Technical Report No. 17-02

Aquatic Studies at Kensington Gold Mine, 2016

By

Katrina M. Kanouse

and

Johnny Zutz

February 2017

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

Symbols and Abbreviations

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

Weights and measures (metric)

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

Weights and measures (English)

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

Time and temperature

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

Physics and chemistry

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

General

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

Measures (fisheries)

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

Mathematics, statistics

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

TECHNICAL REPORT NO. 17-02

AQUATIC STUDIES AT KENSINGTON GOLD MINE, 2016

by

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February 2017

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Cover: Johnson Creek headwaters at Lions Head Mountain.

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Division of Habitat staff Greg Albrecht, Evan Fritz, and Nicole Legere assisted with data collection, Mr. Albrecht processed periphyton samples, and Mr. Albrecht and Katrina Lee identified benthic macroinvertebrates. Matthew Kern of Alder Grove Farms also identified benthic macroinvertebrates. Division of Commercial Fisheries staff Ben Williams and Sara Miller performed the fish population statistical analyses, and Division of Habitat Operations Manager Dr. Al Ott and Southeast Regional Supervisor Jackie Timothy reviewed and edited the report.

Thank you all for your contribution.

EXECUTIVE SUMMARY

The Alaska Department of Fish and Game (ADF&G) Division of Habitat completes the aquatic resource monitoring the U.S. Forest Service (USFS) and Alaska Department of Environmental Conservation (ADEC) require for Coeur Alaska Inc.'s (Coeur) Kensington Gold Mine. This partnership provides ADF&G the opportunity to gather and review data throughout the year, and help identify, assess, and resolve issues at the mine as they arise.

The National Weather Service reports 2016 was one of the warmest years on record for Juneau, and while total precipitation (163 cm) was normal, total snowfall (69 cm) was about 70% below normal (K. Vaughan, Observation Program Leader, National Weather Service, Juneau, personal communication).

Since August 2011, Coeur staff has sampled surface waters monthly in and around the tailings treatment facility (TTF) for ammonia, chlorophyll *a*, nitrate, nitrite, organic carbon, phosphorus, potassium, and sulfur to investigate the cause of algal blooms in the TTF. Sample sites included the TTF, upstream of the TTF at the outlet of Upper Slate Lake,[a] the TTF water treatment plant effluent (Outfall 002), and downstream of Outfall 002 in East Fork Slate Creek[b]. During 2016, phosphorus and chlorophyll *a* concentrations were occasionally detected in the TTF and were generally similar to concentrations observed in 2015. In the Outfall 002 effluent, ammonia, nitrate, potassium, and sulfur concentrations continued to be greater than background Upper Slate Lake concentrations. Organic carbon concentrations were greatest in Upper Slate Lake and nitrite was not detected in any of the samples, as in previous years.

The July 2016 mean periphyton density for each sample site was similar to or greater than previous July mean densities. We also sampled periphyton in Lower Slate Creek and East Fork Slate Creek in April to continue monitoring for changes that may occur from the TTF, and found a similar mean density compared to previous spring sampling results for each site.[c]

Mean benthic macroinvertebrate density at each site was similar to previous years, except the mean density for East Fork Slate Creek and Lower Sherman Creek. At East Fork Slate Creek, we observed the lowest mean density and the greatest proportion of sensitive insects since we began sampling in 2011, largely due to fewer pea clams present. At Lower Sherman Creek, the benthic macroinvertebrate communities were again dominated by worms with few sensitive insects present.

Beginning in winter 2013/2014, Coeur staff observed a white substance occasionally present on the Sherman Creek streambed downstream of Outfall 001, which became persistent in fall 2014. We have worked with Coeur and ADEC staffs to investigate the cause and extent of the white substance and sampled benthic macroinvertebrates to document abundance and community composition near Outfall 001. In April 2016, we sampled benthic macroinvertebrates upstream and downstream of Outfall 001 in Middle Sherman Creek and again found fewer organisms and a smaller proportion of sensitive insects among the samples collected downstream of the outfall. With Coeur and ADEC, we will continue to monitor Sherman Creek in 2017. We have not

[a] Coeur's water quality monitoring station MLA.

[b] Coeur's water quality monitoring station SLA.

[c] Not required.

observed a white substance on the Lower Slate Creek or East Fork Slate Creek stream beds since summer 2014.

The 2016 Upper Slate Creek Dolly Varden char *Salvelinus malma* population was similar to the 2011–2015 populations. For the fourth year in a row we did not capture Dolly Varden char during the East Fork Slate Creek resident fish survey, however, one week following the survey we captured 32 Dolly Varden char in the diversion pipeline plunge pool, about 50 m upstream of the survey reach. Based on our experience, East Fork Slate Creek provides a corridor for downstream fish migration and resident fish population studies do not provide reliable information to assess stream health or determine whether TTF operations impact resident fish populations.

We observed low pink salmon *Oncorhynchus gorbuscha* returns in the lower reaches of Slate, Johnson, and Sherman Creeks in 2016, consistent with parent year low returns in 2014 and region-wide low pink salmon returns in 2016 (M. Sogge, Commercial Fisheries Area Management Biologist, ADF&G, Haines, personal communication). In Lower Slate Creek, we observed the greatest number of chum salmon *O. keta* since we began surveying in 2011, and in Lower Sherman Creek, pink and chum salmon arrived in the system near the end of August, several weeks late. We cannot quantify marine survival factors impacting adult salmon returns, so we are unable to attribute changes in adult salmon abundance to construction and operation of the Kensington Gold Mine. We again recommend the USFS and the Berners Bay working group discontinue the spawning salmon survey requirement.

The geometric mean particle size of pink salmon spawning gravel in Lower Slate Creek has increased by several millimeters at both sample sites since we began sampling in 2011, and the 2016 sampling results were within the range of values observed 2011–2015.

Most metals, arsenic, and selenium concentrations in sediment samples from each of the five sample sites were similar to or less than previous results. The 2016 East Fork Slate Creek sediment sample contained the greatest arsenic concentration observed since sampling began in 2010 and the 2016 Lower Johnson Creek sediment sample contained the greatest silver concentration observed since 2010 (Aquatic Science Inc. 2011). Arsenic, copper, nickel, and zinc concentrations at all sampling sites remain near or above the guidelines for freshwater sediments (Buchman 2008; MacDonald et al. 2000), including the upstream reference site Upper Slate Creek, except in Lower Johnson Creek where nickel and zinc concentrations were below the guidelines in recent years.

Among the five sediment samples we submitted to a private laboratory for 10-day chronic toxicity testing, midge survival on the Lower Sherman Creek sediment sample was significantly ($p \leq 0.05$) less than survival on the control sediment. There were no significant differences in amphipod survival or growth on the five test sediments compared to the control.

INTRODUCTION

The Kensington Gold Mine is located near Berners Bay in Southeast Alaska (Figure 1), about 72 km north of Juneau and 56 km south of Haines within the City and Borough of Juneau and the Tongass National Forest (Tetra Tech Inc. et al. 2004a, 2004b). The mine is owned and operated by Coeur Alaska, Inc., a wholly owned subsidiary of Coeur Mining Inc.

Figure 1.–Kensington Gold Mine project area map.

The underground mine began producing gold concentrate for export on June 24, 2010. Tailings are disposed underground as paste backfill and in the TTF as slurry through a pipeline from the mill. Mine infrastructure is located in three drainages that support resident and anadromous fish: the TTF in the Slate Creek drainage; the waste rock pile, camp and mill facilities in the Johnson Creek drainage; and the waste rock pile and mine water treatment facility in the Sherman Creek drainage.

Contractors gathered aquatic data for the Kensington Gold Mine from the late 1980s through 2005, which provided a basis for Division of Habitat permit decisions, Plan of Operations (Coeur 2005) monitoring requirements, the U.S. Environmental Protection Agency National Pollutant Elimination Discharge System Permit No. AK-005057-1 (Timothy and Kanouse 2012, Appendix A), and the ADEC Alaska Pollutant Elimination System (APDES) Permit No.AK0050571 (Timothy and Kanouse 2012, Appendix A). Contractor reports include Aquatic Science Inc. (1998, 1999, 2000, 2001a, 2001b, 2002, 2004), Archipelago Marine Research Ltd. (1991), Dames and Moore (1991), Earthworks Technology, Inc. (2002), EVS Environment Consultants (2000), HDR Alaska, Inc. (2003), Kline (2003) Kline Environmental Research, LLC (2001, 2003, 2005), Konopacky Environmental (1992a, 1992b, 1993a, 1993b, 1993c, 1995, 1996a, 1996b, 1996c, 1996d), Pentec Environmental (1990, 1991), and Steffen Robertson and Kirsten Consulting Engineers and Scientists (1997). Monitoring reports include Aquatic Science Inc. (2006, 2007, 2008, 2009a, 2009b, 2009c, 2009d, 2011), Brewster (2016), Kanouse (2015), and Timothy and Kanouse (2012, 2013, 2014). Results of the TTF environmental monitoring studies completed during project operation are in Willson-Naranjo and Kanouse (2016).

The Division of Habitat has completed the aquatic studies required for the Kensington Gold Mine in Slate, Johnson, and Sherman Creeks since 2011. The APDES Permit requires sampling periphyton, benthic macroinvertebrates (BMI), resident fish, and sediment. We assess stream health using estimates of periphyton density and community composition, BMI density and community composition, sediment metals concentrations, and pink salmon spawning substrate composition. The Division of Habitat also completes the resident Dolly Varden char population and sediment toxicity studies required by the APDES permit, and adult salmon counts required in the project Plan of Operations (Coeur 2005).

PURPOSE

The purpose of this technical report is to summarize the 2016 aquatic study data and document the condition of biological communities and sediments in the Slate, Johnson, and Sherman Creeks near mine development and operations. This report satisfies the aquatic study requirements in the project Plan of Operations (Coeur 2005) and APDES Permit AK0050571.

AQUATIC STUDIES

We completed the Kensington Gold Mine aquatic studies required in the project Plan of Operations (Coeur 2005) and APDES Permit AK0050571 (Table 1).

Table 1.–2016 aquatic studies required by the Plan of Operations and APDES permit.

Location	Description	Aquatic Study	Frequency
Lower Slate Creek	1 km reach between the stream mouth in Slate Cove and a 25 m waterfall.	Periphyton density and composition	1/year
		Benthic macroinvertebrate density and composition	1/year
		Adult salmon counts	Seasonally
		Spawning substrate quality	1/year
		Sediment metals concentrations and toxicity	1/year
West Fork Slate Creek	A tributary to Lower Slate Creek, upstream of a waterfall and mine influence.	Periphyton density and composition	1/year
		Benthic macroinvertebrate density and composition	1/year
East Fork Slate Creek	A tributary to Lower Slate Creek, 1 km reach between the TTF plunge pool and waterfall at Lower Slate Creek.	Periphyton density and composition	1/year
		Benthic macroinvertebrate density and composition	1/year
		Resident fish population and condition	1/year
		Sediment metals concentrations and toxicity	1/year
Upper Slate Creek	A tributary to Upper Slate Lake and upstream of mine influence.	Periphyton density and composition	1/year
		Benthic macroinvertebrate density and composition	1/year
		Resident fish population and condition	1/year
		Sediment metals concentrations and toxicity	1/year
Lower Johnson Creek	1.5 km reach between the stream mouth in Berners Bay and a 30 m waterfall.	Adult salmon counts	Seasonally
		Sediment metals concentrations and toxicity	1/year
Upper Johnson Creek	Upstream of Bridge #2 to the headwaters, adjacent to the upper camp and mill bench.	Benthic macroinvertebrate density and composition	1/year
Lower Sherman Creek	360 m reach between the stream mouth in Lynn Canal and a 15 m waterfall.	Periphyton density and composition	1/year
		Benthic macroinvertebrate density and composition	1/year
		Adult salmon counts	Seasonally
		Sediment metals concentrations and toxicity	1/year

STUDY AREA

Slate Creek Drainage

Slate Creek drains a 10.5 km^2 watershed into Slate Cove on the northwest side of Berners Bay (Coeur 2005; Figure 2). Two waterfalls about 1 km upstream of the mouth of Lower Slate Creek prevent upstream fish migration to the East and West Forks. West Fork Slate Creek is on river right[d]. East Fork Slate Creek is on river left and flows between the TTF dam plunge pool and the waterfall at Lower Slate Creek. Coeur operates the TTF in Lower Slate Lake and discharges TTF water treatment plant effluent (Outfall 002) to East Fork Slate Creek. Upstream of the TTF, a concrete dam diverts water from Upper Slate Lake through a diversion pipeline and into East Fork Slate Creek at the TTF dam plunge pool, bypassing the TTF. Upper Slate Creek is the inlet to Upper Slate Lake.

[d] The terms "river right" and "river left" reference looking downstream.

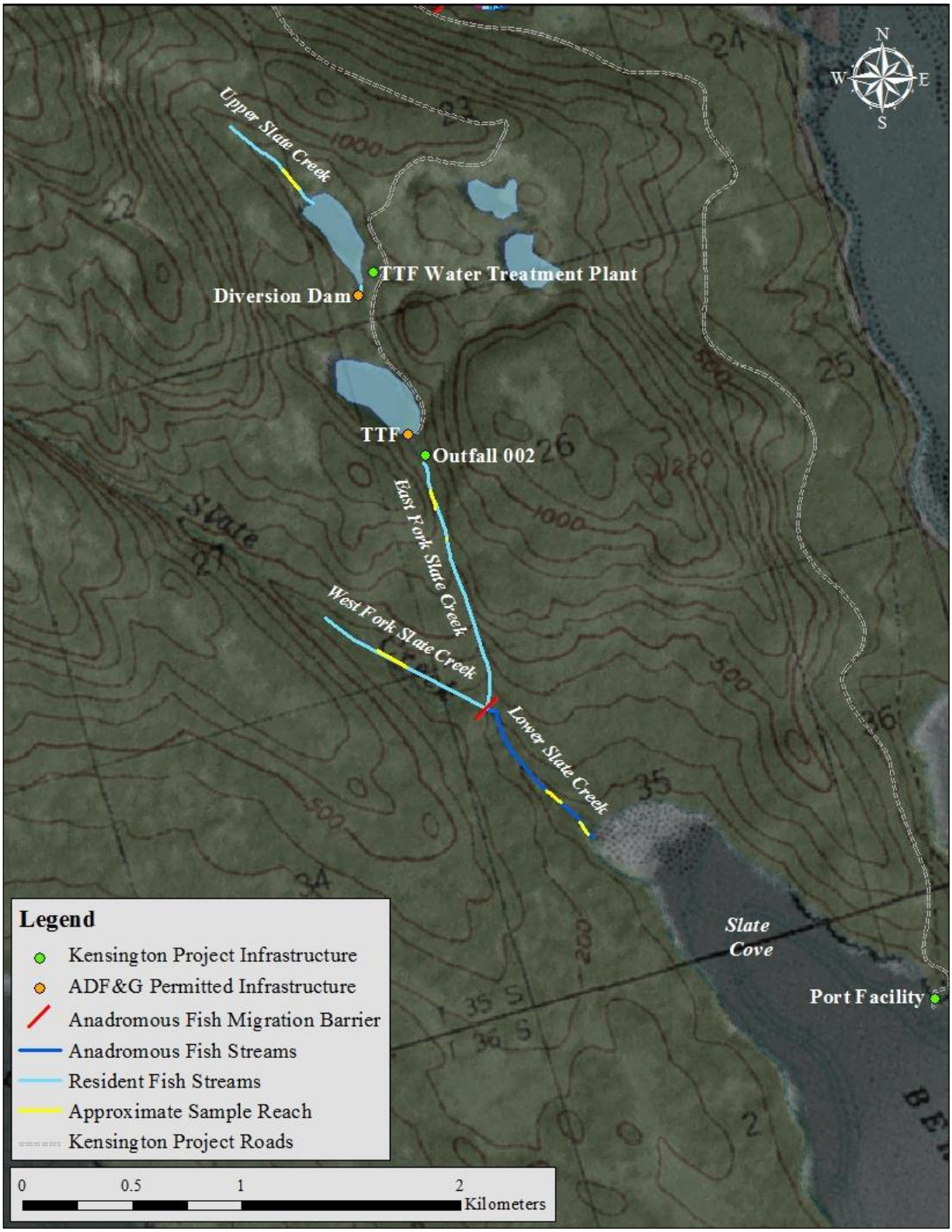

Figure 2.–Slate Creek map.

Lower Slate Creek

Lower Slate Creek provides spawning habitat for chum, coho, and pink salmon, and eulachon *Thaleichthys pacificus*, and rearing habitat for coho salmon (Stream No. 115-20-10030; Johnson and Litchfield 2016). We have also documented juvenile Dolly Varden char and adult cutthroat trout *O. clarkii* in the system (Timothy and Kanouse 2012).

Lower Slate Creek is a mixture of waters from the East and West Forks, Outfall 002, and Upper Slate Lake. We sample periphyton, BMIs, pink salmon spawning substrate, and sediment at Sample Point 1 (SP1; Figure 3), pink salmon spawning substrate again at Sample Point 2 (SP2), and count adult salmon throughout Lower Slate Creek.

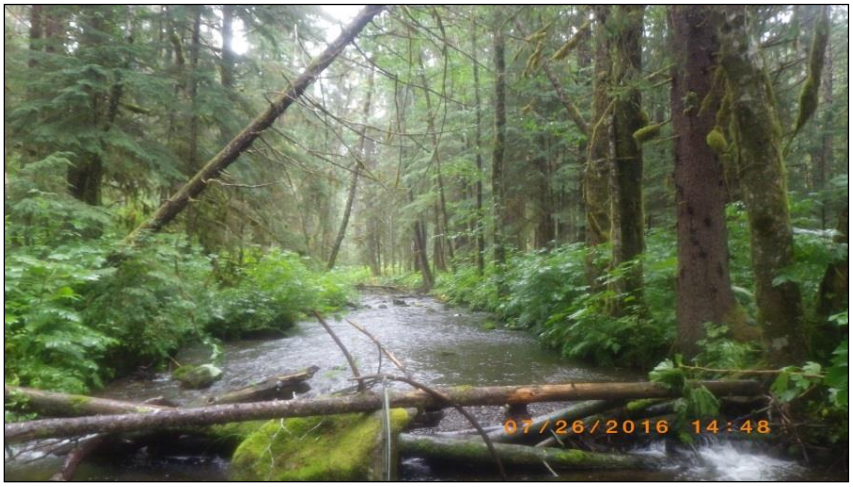

Figure 3.–Lower Slate Creek SP1.

West Fork Slate Creek

West Fork Slate Creek (Figure 4) supports Dolly Varden char (Timothy and Kanouse 2014) and is not influenced by the mine. We sample periphyton and BMIs about 600 m upstream of the waterfall at Lower Slate Creek.

Figure 4.–West Fork Slate Creek.

East Fork Slate Creek

East Fork Slate Creek (Figure 5) provides a corridor for Dolly Varden char and threespine stickleback *Gasterosteus cognatus* emigrating from Upper Slate Lake, currently via the diversion pipeline and formerly via Lower Slate Lake. East Fork Slate Creek is a mixture of Outfall 002 and drainage from Upper Slate Lake. We sample periphyton, BMIs, resident fish, and sediments in East Fork Slate Creek within 200 m downstream of the TTF.

Figure 5.–East Fork Slate Creek.

Upper Slate Creek

Upper Slate Creek (Figure 6) supports Dolly Varden char and is not influenced by the mine. We sample periphyton, BMIs, resident fish, and sediments in Upper Slate Creek within 100 m of Upper Slate Lake.

Figure 6.–Upper Slate Creek.

Johnson Creek Drainage

Johnson Creek drains a 14.6 km^2 watershed to the Lace River on the northwest shore of Berners Bay (Coeur 2005; Figure 7). A waterfall about 1.5 km upstream of the Lower Johnson Creek mouth prevents upstream fish migration. Middle Johnson Creek is the 2.5 km reach between the waterfall and Jualin Road Bridge #2. Upper Johnson Creek is the reach upstream of Jualin Road Bridge #2 to the headwaters.

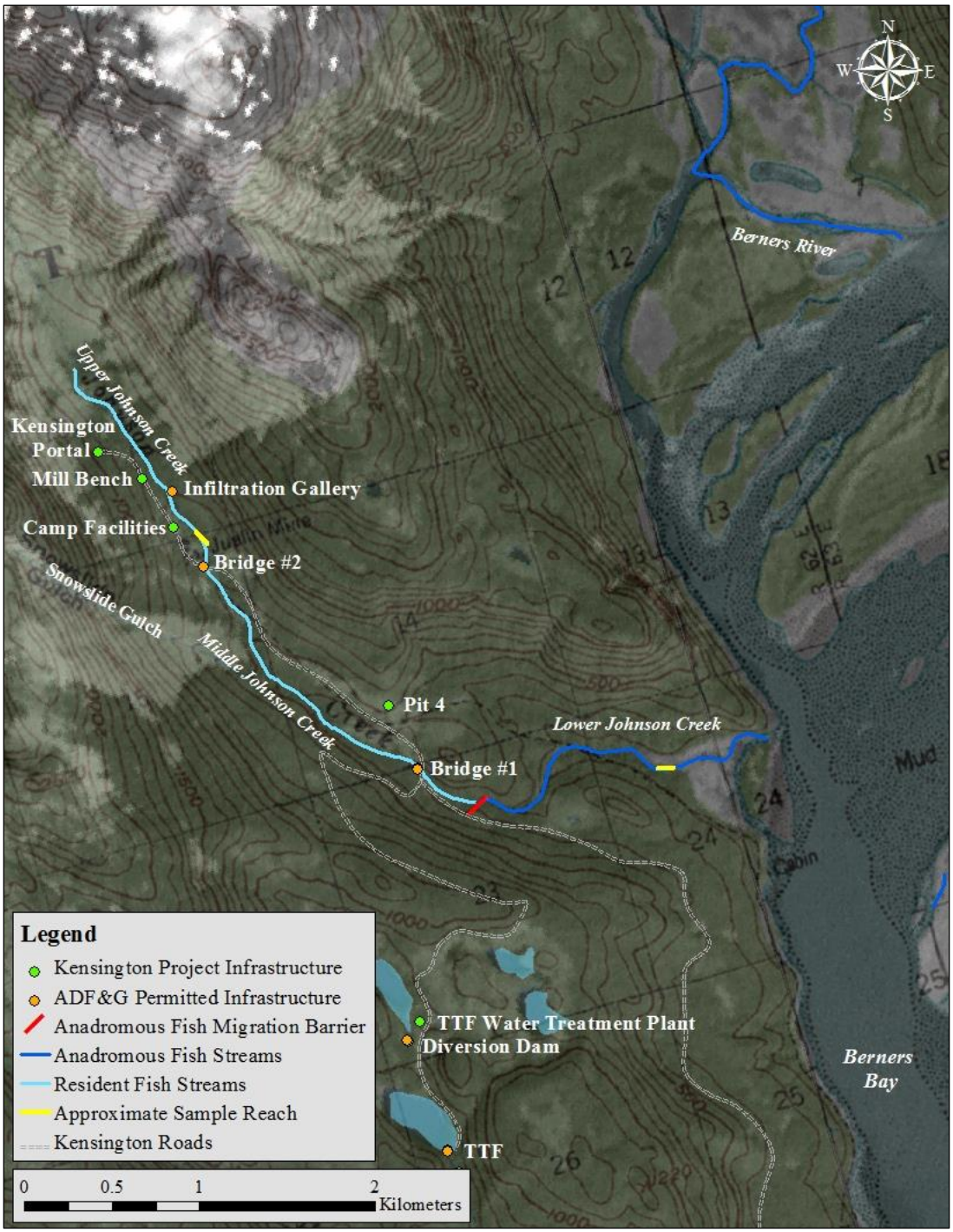

Figure 7.–Johnson Creek map.

Lower Johnson Creek

Lower Johnson Creek provides spawning and rearing habitat for chum, coho, and pink salmon (Stream No. 115-20-10030; Johnson and Litchfield 2016). We have also documented juvenile Dolly Varden char and cutthroat trout (Timothy and Kanouse 2012). Lower Johnson Creek is a mixture of drainages near and from mine infrastructure in Middle[e] and Upper Johnson Creeks. We sample sediment about 600 m upstream from the mouth and count adult salmon throughout Lower Johnson Creek (Figure 8).

Figure 8.–Lower Johnson Creek.

Upper Johnson Creek

Upper Johnson Creek supports Dolly Varden char and flows adjacent to the camp facilities, mill bench, Kensington and Jualin adits, and waste rock pile. An infiltration gallery collects water from Upper Johnson Creek near the mill bench to support the camp. We sample BMIs about 50 m upstream of Bridge #2 (Figure 9).

Figure 9.–Upper Johnson Creek.

[e] Mine facilities include the domestic wastewater treatment plant, warehouse, reclamation material and acid generating rock storage piles, bridges, and Pit 4; drainages include Snowslide Gulch, the domestic wastewater outfall, and storm water discharges; aquatic studies are not required in Middle Johnson Creek.

Sherman Creek Drainage

Sherman Creek drains a 10.84 km^2 watershed to the east shore of Lynn Canal (Coeur 2005; Figure 10). A waterfall about 360 m upstream from the Lower Sherman Creek mouth prevents upstream fish migration. Middle Sherman Creek is the 2 km reach between the waterfall and the Comet Beach road bridge. Upper Sherman Creek is the reach upstream of the bridge to the headwaters.

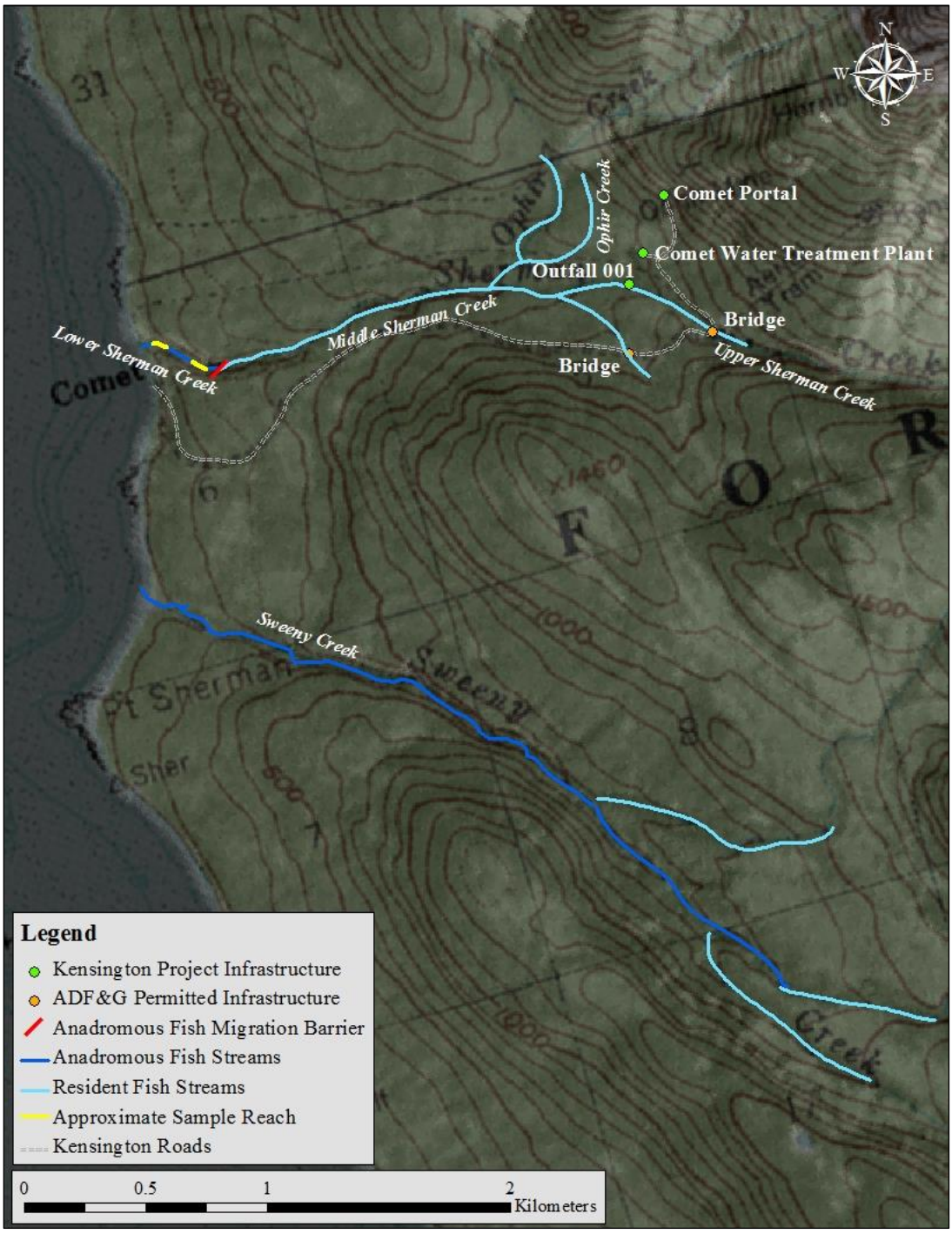

Figure 10.–Sherman Creek map.

Lower Sherman Creek

Lower Sherman Creek provides spawning habitat for chum and pink salmon (Stream No.115-31-10330; Johnson and Litchfield 2016). We have also documented juvenile Dolly Varden char in the system (Timothy and Kanouse 2012). Lower Sherman Creek is a mixture of drainages near and from mine infrastructure in Middle Sherman Creek[f] and its tributaries. We sample periphyton and BMIs at Sample Points 1 and 2 (SP1, SP2), sediment at SP1, and count adult salmon throughout Lower Sherman Creek (Figures 11, 12).

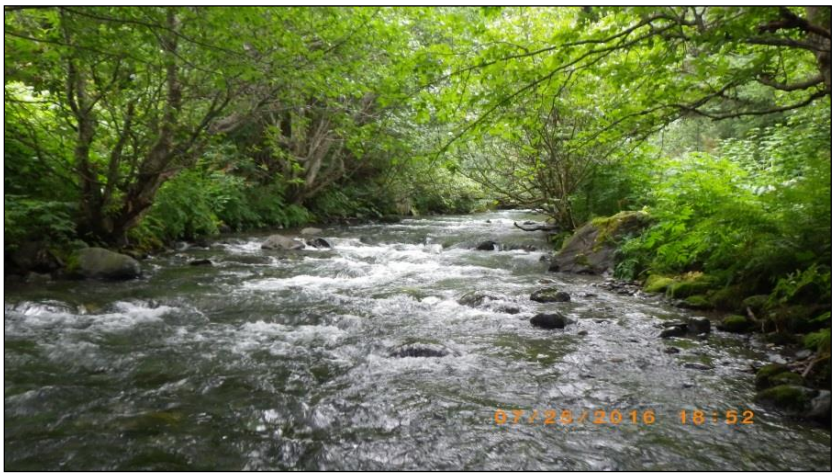

Figure 11.–Lower Sherman Creek SP1.

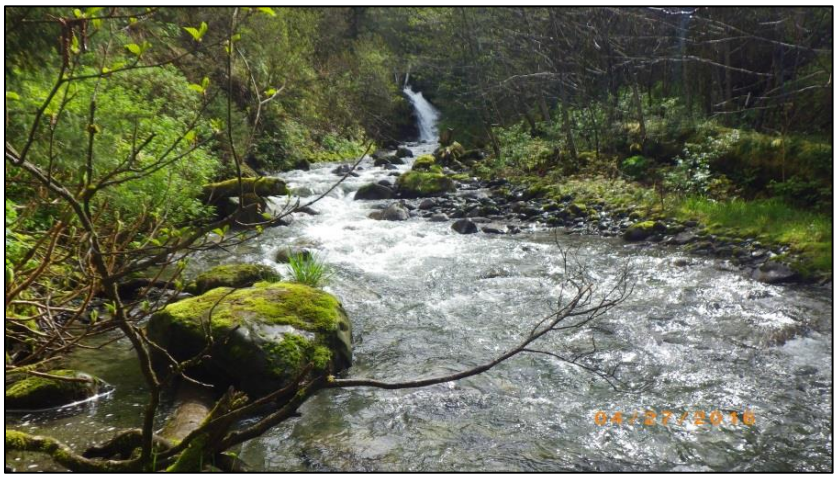

Figure 12.–Lower Sherman Creek SP2.

Table 2 presents the coordinates for each sample site, and Tables 3–5 present the coordinates for adult salmon count reach markers in Lower Slate Creek, Lower Johnson Creek, and Lower Sherman Creek.

[f] Mine facilities include the Comet water treatment plant, waste rock pile, bridges and culverts; drainages include Ivanhoe Creek, Ophir Creek, South Fork Sherman Creek, and Comet water treatment plant Outfall 001; aquatic studies are not required in Middle or Upper Sherman Creeks.

Table 2.–2016 aquatic study sample sites.

Location	Sample Site	Latitude	Longitude
Lower Slate Creek	Periphyton and Benthic Macroinvertebrates	58.7905	-135.0345
	Adult Salmon Counts	Table 3	
	Spawning Substrate		
	Sample Point 1	58.7905	-135.0345
	Sample Point 2	58.7920	-135.0360
	Sediment Metals and Toxicity	58.7905	-135.0345
West Fork Slate Creek	Periphyton and Benthic Macroinvertebrates	58.7993	-135.0457
East Fork Slate Creek	Periphyton and Benthic Macroinvertebrates	58.8045	-135.0381
	Resident Fish (center of 90 m reach)	58.8042	-135.0382
	Sediment Metals and Toxicity	58.8053	-135.0383
Upper Slate Creek	Periphyton and Benthic Macroinvertebrates	58.8189	-135.0415
	Resident Fish (center 90 m of reach)	58.8196	-135.0418
	Sediment Metals and Toxicity	58.8189	-135.0416
Lower Johnson Creek	Adult Salmon Counts	Table 4	
	Sediment Metals and Toxicity	58.8235	-135.0024
Upper Johnson Creek	Benthic Macroinvertebrates	58.8407	-135.0450
Lower Sherman Creek	Periphyton and Benthic Macroinvertebrates		
	Sample Point 1	58.8687	-135.1413
	Sample Point 2	58.8674	-135.1381
	Adult Salmon Counts	Table 5	
	Sediment Metals and Toxicity	58.8687	-135.1413

Note: WGS84 datum.

Table 3.–Lower Slate Creek adult salmon count reach markers.

Location	Latitude	Longitude
100 m	58.7884	-135.0324
200 m	58.7893	-135.0337
300 m	58.7905	-135.0349
400 m	58.7915	-135.0359
500 m	58.7922	-135.0361
600 m	58.7930	-135.0368
700 m	58.7936	-135.0379
800 m	58.7944	-135.0384
900 m	58.7953	-135.0385
Falls	58.7964	-135.0389

Table 4.–Lower Johnson Creek adult salmon count reach markers.

Location	Latitude	Longitude
Lace	58.8215	-135.0010
Mouth	58.8236	-134.9987
Trap	58.8235	-135.0007
#4	58.8236	-135.0039
#7	58.8243	-135.0072
#10	58.8254	-135.0109
Power House	58.8259	-135.0148
Log Falls	58.8258	-135.0168
#15	58.8252	-135.0190
Falls	58.8243	-135.0201

Table 5.–Lower Sherman Creek adult salmon count reach markers.

Location	Latitude	Longitude
50 m	58.8687	-135.1416
100 m	58.8687	-134.1408
150 m	58.8684	-135.1401
200 m	58.8682	-135.1394
250 m	58.8679	-135.1388
300 m	58.8675	-135.1383
350 m	58.8673	-135.1374
Falls	58.8671	-135.1367

MONITORING SCHEDULE

Table 6 presents the dates we collected data in 2016, by site.

Table 6.–2016 aquatic studies sampling schedule.

Aquatic Study	Lower Slate	West Fork Slate	East Fork Slate	Upper Slate	Lower Johnson	Upper Johnson	Lower Sherman	Middle Sherman
Periphyton	4/26	---	4/25	---	---	---	---	---
	7/26	7/26	7/25	7/25	---	---	7/25	---
Benthic Macroinvertebrates	4/26	4/26	4/25	4/25	---	4/27	4/27	4/27
Resident Fish	---	---	8/8	8/10	---	---	---	---
Adult Salmon Counts	7/19–	---	---	---	7/18–	---	7/19–	---
	10/26	---	---	---	10/26	---	8/29	---
Spawning Substrate	7/5	---	---	---	---	---	---	---
Sediment Metals	7/5	---	7/6	7/6	8/8	---	7/6	---
Sediment Toxicity	7/5	---	7/6	7/6	8/8	---	7/6	---

Note: Cells highlighted in gray indicate the sampling was not required by the APDES permit or Plan of Operations.

