bubble Wrap Gel Packs Wet Ice Dry Ice Sleeves
5. Were custody papers properly filled out (ink, signed, etc.)? NA Y N
6. Were samples received in good condition (temperature, unbroken)? Indicate in the table below.
If applicable, tissue samples were received: Frozen Partially Thawed Thawed
7. Were all sample labels complete (i.e. analysis, preservation, etc.)? NA Y N
8. Did all sample labels and tags agree with custody papers? Indicate major discrepancies in the table on page 2.
9. Were appropriate bottles/containers and volumes received for the tests indicated? NA Y N
10. Were the pH-preserved bottles (see SMO GEN SOP) received at the appropriate pH? Indicate in the table below
11. Were VOA vials received without headspace? Indicate in the table below.
12. Was C12/Res negative? NA Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count	Out of Head-Temp space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions: SHORT HOLD TIME



General Chemistry

ALS Environmental—Kelso Laboratory
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Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 180.1
Prep Method: None

Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Units: NTU
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 180.1
Prep Method: None

Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Units: NTU
Basis: NA

Replicate Sample Summary
Turbidity

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 3	K1711129-001	0.42	0.10	1	10/12/17 17:22	
Site 4	K1711129-002	5.59	0.10	1	10/12/17 17:22	
Site 5	K1711129-003	4.60	0.10	1	10/12/17 17:22	
Site 6	K1711129-004	0.77	0.10	1	10/12/17 17:22	
Site 7	K1711129-005	0.53	0.10	1	10/12/17 17:22	
Method Blank	K1711129-MB1	ND U	0.10	1	10/12/17 17:22	

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD Limit	Date Analyzed
Batch QC	K1711026-001DUP	0.10	22.0	22.4	22.2	2	10/12/17
Site 6	K1711129-004DUP	0.10	0.77	0.75	0.759	3	10/12/17

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Analyzed: 10/12/17
Date Extracted: NA

Lab Control Sample Summary
Turbidity

Analysis Method: 180.1
Prep Method: None

Units: NTU
Basis: NA
Analysis Lot: 565872

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1711129-LCS1	6.68	6.51	103	90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: None

Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Units: mg/L
Basis: NA

Chloride

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 3	K1711129-001	ND U	2.0	2	10/13/17 20:10	
Site 4	K1711129-002	6.3	2.0	2	10/13/17 20:21	
Site 5	K1711129-003	6.7	2.0	2	10/13/17 20:31	
Site 6	K1711129-004	ND U	2.0	2	10/14/17 02:17	
Site 7	K1711129-005	ND U	2.0	2	10/13/17 20:51	
Method Blank	K1711129-MB1	ND U	1.0	1	10/13/17 15:16	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1711129
Date Collected: NA
Date Received: NA
Date Analyzed: 10/13/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	Batch QC	Units:	mg/L			
	Lab Code:		K1711098-001	Basis:	NA	
Duplicate Sample						
Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	RPD
Chloride	300.0	2.0	1.90	ND U	1.90	<1
						20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1711129
Date Collected: N/A
Date Received: N/A
Date Analyzed: 10/13/17
Date Extracted: NA

Duplicate Matrix Spike Summary
Chloride

Sample Name: Batch QC
Lab Code: K1711098-001
Analysis Method: 300.0
Prep Method: None
Units: mg/L
Basis: NA

		Matrix Spike		Duplicate Matrix Spike	
		K1711098-001MS		K1711098-001DMS	
Analyte Name	Sample Result	Result	% Rec	Spike Amount	% Rec
Chloride	1.90	9.4	93	8.0	94
		RPD Limit		RPD Limit	
				1	20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Analyzed: 10/13/17
Date Extracted: NA

Lab Control Sample Summary
Chloride

Analysis Method: 300.0
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 565884

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1711129-LCS1	4.9	5.0	98	90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: None

Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Units: mg/L
Basis: NA

Nitrate as Nitrogen

Sample Name	Lab Code	Result	MRL	Dil	Date Analyzed	Q
Site 3	K1711129-001	ND U	0.10	2	10/13/17 20:10	
Site 4	K1711129-002	7.32	0.10	2	10/13/17 20:21	
Site 5	K1711129-003	7.86	0.10	2	10/13/17 20:31	
Site 6	K1711129-004	ND U	0.10	2	10/14/17 02:17	
Site 7	K1711129-005	ND U	0.10	2	10/13/17 20:51	
Method Blank	K1711129-MB1	ND U	0.050	1	10/13/17 15:16	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Collected: NA
Date Received: NA
Date Analyzed: 10/13/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Batch QC
Lab Code: K1711098-001

Units: mg/L
Basis: NA

Duplicate Sample
K1711098-001DUP

Analyte Name	Analysis Method	MRL	Sample Result	Average	RPD	RPD Limit
Nitrate as Nitrogen	300.0	0.10	ND U	NC	NC	20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Collected: N/A
Date Received: N/A
Date Analyzed: 10/13/17
Date Extracted: NA

Duplicate Matrix Spike Summary
Nitrate as Nitrogen

Units: mg/L
Basis: NA

Sample Name: Batch QC
Lab Code: K1711098-001
Analysis Method: 300.0
Prep Method: None

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits	RPD
Nitrate as Nitrogen	ND U	7.79	8.00	97	90-110	2
Duplicate Matrix Spike K1711098-001MS						
			8.00	99	90-110	20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Analyzed: 10/13/17
Date Extracted: NA

Lab Control Sample Summary
Nitrate as Nitrogen

Analysis Method: 300.0
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 565884

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1711129-LCS1	2.30	2.50	92	90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: None

Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Units: mg/L
Basis: NA

Sulfate

Sample Name	Lab Code	Result	MRL	Dil	Date Analyzed	Q
Site 3	K1711129-001	0.57	0.20	2	10/13/17 20:10	
Site 4	K1711129-002	402	50	500	10/14/17 01:56	
Site 5	K1711129-003	408	50	500	10/14/17 02:28	
Site 6	K1711129-004	1.29	0.20	2	10/14/17 02:17	
Site 7	K1711129-005	0.49	0.20	2	10/13/17 20:51	
Method Blank	K1711129-MB1	ND U	0.10	1	10/13/17 15:16	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1711129
Date Collected: NA
Date Received: NA
Date Analyzed: 10/13/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Lab Code:	Batch QC K1711098-001	Duplicate Sample				Units: mg/L		
		Analyte Name	Analysis Method	Sample Result	MRL	Basis: NA		
							RPD	RPD Limit
Sulfate	300.0	0.67	0.20	0.64	3	20		
				Average				
				0.656				

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1711129
Date Collected: N/A
Date Received: N/A
Date Analyzed: 10/13/17
Date Extracted: NA

Duplicate Matrix Spike Summary
Sulfate

Sample Name:	Batch QC	Units:	mg/L
Lab Code:	K1711098-001	Basis:	NA
Analysis Method:	300.0		
Prep Method:	None		
Matrix Spike			
K1711098-001MS			
Sample Result	0.67	Result	8.55
Analyte Name	Sulfate	Amount	8.00
		% Rec	99
		% Rec Limits	100 90-110
		% Rec	100
		RPD	1
		RPD Limit	20
Duplicate Matrix Spike			
K1711098-001DMS			
Sample Result	0.67	Result	8.64
Analyte Name	Sulfate	Amount	8.00
		% Rec	99
		% Rec Limits	100 90-110
		% Rec	100
		RPD	1
		RPD Limit	20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Analyzed: 10/13/17
Date Extracted: NA

Lab Control Sample Summary
Sulfate

Analysis Method: 300.0
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 565884

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1711129-LCS1	4.98	5.00	100	90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2120 B
Prep Method: None

Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Units: Color/Units
Basis: NA

Color

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 3	K1711129-001	90	10	2	10/13/17 15:55	
Site 4	K1711129-002	5.0	5.0	1	10/13/17 16:01	
Site 5	K1711129-003	10.0	5.0	1	10/13/17 16:04	
Site 6	K1711129-004	90	10	2	10/13/17 16:17	
Site 7	K1711129-005	90	10	2	10/13/17 16:20	
Method Blank	K1711129-MB1	ND U	5.0	1	10/13/17 15:50	

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QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Date Analyzed: 10/13/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Site 3
Lab Code: K1711129-001

Duplicate Sample

K1711129-001DUP

Analyte Name	Analysis Method	MRL	Sample Result	Average	RPD	RPD Limit
Color	SM 2120 B	10	90	90.0	<1	20

ALS Group USA, Corp.
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QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Lab Control Sample Summary
Color

Analysis Method: SM 2120 B
Prep Method: None

Units: ColorUnits
Basis: NA
Analysis Lot: 565845

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1711129-LCS1	15.0	15.0	100	85-115

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Superset Reference:17-0000440548 rev 00

Printed 10/31/2017 2:46:49 PM

Superset Reference:17-0000440548 rev 00

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2540 C
Prep Method: None

Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Units: mg/L
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2540 C
Prep Method: None
Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Units: mg/L
Basis: NA

Solids, Total Dissolved

Replicate Sample Summary
Solids, Total Dissolved

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 3	K1711129-001	19.0	2.0	1	10/18/17 23:35	
Site 4	K1711129-002	655	10	1	10/18/17 23:35	
Site 5	K1711129-003	689	10	1	10/18/17 23:35	
Site 6	K1711129-004	23.5	2.0	1	10/18/17 23:35	
Site 7	K1711129-005	26.0	2.0	1	10/19/17 23:30	
Method Blank	K1711129-MB2	ND U	10	1	10/18/17 23:35	
Method Blank	K1711129-MB4	ND U	10	1	10/19/17 23:30	

Sample Name	Lab Code	MRL	Sample Result	Duplicate Result	Average	RPD Limit	Date Analyzed
Batch QC	K171113-001DUP	10	1220	1230	1230	<1	10/19/17
Site 4	K1711129-002DUP	10	655	659	657	<1	10/18/17

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Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Analyzed: 10/18/17
Date Extracted: NA

Service Request: K1711129
Date Analyzed: 10/19/17
Date Extracted: NA

Lab Control Sample Summary
Solids, Total Dissolved

Analysis Method: SM 2540 C
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 566494

Analysis Method: SM 2540 C
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 566691

Sample Name
Lab Control Sample

Result
1640

Spike Amount
1640

% Rec Limits
100 85-115

Lab Code
K1711129-LCS1

Sample Name
Lab Control Sample

Lab Code
K1711129-LCS2

Result
1630

Spike Amount
1640

% Rec Limits
99 85-115

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Lab Control Sample Summary
Solids, Total Dissolved

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Analytical Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2540 D
Prep Method: None

Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Units: mg/L
Basis: NA

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2540 D
Prep Method: None

Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Units: mg/L
Basis: NA

Solids, Total Suspended (TSS)

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 3	K1711129-001	ND U	4.0	1	10/18/17 21:45	
Site 4	K1711129-002	8.4	4.0	1	10/18/17 21:45	
Site 5	K1711129-003	6.4	4.0	1	10/18/17 21:45	
Site 6	K1711129-004	ND U	4.0	1	10/19/17 23:30	
Site 7	K1711129-005	ND U	4.0	1	10/19/17 23:30	
Method Blank	K1711129-MB2	ND U	4.0	1	10/18/17 21:45	
Method Blank	K1711129-MB3	ND U	4.0	1	10/19/17 23:30	

Replicate Sample Summary
Solids, Total Suspended (TSS)

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Site 4	K1711129-002DUP	4.0	8.4	8.8	8.60	5	10	10/18/17

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Superset Reference:17-0000440548 rev 00

Superset Reference:17-0000440548 rev 00

ALS Group USA, Corp.
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QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Analyzed: 10/18/17
Date Extracted: NA

Lab Control Sample Summary
Solids, Total Suspended (TSS)

Analysis Method: SM 2540 D
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 566493

Sample Name Lab Control Sample
Lab Code K1711129-LCS1
Result 404
Spike Amount 429
% Rec 94
% Rec Limits 85-115

ALS Group USA, Corp.
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QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Analyzed: 10/19/17
Date Extracted: NA

Lab Control Sample Summary
Solids, Total Suspended (TSS)

Analysis Method: SM 2540 D
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 566692

Sample Name Lab Control Sample
Lab Code K1711129-LCS2
Result 400
Spike Amount 429
% Rec 93
% Rec Limits 85-115

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 4500-Cl G
Prep Method: None

Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Units: mg/L
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Date Analyzed: 10/13/17

Chlorine, Total Residual

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Site 4
Lab Code: K1711129-002
Units: mg/L
Basis: NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1711129-002DUP Result	Average	RPD	RPD Limit
Chlorine, Total Residual	SM 4500-Cl G	0.050	ND U	ND U	NC	NC	20

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 3	K1711129-001	ND U	0.050	1	10/13/17 14:00	H
Site 4	K1711129-002	ND U	0.050	1	10/13/17 14:00	H
Site 5	K1711129-003	ND U	0.050	1	10/13/17 14:00	H
Site 6	K1711129-004	ND U	0.050	1	10/13/17 14:00	H
Site 7	K1711129-005	ND U	0.050	1	10/13/17 14:00	H
Method Blank	K1711129-MB1	ND U	0.050	1	10/13/17 14:00	
Method Blank	K1711129-MB2	ND U	0.050	1	10/13/17 14:00	
Method Blank	K1711129-MB3	ND U	0.050	1	10/13/17 14:00	

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Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Date Analyzed: 10/13/17
Date Extracted: NA

Matrix Spike Summary
Chlorine, Total Residual

Sample Name: Site 4
Lab Code: K1711129-002
Analysis Method: SM 4500-Cl G
Prep Method: None

Units: mg/L
Basis: NA

Matrix Spike
K1711129-002MS

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Chlorine, Total Residual	ND U	1.02	1.00	102	21-141

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Analyzed: 10/13/17
Date Extracted: NA

Lab Control Sample Summary
Chlorine, Total Residual

Analysis Method: SM 4500-Cl G
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 565816

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1711129-LCS1	1.02	1.00	102	78-116
Lab Control Sample	K1711129-LCS2	0.990	1.00	99	78-116
Lab Control Sample	K1711129-LCS3	0.980	1.00	98	78-116

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 4500-NH3 G
Prep Method: Method

Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Units: mg/L
Basis: NA

Ammonia as Nitrogen

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Site 3	K1711129-001	ND U	0.10	1	10/24/17 10:46	10/24/17	
Site 4	K1711129-002	2.17	0.20	2	10/24/17 10:46	10/24/17	
Site 5	K1711129-003	2.39	0.20	2	10/24/17 10:46	10/24/17	
Site 6	K1711129-004	ND U	0.10	1	10/24/17 10:46	10/24/17	
Site 7	K1711129-005	ND U	0.10	1	10/24/17 10:46	10/24/17	
Method Blank	K1711129-MB1	ND U	0.10	1	10/24/17 10:46	10/24/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1711129
Date Collected: NA
Date Received: NA
Date Analyzed: 10/24/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Batch QC
Lab Code: K1711128-001

Units: mg/L
Basis: NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1711128-001DUP Result	Average	RPD	RPD Limit
Ammonia as Nitrogen	SM 4500-NH3 G	0.10	0.813	0.82	0.817	<1	20

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Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Collected: N/A
Date Received: N/A
Date Analyzed: 10/24/17
Date Extracted: 10/24/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1711129
Date Analyzed: 10/24/17
Date Extracted: 10/24/17

Duplicate Matrix Spike Summary
Ammonia as Nitrogen

Lab Control Sample Summary
Ammonia as Nitrogen

Sample Name: Batch QC
Lab Code: K1711128-001
Analysis Method: SM 4500-NH3 G
Prep Method: Method

Units: mg/L
Basis: NA

Analysis Method: SM 4500-NH3 G
Prep Method: Method
Units: mg/L
Basis: NA
Analysis Lot: 567437

Analyte Name	Sample Result	Matrix Spike		Duplicate Matrix Spike		Spike		% Rec		RPD	
		Amount	Result	Amount	Result	Amount	Result	Limit	Limit	Limit	Limit
Ammonia as Nitrogen	0.813	1.00	1.79	1.00	1.83	1.00	1.00	102	102	4	20

Sample Name		Lab Code		Result		Spike		% Rec		% Rec	
Lab Control Sample		K1711129-LCS1		9.8		10.2		96		90-112	



ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 3
Lab Code: K1711129-001

Service Request: K1711129
Date Collected: 10/12/17 14:25
Date Received: 10/13/17 11:50
Basis: NA

Metals

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	160	ug/L	1.0	1	10/18/17 12:06	10/17/17	
Cadmium	200.8	ND U	ug/L	0.020	1	10/18/17 12:06	10/17/17	
Copper	200.8	ND U	ug/L	1.0	1	10/18/17 12:06	10/17/17	
Iron	200.7	346	ug/L	50	1	10/20/17 11:22	10/17/17	
Lead	200.8	ND U	ug/L	0.16	1	10/18/17 12:06	10/17/17	
Manganese	200.8	28.7	ug/L	1.0	1	10/18/17 12:06	10/17/17	
Nickel	200.8	ND U	ug/L	1.0	1	10/18/17 12:06	10/17/17	
Selenium	200.8	ND U	ug/L	1.0	1	10/18/17 12:06	10/17/17	
Zinc	200.8	ND U	ug/L	2.5	1	10/18/17 12:06	10/17/17	

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
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Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 3
Lab Code: K1711129-001

Service Request: K1711129
Date Collected: 10/12/17 14:25
Date Received: 10/13/17 11:50
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 4
Lab Code: K1711129-002

Service Request: K1711129
Date Collected: 10/12/17 14:15
Date Received: 10/13/17 11:50
Basis: NA

Dissolved Metals

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	163	ug/L	1.0	1	10/18/17 12:31	10/17/17	
Cadmium	200.8	ND U	ug/L	0.020	1	10/18/17 12:31	10/17/17	
Copper	200.8	ND U	ug/L	1.0	1	10/18/17 12:31	10/17/17	
Iron	200.7	339	ug/L	50	1	10/20/17 11:47	10/17/17	
Lead	200.8	ND U	ug/L	0.16	1	10/18/17 12:31	10/17/17	
Manganese	200.8	27.9	ug/L	1.0	1	10/18/17 12:31	10/17/17	
Nickel	200.8	ND U	ug/L	1.0	1	10/18/17 12:31	10/17/17	
Selenium	200.8	ND U	ug/L	1.0	1	10/18/17 12:31	10/17/17	
Zinc	200.8	2.8	ug/L	2.5	1	10/18/17 12:31	10/17/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	103	ug/L	1.0	1	10/18/17 12:17	10/17/17	
Cadmium	200.8	ND U	ug/L	0.020	1	10/18/17 12:17	10/17/17	
Copper	200.8	1.1	ug/L	1.0	1	10/18/17 12:17	10/17/17	
Iron	200.7	172	ug/L	50	1	10/20/17 11:29	10/17/17	
Lead	200.8	ND U	ug/L	0.16	1	10/18/17 12:17	10/17/17	
Manganese	200.8	176	ug/L	1.0	1	10/18/17 12:17	10/17/17	
Nickel	200.8	ND U	ug/L	1.0	1	10/18/17 12:17	10/17/17	
Selenium	200.8	ND U	ug/L	1.0	1	10/18/17 12:17	10/17/17	
Zinc	200.8	ND U	ug/L	2.5	1	10/18/17 12:17	10/17/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 4
Lab Code: K1711129-002

Service Request: K1711129
Date Collected: 10/12/17 14:15
Date Received: 10/13/17 11:50
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 5
Lab Code: K1711129-003

Service Request: K1711129
Date Collected: 10/12/17 14:00
Date Received: 10/13/17 11:50
Basis: NA

Dissolved Metals

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	37.6	ug/L	1.0	1	10/18/17 12:35	10/17/17	
Cadmium	200.8	ND U	ug/L	0.020	1	10/18/17 12:35	10/17/17	
Copper	200.8	ND U	ug/L	1.0	1	10/18/17 12:35	10/17/17	
Iron	200.7	ND U	ug/L	50	1	10/20/17 11:49	10/17/17	
Lead	200.8	ND U	ug/L	0.16	1	10/18/17 12:35	10/17/17	
Manganese	200.8	172	ug/L	1.0	1	10/18/17 12:35	10/17/17	
Nickel	200.8	1.0	ug/L	1.0	1	10/18/17 12:35	10/17/17	
Selenium	200.8	ND U	ug/L	1.0	1	10/18/17 12:35	10/17/17	
Zinc	200.8	2.8	ug/L	2.5	1	10/18/17 12:35	10/17/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	168	ug/L	1.0	1	10/18/17 12:20	10/17/17	
Cadmium	200.8	ND U	ug/L	0.020	1	10/18/17 12:20	10/17/17	
Copper	200.8	ND U	ug/L	1.0	1	10/18/17 12:20	10/17/17	
Iron	200.7	197	ug/L	50	1	10/20/17 11:39	10/17/17	
Lead	200.8	ND U	ug/L	0.16	1	10/18/17 12:20	10/17/17	
Manganese	200.8	200	ug/L	1.0	1	10/18/17 12:20	10/17/17	
Nickel	200.8	1.1	ug/L	1.0	1	10/18/17 12:20	10/17/17	
Selenium	200.8	ND U	ug/L	1.0	1	10/18/17 12:20	10/17/17	
Zinc	200.8	ND U	ug/L	2.5	1	10/18/17 12:20	10/17/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 5
Lab Code: K1711129-003

Service Request: K1711129
Date Collected: 10/12/17 14:00
Date Received: 10/13/17 11:50
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 6
Lab Code: K1711129-004

Service Request: K1711129
Date Collected: 10/12/17 15:15
Date Received: 10/13/17 11:50
Basis: NA

Dissolved Metals

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	39.9	ug/L	1.0	1	10/18/17 12:39	10/17/17	
Cadmium	200.8	ND U	ug/L	0.020	1	10/18/17 12:39	10/17/17	
Copper	200.8	ND U	ug/L	1.0	1	10/18/17 12:39	10/17/17	
Iron	200.7	ND U	ug/L	50	1	10/20/17 11:51	10/17/17	
Lead	200.8	ND U	ug/L	0.16	1	10/18/17 12:39	10/17/17	
Manganese	200.8	190	ug/L	1.0	1	10/18/17 12:39	10/17/17	
Nickel	200.8	1.1	ug/L	1.0	1	10/18/17 12:39	10/17/17	
Selenium	200.8	ND U	ug/L	1.0	1	10/18/17 12:39	10/17/17	
Zinc	200.8	3.3	ug/L	2.5	1	10/18/17 12:39	10/17/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	64.9	ug/L	1.0	1	10/18/17 12:24	10/17/17	
Cadmium	200.8	ND U	ug/L	0.020	1	10/18/17 12:24	10/17/17	
Copper	200.8	ND U	ug/L	1.0	1	10/18/17 12:24	10/17/17	
Iron	200.7	274	ug/L	50	1	10/20/17 11:42	10/17/17	
Lead	200.8	ND U	ug/L	0.16	1	10/18/17 12:24	10/17/17	
Manganese	200.8	38.6	ug/L	1.0	1	10/18/17 12:24	10/17/17	
Nickel	200.8	ND U	ug/L	1.0	1	10/18/17 12:24	10/17/17	
Selenium	200.8	ND U	ug/L	1.0	1	10/18/17 12:24	10/17/17	
Zinc	200.8	ND U	ug/L	2.5	1	10/18/17 12:24	10/17/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 6
Lab Code: K1711129-004

Service Request: K1711129
Date Collected: 10/12/17 15:15
Date Received: 10/13/17 11:50
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 7
Lab Code: K1711129-005

Service Request: K1711129
Date Collected: 10/12/17 15:00
Date Received: 10/13/17 11:50
Basis: NA

Dissolved Metals

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	56.4	ug/L	1.0	1	10/20/17 11:38	10/17/17	
Cadmium	200.8	ND U	ug/L	0.020	1	10/20/17 11:38	10/17/17	
Copper	200.8	ND U	ug/L	1.0	1	10/20/17 11:38	10/17/17	
Iron	200.7	177	ug/L	50	1	10/20/17 11:54	10/17/17	
Lead	200.8	ND U	ug/L	0.16	1	10/20/17 11:38	10/17/17	
Manganese	200.8	25.7	ug/L	1.0	1	10/20/17 11:38	10/17/17	
Nickel	200.8	ND U	ug/L	1.0	1	10/20/17 11:38	10/17/17	
Selenium	200.8	ND U	ug/L	1.0	1	10/20/17 11:38	10/17/17	
Zinc	200.8	ND U	ug/L	2.5	1	10/20/17 11:38	10/17/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	80.3	ug/L	1.0	1	10/18/17 12:28	10/17/17	
Cadmium	200.8	ND U	ug/L	0.020	1	10/18/17 12:28	10/17/17	
Copper	200.8	ND U	ug/L	1.0	1	10/18/17 12:28	10/17/17	
Iron	200.7	214	ug/L	50	1	10/20/17 11:44	10/17/17	
Lead	200.8	ND U	ug/L	0.16	1	10/18/17 12:28	10/17/17	
Manganese	200.8	14.2	ug/L	1.0	1	10/18/17 12:28	10/17/17	
Nickel	200.8	ND U	ug/L	1.0	1	10/18/17 12:28	10/17/17	
Selenium	200.8	ND U	ug/L	1.0	1	10/18/17 12:28	10/17/17	
Zinc	200.8	ND U	ug/L	2.5	1	10/18/17 12:28	10/17/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 7
Lab Code: K1711129-005

Service Request: K1711129
Date Collected: 10/12/17 15:00
Date Received: 10/13/17 11:50
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Method Blank
Lab Code: KQ1715415-01

Service Request: K1711129
Date Collected: NA
Date Received: NA
Basis: NA

Dissolved Metals

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	75.0	ug/L	1.0	1	10/20/17 11:42	10/17/17	
Cadmium	200.8	ND U	ug/L	0.020	1	10/20/17 11:42	10/17/17	
Copper	200.8	ND U	ug/L	1.0	1	10/20/17 11:42	10/17/17	
Iron	200.7	174	ug/L	50	1	10/20/17 11:56	10/17/17	
Lead	200.8	ND U	ug/L	0.16	1	10/20/17 11:42	10/17/17	
Manganese	200.8	10.4	ug/L	1.0	1	10/20/17 11:42	10/17/17	
Nickel	200.8	ND U	ug/L	1.0	1	10/20/17 11:42	10/17/17	
Selenium	200.8	ND U	ug/L	1.0	1	10/20/17 11:42	10/17/17	
Zinc	200.8	2.9	ug/L	2.5	1	10/20/17 11:42	10/17/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Iron	200.7	ND U	ug/L	50	1	10/20/17 10:55	10/17/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Method Blank
Lab Code: KQ1715416-01

Service Request: K1711129
Date Collected: NA
Date Received: NA
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Date Analyzed: 10/20/17

Replicate Sample Summary
Total Recoverable Metals

Sample Name: Site 3
Lab Code: K1711129-001

Units: ug/L
Basis: NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	RPD	RPD Limit
Iron	200.7	50	346	349	348	<1	20