METHODS

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

- corrected two errors in the 2014 periphyton data set and included three 2011 chlorophyll *a* values previously not reported;
- excluded Dolly Varden char measuring less than 40 mm FL from the Upper Slate Creek and East Fork Slate Creek mean fish condition calculations, and updated the 2011–2015 data sets;
- discontinued using the 2.5 peak count multiplier for Lower Johnson Creek adult pink and chum salmon aerial counts and updated the 2011–2015 data; and
- corrected calculation errors and updated the 2011–2015 Lower Slate Creek spawning substrate data.

PERIPHYTON DENSITY AND COMMUNITY COMPOSITION

Requirement APDES 1.5.3.5.2

Periphyton is composed of primary producing organisms such as algae, cyanobacteria, and heterotrophic microbes, and detritus, attached to the submerged surfaces of aquatic ecosystems. Algal density and community structure are influenced by water and sediment quality through physical, chemical, and biological disturbances that change throughout the year (Barbour et al. 1999). The concentration of chlorophyll *a* pigment in periphyton samples provides an estimate of active algal biomass (density), while concentrations of chlorophylls *b* and *c* estimate the composition of algal organisms present, such as green algae that produce chlorophyll *b*, and diatoms and brown algae that produce chlorophyll *c*.

The APDES permit requires monitoring periphyton density and community composition in Lower Slate Creek, East Fork Slate Creek, and Lower Sherman Creek annually between late-June and early-August and not within three weeks following peak discharge to detect changes over time. The APDES permit also requires monitoring periphyton biomass and community composition at reference sites in West Fork Slate Creek and Upper Slate Creek at the same time to detect variations due to natural factors, such as mineral seeps, climate, and stream flow.

Sample Collection and Analysis

We collected 10 smooth, flat, undisturbed, and perennially wetted rocks from submerged cobbles in riffle habitats in less than 0.45 m water depth at each sample site. We placed a 5 × 5 cm square of high-density foam on each rock and scrubbed the area around the foam with a toothbrush to remove algae and other organisms outside the covered area, then rinsed the rock by dipping it in the stream while holding the foam in place.

We removed the foam square and scrubbed the sample area with a rinsed toothbrush over a 1 µm, 47 mm glass fiber filter attached to a vacuum pump. We used stream water in a wash bottle to rinse the loosened periphyton from the rock, the toothbrush, and the inside of the vacuum pump onto the filter. We pumped most of the water through the filter and added a few

drops[g] of saturated magnesium carbonate ($MgCO_3$) solution to the filter to prevent acidification and conversion of chlorophyll to phaeophytin, before we pumped the sample dry. We removed the glass fiber filter, folded it in half with the sample on the inside, and wrapped it in a white coffee filter to absorb additional water. We placed the samples in a sealed, labeled plastic bag with desiccant and stored the samples in a light-proof cooler containing frozen icepacks during transportation, in a camp freezer while onsite, and in a –20°C freezer until we processed them in an ADF&G laboratory.

We followed U.S. Environmental Protection Agency (1997) protocol for chlorophyll extraction and measurement, determining instrument and estimated detection limits, and data analysis.[h] We removed the samples from the freezer, cut them into small pieces, and placed the filter pieces for each sample into individual centrifuge tubes containing 10 mL of 90% buffered acetone. We capped the centrifuge tubes, placed them in a rack, covered them with aluminum foil, and stored them in a refrigerator for less than 24 h to extract the chlorophyll. We centrifuged the samples for 20 min at 1,600 rpm and read them on a Shimadzu UV-1800 Spectrophotometer at optical densities (OD) 664 nm, OD 647 nm, and OD 630 nm, and used an acetone blank to correct for the solvent. We also read the samples at OD 750 nm to correct for turbidity. We treated each sample with 80 μL of 0.1 N hydrochloric acid to convert the chlorophyll to phaeophytin, and read each sample again at OD 665 nm and OD 750 nm.

We used trichromatic equations to estimate chlorophylls *a*, *b*, and *c* concentration, and corrected chlorophyll *a* concentration when phaeophytin was detected. If chlorophyll *a* was not detected in a sample, we report the concentration at the estimated detection limit and do not report values for chlorophylls *b* or *c*. The 2016 chlorophyll *a* concentration estimated detection limit was 0.19 mg/m^2.

Data Presentation

For each site and by year, we present a table of mean chlorophylls *a*, *b*, and *c* density, illustrate mean chlorophyll *a* density and mean proportion of chlorophylls *a, b,* and *c* in figures, and provide the 2011–2016 data in Appendix A.

BENTHIC MACROINVERTEBRATE DENSITY AND COMMUNITY COMPOSITION

Requirement APDES 1.5.3.2

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

[g] This measurement is not exact as the amount of water used to saturate the magnesium carbonate solution is not exact and fixes the sample regardless of the concentration and without affecting sample integrity.

[h] Except we store the samples longer than 3.5 weeks and we cut the sample filters, rather than homogenize them, to reduce risk of acetone exposure.

The APDES permit requires monitoring BMI density and community composition in Lower Slate Creek, East Fork Slate Creek, Upper Johnson Creek, and Lower Sherman Creek annually between late-March and late-May after spring breakup and before peak snowmelt to detect changes over time. The APDES permit also requires monitoring at reference sites in West Fork Slate Creek and Upper Slate Creek at the same time to detect variations due to natural factors.

Sample Collection and Analysis

We opportunistically sampled BMIs using a Surber stream bottom sampler in riffle and run habitats with cobble substrate measuring less than 20 cm along the longest axis, and varying flow velocities (Barbour et al. 1999), collecting six samples at each site. Sampling only riffles and runs, habitats that support greater BMI densities and number of taxa, reduces variability in the data.

The Surber stream bottom sampler has a 0.093 m^2 sample area and a 0.3 mm mesh net and cod end. After securing the frame on the substrate, we scrubbed rocks within the sample area with a brush and disturbed gravels, sand, and silt to about 10 cm depth to dislodge macroinvertebrates into the net. We rinsed the net in the stream to ensure all organisms floated into the cod end of the Surber sampler, transferred each sample from the cod end to labeled 500 mL plastic bottles, and preserved the samples in 95% ethanol at a ratio of three parts ethanol to one part sample.

Biologists used an elutriator system and 0.5 mm and 0.3 mm sieves to sort macroinvertebrates from debris,[i,j] and identified organisms to the lowest practical taxonomic level[k] using Merritt and Cummins (1996) and Stewart and Oswood (2006). Habitat Biologist Greg Albrecht provided quality assurance and control by verifying macroinvertebrate identification of five samples.

We calculated benthic macroinvertebrate density (per m^2) for each sample by dividing the number of macroinvertebrates by 0.093 m^2, the Surber sampling area. We estimated mean BMI density for each site by calculating the mean density among the six samples. We report taxa richness as the number of taxonomic groups identified to the lowest practical level, and exclude terrestrial[l] organisms from all calculations.

Shannon Diversity (*H*) and Evenness (*E*) Indices provide measures of taxonomic diversity and abundance equality. We calculate these indices using the following equations given in Magurran (1988):

$$H = -\sum_{i=1}^{S} (P_i \log_{10} P_i)$$

[i] Gordon Willson-Naranjo and Greg Albrecht, Habitat Biologists, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: Benthic macroinvertebrate elutriation trials amendment; dated 12/17/2013.

[j] Katrina Lee, Administrative Assistant, to Jackie Timothy, Southeast Regional Supervisor, ADF&G Habitat Division. Memorandum: Benthic macroinvertebrate sample enumeration procedures; dated 6/28/2016.

[k] Insects of the orders Ephemeroptera, Plecoptera, Trichoptera, and Diptera to genus, except nonbiting midges to family Chironomidae, and all others to class or order.

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

and

$$E = \frac{H}{\log_{10} S},$$

where P_i is the number of macroinvertebrates per taxonomic group divided by the total number of macroinvertebrates in the sample, and S is the number of taxonomic groups in the sample.[m] A single taxa macroinvertebrate community has an H value of 0, which increases with the number of taxa (richness) and abundance equality (evenness). The Evenness calculation normalizes the H value to a number between 0 and 1, with an E value of 1 indicating all taxa are equally abundant.

Data Presentation

For each site and by year, we present a table summarizing mean BMI density, total taxa, total EPT taxa, percent EPT, and mean Shannon Diversity and Evenness scores, illustrate mean density in a figure, and provide the 2011–2016 data summary in Appendix B.

RESIDENT FISH POPULATION

Requirement APDES 1.5.3.3

The APDES Permit requires estimating resident fish populations by species and habitat types in 360 m reaches in East Fork Slate Creek and Upper Slate Creek so that comparisons can be made between years within each reach, and estimating the variability of the data, including minimum detectable differences between years and the precision of the 95% CI.

Sample Collection and Analysis

In 2011, habitat biologists surveyed East Fork Slate Creek and Upper Slate Creek habitats in about the same 360 m reaches surveyed by Aquatic Science Inc. (2011) using the habitat types described in Bisson et al. (1982). Based on the results of the surveys, we selected a 90 m sampling reach in each creek representative of the habitat types present. Though Bisson et al. (1982) subdivides three main habitat types for precision to detect environmental change, following Aquatic Science Inc. (2011) we counted only the three main habitat types: riffles (steepest bed slopes, shallowest water depths, and a poorly defined thalweg); pools (deepest areas where water surface slope is near zero); and glides (immediately downstream of pools with negative bed slope and positive water surface slope). The East Fork Slate Creek and Upper Slate Creek sample sites are moderate gradient, narrow, shallow, and contained, with East Fork Slate Creek dominated by bedrock, cobble, and boulder substrate. Channels of this type are stable and habitat features are unlikely to change.

We sampled resident fish populations using a modification[n] of a depletion method described by Bryant (2000). We isolated sample reaches using 3.17 mm mesh nets and secured them to the stream bottom and stream banks with rocks. We saturated the 90 m reaches with 6.35 mm and 3.17 mm soft and wire mesh minnow traps baited with disinfected salmon eggs contained in punctured plastic bags, following methods described in Magnus et al. (2006).

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[m] Assuming all taxonomic groups are represented.

[n] We sampled shorter reaches, used more minnow traps, and completed three passes instead of four.

Beginning at the downstream end of each reach, we opportunistically set baited minnow traps in all habitat types where water depth and flow allowed. We recorded the habitat type in which each trap was set, and moved away from the sampling reach so fish were not disturbed while the traps soaked for 1.5 h. We retrieved each trap and recorded fish captured by habitat type, then retained fish in an aerated bucket for processing. We removed the used bait bag, then rebaited and reset each trap in the same place as quickly as possible. We let the traps soak another 1.5 h, and completed the sequence a third time.

We anesthetized fish in an aerated bucket using 9 mg/L AQUI-S 20E (10% eugenol), measured and recorded FL to the nearest 1 mm, weight to the nearest 0.1 g, and species (Pollard et al. 1997). Prior to weighing each fish, we tared the scale and emptied the measuring tray to minimize water weight. We retained fish in a perforated plastic bucket secured in the creek downstream of the sample reach during the study, and returned all fish to the stream upon study completion.

We collected the data while meeting assumptions of closure and of equal probability of capture (Lockwood and Schneider 2000) during the three passes by ensuring the following:

- Fish emigration and immigration during the sampling period was negligible.
    - We isolated sample reaches using fine mesh nets having a cork and lead line.
    - We secured the net to the streambed with rocks along the lead line.

- All fish were equally vulnerable to capture during a pass.
    - We set baited minnow traps in all habitat types where water depth and flow allowed.

- Fish did not become more wary of capture with each pass.
    - We maintained trap numbers and placement during all three passes.
    - We limited the instream field crew to two biologists.
    - We completed all three capture events as quickly possible.
    - To avoid disturbing fish, we moved away from sampling reaches while the traps soaked 1.5 h during all three passes.

- Collection effort and conditions which affect collection efficiency remained constant.
    - We retrieved traps beginning at the downstream end of each reach.
    - We moved upstream setting, retrieving and replacing traps as quickly as possible.
    - We timed each pass exactly 1.5 h.
    - For the second and third passes, we removed the used bait bag, inserted a new bait bag, and reset each trap in the same location.

We estimated fish populations using the multiple-pass depletion method developed by Lockwood and Schneider (2000), based on methods developed by Carle and Strub (1978). The repetitive method produces a maximum likelihood estimate (MLE) of fish with a 95% CI.

Let X represent an intermediate sum statistic where the total number of passes, k, is reduced by the pass number, i, and multiplied by the number of fish caught in the pass, C_i, for each pass:

$$X = \sum_{i=1}^{k} (k - i) C_i$$

Let *T* represent the total number of fish captured in the minnow traps, all passes. Let *n* represent the predicted population of fish, using *T* as the initial value tested. Using *X*, we calculated the MLE, *N*, by repeated estimations of *n*. The MLE is the smallest integer value of *n* greater than or equal to *T* which satisfies[o] the following:

$$\left[\frac{n+1}{n-T+1}\right]\prod_{i=1}^{k}\left[\frac{kn-X-T+1+(k-i)}{kn-X+2+(k-i)}\right]_i \leq 1.000$$

The probability of capture, *p*, is given by the total number of fish captured, divided by an equation where the number of passes is multiplied by the MLE and subtracted by the intermediate statistic, *X*,

$$p = \frac{T}{kN-X}$$

The variance of *N*, a measure of variability from the mean, is given by:

$$Variance\ of\ N = \frac{N(N-T)T}{T^2 - N(N-T)\left[\frac{(kp)^2}{(1-p)}\right]}$$

We determined the SE of *N* by calculating the square root of the variance of *N*, and the 95% CI for the MLE using ± 2(SE). Because we sample a 90 m reach, we multiplied the MLE and 95% CI by four to extrapolate the data to a 360 m sample reach. The size of the 95% CI depends on the number of captures each pass; a small 95% CI results when fewer captures steadily occur with each pass, and a large 95% CI results when captures do not steadily decrease and when the number of fish captured on the second or third pass exceeds the number of fish captured on the previous pass. A MLE cannot be generated from samples from small populations if few fish were captured (e.g. ≤ 20) during the three passes; in these cases, we present the number of fish captured as the result and do not include a MLE. We determined the precision of the estimate by expressing the 95% CI as a percentage of the MLE.

Calculating a MLE using three-pass depletion data relies on equal capture probability among passes (Bryant 2000; Carle and Strub 1978; Lockwood and Schneider 2000). To evaluate equal capture probability, we used the goodness of fit test (White et al. 1982) recommended by Lockwood and Schneider (2000), which follows the χ^2 test form. We first calculated expected numbers of fish captured for each pass ($C_1, C_{2.}, C_3$) using variables previously described:

$$E(C_1) = N(1-p)^{i-1}p$$

Then we calculated χ^2,

$$\chi^2 = \frac{[\mathrm{C_1} - \mathrm{E(C_1)}]^2}{\mathrm{E(C_1)}} + \frac{[\mathrm{C_2} - \mathrm{E(C_2)}]^2}{\mathrm{E(C_2)}} + \frac{[\mathrm{C_3} - \mathrm{E(C_3)}]^2}{\mathrm{E(C_3)}}$$

[o] Lockwood and Schneider (2000) suggest the result should be rounded to one decimal place (1.0). We use three decimal places (1.000) which is an option in Carle and Strub (1978).

We compare the χ^2 test result against $\chi^2_{0.95}$ with one degree of freedom (Lockwood and Schneider (2000), and if the χ^2value is lower, the goodness of fit test suggests we achieved equal capture probability; if not, the MLE will be biased low.

We used Monte-Carlo simulations to assess the power of the three-pass depletion studies to detect changes in abundance of small (N < 200) fish populations. We simulated sampling according to the three-pass depletion design on each year's population of fish where the abundance of fish differs by varying degrees, and estimated the abundance of each population using the techniques described in Lockwood and Schneider (2000). We used a Student's *t*-test with two degrees of freedom to test the null hypothesis that both estimates come from populations of equal size, with one degree of freedom associated with each estimate. We evaluated significance at $\alpha = 0.05$. To assess power we conducted 10,000 simulations of two three-pass depletion experiments, sampling from two populations using parameters *N* and *p* calculated as described above for the two populations of interest. Values of *N* and variance of *N* are calculated for each set of simulated sampling data and a *t*-test was performed. We estimate power as the proportion of simulations where the null hypothesis was rejected (Timothy and Kanouse 2014).

Data Presentation

For each site and by year, we illustrate resident fish population by 360 m reach and by habitat type in figures, and we include the fish capture data, population by reach and by habitat type, statistical analyses results, and length frequency diagram of captured fish 2011–2016 in Appendix C.

RESIDENT FISH CONDITION

Requirement APDES 1.5.3.3

Age, sex, season, maturation, diet, gut contents, fat reserve, and muscular development affect fish condition. The APDES permit requires comparing fish condition by reach and by year in East Fork Slate Creek and Upper Slate Creek.

Sample Collection and Analysis

We used the FL and weight data of Dolly Varden char captured during the resident fish population studies, excluding fish measuring less than 40 mm FL.[p] We calculated Fulton's condition factor (*K*) for each fish using the equation given in Anderson and Neumann (1996), where the fish weight (*W*) is divided by the cubed length (*L*), and the product multiplied by 100,000:

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

Data Presentation

For each site, we present mean Dolly Varden char condition and provide the 2016 data and the 2011–2016 mean fish condition data in Appendix C.

[p] We reviewed the 2011–2015 data set and determined Dolly Varden char less than 40 mm FL usually have flawed weight measurements, which may be due to excess water present during measurement.

ADULT SALMON COUNTS

Requirement Plan of Operations

The Plan of Operations (Coeur 2005) requires weekly surveys of adult chum, coho, and pink salmon in Lower Slate Creek, Lower Johnson Creek, and Lower Sherman Creek throughout the spawning season.

Sample Collection

We surveyed Slate Creek, Johnson Creek, and Sherman Creek downstream of fish migration barriers once per week between mid-July and late-August and counted the number of live adult pink salmon, chum salmon, and carcasses. We surveyed Slate and Sherman Creeks by foot, Johnson Creek by helicopter, and verified three aerial survey counts with foot counts. We also surveyed Slate and Johnson Creeks once per week from late-September through October to count the number of live adult coho salmon and carcasses. To improve coho salmon observations, we snorkeled and recorded underwater videos with a GoPro in large pools and around large woody debris, habitats where adult coho salmon tend to occur.

We began each survey at the stream mouth, moving upstream by section and ending at the fish migration barrier. Slate Creek is sectioned in 100 m reaches, Johnson Creek by landmarks, and Sherman Creek in 50 m reaches. A team of two biologists independently recorded the number of live fish and carcasses by species in each section during the foot and aerial surveys, using polarized glasses as necessary to improve visibility. We also recorded weather and flow conditions during each survey.

We used the average of the two biologists' counts to estimate the total number of fish by species for each reach and survey, and rounded down all intermediate numbers to whole numbers in the calculations.[q] Comparing the 2016 Lower Johnson Creek aerial and foot count data, our mean underestimation of pink salmon counted was a factor of 2.4.[r]

Data Presentation

For each site, we present figures of the weekly adult pink salmon count and by distribution, and provide the 2011–2016 count by species in a table. The 2016 data and pink salmon count by statistical week 2011–2016 are in Appendix D.

SPAWNING SUBSTRATE COMPOSITION

Requirement APDES 1.5.3.5.1

The APDES permit requires annually sampling pink salmon spawning substrate during early-July at Lower Slate Creek SP1 and SP2 to detect change in composition over time. We calculate the geometric mean particle size, an index of substrate textural composition, for each sample and among samples collected at each site each year.

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[q] We no longer multiply the Lower Johnson Creek mean weekly aerial counts for each reach by a factor of 2.5 to account for adult salmon not seen, and we updated the 2011–2015 data reflecting this change.

[r] Previous mean aerial underestimation factors were 3.1 (2011), 1.8 (2012), 2.1 (2013), 1.5 (2014), and 2.0 (2015). Pilot skill, visibility, and weather affect count accuracy and observer confidence decreases with faster helicopter speed and downstream orientation.

Sample Collection

We collected four sediment samples at two locations in Lower Slate Creek using a McNeil sampler, which has a 15 cm basal core diameter and 25 cm core depth. We selected sample sites with substrate measuring less than 10 cm, the maximum gravel size used by pink salmon (Lotspeich and Everest 1981; Kondolf and Wolman 1993), and where the stream gradient was less than 3% (Valentine, B. E. 2001. Unpublished. Stream substrate quality for salmonids: Guidelines for Sampling, Processing, and Analysis. California Department of Forestry and Fire Protection, Coast Cascade Regional Office, Santa Rosa, CA). We pushed the McNeil sampler into the substrate until the sample core was buried, then transferred the sediments to a bucket. We wet-sieved samples onsite using sieve sizes 101.6, 50.8, 25.4, 12.7, 6.35, 1.68, 0.42, and 0.15 mm and measured the contents of each sieve to the nearest 25 mL by the volume of water displaced in 600 mL and 1 L plastic beakers.[s] 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 pass 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. (1979), assuming a gravel density of 2.6 g/cm^3 (Aquatic Science Inc. 2011). 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,

$$d_g = {d_1}^{w1} \times {d_2}^{w2} \times {d_3}^{w3} \ldots {d_n}^{wn}$$

Data Presentation

For each site and by year, we present a table of the geometric mean particle size and include the 2011–2016 data in Appendix E.

SEDIMENT METALS CONCENTRATIONS

Requirement APDES 1.5.2

Sediment metals concentrations are influenced by a variety of factors, such as geochemical composition and weathering within the watershed, sediment grain size, organic content, and development (Tchounwou et al. 2012) and heavy metals in sediments can decrease BMI taxa richness and change the composition of BMI communities (Qu et al. 2010).

The APDES permit requires annually sampling fine sediments in Lower Slate Creek, East Fork Slate Creek, Upper Slate Creek, Lower Johnson Creek, and Lower Sherman Creek for particle size, total solids, total volatile solids, total sulfide, total organic carbon, and total concentrations of silver (Ag), aluminum (Al), arsenic (As) cadmium (Cd), chromium (Cr), copper (Cu), mercury (Hg), nickel (Ni), lead (Pb), selenium (Se), and zinc (Zn).

[s] Except we measure the contents of the 0.15 mm sieve to the nearest 1 mL using an Imhoff cone.

Sample Collection and Analysis

Wearing latex gloves, we opportunistically collected sand and silt at each site within actively flowing channels and retained the top 4 cm of sediment in three glass jars provided by the laboratory.[t] We stored the samples in a cooler with frozen icepacks during transport and in a Juneau ADF&G laboratory fridge until we shipped them to the ALS Environmental laboratory in Kelso, Washington for analyses.

We shipped the samples in a cooler with frozen icepacks via overnight air freight, and maintained written chain of custody documentation.[u] ALS Environmental measured particle size, total solids, total volatile solids, total sulfide, total organic carbon, and total concentrations of Ag, Al, As, Cd, Cu, Fe, Hg, Pb, Se, and Zn on a dry-weight basis using the methods listed in Table 7. The laboratory provided Tier II quality assurance and quality control information, including results for matrix spikes[v], sample blanks, and sample duplicates.

Table 7.–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	160.3 Modified
Puget Sound Estuary Program sediment sulfide	Total sulfide	PSEP Sulfide
Total volatile solids, modified for solids	Total volatile solids	160.4 Modified
Mercury in solid or semisolid waste	Hg	7471B
Determination of trace elements in waters and wastes by ICP/MS	Ag, Al, As, Cd, Cr, Cu, Ni, Pb, Se, Zn	200.8

Data Presentation

For each site, we present the 2016 concentration data in a figure and illustrate the 2011–2016 data by analyte in a figure. We compare the data with the Screening Quick Reference Tables (SQuiRTs) for inorganics in freshwater sediment guidelines developed by the National Oceanic and Atmospheric Administration (NOAA; Buchman 2008; MacDonald et al. 2000), specifically the threshold effects concentrations (TEC) and the probable effects concentrations (PEC). The guidelines are based on results of controlled laboratory bioassays, wherein metals concentrations below the TEC rarely affect aquatic life survival and growth, and metals concentrations above the PEC can affect aquatic life survival and growth. We provide the 2011–2016 sediment data by site and by year and include the 2016 laboratory reports in Appendix F.

[t] In 2015, we discontinued sieving sediments during collection to avoid washing contaminants from the sample.

[u] Despite our effort to schedule field work and shipping as close as possible, ALS Environmental received all sediment samples past the 7-day hold time limit for total volatile solids and total sulfide, as in previous years.

[v] The Al spike recovery exceeded the control criteria on the 2016 Lower Slate Creek sediment sample because the analyte concentration was significantly greater than the added spike concentration, which frequently occurs for matrix spikes on Kensington Gold Mine stream sediment samples due to natural Al concentrations in systems near the project.

SEDIMENT TOXICITY

Requirement APDES 1.5.2.3

The APDES permit requires laboratory toxicity testing of Lower Slate Creek, East Fork Slate Creek, Upper Slate Creek, Lower Johnson Creek, and Lower Sherman Creek sediments using the amphipod *Hyalella azteca* and midge *Chironomus dilutus* following method EPA/600/R-94/024.

Sample Collection and Analysis

Wearing latex gloves, we opportunistically collected sand and silt within actively flowing channels at each site and retained the top 4 cm of sediment in three glass jars provided by the laboratory. Between sites, we rinsed our sampling equipment in stream water. We stored the samples in a cooler with frozen icepacks during transport and in a Juneau ADF&G laboratory fridge until we shipped them to the CH2M Hill Applied Sciences Laboratory[w] in Corvallis, OR for analyses.

We shipped the samples in a cooler with frozen icepacks via overnight air freight,[x] and maintained written chain of custody documentation. Laboratory staff recommended, and followed, the updated bioassay method EPA/600/R-99/064 with the organisms *H. azteca* and *C. tentans* (B. Muckey, Bioassay Laboratory Manager, CH2M Hill Applied Sciences Laboratory, Corvallis, personal communication). For the control sediment, laboratory staff collected sediment from Beaver Creek, upstream of Yaquina Bay near Newport, OR, and press sieved the sediment to remove organisms prior to initiating the experiments.

Data Presentation

For each site, we present the 2016 organism survival and growth results. We provide the 2016 laboratory report in Appendix F.

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[w] CH2M Hill Applied Sciences Laboratory of Corvallis, OR, has performed the 10-day chronic sediment bioassays since 2014; AECOM Environmental Toxicology Laboratory of Fort Collins, CO, performed the bioassays 2011–2013.

[x] Though we shipped the 2016 coolers via FedEx overnight priority delivery, the cooler containing Johnson Creek sediments arrived at the laboratory one day late and the temperature inside the cooler was outside the holding range recommended in the toxicity test method, as in previous years. Since the holding temperature range is a recommendation and not a requirement, we agreed with the laboratory's recommendation to proceed with testing (M. Stanaway, Laboratory Project Manager, CH2M Hill Applied Sciences Laboratory, Corvallis, OR, personal communication).

RESULTS

SLATE CREEK

Lower Slate Creek

Periphyton Density and Composition

The 2016 Lower Slate Creek mean chlorophyll *a* density was 5.26 mg/m^2, within the range observed since 2011 (Table 8). Figure 13 presents the minimum, mean, and maximum chlorophyll *a* density from samples collected each year, and Figure 14 presents the mean proportion of chlorophylls *a*, *b*, and *c* each year.

Table 8.–Lower Slate Creek mean chlorophylls *a*, *b*, and *c* density, 2011–2016.

	7/29/2011	7/25/2012	7/31/2013	7/30/2014	7/28/2015	7/26/2016
Chlorophyll *a* (mg/m^2)	5.15	2.31	12.59	4.00	2.16	5.26
Chlorophyll *b* (mg/m^2)	0.43	0.05	0.00	0.85	0.10	0.21
Chlorophyll *c* (mg/m^2)	0.26	0.18	1.64	0.30	0.21	0.62

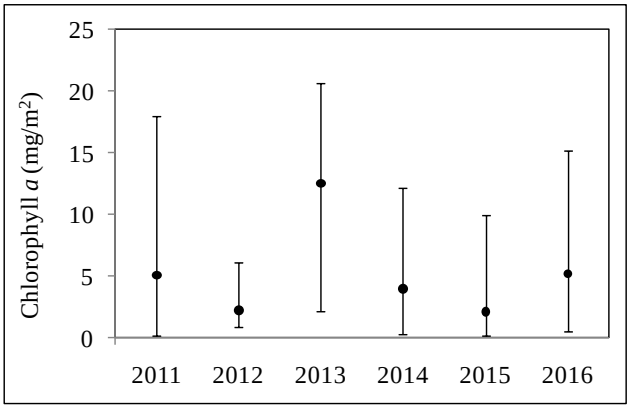

Figure 13.–Lower Slate Creek chlorophyll *a* density, 2011–2016.
Note: Minimum, mean, and maximum values presented.

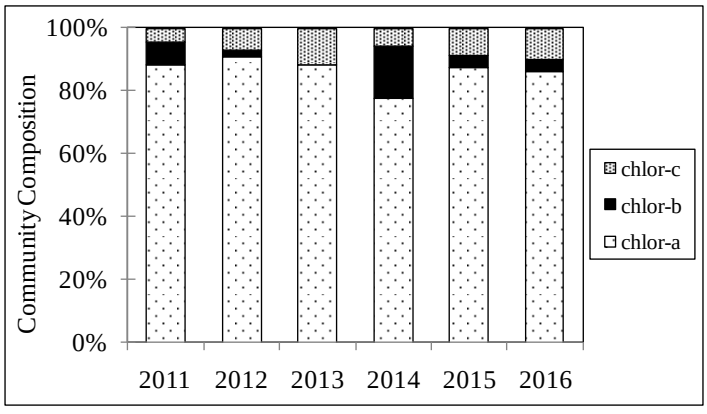

Figure 14.–Lower Slate Creek mean proportion of chlorophylls *a*, *b*, and *c*, 2011–2016.

Benthic Macroinvertebrate Density and Community Composition

Among the 2016 Lower Slate Creek BMI samples, we identified 24 taxa and estimate density at 3,394 BMI/m^2, of which 15% were EPT insects (Table 9, Figure 15), the lowest proportion of EPT insects observed since 2011. The Shannon Diversity and Evenness scores were similar to previous years, and the dominant taxon was Diptera: Chironomidae representing 51% of the samples, also similar to previous years.

Table 9.–Lower Slate Creek BMI data summary, 2011–2016.

	5/4/2011	5/2/2012	4/30/2013	4/30/2014	4/27/2015	4/26/2016
Mean BMI/m^2	2,057	3,154	2,581	4,136	3,407	3,394
Total BMI Taxa	29	32	27	32	26	24
Number of EPT Taxa	13	17	16	17	13	11
% EPT	14%	38%	51%	19%	24%	15%
Shannon Diversity Score	0.51	0.69	0.85	0.64	0.70	0.65
Evenness Score	0.48	0.58	0.70	0.52	0.58	0.57

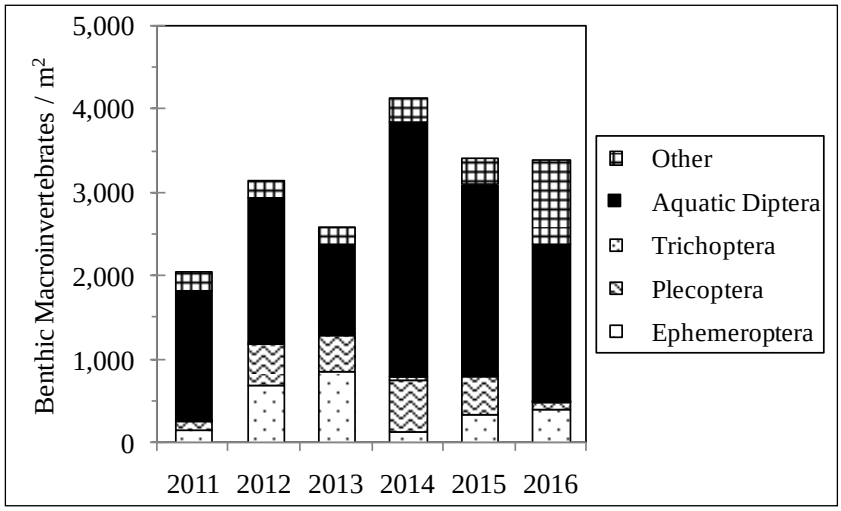

Figure 15.–Lower Slate Creek BMI mean density and community composition, 2011–2016.

Adult Salmon Counts

We counted 79 live pink salmon, 45 live chum salmon, and 2 live coho salmon in Lower Slate Creek during the 2016 spawning season. Figure 16 presents the pink salmon count for each survey, and Figure 17 shows the distribution of pink salmon by reach. Table 10 presents the 2011–2016 adult salmon count.

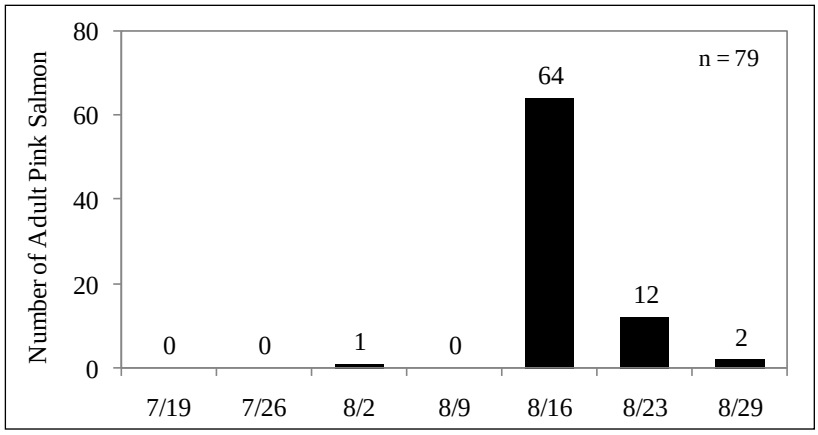

Figure 16.–2016 Lower Slate Creek weekly pink salmon count.

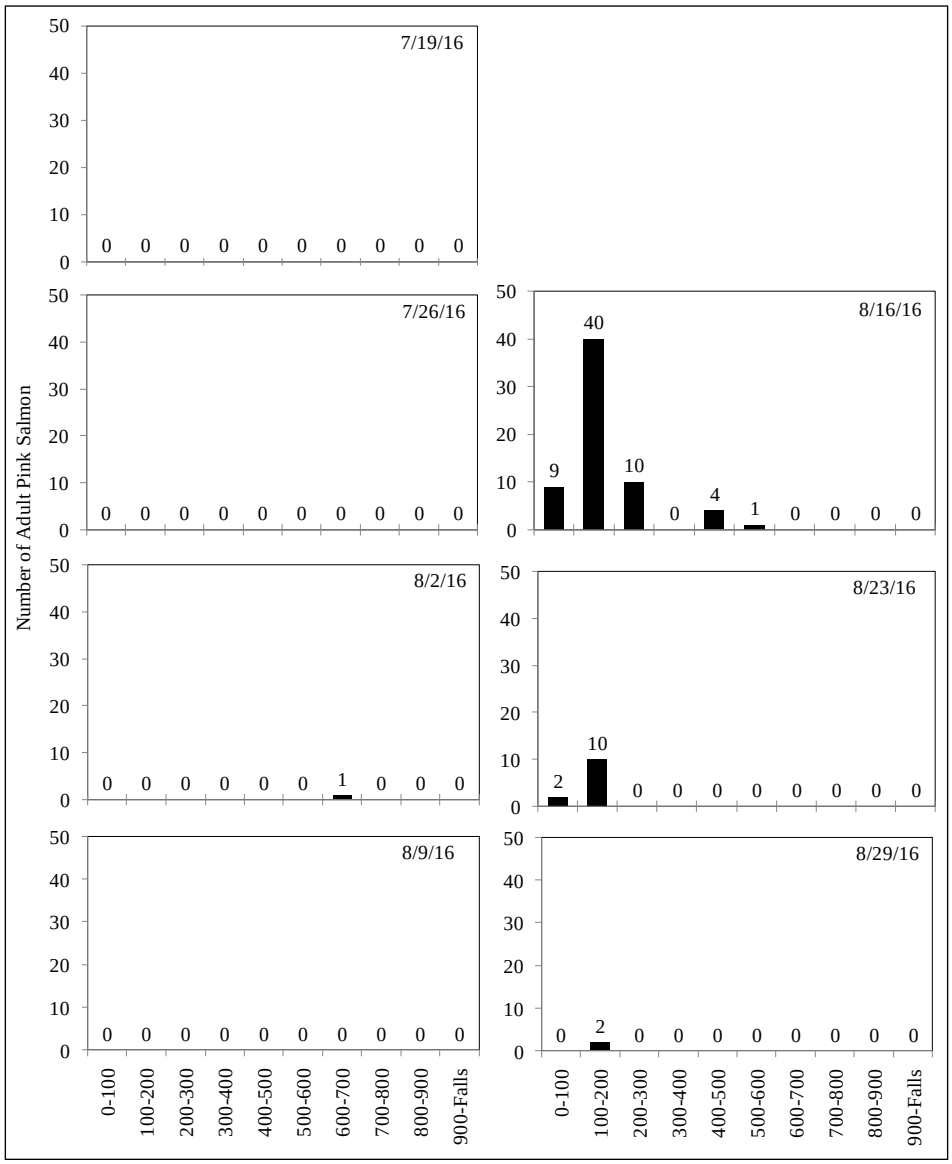

Figure 17.–2016 Lower Slate Creek weekly pink salmon distribution.

Table 10.–Lower Slate Creek adult salmon count, 2011–2016.

	2011	2012	2013	2014	2015	2016
Pink Salmon	6,275	7,272	3,337	41	7,580	79
Chum Salmon	61	1	1	0	13	45
Coho Salmon	0	0	26	5	0	2

Spawning Substrate Composition

Sample Points 1 and 2

The geometric mean particle size among samples collected at Lower Slate Creek SP1 and SP2 was 13.6 mm and 11.6 mm, both within the range of sizes observed at each site since 2011 (Table 11).

Table 11.–Lower Slate Creek SP1 and SP2 geometric mean particle sizes (mm), 2011–2016.

	2011	2012	2013	2014	2015	2016
Sample Point 1	10.3	10.8	14.2	12.9	13.3	13.6
Sample Point 2	11.1	11.2	13.2	16.5	17.5	11.6

Sediment Metals Concentrations

The 2016 Lower Slate Creek sediment metals, As, and Se concentrations were within the range observed 2011–2015. Figure 18 presents the 2016 results and Figure 19 presents the 2011–2016 data. The As, Cu, Ni, and Zn concentrations remain above NOAA's freshwater sediment guidelines (Buchman 2008; MacDonald et al. 2000).

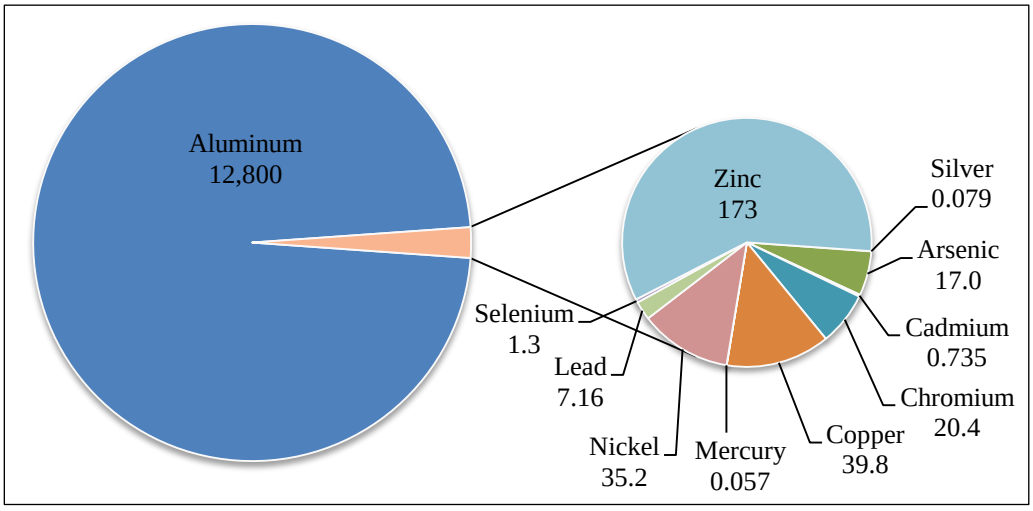

Figure 18.–2016 Lower Slate Creek sediment metals concentrations (mg/kg).

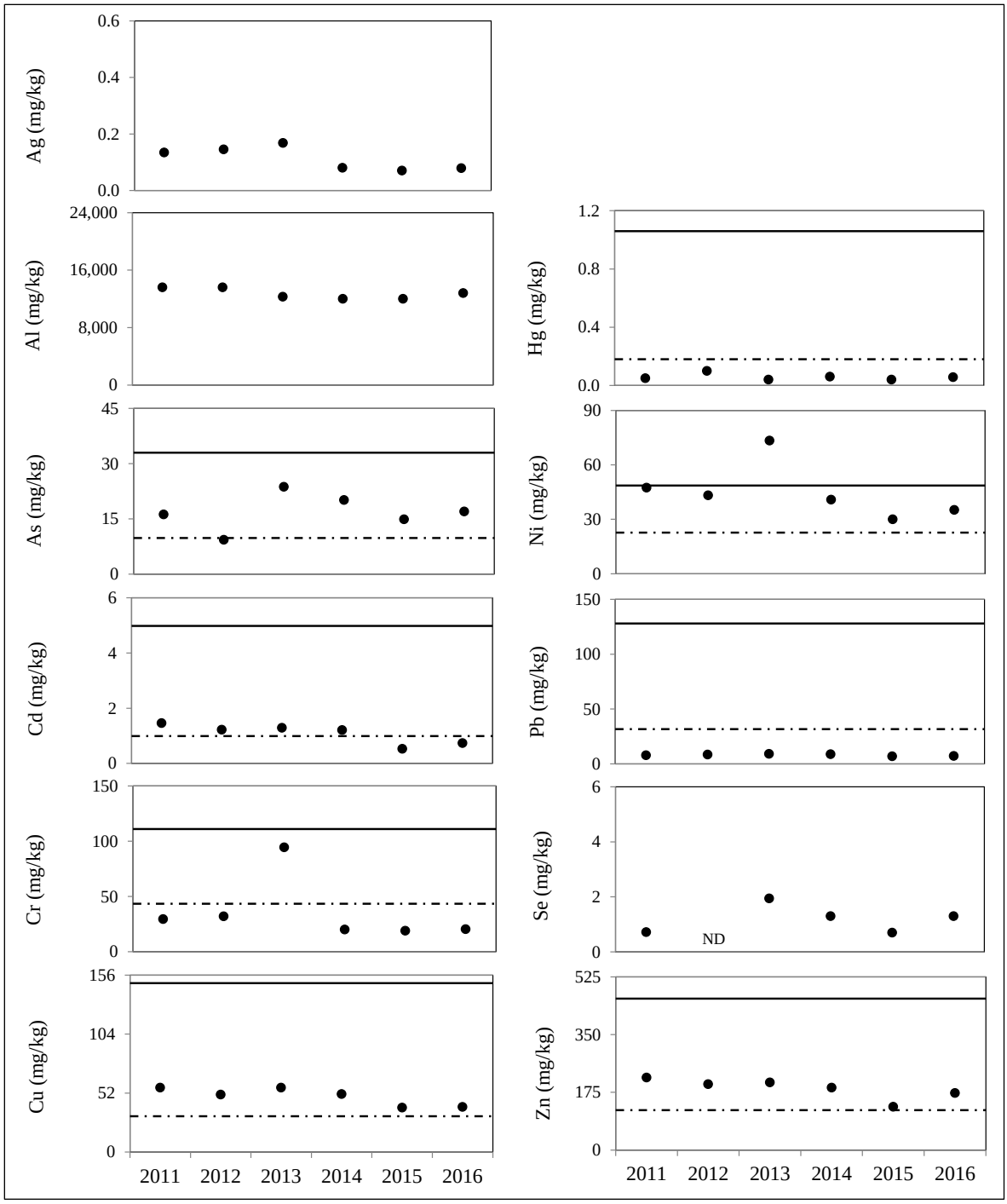

Figure 19.–Lower Slate Creek sediment metals concentrations, 2011–2016.

Note: The dashed line represents the TEC and the solid line represents the PEC for each analyte in freshwater sediments (Buchman 2008; MacDonald et al. 2000); guidelines are not published for Ag, Al, and Se; ND = not detected.

Sediment Toxicity

There were no significant ($p \leq 0.05$) reductions in *H. azteca* or *C. tentans* growth or survival between the laboratory control sediment and the 2016 Lower Slate Creek sediment sample.

West Fork Slate Creek

Periphyton Density and Composition

The 2016 West Fork Slate Creek mean chlorophyll *a* density was 4.93 mg/m^2, the greatest observed since 2011 (Table 12). Figure 20 presents minimum, mean, and maximum chlorophyll *a* density from samples collected each year and Figure 21 presents the mean proportion of chlorophylls *a*, *b*, and *c* each year.

Table 12.–West Fork Slate Creek mean chlorophylls *a*, *b*, and *c* density, 2011–2016.

	7/29/2011	7/25/2012	7/31/2013	7/30/2014	7/28/2015	7/26/2016
Chlorophyll *a* (mg/m^2)	3.92	1.01	4.22	0.77	0.92	4.93
Chlorophyll *b* (mg/m^2)	0.00	0.00	0.00	0.00	0.03	0.00
Chlorophyll *c* (mg/m^2)	0.27	0.10	0.61	0.06	0.06	0.66

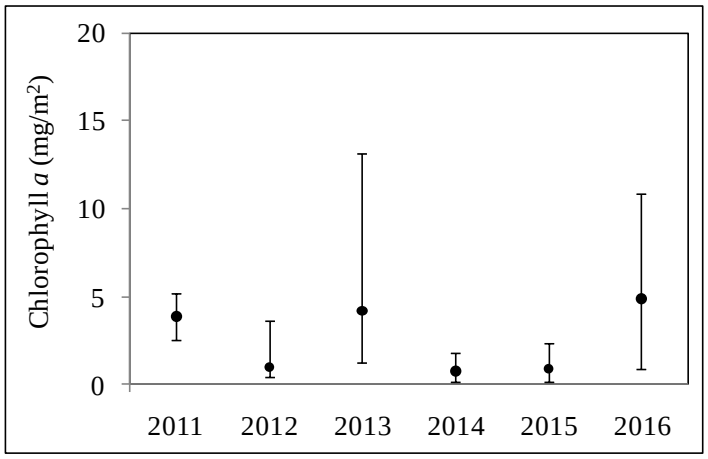

Figure 20.–West Fork Slate Creek chlorophyll *a* density, 2011–2016.

Note: Minimum, mean, and maximum values presented.

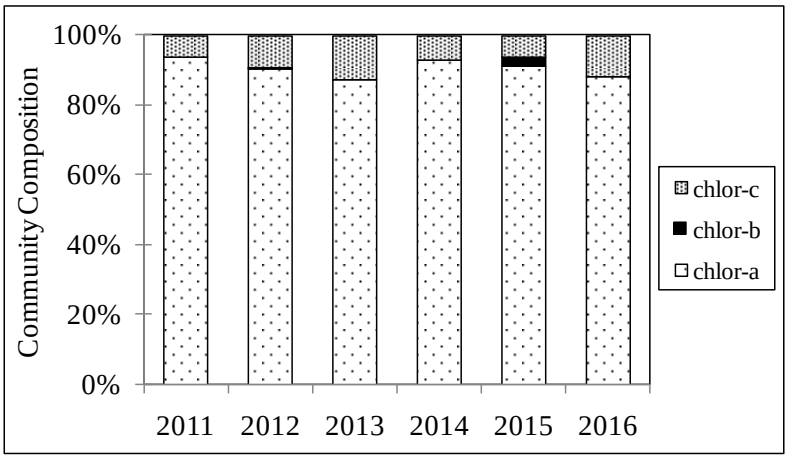

Figure 21.–West Fork Slate Creek mean proportion of chlorophylls *a*, *b*, and *c*, 2011–2016.

Benthic Macroinvertebrate Density and Community Composition

Among the 2016 West Fork Slate Creek BMI samples, we identified 25 taxa and estimate density at 1,470 BMI/m^2, of which 77% were EPT insects (Table 13, Figure 22), all within the range observed in previous years. The Shannon Diversity and Evenness scores were also similar to previous years, and the dominant taxa were Ephemeroptera: *Baetis*, representing 38% of the samples, and Diptera: Chironomidae representing 18% of the samples.

Table 13.–West Fork Slate Creek BMI data summary, 2011–2016.

	5/4/2011	5/2/2012	4/30/2013	4/30/2014	4/27/2015	4/26/2016
Mean BMI/m^2	502	1,819	2,446	973	2,634	1,470
Total BMI Taxa	21	31	28	29	28	25
Number of EPT Taxa	11	21	18	17	16	15
% EPT	80%	80%	90%	71%	82%	77%
Shannon Diversity Score	0.63	0.84	0.73	0.91	0.82	0.72
Evenness Score	0.78	0.71	0.61	0.79	0.71	0.69

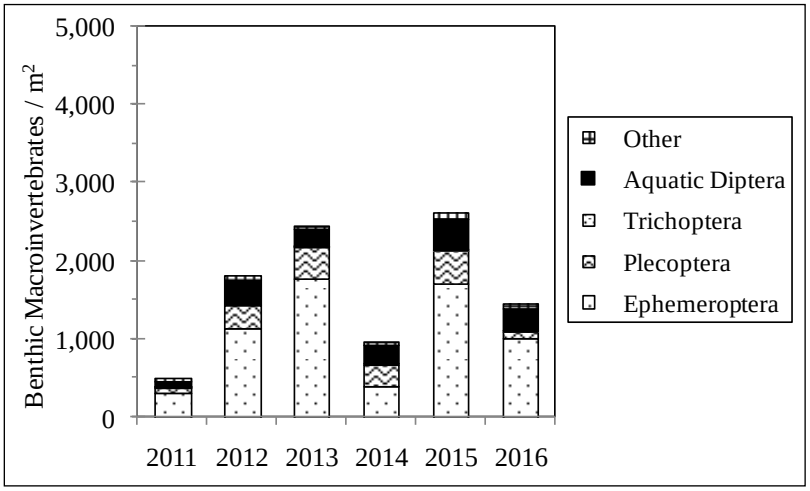

Figure 22.–West Fork Slate Creek BMI mean density and community composition, 2011–2016.

East Fork Slate Creek

East Fork Slate Creek discharge is dependent on Upper Slate Lake discharge, routed through the diversion pipeline bypassing the TTF, and effluent discharge[y] from the TTF water treatment plant. East Fork Slate Creek mean daily discharges[z] during July 2016 were lower than previous years, except during the last week of the month (Figure 23; unpublished data obtained from K. Eppers, Environmental Superintendent, Coeur Alaska Inc., Juneau). The minimum, median, and maximum mean daily discharges three weeks prior to sampling periphyton were the lowest observed since we began sampling in 2011 (Figure 24).

[y] Outfall 002 began discharging to East Fork Slate Creek in December 2010.

[z] Calculated by combining the diversion pipeline Parshall flume and TTF water treatment plant Outfall 002 mean daily discharge data (unpublished data obtained from K. Eppers, Environmental Superintendent, Coeur Alaska Inc., Juneau, AK).

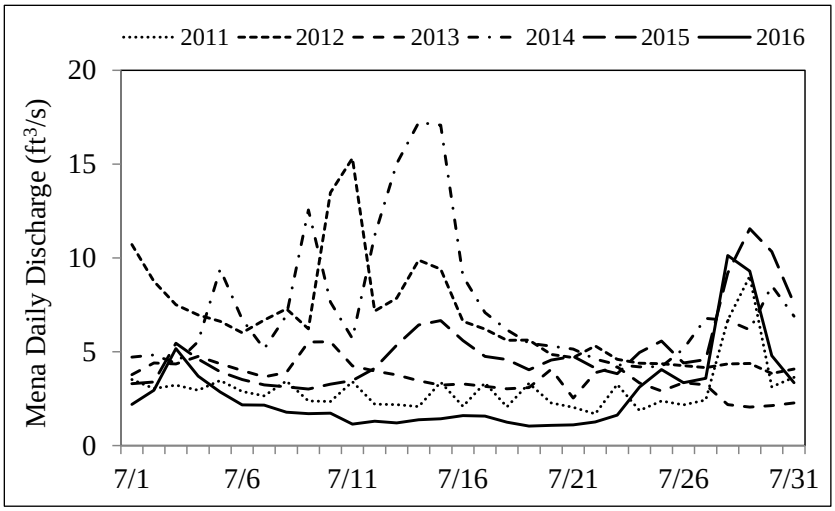

Figure 23.–East Fork Slate Creek July mean daily discharges, 2011–2016.

Note: Combined Parshall flume and TTF water treatment plant Outfall 002 discharge data.

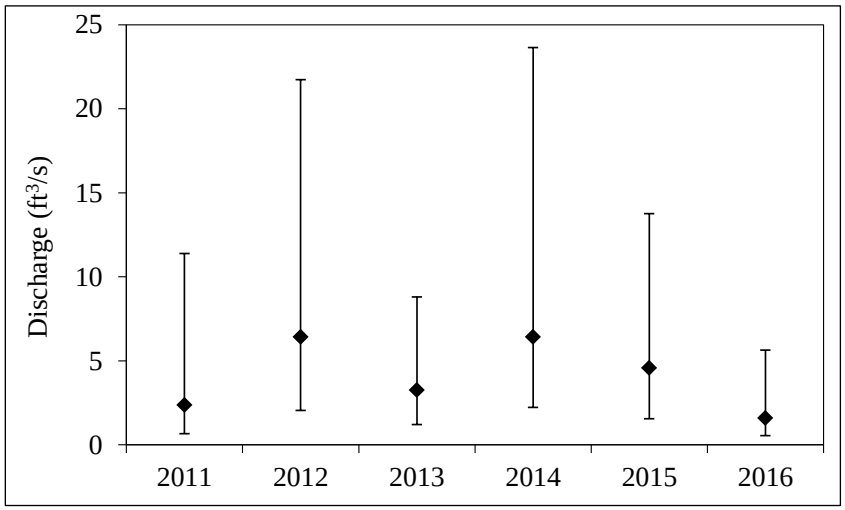

Figure 24.–East Fork Slate Creek mean daily discharges three weeks prior to sampling periphyton, 2011–2016.

*Note: M*inimum, median, and maximum mean daily discharges presented.

Periphyton Density and Composition

The 2016 East Fork Slate Creek mean chlorophyll *a* density was 1.21 mg/m^2, the second lowest observed since 2011 (Table 14). Figure 25 presents the minimum, mean, and maximum chlorophyll *a* density from samples collected each year and Figure 26 presents the mean proportion of chlorophylls *a*, *b*, and *c* each year.

Table 14.–East Fork Slate Creek mean chlorophylls *a*, *b*, and *c* density, 2011–2016.

	7/28/2011	7/24/2012	7/30/2013	7/30/2014	7/27/2015	7/25/2016
Chlorophyll *a* (mg/m^2)	8.84	5.08	2.28	0.27	1.56	1.21
Chlorophyll *b* (mg/m^2)	1.56	0.57	0.06	0.02	0.00	0.00
Chlorophyll *c* (mg/m^2)	0.24	0.18	0.20	0.03	0.15	0.15

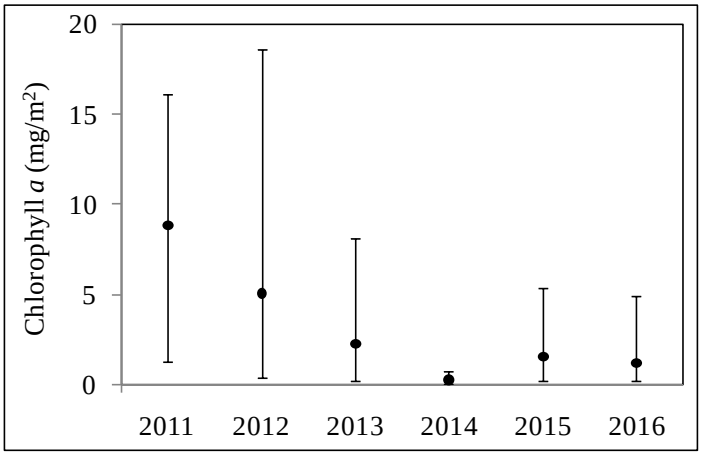

Figure 25.–East Fork Slate Creek chlorophyll *a* density, 2011–2016.

Note: Minimum, mean, and maximum values presented.

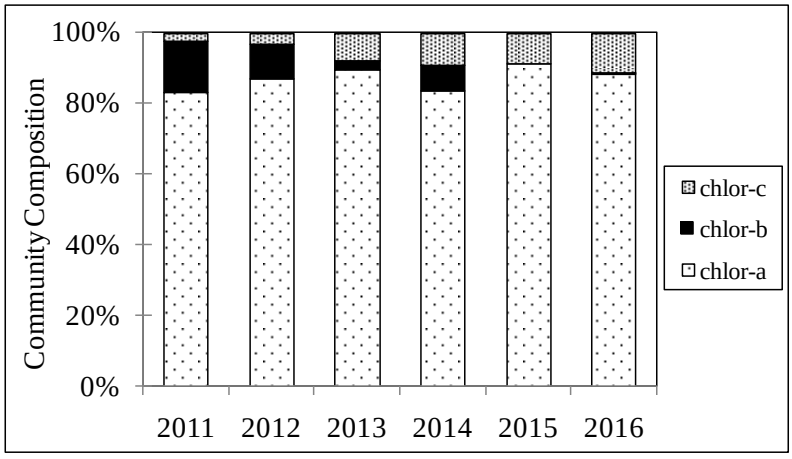

Figure 26.–East Fork Slate Creek mean proportion of chlorophylls *a*, *b*, and *c*, 2011–2016.

Benthic Macroinvertebrate Density and Community Composition

Among the 2016 East Fork Slate Creek BMI samples, we identified 21 taxa and estimate density at 2,002 BMI/m^2, of which 28% were EPT insects (Table 15, Figure 27); the lowest number of taxa and density, yet the greatest proportion[aa] of EPT insects we have observed since 2011. The Shannon Diversity and Evenness scores were similar to the 2015 scores and greater than previous years. The dominant taxa were Diptera: Chironomidae, representing 26% of the samples, and Bivalvia: *Pisidium*, representing 23% of the samples.

Table 15.–East Fork Slate Creek BMI data summary, 2011–2016.

	5/12/2011	4/27/2012	4/29/2013	4/30/2014	4/29/2015	4/25/2016
Mean BMI/m^2	4,688	4,633	9,407	2,048	3,854	2,002
Total BMI Taxa	27	33	33	24	28	21
Number of EPT Taxa	15	17	17	9	16	11
% EPT	19%	23%	2.5%	2.0%	18%	28%
Shannon Diversity Score	0.64	0.78	0.57	0.70	0.92	0.92
Evenness Score	0.54	0.61	0.47	0.63	0.72	0.78

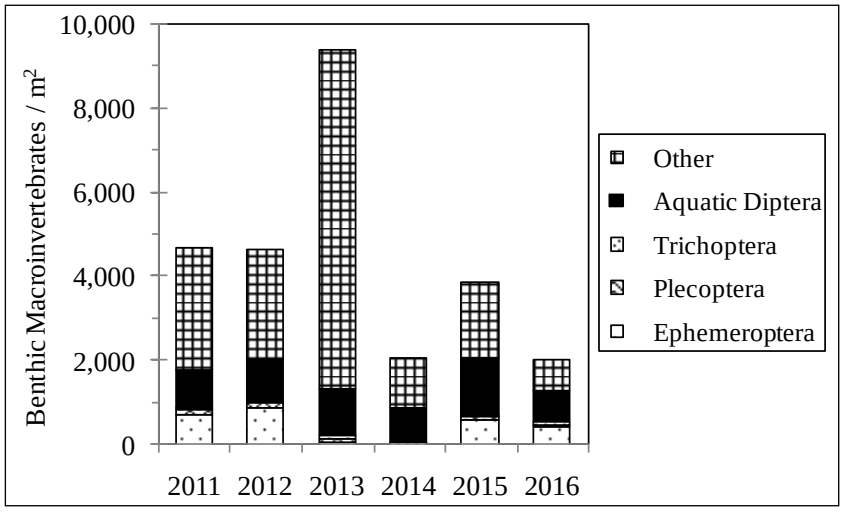

Figure 27.–East Fork Slate Creek BMI mean density and community composition, 2011–2016.

Resident Fish Population and Condition

We did not capture Dolly Varden char during the 2016 East Fork Slate Creek survey, therefore the population estimate was 0 fish, the same as the previous three years (Figures 28, 29).

[aa] Largely due to fewer pea clams (Bivalvia: *Pisidium*).

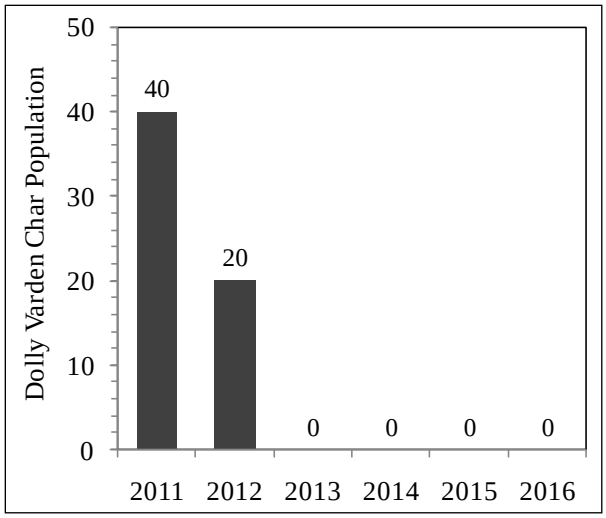

Figure 28.–East Fork Slate Creek Dolly Varden char population, 2011–2016.

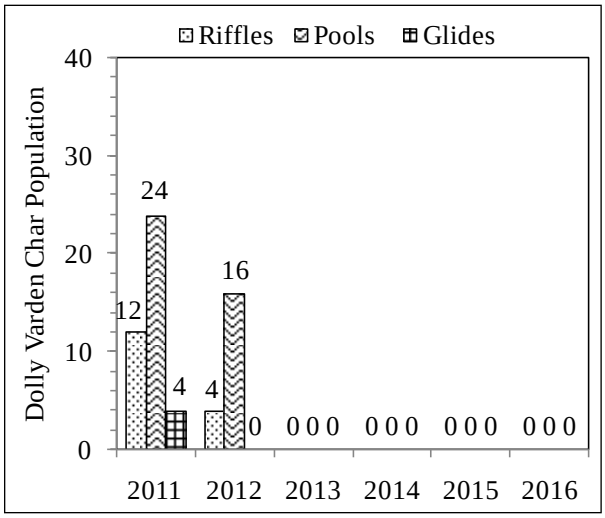

Figure 29.–East Fork Slate Creek Dolly Varden char population by habitat type, 2011–2016.

Sediment Metals Concentrations

Sediment metals, As, and Se concentrations in the 2016 East Fork Slate Creek sediment sample are illustrated in Figure 30, and Figure 31 presents the 2011–2016 data. The 2016 contained a greater concentration of As than previous years, while concentrations of metals and Se were within the range observed 2011–2015. The As, Cd, Cu, Ni, and Zn concentrations remain above NOAA's freshwater sediment guidelines (Buchman 2008; MacDonald et al. 2000).

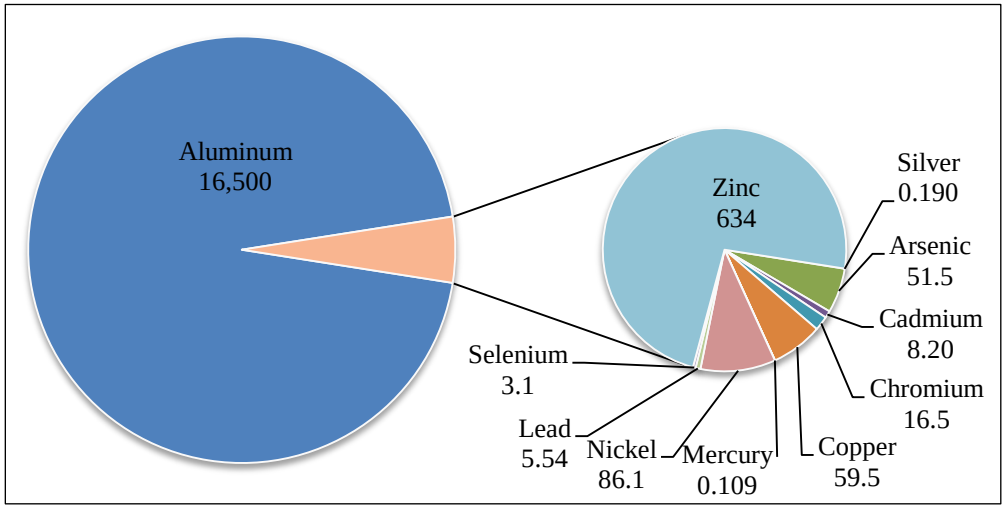

Figure 30.–2016 East Fork Slate Creek sediment metals concentrations (mg/kg).

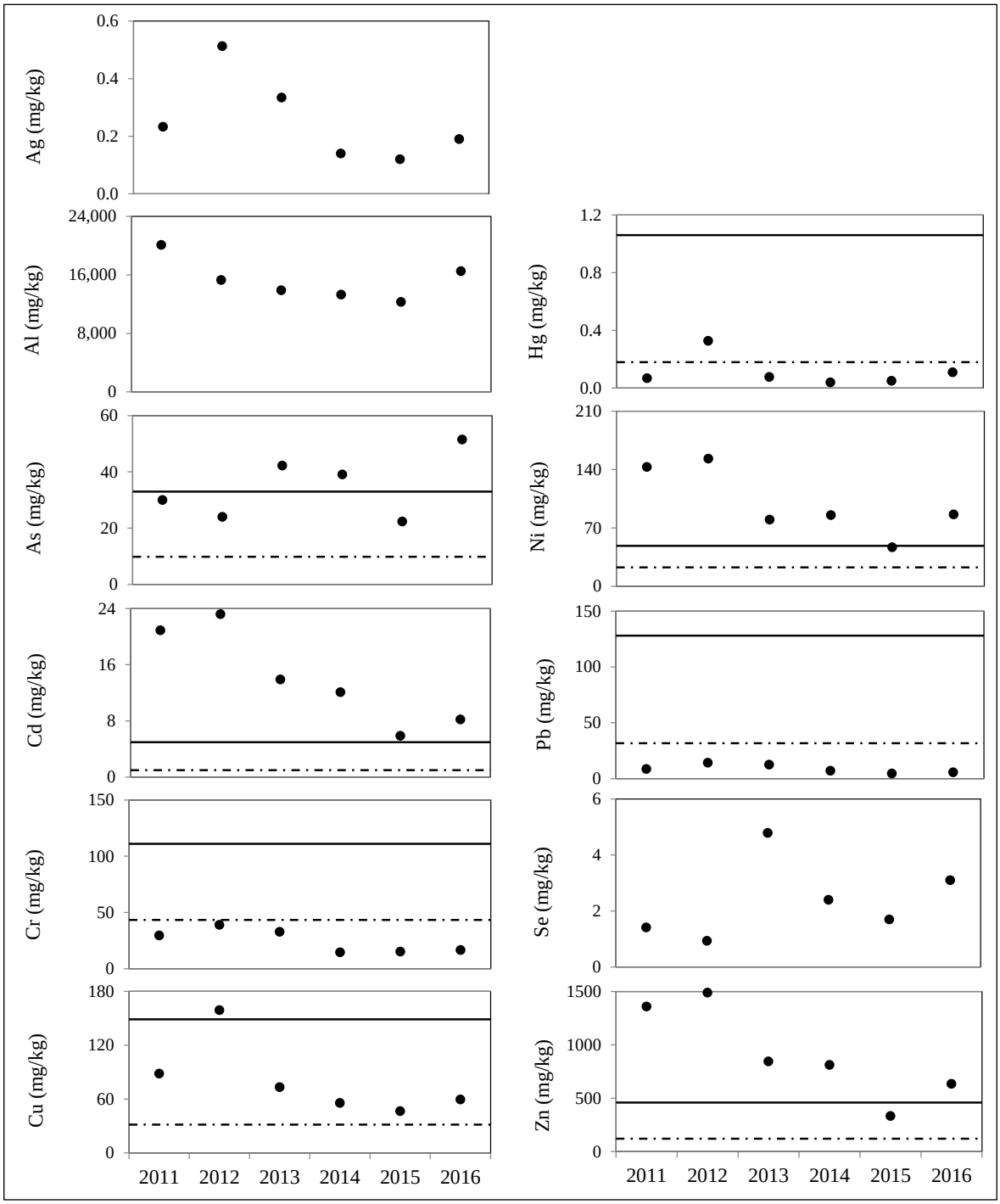

Figure 31.–East Fork Slate Creek sediment metals concentrations, 2011–2016.

Note: The dashed line represents the TEC and the solid line represents the PEC for each analyte in freshwater sediments (Buchman 2008; MacDonald et al. 2000); guidelines are not published for Ag, Al, and Se; ND = not detected.

Sediment Toxicity

There were no significant ($p \leq 0.05$) reductions in *H. azteca* or *C. tentans* growth or survival between the laboratory control sediment and the 2016 East Fork Slate Creek sediment sample.

Upper Slate Creek

Periphyton Density and Composition

The 2016 Upper Slate Creek mean chlorophyll *a* density was 3.86 mg/m^2, the greatest observed since 2011 (Table 16). Figure 32 presents the minimum, mean, and maximum chlorophyll *a* density from samples collected each year and Figure 33 presents the mean proportion of chlorophylls *a*, *b*, and *c* each year.

Table 16.–Upper Slate Creek mean chlorophylls *a*, *b*, and *c* density, 2011–2016.

	7/29/2011	7/24/2012	7/30/2013	7/30/2014	7/27/2015	7/25/2016
Chlorophyll *a* (mg/m^2)	0.76	1.26	2.13	1.09	0.63	3.86
Chlorophyll *b* (mg/m^2)	0.00	0.00	0.00	0.00	0.00	0.02
Chlorophyll *c* (mg/m^2)	0.05	0.07	0.13	0.06	0.09	0.42

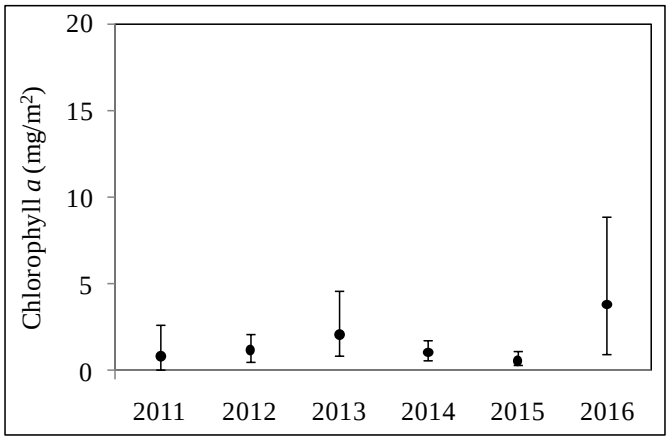

Figure 32.–Upper Slate Creek chlorophyll *a* density, 2011–2016.

Note: Minimum, mean, and maximum values presented.

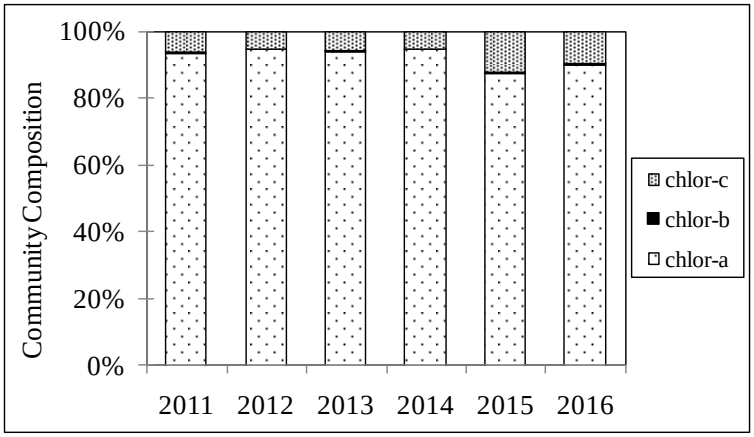

Figure 33.–Upper Slate Creek mean proportion of chlorophylls *a*, *b*, and *c*, 2011–2016.