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	ND U	ug/L	1.0	1	10/18/17 11:30	10/17/17	
Cadmium	200.8	ND U	ug/L	0.020	1	10/18/17 11:30	10/17/17	
Copper	200.8	ND U	ug/L	1.0	1	10/18/17 11:30	10/17/17	
Lead	200.8	ND U	ug/L	0.16	1	10/18/17 11:30	10/17/17	
Manganese	200.8	ND U	ug/L	1.0	1	10/18/17 11:30	10/17/17	
Nickel	200.8	ND U	ug/L	1.0	1	10/18/17 11:30	10/17/17	
Selenium	200.8	ND U	ug/L	1.0	1	10/18/17 11:30	10/17/17	
Zinc	200.8	ND U	ug/L	2.5	1	10/18/17 11:30	10/17/17	

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Date Analyzed: 10/18/17

Replicate Sample Summary
Total Recoverable Metals

Sample Name: Lab Code:	Site 3 K1711129-001	Duplicate Sample KQ1715416-05					Units: ug/L Basis: NA	
	Analyte Name	Analysis Method	MRL	Sample Result	Result	Average	RPD	RPD Limit
	Aluminum	200.8	1.0	160	160	160	<1	20
	Cadmium	200.8	0.020	ND U	ND U	NC	NC	20
	Copper	200.8	1.0	ND U	ND U	NC	NC	20
	Lead	200.8	0.16	ND U	ND U	NC	NC	20
	Manganese	200.8	1.0	28.7	28.6	28.7	<1	20
	Nickel	200.8	1.0	ND U	ND U	NC	NC	20
	Selenium	200.8	1.0	ND U	ND U	NC	NC	20
	Zinc	200.8	2.5	ND U	ND U	NC	NC	20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Date Analyzed: 10/20/17
Date Extracted: 10/17/17

Matrix Spike Summary
Total Recoverable Metals

Sample Name: Site 3
Lab Code: K1711129-001
Analysis Method: 200.7
Prep Method: EPA CLP-METALS ILM04.0

Units: ug/L
Basis: NA

Matrix Spike
KQ1715415-06

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Iron	346	1410	1000	107	70-130

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Date Analyzed: 10/18/17
Date Extracted: 10/17/17

Matrix Spike Summary
Total Recoverable Metals

Sample Name: Site 3
Lab Code: K1711129-001
Analysis Method: 200.8
Prep Method: EPA CLP-METALS ILM04.0

Units: ug/L
Basis: NA

Matrix Spike
KQ1715416-06

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	160	263	100	103	70-130
Cadmium	ND U	26.1	25.0	104	70-130
Copper	ND U	12.9	12.5	103	70-130
Lead	ND U	50.7	50.0	101	70-130
Manganese	28.7	55.3	25.0	107	70-130
Nickel	ND U	25.1	25.0	100	70-130
Selenium	ND U	53.5	50.0	107	70-130
Zinc	ND U	26.6	25.0	106	70-130

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Lab Control Sample Summary
Total Recoverable Metals

Units:ug/L
Basis:NA

Lab Control Sample
KQ1715415-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Iron	200.7	2550	2500	102	85-115

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1711129
Date Analyzed: 10/18/17

Lab Control Sample Summary
Total Recoverable Metals

Units:ug/L
Basis:NA

Lab Control Sample
KQ1715416-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	200.8	106	100	106	85-115
Cadmium	200.8	25.3	25.0	101	85-115
Copper	200.8	12.2	12.5	97	85-115
Lead	200.8	49.9	50.0	100	85-115
Manganese	200.8	26.2	25.0	105	85-115
Nickel	200.8	23.7	25.0	95	85-115
Selenium	200.8	51.2	50.0	102	85-115
Zinc	200.8	25.1	25.0	100	85-115

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17

Mercury, Total

Units: ng/L
Basis: NA

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Sample Name	Lab Code	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Notes
Site 3	K1711129-001	1.0	1	10/19/17	10/20/17	1.1	
Site 4	K1711129-002	1.0	1	10/19/17	10/20/17	2.2	
Site 5	K1711129-003	1.0	1	10/19/17	10/20/17	1.4	
Site 6	K1711129-004	1.0	1	10/19/17	10/20/17	2.2	
Site 7	K1711129-005	1.0	1	10/19/17	10/20/17	2.4	
Method Blank 1	K1711129-MB1	1.0	1	10/19/17	10/20/17	ND	
Method Blank 2	K1711129-MB2	1.0	1	10/19/17	10/20/17	ND	
Method Blank 3	K1711129-MB3	1.0	1	10/19/17	10/20/17	ND	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Collected: NA
Date Received: NA
Date Extracted: 10/19/17
Date Analyzed: 10/20/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
LCS Matrix: Water
Service Request: K1711129
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/20/17

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Sample Name:
Lab Code:
Test Notes:

Batch QC: K1711225-001MS,
K1711225-001MSD

Units: ng/L
Basis: NA

Analyte	Prep Method	Analysis Method	Spike Level				Sample Result	Percent Recovery				Relative Percent Difference	Result Notes
			MRL	MS	DMS	MS	MS	DMS	MS	DMS	MS		
Mercury	METHOD	1631E	1.0	50	50	98	97	48.3	48.8	48.3	97	71-125	1

Sample Name: Ongoing Precision and Recovery (Initial)
Test Notes:

Units: ng/L
Basis: NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	5.49	110	77-123	

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
LCS Matrix: Water

Service Request: K1711129
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/20/17

Ongoing Precision and Recovery (OPR) Sample Summary

Total Metals

Sample Name: Ongoing Precision and Recovery (Final)
Units: ng/L
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Percent Recovery	ALS	
					Percent Recovery	Result Notes
Mercury	METHOD	1631E	5.00	104	77-123	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
LCS Matrix: Water

Service Request: K1711129
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 10/20/17

Quality Control Sample (QCS) Summary

Total Metals

Sample Name: Quality Control Sample
Units: ng/L
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Percent Recovery	ALS	
					Percent Recovery	Result Notes
Mercury	METHOD	1631E	5.00	111	77-123	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Date Extracted: 10/17/17
Date Analyzed: 10/20/17

Hardness, as CaCO3
EPA Method 200.7/ SM Method 2340B
Units: mg/L (ppm)

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1711129
Date Collected: 10/12/17
Date Received: 10/13/17
Date Extracted: 10/17/17
Date Analyzed: 10/20/17

Duplicate Summary
Metals
Units: mg/L (ppm)

Sample Name: Site 3
Lab Code: K1711129-001DUP

Sample Name	Lab Code	MRL	Result	Analyte	Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Site 3	K1711129-001	1.0	12.2	Hardness, as CaCO3	200.7/ SM 2340B	1.0	12.2	12.2	12.2	<1
Site 4	K1711129-002	1.0	398							
Site 5	K1711129-003	1.0	429							
Site 6	K1711129-004	1.0	17.1							
Site 7	K1711129-005	1.0	11.5							
Method Blank	KQ1715415-01	1.0	ND							



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December 04, 2017

Analytical Report for Service Request No: K1712124

Peter Strow
Coeur Alaska, Inc.
3031 Clinton Drive, Suite 202
Juneau, AK 99801

RE: TTF Fish Resource Investigations

Dear Peter,

Enclosed are the results of the sample(s) submitted to our laboratory November 08, 2017
For your reference, these analyses have been assigned our service request number **K1712124**.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3376. You may also contact me via email at Mark.Harris@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Mark Harris
Mark Harris
Project Manager



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Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated value.
- U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
- DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.
- H The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

- # The control limit criteria is not applicable. See case narrative.
- J The result is an estimated value.
- E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See case narrative.
- S The reported value was determined by the Method of Standard Additions (MSA).
- U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
- DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- + The correlation coefficient for the MSA is less than 0.995.
- Q See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- A A tentatively identified compound, a suspected aldol-condensation product.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
- D The reported result is from a dilution.
- E The result is an estimated value.
- J The result is an estimated value.
- N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
- P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
- U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
- DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

- F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
- L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
- H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
- O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
- Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
- Z The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses

Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/capproval.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsys/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certifc/labs/Pages/ELAP.aspx	2795
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bschw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/qa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon - DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification.html	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.alsglobal.com or at the accreditation bodies web site.
Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/analyte is offered by that state.



Case Narrative

ALS Environmental—Kelso Laboratory
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Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1712124
Date Received: 11/08/2017

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), Matrix/Duplicate Matrix Spike (MSDMS), Laboratory Control Sample (LCS), and Laboratory/Duplicate Laboratory Control Sample (LCS/DLCS).

Sample Receipt:

Seven water samples were received for analysis at ALS Environmental on 11/08/2017. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4°C upon receipt at the laboratory.

Metals:

No significant anomalies were noted with this analysis.

General Chemistry:

Method SM 2540 C, 11/16/2017: Samples Site 1, Site 2, Site 3, Site 4, Site 5, Site 6 and Site 7 were received within holding time, but were analyzed past holding time due to laboratory error. The data was flagged to indicate the holding time violation.

Chain of Custody

Approved by Joe D. Davis Date 12/04/2017



Cooler Receipt and Preservation Form

Client Cow AK Service Request K1712124 PC MH
 Received: 11/8/17 Opened: 11/8/17 By: CG Unloaded: 11/8/17 By: CG

- Samples were received via? USPS Fed Ex DHL PDx Hand Delivered
- Samples were received in: (circle) Cooler Box Envelope Other NA
- Were custody seals on coolers? NA N Y If yes, how many and where? 1 right side

If present, were custody seals intact? Y N If present, were they signed and dated? Y N

Raw Cooler Temp	Corrected Cooler Temp	Raw Temp (ink)	Corrected Temp (ink)	Thermometer ID	Corr. Factor	Cooler/COC ID	Tracking Number	NA Filed
2.3	1.7	3.2	3.1	382	-0.1	NA		Y
1.6	1.6	2.8	2.8	390	0.0			

- Packing material: Baggies Bubble Wrap Cel Packs Wet Ice Dry Ice Sleeves
- Were custody papers properly filled out (ink, signed, etc.)? NA Y N
- Were samples received in good condition (temperature, unbroken)? Indicate in the table below.
- Were all sample labels complete (i.e. analysis, preservation, etc.)? Indicate in the table below.
- Did all sample labels and tags agree with custody papers? Indicate major discrepancies in the table on page 2.
- Were appropriate bottles/containers and volumes received for the tests indicated? Indicate in the table below.
- Were the pH-preserved bottles (see SMO GEN SOP) received at the appropriate pH? Indicate in the table below.
- Were VOA vials received without headspace? Indicate in the table below.
- Was C12/Res negative? NA Y N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Head- Temp space	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions:

SHORT HOLD

K1712124

CHAIN OF CUSTODY/TRANSMITTAL RECORD

ALS

C O E U R
 Alaska Department of Fish and Game
 3031 Chena Dr. Suite 202
 Juneau, Alaska 99801
 907.586.3310

PROJECT NAME: TTF Fish Resource Investigations				LAB USE ONLY			
Sample ID: CWG				ANALYSIS REQUIRED			
Contact: PFC Shaw 907.523.3329 FAX: 907.523.3709 Email: PFC@alaska.gov				GROUP #			
Phenol: 907.523.3329				LAB #			
TIME	DATE	SAMPLE ID	STATION	Sample Class	Sample Size	Comments	
12-25	11/07/17	Site 1	USC	2017-11	5		
13-15	11/07/17	Site 2	USC	2017-11	5		
12-50	11/07/17	Site 3	UC	2017-11	5		
12-30	11/07/17	Site 4	TTF	2017-11	5		
12-20	11/07/17	Site 5	TTF	2017-11	5		
14-30	11/07/17	Site 6	USL	2017-11	5		
14-00	11/07/17	Site 7	LSL	2017-11	5		

TURN AROUND TIME	
5 Business Days	10 Business Days
5	10

RECEIVED BY: (signature)		RECEIVED BY: (signature)		RECEIVED BY: (signature)	
DATE	TIME	DATE	TIME	DATE	TIME
11/15/17	16:00	11/15/17	12:10	11/15/17	12:10

CUSTODY SEAL INTACT?		CUSTODY SEAL INTACT?		CUSTODY SEAL INTACT?	
YES	NO	YES	NO	YES	NO
YES	NO	YES	NO	YES	NO

Condition of Sample Containers	
Temp Received: _____ C	# of Containers: _____



ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 180.1
Prep Method: None

Service Request: K1712124
Date Collected: 11/7/17
Date Received: 11/8/17
Units: NTU
Basis: NA

Turbidity

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1712124-001	0.34	0.10	1	11/08/17 16:01	
Site 2	K1712124-002	0.19	0.10	1	11/08/17 16:01	
Site 3	K1712124-003	0.35	0.10	1	11/08/17 16:01	
Site 4	K1712124-004	7.33	0.10	1	11/08/17 16:01	
Site 5	K1712124-005	6.78	0.10	1	11/08/17 16:01	
Site 6	K1712124-006	13.0	0.10	1	11/08/17 16:01	
Site 7	K1712124-007	2.29	0.10	1	11/08/17 16:01	
Method Blank	K1712124-MB1	ND U	0.10	1	11/08/17 16:01	
Method Blank	K1712124-MB2	ND U	0.10	1	11/08/17 16:01	

General Chemistry

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577- 7222 Fax (360)636- 1068
www.alsglobal.com

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 180.1
Prep Method: None

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17

Units: NTU
Basis: NA

Replicate Sample Summary
Turbidity

Sample Name	Lab Code	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Site 1	K1712124-001DUP	0.10	0.34	0.34	0.340	2	20	11/08/17
Batch QC	K1712134-001DUP	0.10	0.60	0.61	0.608	2	20	11/08/17
Batch QC	K1712149-002DUP	0.10	4.05	3.72	3.89	8	20	11/08/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 180.1
Prep Method: None

Service Request: K1712124
Date Analyzed: 11/08/17
Date Extracted: NA

Units: NTU
Basis: NA
Analysis Lot: 569327

Lab Control Sample Summary
Turbidity

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1712124-LCS1	6.43	6.51	99	90-110
Lab Control Sample	K1712124-LCS2	6.52	6.51	100	90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: None

Service Request: K1712124
Date Collected: 11/7/17
Date Received: 11/8/17
Units: mg/L
Basis: NA

Chloride

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1712124-001	ND U	2.0	2	11/08/17 21:40	
Site 2	K1712124-002	ND U	2.0	2	11/08/17 21:07	
Site 3	K1712124-003	ND U	2.0	2	11/08/17 22:22	
Site 4	K1712124-004	6.5	2.0	2	11/08/17 23:15	
Site 5	K1712124-005	6.6	2.0	2	11/08/17 23:58	
Site 6	K1712124-006	ND U	2.0	2	11/08/17 22:54	
Site 7	K1712124-007	ND U	2.0	2	11/08/17 23:05	
Method Blank	K1712124-MB1	ND U	1.0	1	11/08/17 16:41	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Date Analyzed: 11/08/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Site 1
Lab Code: K1712124-001

Units: mg/L
Basis: NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	RPD	RPD Limit
Chloride	300.0	2.0	ND U	K1712124-001DUP ND U	NC	NC	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Date Analyzed: 11/8/17
Date Extracted: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1712124
Date Analyzed: 11/08/17
Date Extracted: NA

Duplicate Matrix Spike Summary
Chloride

Sample Name: Site 1
Lab Code: K1712124-001
Analysis Method: 300.0
Prep Method: None

Units: mg/L
Basis: NA

Matrix Spike
K1712124-001MS

Sample Result
ND U

Result 8.6
% Rec 107

Duplicate Matrix Spike
K1712124-001DMS

Spike Amount 8.0

% Rec 108
% Rec Limits 90-110
RPD <1
RPD Limit 20

Lab Control Sample Summary
Chloride

Sample Name
Lab Control Sample

Lab Code
K1712124-LCS1

Result
4.8

Spike Amount 5.0
% Rec 95
% Rec Limits 90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: None

Service Request: K1712124
Date Collected: 11/7/17
Date Received: 11/8/17
Units: mg/L
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: None
Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Units:mg/L
Basis:NA

Nitrate as Nitrogen

Replicate Sample Summary
Nitrate as Nitrogen

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1712124-001	ND U	0.10	2	11/08/17 21:40	
Site 2	K1712124-002	0.10	0.10	2	11/08/17 21:07	
Site 3	K1712124-003	ND U	0.10	2	11/08/17 22:22	
Site 4	K1712124-004	7.85	0.10	2	11/08/17 23:15	
Site 5	K1712124-005	7.93	0.10	2	11/08/17 23:58	
Site 6	K1712124-006	ND U	0.10	2	11/08/17 22:54	
Site 7	K1712124-007	ND U	0.10	2	11/08/17 23:05	
Method Blank	K1712124-MB1	ND U	0.050	1	11/08/17 16:41	

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD Limit	Date Analyzed
Site 1	K1712124-001DUP	0.10	ND U	ND U	NC	20	11/08/17
Batch QC	K1712125-002DUP	0.10	0.73	0.74	0.737	<1	11/08/17

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Date Analyzed: 11/8/17
Date Extracted: NA

Service Request: K1712124
Date Collected: N/A
Date Received: N/A
Date Analyzed: 11/8/17
Date Extracted: NA

Duplicate Matrix Spike Summary
Nitrate as Nitrogen

Sample Name: Site 1
Lab Code: K1712124-001
Analysis Method: 300.0
Prep Method: None

Sample Name: Batch QC
Lab Code: K1712125-002
Analysis Method: 300.0
Prep Method: None

Units: mg/L
Basis: NA

Matrix Spike
K1712124-001MS

Duplicate Matrix Spike
K1712124-001DMS

Matrix Spike
K1712125-002MS

Duplicate Matrix Spike
K1712125-002DMS

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits	RPD	Limit
Nitrate as Nitrogen	ND U	7.81	8.00	98	90-110	<1	20

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits	RPD	Limit
Nitrate as Nitrogen	0.73	8.41	8.00	96	90-110	1	20

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits	RPD	Limit
Nitrate as Nitrogen	0.73	8.41	8.00	97	90-110	1	20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Analyzed: 11/08/17
Date Extracted: NA

Lab Control Sample Summary
Nitrate as Nitrogen

Analysis Method: 300.0
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 569334

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1712124-LCS1	2.38	2.50	95	90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: 300.0
Prep Method: None

Service Request: K1712124
Date Collected: 11/7/17
Date Received: 11/8/17
Units: mg/L
Basis: NA

Sulfate

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1712124-001	3.40	0.20	2	11/08/17 21:40	
Site 2	K1712124-002	3.29	0.20	2	11/08/17 21:07	
Site 3	K1712124-003	0.60	0.20	2	11/08/17 22:22	
Site 4	K1712124-004	368	10	100	11/08/17 22:33	
Site 5	K1712124-005	381	10	100	11/08/17 22:43	
Site 6	K1712124-006	3.87	0.20	2	11/08/17 22:54	
Site 7	K1712124-007	0.58	0.20	2	11/08/17 23:05	
Method Blank	K1712124-MB1	ND U	0.10	1	11/08/17 16:41	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Date Analyzed: 11/08/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Site 1		Units: mg/L	
Lab Code: K1712124-001		Basis: NA	
Analyte Name Sulfate	Analysis Method 300.0	MRL 0.20	Average 3.37
	Sample Result 3.40	Duplicate Sample K1712124-001DUP Result 3.33	RPD Limit 20
		RPD 2	RPD 20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Date Analyzed: 11/8/17
Date Extracted: NA

Duplicate Matrix Spike Summary
Sulfate

Sample Name: Site 1
Lab Code: K1712124-001
Analysis Method: 300.0
Prep Method: None

Units: mg/L
Basis: NA

Analyte Name	Sample Result	Matrix Spike K1712124-001MS				Duplicate Matrix Spike K1712124-001DMS				RPD	
		Spike		% Rec		Spike		% Rec		RPD	
		Result	Amount	Result	% Rec	Result	Amount	Result	% Rec	Limits	Limit
Sulfate	3.40	11.0	8.00	95	11.0	8.00	94	90-110	<1	20	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Analyzed: 11/08/17
Date Extracted: NA

Lab Control Sample Summary
Sulfate

Analysis Method: 300.0
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 569334

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1712124-LCS1	4.78	5.00	96	90-110

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2120 B
Prep Method: None

Service Request: K1712124
Date Collected: 11/7/17
Date Received: 11/8/17
Units: Color/Units
Basis: NA

Color

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1712124-001	15.0	5.0	1	11/09/17 10:40	
Site 2	K1712124-002	15.0	5.0	1	11/09/17 10:42	
Site 3	K1712124-003	80	10	2	11/09/17 10:48	
Site 4	K1712124-004	ND U	5.0	1	11/09/17 10:56	
Site 5	K1712124-005	ND U	5.0	1	11/09/17 10:59	
Site 6	K1712124-006	80	10	2	11/09/17 11:06	
Site 7	K1712124-007	90	10	2	11/09/17 11:14	
Method Blank	K1712124-MB1	ND U	5.0	1	11/09/17 10:38	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Date Analyzed: 11/09/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Site 1
Lab Code: K1712124-001

Duplicate

Sample

K1712124-

001DUP

Result

15.0

15.0

20

Units: ColorUnits
Basis: NA

Average: 15.0
RPD: <1
RPD Limit: 20

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Lab Control Sample Summary
Color

Analysis Method: SM 2120 B
Prep Method: None

Units: ColorUnits
Basis: NA
Analysis Lot: 568882

Sample Name: Lab Control Sample
Lab Code: K1712124-LCS1
Result: 15.0
Spike Amount: 15.0
% Rec: 100
% Rec Limits: 85-115

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:17-0000443800 rev 00

Superset Reference:17-0000443800 rev 00

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2540 C
Prep Method: None

Service Request: K1712124
Date Collected: 11/7/17
Date Received: 11/8/17
Units: mg/L
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2540 C
Prep Method: None
Service Request: K1712124
Date Collected: NA
Date Received: NA
Units: mg/L
Basis: NA

Solids, Total Dissolved

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1712124-001	91	10	1	11/16/17 16:40	*
Site 2	K1712124-002	91	10	1	11/16/17 16:40	*
Site 3	K1712124-003	27	10	1	11/16/17 16:40	*
Site 4	K1712124-004	663	10	1	11/16/17 16:40	*
Site 5	K1712124-005	655	10	1	11/16/17 16:40	*
Site 6	K1712124-006	35	10	1	11/16/17 16:40	*
Site 7	K1712124-007	20	10	1	11/16/17 16:40	*
Method Blank	K1712124-MB1	ND U	10	1	11/16/17 16:40	
Method Blank	K1712124-MB2	ND U	10	1	11/16/17 16:40	

Replicate Sample Summary
Solids, Total Dissolved

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD Limit	Date Analyzed
Batch QC	K1712196-003DUP	10	90.3	93	91.8	10	11/16/17
Batch QC	K1712288-004DUP	10	232	230	231	<1	11/16/17

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Analyzed: 11/16/17
Date Extracted: NA

Lab Control Sample Summary
Solids, Total Dissolved

Analysis Method: SM 2540 C
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 570359

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1712124-LCS1	1520	1640	93	85-115

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 2540 D
Prep Method: None

Service Request: K1712124
Date Collected: 11/7/17
Date Received: 11/8/17
Units: mg/L
Basis: NA

Solids, Total Suspended (TSS)

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1712124-001	ND U	4.0	1	11/09/17 15:30	
Site 2	K1712124-002	ND U	4.0	1	11/09/17 15:30	
Site 3	K1712124-003	ND U	4.0	1	11/09/17 15:30	
Site 4	K1712124-004	92	4.0	1	11/09/17 15:30	
Site 5	K1712124-005	8.8	4.0	1	11/09/17 15:30	
Site 6	K1712124-006	51.6	4.0	1	11/09/17 15:30	
Site 7	K1712124-007	ND U	4.0	1	11/09/17 15:30	
Method Blank	K1712124-MB2	ND U	4.0	1	11/09/17 15:30	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Date Analyzed: 11/09/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Site 4
Lab Code: K1712124-004

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	RPD	RPD Limit
Solids, Total Suspended (TSS)	SM 2540 D	4.0	9.2	9.2	9.20	<1	10

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Lab Control Sample Summary
Solids, Total Suspended (TSS)

Analysis Method: SM 2540 D
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 569570

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1712124-LCS1	402	429	94	85-115

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Superset Reference:17-0000443800 rev 00

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 4500-Cl G
Prep Method: None

Service Request: K1712124
Date Collected: 11/7/17
Date Received: 11/8/17
Units: mg/L
Basis: NA

Chlorine, Total Residual

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Site 1	K1712124-001	ND U	0.050	1	11/08/17 14:45	
Site 2	K1712124-002	ND U	0.050	1	11/08/17 14:45	
Site 3	K1712124-003	ND U	0.050	1	11/08/17 14:45	
Site 4	K1712124-004	ND U	0.050	1	11/08/17 14:45	
Site 5	K1712124-005	ND U	0.050	1	11/08/17 14:45	
Site 6	K1712124-006	ND U	0.050	1	11/08/17 14:45	
Site 7	K1712124-007	ND U	0.050	1	11/08/17 14:45	
Method Blank	K1712124-MB1	ND U	0.050	1	11/08/17 14:45	
Method Blank	K1712124-MB2	ND U	0.050	1	11/08/17 14:45	
Method Blank	K1712124-MB3	ND U	0.050	1	11/08/17 14:45	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Date Analyzed: 11/08/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: Site 1
Lab Code: K1712124-001

Units: mg/L
Basis: NA

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1712124-001DUP Result	Average	RPD	RPD Limit
Chlorine, Total Residual	SM 4500-Cl G	0.050	ND U	ND U	NC	NC	20

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Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Date Analyzed: 11/8/17
Date Extracted: NA

Duplicate Matrix Spike Summary
Chlorine, Total Residual

Sample Name: Site 1
Lab Code: K1712124-001
Analysis Method: SM 4500-Cl G
Prep Method: None

Units: mg/L
Basis: NA

Analyte Name	Sample Result	Matrix Spike		Duplicate Matrix Spike		Spike		% Rec		RPD	
		Result	Amount	Result	Amount	Amount	Amount	% Rec	Limits	RPD	Limit
Chlorine, Total Residual	ND U	0.980	1.00	0.980	1.00	0.980	1.00	98	21-141	<1	20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Analyzed: 11/08/17
Date Extracted: NA

Lab Control Sample Summary
Chlorine, Total Residual

Analysis Method: SM 4500-Cl G
Prep Method: None

Units: mg/L
Basis: NA
Analysis Lot: 569319

Sample Name	Lab Code	Result	Spike Amount	% Rec		% Rec Limits
				% Rec	Amount	
Lab Control Sample	K1712124-LCS1	0.970	1.00	97		78-116
Lab Control Sample	K1712124-LCS2	0.940	1.00	94		78-116
Lab Control Sample	K1712124-LCS3	0.910	1.00	91		78-116

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 4500-NH3 G
Prep Method: Method

Service Request: K1712124
Date Collected: 11/7/17
Date Received: 11/8/17
Units: mg/L
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Analysis Method: SM 4500-NH3 G
Prep Method: Method