Benthic Macroinvertebrate Density and Community Composition

Among the 2016 Upper Slate Creek BMI samples, we identified 28 taxa and estimate density at 2,398 BMI/m^2, of which 68% were EPT insects (Table 17, Figure 34); a lower number of taxa and density we have observed since 2011. The Shannon Diversity and Evenness scores were greater than previous years. The dominant taxa were Ephemeroptera: *Baetis*, representing 18% of the samples, Plecoptera: *Despaxia*, representing 11% of the samples, and Diptera: Chironomidae, representing 11% of the samples.

Table 17.–Upper Slate Creek BMI data summary, 2011–2016.

	5/12/2011	4/27/2012	4/29/2013	4/28/2014	4/29/2015	4/25/2016
Mean BMI/m^2	2,523	2,256	2,880	3,125	3,776	2,398
Total BMI Taxa	33	39	34	36	31	28
Number of EPT Taxa	18	21	20	20	19	15
% EPT	63%	68%	72%	63%	68%	68%
Shannon Diversity Score	0.97	1.04	1.02	1.03	0.98	1.06
Evenness Score	0.76	0.79	0.78	0.76	0.74	0.82

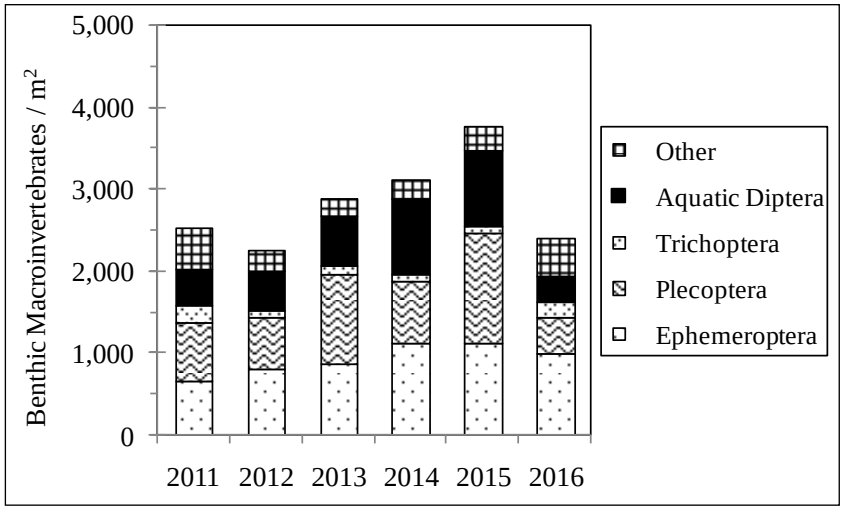

Figure 34.–Upper Slate Creek BMI mean density and community composition, 2011–2016.

Resident Fish Population and Condition

The 2016 Upper Slate Creek Dolly Varden char population estimate was 168 ± 48 fish[bb], similar to populations observed since 2011 (Figure 35). As in previous years, we captured more Dolly Varden char in pools than riffles or glides (Figure 36), and captured fish represented several age classes. Mean fish condition was 1.2, greater than previous years.

[bb] The goodness of fit X^2 test indicates we achieved equal capture probability between passes.

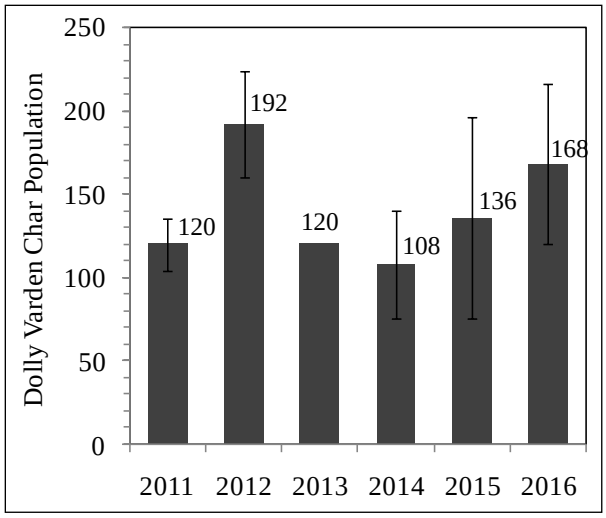

Figure 35.–Upper Slate Creek Dolly Varden char population, 2011–2016.

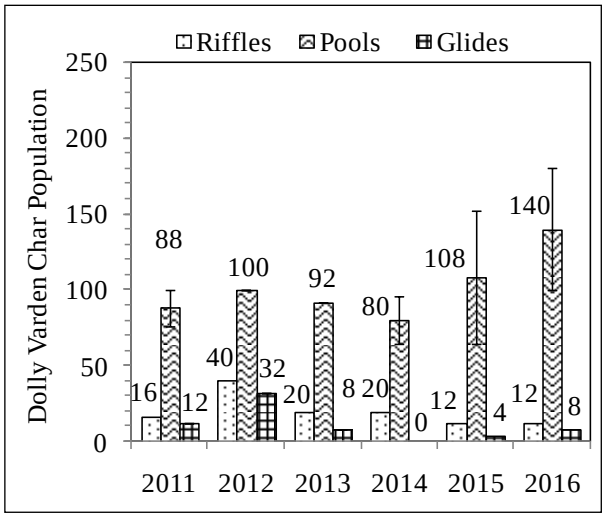

Figure 36.–Upper Slate Creek Dolly Varden char population by habitat type, 2011–2016.

Sediment Metals Concentrations

Sediment metals, As, and Se concentrations in the 2016 Upper Slate Creek sediment sample are shown in Figure 37, and Figure 38 presents the 2011–2016 data. The 2016 sample contained lower concentrations of Al, Cd, Cr, Cu, Ni and Pb than previous years and concentrations of other metals, As and Se were within the range observed 2011–2015. The As, Cr, Cu, and Ni concentrations remain above NOAA's freshwater sediment guidelines (Buchman 2008; MacDonald et al. 2000).

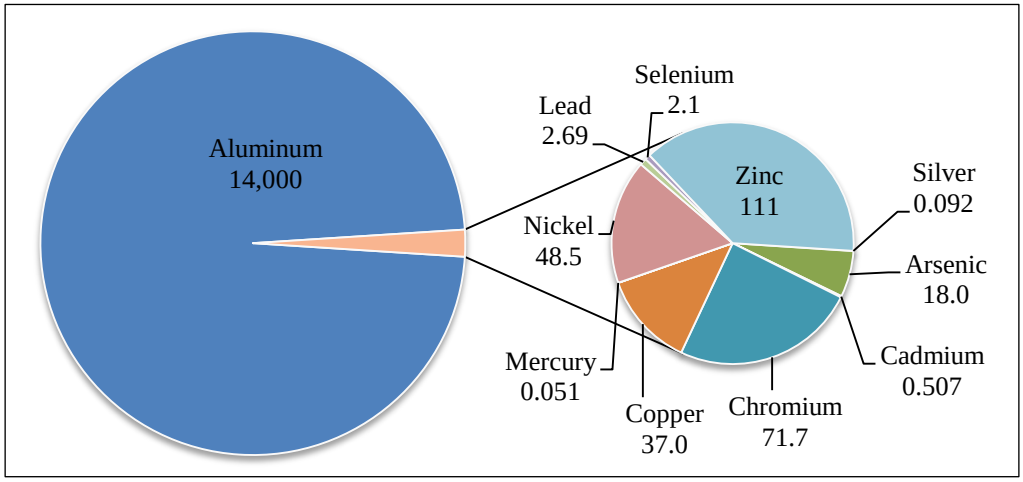

Figure 37.–2016 Upper Slate Creek sediment metals concentrations (mg/kg).

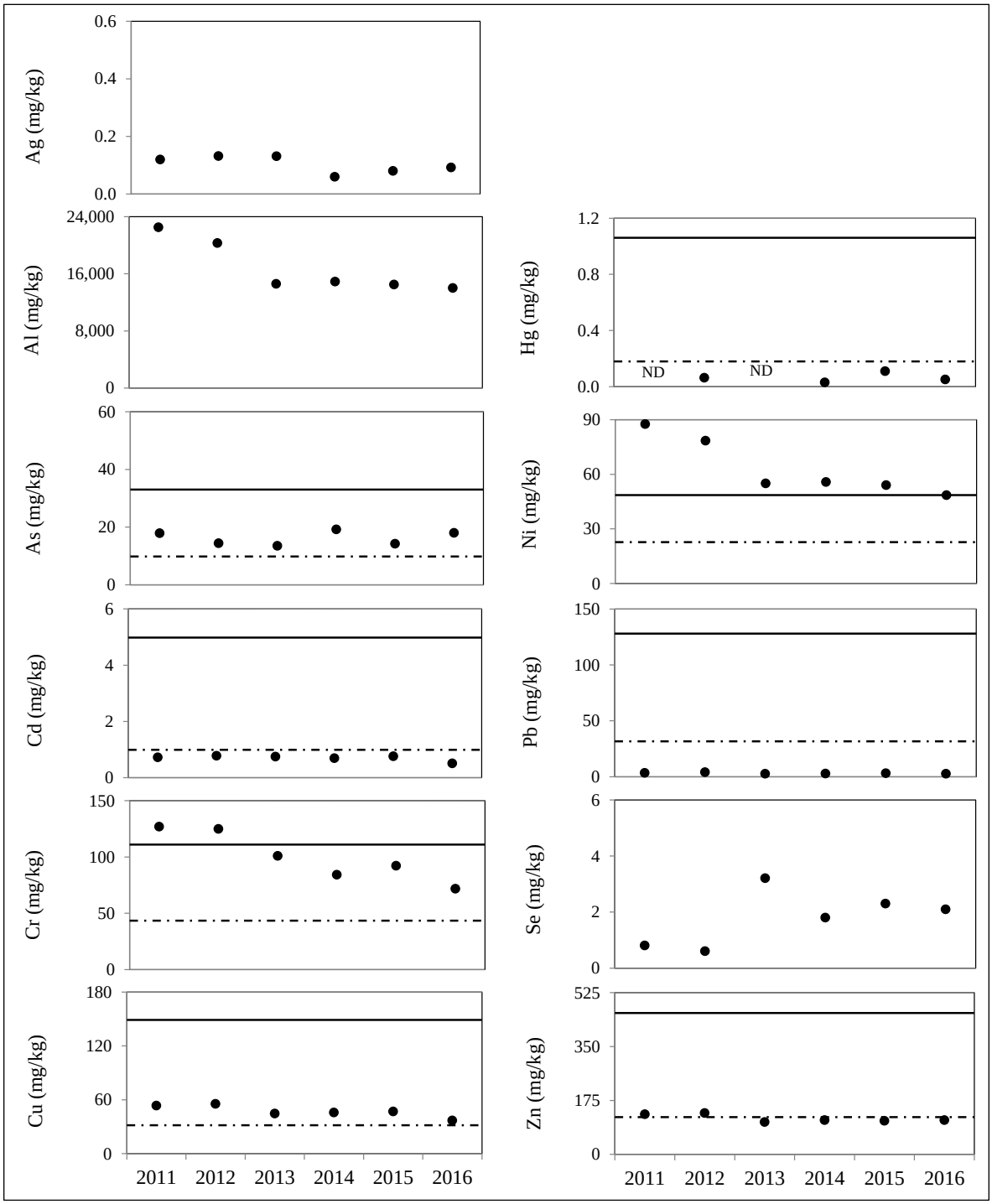

Figure 38.–Upper Slate Creek sediment metals concentrations, 2011–2016.

Note: The dashed line represents the TEC and the solid line represents the PEC for each analyte in freshwater sediments (Buchman 2008; MacDonald et al. 2000); guidelines are not published for Ag, Al, and Se; ND = not detected.

Sediment Toxicity

There were no significant ($p \leq 0.05$) reductions in *H. azteca* or *C. tentans* growth or survival between the laboratory control sediment and the 2016 Upper Slate Creek sediment sample.

JOHNSON CREEK

Lower Johnson Creek

Adult Salmon Counts

We counted 428 live adult pink salmon, 39 live chum salmon, and 24 live coho salmon in Lower Johnson Creek during the 2016 spawning season. Figure 39 presents the pink salmon count for each survey, and Figure 40 shows the distribution of pink salmon by reach. Table 18 presents 2011–2016 adult salmon count.

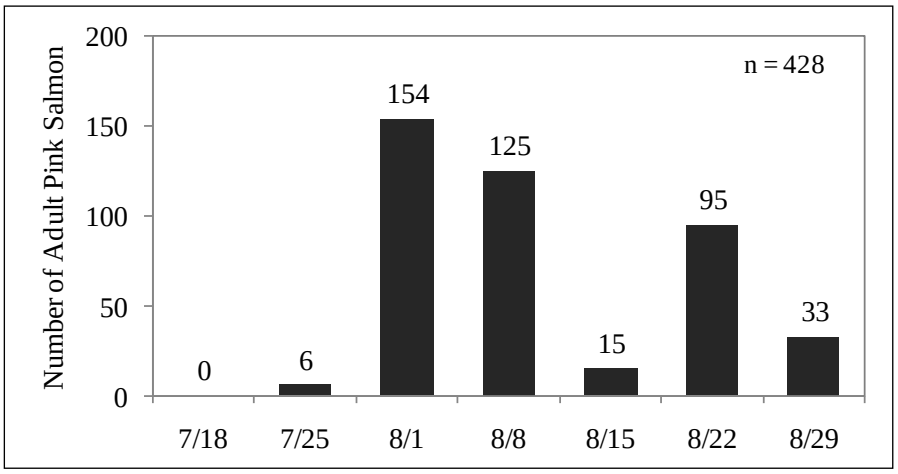

Figure 39.–2016 Lower Johnson Creek weekly pink salmon count.

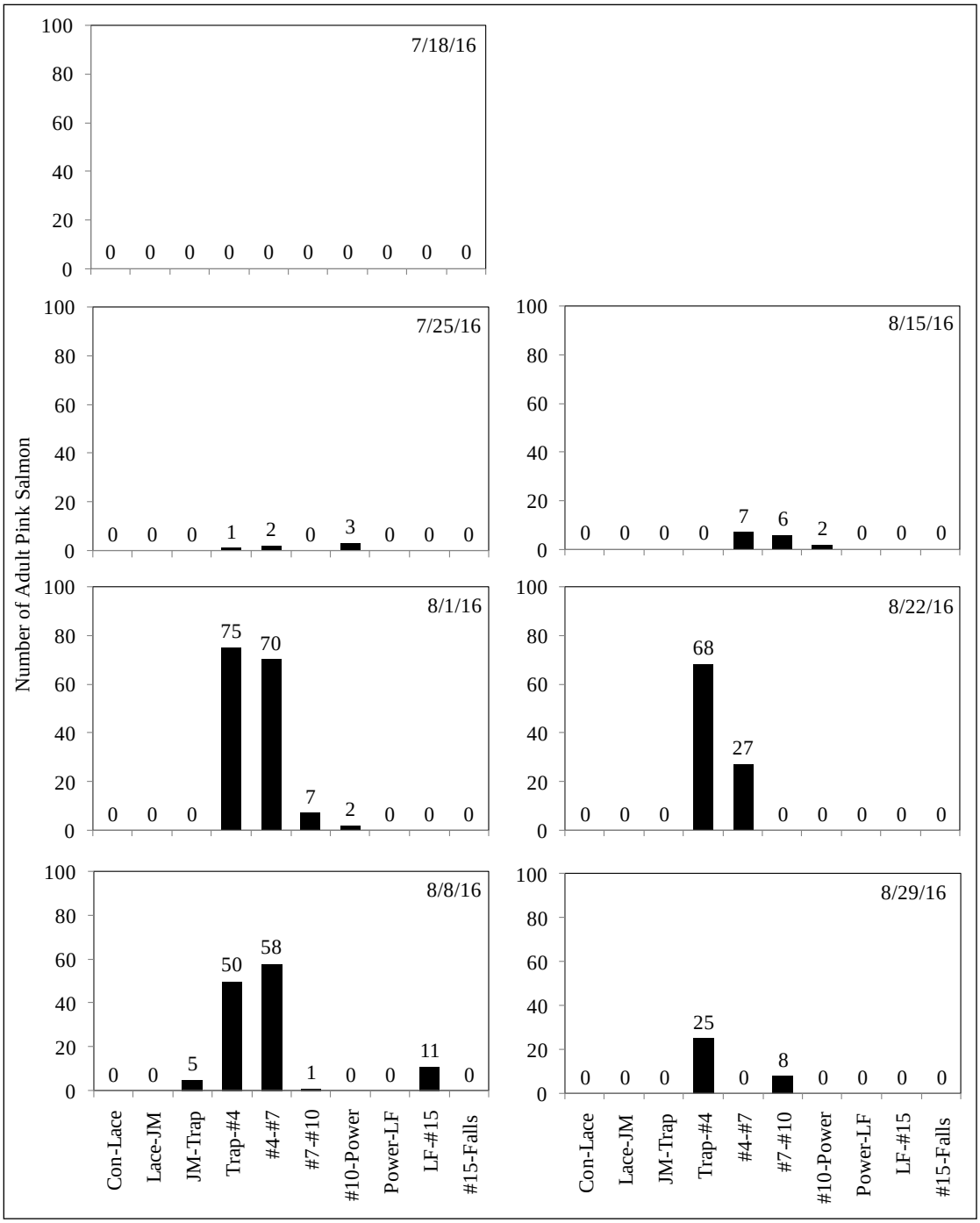

Figure 40.–2016 Lower Johnson Creek weekly pink salmon distribution.

Table 18.–Lower Johnson Creek adult salmon count, 2011–2016.

	2011	2012	2013	2014	2015	2016
Pink Salmon	17,509	5,016	8,186	189	51,325	428
Chum Salmon	18	99	17	3	0	39
Coho Salmon	33	90	64	107	88	24

Sediment Metals Concentrations

Sediment metals, As, and Se concentrations in the 2016 Lower Johnson Creek sediment sample are shown in Figure 41, and Figure 42 presents the 2011–2016 data. The 2016 sample contained a greater concentration of Ag and lower concentrations of Al, Ni and Zn than previous years, and the concentrations of other metals and As, and Se were within the range observed 2011–2015. As and Cu concentrations remain above NOAA's freshwater sediment guidelines (Buchman 2008; MacDonald et al. 2000). Se was not detected for the sixth year in a row.

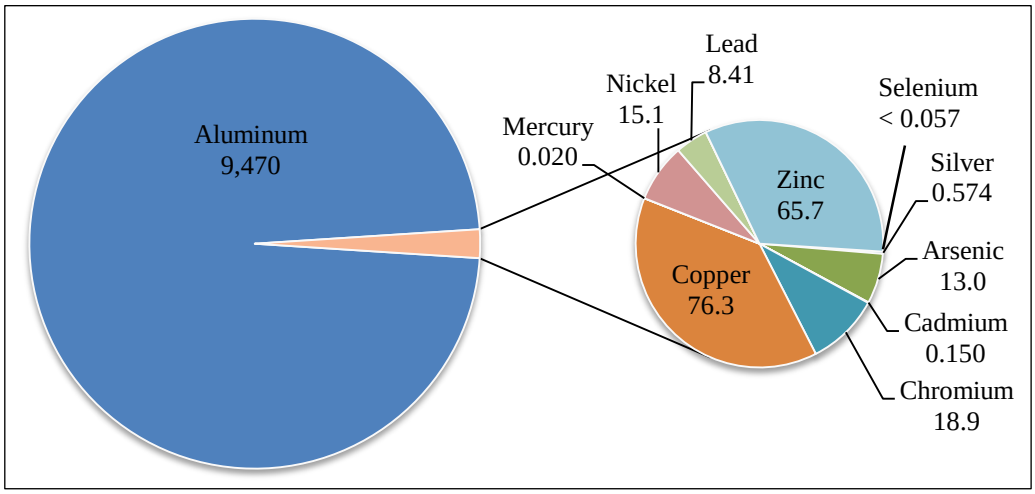

Figure 41.–2016 Lower Johnson Creek sediment metals concentrations (mg/kg).

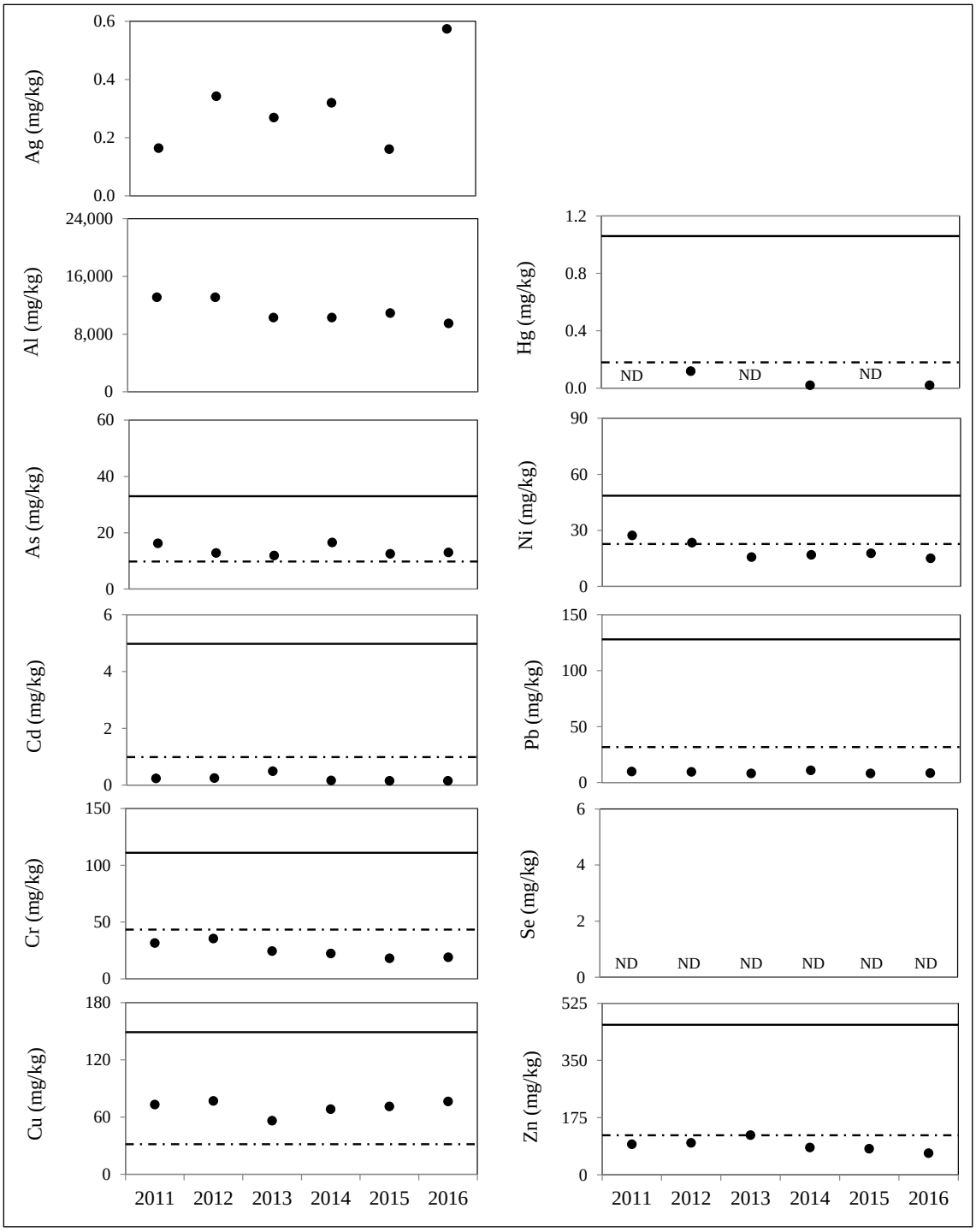

Figure 42.–Lower Johnson Creek sediment metals concentrations, 2011–2016.

Note: The dashed line represents the TEC and the solid line represents the PEC for each analyte in freshwater sediments(Buchman 2008; MacDonald et al. 2000); guidelines are not published for Ag, Al, and Se; ND = not detected.

Sediment Toxicity

There were no significant ($p \leq 0.05$) reductions in *H. azteca* or *C. tentans* growth or survival between the laboratory control sediment and the 2016 Lower Johnson Creek sediment sample.

Upper Johnson Creek

Benthic Macroinvertebrate Density and Community Composition

Among the 2016 Upper Johnson Creek BMI samples, we identified 32 taxa and estimate density at 3,681 BMI/m^2, of which 71% were EPT insects (Table 19, Figure 43), all within ranges observed since 2011. The Shannon Diversity and Evenness scores were also similar to previous years. The dominant taxa were Ephemeroptera: *Baetis*, representing 30% of the samples, and Diptera: Chironomidae, representing 22% of the samples.

Table 19.–Upper Johnson Creek BMI data summary, 2011–2016.

	5/3/11	4/26/12	4/29/13	4/29/14	4/28/15	4/27/16
Mean BMI/m^2	3,735	3,968	5,265	2,658	2,789	3,681
Total BMI Taxa	24	28	34	32	28	32
Number of EPT Taxa	14	14	24	21	17	21
% EPT	55%	64%	65%	69%	71%	71%
Shannon Diversity Score	0.76	0.81	0.74	0.74	0.87	0.88
Evenness Score	0.66	0.68	0.59	0.59	0.71	0.70

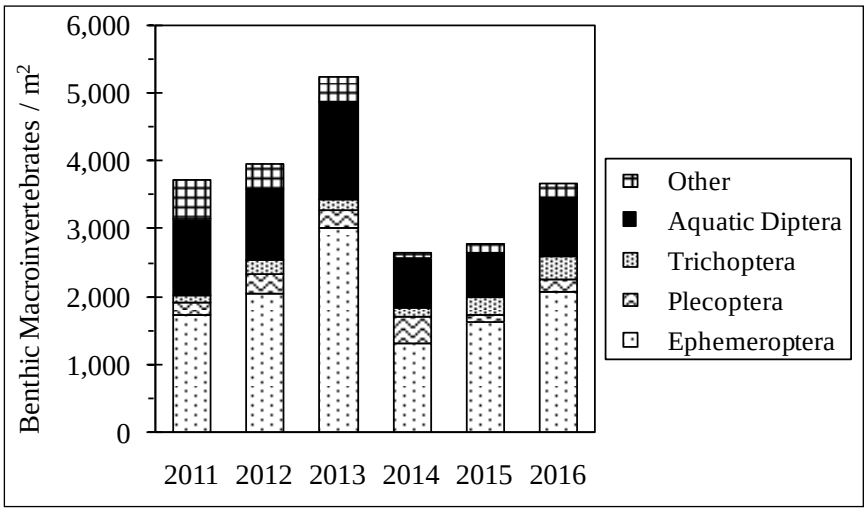

Figure 43.–Upper Johnson Creek BMI mean density and community composition, 2011–2016.

SHERMAN CREEK

Lower Sherman Creek

Periphyton Density and Composition

Sample Point 1

The 2016 Lower Sherman Creek SP1 mean chlorophyll *a* density was 3.70 mg/m^2, within the range observed since 2011 (Table 20). Figure 44 presents the minimum, mean, and maximum chlorophyll *a* density from samples collected each year and Figure 45 presents the mean proportion of chlorophylls *a*, *b*, and *c* each year.

Table 20.–Lower Sherman Creek SP1 mean chlorophylls *a*, *b*, and *c* density, 2011–2016.

	7/28/2011	7/26/2012	7/29/2013	7/28/2014	7/27/2015	7/25/2016
Chlorophyll *a* (mg/m^2)	7.60	2.54	3.69	1.34	1.36	3.70
Chlorophyll *b* (mg/m^2)	0.69	0.93	0.00	0.00	0.00	0.74
Chlorophyll *c* (mg/m^2)	0.49	0.08	0.51	0.18	0.17	0.33

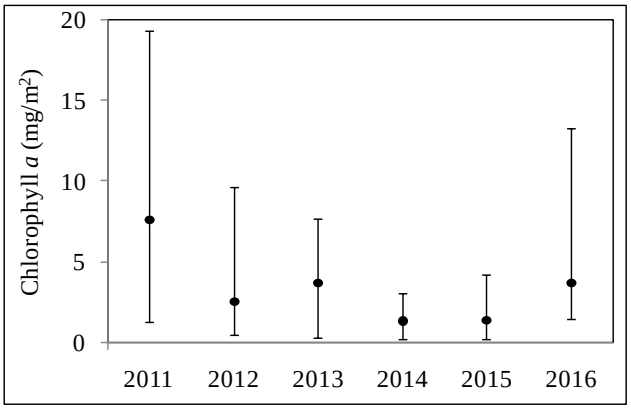

Figure 44.–Lower Sherman SP1 chlorophyll *a* density, 2011–2016.

Note: Minimum, mean, and maximum values presented.

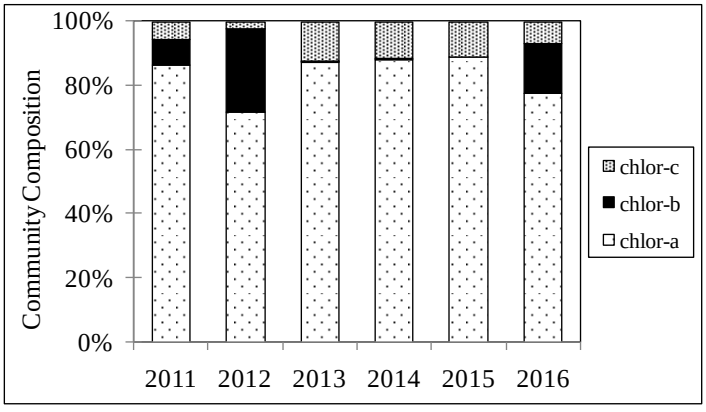

Figure 45.–Lower Sherman SP1 mean proportion of chlorophylls *a*, *b*, and *c*, 2011–2016.

Sample Point 2

The 2016 Lower Sherman Creek SP2 mean chlorophyll *a* density was 1.42 mg/m^2, similar to the mean observed in 2014 and 2015 (Table 21). Figure 46 presents the minimum, mean, and maximum chlorophyll *a* density from samples collected each year and Figure 47 presents the mean proportion of chlorophylls *a*, *b*, and *c* each year.

Table 21.–Lower Sherman Creek SP2 mean chlorophylls *a, b,* and *c* density, 2011–2016.

	7/28/2011	7/26/2012	7/29/2013	7/28/2014	7/27/2015	7/25/2016
Chlorophyll *a* (mg/m^2)	5.61	0.67	2.87	1.32	1.62	1.42
Chlorophyll *b* (mg/m^2)	0.02	0.01	0.00	0.00	0.15	0.04
Chlorophyll *c* (mg/m^2)	0.32	0.09	0.32	0.12	0.27	0.18

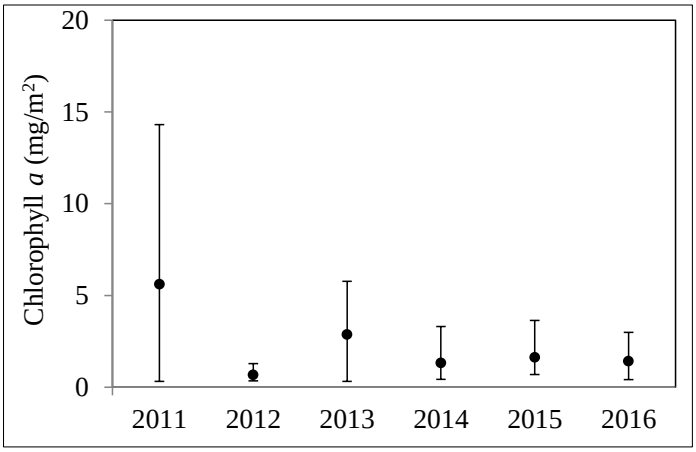

Figure 46.–Lower Sherman SP2 chlorophyll *a* density, 2011–2016.

Note: Minimum, mean, and maximum values presented.

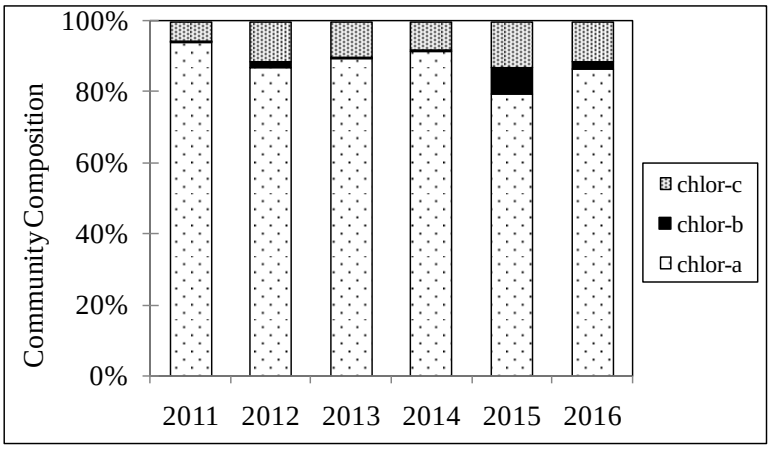

Figure 47.–Lower Sherman SP2 mean proportion of chlorophylls *a*, *b*, and *c*, 2011–2016.

Benthic Macroinvertebrate Density and Community Composition

Sample Point 1

Among the 2016 Lower Sherman Creek SP1 BMI samples, we identified 26 taxa and estimate density at 6,839 BMI/m^2, of which 4% were EPT insects (Table 22, Figure 48); the greatest density and lowest proportion[cc] of EPT insects we have observed since 2011. The Shannon Diversity and Evenness scores were lower than previous years and the dominant taxon was Annelida: Oligochaeta, representing 83% of the samples.

Table 22.–Lower Sherman Creek SP1 BMI data summary, 2011–2016.

	5/4/11	4/30/12	5/1/13	4/29/14	4/28/15	4/27/16
Mean BMI/m^2	1,118	2,733	1,796	3,023	1,651	6,839
Total BMI Taxa	26	31	28	30	26	26
Number of EPT Taxa	15	18	16	13	13	13
% EPT	32%	66%	64%	14%	27%	4%
Shannon Diversity Score	0.76	0.74	0.85	0.71	0.84	0.32
Evenness Score	0.71	0.62	0.71	0.57	0.70	0.27

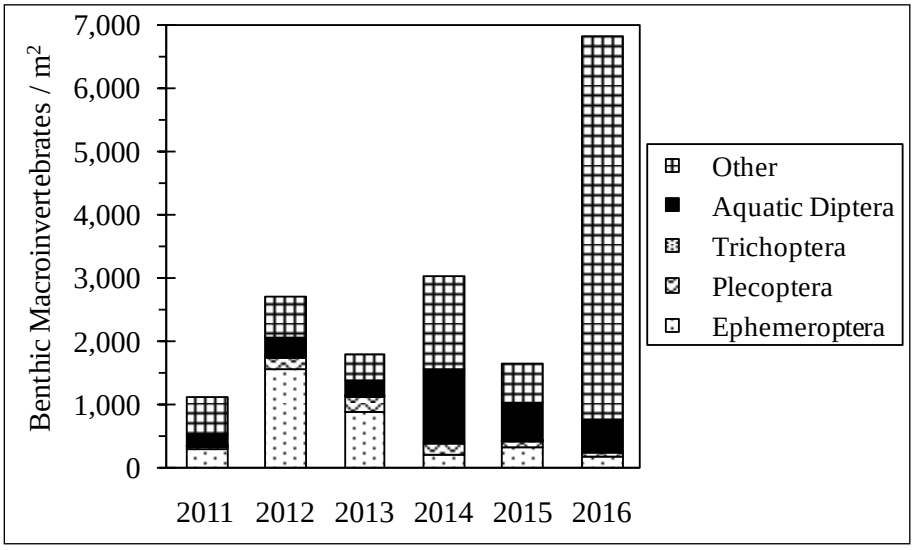

Figure 48.–Lower Sherman Creek SP1 BMI mean density and community composition, 2011–2016.

[cc] Largely due to an increase in the number of aquatic worms (Oligochaeta); three of the six BMI samples we collected contained pink salmon fry, coinciding with the greatest worm densities among the six samples.

Sample Point 2

Among 2016 Lower Sherman Creek SP2 BMI samples, we identified 23 taxa and estimate density at 1,873 BMI/m^2, of which 12% were EPT insects (Table 23, Figure 49), similar to the 2014 and 2015 sample results and due in part to an increase in the number of aquatic worms (Oligochaeta). The Shannon Diversity and Evenness scores were the lowest observed since 2011, and the dominant taxon was Annelida: Oligochaeta, representing 65% of the samples.

Table 23.–Lower Sherman Creek SP2 BMI data summary, 2011–2016.

	5/3/11	4/30/12	4/30/13	4/29/14	4/28/15	4/27/16
Mean BMI/m^2	1,651	2,823	3,385	1,185	1,609	1,873
Total BMI Taxa	30	37	39	28	23	23
Number of EPT Taxa	17	26	25	16	13	13
% EPT	76%	79%	72%	12%	25%	12%
Shannon Diversity Score	0.93	0.70	0.84	0.70	0.77	0.53
Evenness Score	0.76	0.57	0.65	0.62	0.66	0.49

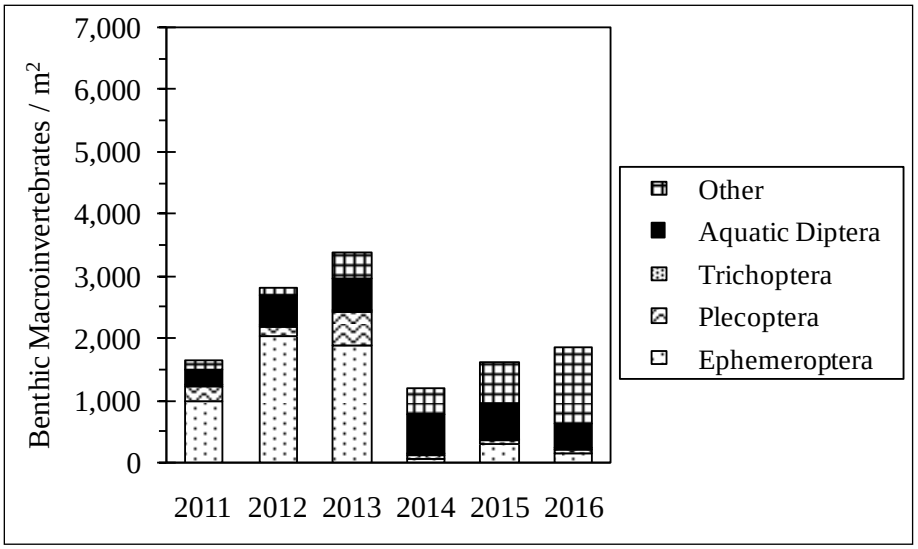

Figure 49.–Lower Sherman Creek SP2 BMI mean density and community composition, 2011–2016.

Adult Salmon Counts

We counted 26 live adult pink salmon and 5 live chum salmon in Lower Sherman Creek during the 2016 spawning season.[dd] Figure 50 presents the pink salmon count for each survey, and Figure 51 shows the distribution of pink salmon by reach. Table 24 presents the 2011–2016 adult salmon count.

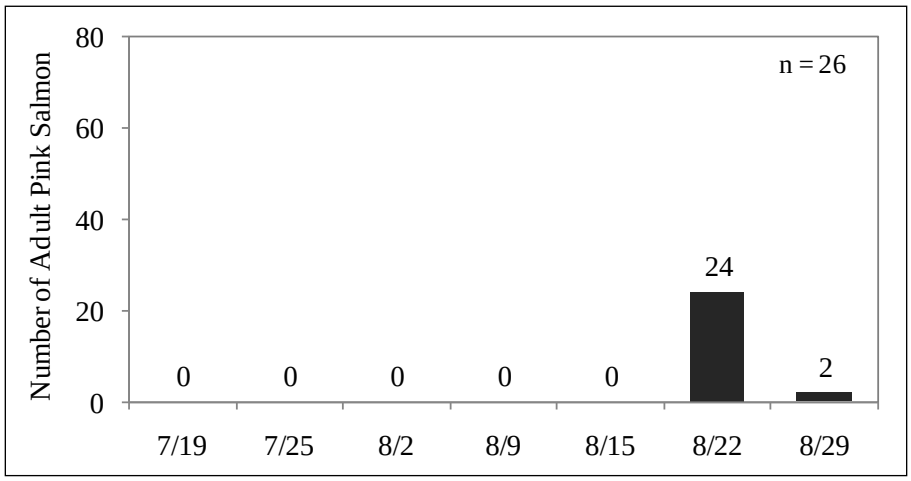

Figure 50.–2016 Lower Sherman Creek weekly pink salmon count.

[dd] On August 15 we were only able to survey the lower 150 m due to high flow and poor visibility, and on August 29 we surveyed by helicopter because the Comet Beach road was closed.

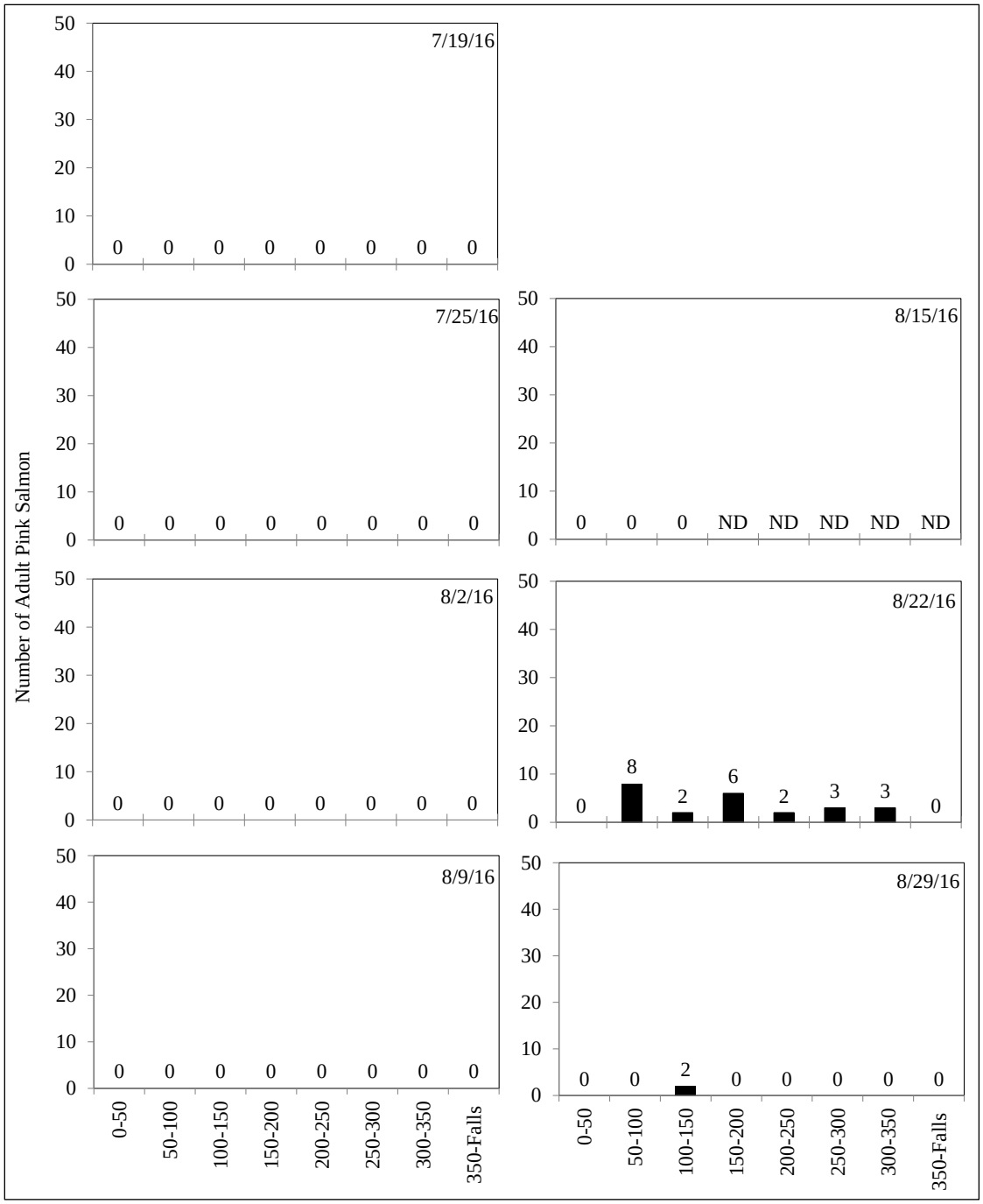

Figure 51.–2016 Lower Sherman Creek weekly pink salmon distribution.

Table 24.–Lower Sherman Creek adult salmon count, 2011–2016.

	2011	2012	2013	2014	2015	2016
Pink Salmon	4,624	1,608	4,981	70	2,798	26
Chum Salmon	0	0	12	0	1	5

Sediment Metals Concentrations

Sediment metals, As, and Se concentrations in the 2016 Lower Sherman Creek sediment sample are shown in Figure 52, and Figure 53 presents the 2011–2016 data. The 2016 sample contained lower concentrations of Ag, Al, As, Cr and Pb than previous years, and the concentrations of other metals and Se were within the range observed 2011–2015. The As, Cu, Ni, and Zn concentrations remain above NOAA's freshwater sediment guidelines (Buchman 2008; MacDonald et al. 2000).

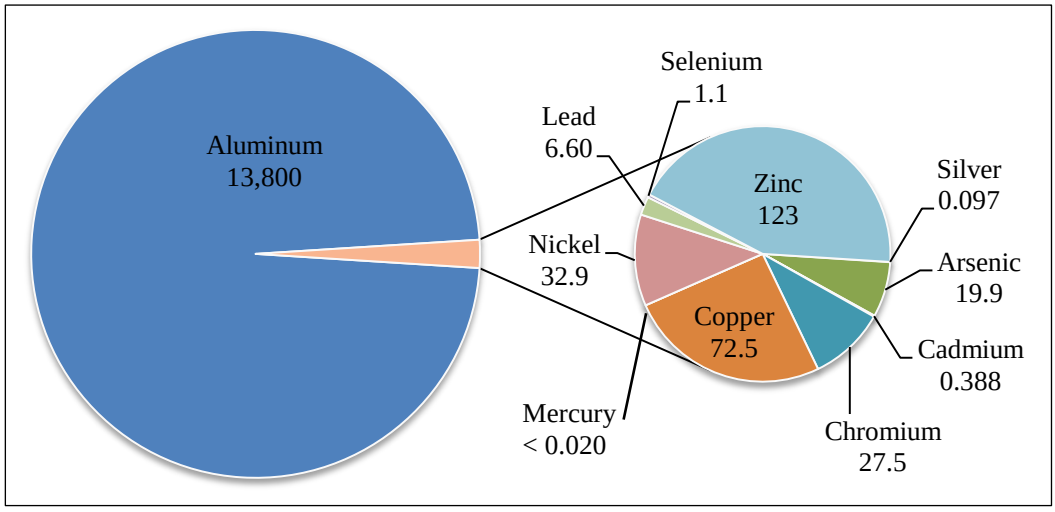

Figure 52.–2016 Lower Sherman Creek sediment metals concentrations (mg/kg).

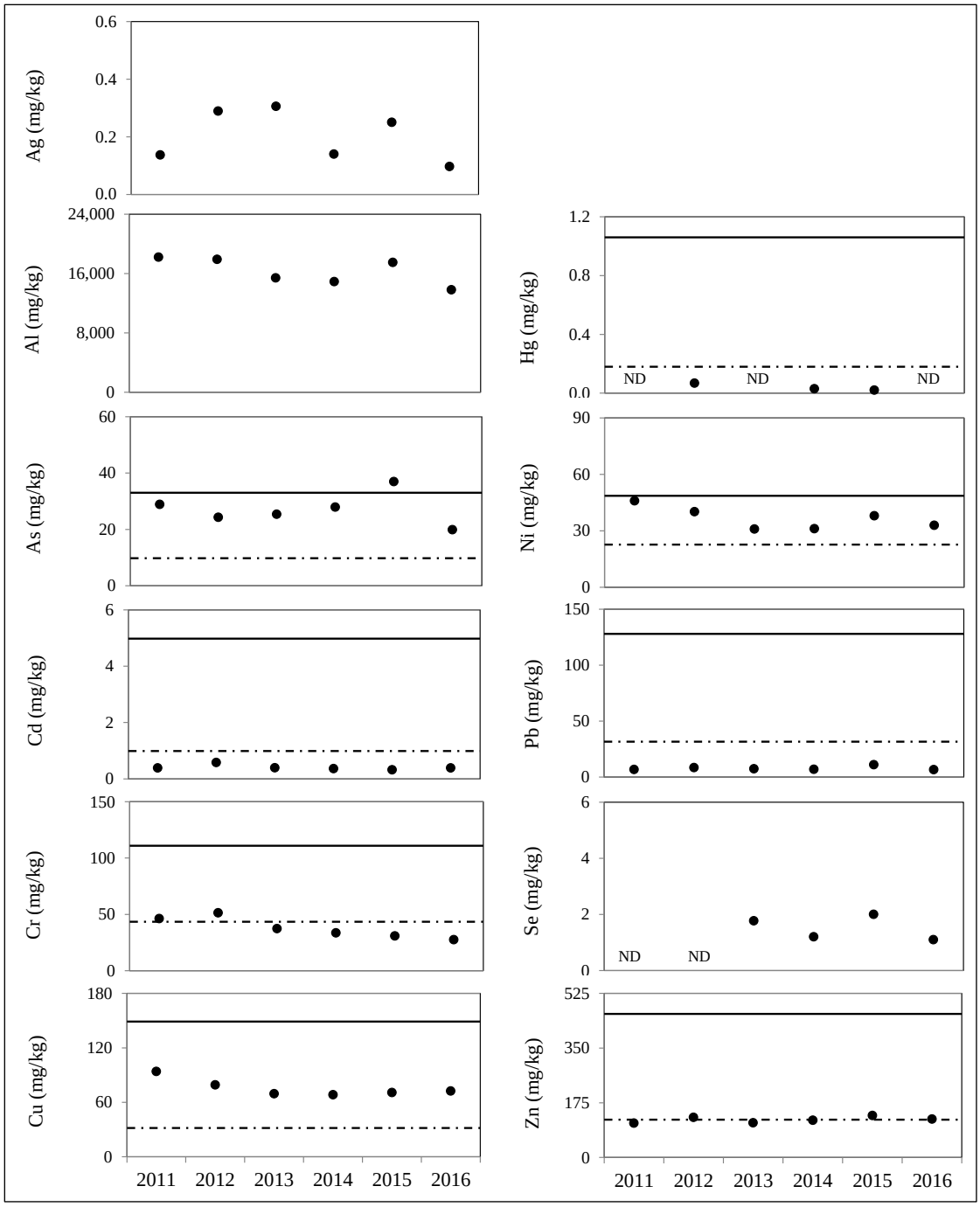

Figure 53.–Lower Sherman Creek sediment metals concentrations, 2011–2016.

Note: The dashed line represents the TEC and the solid line represents the PEC for each analyte in freshwater sediments(Buchman 2008; MacDonald et al. 2000); guidelines are not published for Ag, Al, and Se; ND = not detected.

Sediment Toxicity

C. tentans survival on the 2016 Lower Sherman Creek sediment sample was significantly ($p \leq 0.05$) lower than on the control sediment. *H. Azteca* growth and survival on the 2016 sediment sample were not significantly ($p \leq 0.05$) different than on the control sediment.

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[ee] This publication is actually the resident fish survey report.

[ff] This publication is actually the invertebrate tissue analysis.

[gg] Actually published February 2010.

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APPENDIX A: PERIPHYTON DATA

Appendix A.1.–Lower Slate Creek chlorophylls *a*, *b*, and *c* density, 2011–2016.

	July 2011			July 2012			July 2013			July 2014		
mg/m²	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*
	0.21	0.05	0.00	1.60	0.13	0.07	14.10	0.00	1.56	0.37	0.00	0.00
	1.28	0.02	0.11	4.06	0.00	0.39	20.72	0.00	3.11	9.29	3.22	0.48
	0.85	0.01	0.07	2.03	0.00	0.18	10.89	0.00	1.01	1.45	0.00	0.23
	3.31	0.08	0.25	0.96	0.00	0.04	17.84	0.00	2.66	12.18	5.27	0.38
	11.85	3.11	0.30	2.56	0.04	0.22	2.14	0.00	0.24	0.75	0.00	0.05
	18.05	0.42	0.91	0.92	0.00	0.01	6.09	0.00	0.95	4.70	0.00	0.67
	0.72	0.13	0.00	1.49	0.13	0.13	15.49	0.00	1.99	2.88	0.00	0.49
	0.43	0.05	0.00	2.35	0.12	0.19	12.71	0.00	1.58	1.82	0.00	0.15
	8.54	0.39	0.58	6.19	0.05	0.54	11.32	0.00	1.87	0.73	0.00	0.07
	6.30	0.03	0.38	0.96	0.00	0.06	14.63	0.00	1.46	5.87	0.00	0.51
mean	5.15	0.43	0.26	2.31	0.05	0.18	12.59	0.00	1.64	4.00	0.85	0.30
max	18.05	3.11	0.91	6.19	0.13	0.54	20.72	0.00	3.11	12.18	5.27	0.67
min	0.21	0.01	0.00	0.92	0.00	0.01	2.14	0.00	0.24	0.37	0.00	0.00

	July 2015			April 2016			July 2016		
mg/m²	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*
	0.45	0.10	0.01	1.82	0.00	0.37	0.60	0.00	0.12
	3.06	0.00	0.28	2.88	0.00	0.54	15.27	0.00	2.14
	0.95	0.09	0.04	3.95	0.00	0.43	6.41	0.00	0.97
	0.85	0.00	0.06	3.17	0.00	0.52	2.35	0.00	0.22
	0.72	0.13	0.00	3.26	0.00	0.48	9.51	0.76	0.88
	2.24	0.44	0.12	1.47	0.00	0.23	2.88	0.66	0.20
	9.93	0.00	1.13	2.71	0.00	0.46	3.52	0.00	0.40
	0.19	-	-	0.78	0.00	0.06	2.03	0.00	0.28
	2.88	0.14	0.28	2.14	0.07	0.19	5.34	0.67	0.36
	0.32	0.01	0.00	5.23	0.00	0.86	4.70	0.00	0.65
mean	2.16	0.10	0.21	2.74	0.01	0.41	5.26	0.21	0.62
max	9.93	0.44	1.13	5.23	0.07	0.86	15.27	0.76	2.14
min	0.19	0.00	0.00	0.78	0.00	0.06	0.60	0.00	0.12

Note: Bolded values are the spectrophotometer estimated detection limit, chlorophyll *a* not detected.

Appendix A.2.–West Fork Slate Creek chlorophylls *a*, *b*, and *c* density, 2011–2016.

	July 2011			July 2012			July 2013			July 2014		
mg/m²	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*
	2.52	0.00	0.19	1.15	0.00	0.04	4.70	0.00	0.74	0.32	0.00	0.01
	4.70	0.00	0.43	0.41	0.00	0.08	1.39	0.00	0.16	0.19	0.00	0.00
	2.78	0.00	0.26	0.53	0.00	0.02	13.14	0.00	2.19	0.75	0.00	0.05
	3.35	0.00	0.04	0.64	0.00	0.16	4.38	0.00	0.47	0.88	0.00	0.00
	4.27	0.00	0.25	3.62	0.00	0.24	1.28	0.00	0.11	1.60	0.00	0.19
	4.91	0.00	0.42	0.85	0.00	0.14	3.10	0.00	0.50	0.23	0.00	0.03
	3.95	0.00	0.27	0.96	0.01	0.07	3.74	0.00	0.53	0.41	0.00	0.00
	3.10	0.00	0.25	0.41	0.00	0.08	2.03	0.00	0.33	0.33	0.00	0.02
	4.38	0.00	0.39	0.60	0.00	0.12	5.02	0.00	0.67	1.18	0.00	0.13
	5.23	0.00	0.20	0.96	0.00	0.06	3.40	0.00	0.36	1.82	0.00	0.15
mean	3.92	0.00	0.27	1.01	0.00	0.10	4.22	0.00	0.61	0.77	0.00	0.06
max	5.23	0.00	0.43	3.62	0.01	0.24	13.14	0.00	2.19	1.82	0.00	0.19
min	2.52	0.00	0.04	0.41	0.00	0.02	1.28	0.00	0.11	0.19	0.00	0.00

	July 2015			July 2016		
mg/m²	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*
	1.34	0.00	0.21	7.48	0.00	1.16
	0.92	0.00	0.01	4.70	0.00	0.71
	0.77	0.02	0.03	3.22	0.00	0.25
	0.54	0.05	0.00	5.34	0.00	0.61
	0.19	-	-	2.67	0.00	0.34
	1.64	0.00	0.04	3.31	0.00	0.45
	2.35	0.00	0.21	4.27	0.00	0.44
	0.53	0.12	0.00	0.92	0.00	0.01
	0.56	0.00	0.06	10.89	0.00	1.64
	0.32	0.05	0.00	6.51	0.00	0.95
mean	0.92	0.03	0.06	4.93	0.00	0.66
max	2.35	0.12	0.21	10.89	0.00	1.64
min	0.19	0.00	0.00	0.92	0.00	0.01

Note: Bolded values are the spectrophotometer estimated detection limit, chlorophyll *a* not detected.

Appendix A.3.–East Fork Slate Creek chlorophylls *a*, *b*, and *c* density, 2011–2016.

	July 2011			July 2012			July 2013			July 2014		
mg/m²	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*
	9.51	2.16	0.24	11.53	3.24	0.28	8.12	0.00	0.67	0.14	0.00	0.00
	9.18	0.02	0.20	0.41	0.04	0.04	**0.24**	-	-	0.64	0.00	0.07
	1.28	0.03	0.00	0.88	0.00	0.05	1.07	0.03	0.07	**0.05**	-	-
	5.13	1.15	0.11	0.50	0.00	0.03	0.32	0.07	0.00	0.75	0.14	0.10
	16.02	0.18	0.44	3.42	0.00	0.11	0.64	0.10	0.00	**0.05**	-	-
	8.86	1.94	0.70	0.64	0.08	0.05	5.02	0.16	0.35	0.37	0.00	0.00
	4.70	0.70	0.13	18.58	0.00	0.66	0.43	0.00	0.03	**0.05**	-	-
	16.13	5.35	0.28	13.67	2.32	0.57	6.41	0.11	0.50	0.11	0.00	0.00
	4.91	0.49	0.12	0.69	0.00	0.00	0.32	0.00	0.00	0.53	0.00	0.01
	12.71	3.59	0.15	0.43	0.00	0.00	**0.24**	-	-	**0.05**	-	-
mean	8.84	1.56	0.24	5.08	0.57	0.18	2.28	0.06	0.20	0.27	0.02	0.03
max	16.13	5.35	0.70	18.58	3.24	0.66	8.12	0.16	0.67	0.75	0.14	0.10
min	1.28	0.02	0.00	0.41	0.00	0.00	0.24	0.00	0.00	0.05	0.00	0.00

	July 2015			April 2016			July 2016		
mg/m²	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*
	0.85	0.00	0.12	0.32	0.00	0.09	0.23	0.00	0.03
	0.19	-	-	1.07	0.00	0.04	4.91	0.00	0.69
	1.92	0.00	0.09	10.04	0.00	1.53	0.75	0.00	0.05
	0.96	0.00	0.09	2.98	0.00	0.48	1.42	0.00	0.14
	1.60	0.00	0.22	1.82	0.25	0.15	0.85	0.02	0.17
	5.34	0.00	0.55	0.77	0.01	0.13	1.56	0.00	0.12
	2.14	0.00	0.09	1.15	0.00	0.24	0.64	0.00	0.08
	0.37	0.00	0.00	0.87	0.00	0.11	**0.19**	-	-
	0.92	0.00	0.11	**0.19**	---	---	0.87	0.00	0.02
	1.28	0.00	0.08	0.55	0.00	0.12	0.64	0.00	0.06
mean	1.56	0.00	0.15	1.98	0.03	0.32	1.21	0.00	0.15
max	5.34	0.00	0.55	10.04	0.25	1.53	4.91	0.02	0.69
min	0.19	0.00	0.00	0.19	0.00	0.04	0.19	0.00	0.02

Note: Bolded values are the spectrophotometer estimated detection limit, chlorophyll *a* not detected.

Appendix A.4.–Upper Slate Creek chlorophylls *a*, *b*, and *c* density, 2011–2016.

	July 2011			July 2012			July 2013			July 2014		
mg/m²	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*
	0.41	0.00	0.00	2.03	0.00	0.14	1.82	0.00	0.27	0.92	0.00	0.11
	0.32	0.00	0.04	0.96	0.00	0.09	0.85	0.01	0.07	1.20	0.00	0.07
	0.96	0.01	0.07	0.75	0.00	0.00	2.94	0.00	0.13	1.52	0.00	0.06
	0.11	0.00	0.00	0.50	0.00	0.03	1.39	0.00	0.12	1.82	0.00	0.15
	2.67	0.00	0.26	2.03	0.00	0.14	2.99	0.00	0.11	0.85	0.00	0.00
	0.28	0.00	0.00	1.07	0.00	0.14	4.59	0.00	0.20	0.64	0.00	0.01
	0.60	0.00	0.12	0.55	0.00	0.02	0.85	0.00	0.01	1.18	0.00	0.07
	1.14	0.00	0.01	1.71	0.00	0.06	2.03	0.00	0.20	0.96	0.00	0.00
	0.53	0.00	0.00	2.14	0.00	0.12	0.85	0.00	0.00	0.64	0.00	0.01
	0.60	0.00	0.02	0.83	0.00	0.00	2.94	0.00	0.20	1.17	0.00	0.12
mean	0.76	0.00	0.05	1.26	0.00	0.07	2.13	0.00	0.13	1.09	0.00	0.06
max	2.67	0.01	0.26	2.14	0.00	0.14	4.59	0.01	0.27	1.82	0.00	0.15
min	0.11	0.00	0.00	0.50	0.00	0.00	0.85	0.00	0.00	0.64	0.00	0.00

	July 2015			July 2016		
mg/m²	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*
	0.37	0.00	0.08	1.15	0.00	0.07
	0.64	0.00	0.08	8.86	0.00	1.12
	0.64	0.00	0.07	1.52	0.00	0.06
	0.51	0.00	0.06	5.34	0.00	0.93
	0.43	0.00	0.08	2.85	0.00	0.14
	0.55	0.00	0.28	1.01	0.00	0.09
	0.64	0.00	0.02	4.81	0.00	0.40
	0.64	0.00	0.08	2.40	0.16	0.21
	0.69	0.00	0.00	4.49	0.00	0.36
	1.17	0.00	0.13	6.19	0.00	0.79
mean	0.63	0.00	0.09	3.86	0.02	0.42
max	1.17	0.00	0.28	8.86	0.16	1.12
min	0.37	0.00	0.00	1.01	0.00	0.06

Appendix A.5.–Lower Sherman Creek SP1 chlorophylls *a*, *b*, and *c* density, 2011–2016.

	July 2011			July 2012			July 2013			July 2014		
mg/m²	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*
	1.28	0.00	0.05	1.07	0.00	0.14	4.06	0.00	0.38	2.46	0.00	0.30
	5.34	0.00	0.36	2.88	0.87	0.16	5.55	0.00	0.73	0.74	0.00	0.10
	5.98	0.00	0.54	0.41	0.04	0.04	**0.24**	-	-	0.19	0.00	0.00
	3.84	0.10	0.48	2.67	1.27	0.00	4.67	0.00	0.55	0.92	0.00	0.14
	15.59	3.98	0.17	0.60	0.00	0.12	7.69	0.00	0.89	0.83	0.00	0.15
	11.11	2.64	0.28	1.07	0.00	0.11	7.37	0.00	0.62	2.99	0.00	0.47
	19.33	0.00	1.65	3.63	1.56	0.03	**0.24**	-	-	1.39	0.00	0.17
	7.26	0.00	0.74	9.61	4.12	0.08	2.67	0.00	0.35	2.46	0.00	0.25
	1.92	0.04	0.19	2.99	1.43	0.02	0.75	0.03	0.08	0.45	0.01	0.04
	4.38	0.17	0.44	0.43	0.00	0.06	ND	ND	ND	0.96	0.00	0.16
mean	7.60	0.69	0.49	2.54	0.93	0.08	3.69	0.00	0.51	1.34	0.00	0.18
max	19.33	3.98	1.65	9.61	4.12	0.16	7.69	0.03	0.89	2.99	0.01	0.47
min	1.28	0.00	0.05	0.41	0.00	0.00	0.24	0.00	0.08	0.19	0.00	0.00

	July 2015			July 2016		
mg/m²	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*
	0.28	0.00	0.03	3.31	0.52	0.31
	0.19	-	-	4.27	0.00	0.76
	0.92	0.00	0.11	1.39	0.00	0.16
	0.64	0.00	0.01	2.14	0.00	0.37
	2.67	0.00	0.31	2.28	0.00	0.32
	0.79	0.00	0.00	13.24	6.47	0.31
	2.78	0.00	0.32	2.78	0.13	0.23
	0.19	-	-	2.24	0.00	0.31
	4.17	0.00	0.49	3.31	0.12	0.35
	1.01	0.00	0.09	2.03	0.20	0.17
mean	1.36	0.00	0.17	3.70	0.74	0.33
max	4.17	0.00	0.49	13.24	6.47	0.76
min	0.19	0.00	0.00	1.39	0.00	0.16

Note: Bolded values are the spectrophotometer estimated detection limit, chlorophyll *a* not detected.

Appendix A.6.–Lower Sherman Creek SP2 chlorophylls *a*, *b*, and *c* density, 2011–2016.

	July 2011			July 2012			July 2013			July 2014		
mg/m²	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*
	3.10	0.00	0.26	1.05	0.04	0.12	1.07	0.00	0.14	0.74	0.00	0.10
	6.30	0.19	0.62	0.64	0.00	0.11	3.84	0.00	0.34	1.38	0.00	0.18
	4.59	0.00	0.38	0.73	0.00	0.07	0.96	0.00	0.15	2.83	0.00	0.15
	0.32	0.00	0.00	0.50	0.07	0.10	4.81	0.00	0.49	3.31	0.00	0.31
	13.88	0.00	0.54	**0.34**	-	-	5.77	0.00	0.78	0.75	0.00	0.06
	7.37	0.00	0.46	0.51	0.00	0.06	0.32	0.02	0.10	0.85	0.03	0.08
	1.50	0.00	0.09	0.96	0.00	0.16	4.70	0.00	0.44	0.85	0.00	0.01
	14.31	0.00	0.59	0.37	0.00	0.00	3.52	0.00	0.35	1.39	0.00	0.16
	0.85	0.00	0.01	1.28	0.00	0.09	0.53	0.00	0.02	0.43	0.01	0.04
	3.84	0.00	0.25	**0.34**	-	-	3.20	0.00	0.43	0.69	0.00	0.07
mean	5.61	0.02	0.32	0.67	0.01	0.09	2.87	0.00	0.32	1.32	0.00	0.12
max	14.31	0.19	0.62	1.28	0.07	0.16	5.77	0.02	0.78	3.31	0.03	0.31
min	0.32	0.00	0.00	0.34	0.00	0.00	0.32	0.00	0.02	0.43	0.00	0.01

	July 2015			July 2016		
mg/m²	chlor-*a*	chlor-*b*	chlor-*c*	chlor-*a*	chlor-*b*	chlor-*c*
	0.69	0.00	0.00	1.50	0.00	0.17
	0.96	0.00	0.00	2.03	0.00	0.30
	0.85	0.00	0.11	0.43	0.00	0.13
	1.28	0.00	0.16	2.98	0.00	0.38
	2.14	0.00	0.24	0.96	0.00	0.09
	3.63	0.65	0.43	1.28	0.04	0.26
	0.96	0.07	0.03	1.71	0.00	0.22
	2.14	0.78	1.30	1.92	0.35	0.16
	1.07	0.00	0.14	0.41	0.00	0.08
	2.46	0.00	0.24	0.96	0.00	0.06
mean	1.62	0.15	0.27	1.42	0.04	0.19
max	3.63	0.78	1.30	2.98	0.35	0.38
min	0.69	0.00	0.00	0.41	0.00	0.06

Note: Bolded values are the spectrophotometer estimated detection limit, chlorophyll *a* not detected.

APPENDIX B: BENTHIC MACROINVERTEBRATE DATA

Appendix B.1.–Lower Slate Creek BMI data summary, 2011–2016.

	5/4/11	5/2/12	4/30/13	4/30/14	4/27/15	4/26/16
Total BMI Taxa	29	32	27	32	26	24
Total EPT Taxa	13	17	16	17	13	11
Total BMI Counted	1,148	1,760	1,200	2,308	1,901	1,894
Ephemeroptera	85	387	400	73	196	225
Plecoptera	70	274	203	352	258	61
Trichoptera	2	8	6	17	6	3
Aquatic Diptera	862	975	503	1,711	1,268	1038
Other	129	116	88	155	173	567
% Ephemeroptera	7%	22%	33%	3%	10%	12%
% Plecoptera	6%	16%	17%	15%	14%	3%
% Trichoptera	0.2%	0.5%	0.5%	0.7%	0.3%	0.2%
% Aquatic Diptera	75%	55%	42%	74%	67%	55%
% Other	11%	7%	7%	7%	9%	30%
% EPT	14%	38%	51%	19%	24%	15%
% Chironomidae	72%	53%	35%	68%	64%	51%
Shannon Diversity Score (H)	0.51	0.69	0.85	0.64	0.70	0.65
Evenness Score (E)	0.48	0.58	0.70	0.52	0.58	0.57
Total Sample Area (m^2)	0.558	0.558	0.465	0.558	0.558	0.558
Mean BMI/m^2	2,057	3,154	2,581	4,136	3,407	3,394
±1 SD	1,046	1,849	551	3,592	2,458	1,667
Terrestrial Invertebrates	0	4	0	1	3	88
Juvenile Fish	1	0	0	1	0	0

Appendix B.2.–West Fork Slate Creek BMI data summary, 2011–2016.

	5/4/11	5/2/12	4/30/13	4/30/14	4/27/15	4/26/16
Total BMI Taxa	21	31	28	29	28	25
Total EPT Taxa	11	21	18	17	16	15
Total BMI Counted	280	1,015	1,365	543	1,470	820
Ephemeroptera	181	634	991	223	956	564
Plecoptera	41	166	233	150	243	55
Trichoptera	3	11	10	15	10	10
Aquatic Diptera	35	175	118	136	215	151
Other	20	29	13	19	46	40
% Ephemeroptera	65%	63%	73%	41%	65%	69%
% Plecoptera	15%	16%	17%	28%	17%	7%
% Trichoptera	1%	1%	0.7%	3%	0.7%	1%
% Aquatic Diptera	13%	17%	9%	25%	15%	18%
% Other	7%	3%	1%	3%	3%	5%
% EPT	80%	80%	90%	71%	82%	77%
% Chironomidae	10%	15%	7%	22%	12%	18%
Shannon Diversity Score (H)	0.63	0.84	0.73	0.91	0.82	0.72
Evenness Score (E)	0.78	0.71	0.61	0.79	0.71	0.69
Total Sample Area (m^2)	0.558	0.558	0.558	0.558	0.558	0.558
Mean BMI/m^2	502	1,819	2,446	973	2,634	1,470
±1 SD	410	1,009	777	482	1,400	703
Terrestrial Invertebrates	2	0	0	0	1	7
Juvenile Fish	0	0	0	0	0	0

Appendix B.3.–East Fork Slate Creek BMI data summary, 2011–2016.