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Units:mg/L
Basis:NA

Ammonia as Nitrogen

Replicate Sample Summary
Ammonia as Nitrogen

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Site 1	K1712124-001	ND U	0.10	1	11/14/17 12:19	11/14/17	
Site 2	K1712124-002	ND U	0.10	1	11/14/17 12:19	11/14/17	
Site 3	K1712124-003	ND U	0.10	1	11/14/17 12:19	11/14/17	
Site 4	K1712124-004	2.22	0.10	1	11/14/17 12:19	11/14/17	
Site 5	K1712124-005	2.22	0.10	1	11/14/17 12:19	11/14/17	
Site 6	K1712124-006	ND U	0.10	1	11/14/17 12:19	11/14/17	
Site 7	K1712124-007	ND U	0.10	1	11/14/17 12:19	11/14/17	
Method Blank	K1712124-MB1	ND U	0.10	1	11/14/17 12:19	11/14/17	
Method Blank	K1712124-MB2	ND U	0.10	1	11/14/17 12:19	11/14/17	

Sample Name	Lab Code	MRL	Sample Result	Duplicate Result	Average	RPD Limit	Date Analyzed
Batch QC	K1711276-002DUP	0.10	0.050	ND U	NC	NC	11/14/17
Batch QC	K1712082-001DUP	0.20	5.85	5.87	5.86	<1	11/14/17
Site 1	K1712124-001DUP	0.10	ND U	ND U	NC	NC	11/14/17

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Superset Reference:17-0000443800 rev 00

Superset Reference:17-0000443800 rev 00

Client:	Coeur Alaska, Inc.	Service Request:	K1712124
Project:	TTF Fish Resource Investigations	Date Collected:	N/A
Sample Matrix:	Water	Date Received:	N/A
		Date Analyzed:	11/14/17
		Date Extracted:	11/14/17
Duplicate Matrix Spike Summary			
Ammonia as Nitrogen			
Sample Name:	Batch QC	Units:	mg/L
Lab Code:	K1711276-002	Basis:	NA
Analysis Method:	SM 4500-NH3 G		
Prep Method:	Method		
Matrix Spike			
K1711276-002MS			
Sample Result	0.050	Result	2.15
Analyte Name	Ammonia as Nitrogen	Amount	2.00
		% Rec	105
		% Rec Limits	90-112
		RPD	<1
		Limit	20

Client:	Coeur Alaska, Inc.	Service Request:	K1712124
Project:	TTF Fish Resource Investigations	Date Collected:	N/A
Sample Matrix:	Water	Date Received:	N/A
		Date Analyzed:	11/14/17
		Date Extracted:	11/14/17
Duplicate Matrix Spike Summary			
Ammonia as Nitrogen			
Sample Name:	Batch QC	Units:	mg/L
Lab Code:	K1712082-001	Basis:	NA
Analysis Method:	SM 4500-NH3 G		
Prep Method:	Method		
Matrix Spike			
K1712082-001MS			
Sample Result	5.85	Result	15.6
Analyte Name	Ammonia as Nitrogen	Amount	10.0
		% Rec	97
		% Rec Limits	90-112
		RPD	<1
		Limit	20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Date Analyzed: 11/14/17
Date Extracted: 11/14/17

Duplicate Matrix Spike Summary
Ammonia as Nitrogen

Sample Name: Site 1
Lab Code: K1712124-001
Analysis Method: SM 4500-NH3 G
Prep Method: Method

Units: mg/L
Basis: NA

Matrix Spike
K1712124-001MS

Sample	Result	Amount	Spike	Result	Amount	Spike	% Rec	% Rec	Limit	RPD
ND U	1.94	2.00	2.00	1.95	2.00	2.00	97	97	<1	20

Duplicate Matrix Spike
K1712124-001DMS

Sample	Result	Amount	Spike	Result	Amount	Spike	% Rec	% Rec	Limit	RPD
ND U	1.94	2.00	2.00	1.95	2.00	2.00	97	97	<1	20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Lab Control Sample Summary
Ammonia as Nitrogen

Analysis Method: SM 4500-NH3 G
Prep Method: Method

Units: mg/L
Basis: NA
Analysis Lot: 570020

Sample Name
Lab Control Sample

Lab Code
K1712124-LCS1

Result
9.62

Spike Amount
10.2

% Rec
94

% Rec Limits
90-112



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Analytical Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 1
Lab Code: K1712124-001

Service Request: K1712124
Date Collected: 11/07/17 14:25
Date Received: 11/08/17 12:10
Basis: NA

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	28.1	ug/L	1.0	1	11/13/17 13:32	11/10/17	
Cadmium	200.8	ND U	ug/L	0.020	1	11/13/17 13:32	11/10/17	
Copper	200.8	ND U	ug/L	1.0	1	11/13/17 13:32	11/10/17	
Iron	200.7	57	ug/L	50	1	11/13/17 16:58	11/10/17	
Lead	200.8	ND U	ug/L	0.16	1	11/13/17 13:32	11/10/17	
Manganese	200.8	4.1	ug/L	1.0	1	11/13/17 13:32	11/10/17	
Nickel	200.8	ND U	ug/L	1.0	1	11/13/17 13:32	11/10/17	
Selenium	200.8	ND U	ug/L	1.0	1	11/13/17 13:32	11/10/17	
Zinc	200.8	ND U	ug/L	2.5	1	11/13/17 13:32	11/10/17	

Metals

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 1
Lab Code: K1712124-001

Service Request: K1712124
Date Collected: 11/07/17 14:25
Date Received: 11/08/17 12:10
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 2
Lab Code: K1712124-002

Service Request: K1712124
Date Collected: 11/07/17 14:15
Date Received: 11/08/17 12:10
Basis: NA

Dissolved Metals

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	23.4	ug/L	1.0	1	11/13/17 14:19	11/10/17	
Cadmium	200.8	ND U	ug/L	0.020	1	11/13/17 14:19	11/10/17	
Copper	200.8	ND U	ug/L	1.0	1	11/13/17 14:19	11/10/17	
Iron	200.7	ND U	ug/L	50	1	11/13/17 17:30	11/10/17	
Lead	200.8	ND U	ug/L	0.16	1	11/13/17 14:19	11/10/17	
Manganese	200.8	3.6	ug/L	1.0	1	11/13/17 14:19	11/10/17	
Nickel	200.8	ND U	ug/L	1.0	1	11/13/17 14:19	11/10/17	
Selenium	200.8	ND U	ug/L	1.0	1	11/13/17 14:19	11/10/17	
Zinc	200.8	ND U	ug/L	2.5	1	11/13/17 14:19	11/10/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	24.2	ug/L	1.0	1	11/13/17 13:46	11/10/17	
Cadmium	200.8	ND U	ug/L	0.020	1	11/13/17 13:46	11/10/17	
Copper	200.8	ND U	ug/L	1.0	1	11/13/17 13:46	11/10/17	
Iron	200.7	ND U	ug/L	50	1	11/13/17 17:16	11/10/17	
Lead	200.8	ND U	ug/L	0.16	1	11/13/17 13:46	11/10/17	
Manganese	200.8	4.1	ug/L	1.0	1	11/13/17 13:46	11/10/17	
Nickel	200.8	ND U	ug/L	1.0	1	11/13/17 13:46	11/10/17	
Selenium	200.8	ND U	ug/L	1.0	1	11/13/17 13:46	11/10/17	
Zinc	200.8	ND U	ug/L	2.5	1	11/13/17 13:46	11/10/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 2
Lab Code: K1712124-002

Service Request: K1712124
Date Collected: 11/07/17 14:15
Date Received: 11/08/17 12:10
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 3
Lab Code: K1712124-003

Service Request: K1712124
Date Collected: 11/07/17 13:50
Date Received: 11/08/17 12:10
Basis: NA

Dissolved Metals

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	24.9	ug/L	1.0	1	11/13/17 14:23	11/10/17	
Cadmium	200.8	ND U	ug/L	0.020	1	11/13/17 14:23	11/10/17	
Copper	200.8	ND U	ug/L	1.0	1	11/13/17 14:23	11/10/17	
Iron	200.7	ND U	ug/L	50	1	11/13/17 17:33	11/10/17	
Lead	200.8	ND U	ug/L	0.16	1	11/13/17 14:23	11/10/17	
Manganese	200.8	3.7	ug/L	1.0	1	11/13/17 14:23	11/10/17	
Nickel	200.8	ND U	ug/L	1.0	1	11/13/17 14:23	11/10/17	
Selenium	200.8	ND U	ug/L	1.0	1	11/13/17 14:23	11/10/17	
Zinc	200.8	2.5	ug/L	2.5	1	11/13/17 14:23	11/10/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	119	ug/L	1.0	1	11/13/17 13:59	11/10/17	
Cadmium	200.8	ND U	ug/L	0.020	1	11/13/17 13:59	11/10/17	
Copper	200.8	ND U	ug/L	1.0	1	11/13/17 13:59	11/10/17	
Iron	200.7	309	ug/L	50	1	11/13/17 17:18	11/10/17	
Lead	200.8	ND U	ug/L	0.16	1	11/13/17 13:59	11/10/17	
Manganese	200.8	22.2	ug/L	1.0	1	11/13/17 13:59	11/10/17	
Nickel	200.8	ND U	ug/L	1.0	1	11/13/17 13:59	11/10/17	
Selenium	200.8	ND U	ug/L	1.0	1	11/13/17 13:59	11/10/17	
Zinc	200.8	ND U	ug/L	2.5	1	11/13/17 13:59	11/10/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 3
Lab Code: K1712124-003

Service Request: K1712124
Date Collected: 11/07/17 13:50
Date Received: 11/08/17 12:10
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 4
Lab Code: K1712124-004

Service Request: K1712124
Date Collected: 11/07/17 13:30
Date Received: 11/08/17 12:10
Basis: NA

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	121	ug/L	1.0	1	11/13/17 14:27	11/10/17	
Cadmium	200.8	ND U	ug/L	0.020	1	11/13/17 14:27	11/10/17	
Copper	200.8	ND U	ug/L	1.0	1	11/13/17 14:27	11/10/17	
Iron	200.7	294	ug/L	50	1	11/13/17 17:35	11/10/17	
Lead	200.8	ND U	ug/L	0.16	1	11/13/17 14:27	11/10/17	
Manganese	200.8	220	ug/L	1.0	1	11/13/17 14:27	11/10/17	
Nickel	200.8	ND U	ug/L	1.0	1	11/13/17 14:27	11/10/17	
Selenium	200.8	ND U	ug/L	1.0	1	11/13/17 14:27	11/10/17	
Zinc	200.8	3.1	ug/L	2.5	1	11/13/17 14:27	11/10/17	

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	106	ug/L	1.0	1	11/13/17 14:03	11/10/17	
Cadmium	200.8	ND U	ug/L	0.020	1	11/13/17 14:03	11/10/17	
Copper	200.8	ND U	ug/L	1.0	1	11/13/17 14:03	11/10/17	
Iron	200.7	200	ug/L	50	1	11/13/17 17:20	11/10/17	
Lead	200.8	ND U	ug/L	0.16	1	11/13/17 14:03	11/10/17	
Manganese	200.8	164	ug/L	1.0	1	11/13/17 14:03	11/10/17	
Nickel	200.8	ND U	ug/L	1.0	1	11/13/17 14:03	11/10/17	
Selenium	200.8	ND U	ug/L	1.0	1	11/13/17 14:03	11/10/17	
Zinc	200.8	ND U	ug/L	2.5	1	11/13/17 14:03	11/10/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 4
Lab Code: K1712124-004

Service Request: K1712124
Date Collected: 11/07/17 13:30
Date Received: 11/08/17 12:10
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 5
Lab Code: K1712124-005

Service Request: K1712124
Date Collected: 11/07/17 13:20
Date Received: 11/08/17 12:10
Basis: NA

Dissolved Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	30.1	ug/L	1.0	1	11/13/17 14:30	11/10/17	
Cadmium	200.8	ND U	ug/L	0.020	1	11/13/17 14:30	11/10/17	
Copper	200.8	ND U	ug/L	1.0	1	11/13/17 14:30	11/10/17	
Iron	200.7	ND U	ug/L	50	1	11/13/17 17:45	11/10/17	
Lead	200.8	ND U	ug/L	0.16	1	11/13/17 14:30	11/10/17	
Manganese	200.8	162	ug/L	1.0	1	11/13/17 14:30	11/10/17	
Nickel	200.8	1.0	ug/L	1.0	1	11/13/17 14:30	11/10/17	
Selenium	200.8	ND U	ug/L	1.0	1	11/13/17 14:30	11/10/17	
Zinc	200.8	3.2	ug/L	2.5	1	11/13/17 14:30	11/10/17	

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	120	ug/L	1.0	1	11/13/17 14:07	11/10/17	
Cadmium	200.8	0.022	ug/L	0.020	1	11/13/17 14:07	11/10/17	
Copper	200.8	ND U	ug/L	1.0	1	11/13/17 14:07	11/10/17	
Iron	200.7	244	ug/L	50	1	11/13/17 17:23	11/10/17	
Lead	200.8	ND U	ug/L	0.16	1	11/13/17 14:07	11/10/17	
Manganese	200.8	192	ug/L	1.0	1	11/13/17 14:07	11/10/17	
Nickel	200.8	1.1	ug/L	1.0	1	11/13/17 14:07	11/10/17	
Selenium	200.8	ND U	ug/L	1.0	1	11/13/17 14:07	11/10/17	
Zinc	200.8	ND U	ug/L	2.5	1	11/13/17 14:07	11/10/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 5
Lab Code: K1712124-005

Service Request: K1712124
Date Collected: 11/07/17 13:20
Date Received: 11/08/17 12:10
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 6
Lab Code: K1712124-006

Service Request: K1712124
Date Collected: 11/07/17 15:30
Date Received: 11/08/17 12:10
Basis: NA

Dissolved Metals

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	29.6	ug/L	1.0	1	11/13/17 14:34	11/10/17	
Cadmium	200.8	ND U	ug/L	0.020	1	11/13/17 14:34	11/10/17	
Copper	200.8	ND U	ug/L	1.0	1	11/13/17 14:34	11/10/17	
Iron	200.7	ND U	ug/L	50	1	11/13/17 17:47	11/10/17	
Lead	200.8	ND U	ug/L	0.16	1	11/13/17 14:34	11/10/17	
Manganese	200.8	184	ug/L	1.0	1	11/13/17 14:34	11/10/17	
Nickel	200.8	1.1	ug/L	1.0	1	11/13/17 14:34	11/10/17	
Selenium	200.8	ND U	ug/L	1.0	1	11/13/17 14:34	11/10/17	
Zinc	200.8	3.1	ug/L	2.5	1	11/13/17 14:34	11/10/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	170	ug/L	1.0	1	11/13/17 14:11	11/10/17	
Cadmium	200.8	ND U	ug/L	0.020	1	11/13/17 14:11	11/10/17	
Copper	200.8	ND U	ug/L	1.0	1	11/13/17 14:11	11/10/17	
Iron	200.7	1590	ug/L	50	1	11/13/17 17:25	11/10/17	
Lead	200.8	0.28	ug/L	0.16	1	11/13/17 14:11	11/10/17	
Manganese	200.8	142	ug/L	1.0	1	11/13/17 14:11	11/10/17	
Nickel	200.8	ND U	ug/L	1.0	1	11/13/17 14:11	11/10/17	
Selenium	200.8	ND U	ug/L	1.0	1	11/13/17 14:11	11/10/17	
Zinc	200.8	ND U	ug/L	2.5	1	11/13/17 14:11	11/10/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 6
Lab Code: K1712124-006

Service Request: K1712124
Date Collected: 11/07/17 15:30
Date Received: 11/08/17 12:10
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 7
Lab Code: K1712124-007

Service Request: K1712124
Date Collected: 11/07/17 15:00
Date Received: 11/08/17 12:10
Basis: NA

Dissolved Metals

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	44.7	ug/L	1.0	1	11/13/17 14:47	11/10/17	
Cadmium	200.8	ND U	ug/L	0.020	1	11/13/17 14:47	11/10/17	
Copper	200.8	ND U	ug/L	1.0	1	11/13/17 14:47	11/10/17	
Iron	200.7	225	ug/L	50	1	11/13/17 17:49	11/10/17	
Lead	200.8	ND U	ug/L	0.16	1	11/13/17 14:47	11/10/17	
Manganese	200.8	9.5	ug/L	1.0	1	11/13/17 14:47	11/10/17	
Nickel	200.8	ND U	ug/L	1.0	1	11/13/17 14:47	11/10/17	
Selenium	200.8	ND U	ug/L	1.0	1	11/13/17 14:47	11/10/17	
Zinc	200.8	3.1	ug/L	2.5	1	11/13/17 14:47	11/10/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	77.1	ug/L	1.0	1	11/13/17 14:15	11/10/17	
Cadmium	200.8	ND U	ug/L	0.020	1	11/13/17 14:15	11/10/17	
Copper	200.8	ND U	ug/L	1.0	1	11/13/17 14:15	11/10/17	
Iron	200.7	501	ug/L	50	1	11/13/17 17:28	11/10/17	
Lead	200.8	ND U	ug/L	0.16	1	11/13/17 14:15	11/10/17	
Manganese	200.8	32.4	ug/L	1.0	1	11/13/17 14:15	11/10/17	
Nickel	200.8	ND U	ug/L	1.0	1	11/13/17 14:15	11/10/17	
Selenium	200.8	ND U	ug/L	1.0	1	11/13/17 14:15	11/10/17	
Zinc	200.8	ND U	ug/L	2.5	1	11/13/17 14:15	11/10/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Site 7
Lab Code: K1712124-007

Service Request: K1712124
Date Collected: 11/07/17 15:00
Date Received: 11/08/17 12:10
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Method Blank
Lab Code: KQ1716793-01

Service Request: K1712124
Date Collected: NA
Date Received: NA
Basis: NA

Dissolved Metals

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	69.2	ug/L	1.0	1	11/13/17 14:51	11/10/17	
Cadmium	200.8	ND U	ug/L	0.020	1	11/13/17 14:51	11/10/17	
Copper	200.8	ND U	ug/L	1.0	1	11/13/17 14:51	11/10/17	
Iron	200.7	312	ug/L	50	1	11/13/17 17:52	11/10/17	
Lead	200.8	ND U	ug/L	0.16	1	11/13/17 14:51	11/10/17	
Manganese	200.8	22.8	ug/L	1.0	1	11/13/17 14:51	11/10/17	
Nickel	200.8	ND U	ug/L	1.0	1	11/13/17 14:51	11/10/17	
Selenium	200.8	ND U	ug/L	1.0	1	11/13/17 14:51	11/10/17	
Zinc	200.8	2.7	ug/L	2.5	1	11/13/17 14:51	11/10/17	

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Iron	200.7	ND U	ug/L	50	1	11/13/17 16:45	11/10/17	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Sample Name: Method Blank
Lab Code: KQ1716795-01

Service Request: K1712124
Date Collected: NA
Date Received: NA
Basis: NA

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water
Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Date Analyzed: 11/13/17

Replicate Sample Summary
Total Recoverable Metals

Sample Name: Site 1
Lab Code: K1712124-001

Units: ug/L
Basis: NA

Total Recoverable Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	ND U	ug/L	1.0	1	11/13/17 12:52	11/10/17	
Cadmium	200.8	ND U	ug/L	0.020	1	11/13/17 12:52	11/10/17	
Copper	200.8	ND U	ug/L	1.0	1	11/13/17 12:52	11/10/17	
Lead	200.8	ND U	ug/L	0.16	1	11/13/17 12:52	11/10/17	
Manganese	200.8	ND U	ug/L	1.0	1	11/13/17 12:52	11/10/17	
Nickel	200.8	ND U	ug/L	1.0	1	11/13/17 12:52	11/10/17	
Selenium	200.8	ND U	ug/L	1.0	1	11/13/17 12:52	11/10/17	
Zinc	200.8	ND U	ug/L	2.5	1	11/13/17 12:52	11/10/17	

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	RPD	RPD Limit
Iron	200.7	50	57	54	56	5	20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Date Analyzed: 11/13/17

Replicate Sample Summary
Total Recoverable Metals

Sample Name: Site 1		Units: ug/L					
Lab Code: K1712124-001		Basis: NA					
Analyte Name	Analysis Method	MRL	Duplicate Sample		Average	RPD	RPD Limit
			Sample Result	KQ1716795-05 Result			
Aluminum	200.8	1.0	28.1	28.3	28.2	<1	20
Cadmium	200.8	0.020	ND U	ND U	ND	-	20
Copper	200.8	1.0	ND U	ND U	NC	NC	20
Lead	200.8	0.16	ND U	ND U	ND	-	20
Manganese	200.8	1.0	4.1	4.2	4.2	2	20
Nickel	200.8	1.0	ND U	ND U	ND	-	20
Selenium	200.8	1.0	ND U	ND U	NC	NC	20
Zinc	200.8	2.5	ND U	ND U	NC	NC	20

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Date Analyzed: 11/13/17
Date Extracted: 11/10/17

Matrix Spike Summary
Total Recoverable Metals

Sample Name: Site 1
Lab Code: K1712124-001
Analysis Method: 200.7
Prep Method: EPA CLP-METALS ILM04.0

Units: ug/L
Basis: NA

Matrix Spike
KQ1716793-04

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Iron	57	1060	1000	100	70-130

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Date Analyzed: 11/13/17
Date Extracted: 11/10/17

Matrix Spike Summary
Total Recoverable Metals

Sample Name: Site 1
Lab Code: K1712124-001
Analysis Method: 200.8
Prep Method: EPA CLP-METALS ILM04.0

Units: ug/L
Basis: NA

Matrix Spike
KQ1716795-06

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	28.1	119	100	91	70-130
Cadmium	ND U	24.2	25.0	97	70-130
Copper	ND U	11.7	12.5	94	70-130
Lead	ND U	48.7	50.0	97	70-130
Manganese	4.1	27.2	25.0	92	70-130
Nickel	ND U	23.0	25.0	92	70-130
Selenium	ND U	49.3	50.0	99	70-130
Zinc	ND U	23.8	25.0	95	70-130

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Lab Control Sample Summary
Total Recoverable Metals

Units:ug/L
Basis:NA

Lab Control Sample
KQ1716793-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Iron	200.7	2570	2500	103	85-115

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Analyzed: 11/13/17

Lab Control Sample Summary
Total Recoverable Metals

Units:ug/L
Basis:NA

Lab Control Sample
KQ1716795-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	200.8	90.6	100	91	85-115
Cadmium	200.8	24.3	25.0	97	85-115
Copper	200.8	11.3	12.5	91	85-115
Lead	200.8	49.0	50.0	98	85-115
Manganese	200.8	22.9	25.0	91	85-115
Nickel	200.8	22.9	25.0	92	85-115
Selenium	200.8	48.1	50.0	96	85-115
Zinc	200.8	23.8	25.0	95	85-115

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17

Mercury, Total

Prep Method: METHOD
Analysis Method: 1631E
Test Notes:

Units: ng/L
Basis: NA

Sample Name	Lab Code	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Notes
Site 1	K1712124-001	1.0	1	11/13/17	11/14/17	ND	
Site 2	K1712124-002	1.0	1	11/13/17	11/14/17	ND	
Site 3	K1712124-003	1.0	1	11/13/17	11/14/17	1.6	
Site 4	K1712124-004	1.0	1	11/13/17	11/14/17	ND	
Site 5	K1712124-005	1.0	1	11/13/17	11/14/17	ND	
Site 6	K1712124-006	1.0	1	11/13/17	11/14/17	2.7	
Site 7	K1712124-007	1.0	1	11/13/17	11/14/17	1.5	
Method Blank 1	K1712124-MB1	1.0	1	11/13/17	11/14/17	ND	
Method Blank 2	K1712124-MB2	1.0	1	11/13/17	11/14/17	ND	
Method Blank 3	K1712124-MB3	1.0	1	11/13/17	11/14/17	ND	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Date Extracted: 11/13/17
Date Analyzed: 11/14/17

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
LCS Matrix: Water
Service Request: K1712124
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 11/14/17

Matrix Spike/Duplicate Matrix Spike Summary
Total Metals

Ongoing Precision and Recovery (OPR) Sample Summary
Total Metals

Sample Name: Site 1
Lab Code: K1712124-001MS,
Test Notes:

Units: ng/L
Basis: NA

Sample Name: Ongoing Precision and Recovery (Initial)
Test Notes:

Units: ng/L
Basis: NA

Analyte	Prep Method	Analysis Method	Percent Recovery												Relative Percent Difference	Result Notes	
			MRL		Spike Level		Sample		Spike Result		MS		DMS				ALS Acceptance Limits
			1.0	50	50	50	ND	47.5	47.2	95	94	71-125					
Mercury	METHOD	1631E	1.0	50	50	50	ND	47.5	47.2	95	94	71-125	<1				

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	ALS Percent Recovery Acceptance Limits	Result Notes
Mercury	METHOD	1631E	5.00	4.71	94	77-123	

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
LCS Matrix: Water

Service Request: K1712124
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 11/14/17

Ongoing Precision and Recovery (OPR) Sample Summary

Total Metals

Sample Name: Ongoing Precision and Recovery (Final) Units: ng/L
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Percent Recovery	ALS	
					Percent Recovery	Result Notes
Mercury	METHOD	1631E	5.00	4.79	96	77-123

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
LCS Matrix: Water

Service Request: K1712124
Date Collected: NA
Date Received: NA
Date Extracted: NA
Date Analyzed: 11/14/17

Quality Control Sample (QCS) Summary

Total Metals

Sample Name: Quality Control Sample Units: ng/L
Basis: NA

Test Notes:

Analyte	Prep Method	Analysis Method	True Value	Percent Recovery	ALS	
					Percent Recovery	Result Notes
Mercury	METHOD	1631E	5.00	4.83	97	77-123

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Date Extracted: 11/10/17
Date Analyzed: 11/13/17

Hardness, as CaCO3
EPA Method 200.7/ SM Method 2340B
Units: mg/L (ppm)

Client: Coeur Alaska, Inc.
Project: TTF Fish Resource Investigations
Sample Matrix: Water

Service Request: K1712124
Date Collected: 11/07/17
Date Received: 11/08/17
Date Extracted: 11/10/17
Date Analyzed: 11/13/17

Duplicate Summary
Metals
Units: mg/L (ppm)

Sample Name: Site 1
Lab Code: K1712124-001DUP

Sample Name	Lab Code	MRL	Result	Analyte	Method	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Site 1	K1712124-001	1.0	87.2	Hardness, as CaCO3	200.7/ SM 2340B	1.0	87.2	87.9	87.6	<1
Site 2	K1712124-002	1.0	86.5							
Site 3	K1712124-003	1.0	12.2							
Site 4	K1712124-004	1.0	397							
Site 5	K1712124-005	1.0	400							
Site 6	K1712124-006	1.0	18.4							
Site 7	K1712124-007	1.0	12.7							
Method Blank	KQ1716793-01	1.0	ND							

APPENDIX B: DISCHARGE DATA

Appendix B.1.—Upper Slate Creek discharge data.

Upper Slate Creek: Upstream reach, 9/8/2017		
Distance (ft)	Depth (ft)	Velocity (ft/s)
9.92	0.00	1.7
10.25	0.52	3.8
10.50	0.60	4.0
10.75	0.58	5.0
11.00	0.60	4.7
11.25	0.68	5.0
11.50	0.72	3.9
11.75	0.56	3.2
12.00	0.82	2.9
12.25	0.64	2.9
12.50	0.62	3.4
12.75	0.52	2.5
13.00	0.64	2.4
13.25	0.70	2.4
13.50	0.70	1.9
13.75	0.64	3.0
14.00	0.64	2.7
14.25	0.46	1.7
14.50	0.40	1.6
14.75	0.44	2.7
15.00	0.34	3.0
15.25	0.28	2.3
15.50	0.20	1.9
15.58	0.00	1.9
Total Discharge (ft ³ /s)		9.6

Upper Slate Creek: Flooded reach, 9/8/2017		
Distance (ft)	Depth (ft)	Velocity (ft/s)
9.92	0.58	1.7
10.08	0.66	3.8
10.33	0.84	4.0
10.50	0.78	5.0
10.67	0.84	4.7
10.83	0.94	5.0
11.00	0.96	3.9
11.25	1.06	3.2
11.50	0.90	2.9
11.75	0.94	2.9
12.00	0.84	3.4
12.25	0.80	2.5
12.50	0.78	2.4
12.75	0.72	2.4
13.00	0.68	1.9
13.25	0.66	3.0
13.50	0.62	2.7
13.75	0.52	1.7
14.00	0.50	1.6
14.25	0.40	2.7
14.50	0.42	3.0
14.75	0.38	2.3
15.00	0.38	1.9
15.50	0.34	1.9
16.00	0.20	0.0
Total Discharge (ft ³ /s)		11.5

Appendix B.1.–Page 2 of 3.

Upper Slate Creek: Flooded reach, 9/21/2017		
Distance (ft)	Depth (ft)	Velocity (ft/s)
10.50	0.36	0.7
10.67	0.42	2.0
10.83	0.52	2.6
11.00	0.52	1.9
11.17	0.60	2.4
11.33	0.48	1.8
11.50	0.45	1.3
11.67	0.46	2.0
11.83	0.43	2.1
12.00	0.45	2.2
12.17	0.43	2.2
12.33	0.35	1.9
12.50	0.30	2.1
12.67	0.20	1.7
12.83	0.25	1.1
13.00	0.12	1.4
13.17	0.18	1.8
13.33	0.10	1.6
13.50	0.10	1.9
13.67	0.08	0.8
13.83	0.05	0.0
14.33	0.00	0.0
Total Discharge (ft ³ /s)		2.1

Upper Slate Creek: Flooded reach, 11/2/2017		
Distance (ft)	Depth (ft)	Velocity (ft/s)
9.25	0.56	0.1
9.42	0.55	0.6
9.58	0.55	1.4
9.75	0.56	4.4
9.92	0.54	0.9
10.08	0.52	1.1
10.25	0.49	1.1
10.42	0.49	1.5
10.58	0.44	1.4
10.75	0.48	1.6
10.92	0.48	1.7
11.08	0.48	1.8
11.25	0.50	1.7
11.42	0.45	1.7
11.58	0.50	1.6
11.75	0.49	1.7
11.92	0.54	1.6
12.08	0.45	1.7
12.25	0.44	1.7
12.42	0.44	1.7
12.58	0.40	1.6
12.75	0.34	1.6
12.92	0.30	1.1
13.08	0.20	1.2
13.25	0.20	1.0
13.42	0.16	0.4
13.58	0.15	0.4
13.75	0.10	0.1
13.92	0.05	0.1
14.08	0.02	0.0
14.42	0.00	0.0
Total Discharge (ft ³ /s)		2.9

Appendix B.1.–Page 3 of 3.

Upper Slate Creek: Upstream reach, 11/2/2017		
Distance (ft)	Depth (ft)	Velocity (ft/s)
12.17	0.00	0.0
12.42	0.12	0.9
12.67	0.16	0.9
12.92	0.20	1.6
13.17	0.20	2.1
13.42	0.20	2.0
13.67	0.22	2.2
13.92	0.41	2.1
14.17	0.46	1.7
14.42	0.38	2.5
14.67	0.35	2.6
14.92	0.40	2.4
15.17	0.46	2.9
15.42	0.42	2.8
15.67	0.49	2.7
15.92	0.43	1.8
16.17	0.44	1.5
16.42	0.28	1.6
16.67	0.30	1.3
16.92	0.20	1.3
17.17	0.18	0.1
17.42	0.18	0.2
17.67	0.00	0.0
Total Discharge (ft ³ /s)		3.2

Upper Slate Creek: Flooded reach, 10/10/2017		
Distance (ft)	Depth (ft)	Velocity (ft/s)
5.17	0.56	0.2
5.42	0.57	0.3
5.67	0.71	1.7
5.92	0.74	2.9
6.17	0.71	2.9
6.42	0.72	2.7
6.67	0.61	2.1
6.92	0.46	1.9
7.17	0.28	0.9
7.58	0.30	1.3
7.83	0.28	0.1
Total Discharge (ft ³ /s)		2.6

Appendix B.2.—South Creek discharge data.

South Creek: Flooded reach, 9/5/2017		
Distance (ft)	Depth (ft)	Velocity (ft/s)
7.42	0.38	0.5
7.67	0.38	0.8
7.92	0.36	1.0
8.17	0.36	1.1
8.42	0.34	1.0
8.67	0.34	1.1
8.92	0.30	1.3
9.17	0.34	1.3
9.42	0.38	1.4
9.67	0.40	1.4
9.92	0.40	1.3
10.08	0.44	1.2
10.33	0.44	1.3
10.58	0.46	1.3
10.83	0.46	1.2
11.08	0.46	1.2
11.33	0.46	1.0
11.58	0.48	0.9
11.83	0.46	0.2
12.08	0.46	0.0
12.42	0.46	0.0
Total Discharge (ft ³ /s)		2.0

South Creek: Upstream reach, 9/5/2017		
Distance (ft)	Depth (ft)	Velocity (ft/s)
7.17	0.38	1.1
7.42	0.38	0.9
7.67	0.36	0.8
7.92	0.38	1.0
8.17	0.42	1.1
8.42	0.46	1.1
8.67	0.50	0.9
8.92	0.46	0.8
9.17	0.49	0.7
9.42	0.48	0.7
9.67	0.42	0.7
9.92	0.40	0.7
10.17	0.32	1.5
10.42	0.20	0.1
Total Discharge (ft ³ /s)		1.1

Appendix B.2.–Page 2 of 3.

South Creek: Upstream reach, 9/21/2017		
Distance (ft)	Depth (ft)	Velocity (ft/s)
7.75	0.00	0.0
8.00	0.10	0.8
8.25	0.10	0.8
8.42	0.14	1.4
8.58	0.18	1.4
8.75	0.18	1.0
8.92	0.19	0.5
9.00	0.36	0.0
9.17	0.36	0.0
9.33	0.40	0.0
9.50	0.40	0.0
9.67	0.40	0.0
9.83	0.30	0.3
10.00	0.25	0.4
10.17	0.20	0.5
10.33	0.16	0.1
10.50	0.10	0.1
10.83	0.00	0.0
Total Discharge (ft ³ /s)		0.2

South Creek: Flooded reach, 11/2/2017		
Distance (ft)	Depth (ft)	Velocity (ft/s)
5.67	0.00	0.0
6.00	0.10	0.0
6.17	0.18	0.1
6.33	0.20	0.0
6.50	0.20	0.1
6.67	0.24	0.1
6.83	0.26	0.2
7.00	0.27	0.2
7.17	0.30	0.3
7.33	0.31	0.3
7.50	0.30	0.2
7.67	0.32	0.2
7.83	0.32	0.4
8.00	0.30	0.5
8.17	0.28	0.5
8.33	0.26	0.5
8.50	0.25	0.4
8.67	0.27	0.3
8.83	0.20	0.1
9.00	0.16	0.1
9.33	0.00	0.0
Total Discharge (ft ³ /s)		0.2

Appendix B.2.–Page 3 of 3.

South Creek: Upstream reach, 11/2/2017		
Distance (ft)	Depth (ft)	Velocity (ft/s)
7.17	0.05	0.0
7.33	0.10	0.0
7.50	0.12	0.0
7.67	0.21	0.4
7.83	0.22	0.6
8.00	0.25	0.5
8.17	0.26	0.5
8.33	0.26	0.4
8.50	0.27	0.3
8.67	0.28	0.1
8.83	0.28	0.2
9.00	0.24	0.1
9.17	0.23	0.0
9.33	0.21	0.0
9.50	0.24	0.0
9.67	0.26	0.0
10.00	0.28	0.0
11.17	0.22	0.0
Total Discharge (ft ³ /s)		0.1

South Creek: Upstream reach, 11/11/2017		
Distance (ft)	Depth (ft)	Velocity (ft/s)
2.00	0.00	0.0
2.67	0.28	0.0
2.92	0.34	0.0
3.17	0.36	0.0
3.42	0.36	0.0
3.67	0.31	0.0
3.92	0.31	0.1
4.17	0.31	0.4
4.42	0.30	0.4
4.67	0.34	0.4
4.92	0.31	0.4
5.17	0.31	0.4
5.42	0.28	0.0
Total Discharge (ft ³ /s)		0.2

Appendix B.3.—Spectacle Creek discharge data.

Spectacle Creek: Mouth, 9/21/2017		
Distance (ft)	Depth (ft)	Velocity (ft/s)
11.75	0.10	0.0
12.33	0.28	0.0
12.67	0.30	0.0
13.00	0.30	0.1
13.25	0.38	0.6
13.50	0.42	0.9
13.75	0.40	1.3
14.00	0.36	1.5
14.17	0.38	1.5
14.33	0.40	1.5
14.50	0.36	1.6
14.67	0.40	1.4
14.83	0.42	1.4
15.00	0.34	1.3
15.17	0.36	1.1
15.33	0.38	1.0
15.50	0.36	1.2
15.75	0.32	1.1
16.00	0.20	0.6
16.25	0.18	0.0
16.50	0.15	0.0
17.25	0.00	0.0
Total Discharge (ft ³ /s)		1.3

Spectacle Creek: Road, 9/21/2017		
Distance (ft)	Depth (ft)	Velocity (ft/s)
6.50	0.00	0.0
6.75	0.05	0.0
7.00	0.08	0.0
7.25	0.18	0.0
7.50	0.22	0.3
7.75	0.28	0.4
8.00	0.25	0.4
8.25	0.27	0.5
8.50	0.30	0.5
8.75	0.30	0.5
9.00	0.30	0.6
9.25	0.30	0.5
9.50	0.31	0.5
9.75	0.30	0.5
10.00	0.20	0.6
10.25	0.27	0.6
10.50	0.25	0.6
10.75	0.14	0.1
11.00	0.00	0.0
Total Discharge (ft ³ /s)		0.4

Appendix B.3.—Page 2 of 3.

Spectacle Creek: Lake outlet, 9/21/2017		
Distance (ft)	Depth (ft)	Velocity (ft/s)
6.33	0.10	0.0
6.75	0.20	0.3
6.92	0.30	0.4
7.08	0.34	0.5
7.25	0.32	0.5
7.42	0.28	0.4
7.58	0.30	0.2
7.75	0.30	0.4
7.92	0.30	0.5
8.08	0.28	0.5
8.25	0.20	0.5
8.42	0.28	0.5
8.58	0.26	0.5
8.75	0.24	0.4
8.92	0.22	0.4
9.08	0.14	0.5
9.25	0.14	0.3
9.42	0.20	0.1
9.58	0.18	0.1
9.75	0.22	0.0
10.17	0.10	0.0
Total Discharge (ft ³ /s)		0.3

Spectacle Creek: Road, 11/2/2017		
Distance (ft)	Depth (ft)	Velocity (ft/s)
6.58	0.10	0.0
7.25	0.15	0.0
7.50	0.16	0.0
7.75	0.20	0.3
8.00	0.20	0.2
8.25	0.25	0.3
8.50	0.25	0.4
8.75	0.28	0.5
9.00	0.28	0.6
9.25	0.26	0.5
9.50	0.26	0.5
9.75	0.26	0.5
10.00	0.28	0.5
10.25	0.25	0.5
10.50	0.18	0.5
10.75	0.19	0.5
11.00	0.20	0.3
11.25	0.20	0.1
11.50	0.20	0.0
11.67	0.15	0.0
Total Discharge (ft ³ /s)		0.4

Appendix B.3.–Page 3 of 3.

Spectacle Creek: Lake outlet, 11/2/2017		
Distance (ft)	Depth (ft)	Velocity (ft/s)
7.83	0.30	0.0
8.00	0.28	0.0
8.17	0.32	0.0
8.33	0.28	0.1
8.50	0.28	0.0
8.67	0.20	0.2
8.83	0.26	0.5
9.00	0.30	0.5
9.17	0.32	0.4
9.33	0.32	0.5
9.50	0.32	0.4
9.67	0.32	0.4
9.83	0.34	0.5
10.00	0.34	0.6
10.17	0.36	0.5
10.33	0.36	0.4
10.50	0.36	0.2
10.67	0.34	0.2
10.83	0.26	0.1
11.00	0.28	0.2
11.17	0.28	0.0
11.33	0.26	0.0
Total Discharge (ft ³ /s)		0.3

Spectacle Creek: Lake outlet, 10/11/2017		
Distance (ft)	Depth (ft)	Velocity (ft/s)
6.33	0.00	0.0
6.50	0.46	0.0
6.83	0.49	0.0
7.00	0.44	0.7
7.17	0.46	0.7
7.33	0.48	0.5
7.67	0.48	0.7
7.83	0.46	0.6
8.00	0.46	0.8
8.17	0.44	0.7
8.33	0.44	0.5
8.50	0.46	0.6
8.67	0.41	0.5
8.83	0.41	0.4
9.00	0.46	0.3
9.17	0.41	0.3
9.33	0.38	0.1
Total Discharge (ft ³ /s)		0.6

APPENDIX C: FISH HABITAT AND PRESENCE MAPS

Appendix C.1.—Upper Slate Creek field notes.

Wypt	Stn (m)	DV FL (mm)	Grad (%)	Spawn hab (m)	OHW widths (m)	Latitude	Longitude	Notes
101	0					58.8184	-135.0413	Upper Slate Creek mouth and start of survey.
102	42					58.8188	-135.0415	Discharge measured here.
103	50	70, 50, 75	1	27	3.1, 3.0, 1.8, 1.5	58.8189	-135.0415	Spawning habitat is all gravel with some substrate >3 cm, upper 25 m of reach transitions to angular cobble.
104	100	130, 80, 50	2	18	1.3, 1.4, 1.9, 2.0	58.8191	-135.0418	Angular cobble and gravel.
105	150	160	3, 4	7	2.6, 1.9, 1.8	58.8197	-135.0420	Angular cobble and gravel, surface flow enters river right.
106	200	60, 40	3, 4	2	1.3, 1.4, 2.1	58.8200	-135.0427	Angular cobble and gravel. Two minor surface tributaries enter with no fish habitat in this reach, then Tributary 1 enters river left.
107	235					58.8201	-135.0432	Tributary 2 enters here.
108	250	40	4, 7	1	1.9, 2.3, 2.2	58.8203	-135.0434	Angular cobble and gravel with spawning habitat in margins only.
109	300	120	6	0	1.1, 1.4, 1.7	58.8205	-135.0442	Angular cobble.
110	320	80, 40, 50	8, 7, 9	0	1.3, 1.8, 2.0	58.8206	-135.0445	Boulder and step pool habitat, tributary enters river left with no habitat. Discharge measured here.
111	370	140	10	3	2.4, 1.8, 1.7	58.8208	-135.0450	Spawning habitat in pool tails. Some bedrock chutes in this reach.
112	420	55	9, 3	4	1.0, 1.8, 2.4, 1.3	58.8212	-135.0456	Tributary enters river right with 1/4 of the flow. Immediate 35% falls coming from steep hillside, no fish habitat. Main channel is bedrock, boulder, and cobble with 1 m tall, 3 m long falls section at 18% gradient. Above step falls is lower gradient with spawning habitat in pool tails.
113	470	40, 120	3, 5	1	1.5, 1.8, 1.2, 1.1	58.8215	-135.0464	
114	475					58.8216	-135.0465	Tributary 3 enters river right.
115	520	80	5	3	2.2, 1.9	58.8218	-135.0464	Angular cobble and boulder, with patches of gravel in margins.
116	570	35	5, 6		1.6, 1.2, 1.9, 1.1	58.8223	-135.0465	Mostly cobbly chute.
117	595					58.8225	-135.0467	Tributary 4 enters river left.
118	620		7	3	0.9, 1.3, 1.4	58.8226	-135.0472	Some plunge pool habitat with sections of spawning gravel at tails.
119	670			1	0.9, 1.1, 1.2	58.8230	-135.0477	Moss covered cobble, tributary enters river left with no habitat.
120	710					58.8232	-135.0481	Tributary 5 enters river left.
121	720		9, 10	3	0.7, 0.8, 0.6	58.8232	-135.0483	Some spawning habitat in pool tails now that flow is reduced.

Note: Dolly Varden char = DV.

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Appendix C.1.–Page 2 of 3.

Wypt	Stn (m)	DVFL (mm)	Grad (%)	Spawn hab (m)	OHW widths (m)	Latitude	Longitude	Notes
122	765					58.8234	-135.0490	Tributary on river right with a tiny patch of gravel at the confluence, but too small for habitat, channel is vegetated over.
123	780		25		1.2, 0.7, 1.0	58.8235	-135.0490	Step falls with gravel and cobble.
124	805					58.8237	-135.0494	Habitat ends here where stream forks into two braided cobble boulder channels.
125	65		18, 24	4	0.6	58.8238	-135.0485	Tributary 5, 1/3 flow, step pool habitat with marginal spawning habitat in pool tails and upstream of log jams. Habitat ends due to gradient and low flow in tributaries.
126	60		4, 5	3	0.5, 1.0, 0.7	58.8229	-135.0470	Tributary 4, some pools and sandy substrate in first 10 m, becoming incised and too steep for habitat with reduce flow.
127	70		5, 18		0.2, 0.6, 0.5	58.8230	-135.0471	Tributary 4, end of fish habitat.
128	25			12	0.6, 0.8, 0.3	58.8218	-135.0467	Tributary 3, sandy spawn habitat near confluence. secondary tributary enters river left here, proceeding up main channel.
129	50		1, 3		0.4, 0.3, 0.3	58.8219	-135.0469	Tributary 3, muskeg habitat.
130	60					58.8220	-135.0471	Tributary 3, a minor tributary enters on river right and goes immediately to >35% gradient. Main channel is somewhat ponded with organic bottom, continuing on main channel.
131	80					58.8221	-135.0473	Tributary 3, end of habitat, channel splits in wetland.
132	70	70, 55	3, 4	7	0.6, 0.3, 0.8	58.8222	-135.0474	Tributary 3a, sand and organic bottom, becoming steeper with marginal flow.
133	140		8	12	0.3, 0.5, 0.4	58.8226	-135.0481	Tributary 3a habitat ends here. Chnnel depth and habitat marginal downstream of here, spawning sand substrate present.
134	50	60, 80, 80	9, 11	11	2.4, 0.8, 1.5, 1.2	58.8201	-135.0440	Tributary 2, some log jams and pools, pretty high energy creek with lots of alluvium, possibly minimal flow seasonally.
135	60	175	13	2	1.3, 1.8	58.8201	-135.0441	Tributary 2, DV in spawning colors, pretty high energy creek from steep hillside with coble and gravel, step falls, sand in margins, spawning substrate taken in this reach.
136	100					58.8199	-135.0445	Tributary 2, end fish habitat at 2 m falls with >25% upstream habitat.

Note: Dolly Varden char = DV.

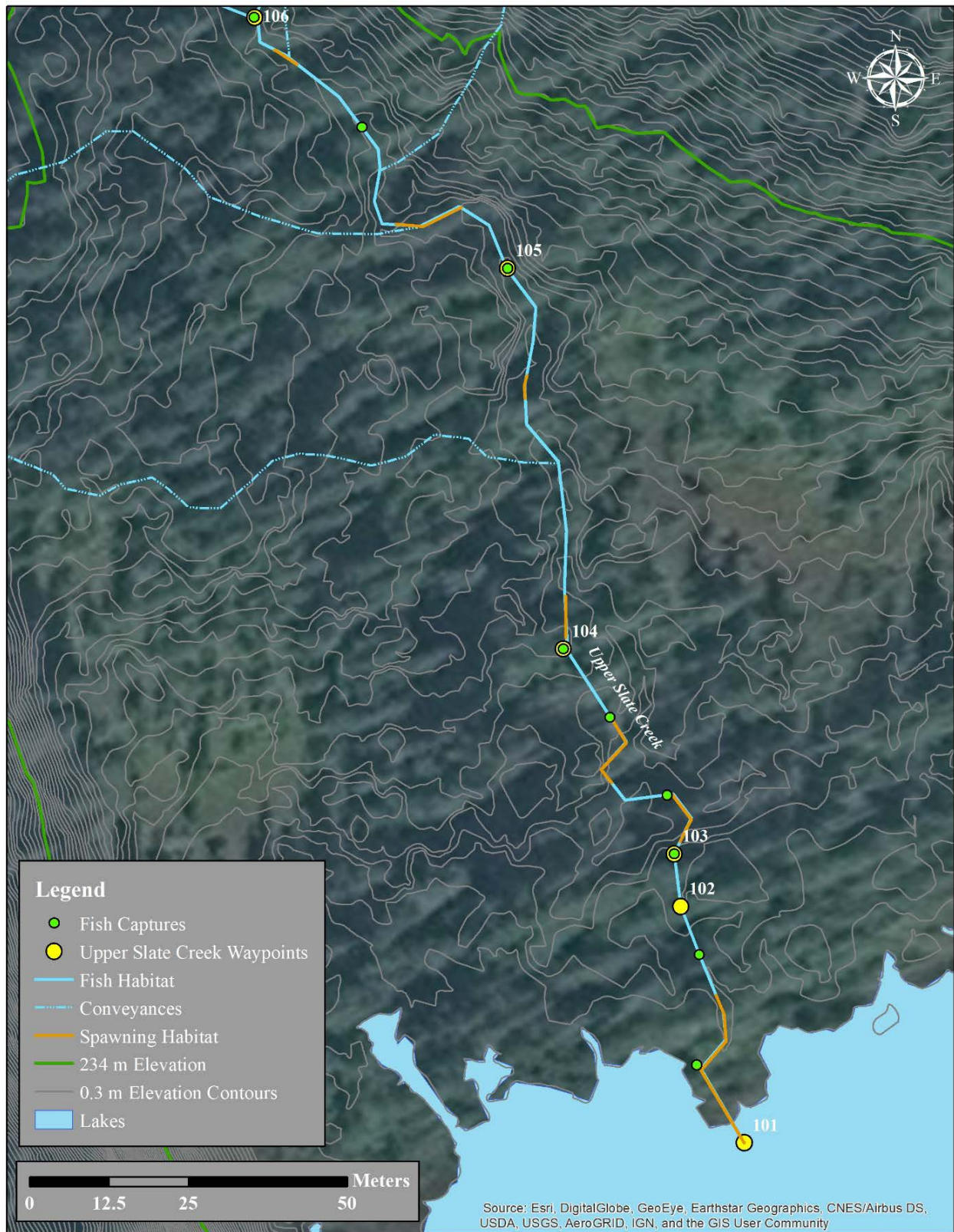
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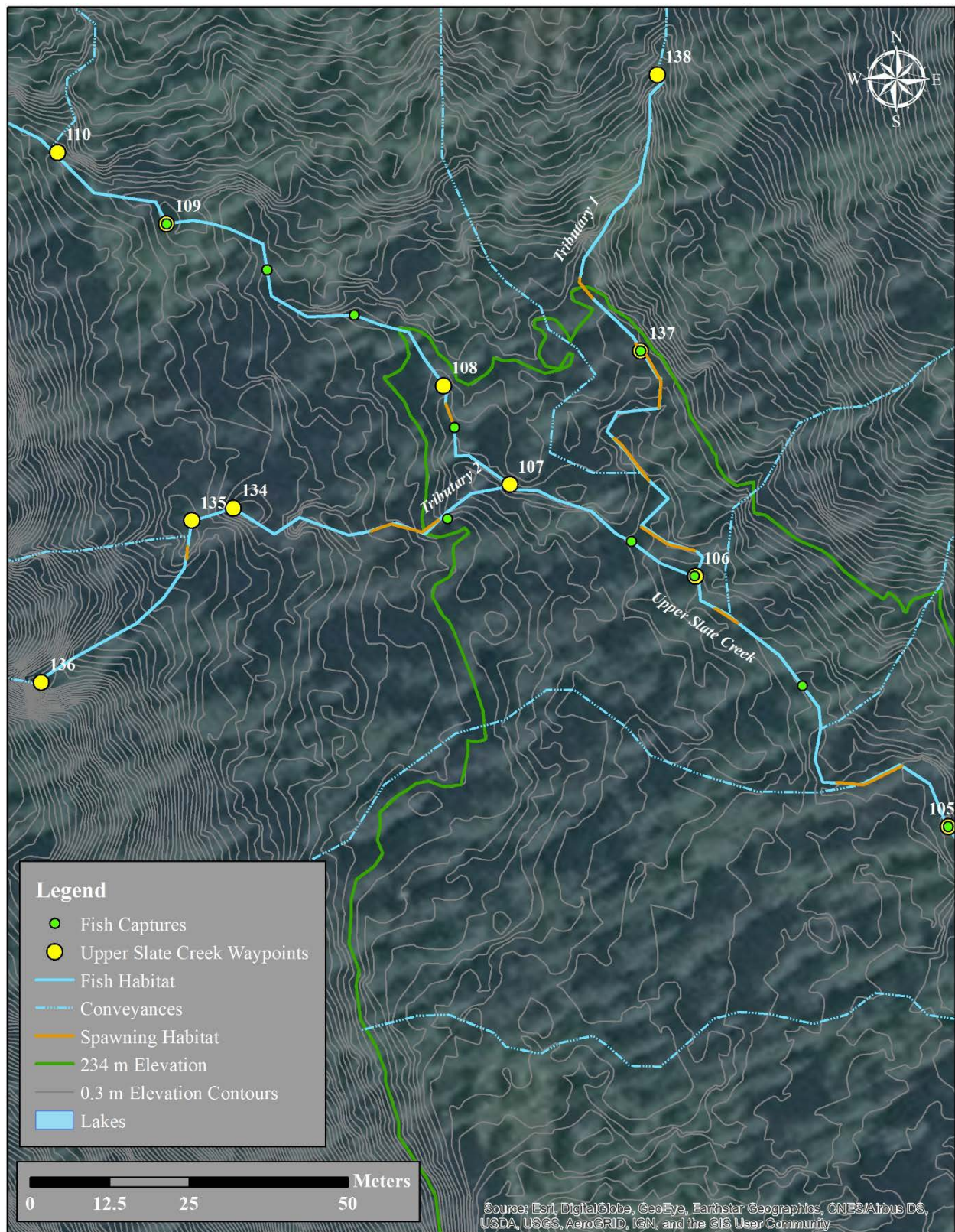
Appendix C.1. Page 3 of 3.