	5/12/11	4/27/12	4/29/13	4/30/14	4/29/15	4/25/16
Total BMI Taxa	27	33	33	24	28	21
Total EPT Taxa	15	17	17	9	16	11
Total BMI Counted	2,616	2,585	5,249	1,143	1,792	1,117
Ephemeroptera	387	490	19	9	274	227
Plecoptera	70	73	45	10	36	42
Trichoptera	28	23	66	3	14	40
Aquatic Diptera	507	547	598	454	633	398
Other	1,624	1,451	4,521	667	835	410
% Ephemeroptera	15%	19%	0.4%	0.8%	15%	20%
% Plecoptera	3%	3%	0.9%	0.9%	2%	4%
% Trichoptera	1%	0.9%	1%	0.3%	0.8%	4%
% Aquatic Diptera	19%	21%	11%	40%	35%	36%
% Other	62%	56%	86%	58%	47%	37%
% EPT	19%	23%	2%	2%	18%	28%
% Chironomidae	17%	15%	10%	35%	28%	26%
Shannon Diversity Score (H)	0.64	0.78	0.57	0.70	0.92	0.92
Evenness Score (E)	0.54	0.61	0.47	0.63	0.72	0.78
Total Sample Area (m^2)	0.558	0.558	0.558	0.558	0.465	0.558
Mean BMI/m^2	4,688	4,633	9,407	2,048	3,854	2,002
±1 SD	1,081	1,325	3,830	952	837	469
Terrestrial Invertebrates	3	1	0	0	5	11
Juvenile Fish	0	0	0	0	0	0

Appendix B.4.–Upper Slate Creek BMI data summary, 2011–2016.

	5/12/11	4/27/12	4/29/13	4/28/14	4/29/15	4/25/16
Total BMI Taxa	33	39	34	36	31	28
Total EPT Taxa	18	21	20	20	19	15
Total BMI Counted	1,408	1,259	1,607	1,744	2,107	1,338
Ephemeroptera	368	454	492	622	622	554
Plecoptera	401	349	604	429	758	252
Trichoptera	116	48	55	44	44	104
Aquatic Diptera	248	273	338	518	517	169
Other	275	135	118	131	166	259
% Ephemeroptera	26%	36%	31%	36%	30%	41%
% Plecoptera	29%	28%	38%	25%	36%	19%
% Trichoptera	8.2%	4%	3%	3%	2%	8%
% Aquatic Diptera	18%	22%	21%	30%	25%	13%
% Other	20%	11%	7%	8%	8%	19%
% EPT	63%	68%	72%	63%	68%	68%
% Chironomidae	15%	20%	19%	28%	22%	11%
Shannon Diversity Score (H)	0.97	1.04	1.02	1.03	0.98	1.06
Evenness Score (E)	0.76	0.79	0.78	0.76	0.74	0.82
Total Sample Area (m^2)	0.558	0.558	0.558	0.558	0.558	0.558
Mean BMI/m^2	2,523	2,256	2,880	3,125	3,776	2,398
±1 SD	1,173	1,321	1,049	660	1,174	520
Terrestrial Invertebrates	1	0	0	1	3	6
Juvenile Fish	0	0	0	0	0	0

Appendix B.5.–Upper Johnson Creek BMI data summary, 2011–2016.

	5/3/11	4/26/12	4/29/13	4/29/14	4/28/15	4/27/16
Total BMI Taxa	24	28	34	32	28	32
Total EPT Taxa	14	14	24	21	17	21
Total BMI Counted	2,084	2,214	2,938	1,483	1,556	2,054
Ephemeroptera	962	1,139	1,680	740	917	1160
Plecoptera	114	163	147	217	58	97
Trichoptera	59	118	95	68	137	198
Aquatic Diptera	619	586	799	407	366	476
Other	330	208	217	51	78	123
% Ephemeroptera	46%	51%	57%	50%	59%	56%
% Plecoptera	6%	7%	5%	15%	4%	5%
% Trichoptera	3%	5%	3%	5%	9%	10%
% Aquatic Diptera	30%	27%	27%	27%	24%	23%
% Other	16%	9%	7%	3%	5%	6%
% EPT	55%	64%	65%	69%	71%	71%
% Chironomidae	29%	26%	27%	26%	22%	22%
Shannon Diversity Score (H)	0.76	0.81	0.74	0.74	0.87	0.88
Evenness Score (E)	0.66	0.68	0.59	0.59	0.71	0.70
Total Sample Area (m^2)	0.558	0.558	0.558	0.558	0.558	0.558
Mean BMI/m^2	3,735	3,968	5,265	2,658	2,789	3,681
±1 SD	1,918	2,305	2,512	2,017	858	1,025
Terrestrial Invertebrates	1	1	1	4	1	2
Juvenile Fish	0	0	0	0	0	0

Appendix B.6.–Lower Sherman Creek SP1 BMI data summary, 2011–2016.

	5/4/11	4/30/12	5/1/13	4/29/14	4/28/15	4/27/16
Total BMI Taxa	26	31	28	30	26	26
Total EPT Taxa	15	18	16	13	13	13
Total BMI Counted	624	1,525	1,002	1,687	921	3,816
Ephemeroptera	157	876	499	114	175	101
Plecoptera	36	103	135	97	67	41
Trichoptera	7.0	14	6	18	6	9
Aquatic Diptera	89	160	131	648	326	273
Other	335	372	231	810	347	3,392
% Ephemeroptera	25%	58%	50%	7%	19%	3%
% Plecoptera	6%	7%	13%	6%	7%	1%
% Trichoptera	1%	0.9%	0.6%	1%	1%	0.2%
% Aquatic Diptera	14%	11%	13%	38%	35%	7%
% Other	54%	24%	23%	48%	38%	89%
% EPT	32%	66%	64%	14%	27%	4%
% Chironomidae	6%	8%	12%	33%	33%	7%
Shannon Diversity Score (H)	0.76	0.74	0.85	0.71	0.84	0.32
Evenness Score (E)	0.71	0.62	0.71	0.57	0.70	0.27
Total Sample Area (m^2)	0.558	0.558	0.558	0.558	0.558	0.558
Mean BMI/m^2	1,118	2,733	1,796	3,023	1,651	6,839
±1 SD	1,000	1,410	247	936	718	1,398
Terrestrial Invertebrates	1	0	14	1	14	21
Juvenile Fish	10	12	0	8	0	77

Appendix B.7.–Lower Sherman Creek SP2 BMI data summary, 2011–2016.

	5/3/11	4/30/12	4/30/13	4/29/14	4/28/15	4/27/16
Total BMI Taxa	30	36	39	28	23	23
Total EPT Taxa	17	26	25	16	13	13
Total BMI Counted	921	1,573	1,889	661	898	1,045
Ephemeroptera	548	1,143	1,049	31	163	84
Plecoptera	137	77	299	40	47	32
Trichoptera	14	26	18	7	13	10
Aquatic Diptera	143	254	289	354	315	224
Other	79	75	234	229	360	695
% Ephemeroptera	60%	73%	56%	5%	18%	8%
% Plecoptera	15%	5%	16%	6%	5%	3%
% Trichoptera	2%	2%	1%	1%	1%	1%
% Aquatic Diptera	16%	16%	15%	54%	35%	21%
% Other	8.6%	4.8%	12%	35%	40%	67%
% EPT	76%	79%	72%	12%	25%	12%
% Chironomidae	11%	15%	14%	48%	33%	20%
Shannon Diversity Score (H)	0.93	0.70	0.84	0.70	0.77	0.53
Evenness Score (E)	0.76	0.57	0.65	0.62	0.66	0.49
Total Sample Area (m^2)	0.558	0.558	0.558	0.558	0.558	0.558
Mean BMI/m^2	1,651	2,823	3,385	1,185	1,609	1,873
±1 SD	927	1,174	1,471	769	748	982
Terrestrial Invertebrates	1	2	18	1	10	4
Juvenile Fish	0	0	14	0	0	6

APPENDIX C: RESIDENT FISH DATA

Appendix C.1.–East Fork Slate Creek Dolly Varden char population, 2011–2016.

Sample		Number of Fish Captured				Population			
Date	FL (mm)	Set 1	Set 2	Set 3	Total	Estimate	95% CI	Precision	Power
9/1/2011	105-140	6	2	2	10	40	---	---	---
8/1/2012	165-175	2	1	2	5	20	---	---	---
8/27/2013	---	0	0	0	0	0	---	---	---
8/20/2014	---	0	0	0	0	0	---	---	---
8/17/2015	---	0	0	0	0	0	---	---	---
8/8/2016	---	0	0	0	0	0	---	---	---

Appendix C.2.–Upper Slate Creek Dolly Varden char population, 2011–2016.

Sample		Number of Fish Captured				Population			
Date	FL (mm)	Set 1	Set 2	Set 3	Total	Estimate	95% CI	Precision	Power
8/10/2011	35-145	14	12	2	28	120	104-136	13%	---
8/2/2012	60-164	23	14	6	43	192	160-224	17%	44%
8/28/2013	35-190	21	7	2	30	120	120-120	---	---
8/21/2014	55-160	13	4	6	23	108	76-140	30%	0.03%
8/20/2015	56-154	10	9	6	25	136	76-196	44%	0.10%
8/10/2016	33-135	18	7	9	34	168	120-216	29%	0.55%

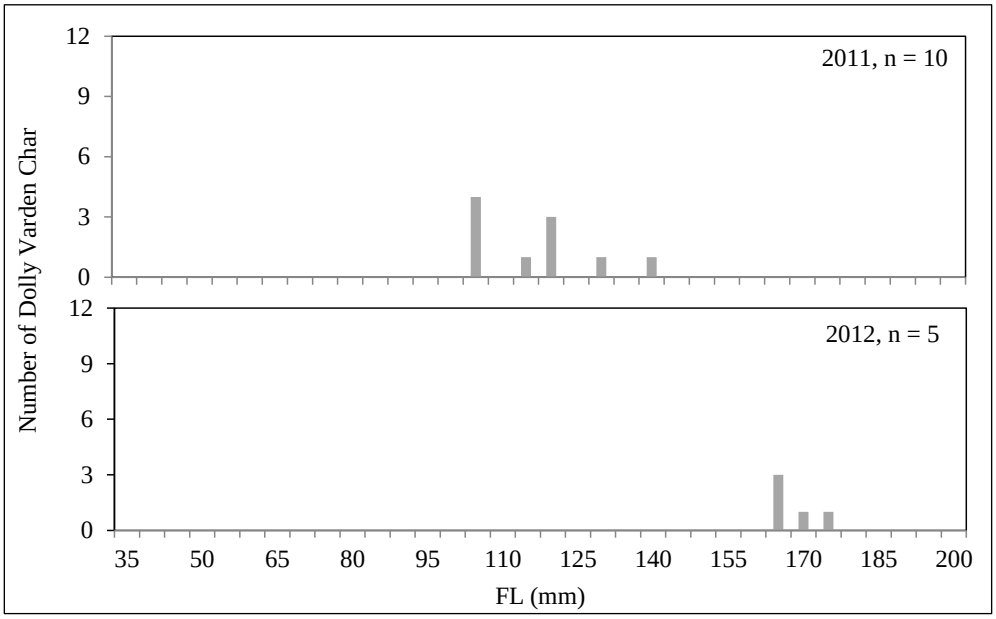
Appendix C.3.–East Fork Slate Creek Dolly Varden char capture data and population by habitat type, 2011–2016.

	Habitat	Number of Fish Captured				Population	
Year	Type	Set 1	Set 2	Set 3	Total	Estimate	95% CI
2011	Riffle	3	0	0	3	12	---
2011	Pool	3	1	2	6	24	---
2011	Glide	0	1	0	1	4	---
2012	Riffle	0	0	1	1	4	---
2012	Pool	2	1	1	4	16	---
2012	Glide	0	0	0	0	0	---
2013	Riffle	0	0	0	0	0	---
2013	Pool	0	0	0	0	0	---
2013	Glide	0	0	0	0	0	---
2014	Riffle	0	0	0	0	0	---
2014	Pool	0	0	0	0	0	---
2014	Glide	0	0	0	0	0	---
2015	Riffle	0	0	0	0	0	---
2015	Pool	0	0	0	0	0	---
2015	Glide	0	0	0	0	0	---
2016	Riffle	0	0	0	0	0	---
2016	Pool	0	0	0	0	0	---
2016	Glide	0	0	0	0	0	---

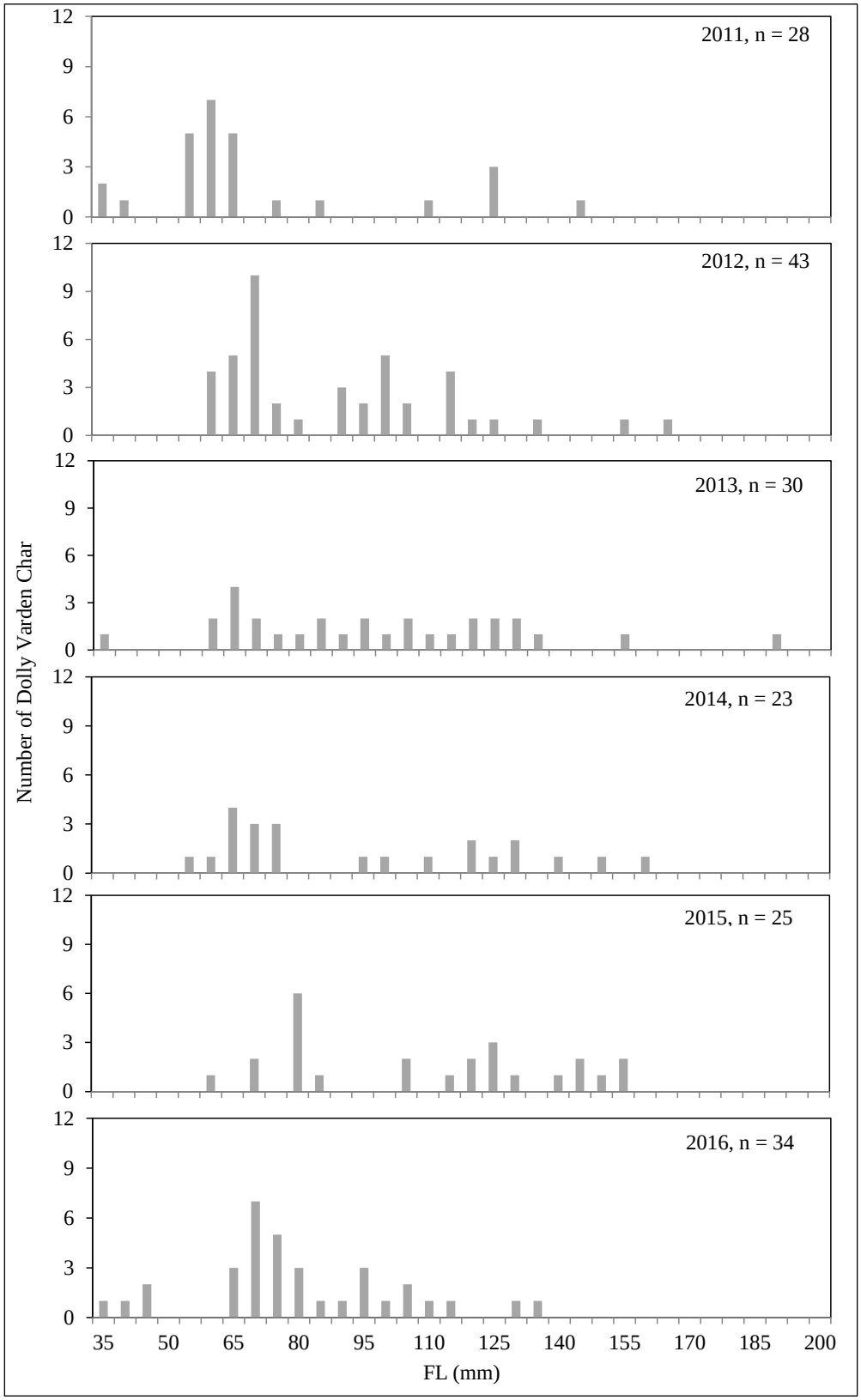
Appendix C.4.–Upper Slate Creek Dolly Varden char capture data and population by habitat type, 2011–2016.

	Habitat	Number of Fish Captured				Population	
Year	Type	Set 1	Set 2	Set 3	Total	Estimate	95% CI
2011	Riffle	2	2	0	4	16	---
2011	Pool	11	9	1	22	88	76-100
2011	Glide	1	1	1	3	12	---
2012	Riffle	2	4	4	10	40	---
2012	Pool	20	3	2	25	100	100-100
2012	Glide	1	7	0	8	32	---
2013	Riffle	4	1	0	5	20	---
2013	Pool	17	5	1	23	92	92-92
2013	Glide	0	1	1	2	8	---
2014	Riffle	3	0	2	5	20	---
2014	Pool	10	4	4	18	80	64-96
2014	Glide	0	0	0	0	0	---
2015	Riffle	1	2	0	3	12	---
2015	Pool	9	7	5	21	108	64-152
2015	Glide	0	0	1	1	4	---
2016	Riffle	1	0	2	3	12	---
2016	Pool	15	7	7	29	140	100-180
2016	Glide	2	0	0	2	8	---

Appendix C.5.–Length frequency diagram of Dolly Varden char captured in East Fork Slate Creek, 2011–2012.



Appendix C.6.–Length frequency diagram of Dolly Varden char captured in Upper Slate Creek, 2011–2016.



Appendix C.7.–Length, weight, and condition data for Dolly Varden char captured in Upper Slate Creek, 2016.

Pass No.	FL (mm)	Weight (g)	Condition Factor
1	76	4.5	1.0
1	33	1.5	ND
1	104	13.9	1.2
1	110	14.5	1.1
1	101	10.6	1.0
1	114	15	1.0
1	63	3.5	1.4
1	69	3.9	1.2
1	80	6.7	1.3
1	79	5.8	1.2
1	66	3.8	1.3
1	90	7.8	1.1
1	69	3.9	1.2
1	71	3.9	1.1
1	69	3.5	1.1
1	82	4.8	0.9
1	66	3.2	1.1
1	75	4.8	1.1
2	44	1.6	1.9
2	94	8	1.0
2	97	9.1	1.0
2	93	6.4	0.8
2	135	26.8	1.1
2	62	2.8	1.2
2	64	3.6	1.4
3	71	4.7	1.3
3	126	20.4	1.0
3	68	3.8	1.2
3	75	4.5	1.1
3	44	1.4	1.6
3	37	1.7	ND
3	91	9.1	1.2
3	69	4.7	1.4
3	72	4.8	1.3

Appendix C.8.–Mean Dolly Varden char condition factor by sample reach, 2011–2016.

Site	2011	2012	2013	2014	2015	2016
East Fork Slate Creek	1.1	1.1	ND	ND	ND	ND
Upper Slate Creek	1.1	1.0	1.0	1.0	0.9	1.2

APPENDIX D: ADULT SALMON DATA

Appendix D.l.–2016 Lower Slate Creek weekly adult pink salmon count by reach.

	7/19/2016				7/26/2016				8/2/2016			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-100 m	0	0	0	0	0	0	0	0	0	0	0	0
100-200 m	0	0	0	0	0	0	0	0	0	0	0	0
200-300 m	0	0	0	0	0	0	0	0	0	0	0	0
300-400 m	0	0	0	0	0	0	0	0	0	0	0	0
400-500 m	0	0	0	0	0	0	0	0	0	0	0	0
500-600 m	0	0	0	0	0	0	0	0	0	0	0	0
600-700 m	0	0	0	0	0	0	0	0	2	0	1	0
700-800 m	0	0	0	0	0	0	0	0	0	0	0	0
800-900 m	0	0	0	0	0	0	0	0	0	0	0	0
900-Falls	ND	ND	ND	ND	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**1**	**0**

	8/9/2016				8/16/2016				8/23/2016			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-100 m	0	0	0	0	10	8	9	0	2	2	2	0
100-200 m	0	0	0	0	40	40	40	0	10	10	10	0
200-300 m	0	0	0	0	10	10	10	0	0	0	0	1
300-400 m	0	0	0	0	0	0	0	0	0	0	0	0
400-500 m	0	0	0	0	4	4	4	0	0	0	0	0
500-600 m	0	0	0	0	1	1	1	0	0	0	0	0
600-700 m	0	0	0	0	0	0	0	0	0	0	0	0
700-800 m	0	0	0	0	0	0	0	0	0	0	0	0
800-900 m	0	0	0	0	0	1	0	0	0	0	0	0
900-Falls	0	0	0	0	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**65**	**64**	**64**	**0**	**12**	**12**	**12**	**1**

	8/29/2016			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-100 m	0	0	0	0
100-200 m	2	2	2	0
200-300 m	0	0	0	0
300-400 m	0	0	0	0
400-500 m	0	0	0	0
500-600 m	ND	ND	ND	ND
600-700 m	ND	ND	ND	ND
700-800 m	ND	ND	ND	ND
800-900 m	ND	ND	ND	ND
900-Falls	ND	ND	ND	ND
Total	2	2	2	0

ND = no data

Appendix D.2.–2016 Lower Slate Creek weekly adult chum salmon count by reach.

	7/19/2016				7/26/2016				8/2/2016			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-100 m	0	0	0	0	0	0	0	0	0	0	0	0
100-200 m	0	0	0	0	0	0	0	0	0	0	0	0
200-300 m	0	0	0	0	0	0	0	0	0	0	0	0
300-400 m	0	0	0	0	0	0	0	0	0	0	0	0
400-500 m	0	0	0	0	0	0	0	0	0	0	0	0
500-600 m	0	0	0	0	0	0	0	0	0	0	0	0
600-700 m	0	0	0	0	0	0	0	0	3	4	3	0
700-800 m	0	0	0	0	0	0	0	0	2	0	1	0
800-900 m	0	0	0	0	0	0	0	0	0	0	0	0
900-Falls	ND	ND	ND	ND	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**4**	**4**	**0**

	8/9/2016				8/16/2016				8/23/2016			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-100 m	5	5	5	0	5	6	5	0	0	0	0	0
100-200 m	2	2	2	0	5	6	5	0	9	9	9	0
200-300 m	0	0	0	0	0	0	0	0	6	6	6	0
300-400 m	0	0	0	0	0	0	0	0	5	5	5	0
400-500 m	2	5	3	0	0	0	0	0	0	0	0	0
500-600 m	0	0	0	0	0	0	0	0	0	0	0	0
600-700 m	1	0	0	0	0	0	0	0	0	0	0	0
700-800 m	0	0	0	0	0	0	0	0	0	0	0	0
800-900 m	0	0	0	0	0	0	0	0	0	0	0	0
900-Falls	0	0	0	0	0	0	0	0	0	0	0	0
Total	**10**	**12**	**10**	**0**	**10**	**12**	**10**	**0**	**20**	**20**	**20**	**0**

	8/29/2016			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-100 m	0	0	0	0
100-200 m	1	1	1	0
200-300 m	0	0	0	0
300-400 m	0	0	0	0
400-500 m	0	0	0	0
500-600 m	ND	ND	ND	ND
600-700 m	ND	ND	ND	ND
700-800 m	ND	ND	ND	ND
800-900 m	ND	ND	ND	ND
900-Falls	ND	ND	ND	ND
Total	1	1	1	0

ND = no data

Appendix D.3.–2016 Lower Slate Creek weekly adult coho salmon count by reach.

	9/28/2016		10/5/2016		10/12/2016		10/20/2016		10/26/2016	
Stream Reach	**Obs.**	**Carcass**	**Obs.**	**Carcass**	**Obs.**	**Carcass**	**Obs.**	**Carcass**	**Obs.**	**Carcass**
0-100 m	0	0	0	0	0	0	0	0	0	0
100-200 m	0	0	0	0	0	0	0	0	0	0
200-300 m	0	0	0	0	0	0	0	0	0	0
300-400 m	0	0	0	0	0	0	0	0	0	0
400-500 m	0	0	0	0	0	0	2	0	0	0
500-600 m	0	0	0	0	0	0	0	0	0	0
600-700 m	0	0	0	0	0	0	0	0	0	0
700-800 m	0	0	0	0	0	0	0	0	0	0
800-900 m	0	0	0	0	0	0	0	0	0	0
900-Falls	0	0	0	0	ND	ND	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**

Appendix D.4.–2016 Lower Johnson Creek weekly adult pink salmon count by reach.

	7/18/2016				7/25/2016				8/1/2016			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
Con-Lace	0	0	0	0	0	0	0	0	0	0	0	0
Lace-JM	0	0	0	0	0	0	0	0	0	0	0	0
JM-Trap Site	0	0	0	0	0	0	0	0	0	0	0	0
Trap-Site #4	0	0	0	0	2	0	1	0	100	50	75	0
Site #4-Site #7	0	0	0	0	3	2	2	0	60	80	70	0
Site #7-Site #10	0	0	0	0	0	0	0	0	11	3	7	0
Site #10-PH	0	0	0	0	0	6	3	0	0	4	2	0
PH-LF	0	0	0	0	0	0	0	0	0	0	0	0
LF-Site #15	0	0	0	0	0	0	0	0	0	0	0	0
Site #15-Falls	0	0	0	0	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**5**	**8**	**6**	**0**	**171**	**137**	**154**	**0**

	8/8/2016				8/15/2016				8/22/2016			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
Con-Lace	0	0	0	0	0	0	0	0	0	0	0	0
Lace-JM	0	0	0	0	0	0	0	0	0	0	0	0
JM-Trap Site	0	10	5	0	1	0	0	0	0	0	0	0
Trap-Site #4	0	100	50	0	0	0	0	0	68	68	68	0
Site #4-Site #7	46	70	58	0	5	10	7	0	27	27	27	2
Site #7-Site #10	2	0	1	0	1	11	6	0	0	0	0	4
Site #10-PH	0	0	0	0	0	5	2	0	0	0	0	0
PH-LF	0	0	0	0	0	0	0	0	0	0	0	0
LF-Site #15	13	10	11	0	0	0	0	0	0	0	0	0
Site #15-Falls	0	0	0	0	0	0	0	0	0	0	0	0
Total	**61**	**190**	**125**	**0**	**7**	**26**	**15**	**0**	**95**	**95**	**95**	**6**

	8/29/2016			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
Con-Lace	0	0	0	0
Lace-JM	0	0	0	0
JM-Trap Site	0	0	0	0
Trap-Site #4	30	20	25	0
Site #4-Site #7	0	0	0	0
Site #7-Site #10	3	13	8	0
Site #10-PH	0	0	0	0
PH-LF	0	0	0	0
LF-Site #15	0	0	0	0
Site #15-Falls	0	0	0	0
Total	**33**	**33**	**33**	**0**

Appendix D.5.–2016 Lower Johnson Creek weekly adult chum salmon count by reach.

	7/18/2016				7/25/2016				8/1/2016			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
Con-Lace	0	0	0	0	0	0	0	0	0	0	0	0
Lace-JM	0	0	0	0	0	0	0	0	0	0	0	0
JM-Trap Site	0	0	0	0	0	0	0	0	0	0	0	0
Trap-Site #4	0	0	0	0	0	1	0	0	0	0	0	0
Site #4-Site #7	0	0	0	0	0	8	4	0	2	2	2	0
Site #7-Site #10	0	0	0	0	7	0	3	0	0	0	0	0
Site #10-PH	0	0	0	0	0	0	0	0	0	0	0	0
PH-LF	0	0	0	0	0	0	0	0	0	0	0	0
LF-Site #15	0	0	0	0	0	0	0	0	0	0	0	0
Site #15-Falls	0	0	0	0	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**7**	**9**	**7**	**0**	**2**	**2**	**2**	**0**

	8/8/2016				8/15/2016				8/22/2016			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
Con-Lace	0	0	0	0	0	0	0	0	0	0	0	0
Lace-JM	0	0	0	0	0	0	0	0	0	0	0	0
JM-Trap Site	0	0	0	0	7	5	6	0	0	0	0	0
Trap-Site #4	4	2	3	0	1	0	0	0	0	0	0	0
Site #4-Site #7	2	0	1	2	10	3	6	0	0	0	0	0
Site #7-Site #10	0	0	0	0	6	10	8	0	0	0	0	0
Site #10-PH	0	0	0	0	0	0	0	0	0	0	0	0
PH-LF	0	0	0	0	0	0	0	0	0	0	0	0
LF-Site #15	0	0	0	0	0	0	0	0	0	0	0	0
Site #15-Falls	0	0	0	0	0	0	0	0	0	0	0	0
Total	**6**	**2**	**4**	**2**	**24**	**18**	**20**	**0**	**0**	**0**	**0**	**0**

	8/29/2016			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
Con-Lace	0	0	0	0
Lace-JM	0	0	0	0
JM-Trap Site	0	0	0	0
Trap-Site #4	0	0	0	0
Site #4-Site #7	5	3	4	0
Site #7-Site #10	5	0	2	0
Site #10-PH	0	0	0	0
PH-LF	0	0	0	0
LF-Site #15	0	0	0	0
Site #15-Falls	0	0	0	0
Total	**10**	**3**	**6**	**0**

Appendix D.6.–2016 Lower Johnson Creek weekly adult coho salmon count by reach.

	9/28/2016		10/5/2016		10/12/2016		10/20/2016		10/26/2016	
Stream Reach	**Obs.**	**Carcass**	**Obs.**	**Carcass**	**Obs.**	**Carcass**	**Obs.**	**Carcass**	**Obs.**	**Carcass**
Con-Lace	ND	ND	ND	ND	0	0	ND	ND	ND	ND
Lace-JM	ND	ND	ND	ND	0	0	ND	ND	ND	ND
JM-Trap Site	1	0	0	0	0	0	0	0	0	0
Trap-Site #4	0	0	0	0	0	0	1	0	1	0
Site #4-Site #7	0	0	0	0	0	0	3	0	1	0
Site #7-Site #10	0	0	0	0	0	0	1	0	1	0
Site #10-PH	1	0	0	0	0	0	5	0	7	0
PH-LF	0	0	0	0	0	0	0	0	0	0
LF-Site #15	0	0	0	0	0	0	2	0	0	1
Site #15-Falls	0	0	0	0	0	0	0	0	0	0
Total	**2**	**0**	**0**	**0**	**0**	**0**	**12**	**0**	**10**	**1**

ND = no data

Appendix D.7.–2016 Lower Sherman Creek weekly adult pink salmon count by reach.

	7/19/2016				7/25/2016				8/2/2016			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-50 m	0	0	0	0	0	0	0	0	0	0	0	0
50-100 m	0	0	0	0	0	0	0	0	0	0	0	0
100-150 m	0	0	0	0	0	0	0	0	0	0	0	0
150-200 m	0	0	0	0	0	0	0	0	0	0	0	0
200-250 m	0	0	0	0	0	0	0	0	0	0	0	0
250-300 m	0	0	0	0	0	0	0	0	0	0	0	0
300-350 m	0	0	0	0	0	0	0	0	0	0	0	0
350-Falls	0	0	0	0	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

	8/9/2016				8/15/2016				8/22/2016			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-50 m	0	0	0	0	0	0	0	0	0	0	0	0
50-100 m	0	0	0	0	0	0	0	0	9	8	8	0
100-150 m	0	0	0	0	0	0	0	0	1	3	2	0
150-200 m	0	0	0	0	ND	ND	ND	ND	6	7	6	0
200-250 m	0	0	0	0	ND	ND	ND	ND	2	2	2	0
250-300 m	0	0	0	0	ND	ND	ND	ND	3	3	3	0
300-350 m	0	0	0	0	ND	ND	ND	ND	3	3	3	0
350-Falls	0	0	0	0	ND	ND	ND	ND	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	24	26	24	0

	8/29/2016			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-50 m	0	0	0	0
50-100 m	0	0	0	0
100-150 m	0	4	2	0
150-200 m	0	0	0	0
200-250 m	0	0	0	0
250-300 m	0	0	0	0
300-350 m	0	0	0	0
350-Falls	0	0	0	0
Total	**0**	**4**	**2**	**0**

ND = no data

Appendix D.8.–2016 Lower Sherman Creek weekly adult chum salmon count by reach.

	7/19/2016				7/25/2016				8/2/2016			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-50 m	0	0	0	0	0	0	0	0	0	0	0	0
50-100 m	0	0	0	0	0	0	0	0	0	0	0	0
100-150 m	0	0	0	0	0	0	0	0	0	0	0	0
150-200 m	0	0	0	0	0	0	0	0	0	0	0	0
200-250 m	0	0	0	0	0	0	0	0	0	0	0	0
250-300 m	0	0	0	0	0	0	0	0	0	0	0	0
300-350 m	0	0	0	0	0	0	0	0	0	0	0	0
350-Falls	0	0	0	0	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

	8/9/2016				8/15/2016				8/22/2016			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-50 m	0	0	0	0	0	0	0	0	0	0	0	0
50-100 m	0	0	0	0	0	0	0	0	0	0	0	0
100-150 m	0	0	0	0	0	0	0	0	0	0	0	0
150-200 m	0	0	0	0	ND	ND	ND	ND	2	2	2	0
200-250 m	0	0	0	0	ND	ND	ND	ND	0	0	0	0
250-300 m	0	0	0	0	ND	ND	ND	ND	0	0	0	0
300-350 m	0	0	0	0	ND	ND	ND	ND	4	3	3	0
350-Falls	0	0	0	0	ND	ND	ND	ND	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	6	5	5	0

	8/29/2016			
Stream Reach	**Obs. 1**	**Obs. 2**	**Mean**	**Carcass**
0-50 m	0	0	0	0
50-100 m	0	0	0	0
100-150 m	0	0	0	0
150-200 m	0	0	0	0
200-250 m	0	0	0	0
250-300 m	0	0	0	0
300-350 m	0	0	0	0
350-Falls	0	0	0	0
Total	**0**	**0**	**0**	**0**

ND = no data

Appendix D.9.–Lower Slate Creek adult pink salmon count by statistical week, 2011–2016.

Statistical Week No.	2011	2012	2013	2014	2015	2016
29	ND	0	0	0	ND	ND
30	ND	0	7	0	12	0
31	0	364	66	2	487	0
32	371	1,106	604	14	1,769	1
33	765	3,152	864	13	1,783	0
34	1,396	2,331	1,199	12	1,543	64
35	1,649	318	472	0	850	12
36	1,816	1	97	ND	527	2
37	232	0	27	ND	575	ND
38	46	ND	1	ND	32	ND
39	0	ND	ND	ND	2	ND

Appendix D.10.–Lower Johnson Creek adult pink salmon count by statistical week, 2011–2016.

Statistical Week No.	2011	2012	2013	2014	2015	2016
29	ND	0	59	ND	ND	ND
30	1	73	200	44	4,512	0
31	181	411	2,250	48	568	6
32	1,893	753	1,456	84	17,517	154
33	3,850	1,698	1,873	2	19,028	125
34	5,264	1,816	1,557	11	5,444	15
35	1,352	198	545	0	2,057	95
36	3,713	60	149	0	1,238	33
37	672	7	97	ND	702	ND
38	438	0	ND	ND	249	ND
39	145	ND	ND	ND	10	ND

Appendix D.11.–Lower Sherman Creek adult pink salmon count by statistical week, 2011–2016.

Statistical Week No.	2011	2012	2013	2014	2015	2016
29	ND	0	2	ND	ND	ND
30	1	2	164	0	120	0
31	301	9	860	6	38	0
32	774	97	979	40	348	0
33	1,051	285	765	10	723	0
34	399	521	549	4	334	0
35	159	521	785	10	0	24
36	873	145	624	0	413	2
37	418	25	232	ND	648	ND
38	612	3	21	ND	159	ND
39	36	ND	ND	ND	15	ND

APPENDIX E: SPAWNING SUBSTRATE DATA

Appendix E.1.–Lower Slate Creek SP1 pink salmon spawning substrate data, 2011–2016.

Sample	Sample	Volume (mL/L) Retained Each Sieve (mm)									
Date	No.	101.6	50.8	25.4	12.7	6.35	1.68	0.42	0.15	Imhoff	GMPS
08/17/11	1	0	0	470	260	340	425	225	20	22.0	9.8
08/17/11	2	0	70	460	250	200	280	100	25	8.0	14.0
08/17/11	3	525	280	240	210	290	440	100	70	20.5	12.2
08/17/11	4	0	0	250	340	495	1425	525	55	68.0	5.2
07/09/12	1	1,050	140	140	280	190	395	95	15	24.0	10.6
07/09/12	2	0	0	200	225	140	325	140	15	24.0	8.2
07/09/12	3	0	515	310	225	250	580	240	27	65.0	12.8
07/09/12	4	0	570	510	260	290	750	435	53	54.0	11.8
07/02/13	1	0	400	460	430	320	365	145	25	66.0	15.4
07/02/13	2	0	150	400	250	245	515	225	36	53.0	9.8
07/02/13	3	0	800	325	320	255	445	205	25	60.0	18.0
07/02/13	4	0	275	565	385	245	495	250	19	28.0	13.5
07/01/14	1	600	420	375	225	235	320	165	22	57.0	15.5
07/01/14	2	0	50	350	300	175	225	25	7.5	41.0	14.0
07/01/14	3	0	100	510	465	275	420	250	38	52.0	11.0
07/01/14	4	400	275	260	220	225	375	225	19	51.0	11.2
07/06/15	1	0	75	300	350	325	350	325	70	42.0	8.2
07/06/15	2	0	225	350	400	325	525	300	24	20.5	10.8
07/06/15	3	0	150	475	150	150	200	50	6	6.5	19.6
07/06/15	4	0	275	400	225	275	375	150	16	17.0	14.6
07/05/16	1	0	175	600	300	375	625	100	25	34.0	12.8
07/05/16	2	0	500	375	375	300	700	100	50	26.0	14.6
07/05/16	3	0	275	300	475	725	500	100	25	15.0	12.9
07/05/16	4	0	100	725	250	300	500	125	25	15.0	13.9

Note: GMPS = Geometric mean particle size.