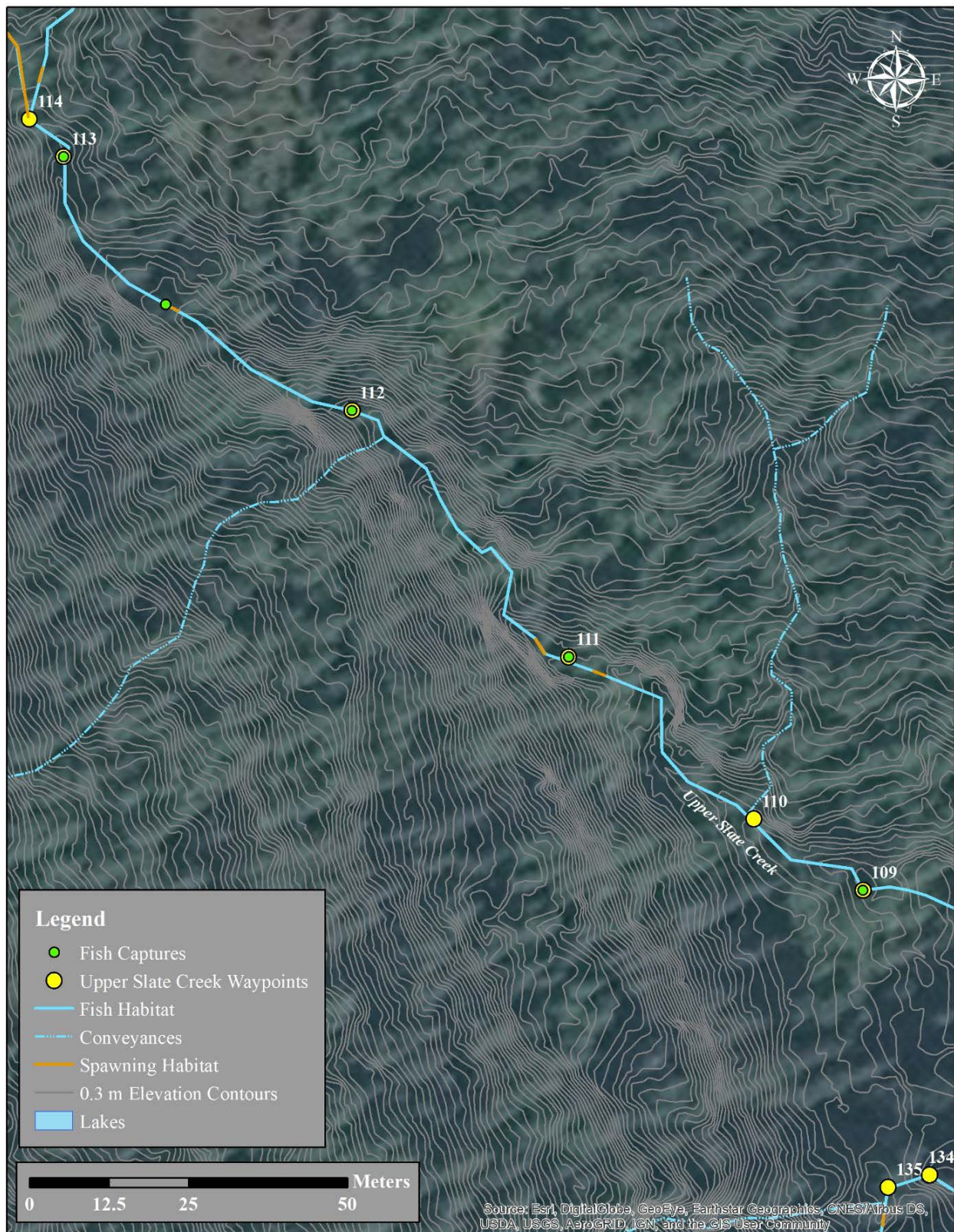
Wypt	Stn (m)	DVFL (mm)	Grad (%)	Spawn hab (m)	OHW widths (m)	Latitude	Longitude	Notes
137	50	65, 65	2, 3	23	1.2, 1.2	58.8203	-135.0429	Tributary 1, habitat is a mix of ponded areas, step falls with sand and organics in tails with marginal flow and tributaries enter at upper end, trib enters river right, no habitat.
138	100	90	10, 18	2	0.4, 0.6, 0.6	58.8207	-135.0428	Tributary 1, Channel becoming small and steep, flows under trees and brushed in upstream of here. Sediment composition and spawning substrate samples taken downstream of here.

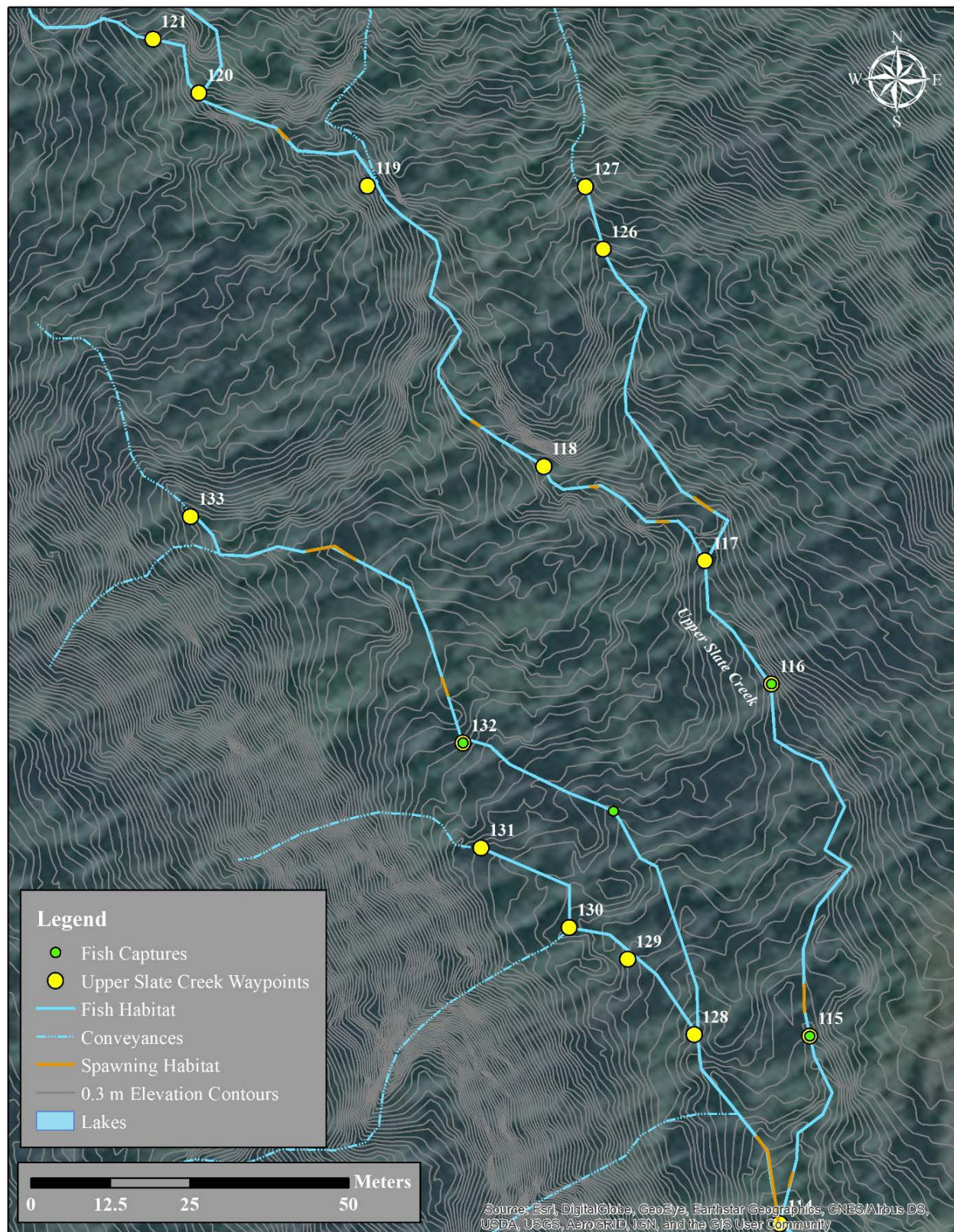
Note: Dolly Varden char = DV.

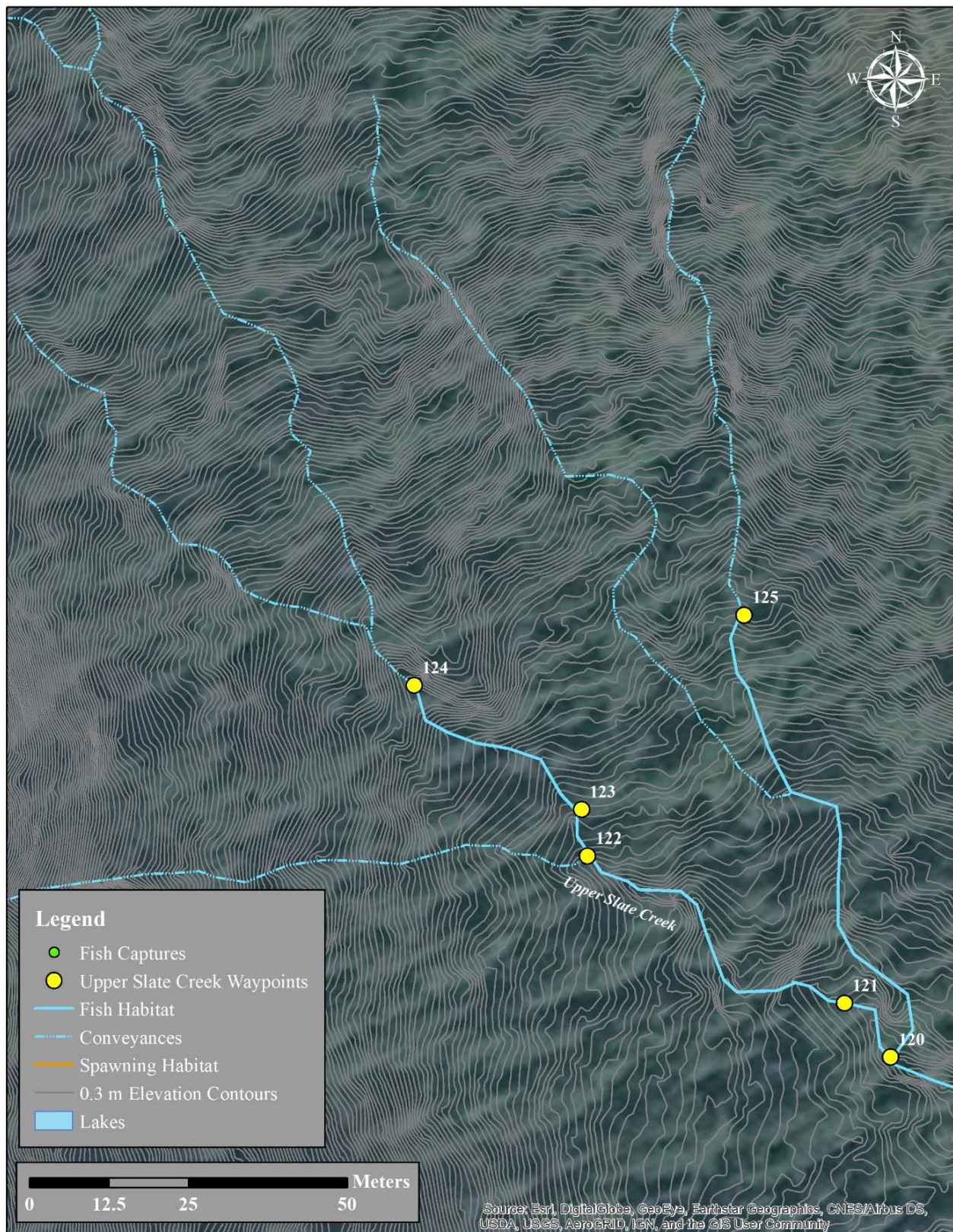
Appendix C.2.—Upper Slate Creek maps.











Appendix C.3.–South Creek field notes.

Wypt	Stn (m)	DV FL (mm)	Grad (%)	Spawn hab (m)	OHW widths (m)	Latitude	Longitude	Notes
1	0			10		58.8154	-135.0386	Mouth, begin survey here on 9/5. Note, actual mouth is 15 m downstream of here as surveyed on 10/20. 10 m additional spawning habitat present.
2	50	30, 45, 45, 50, 60	1	44	1.0, 1.5, 1.3	58.8152	-135.0383	Discharge taken here. Spawning substrate sampled in this reach.
3	55					58.8152	-135.0382	Tributary 1 from Fat Rat Lake enters river right, no fish habitat until upstream of road, did not investigate, no upstream passage to there.
4	100	55, 145, 75	5, 8	0	1.0, 1.3, 0.9	58.8150	-135.0378	Mossy cobble.
5	125	120, 175	12	0	1.1, 1.6, 1.2	58.8149	-135.0378	Boulder and cobble, red fins on 175 mm fish.
6	135					58.8147	-135.0375	Culvert outlet, perched smooth walled twin pipes.
7	150					58.8146	-135.0372	Culvert inlet.
8	200	75, 90, 90, 95, 65	1, 2	37	2.0, 1.6, 1.5	58.8144	-135.0366	Sediment composition samples taken in this reach. Discharge measured in this reach.
9	250	100, 130, 120	1, 2	25	0.8, 0.6, 1.8	58.8143	-135.0361	Tannic water makes capturing all fish difficult. Some skunk cabbage in main channel indicates lower seasonal flow. Sediment composition samples taken between here and the culvert. Slight spawning coloration on 130 mm fish.
10	300	120, 65, 70	3, 8	13	0.9, 0.7, 1.0, 0.5	58.8141	-135.0356	
11	320	120	2	18	1.0, 0.9, 1.3	58.8140	-135.0355	Tributary enters river right contributing about 1/4 of total flow.
32	42					58.8141	-135.0349	Tributary 1, step falls present, fish in deepest pool (0.3 m), flow appears to be ephemeral, upper extent of habitat ends here.
12	350	110		3	0.5, 1.2	58.8138	-135.0354	Mostly sand and organics.
13	400	75, 65, 60	4, 6	21	1.3, 0.8, 1.1	58.8137	-135.0349	Sand and pebbles. Wetland borders river left with seeps entering.
14	450	80	8	7	1.2, 0.6, 0.8	58.8136	-135.0344	Mossy cobble all through narrow portions, sand and pools, 1 woody 0.6 m woody step falls.
15	500	85, 140, 75	4, 6	19	0.4, 1.8, 0.8	58.8135	-135.0337	Spawning habitat is all sand.
16	550	75, 90, 75, 55		33	0.5, 0.6, 0.9	58.8132	-135.0333	Spawning habitat is gravel, pebble, and sand.
17	600		6, 9	4	0.8, 0.5, 0.5	58.8129	-135.0328	Flow appears to now be above ordinary high water here.
18	650		13, 18	0	0.3, 0.9, 0.8	58.8126	-135.0323	Incised step pool habitat, becoming narrow chute with angular bedrock and cobble.

Note: Dolly Varden char = DV.

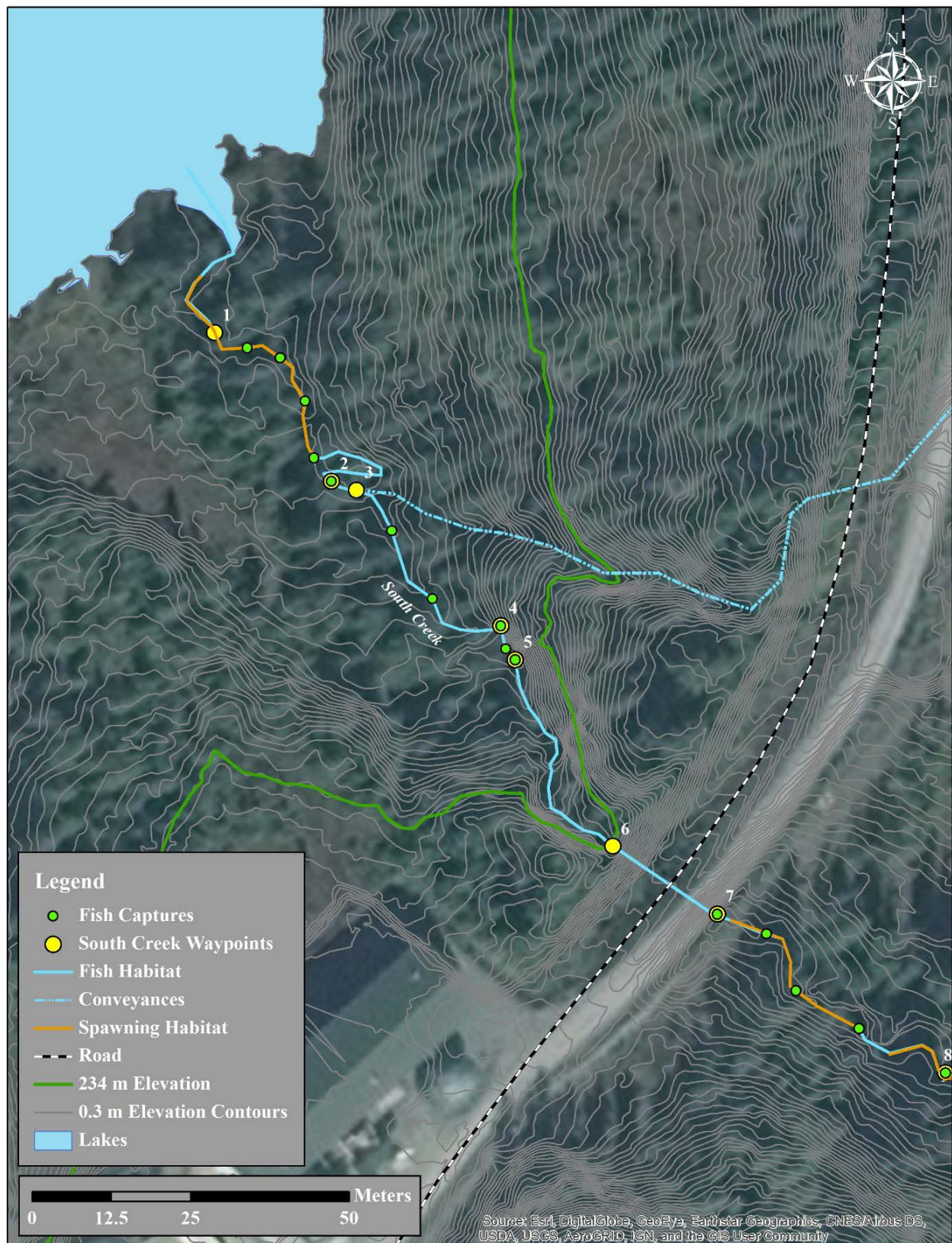
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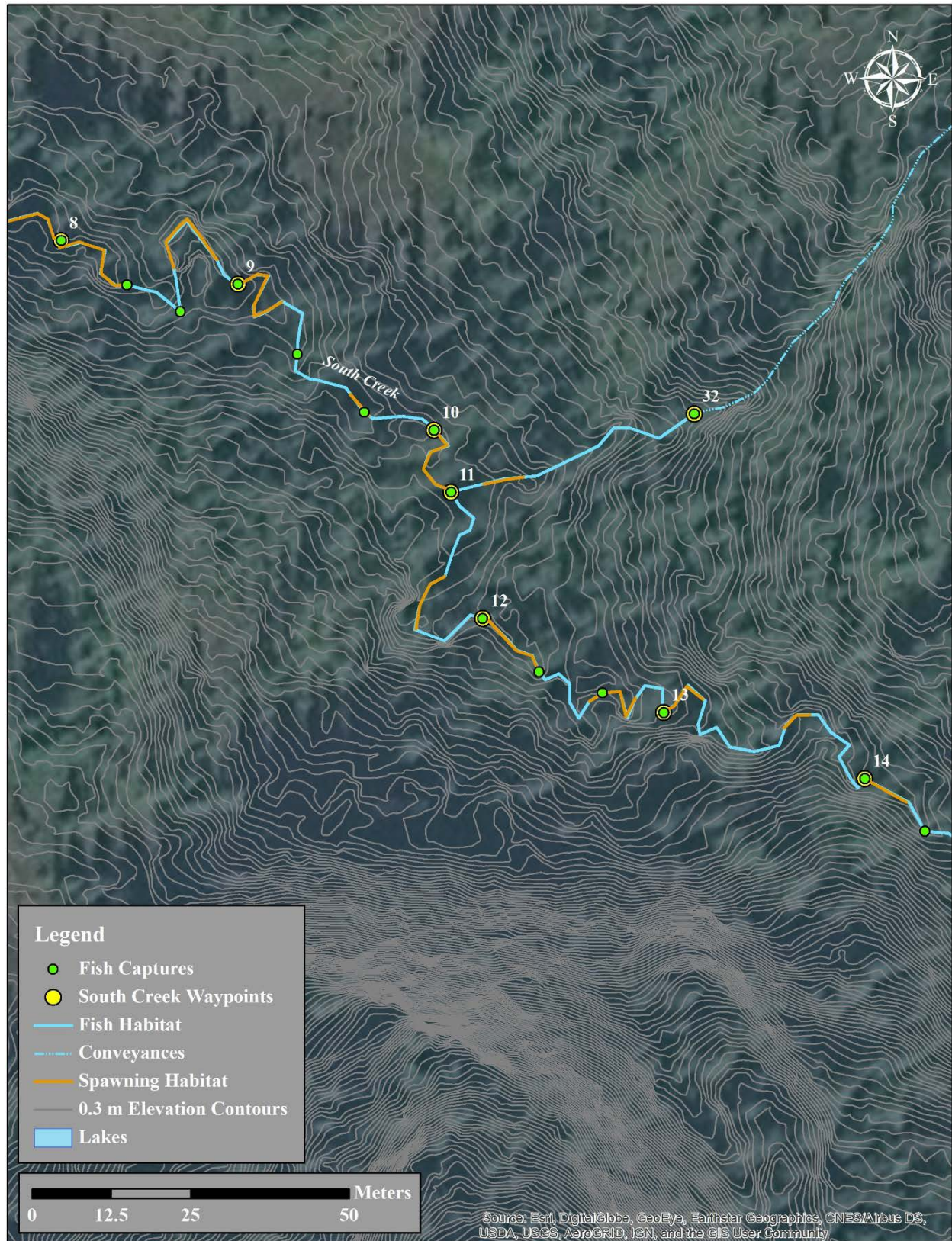
Appendix C.3.–Page 2 of 2.

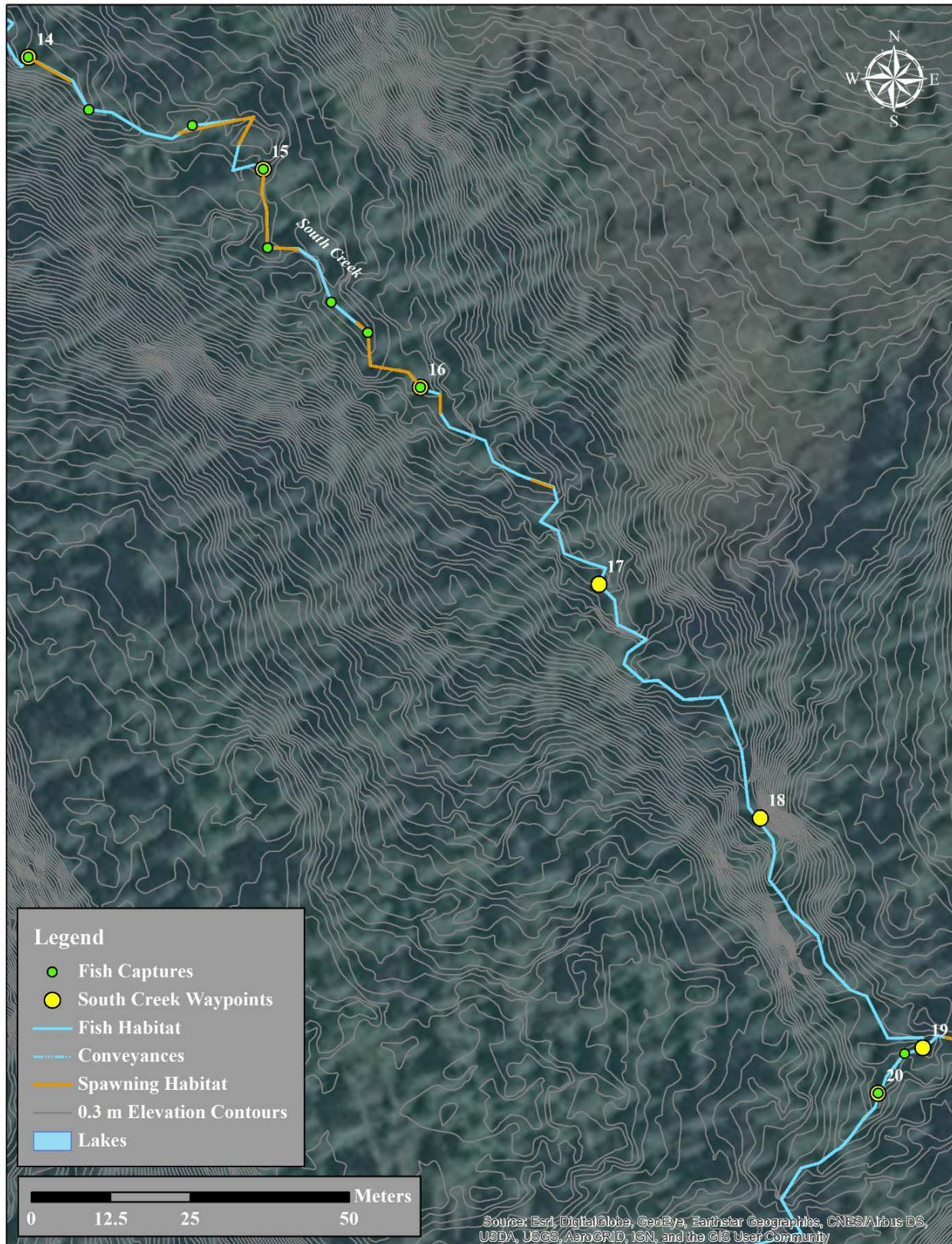
Wypt	Stn (m)	DV FL (mm)	Grad (%)	Spawn hab (m)	OHW widths (m)	Latitude	Longitude	Notes
19	690					58.8123	-135.0319	Tributary 2 enters river right, proceeding up river left.
20	700	85, 120	15	0	0.8, 1.3, 0.7	58.8122	-135.0320	This channel doesn't appear to have sufficient year round flow. Vegetation in channel, tiny patches of sand and organics.
21	750		1,3	0	1.0, 0.3, 0.4	58.8119	-135.0327	
22	775	100				58.8117	-135.0327	Tributary enters river left, no fish habitat.
23	800	55	3	0	0.3, 1.0, 0.6	58.8117	-135.0323	Minimal flow with some 0.3 m deep pools
24	850		11, 15	0	0.2, 0.6, 0.5	58.8115	-135.0317	Top of fish habitat, stream vegetated in, reduced to a trickle, seasonal habitat only.
25	50	45, 50	2, 5	13	0.2, 0.8, 0.6	58.8123	-135.0313	Tributary 2, sand for spawning, but too shallow for year round use. Channel goes subsurface once.
26	100	60		15	1.0, 0.7, 0.4	58.8125	-135.0307	Tributary 2, angular pebble substrate.
27	150		4, 8	4	0.6, 0.8, 0.9	58.8123	-135.0301	Tributary 2, very brushy, less than 7 cm creek depth.
28	200	80, 75	8	10	1.2, 1.0, 0.6	58.8119	-135.0296	Tributary 2, two 0.4 m deep step pools, tributary from river left with no habitat.
29	250	110	5, 8	4	0.5, 1.0, 0.8	58.8116	-135.0292	Tributary 2, angular gravel, two pools, channel is vegetated over near the top, but periodically defined through reach.
30	300	115	5	3	0.3, 1.0, 0.8	58.8113	-135.0285	Tributary 2, 1 m step falls that is partial barrier, exposed angular gravel.
31	350		10, 15	0	1.0, 3.0, 1.5	58.8110	-135.0278	Tributary 2, braided channel with lots of alluvium entering from canyon upstream. End fish habitat.

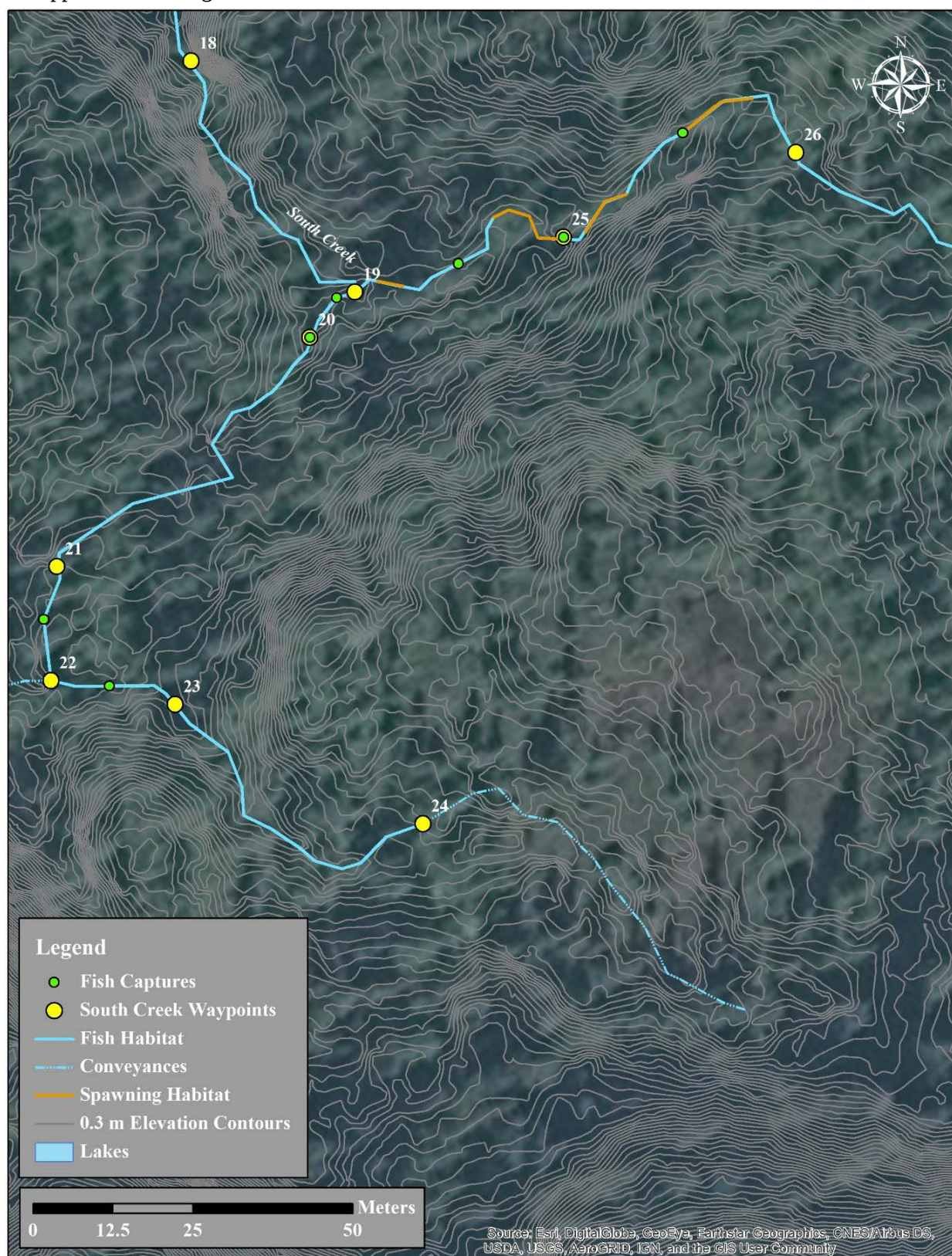
Note: Dolly Varden char = DV.

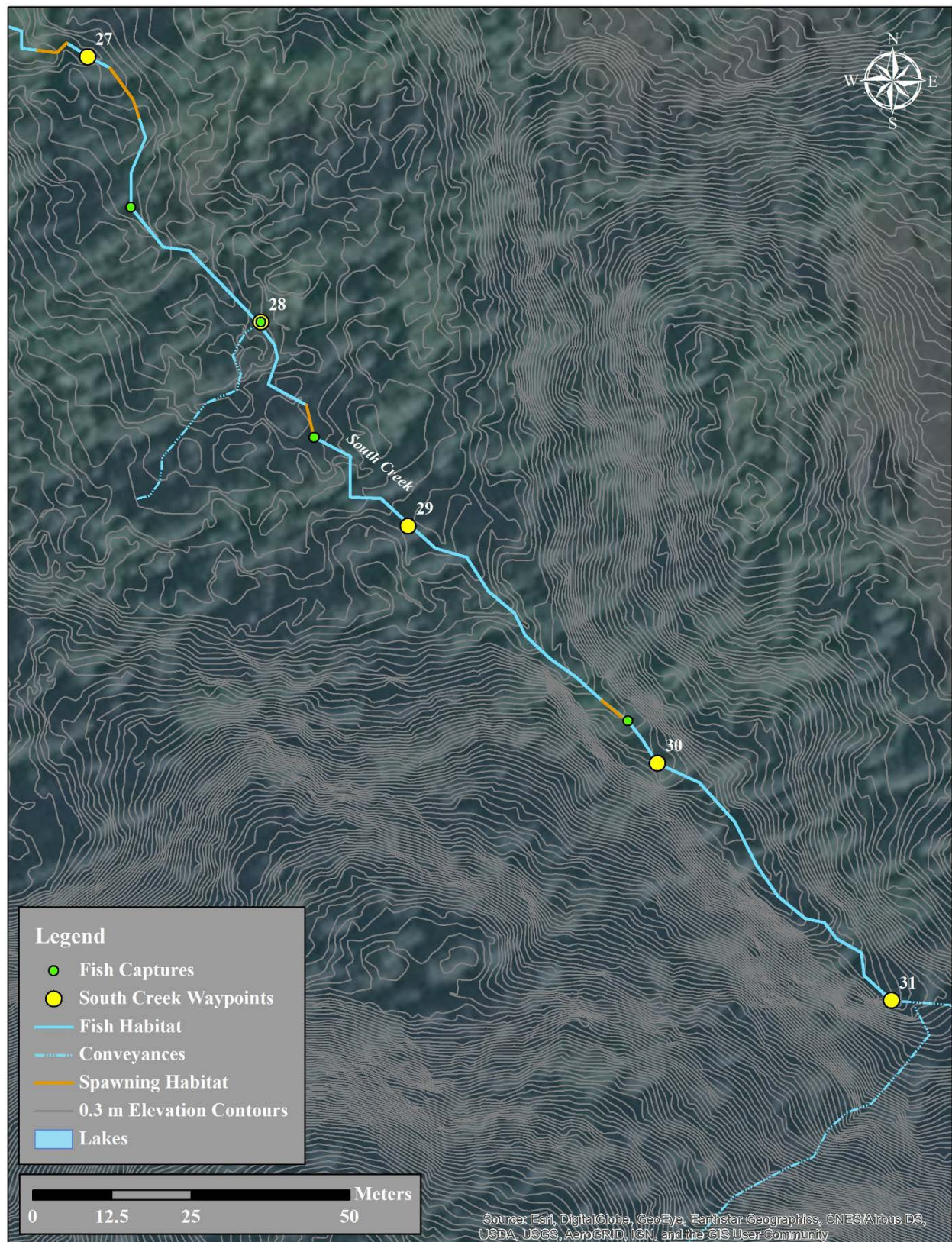
Appendix C.4.–South Creek maps.











Appendix C.5.–Spectacle Creek field notes.

Waypoint	Fish FL (mm)	Latitude	Longitude	Notes
201		58.8077	-135.0021	5% step falls, 5 m spawning gravel upstream of mouth, salmon redds in Lace River at confluence.
202	CT 95, 100, 75	58.8078	-135.0023	
203	6 CT 45-55	58.8079	-135.0028	Discharge measured here.
204		58.8078	-135.0030	Gradient increases to 20%, boulders and log jam not technically FRPA barrier, but functionally difficult to pass. Gradient decreases to 8% directly upstream.
205	4 CT 40-90	58.8079	-135.0034	Log jams, gravel, and cobble substrate at tail end of canyon. OHW widths average 2-3 m.
206	4 CT 55-75	58.8080	-135.0041	
207	CT 170, 65	58.8080	-135.0045	Canyon begins 15 m upstream of here, gradient is 14%.
208	2 CT 75, 110	58.8081	-135.0049	Boulders, step pools, and log jams.
209	CT 130, 65, 85, 85, 75, 110	58.8081	-135.0055	
210	CT 140, 65, 65	58.8078	-135.0061	Barrier falls 3.6 m tall, then 15 m long bedrock chute at 35%, fish passage barrier.
211		58.8078	-135.0066	Gradient decreases to 6%, OHW stream widths maintained at 2-3 m average.
212	CT 120	58.8080	-135.0085	Tributary enters river right, 0.3 m wide.
213		58.8080	-135.0092	Tributary enters river right, 0.3 m wide. Main channel has gravel, sand, and cobble substrate with woody debris and pools, but few fish.
214	CT 130	58.8081	-135.0098	Tributary enters river right, 0.4 m wide.
215		58.8084	-135.0107	3-4% channel with good habitat, but few fish.
216	CT 65	58.8087	-135.0111	
217	DV 105	58.8089	-135.0113	Tributary enters river right, 0.4 m wide.
218	DV 110	58.8090	-135.0115	Seep enters river right.
219		58.8094	-135.0116	Discharge measured here about 30 m downstream of the road.
220		58.8098	-135.0127	Outlet of 1.2 m smooth walled culvert that is a fish barrier due to gradient.
221	DV 140	58.8099	-135.0131	Step pool habitat with resident fish spawning habitat present, 5-7% gradient.
222		58.8102	-135.0137	0.8 m log falls.
223		58.8102	-135.0144	Gradient increases to 15%.
224		58.8103	-135.0149	Upstream end of 30 m at 20% bedrock chute. Gradient then increases to >35% upstream of here. End of potential fish habitat.

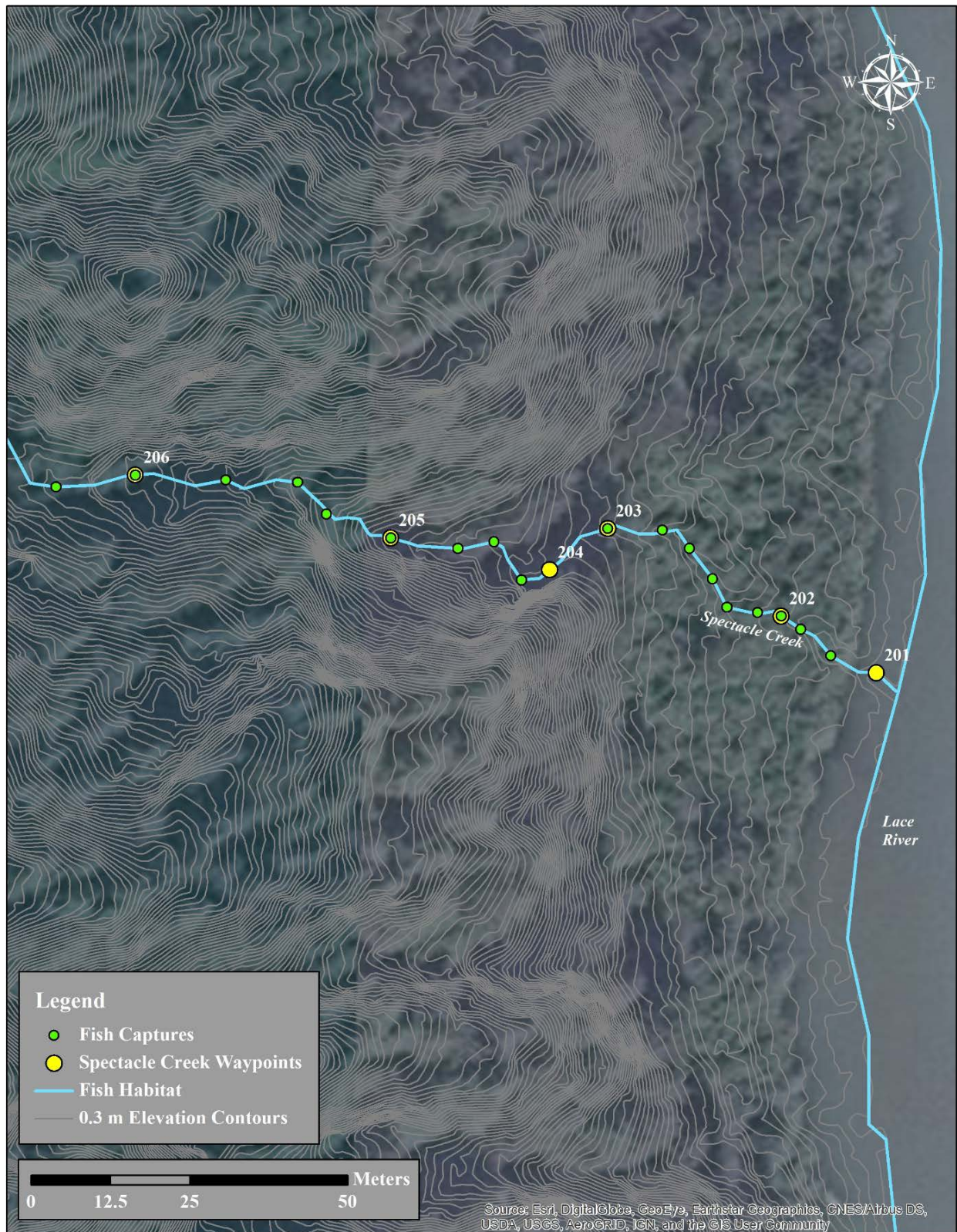
Note: Dolly Varden char = DV, cutthroat trout = CT.

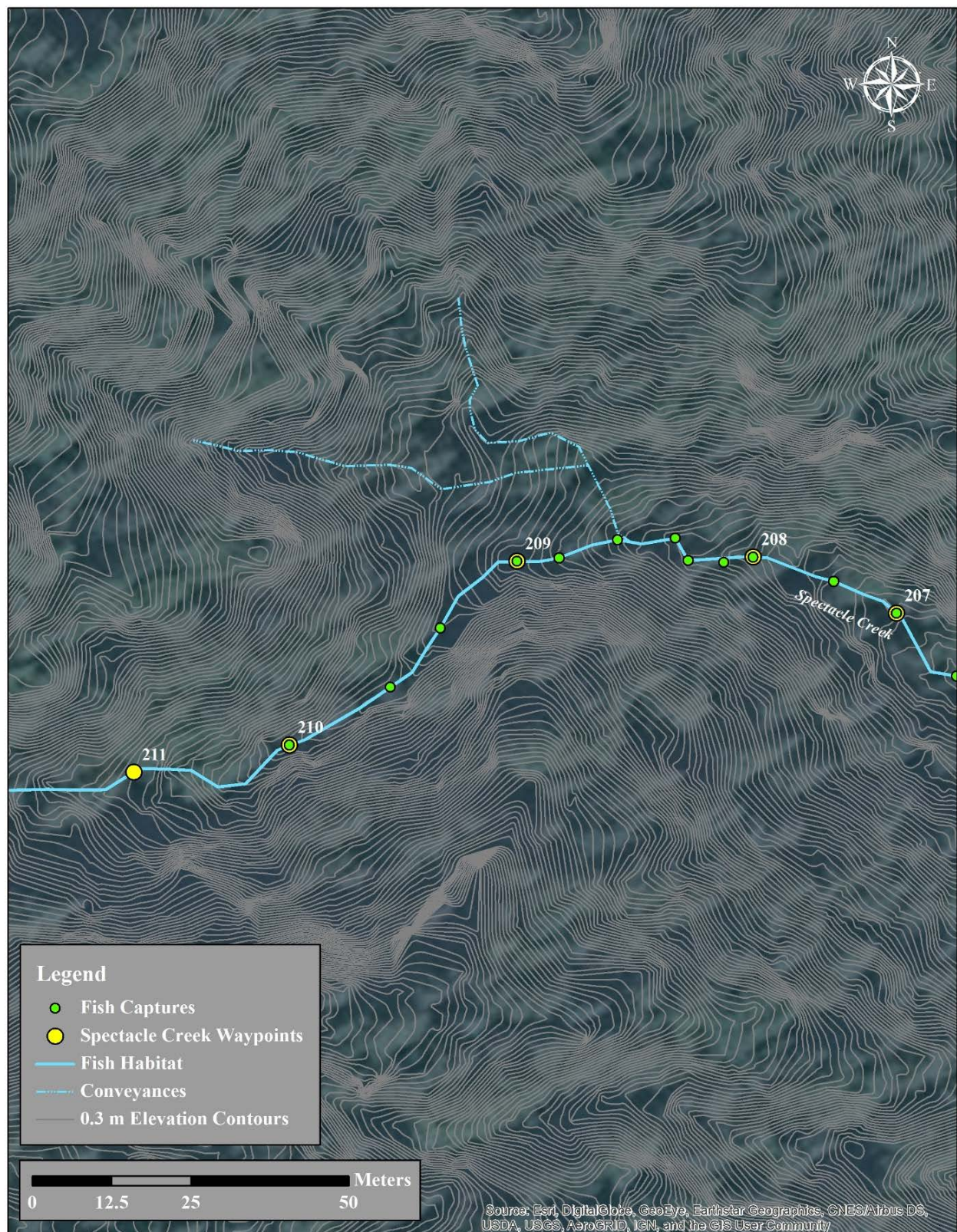
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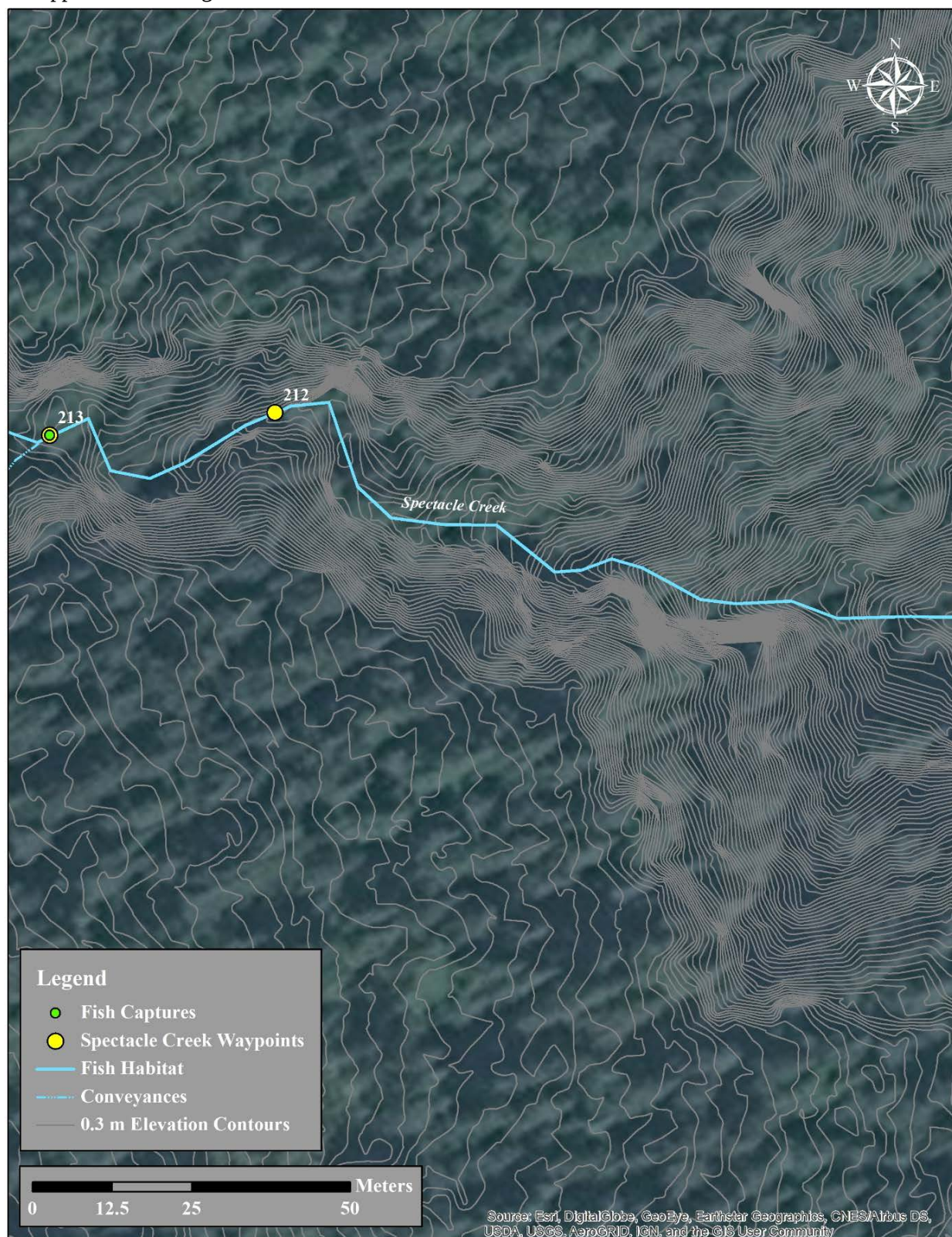
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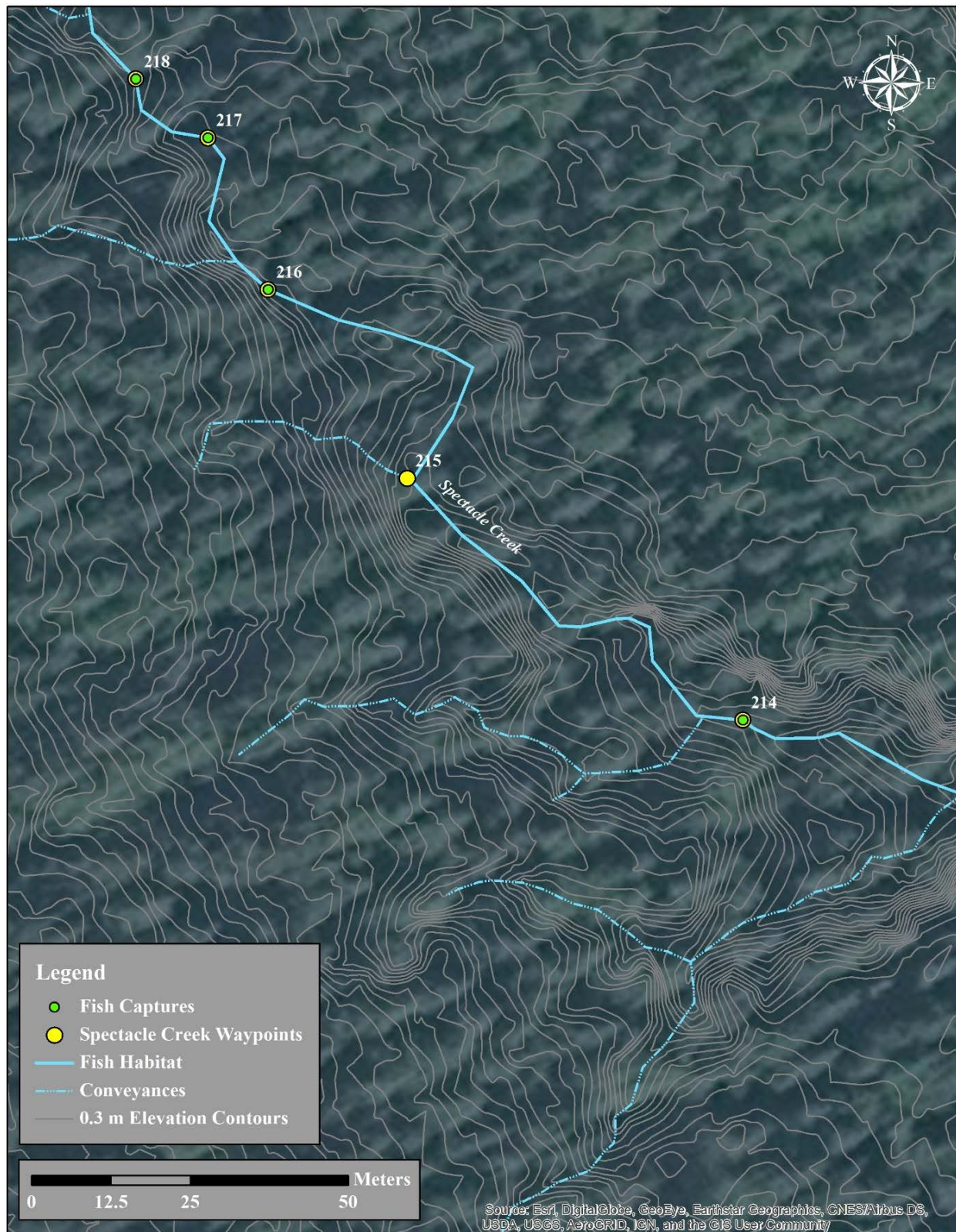
Waypoint	Fish FL (mm)	Latitude	Longitude	Notes
226		58.8165	-135.0269	Minnow trap.
227		58.8164	-135.0269	Minnow trap.
228		58.8162	-135.0266	Minnow trap.
229		58.8161	-135.0264	Minnow trap.
230		58.8145	-135.0257	Minnow trap.
232		58.8142	-135.0258	Minnow trap.
234		58.8139	-135.0257	Minnow trap.
235		58.8136	-135.0256	Minnow trap.
236		58.8130	-135.0246	Minnow trap.
237		58.8124	-135.0231	Minnow Trap here, discharge measured here.