Appendix E.2.–Lower Slate Creek SP2 pink salmon spawning substrate data, 2011–2016.

Sample	Sample	Volume (mL/L) Retained Each Sieve (mm)									
Date	No.	101.6	50.8	25.4	12.7	6.35	1.68	0.42	0.15	Imhoff	GMPS
08/17/11	1	1050	130	305	210	205	350	200	20	11.5	11.0
08/17/11	2	0	120	320	405	335	740	415	85	53.0	7.3
08/17/11	3	0	400	350	295	290	540	200	40	17.5	13.4
08/17/11	4	0	100	450	580	320	390	160	15	25.0	12.8
07/09/12	1	0	250	380	270	260	475	195	23	46.5	11.8
07/09/12	2	600	75	395	295	180	375	135	15	18.5	12.0
07/09/12	3	0	450	340	370	340	590	295	30	18.0	12.8
07/09/12	4	0	0	320	460	285	545	300	28	16.5	8.3
07/02/13	1	0	310	490	440	505	640	410	35	107.5	9.8
07/02/13	2	0	420	270	240	215	560	150	34	42.0	13.1
07/02/13	3	0	550	885	375	290	570	290	45	107.8	15.0
07/02/13	4	0	785	230	340	240	580	330	30	46.5	14.8
07/01/14	1	0	1225	450	495	305	760	300	12	110.0	17.7
07/01/14	2	0	450	250	250	200	300	100	11	65.0	16.5
07/01/14	3	0	850	480	200	175	490	175	30	106.0	18.4
07/01/14	4	0	150	350	200	225	300	120	15	20.0	13.3
07/06/15	1	0	75	175	325	425	475	50	6	5.5	10.7
07/06/15	2	500	825	225	225	175	250	50	11	8.0	28.9
07/06/15	3	300	225	500	200	175	300	50	15	21.5	18.1
07/06/15	4	275	100	200	200	150	225	100	22	9.0	12.2
07/05/16	1	0	300	275	400	350	525	100	25	26.0	13.1
07/05/16	2	0	0	200	600	575	550	150	25	30.0	9.0
07/05/16	3	0	0	100	1150	450	650	100	25	26.0	10.1
07/05/16	4	125	275	575	525	450	475	150	25	39.0	14.3

Note: GMPS = Geometric mean particle size.

APPENDIX F: SEDIMENT DATA AND LAB REPORTS

Appendix F.1.–Sediment sample compositions, 2011–2016.

Sample Date	Particle Size Data				% Total Solids	% Total Volatile Solids	Total Sulfide (mg/kg)	% Total Organic Carbon
	% Clay	% Silt	% Sand	% Coarse material (> 2 mm)				
Lower Slate Creek								
10/03/11	2.0	4.0	94.0	0.4	78.00	3.38	ND	2.04
07/03/12	2.0	0.0	98.0	0.1	79.22	3.37	ND	1.67
07/02/13	2.0	2.0	96.0	0.0	74.57	1.63	ND	1.67
07/28/14	2.3	3.8	91.8	0.9	75.3	3.28	<1.3	0.58
07/06/15	1.8	3.1	72.2	22.8	83.5	ND	<1.2	0.473
07/05/16	0.0	23.1	55.1	21.8	70.3	7.70	<2.5	0.585
East Fork Slate Creek								
10/03/11	10.0	4.0	86.0	1.7	60.17	7.81	ND	11.00
07/10/12	40.0	34.0	26.0	0.0	23.72	28.54	ND	16.70
07/01/13	6.0	12.0	82.0	0.0	43.66	13.30	ND	18.30
07/30/14	3.8	21.1	75.0	0.1	65.5	6.21	<1.5	1.84
07/07/15	2.3	6.9	82.3	8.5	76.2	ND	<1.3	0.792
07/06/16	3.5	24.8	53.7	18.0	21.0	31.40	<6.8	13.0
Upper Slate Creek								
10/06/11	4.0	2.0	94.0	0.0	72.10	4.12	ND	5.46
07/02/12	2.0	0.0	98.0	0.3	79.58	2.90	ND	3.74
07/01/13	4.0	0.0	96.0	0.2	74.21	2.73	ND	5.50
07/30/14	4.3	8.2	87.5	0.0	72.4	3.88	<1.4	0.87
07/07/15	1.5	0.2	31.9	66.3	76.5	ND	<1.3	1.04
07/06/16	0.0	2.9	73.1	24.0	62.9	5.00	<2.2	2.14
Lower Johnson Creek								
10/03/11	2.0	2.0	96.0	0.0	74.28	2.01	ND	0.89
07/02/12	8.0	0.0	92.0	0.0	77.67	2.55	ND	1.19
07/01/13	2.0	2.0	96.0	0.3	73.21	0.90	ND	1.08
07/30/14	2.9	4.8	91.4	0.2	73.7	1.93	<1.4	0.26
07/06/15	0.4	1.1	41.9	56.6	80.0	ND	<1.3	0.376
08/08/16	5.1	28.1	66.8	0.0	71.9	2.40	<2.5	0.422
Lower Sherman Creek								
10/04/11	2.0	2.0	96.0	0.1	73.15	2.75	ND	0.54
07/03/12	4.0	0.0	96.0	0.1	78.55	3.05	ND	0.82
07/01/13	2.0	2.0	96.0	0.6	75.66	0.75	ND	0.61
07/28/14	3.4	6.5	89.9	0.3	76.7	2.50	<1.3	0.35
07/07/15	1.8	3.0	86.1	9.0	76.2	ND	<1.3	0.399
07/06/16	0.1	0.9	71.19	27.8	80.5	3.10	<2.4	0.322

Appendix F.2.–Sediment sample metals, As, and Se concentrations, 2011–2016.

Sample	Concentration (mg/kg dry weight)										
Date	Ag	Al	As	Cd	Cr	Cu	Hg	Ni	Pb	Se	Zn
Lower Slate Creek											
10/03/11	0.134	13,600	16.2	1.46	29.4	56.7	0.0502	47.4	7.79	0.720	220
07/03/12	0.145	13,600	9.31	1.22	32.0	50.7	0.0994	43.2	8.45	<0.170	200
07/02/13	0.168	12,300	23.7	1.29	94.5	56.7	0.0402	73.4	9.14	1.94	205
07/28/14	0.08	12,000	20.1	1.21	20.0	51.1	0.06	40.8	8.78	1.3	189
07/06/15	0.07	12,000	14.9	0.53	18.9	39.1	0.04	30.0	6.86	0.7	131
07/05/16	0.079	12,800	17.0	0.735	20.4	39.8	0.057	35.2	7.16	1.3	173
East Fork Slate Creek											
10/03/11	0.233	20,100	30.0	20.9	29.5	88.4	0.0692	143	8.50	1.41	1,360
07/10/12	0.513	15,300	24.0	23.2	38.9	159.0	0.3270	153	14.2	0.934	1,490
07/01/13	0.334	13,900	42.2	13.9	32.7	73.4	0.0774	79.8	12.5	4.79	844
07/30/14	0.14	13,300	39.1	12.1	14.6	55.7	0.04	85.3	6.94	2.4	812
07/07/15	0.12	12,300	22.3	5.87	15.1	46.7	0.05	46.8	4.48	1.7	333
07/06/16	0.190	16,500	51.5	8.20	16.5	59.5	0.109	86.1	5.54	3.1	634
Upper Slate Creek											
10/06/11	0.120	22,500	17.9	0.722	127	53.4	<0.0489	87.5	3.37	0.809	130
07/02/12	0.132	20,300	14.4	0.776	125	55.4	0.0625	78.4	4.05	0.606	134
07/01/13	0.131	14,600	13.5	0.750	101	44.6	<0.0380	55.0	2.70	3.21	105
07/30/14	0.06	14,900	19.2	0.69	84.2	45.8	0.03	55.7	2.86	1.8	111
07/07/15	0.08	14,500	14.2	0.76	92.2	47.0	0.11	54.0	3.17	2.3	109
07/06/16	0.092	14,000	18.0	0.507	71.7	37.0	0.051	48.5	2.69	2.1	111
Lower Johnson Creek											
10/03/11	0.164	13,100	16.2	0.238	31.5	73.1	<0.0386	27.3	9.76	<0.181	93.3
07/02/12	0.342	13,100	12.8	0.250	35.5	76.8	0.119	23.4	9.45	<0.167	97.3
07/01/13	0.269	10,300	11.9	0.492	24.4	56.1	<0.0354	15.7	8.00	<0.163	121
07/30/14	0.32	10,300	16.5	0.16	22.2	68.2	0.02	16.9	10.9	<0.5	83.4
07/06/15	0.16	10,900	12.5	0.15	18.1	71.1	<0.02	17.7	8.04	<0.8	79.7
08/08/16	0.574	9,470	13.0	0.150	18.9	76.3	0.020	15.1	8.41	<0.57	65.7
Lower Sherman Creek											
10/04/11	0.137	18,200	28.9	0.389	46.2	94.0	<0.0455	45.9	6.70	<0.178	110
07/03/12	0.289	17,900	24.3	0.578	51.4	79.1	0.0681	40.2	8.43	<0.174	128
07/01/13	0.306	15,400	25.4	0.390	37.4	69.4	<0.0384	30.9	7.39	1.77	111
07/28/14	0.14	14,900	27.9	0.360	33.6	68.4	0.03	31.1	6.97	1.2	119
07/07/15	0.25	17,500	37.0	0.32	30.9	70.8	0.02	38.0	11.0	2.0	134
07/06/16	0.097	13,800	19.9	0.388	27.5	72.5	<0.020	32.9	6.6	1.1	123

ALS Environmental
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September 23, 2016 **Analytical Report for Service Request No:** K1607834

Kate Kanouse
Alaska Department of Fish and Game
Division of Habitat
802 3rd Street
P.O. Box 110024
Douglas, AK 99811-0024

RE: Coeur AK Biomonitoring

Dear Kate,

Enclosed are the results of the sample(s) submitted to our laboratory July 13, 2016
For your reference, these analyses have been assigned our service request number **K1607834.**

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-detect") 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-detect") 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-detect") 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 DEC UST	http://dec.alaska.gov/applications/eh/ehllabreports/USTLabs.aspx	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/certlic/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	Not available	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx	03016
Maine DHS	Not available	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Montana DPHHS	http://www.dphhs.mt.gov/publichealth/	CERT0047
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/oqa/	WA005
North Carolina DWQ	http://www.dwqlab.org/	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/envserv/	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)	http://www.epa.gov/region8/water/dwhome/wyomingdi.html	-
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/anlayte 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	**Service Request No.:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Received:**	07/13/16
Sample Matrix:	Sediment		

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 07/13/16. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4ºC upon receipt at the laboratory.

General Chemistry Parameters

Total Volatile Solids by EPA Method 160.4 Modified and Total Sulfide by PSEP:
All samples were received past holding time or with insufficient time remaining. The analysis was performed as soon as possible after receipt by the laboratory. The data was flagged to indicate the holding time violation.

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

Total Metals

Matrix Spike Recovery Exceptions:
The control criteria for matrix spike recovery of Aluminum for sample Lower Slate Creek were not applicable. The analyte concentration in the sample was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

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

Approved by_____

Chain of Custody

ALS Environmental—Kelso Laboratory
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Phone (360)577-7222 Fax (360)636-1068
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ALS Environmental

CHAIN OF CUSTODY
70615

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SR# K1607834

COC Set____of____

COC#_____

1317 South 13th Ave, Kelso, WA 98626 Phone (360) 577-7222 / 800-695-7222 / FAX (360) 636-1068
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Project Name: Coeur AK Biomonitoring	Project Number:
Project Manager: Kate Kanouse	
Company: Coeur Alaska / AK Dept. of Fish and Game	
Address: 802 3rd St., Douglas, AK 99824	
Phone #: (907) 465-4290	email: Kate.Kanouse@alaska.gov
Sampler Signature: Kate Kanouse	Sampler Printed Name: Kate Kanouse

CLIENT SAMPLE ID	LABID	SAMPLING Date	SAMPLING Time	Matrix	NUMBER OF CONTAINERS	7D PSEP Sulfide / PSEP Sulfide	14D PSEP TOC / PSEP TOC T	28D 7471B / Hg	180D 200.8 / Metals T	180D ASTM D422 / Part Size	999D 160.3 Modified / TS	1160.4 mod - TVS	2	3	4	5	Remarks
1. Lower Slate Creek		7/5/16	0900		3	X	X	X	X	X	X	X					
2. East Fork Slate Creek		7/6/16	1300		3	X	X	X	X	X	X	X					
3. Upper Slate Creek		7/6/16	1500		3	X	X	X	X	X	X	X					
4. ~~Lower Johnson Creek~~		7/6/16	1000		3	X	X	X	X	X	X	X					
5. Lower Sherman Creek		7/6/16	1000		3	X	X	X	X	X	X	X					
6.																	
7.																	
8.																	
9.																	
10.																	

Report Requirements

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

Invoice Information

P.O.#_____

Bill To: Coeur Alaska

Turnaround Requirements

___ 24 hr. ___ 48 hr.
___ 5 Day
✓ Standard

Requested Report Date

Circle which metals are to be analyzed

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

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

Special Instructions/Comments:

*Indicate State Hydrocarbon Procedure: AK CA WI Northwest Other____(Circle One)

Relinquished By:	Received By:	Relinquished By:	Received By:	Relinquished By:	Received By:
Signature: Kate Kanouse	Signature: [illegible]	Signature	Signature	Signature	Signature
Printed Name: Kate Kanouse	Printed Name: ALS-Kelso	Printed Name	Printed Name	Printed Name	Printed Name
Firm: ADF&G	Firm: 7/13/16 0940	Firm	Firm	Firm	Firm
Date/Time: 7/11/16 0800	Date/Time	Date/Time	Date/Time	Date/Time	Date/Time

PC Shav

Cooler Receipt and Preservation Form

Client Clear Alaska Service Request *K16* 07834

Received: July 13th Opened: 7/13 By: SD Unloaded: 7/13 By: SD

1. Samples were received via? *USPS* (*Fed 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? 2-FRONT
   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	Corr. Factor	Thermometer ID	Cooler/COC ID (NA)	Tracking Number NA	Filed
1.9	1.4	1.1	1.1	CF	3CO		7835 5509 0331	

4. Packing material: *Inserts* *Baggies* (*Bubble Wrap*) (*Gel Packs*) *Wet Ice* *Dry Ice* *Sleeves* _____
5. Were custody papers properly filled out (ink, signed, etc.)? NA (Y) N
6. Did all bottles arrive in good condition (unbroken)? *Indicate in the table below.* NA (Y) N
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.* NA (Y) N
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* (NA) Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* (NA) Y N
12. 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 Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions: _____

*Page*____ *of*____

Total Solids

ALS Environmental—Kelso Laboratory
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Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	07/05/16 - 07/06/16
Sample Matrix:	Sediment	**Date Received:**	07/13/16
Analysis Method:	160.3 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	As Received

Solids, Total

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Lower Slate Creek	K1607834-001	**70.7**	-	1	07/27/16 16:00	
East Fork Slate Creek	K1607834-002	**21.0**	-	1	07/27/16 16:00	
Upper Slate Creek	K1607834-003	**62.9**	-	1	07/27/16 16:00	
Lower Sherman Creek	K1607834-004	**80.5**	-	1	07/27/16 16:00	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project	Coeur AK Biomonitoring	**Date Collected:**	07/05/16
Sample Matrix:	Sediment	**Date Received:**	07/13/16
Analysis Method:	160.3 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	As Received

Replicate Sample Summary
Inorganic Parameters

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Lower Slate Creek	K1607834-001DUP	-	70.7	69.9	70.3	1	20	07/27/16
Batch QC	K1608007-001DUP	-	76.2	77.5	76.9	2	20	07/27/16

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.

General Chemistry

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	07/05/16 - 07/06/16
Sample Matrix:	Sediment	**Date Received:**	07/13/16
Analysis Method:	160.4 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	Dry, per Method

Solids, Total Volatile

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Lower Slate Creek	K1607834-001	**7.70**	0.010	1	07/14/16 08:43	*
East Fork Slate Creek	K1607834-002	**32.5**	0.010	1	07/14/16 08:43	*
Upper Slate Creek	K1607834-003	**5.00**	0.010	1	07/14/16 08:43	*
Lower Sherman Creek	K1607834-004	**3.10**	0.010	1	07/14/16 08:43	*
Method Blank	K1607834-MB	ND U	0.010	1	07/14/16 08:43	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project	Coeur AK Biomonitoring	**Date Collected:**	07/06/16
Sample Matrix:	Sediment	**Date Received:**	07/13/16
		Date Analyzed:	07/14/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	East Fork Slate Creek	**Units:**	Percent
Lab Code:	K1607834-002	**Basis:**	Dry, per Method

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1607834-002DUP Result	Average	RPD	RPD Limit
Solids, Total Volatile	160.4 Modified	0.010	32.5	30.2	31.4	7	20

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	7/5/2016
Sample Matrix:	Sediment	**Date Received:**	7/13/2016
		Date Analyzed:	7/19/2016

Particle Size Determination
ASTM D422

Sample Name: Lower Slate Creek
Lab Code: K1607834-001

Gravel and Sand
(Sieve Analysis)

Description	Sieve Size	Weight (g)	Percent Passing
Gravel (19.0 mm)	**No.3/4"(19.0 mm)**	0.0957	99.28
Gravel (9.50 mm)	**No.3/8"(9.50 mm)**	6.0386	81.77
Gravel, Medium	**No.4 (4.75 mm)**	1.1718	78.37
Gravel, Fine	**No.10 (2.00 mm)**	0.0584	78.20
Sand, Very Coarse	**No.20 (0.850 mm)**	2.7406	70.20
Sand, Coarse	**No.40 (0.425 mm)**	1.8150	64.90
Sand, Medium	**No.60 (0.250 mm)**	3.7860	53.85
Sand, Fine	**No.140 (0.106 mm)**	10.0533	24.49
Sand, Very Fine	**No.200 (0.0750 mm)**	2.6145	16.86

Silt and Clay
(Hydrometer Analysis)

Particle Diameter	Percent Passing
0.074 mm	23.11
0.005 mm	0.00
0.001 mm	0.00

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	7/6/2016
Sample Matrix:	Sediment	**Date Received:**	7/13/2016
		Date Analyzed:	7/19/2016

Particle Size Determination
ASTM D422

Sample Name: East Fork Slate Creek
Lab Code: K1607834-002

Gravel and Sand
(Sieve Analysis)

Description	Sieve Size	Weight (g)	Percent Passing
Gravel (19.0 mm)	**No.3/4"(19.0 mm)**	0.0000	94.07
Gravel (9.50 mm)	**No.3/8"(9.50 mm)**	0.1721	92.91
Gravel, Medium	**No.4 (4.75 mm)**	1.1775	84.96
Gravel, Fine	**No.10 (2.00 mm)**	0.4382	81.99
Sand, Very Coarse	**No.20 (0.850 mm)**	2.5596	64.93
Sand, Coarse	**No.40 (0.425 mm)**	2.0926	50.98
Sand, Medium	**No.60 (0.250 mm)**	0.8673	45.19
Sand, Fine	**No.140 (0.106 mm)**	2.1104	31.12
Sand, Very Fine	**No.200 (0.0750 mm)**	0.6597	26.72

Silt and Clay
(Hydrometer Analysis)

Particle Diameter	Percent Passing
0.074 mm	28.32
0.005 mm	3.48
0.001 mm	0.00

ALS Group USA, Corp.
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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	7/6/2016
Sample Matrix:	Sediment	**Date Received:**	7/13/2016
		Date Analyzed:	7/19/2016

Particle Size Determination
ASTM D422

Sample Name: Upper Slate Creek
Lab Code: K1607834-003

Gravel and Sand
(Sieve Analysis)

Description	Sieve Size	Weight (g)	Percent Passing
Gravel (19.0 mm)	**No.3/4"(19.0 mm)**	0.0000	100.05
Gravel (9.50 mm)	**No.3/8"(9.50 mm)**	3.1101	91.08
Gravel, Medium	**No.4 (4.75 mm)**	5.0954	76.39
Gravel, Fine	**No.10 (2.00 mm)**	0.1177	76.05
Sand, Very Coarse	**No.20 (0.850 mm)**	17.1372	26.12
Sand, Coarse	**No.40 (0.425 mm)**	4.9260	11.77
Sand, Medium	**No.60 (0.250 mm)**	1.9467	6.10
Sand, Fine	**No.140 (0.106 mm)**	1.0710	2.98
Sand, Very Fine	**No.200 (0.0750 mm)**	0.1374	2.58

Silt and Clay
(Hydrometer Analysis)

Particle Diameter	Percent Passing
0.074 mm	2.93
0.005 mm	0.00
0.001 mm	0.00

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	7/6/2016
Sample Matrix:	Sediment	**Date Received:**	7/13/2016
		Date Analyzed:	7/19/2016

Particle Size Determination
ASTM D422

Sample Name: Lower Sherman Creek
Lab Code: K1607834-004

Gravel and Sand
(Sieve Analysis)

Description	Sieve Size	Weight (g)	Percent Passing
Gravel (19.0 mm)	**No.3/4"(19.0 mm)**	0.0000	100.01
Gravel (9.50 mm)	**No.3/8"(9.50 mm)**	4.0688	90.68
Gravel, Medium	**No.4 (4.75 mm)**	7.9300	72.49
Gravel, Fine	**No.10 (2.00 mm)**	0.1319	72.19
Sand, Very Coarse	**No.20 (0.850 mm)**	26.4918	11.29
Sand, Coarse	**No.40 (0.425 mm)**	3.1914	3.96
Sand, Medium	**No.60 (0.250 mm)**	0.9920	1.68
Sand, Fine	**No.140 (0.106 mm)**	0.3901	0.78
Sand, Very Fine	**No.200 (0.0750 mm)**	0.0365	0.69

Silt and Clay
(Hydrometer Analysis)

Particle Diameter	Percent Passing
0.074 mm	1.00
0.005 mm	0.07
0.001 mm	0.00

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	7/6/2016
Sample Matrix:	Sediment	**Date Received:**	7/13/2016
		Date Analyzed:	7/19/2016

Particle Size Determination
ASTM D422

Sample Name: Lower Sherman Creek
Lab Code: K1607834-004DUP

Gravel and Sand
(Sieve Analysis)

Description	Sieve Size	Weight (g)	Percent Passing
Gravel (19.0 mm)	**No.3/4"(19.0 mm)**	0.0000	100.01
Gravel (9.50 mm)	**No.3/8"(9.50 mm)**	0.0000	100.01
Gravel, Medium	**No.4 (4.75 mm)**	8.0611	81.30
Gravel, Fine	**No.10 (2.00 mm)**	0.1051	81.06
Sand, Very Coarse	**No.20 (0.850 mm)**	27.3535	17.40
Sand, Coarse	**No.40 (0.425 mm)**	4.8084	6.21
Sand, Medium	**No.60 (0.250 mm)**	1.6003	2.48
Sand, Fine	**No.140 (0.106 mm)**	0.6265	1.03
Sand, Very Fine	**No.200 (0.0750 mm)**	0.0598	0.89

Silt and Clay
(Hydrometer Analysis)

Particle Diameter	Percent Passing
0.074 mm	1.28
0.005 mm	0.04
0.001 mm	0.00

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	07/05/16 - 07/06/16
Sample Matrix:	Sediment	**Date Received:**	07/13/16
Analysis Method:	PSEP Sulfide	**Units:**	mg/Kg
Prep Method:	Method	**Basis:**	Dry

Sulfide, Total

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Lower Slate Creek	K1607834-001	ND U	2.5	1	07/29/16 21:57	7/29/16	*
East Fork Slate Creek	K1607834-002	ND U	6.8	1	07/29/16 21:57	7/29/16	*
Upper Slate Creek	K1607834-003	ND U	2.2	1	07/29/16 21:57	7/29/16	*
Lower Sherman Creek	K1607834-004	ND U	2.4	1	07/29/16 21:57	7/29/16	*
Method Blank	K1607834-MB	ND U	1.0	1	07/29/16 21:57	7/29/16	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project	Coeur AK Biomonitoring	**Date Collected:**	07/05/16
Sample Matrix:	Sediment	**Date Received:**	07/13/16
		Date Analyzed:	07/29/16

Triplicate Sample Summary
General Chemistry Parameters

Sample Name:	Lower Slate Creek	**Units:**	mg/Kg
Lab Code:	K1607834-001	**Basis:**	Dry
Analysis Method:	PSEP Sulfide		
Prep Method:	Method		

Analyte Name	MRL	Sample Result	Duplicate K1607834-001DUP Result	Triplicate K1607834-001TRP Result	Average	RSD	RSD Limit
Sulfide, Total	2.6	ND	ND	ND	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:16-0000384754 rev 00

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	07/05/16
Sample Matrix:	Sediment	**Date Received:**	07/13/16
		Date Analyzed:	07/29/16
		Date Extracted:	07/29/16

Duplicate Matrix Spike Summary
Sulfide, Total

Sample Name:	Lower Slate Creek	**Units:**	mg/Kg
Lab Code:	K1607834-001	**Basis:**	Dry
Analysis Method:	PSEP Sulfide		
Prep Method:	Method		

		Matrix Spike			**Duplicate Matrix Spike**					
		K1607834-001MS			K1607834-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Sulfide, Total	ND U	770	930	83	740	910	81	28-175	4	20

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

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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:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Analyzed:**	07/29/16
Sample Matrix:	Sediment	**Date Extracted:**	07/29/16

Lab Control Sample Summary
Sulfide, Total

Analysis Method:	PSEP Sulfide	**Units:**	mg/Kg
Prep Method:	Method	**Basis:**	Dry
		Analysis Lot:	507779

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1607834-LCS	391	410	94	39-166

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	07/05/16 - 07/06/16
Sample Matrix:	Sediment	**Date Received:**	07/13/16
Analysis Method:	PSEP TOC	**Units:**	Percent
Prep Method:	ALS SOP	**Basis:**	Dry, per Method

Carbon, Total Organic (TOC)

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Lower Slate Creek	K1607834-001	**0.585**	0.050	1	07/19/16 12:00	7/19/16	
East Fork Slate Creek	K1607834-002	**13.0**	0.050	1	07/19/16 12:00	7/19/16	
Upper Slate Creek	K1607834-003	**2.14**	0.050	1	07/19/16 12:00	7/19/16	
Lower Sherman Creek	K1607834-004	**0.322**	0.050	1	07/19/16 12:00	7/19/16	
Method Blank	K1607834-MB	ND U	0.050	1	07/19/16 12:00	7/19/16	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project	Coeur AK Biomonitoring	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA
		Date Analyzed:	07/19/16

Triplicate Sample Summary
General Chemistry Parameters

Sample Name:	Batch QC	**Units:**	Percent
Lab Code:	K1607938-013	**Basis:**	Dry, per Method
Analysis Method:	PSEP TOC		
Prep Method:	ALS SOP		

Analyte Name	MRL	Sample Result	Duplicate K1607938-013DUP Result	Triplicate K1607938-013TRP Result	Average	RSD	RSD Limit
Carbon, Total Organic (TOC)	0.050	0.873	0.873	0.874	0.874	<1	27

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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:16-0000384754 rev 00

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	N/A
Sample Matrix:	Sediment	**Date Received:**	N/A
		Date Analyzed:	07/19/16
		Date Extracted:	07/19/16

Duplicate Matrix Spike Summary
Carbon, Total Organic (TOC)

Sample Name:	Batch QC	**Units:**	Percent
Lab Code:	K1607938-013	**Basis:**	Dry, per Method
Analysis Method:	PSEP TOC		
Prep Method:	ALS SOP		

		Matrix Spike			Duplicate Matrix Spike					
		K1607938-013MS			K1607938-013DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Carbon, Total Organic (TOC)	0.873	3.91	3.02	101	3.80	3.00	98	69-123	3	27

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

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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:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Analyzed:**	07/19/16
Sample Matrix:	Sediment	**Date Extracted:**	07/19/16

Lab Control Sample Summary
Carbon, Total Organic (TOC)

Analysis Method:	PSEP TOC	**Units:**	Percent
Prep Method:	ALS SOP	**Basis:**	Dry, per Method
		Analysis Lot:	507692

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1607834-LCS	0.579	0.582	99	74-118

Metals

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1317 South 13th Avenue, Kelso, WA 98626
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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	07/05/16 09:00
Sample Matrix:	Sediment	**Date Received:**	07/13/16 09:40
Sample Name:	Lower Slate Creek	**Basis:**	Dry
Lab Code:	K1607834-001		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.7	**13100**	mg/Kg	2.1	2	08/15/16 05:35	08/15/16	
Arsenic	200.8	**17.5**	mg/Kg	0.52	5	08/25/16 10:07	08/15/16	
Cadmium	200.8	**0.673**	mg/Kg	0.021	5	08/25/16 10:07	08/15/16	
Chromium	200.8	**21.1**	mg/Kg	0.21	5	08/25/16 10:07	08/15/16	
Copper	200.8	**37.5**	mg/Kg	0.10	5	08/25/16 10:07	08/15/16	
Lead	200.8	**7.00**	mg/Kg	0.052	5	08/25/16 10:07	08/15/16	
Mercury	7471B	**0.057**	mg/Kg	0.019	1	08/02/16 12:35	08/02/16	
Nickel	200.8	**33.8**	mg/Kg	0.21	5	08/25/16 10:07	08/15/16	
Selenium	200.8	**1.4**	mg/Kg	1.0	5	08/25/16 10:07	08/15/16	
Silver	200.8	**0.076**	mg/Kg	0.021	5	08/25/16 10:07	08/15/16	
Zinc	200.8	**177**	mg/Kg	0.52	5	08/25/16 10:07	08/15/16	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	07/06/16 13:00
Sample Matrix:	Sediment	**Date Received:**	07/13/16 09:40
Sample Name:	East Fork Slate Creek	**Basis:**	Dry
Lab Code:	K1607834-002		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.7	**16500**	mg/Kg	5.7	2	08/15/16 05:52	08/15/16	
Arsenic	200.8	**51.5**	mg/Kg	1.4	5	08/25/16 10:35	08/15/16	
Cadmium	200.8	**8.20**	mg/Kg	0.057	5	08/25/16 10:35	08/15/16	
Chromium	200.8	**16.5**	mg/Kg	0.57	5	08/25/16 10:35	08/15/16	
Copper	200.8	**59.5**	mg/Kg	0.28	5	08/25/16 10:35	08/15/16	
Lead	200.8	**5.54**	mg/Kg	0.14	5	08/25/16 10:35	08/15/16	
Mercury	7471B	**0.109**	mg/Kg	0.020	1	08/02/16 12:37	08/02/16	
Nickel	200.8	**86.1**	mg/Kg	0.57	5	08/25/16 10:35	08/15/16	
Selenium	200.8	**3.1**	mg/Kg	2.8	5	08/25/16 10:35	08/15/16	
Silver	200.8	**0.190**	mg/Kg	0.057	5	08/25/16 10:35	08/15/16	
Zinc	200.8	**634**	mg/Kg	1.4	5	08/25/16 10:35	08/15/16	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	07/06/16 15:00
Sample Matrix:	Sediment	**Date Received:**	07/13/16 09:40
Sample Name:	Upper Slate Creek	**Basis:**	Dry
Lab Code:	K1607834-003		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.7	**14000**	mg/Kg	2.0	2	08/15/16 05:55	08/15/16	
Arsenic	200.8	**18.0**	mg/Kg	0.51	5	08/25/16 10:39	08/15/16	
Cadmium	200.8	**0.507**	mg/Kg	0.020	5	08/25/16 10:39	08/15/16	
Chromium	200.8	**71.7**	mg/Kg	0.20	5	08/25/16 10:39	08/15/16	
Copper	200.8	**37.0**	mg/Kg	0.10	5	08/25/16 10:39	08/15/16	
Lead	200.8	**2.69**	mg/Kg	0.051	5	08/25/16 10:39	08/15/16	
Mercury	7471B	**0.051**	mg/Kg	0.019	1	08/02/16 12:39	08/02/16	
Nickel	200.8	**48.5**	mg/Kg	0.20	5	08/25/16 10:39	08/15/16	
Selenium	200.8	**2.1**	mg/Kg	1.0	5	08/25/16 10:39	08/15/16	
Silver	200.8	**0.092**	mg/Kg	0.020	5	08/25/16 10:39	08/15/16	
Zinc	200.8	**111**	mg/Kg	0.51	5	08/25/16 10:39	08/15/16	

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	07/06/16 10:00
Sample Matrix:	Sediment	**Date Received:**	07/13/16 09:40
Sample Name:	Lower Sherman Creek	**Basis:**	Dry
Lab Code:	K1607834-004		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.7	**13800**	mg/Kg	2.1	2	08/15/16 05:58	08/15/16	
Arsenic	200.8	**19.9**	mg/Kg	0.52	5	08/25/16 10:42	08/15/16	
Cadmium	200.8	**0.388**	mg/Kg	0.021	5	08/25/16 10:42	08/15/16	
Chromium	200.8	**27.5**	mg/Kg	0.21	5	08/25/16 10:42	08/15/16	
Copper	200.8	**72.5**	mg/Kg	0.10	5	08/25/16 10:42	08/15/16	
Lead	200.8	**6.60**	mg/Kg	0.052	5	08/25/16 10:42	08/15/16	
Mercury	7471B	ND U	mg/Kg	0.020	1	08/02/16 12:44	08/02/16	
Nickel	200.8	**32.9**	mg/Kg	0.21	5	08/25/16 10:42	08/15/16	
Selenium	200.8	**1.1**	mg/Kg	1.0	5	08/25/16 10:42	08/15/16	
Silver	200.8	**0.097**	mg/Kg	0.021	5	08/25/16 10:42	08/15/16	
Zinc	200.8	**123**	mg/Kg	0.52	5	08/25/16 10:42	08/15/16	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	Dry
Lab Code:	KQ1609655-01		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.7	ND U	mg/Kg	2.0	2	08/15/16 05:28	08/15/16	
Arsenic	200.8	ND U	mg/Kg	0.50	5	08/25/16 09:56	08/15/16	
Cadmium	200.8	ND U	mg/Kg	0.020	5	08/25/16 09:56	08/15/16	
Chromium	200.8	ND U	mg/Kg	0.20	5	08/25/16 09:56	08/15/16	
Copper	200.8	ND U	mg/Kg	0.10	5	08/25/16 09:56	08/15/16	
Lead	200.8	ND U	mg/Kg	0.050	5	08/25/16 09:56	08/15/16	
Nickel	200.8	ND U	mg/Kg	0.20	5	08/25/16 09:56	08/15/16	
Selenium	200.8	ND U	mg/Kg	1.0	5	08/25/16 09:56	08/15/16	
Silver	200.8	ND U	mg/Kg	0.020	5	08/25/16 09:56	08/15/16	
Zinc	200.8	ND U	mg/Kg	0.50	5	08/25/16 09:56	08/15/16	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	Dry
Lab Code:	KQ1609070-04		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Mercury	7471B	ND U	mg/Kg	0.020	1	08/02/16 12:05	08/02/16	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project	Coeur AK Biomonitoring	**Date Collected:**	07/05/16
Sample Matrix:	Sediment	**Date Received:**	07/13/16
		Date Analyzed:	08/15/16 - 08/25/16