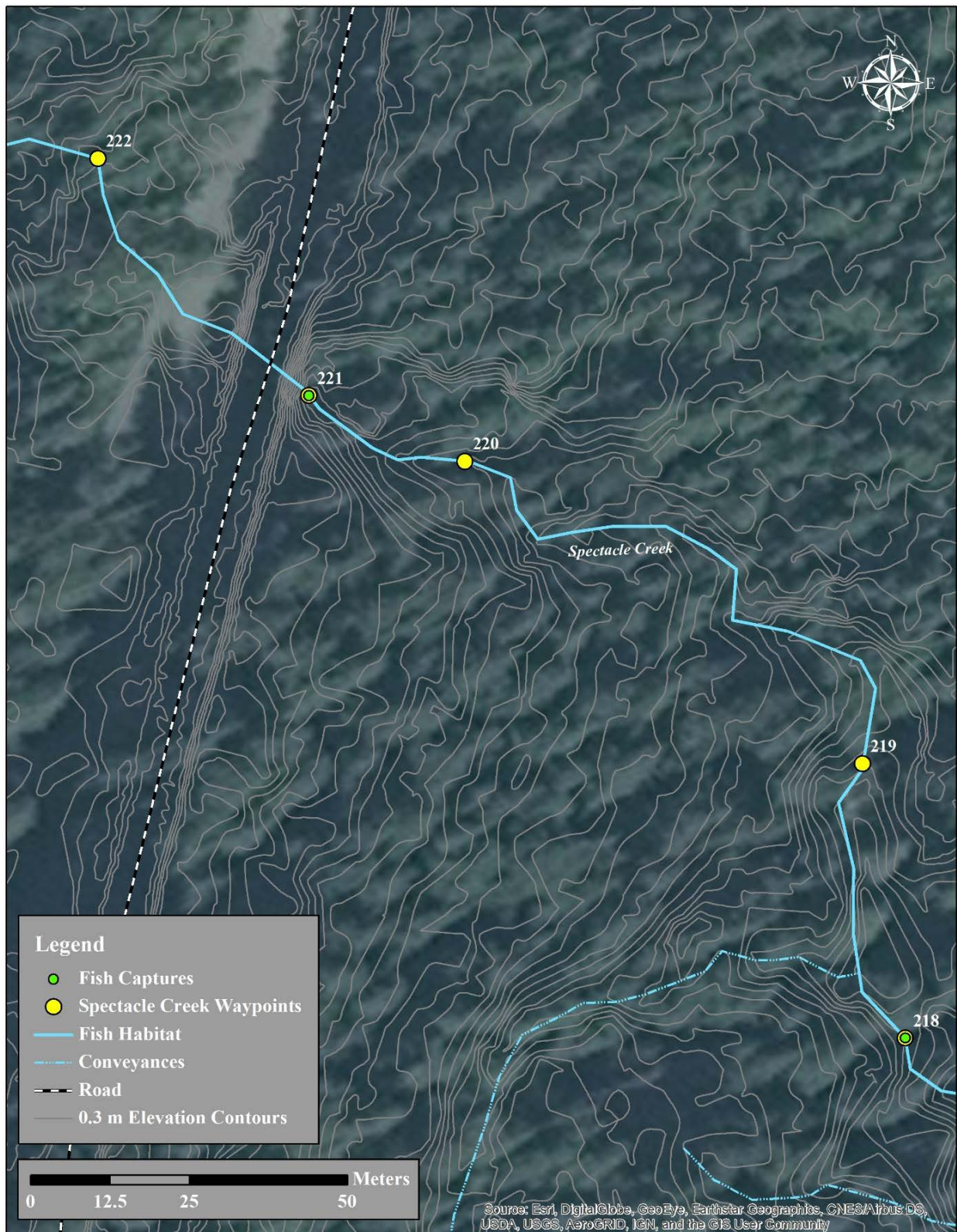
Appendix C.6.—Spectacle Creek maps.

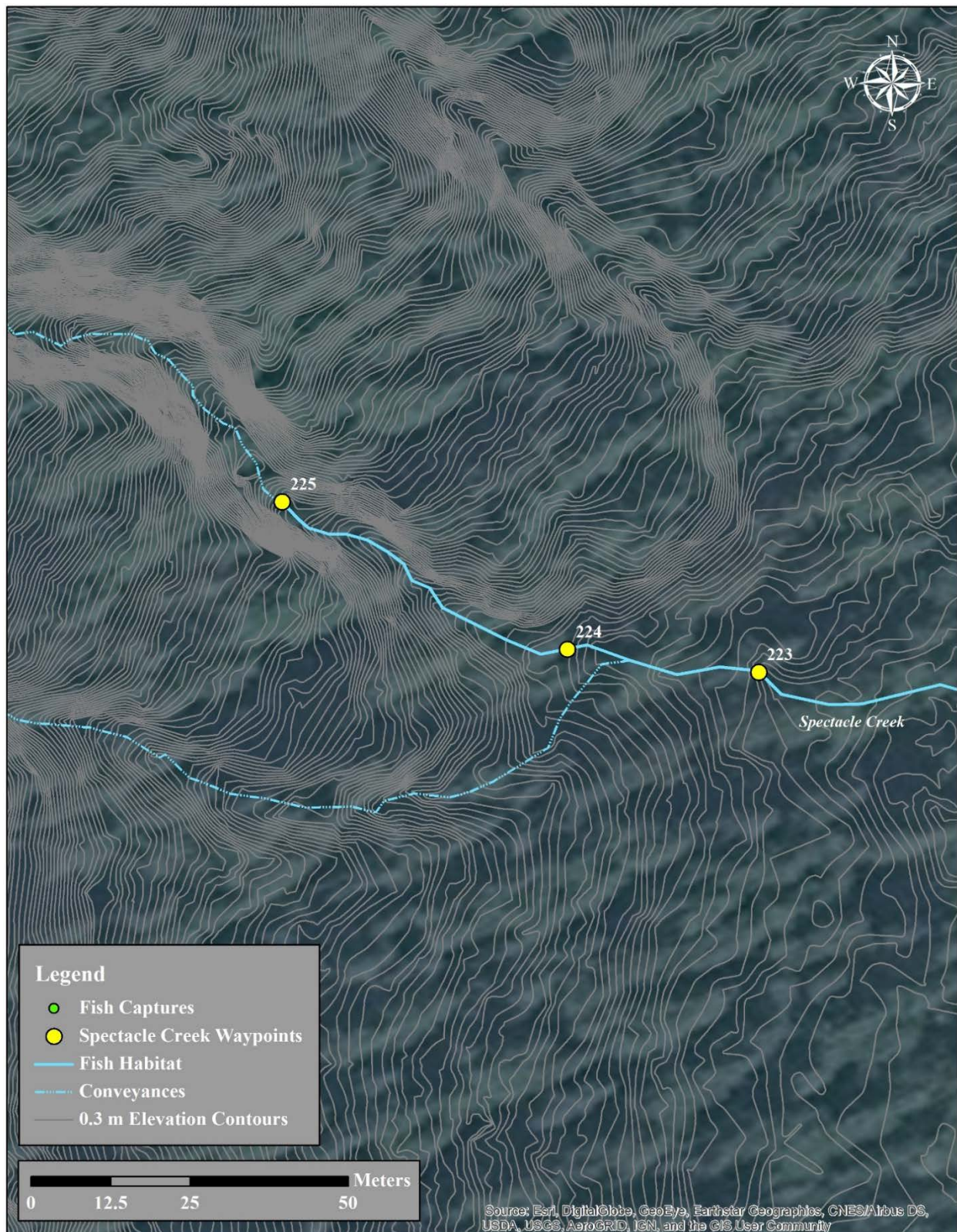












APPENDIX D: SPAWNING SUBSTRATE DATA

Appendix D.1.–Upper Slate Creek flooded reach spawning substrate data.

Sample Date	Sample No.	Volume (mL/L) Retained Each Sieve (mm)								Imhoff	GMPS
		50.8	25.4	19.0	12.5	6.35	2.36	0.0425	0.15		
09/22/17	1	50	250	250	450	550	600	250	50	43	8.5
09/22/17	2	0	200	175	275	425	600	650	100	105	5.2
09/22/17	3	175	275	150	275	400	450	550	50	70	6.4
09/22/17	4	400	300	250	300	350	375	400	50	101	7.3

Appendix D.2.–Upper Slate Creek flooded reach substrate sample site.



Appendix D.3.–Upper Slate Creek upstream reach spawning substrate data.

Sample Date	Sample No.	Volume (mL/L) Retained Each Sieve (mm)								Imhoff	GMPS
		50.8	25.4	19.0	12.5	6.35	2.36	0.0425	0.15		
09/22/17	1 (Trib 2)	250	275	125	250	500	475	375	75	125	6.2
09/22/17	2 (Trib 2)	75	300	150	200	250	350	350	50	136	6.2
09/22/17	3 (Trib 1)	150	250	150	200	350	350	550	100	198	4.6
09/22/17	4 (Trib 1)	0	100	50	100	225	450	700	125	232	2.5

Appendix D.4.–Upper Slate Creek Tributary 1 substrate sample site.



Appendix D.5.–Upper Slate Creek Tributary 2 substrate sample site.



Appendix D.6.–South Creek flooded reach spawning substrate data.

Sample Date	Sample No.	Volume (mL/L) Retained Each Sieve (mm)								Imhoff	GMPS
		50.8	25.4	19.0	12.5	6.35	2.36	0.0425	0.15		
09/05/17	1	0	675	275	450	525	550	450	75	132	8.8
09/05/17	2	0	25	50	25	650	750	700	175	103	3.4
09/05/17	3	175	275	150	350	375	475	300	150	93	6.6
09/05/17	4	275	100	100	225	350	475	300	50	50	5.9

Appendix D.7.–South Creek flooded reach substrate sample site.



Appendix D.8.–South Creek upstream reach spawning substrate data.

Sample Date	Sample No.	Volume (mL/L) Retained Each Sieve (mm)								Imhoff	GMPS
		50.8	25.4	19.0	12.5	6.35	2.36	0.0425	0.15		
09/05/17	1	0	25	150	225	300	400	300	25	210	4.0
09/05/17	2	0	400	200	250	375	500	325	50	74	8.1
09/05/17	3	100	150	75	250	250	425	400	100	160	4.3
09/05/17	4	0	375	200	275	350	450	300	25	142	7.5

Appendix D.9.–South Creek flooded reach substrate sample site.



APPENDIX E: SEDIMENT COMPOSITION LAB REPORTS



ALS Environmental
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October 09, 2017

Analytical Report for Service Request No: K1709696

Kate Kanouse
Alaska Department of Fish and Game
Division of Habitat
802 3rd Street
P.O. Box 110024
Douglas, AK 99811-0024

RE: USL Investigation

Dear Kate,

Enclosed are the results of the sample(s) submitted to our laboratory September 13, 2017
For your reference, these analyses have been assigned our service request number **K1709696**.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. All results are intended to be considered in their entirety, and ALS Group USA Corp. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please contact me if you have any questions. My extension is 3293. You may also contact me via email at Shar.Samy@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Shar Samy, Ph.D.
Project Manager



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Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

Inorganic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated value.
- U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
- DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.
- H The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

Metals Data Qualifiers

- # The control limit criteria is not applicable. See case narrative.
- J The result is an estimated value.
- E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See case narrative.
- S The reported value was determined by the Method of Standard Additions (MSA).
- U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
- DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- + The correlation coefficient for the MSA is less than 0.995.
- Q See case narrative. One or more quality control criteria was outside the limits.

Organic Data Qualifiers

- * The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- A A tentatively identified compound, a suspected add-on-condensation product.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
- D The reported result is from a dilution.
- E The result is an estimated value.
- J The result is an estimated value.
- N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
- P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
- U The analyte was analyzed for, but was not detected ("Non-detected") at or above the MRL/MDL.
- DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.

Additional Petroleum Hydrocarbon Specific Qualifiers

- F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
- L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
- H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
- O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
- Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
- Z The chromatographic fingerprint does not resemble a petroleum product.

ALS Group USA Corp. dba ALS Environmental (ALS) - Kelso
State Certifications, Accreditations, and Licenses



Agency	Web Site	Number
Alaska DEH	http://dec.alaska.gov/eh/lab/cs/csappraisal.htm	UST-040
Arizona DHS	http://www.azdhs.gov/lab/license/env.htm	AZ0339
Arkansas - DEQ	http://www.adeq.state.ar.us/techsys/labcert.htm	88-0637
California DHS (ELAP)	http://www.cdph.ca.gov/certificat/labs/Pages/ELAP.aspx	2795
DOD ELAP	http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm	L14-51
Florida DOH	http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm	E87412
Hawaii DOH	http://health.hawaii.gov/	-
ISO 17025	http://www.pilabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/page/la-lab-accreditation	03016
Maine DHS	http://www.maine.gov/dhhs/	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/enforcement/oqa.html	WA005
New York - DOH	https://www.wadsworth.org/regulatory/elap	12060
North Carolina DEQ	https://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/laboratory-certification-branch/non-field-lab-certification	605
Oklahoma DEQ	http://www.deq.state.ok.us/CSDnew/labcert.htm	9801
Oregon - DEQ (NELAP)	http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	WA100010
South Carolina DHEC	http://www.scdhec.gov/environment/EnvironmentalLabCertification/	61002
Texas CEQ	http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html	T104704427
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C544
Wyoming (EPA Region 8)	https://www.epa.gov/region8-waterops/epa-region-8-certified-drinking-water	-
Kelso Laboratory Website	www.alsglobal.com	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at www.alsglobal.com or at the accreditation bodies web site.

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/analyte is offered by that state.

Case Narrative

ALS Environmental—Kelso Laboratory
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Phone (360)577- 7222 Fax (360)636- 1068
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ALS ENVIRONMENTAL



Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Service Request No.: K1709696
Date Received: 09/13/17

Case Narrative

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier II data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), and Matrix/Duplicate Matrix Spike (MS/DMS).

Sample Receipt

Four sediment samples were received for analysis at ALS Environmental on 09/13/17. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4°C upon receipt at the laboratory.

General Chemistry Parameters

No anomalies associated with the analysis of these samples were observed.

Total Metals

Relative Percent Difference Exceptions:

The Relative Percent Difference (RPD) for the replicate analysis of Chromium in sample 2017 USC1 was outside the normal ALS control limits. The variability in the results was attributed to the heterogeneous character of the sample. Standard mixing techniques were used, but were not sufficient for complete homogenization of this sample.

Matrix Spike Recovery Exceptions:

The matrix spike recovery of Mercury for sample 2017 USC1 was outside control criteria. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control. No further corrective action was appropriate.

No other anomalies associated with the analysis of these samples were observed.

Approved by 

Chain of Custody

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com



Cooler Receipt and Preservation Form

Client: AK Dept of Fish and Game Service Request K17 096910
Received: 9/13/17 Opened: 9/13/17 By: BR Unloaded: 9/13/17 By: BR

- 1. Samples were received via? USPS UPS Fed Ex DHL PDX Courier Hand Delivered
2. Samples were received in: (circle) Cooler Box Envelope Other
3. Were custody seals on coolers? NA Y N If yes, how many and where? 1 front

Table with 10 columns: Raw Cooler Temp, Connected Cooler Temp, Raw Temp, Connected Temp, Bottle Count, Bottle Type, Out of Head-Temp space, Broke, pH, Resagent, Volume added, Resagent Lot Number, Initials, Time.

4. Packing material: Inserts Baggies Bubble Wrap Gel Packs Wet Ice Dry Ice Sleeves

- 5. Were custody papers properly filled out (ink, signed, etc.)?
5. Were samples received in good condition (temperature, unbroken)? Indicate in the table below.
7. Were all sample labels complete (i.e. analysis, preservation, etc.)?
8. Did all sample labels and tags agree with custody papers? Indicate major discrepancies in the table on page 2.
9. Were appropriate bottles/containers and volumes received for the tests indicated?
10. Were the pH-preserved bottles (see SMO GEN SOP) received at the appropriate pH? Indicate in the table below.
11. Were VOA vials received without headspace? Indicate in the table below.
12. Was C12/Res negative?

Table with 2 columns: Sample ID on Bottle, Sample ID on COC, Identified by.

Table with 10 columns: Sample ID, Bottle Count, Bottle Type, Out of Head-Temp space, Broke, pH, Resagent, Volume added, Resagent Lot Number, Initials, Time.

Notes, Discrepancies, & Resolutions:

SR# 2469102
COC S# of
COC#

CHAIN OF CUSTODY
82553

ALS Environmental
1317 South 13th Ave. Reno, NV 89508 Phone (800) 577-7222 / (702) 465-7222 FAX (800) 684-1068

Table with 10 columns: CLIENT SAMPLE ID, LAB ID, SAMPLING Date, Time, Matrix, Remarks.

Report Requirements, Invoice Information, Turnaround Requirements, Relinquished By, Received By, Signature, Printed Name, Date/Time.



ALS Group USA, Corp.
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Analytical Report

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Analysis Method: 160.3 Modified
Prep Method: None
Service Request: K1709696
Date Collected: 09/8/17
Date Received: 09/13/17
Units: Percent
Basis: As Received

Solids, Total

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
2017 USC1	K1709696-001	66.6	-	1	09/14/17 16:05	
2017 USC2	K1709696-002	73.1	-	1	09/14/17 16:05	
2017 UNC1	K1709696-003	68.1	-	1	09/14/17 16:05	
2017 UNC2	K1709696-004	80.2	-	1	09/14/17 16:05	

Total Solids

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ALS Group USA, Corp.
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QA/QC Report

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Soil
Analysis Method: 160.3 Modified
Prep Method: None
Service Request: K1709696
Date Collected: 09/08/17
Date Received: 09/13/17
Units: Percent
Basis: As Received

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sludge, Solid
Analysis Method: 160.3 Modified
Prep Method: None
Service Request: K1709696
Date Collected: NA
Date Received: NA
Units: Percent
Basis: NA

Replicate Sample Summary
Inorganic Parameters

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD Limit	Date Analyzed
Batch QC	K1709676-001DUP	-	76.9	76.8	76.9	<1	09/14/17
2017 USC1	K1709696-001DUP	-	66.6	66.6	66.6	<1	09/14/17

Replicate Sample Summary
Inorganic Parameters

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD Limit	Date Analyzed
Batch QC	K1709695-001DUP	-	21.4	21.5	21.5	<1	09/14/17

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:17-0000437122 rev 00

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Analysis Method: 160.4 Modified
Prep Method: None
Service Request: K1709696
Date Collected: 09/8/17
Date Received: 09/13/17
Units: Percent
Basis: Dry, per Method

Solids, Total Volatile

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
2017 USC1	K1709696-001	5.20	0.10	1	09/15/17 21:15	
2017 USC2	K1709696-002	3.30	0.10	1	09/15/17 21:15	
2017 UNC1	K1709696-003	3.70	0.10	1	09/15/17 21:15	
2017 UNC2	K1709696-004	3.00	0.10	1	09/15/17 21:15	
Method Blank	K1709696-MB	ND U	0.10	1	09/15/17 21:15	

General Chemistry

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ALS Group USA, Corp.
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QA/QC Report

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment

Service Request: K1709696
Date Collected: 09/08/17
Date Received: 09/13/17
Date Analyzed: 09/15/17

Replicate Sample Summary
General Chemistry Parameters

Sample Name: 2017 USC1
Lab Code: K1709696-001

Units: Percent
Basis: Dry, per Method

Duplicate
Sample
K1709696-
001DUP

Analyte Name	Analysis Method	MRL	Sample Result	Average	RPD	RPD Limit
Solids, Total Volatile	160.4 Modified	0.10	5.20	5.15	2	20

ALS Group USA, Corp.
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Analytical Report

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment

Service Request: K1709696
Date Collected: 9/8/2017
Date Received: 9/13/2017
Date Analyzed: 10/1/2017

Particle Size Determination
ASTM D422

Sample Name: 2017 USC1
Lab Code: K1709696-001

Gravel and Sand
(Sieve Analysis)

Description	Sieve Size	Weight (g)	Percent Passing
Gravel (19.0 mm)	No.3/4" (19.0 mm)	0.0000	99.76
Gravel (9.50 mm)	No.3/8" (9.50 mm)	0.0000	99.76
Gravel, Medium	No.4 (4.75 mm)	2.3602	92.08
Gravel, Fine	No.10 (2.00 mm)	3.7506	79.88
Sand, Very Coarse	No.20 (0.850 mm)	3.8033	67.48
Sand, Coarse	No.40 (0.425 mm)	4.1870	53.83
Sand, Medium	No.60 (0.250 mm)	3.7092	41.73
Sand, Fine	No.140 (0.106 mm)	5.1893	24.81
Sand, Very Fine	No.200 (0.0750 mm)	0.6500	22.69

Silt and Clay
(Hydrometer Analysis)

Particle Diameter	Percent Passing
0.074 mm	23.75
0.005 mm	5.98
0.001 mm	0.00

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K1709696WET.AP1.006/2017

Page No.:

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Service Request: K1709696
Date Collected: 9/8/2017
Date Received: 9/13/2017
Date Analyzed: 10/1/2017

Particle Size Determination
ASTM D422

Sample Name: 2017 USC2
Lab Code: K1709696-002

Gravel and Sand
(Sieve Analysis)

Description	Sieve Size	Weight (g)	Percent Passing
Gravel (19.0 mm)	No.3/4" (19.0 mm)	0.0000	99.79
Gravel (9.50 mm)	No.3/8" (9.50 mm)	0.0000	99.79
Gravel, Medium	No.4 (4.75 mm)	4.7019	84.60
Gravel, Fine	No.10 (2.00 mm)	7.6261	59.96
Sand, Very Coarse	No.20 (0.850 mm)	9.0032	30.77
Sand, Coarse	No.40 (0.425 mm)	5.1583	14.05
Sand, Medium	No.60 (0.250 mm)	1.6570	8.68
Sand, Fine	No.140 (0.106 mm)	0.9797	5.50
Sand, Very Fine	No.200 (0.0750 mm)	0.1475	5.02

Silt and Clay
(Hydrometer Analysis)

Particle Diameter	Percent Passing
0.074 mm	6.86
0.005 mm	4.73
0.001 mm	3.46

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Service Request: K1709696
Date Collected: 9/8/2017
Date Received: 9/13/2017
Date Analyzed: 10/1/2017

Particle Size Determination
ASTM D422

Sample Name: 2017 UNC1
Lab Code: K1709696-003

Gravel and Sand
(Sieve Analysis)

Description	Sieve Size	Weight (g)	Percent Passing
Gravel (19.0 mm)	No.3/4" (19.0 mm)	0.0000	100.00
Gravel (9.50 mm)	No.3/8" (9.50 mm)	0.0000	100.00
Gravel, Medium	No.4 (4.75 mm)	1.2087	96.07
Gravel, Fine	No.10 (2.00 mm)	2.2671	88.71
Sand, Very Coarse	No.20 (0.850 mm)	7.8868	62.93
Sand, Coarse	No.40 (0.425 mm)	10.1563	29.74
Sand, Medium	No.60 (0.250 mm)	4.1172	16.28
Sand, Fine	No.140 (0.106 mm)	1.9025	10.06
Sand, Very Fine	No.200 (0.0750 mm)	0.2922	9.10

Silt and Clay
(Hydrometer Analysis)

Particle Diameter	Percent Passing
0.074 mm	10.10
0.005 mm	4.06
0.001 mm	0.45

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Service Request: K1709696
Date Collected: 9/8/2017
Date Received: 9/13/2017
Date Analyzed: 10/1/2017

Particle Size Determination
ASTM D422

Sample Name: 2017 UNC2
Lab Code: K1709696-004

Gravel and Sand
(Sieve Analysis)

Description	Sieve Size	Weight (g)	Percent Passing
Gravel (19.0 mm)	No.3/4" (19.0 mm)	0.0000	99.80
Gravel (9.50 mm)	No.3/8" (9.50 mm)	0.0000	99.80
Gravel, Medium	No.4 (4.75 mm)	3.0393	89.90
Gravel, Fine	No.10 (2.00 mm)	5.9948	70.38
Sand, Very Coarse	No.20 (0.850 mm)	10.4641	36.18
Sand, Coarse	No.40 (0.425 mm)	6.9338	13.51
Sand, Medium	No.60 (0.250 mm)	1.7772	7.70
Sand, Fine	No.140 (0.106 mm)	0.8235	5.01
Sand, Very Fine	No.200 (0.0750 mm)	0.1392	4.55

Silt and Clay
(Hydrometer Analysis)

Particle Diameter	Percent Passing
0.074 mm	6.71
0.005 mm	5.20
0.001 mm	4.31

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Service Request: K1709696
Date Collected: 9/8/2017
Date Received: 9/13/2017
Date Analyzed: 10/1/2017

Particle Size Determination
ASTM D422

Sample Name: 2017 UNC2
Lab Code: K1709696-004DUP

Gravel and Sand
(Sieve Analysis)

Description	Sieve Size	Weight (g)	Percent Passing
Gravel (19.0 mm)	No.3/4" (19.0 mm)	0.0000	99.76
Gravel (9.50 mm)	No.3/8" (9.50 mm)	0.0000	99.76
Gravel, Medium	No.4 (4.75 mm)	7.1005	76.77
Gravel, Fine	No.10 (2.00 mm)	5.3361	59.50
Sand, Very Coarse	No.20 (0.850 mm)	9.0285	30.22
Sand, Coarse	No.40 (0.425 mm)	5.4578	12.52
Sand, Medium	No.60 (0.250 mm)	1.2917	8.33
Sand, Fine	No.140 (0.106 mm)	0.6585	6.20
Sand, Very Fine	No.200 (0.0750 mm)	0.0840	5.93

Silt and Clay
(Hydrometer Analysis)

Particle Diameter	Percent Passing
0.074 mm	7.46
0.005 mm	4.02
0.001 mm	1.97

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Analysis Method: PSEP Sulfide
Prep Method: Method

Service Request: K1709696
Date Collected: 09/08/17
Date Received: 09/13/17
Units: mg/Kg
Basis: Dry

Sulfide, Total

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
2017 USC1	K1709696-001	ND U	2.9	1	09/15/17 21:18	9/15/17	
2017 USC2	K1709696-002	ND U	2.5	1	09/15/17 21:18	9/15/17	
2017 UNC1	K1709696-003	ND U	2.8	1	09/15/17 21:18	9/15/17	
2017 UNC2	K1709696-004	ND U	2.2	1	09/15/17 21:18	9/15/17	
Method Blank	K1709696-MB	ND U	1.0	1	09/15/17 21:18	9/15/17	

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Service Request: K1709696
Date Collected: 09/08/17
Date Received: 09/13/17
Date Analyzed: 09/15/17

Triplicate Sample Summary
General Chemistry Parameters

Sample Name:	2017 USC1	Units: mg/Kg					
Lab Code:	K1709696-001	Basis: Dry					
Analysis Method:	PSEP Sulfide						
Prep Method:	Method						
Analyte Name	MRL	Sample Result	Duplicate K1709696- 001DUP	Triplicate K1709696- 001TRP	Average	RSD	RSD Limit
			Result	Result			
Sulfide, Total	2.8	ND	ND	ND	NC	NC	20

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Superset Reference:17-0000437122 rev 00

Superset Reference:17-0000437122 rev 00

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment

Service Request: K1709696
Date Collected: 09/08/17
Date Received: 09/13/17
Date Analyzed: 09/15/17
Date Extracted: 09/15/17

Duplicate Matrix Spike Summary
Sulfide, Total

Sample Name: 2017 USC1
Lab Code: K1709696-001
Analysis Method: PSEP Sulfide
Prep Method: Method

Units: mg/Kg
Basis: Dry

Matrix Spike
K1709696-001MS

Sample Result
ND U

Result 920
% Rec 84

Duplicate Matrix Spike
K1709696-001DMS

Spike Amount 1100

% Rec 79
% Rec Limits 28-175
RPD 5
RPD Limit 20

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment

Lab Control Sample Summary
Sulfide, Total

Analysis Method: PSEP Sulfide
Prep Method: Method

Units: mg/Kg
Basis: Dry
Analysis Lot: 561883

Sample Name
Lab Control Sample

Lab Code
K1709696-LCS

Result 360
Spike Amount 390
% Rec 92
% Rec Limits 39-166

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Analysis Method: PSEP TOC
Prep Method: ALS SOP

Service Request: K1709696
Date Collected: 09/8/17
Date Received: 09/13/17
Units: Percent
Basis: Dry, per Method

Carbon, Total Organic (TOC)

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
2017 USC1	K1709696-001	1.07	0.050	1	09/22/17 14:45	9/22/17	
2017 USC2	K1709696-002	0.951	0.050	1	09/22/17 14:45	9/22/17	
2017 UNC1	K1709696-003	0.768	0.050	1	09/22/17 14:45	9/22/17	
2017 UNC2	K1709696-004	0.470	0.050	1	09/22/17 14:45	9/22/17	
Method Blank	K1709696-MB	ND U	0.050	1	09/22/17 14:45	9/22/17	

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment

Service Request: K1709696
Date Collected: 09/08/17
Date Received: 09/13/17
Date Analyzed: 09/22/17

Triplicate Sample Summary
General Chemistry Parameters

Sample Name:	2017 USC1					Units: Percent	
Lab Code:	K1709696-001					Basis: Dry, per Method	
Analysis Method:	PSEP TOC						
Prep Method:	ALS SOP						
Analyte Name	MRL	Sample Result	Duplicate K1709696-001DUP	Triplicate K1709696-001TRP	Average	RSD	RSD Limit
Carbon, Total Organic (TOC)	0.050	1.07	1.08	1.08	1.08	<1	27

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SuperSet Reference:17-0000437122 rev 00

Superset Reference:17-0000437122 rev 00

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment

Service Request: K1709696
Date Collected: 09/08/17
Date Received: 09/13/17
Date Analyzed: 09/22/17
Date Extracted: 09/22/17

Service Request: K1709696
Date Analyzed: 09/22/17
Date Extracted: 09/22/17

Duplicate Matrix Spike Summary
Carbon, Total Organic (TOC)

Sample Name: 2017 USC1
Lab Code: K1709696-001
Analysis Method: PSEP TOC
Prep Method: ALS SOP

Units: Percent
Basis: Dry, per Method

Analysis Method: PSEP TOC
Prep Method: ALS SOP

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Lab Control Sample Summary
Carbon, Total Organic (TOC)

Units: Percent
Basis: Dry, per Method
Analysis Lot: 562855

Analyte Name	Sample Result	Matrix Spike		Duplicate Matrix Spike		% Rec	Limits	% Rec	Limits	RPD	Limit
		Result	Spike Amount	Result	Spike Amount						
Carbon, Total Organic (TOC)	1.07	4.27	3.24	4.46	3.39	100	69-123	1	1	1	27

Sample Name	Lab Code	Result	Spike Amount	% Rec	Limits
Lab Control Sample	K1709696-LCS	0.553	0.603	92	74-118



ALS Group USA, Corp.
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Analytical Report

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Sample Name: 2017 USC1
Lab Code: K1709696-001

Service Request: K1709696
Date Collected: 09/08/17 14:00
Date Received: 09/13/17 10:20
Basis: Dry

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	16000	mg/Kg	2.7	5	09/26/17 09:57	09/14/17	
Arsenic	200.8	16.5	mg/Kg	0.67	5	09/26/17 09:57	09/14/17	
Cadmium	200.8	1.01	mg/Kg	0.027	5	09/26/17 09:57	09/14/17	
Chromium	200.8	115	mg/Kg	0.27	5	09/26/17 09:57	09/14/17	
Copper	200.8	73.3	mg/Kg	0.13	5	09/26/17 09:57	09/14/17	
Lead	200.8	5.30	mg/Kg	0.067	5	09/26/17 09:57	09/14/17	
Mercury	7471B	0.064	mg/Kg	0.029	1	09/15/17 09:11	09/14/17	
Nickel	200.8	75.7	mg/Kg	0.27	5	09/26/17 09:57	09/14/17	
Selenium	200.8	3.4	mg/Kg	1.3	5	09/26/17 09:57	09/14/17	
Silver	200.8	0.187	mg/Kg	0.027	5	09/26/17 09:57	09/14/17	
Zinc	200.8	155	mg/Kg	0.67	5	09/26/17 09:57	09/14/17	

Metals

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Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Sample Name: 2017 USC2
Lab Code: K1709696-002

Service Request: K1709696
Date Collected: 09/08/17 14:00
Date Received: 09/13/17 10:20
Basis: Dry

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Sample Name: 2017 UNC1
Lab Code: K1709696-003
Service Request: K1709696
Date Collected: 09/08/17 15:15
Date Received: 09/13/17 10:20
Basis: Dry

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	8300	mg/Kg	2.6	5	09/26/17 10:07	09/14/17	
Arsenic	200.8	9.28	mg/Kg	0.64	5	09/26/17 10:07	09/14/17	
Cadmium	200.8	0.160	mg/Kg	0.026	5	09/26/17 10:07	09/14/17	
Chromium	200.8	15.6	mg/Kg	0.26	5	09/26/17 10:07	09/14/17	
Copper	200.8	13.3	mg/Kg	0.13	5	09/26/17 10:07	09/14/17	
Lead	200.8	1.81	mg/Kg	0.064	5	09/26/17 10:07	09/14/17	
Mercury	7471B	ND U	mg/Kg	0.023	1	09/15/17 09:21	09/14/17	
Nickel	200.8	15.8	mg/Kg	0.26	5	09/26/17 10:07	09/14/17	
Selenium	200.8	ND U	mg/Kg	1.3	5	09/26/17 10:07	09/14/17	
Silver	200.8	ND U	mg/Kg	0.026	5	09/26/17 10:07	09/14/17	
Zinc	200.8	52.2	mg/Kg	0.64	5	09/26/17 10:07	09/14/17	

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	10600	mg/Kg	2.7	5	09/26/17 10:10	09/14/17	
Arsenic	200.8	44.9	mg/Kg	0.68	5	09/26/17 10:10	09/14/17	
Cadmium	200.8	0.173	mg/Kg	0.027	5	09/26/17 10:10	09/14/17	
Chromium	200.8	10.6	mg/Kg	0.27	5	09/26/17 10:10	09/14/17	
Copper	200.8	9.67	mg/Kg	0.14	5	09/26/17 10:10	09/14/17	
Lead	200.8	4.26	mg/Kg	0.068	5	09/26/17 10:10	09/14/17	
Mercury	7471B	ND U	mg/Kg	0.028	1	09/15/17 09:23	09/14/17	
Nickel	200.8	10.6	mg/Kg	0.27	5	09/26/17 10:10	09/14/17	
Selenium	200.8	ND U	mg/Kg	1.4	5	09/26/17 10:10	09/14/17	
Silver	200.8	ND U	mg/Kg	0.027	5	09/26/17 10:10	09/14/17	
Zinc	200.8	72.6	mg/Kg	0.68	5	09/26/17 10:10	09/14/17	

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Sample Name: 2017 UNC2
Lab Code: K1709696-004

Service Request: K1709696
Date Collected: 09/08/17 15:15
Date Received: 09/13/17 10:20
Basis: Dry

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Sample Name: Method Blank
Lab Code: KQ1713344-01
Service Request: K1709696
Date Collected: NA
Date Received: NA
Basis: Dry

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	8600	mg/Kg	2.4	5	09/26/17 10:25	09/14/17	
Arsenic	200.8	27.8	mg/Kg	0.61	5	09/26/17 10:25	09/14/17	
Cadmium	200.8	0.330	mg/Kg	0.024	5	09/26/17 10:25	09/14/17	
Chromium	200.8	10.1	mg/Kg	0.24	5	09/26/17 10:25	09/14/17	
Copper	200.8	7.44	mg/Kg	0.12	5	09/26/17 10:25	09/14/17	
Lead	200.8	3.30	mg/Kg	0.061	5	09/26/17 10:25	09/14/17	
Mercury	7471B	0.024	mg/Kg	0.021	1	09/15/17 09:24	09/14/17	
Nickel	200.8	10.6	mg/Kg	0.24	5	09/26/17 10:25	09/14/17	
Selenium	200.8	ND U	mg/Kg	1.2	5	09/26/17 10:25	09/14/17	
Silver	200.8	ND U	mg/Kg	0.024	5	09/26/17 10:25	09/14/17	
Zinc	200.8	62.3	mg/Kg	0.61	5	09/26/17 10:25	09/14/17	

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Sample Name: Method Blank
Lab Code: KQ1713344-01

Service Request: K1709696
Date Collected: NA
Date Received: NA
Basis: Dry

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	ND U	mg/Kg	2.0	5	09/26/17 09:51	09/14/17	
Arsenic	200.8	ND U	mg/Kg	0.5	5	09/26/17 09:51	09/14/17	
Cadmium	200.8	ND U	mg/Kg	0.020	5	09/26/17 09:51	09/14/17	
Chromium	200.8	ND U	mg/Kg	0.20	5	09/26/17 09:51	09/14/17	
Copper	200.8	ND U	mg/Kg	0.10	5	09/26/17 09:51	09/14/17	
Lead	200.8	ND U	mg/Kg	0.05	5	09/26/17 09:51	09/14/17	
Nickel	200.8	ND U	mg/Kg	0.20	5	09/26/17 09:51	09/14/17	
Selenium	200.8	ND U	mg/Kg	1.0	5	09/26/17 09:51	09/14/17	
Silver	200.8	ND U	mg/Kg	0.020	5	09/26/17 09:51	09/14/17	
Zinc	200.8	ND U	mg/Kg	0.5	5	09/26/17 09:51	09/14/17	

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Sample Name: Method Blank
Lab Code: KQ1713291-01

Service Request: K1709696
Date Collected: NA
Date Received: NA
Basis: Dry

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment

Service Request: K1709696
Date Collected: 09/08/17
Date Received: 09/13/17
Date Analyzed: 09/26/17

Replicate Sample Summary

Total Metals

Sample Name: 2017 USC1
Lab Code: K1709696-001

Units: mg/Kg
Basis: Dry

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample Result	Average	RPD	RPD Limit
Aluminum	200.8	2.8	16000	12400	14200	25	30
Arsenic	200.8	0.70	16.5	14.6	15.6	12	30
Cadmium	200.8	0.028	1.01	1.02	1.02	<1	30
Chromium	200.8	0.28	115	72.9	94.0	45 *	30
Copper	200.8	0.14	73.3	76.3	74.8	4	30
Lead	200.8	0.070	5.30	5.13	5.22	3	30
Nickel	200.8	0.28	75.7	60.6	68.2	22	30
Selenium	200.8	1.4	3.4	3.8	3.6	11	30
Silver	200.8	0.028	0.187	0.192	0.190	3	30
Zinc	200.8	0.70	155	150	153	3	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment

Service Request: K1709696
Date Collected: 09/08/17
Date Received: 09/13/17
Date Analyzed: 09/15/17

Replicate Sample Summary

Total Metals

Sample Name: Lab Code:	2017 USC1 K1709696-001	Duplicate Sample KQ1713291-03				Units: mg/Kg
		Analysis Method	MRL	Sample Result	Duplicate Sample Result	Basis: Dry
Analyte Name		7471B	0.026	0.064	Average	RPD
Mercury					0.067	7
					0.070	20

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment

Service Request: K1709696
Date Collected: 09/08/17
Date Received: 09/13/17
Date Analyzed: 09/26/17
Date Extracted: 09/14/17

Matrix Spike Summary

Total Metals

Sample Name: 2017 USC1
Lab Code: K1709696-001
Analysis Method: 200.8
Prep Method: EPA 3050B

Units: mg/Kg
Basis: Dry

Matrix Spike
KQ1713344-04

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	16000	15500	548	-89 #	70-130
Arsenic	16.5	158	137	104	70-130
Cadmium	1.01	15.8	13.7	108	70-130
Chromium	115	154	54.8	71	70-130
Copper	73.3	150	68.5	113	70-130
Lead	5.30	150	137	106	70-130
Nickel	75.7	207	137	96	70-130
Selenium	3.4	148	137	105	70-130
Silver	0.187	14.3	13.7	103	70-130
Zinc	155	289	137	98	70-130

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:

Results flagged with an asterisk (*) indicate values outside control criteria.
Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

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Superset Reference:

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment

Service Request: K1709696
Date Collected: 09/08/17
Date Received: 09/13/17
Date Analyzed: 09/15/17
Date Extracted: 09/14/17

Matrix Spike Summary
Total Metals

Sample Name: 2017 USC1
Lab Code: K1709696-001
Analysis Method: 7471B
Prep Method: Method

Units: mg/Kg
Basis: Dry

Matrix Spike
KQ1713291-04

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Mercury	0.064	1.01	0.718	132 N	80-120

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment

Service Request: K1709696
Date Analyzed: 09/26/17

Lab Control Sample Summary
Total Metals

Units:mg/Kg
Basis:Dry

Lab Control Sample
KQ1713344-02

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	200.8	384	400	96	85-115
Arsenic	200.8	99.0	100	99	85-115
Cadmium	200.8	10.3	10.0	103	85-115
Chromium	200.8	39.3	40.0	98	85-115
Copper	200.8	49.1	50.0	98	85-115
Lead	200.8	99.5	100	99	85-115
Nickel	200.8	99.7	100	100	85-115
Selenium	200.8	97.5	100	97	85-115
Silver	200.8	10.3	10.0	103	85-115
Zinc	200.8	97.3	100	97	85-115

ALS Group USA, Corp.
dba ALS Environmental
QA/QC Report

Client: Alaska Department of Fish and Game
Project: USL Investigation
Sample Matrix: Sediment
Service Request: K1709696
Date Analyzed: 09/15/17

Lab Control Sample Summary
Total Metals

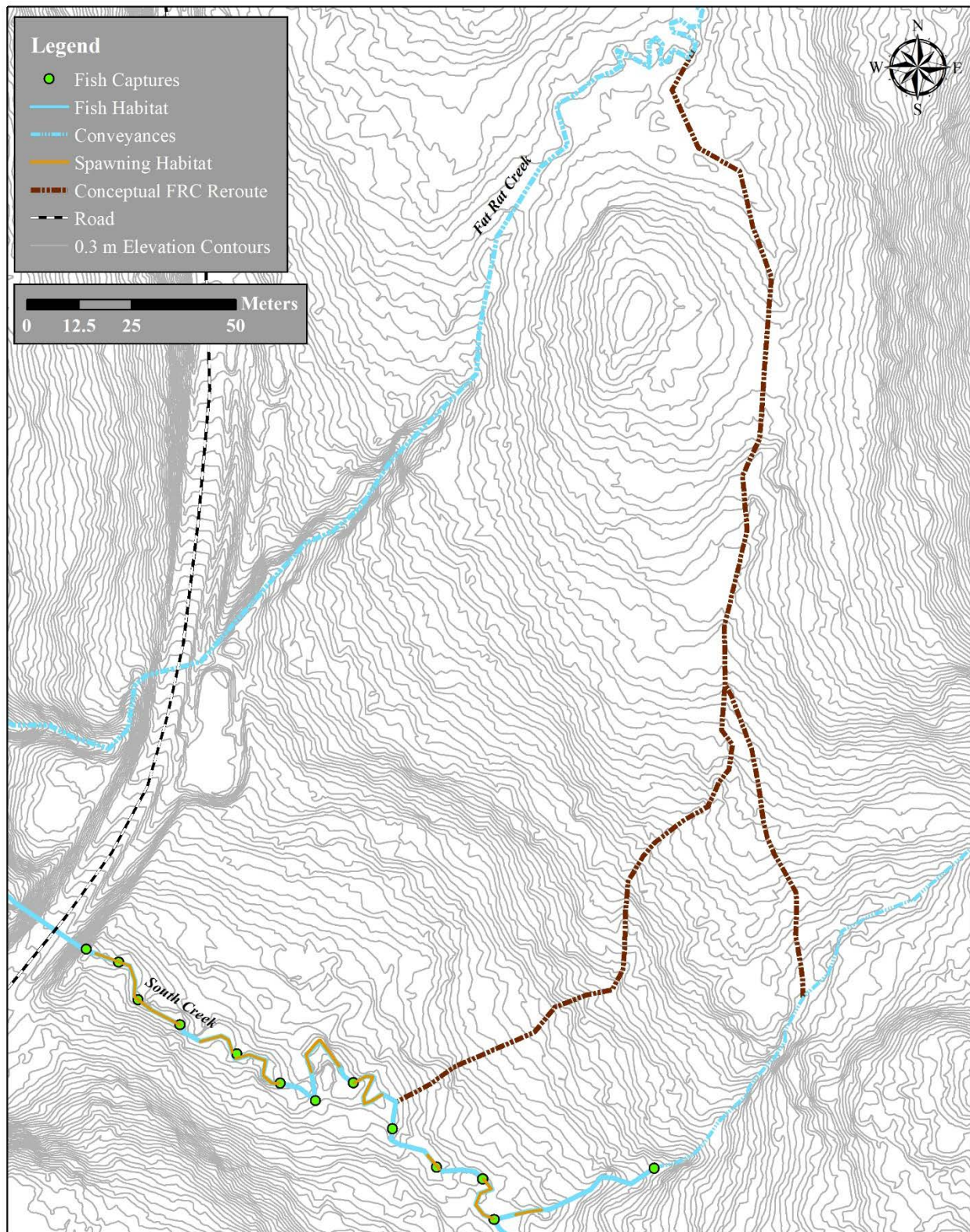
Units:mg/Kg
Basis:Dry

Lab Control Sample
KQ1713291-02

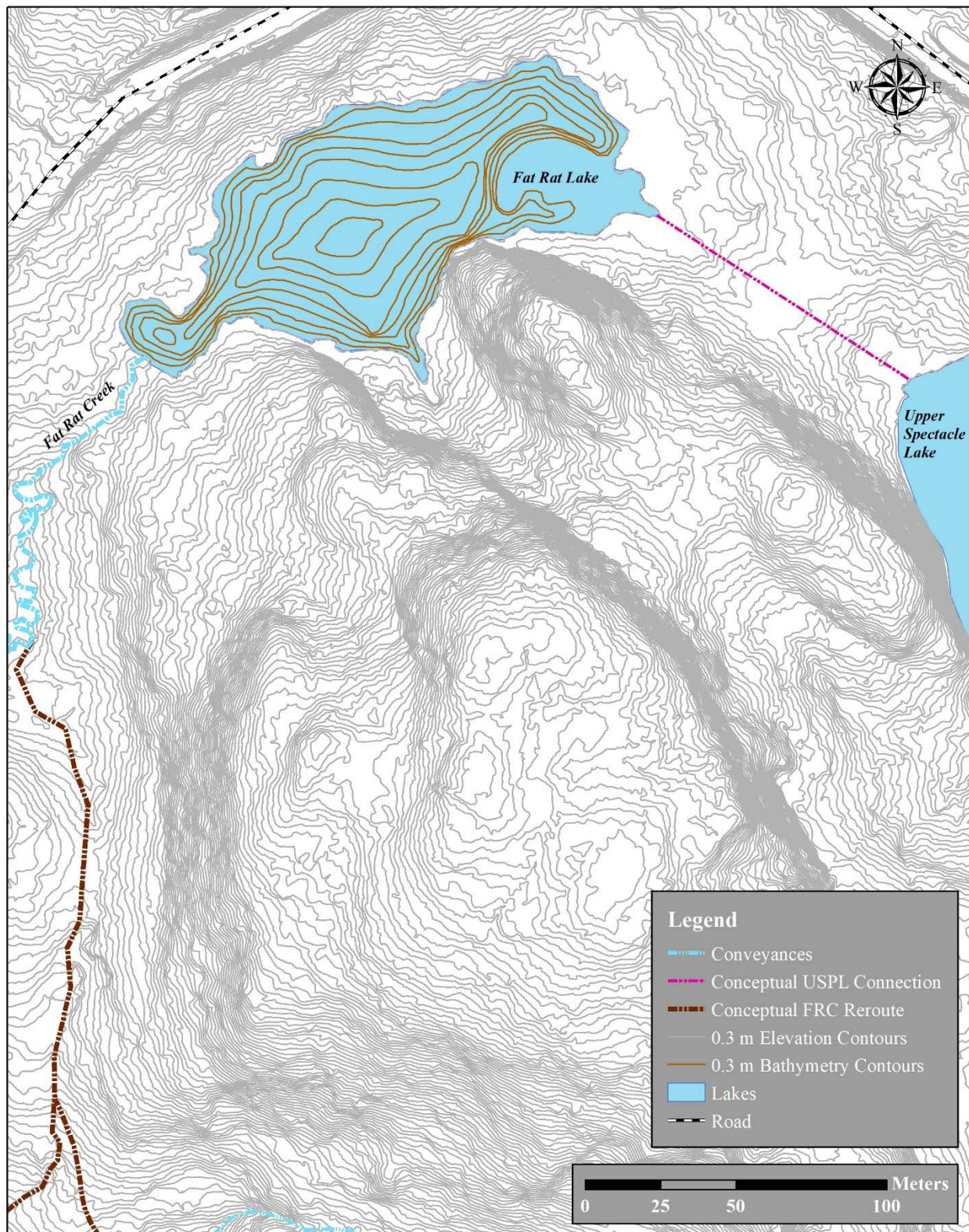
Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Mercury	7471B	7.15	7.10	101	51-149

APPENDIX F: HABITAT MITIGATION OPPORTUNITIES

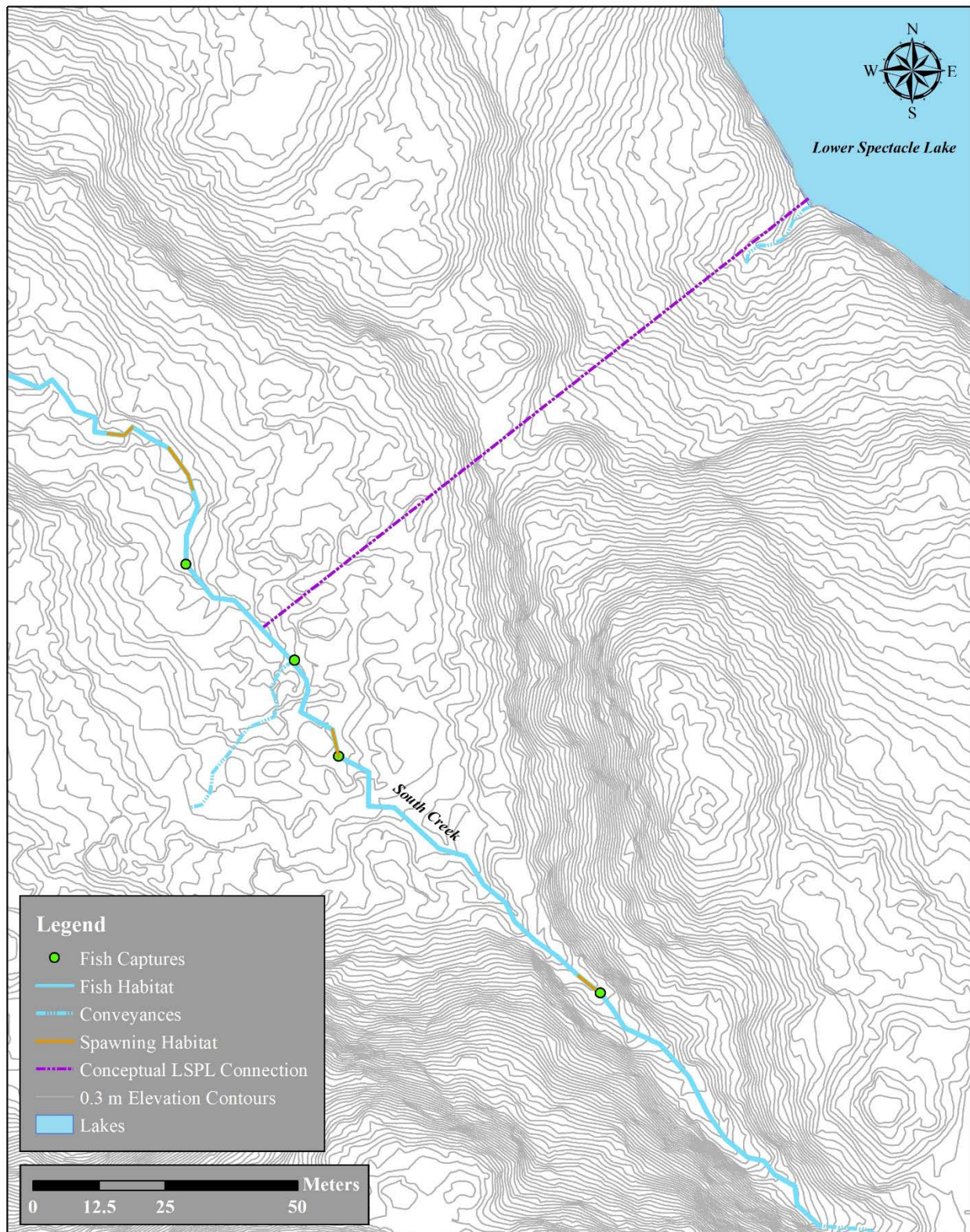
Appendix F.1.—Conceptual Fat Rat Creek reroute.



Appendix F.2.—Conceptual Fat Rat Creek connection.



Appendix F.3.—Conceptual Lower Spectacle Creek connection.



Appendix F.4.—Conceptual Lower Spectacle Lake dam alternatives.