Replicate Sample Summary

Total Metals

Sample Name:	Lower Slate Creek	**Units:**	mg/Kg
Lab Code:	K1607834-001	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1609655-04 Result	Average	RPD	RPD Limit
Aluminum	200.7	2.0	13100	12500	12800	5	20
Arsenic	200.8	0.51	17.5	16.5	17.0	6	20
Cadmium	200.8	0.020	0.673	0.797	0.735	17	20
Chromium	200.8	0.20	21.1	19.6	20.4	8	20
Copper	200.8	0.10	37.5	42.1	39.8	11	20
Lead	200.8	0.051	7.00	7.31	7.16	4	20
Nickel	200.8	0.20	33.8	36.5	35.2	8	20
Selenium	200.8	1.0	1.4	1.1	1.3	28	20
Silver	200.8	0.020	0.076	0.082	0.079	7	20
Zinc	200.8	0.51	177	168	173	5	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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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project	Coeur AK Biomonitoring	**Date Collected:**	NA
Sample Matrix:	Biosolids Solids	**Date Received:**	NA
		Date Analyzed:	08/15/16 - 08/25/16

Replicate Sample Summary

Total Metals

Sample Name:	Batch QC	**Units:**	mg/Kg
Lab Code:	K1607934-001	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1609655-06 Result	Average	RPD	RPD Limit
Aluminum	200.7	11	4730	4680	4710	1	20
Arsenic	200.8	2.8	ND U	ND U	ND	-	20
Cadmium	200.8	0.11	1.37	1.44	1.41	5	20
Chromium	200.8	1.1	29.2	34.3	31.8	16	20
Copper	200.8	0.56	267	275	271	3	20
Lead	200.8	0.28	11.5	11.3	11.4	2	20
Nickel	200.8	1.1	24.3	27.7	26.0	13	20
Selenium	200.8	5.6	ND U	ND U	ND	-	20
Silver	200.8	0.11	1.90	2.25	2.08	17	20
Zinc	200.8	2.8	681	685	683	<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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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project	Coeur AK Biomonitoring	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
		Date Analyzed:	08/02/16

Replicate Sample Summary

Total Metals

Sample Name:	Batch QC	**Units:**	mg/Kg
Lab Code:	K1607727-003	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1609070-09 Result	Average	RPD	RPD Limit
Mercury	7471B	0.020	0.093	0.066	0.080	33	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.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	07/05/16
Sample Matrix:	Sediment	**Date Received:**	07/13/16
		Date Analyzed:	08/15/16 - 08/25/16

Matrix Spike Summary
Total Metals

Sample Name:	Lower Slate Creek	**Units:**	mg/Kg
Lab Code:	K1607834-001	**Basis:**	Dry

Matrix Spike
KQ1609655-05

Analyte Name	Method	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	200.7	13100	13600	407	117 #	70-130
Arsenic	200.8	17.5	114	102	95	70-130
Cadmium	200.8	0.673	10.5	10.2	97	70-130
Chromium	200.8	21.1	59.8	40.7	95	70-130
Copper	200.8	37.5	88.2	50.9	100	70-130
Lead	200.8	7.00	103	102	94	70-130
Nickel	200.8	33.8	135	102	100	70-130
Selenium	200.8	1.4	105	102	102	70-130
Silver	200.8	0.076	9.59	10.2	94	70-130
Zinc	200.8	177	260	102	82	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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Client: Alaska Department of Fish and Game
Project: Coeur AK Biomonitoring
Sample Matrix: Biosolids Solids

Service Request:K1607834
Date Collected:N/A
Date Received:N/A
Date Analyzed:08/15/16 - 08/25/16

Matrix Spike Summary
Total Metals

Sample Name: Batch QC
Lab Code: K1607934-001

Units:mg/Kg
Basis: Dry

Matrix Spike
KQ1609655-07

Analyte Name	Method	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	200.7	4730	7220	2250	111	70-130
Arsenic	200.8	ND U	579	563	103	70-130
Cadmium	200.8	1.37	56.5	56.3	98	70-130
Chromium	200.8	29.2	264	225	104	70-130
Copper	200.8	267	572	282	108	70-130
Lead	200.8	11.5	569	563	99	70-130
Nickel	200.8	24.3	604	563	103	70-130
Selenium	200.8	ND U	594	563	105	70-130
Silver	200.8	1.90	56.5	56.3	97	70-130
Zinc	200.8	681	1270	563	105	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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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Collected:**	N/A
Sample Matrix:	Soil	**Date Received:**	N/A
		Date Analyzed:	08/2/16
		Date Extracted:	08/2/16

Duplicate Matrix Spike Summary
Total Metals

Sample Name:	Batch QC	**Units:**	mg/Kg
Lab Code:	K1607727-003	**Basis:**	Dry
Analysis Method:	7471B		
Prep Method:	Method		

		Matrix Spike KQ1609070-01			Duplicate Matrix Spike KQ1609070-02					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Mercury	0.093	0.545	0.490	92	0.550	0.490	93	80-120	<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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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Analyzed:**	08/15/16
Sample Matrix:	Sediment	**Date Extracted:**	08/15/16

Lab Control Sample Summary
Total Metals

Analysis Method:	200.7	**Units:**	mg/Kg
Prep Method:	EPA 3050B	**Basis:**	Dry
		Analysis Lot:	509941

Lab Control Sample
KQ1609655-02

Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	405	374	108	85-115

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Analyzed:**	08/25/16
Sample Matrix:	Sediment	**Date Extracted:**	08/15/16

Lab Control Sample Summary
Total Metals

Analysis Method:	200.8	**Units:**	mg/Kg
Prep Method:	EPA 3050B	**Basis:**	Dry
		Analysis Lot:	511439

Lab Control Sample
KQ1609655-02

Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
Arsenic	97.6	93.5	104	85-115
Cadmium	9.16	9.35	98	85-115
Chromium	37.9	37.4	101	85-115
Copper	48.2	46.7	103	85-115
Lead	90.2	93.5	96	85-115
Nickel	96.6	93.5	103	85-115
Selenium	103	93.5	110	85-115
Silver	9.01	9.35	96	85-115
Zinc	102	93.5	109	85-115

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Analyzed:**	08/15/16
Sample Matrix:	Sediment	**Date Extracted:**	08/15/16

Lab Control Sample Summary
Total Metals

Analysis Method:	200.7	**Units:**	mg/Kg
Prep Method:	EPA 3050B	**Basis:**	Dry
		Analysis Lot:	509941

Lab Control Sample
KQ1609655-03

Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	5970	7930	75	39-161

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Analyzed:**	08/25/16
Sample Matrix:	Sediment	**Date Extracted:**	08/15/16

Lab Control Sample Summary
Total Metals

Analysis Method:	200.8	**Units:**	mg/Kg
Prep Method:	EPA 3050B	**Basis:**	Dry
		Analysis Lot:	511439

Lab Control Sample
KQ1609655-03

Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
Arsenic	102	98.5	104	69-145
Cadmium	143	146	98	73-127
Chromium	183	182	100	71-130
Copper	108	106	102	75-125
Lead	127	130	98	72-127
Nickel	153	149	103	73-127
Selenium	169	154	110	68-132
Silver	39.7	40.9	97	66-134
Zinc	201	191	105	70-130

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Analyzed:**	08/02/16
Sample Matrix:	Sediment	**Date Extracted:**	08/02/16

Lab Control Sample Summary
Total Metals

Analysis Method:	7471B	**Units:**	mg/Kg
Prep Method:	Method	**Basis:**	Dry
		Analysis Lot:	508132

Lab Control Sample
KQ1609070-06

Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
Mercury	0.490	0.500	98	80-120

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1607834
Project:	Coeur AK Biomonitoring	**Date Analyzed:**	08/02/16
Sample Matrix:	Sediment	**Date Extracted:**	08/02/16

Lab Control Sample Summary
Total Metals

Analysis Method:	7471B	**Units:**	mg/Kg
Prep Method:	Method	**Basis:**	Dry
		Analysis Lot:	508132

Lab Control Sample
KQ1609070-08

Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
Mercury	6.91	7.10	97	51-149

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September 27, 2016 **Analytical Report for Service Request No:** K1609286

Kate Kanouse
Alaska Department of Fish and Game
Division of Habitat
802 3rd Street
P.O. Box 110024
Douglas, AK 99811-0024

RE: Coeur AK Biomonitoring

Dear Kate,

Enclosed are the results of the sample(s) submitted to our laboratory August 11, 2016
For your reference, these analyses have been assigned our service request number **K1609286.**

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-detect") 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-detect") 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-detect") 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 DEC UST	http://dec.alaska.gov/applications/eh/ehllabreports/USTLabs.aspx	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/certlic/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	Not available	-
ISO 17025	http://www.pjlabs.com/	L16-57
Louisiana DEQ	http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx	03016
Maine DHS	Not available	WA01276
Minnesota DOH	http://www.health.state.mn.us/accreditation	053-999-457
Montana DPHHS	http://www.dphhs.mt.gov/publichealth/	CERT0047
Nevada DEP	http://ndep.nv.gov/bsdw/labservice.htm	WA01276
New Jersey DEP	http://www.nj.gov/dep/oqa/	WA005
North Carolina DWQ	http://www.dwqlab.org/	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/envserv/	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)	http://www.epa.gov/region8/water/dwhome/wyomingdi.html	-
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/anlayte is offered by that state.

Case Narrative

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ALS ENVIRONMENTAL

Client:	Alaska Department of Fish and Game	**Service Request No.:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Received:**	08/11/16
Sample Matrix:	Sediment		

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

One sediment sample was received for analysis at ALS Environmental on 08/11/16. The sample was received in good condition and consistent with the accompanying chain of custody form. The sample was stored in a refrigerator at 4ºC upon receipt at the laboratory.

General Chemistry Parameters

No anomalies associated with the analysis of this sample were observed.

Total Metals

Relative Percent Difference Exceptions:
The Relative Percent Difference (RPD) for the replicate analysis of Aluminum in the Batch QC sample 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.

No other anomalies associated with the analysis of this sample were observed.

Approved by_____

Chain of Custody

ALS Environmental—Kelso Laboratory
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Chain of Custody

ADDRESS 1317 South 13th Ave., Kelso, WA 98626
PHONE 1 360 577 7222 FAX 1 360 636 1068
Columbia Analytical Services, Inc.
Part of the ALS Group A Campbell Brothers Limited Company

Work Order No.: K1609280

Project Manager:	Kate Kanouse	Bill to:	Coeur Alaska
Client Name:	Coeur Alaska / AK. Dept. of Fish and Game	Company:	Kevin Eppers
Address:	802 3rd Street	Address:	3031 Clinton Dr. Ste 202
City, State ZIP:	Douglas, AK 99824	City, State ZIP:	Juneau, AK 99801
Email:	Kate.Kanouse@alaska.gov Phone: (907) 465-4290	Email:	keppers@coeur.com
Project Name:	Coeur AK Biomonitoring		
Project Number:			
P.O. Number:			
Sampler's Name:	Kate Kanouse		

SAMPLE RECEIPT

Temperature (°C):			Temp Blank Present		
Received Intact:	Yes	No	N/A	Wet Ice / Blue Ice	
Cooler Custody Seals:	Yes	No	N/A	Total Containers:	
Sample Custody Seals:	Yes	No	N/A		

REQUESTED ANALYSIS

TAT

- [ ] Routine
- [ ] Same Day ***
- [ ] Next Day ***
- [ ] 5 Day
- [ ] 7 Day

*** Please call for availability

Due Date:

Sample Identification	Matrix	Date Sampled	Time Sampled	Lab ID	No. of Containers	PSEP Sulfide	PSEP TOC	7471B / Hg	200.8 / Metals T	ASTM D422 / Part size	1600.3 mod / TS	1600.4 mod / TVS
Lower Johnson Creek		8/8/16	1500		3	X	X	X	X	X	X	X

Comments

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

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

Additional Methods Available Upon Request

RELINQUISHED BY			RECEIVED BY		
Print Name	Signature	Date/Time	Print Name	Signature	Date/Time
Kate Kanouse	Kate Kan	8/9/16 0800	B Wygant		8/11/16 9:45

PC Shar

Cooler Receipt and Preservation Form

Client Coeur Alaska Service Request *K16* 09286

Received: 8/11/16 Opened: 8/11/16 By: DW Unloaded: 8/11/16 By: DW

1. Samples were received via? *USPS* (*Fed 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? 1 Front
   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	Corr. Factor	Thermometer ID	Cooler/COC ID (NA)	Tracking Number NA	Filed
18.2	17.8	18.4	18.0	-04	365		7837-8021-1987	

4. Packing material: *Inserts* *Baggies* (*Bubble Wrap*) (*Gel Packs*) *Wet Ice* *Dry Ice* *Sleeves* THAWED
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.* NA (Y) N
   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.* NA (Y) N
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* (NA) Y N
11. Were VOA vials received without headspace? *Indicate in the table below.* (NA) Y N
12. 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 Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

*Notes, Discrepancies, & Resolutions:*_____

Total Solids

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Collected:**	08/8/16
Sample Matrix:	Sediment	**Date Received:**	08/11/16
Analysis Method:	160.3 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	As Received

Solids, Total

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Lower Johnson Creek	K1609286-001	**71.9**	-	1	08/17/16 14:22	

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project	Coeur AK Biomonitoring	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Analysis Method:	160.3 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	As Received

Replicate Sample Summary
Inorganic Parameters

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Batch QC	K1609223-001DUP	-	56.1	55.6	55.9	<1	20	08/17/16

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:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project	Coeur AK Biomonitoring	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA
Analysis Method:	160.3 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	NA

Replicate Sample Summary
Inorganic Parameters

Sample Name:	Lab Code:	MRL	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
Batch QC	K1609256-001DUP	-	41.2	41.1	41.2	<1	20	08/17/16

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General Chemistry

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Collected:**	08/8/16
Sample Matrix:	Sediment	**Date Received:**	08/11/16
Analysis Method:	160.4 Modified	**Units:**	Percent
Prep Method:	None	**Basis:**	Dry, per Method

Solids, Total Volatile

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Q
Lower Johnson Creek	K1609286-001	**2.30**	0.010	1	08/12/16 13:45	
Method Blank	K1609286-MB	ND U	0.010	1	08/12/16 13:45	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project	Coeur AK Biomonitoring	**Date Collected:**	08/08/16
Sample Matrix:	Sediment	**Date Received:**	08/11/16
		Date Analyzed:	08/12/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	Lower Johnson Creek	**Units:**	Percent
Lab Code:	K1609286-001	**Basis:**	Dry, per Method

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1609286-001DUP Result	Average	RPD	RPD Limit
Solids, Total Volatile	160.4 Modified	0.010	2.30	2.50	2.40	8	20

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Collected:**	8/8/2016
Sample Matrix:	Sediment	**Date Received:**	8/11/2016
		Date Analyzed:	8/30/2016

Particle Size Determination
ASTM D422

Sample Name: Lower Johnson Creek
Lab Code: K1609286-001

Gravel and Sand
(Sieve Analysis)

Description	Sieve Size	Weight (g)	Percent Passing
Gravel (19.0 mm)	**No.3/4"(19.0 mm)**	0.0000	100.00
Gravel (9.50 mm)	**No.3/8"(9.50 mm)**	0.0000	100.00
Gravel, Medium	**No.4 (4.75 mm)**	0.0000	100.00
Gravel, Fine	**No.10 (2.00 mm)**	0.0000	100.00
Sand, Very Coarse	**No.20 (0.850 mm)**	0.3049	98.53
Sand, Coarse	**No.40 (0.425 mm)**	0.4190	96.52
Sand, Medium	**No.60 (0.250 mm)**	1.7426	88.13
Sand, Fine	**No.140 (0.106 mm)**	8.2435	48.47
Sand, Very Fine	**No.200 (0.0750 mm)**	3.1642	33.25

Silt and Clay
(Hydrometer Analysis)

Particle Diameter	Percent Passing
0.074 mm	30.57
0.005 mm	5.14
0.001 mm	0.00

ALS Group USA, Corp.
dba ALS Environmental
Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Collected:**	8/8/2016
Sample Matrix:	Sediment	**Date Received:**	8/11/2016
		Date Analyzed:	8/30/2016

Particle Size Determination
ASTM D422

Sample Name: Lower Johnson Creek
Lab Code: K1609286-001DUP

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)**	0.0000	100.00
Gravel, Fine	**No.10 (2.00 mm)**	0.0000	100.00
Sand, Very Coarse	**No.20 (0.850 mm)**	0.1436	99.29
Sand, Coarse	**No.40 (0.425 mm)**	0.3416	97.60
Sand, Medium	**No.60 (0.250 mm)**	1.3571	90.87
Sand, Fine	**No.140 (0.106 mm)**	7.7890	52.27
Sand, Very Fine	**No.200 (0.0750 mm)**	3.0595	37.11

Silt and Clay
(Hydrometer Analysis)

Particle Diameter	Percent Passing
0.074 mm	33.00
0.005 mm	5.24
0.001 mm	0.00

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Collected:**	08/8/16
Sample Matrix:	Sediment	**Date Received:**	08/11/16
Analysis Method:	PSEP Sulfide	**Units:**	mg/Kg
Prep Method:	Method	**Basis:**	Dry

Sulfide, Total

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Lower Johnson Creek	K1609286-001	ND U	2.5	1	08/15/16 20:07	8/15/16	
Method Blank	K1609286-MB	ND U	1.0	1	08/15/16 20:07	8/15/16	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project	Coeur AK Biomonitoring	**Date Collected:**	08/08/16
Sample Matrix:	Sediment	**Date Received:**	08/11/16
		Date Analyzed:	08/15/16

Replicate Sample Summary

General Chemistry Parameters

Sample Name:	Lower Johnson Creek	**Units:**	mg/Kg
Lab Code:	K1609286-001	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1609286-001DUP Result	Average	RPD	RPD Limit
Sulfide, Total	PSEP Sulfide	2.2	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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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project	Coeur AK Biomonitoring	**Date Collected:**	08/08/16
Sample Matrix:	Sediment	**Date Received:**	08/11/16
		Date Analyzed:	08/15/16

Triplicate Sample Summary
General Chemistry Parameters

Sample Name:	Lower Johnson Creek	**Units:**	mg/Kg
Lab Code:	K1609286-001	**Basis:**	Dry
Analysis Method:	PSEP Sulfide		
Prep Method:	Method		

Analyte Name	MRL	Sample Result	Duplicate K1609286-001DUP Result	Triplicate K1609286-001TRP Result	Average	RSD	RSD Limit
Sulfide, Total	2.4	ND	ND	ND	NC	NC	20

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Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Collected:**	08/08/16
Sample Matrix:	Sediment	**Date Received:**	08/11/16
		Date Analyzed:	08/15/16
		Date Extracted:	08/15/16

Duplicate Matrix Spike Summary
Sulfide, Total

Sample Name:	Lower Johnson Creek	**Units:**	mg/Kg
Lab Code:	K1609286-001	**Basis:**	Dry
Analysis Method:	PSEP Sulfide		
Prep Method:	Method		

		Matrix Spike K1609286-001MS			**Duplicate Matrix Spike** K1609286-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Sulfide, Total	ND U	850	970	88	830	970	86	28-175	3	20

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Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Analyzed:**	08/15/16
Sample Matrix:	Sediment	**Date Extracted:**	08/15/16

Lab Control Sample Summary
Sulfide, Total

Analysis Method:	PSEP Sulfide	**Units:**	mg/Kg
Prep Method:	Method	**Basis:**	Dry
		Analysis Lot:	510030

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1609286-LCS	359	400	90	39-166

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Collected:**	08/8/16
Sample Matrix:	Sediment	**Date Received:**	08/11/16
Analysis Method:	PSEP TOC	**Units:**	Percent
Prep Method:	ALS SOP	**Basis:**	Dry, per Method

Carbon, Total Organic (TOC)

Sample Name	Lab Code	Result	MRL	Dil.	Date Analyzed	Date Extracted	Q
Lower Johnson Creek	K1609286-001	**0.422**	0.050	1	08/19/16 11:00	8/18/16	
Method Blank	K1609286-MB	ND U	0.050	1	08/19/16 11:00	8/18/16	

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project	Coeur AK Biomonitoring	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA
		Date Analyzed:	08/19/16

Replicate Sample Summary
General Chemistry Parameters

Sample Name:	Batch QC	**Units:**	Percent
Lab Code:	K1609115-012	**Basis:**	Dry, per Method

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample K1609115-012DUP Result	Average	RPD	RPD Limit
Carbon, Total Organic (TOC)	PSEP TOC	0.050	1.26	1.26	1.26	<1	27

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QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project	Coeur AK Biomonitoring	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA
		Date Analyzed:	08/19/16

Triplicate Sample Summary
General Chemistry Parameters

Sample Name:	Batch QC	**Units:**	Percent
Lab Code:	K1609115-012	**Basis:**	Dry, per Method
Analysis Method:	PSEP TOC		
Prep Method:	ALS SOP		

Analyte Name	MRL	Sample Result	Duplicate K1609115-012DUP Result	Triplicate K1609115-012TRP Result	Average	RSD	RSD Limit
Carbon, Total Organic (TOC)	0.050	1.26	1.26	1.25	1.26	<1	27

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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 9/9/2016 3:30:17 PM

SuperSet Reference:16-0000388929 rev 00

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Collected:**	N/A
Sample Matrix:	Sediment	**Date Received:**	N/A
		Date Analyzed:	08/19/16
		Date Extracted:	08/18/16

Duplicate Matrix Spike Summary
Carbon, Total Organic (TOC)

Sample Name:	Batch QC	**Units:**	Percent
Lab Code:	K1609115-012	**Basis:**	Dry, per Method
Analysis Method:	PSEP TOC		
Prep Method:	ALS SOP		

		Matrix Spike			**Duplicate Matrix Spike**					
		K1609115-012MS			K1609115-012DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Carbon, Total Organic (TOC)	1.26	4.98	3.73	100	4.86	3.64	99	69-123	1	27

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

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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:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Analyzed:**	08/19/16
Sample Matrix:	Sediment	**Date Extracted:**	08/18/16

Lab Control Sample Summary
Carbon, Total Organic (TOC)

Analysis Method:	PSEP TOC	**Units:**	Percent
Prep Method:	ALS SOP	**Basis:**	Dry, per Method
		Analysis Lot:	510765

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1609286-LCS	0.563	0.582	97	74-118

Metals

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Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Collected:**	08/08/16 15:00
Sample Matrix:	Sediment	**Date Received:**	08/11/16 09:45
Sample Name:	Lower Johnson Creek	**Basis:**	Dry
Lab Code:	K1609286-001		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Aluminum	200.8	**9470**	mg/Kg	110	500	09/13/16 11:57	09/02/16	
Arsenic	200.8	**13.0**	mg/Kg	0.28	5	09/13/16 11:53	09/02/16	
Cadmium	200.8	**0.150**	mg/Kg	0.011	5	09/13/16 11:53	09/02/16	
Chromium	200.8	**18.9**	mg/Kg	0.11	5	09/13/16 11:53	09/02/16	
Copper	200.8	**76.3**	mg/Kg	0.057	5	09/13/16 11:53	09/02/16	
Lead	200.8	**8.41**	mg/Kg	0.028	5	09/13/16 11:53	09/02/16	
Mercury	7471B	**0.020**	mg/Kg	0.020	1	09/02/16 12:00	09/02/16	
Nickel	200.8	**15.1**	mg/Kg	0.11	5	09/13/16 11:53	09/02/16	
Selenium	200.8	ND	mg/Kg	0.57	5	09/13/16 11:53	09/02/16	U
Silver	200.8	**0.574**	mg/Kg	0.011	5	09/13/16 11:53	09/02/16	
Zinc	200.8	**65.7**	mg/Kg	0.28	5	09/13/16 11:53	09/02/16	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	Dry
Lab Code:	KQ1610690-01		

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	09/13/16 11:45	09/02/16	
Arsenic	200.8	ND U	mg/Kg	0.50	5	09/13/16 11:45	09/02/16	
Cadmium	200.8	ND U	mg/Kg	0.020	5	09/13/16 11:45	09/02/16	
Chromium	200.8	ND U	mg/Kg	0.20	5	09/13/16 11:45	09/02/16	
Copper	200.8	ND U	mg/Kg	0.10	5	09/13/16 11:45	09/02/16	
Lead	200.8	ND U	mg/Kg	0.050	5	09/13/16 11:45	09/02/16	
Nickel	200.8	ND U	mg/Kg	0.20	5	09/13/16 11:45	09/02/16	
Selenium	200.8	ND U	mg/Kg	1.0	5	09/13/16 11:45	09/02/16	
Silver	200.8	ND U	mg/Kg	0.020	5	09/13/16 11:45	09/02/16	
Zinc	200.8	ND U	mg/Kg	0.50	5	09/13/16 11:45	09/02/16	

Analytical Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Collected:**	NA
Sample Matrix:	Sediment	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	Dry
Lab Code:	KQ1610699-01		

Total Metals

Analyte Name	Analysis Method	Result	Units	MRL	Dil.	Date Analyzed	Date Extracted	Q
Mercury	7471B	ND U	mg/Kg	0.020	1	09/02/16 11:56	09/02/16	

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dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project	Coeur AK Biomonitoring	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
		Date Analyzed:	09/13/16

Replicate Sample Summary

Total Metals

Sample Name:	Batch QC	**Units:**	mg/Kg
Lab Code:	K1609967-001	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1610690-03 Result	Average	RPD	RPD Limit
Aluminum	200.8	20	275	364	320	28 *	20
Arsenic	200.8	5.0	ND U	ND U	ND	-	20
Cadmium	200.8	0.20	ND U	ND U	ND	-	20
Chromium	200.8	2.0	8.4	10.0	9.2	17	20
Copper	200.8	1.00	114	124	119	9	20
Lead	200.8	0.50	1.57	1.95	1.76	22	20
Nickel	200.8	2.0	59.6	66.6	63.1	11	20
Selenium	200.8	10.0	ND U	ND U	ND	-	20
Silver	200.8	0.20	0.23	ND U	NC	NC	20
Zinc	200.8	5.0	562	607	585	8	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.

ALS Group USA, Corp.

dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project	Coeur AK Biomonitoring	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
		Date Analyzed:	09/02/16

Replicate Sample Summary

Total Metals

Sample Name:	Batch QC	**Units:**	mg/Kg
Lab Code:	K1609479-001	**Basis:**	Dry

Analyte Name	Analysis Method	MRL	Sample Result	Duplicate Sample KQ1610699-04 Result	Average	RPD	RPD Limit
Mercury	7471B	0.020	0.043	0.042	0.043	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.

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Collected:**	N/A
Sample Matrix:	Soil	**Date Received:**	N/A
		Date Analyzed:	09/13/16
		Date Extracted:	09/2/16

Matrix Spike Summary
Total Metals

Sample Name:	Batch QC	**Units:**	mg/Kg
Lab Code:	K1609967-001	**Basis:**	Dry
Analysis Method:	200.8		
Prep Method:	EPA 3050B		

Matrix Spike
KQ1610690-04

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	275	3860	3920	92	70-130
Arsenic	ND U	905	980	92	70-130
Cadmium	ND U	94.3	98.0	96	70-130
Chromium	8.4	379	392	95	70-130
Copper	114	584	489	96	70-130
Lead	1.57	950	980	97	70-130
Nickel	59.6	982	980	94	70-130
Selenium	ND U	912	980	93	70-130
Silver	0.23	92.1	98.0	94	70-130
Zinc	562	1470	980	93	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.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Collected:**	N/A
Sample Matrix:	Soil	**Date Received:**	N/A
		Date Analyzed:	09/2/16
		Date Extracted:	09/2/16

Duplicate Matrix Spike Summary
Total Metals

Sample Name:	Batch QC	**Units:**	mg/Kg
Lab Code:	K1609479-001	**Basis:**	Dry
Analysis Method:	7471B		
Prep Method:	Method		

		Matrix Spike KQ1610699-05			Duplicate Matrix Spike KQ1610699-06					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Mercury	0.043	0.506	0.496	93	0.485	0.496	89	80-120	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.

Printed 9/16/2016 8:21:22 AM Superset Reference:

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Analyzed:**	09/13/16
Sample Matrix:	Sediment	**Date Extracted:**	09/02/16

Lab Control Sample Summary
Total Metals

Analysis Method:	200.8	**Units:**	mg/Kg
Prep Method:	EPA 3050B	**Basis:**	Dry
		Analysis Lot:	513863

Lab Control Sample
KQ1610690-02

Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
Aluminum	5350	7930	67	39-161
Arsenic	91.8	98.5	93	69-145
Cadmium	130	146	89	73-127
Chromium	159	182	87	71-130
Copper	95.6	106	90	75-125
Lead	120	130	92	72-127
Nickel	133	149	90	73-127
Selenium	150	154	97	68-132
Silver	36.0	40.9	88	66-134
Zinc	178	191	93	70-130

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Analyzed:**	09/02/16
Sample Matrix:	Sediment	**Date Extracted:**	09/02/16

Lab Control Sample Summary
Total Metals

Analysis Method:	7471B	**Units:**	mg/Kg
Prep Method:	Method	**Basis:**	Dry
		Analysis Lot:	512823

Lab Control Sample
KQ1610699-02

Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
Mercury	0.512	0.500	102	80-120

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	Alaska Department of Fish and Game	**Service Request:**	K1609286
Project:	Coeur AK Biomonitoring	**Date Analyzed:**	09/02/16
Sample Matrix:	Sediment	**Date Extracted:**	09/02/16

Lab Control Sample Summary
Total Metals

Analysis Method:	7471B	**Units:**	mg/Kg
Prep Method:	Method	**Basis:**	Dry
		Analysis Lot:	512823

Lab Control Sample
KQ1610699-03

Analyte Name	Result	Spike Amount	% Rec	% Rec Limits
Mercury	7.15	7.10	101	51-149

Appendix F.5.–2016 sediment toxicity lab report.

BIOASSAY REPORT

CHRONIC DEFINITIVE SEDIMENT
BIOASSAYS CONDUCTED
August 22 through September 1, 2016

Prepared for

COEUR ALASKA / ALASKA DEPARTMENT OF FISH AND GAME
KENSINGTON MINE
DOUGLAS, ALASKA

Prepared by

ch2m:

Applied Sciences Laboratory (ASL)

1100 NE Circle Boulevard, Suite 300
Corvallis, Oregon 97330
541-768-3160

NELAC #OR100022

Report Date: September 21, 2016
Lab I.D. No. B3584

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INTRODUCTION

CH2M HILL conducted 10 day chronic definitive sediment bioassays from August 22 through September 31, 2016, on samples provided by Coeur Alaska / Alaska Department of Fish and Game, Douglas, Alaska on behalf of the Kensington Gold Mine. The tests were conducted using the freshwater amphipod (*Hyalella azteca*) and the freshwater chironomid (*Chironomus tentans*).

OVERVIEW OF REGULATORY GUIDANCE

The following provides an overview and excerpts of applicable permit specifics, regulatory guidance, and other relevant information. This is intended only as a helpful guide, from a laboratory perspective, for understanding test outcomes. The final responsibility for interpretation of results remains with the client and/or regulatory agency.

The following guidance is taken from CH2M's reading of the APDES permit for Kensington Mine (permit #AK0050571).

1.5.2.3 Biological Testing of Sediments:

- *1.5.2.3.1* Sediment samples will undergo acute toxicity testing to assess the relative toxicity … The following bioassays are required:
  - Test method 100.1 : *Hyalella azteca* 10-day survival test for sediments
  - Test method 100.2 : *Chironomus dilutus* 10-day survival test for sediments
- *1.5.2.3.2* Test methods … shall be in accordance with *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates,* EPA/600/R-94/024.

SUMMARY OF TEST RESULTS

Exhibit 1 provides a summary of the final test results.

EXHIBIT 1
Summary of Chronic Test Results

Sample ID	Species	NOEC (%)	LOEC (%)
Lower Sherman Creek	*H. azteca*	100%	> 100%
Lower Sherman Creek	*C. tentans*	< 100%	100%
East Fork Slate Creek	*H. azteca*	100%	> 100%
East Fork Slate Creek	*C. tentans*	100%	> 100%
Lower Johnson Creek	*H. azteca*	100%	> 100%
Lower Johnson Creek	*C. tentans*	100%	> 100%
Lower Slate Creek	*H. azteca*	100%	> 100%
Lower Slate Creek	*C. tentans*	100%	> 100%
Upper Slate Creek	*H. azteca*	100%	> 100%
Upper Slate Creek	*C. tentans*	100%	> 100%

Note: acronyms are as defined below Exhibit 2.

More detailed information is provided in the Acute Results and Data Interpretation sections.

ACRONYM DEFINITIONS (from EPA guidance):

NOEC = No Observed Effect Concentration: The highest test concentration that causes no observable adverse effects on the test organisms (i.e. no statistically significant reduction from the control).
LOEC = Low Observed Effect Concentration: The lowest test concentration that does cause an observable adverse effect on the test organisms (i.e. is statistically significant reduction from the control).

METHODS AND MATERIALS

TEST METHODS

The tests were performed according to: *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates*, Second Edition, EPA 600/R-99/064 (EPA 2000). (Most recent update to the EPA 600/R-94/024 method sited in the permit)

Note: The test species *Chironomus dilutus* was replaced with *Chironomus tentans* in the newer version of the protocol and was used for this testing.

DEVIATIONS FROM PROTOCOLS

Deviations from required procedures in the test methods:

- None noted.

Deviations from recommended procedures in the test methods:

- Not all of the samples were within the EPA recommended holding temperature range of 0 to 6 °C upon arrival at the laboratory. See notation in Sample Collection and Storage below.

TEST DESIGN

The following summarizes the conditions used for both overall testing and the specifics for each test (observations and notations can be found on the datasheets in Appendix A):

Overall Test Design:

- Acute tests: 100 percent sample + dilution sediment for the control.

H. azteca 10-day sediment test:

- Source: Chesapeake Cultures, Nayes, Virginia
- Age: 7 to 14 days old (required), within a 1-2 age range (recommended)
- Design: Eight test vessels per concentration (a minimum of 4 required), ten organisms per vessel
    - 100 ml of sediment per vessel
    - 175 ml of overlying water (Reconstituted Moderately Hard water)
- Overlying Water Renewal: Twice Daily
- Monitoring:
    - Initiation and Termination: Hardness, Alkalinity, Ammonia, DO, pH, Conductivity, and Temperature in the overlying water.

    - Daily: DO and Temperature in pre-renewal solutions in the overlying water, all concentrations.
    - Termination: Survival and Dry Weight.
- Feeding: 1.0 ml YCT per vessel daily.
- Termination: 10 days after test initiation.
- Endpoints: Survival and Growth (average dry weight per surviving organism)

C. tentans 10-day sediment test:

- Source: Aquatic Biosystems, Fort Collins, Colorado
- Age: 2nd to 3rd instar (~10 days old)
- Design: Eight test vessels per concentration (a minimum of 4), ten organisms per vessel
    - 100 ml of sediment per vessel.
    - 175 ml of overlying water (Reconstituted Moderately Hard water)
- Overlying Water Renewal: Twice Daily
- Monitoring:
    - Initiation and Termination: Hardness, Alkalinity, Ammonia, DO, pH, Conductivity, and Temperature in the overlying water.
    - Daily: DO and Temperature in pre-renewal solutions in the overlying water, all concentrations.
    - Termination: Survival and Ash-Free Dry Weight (AFDW).
- Feeding: 1.5 ml of a 4 g/L TetraMin slurry per vessel daily.
- Termination: 10 days after test initiation.
- Endpoints: Survival and AFDW (average AFDW per surviving organism)

CONTROL SEDIMENT AND OVERLYING WATER

The dilution water used was the standard culture water used by CH2M-ASL:

- Reconstituted, moderately hard water (as per EPA protocol) with a total hardness of 80 to 100 mg/L as $CaCO_3$ and an alkalinity of 60 to 70 mg/L as $CaCO_3$.

The dilution sediment used was field collected sediment from Beaver Creek, upstream of Yaquina bay, near the town of Newport, Oregon.

- The Beaver Creek sediment was press sieved to remove indigenous organisms.

SAMPLE COLLECTION AND STORAGE

Samples were collected by Coeur Alaska / Alaska Department of Fish and Game personnel. The samples were accepted as scheduled by CH2M's Applied Sciences Laboratory. Chain of Custody and Sample Receipt Records are provided in Appendix C.

- Not all samples were received within the EPA recommended 0 to 6 °C range.
    - The sample collected on Aug. 8, 2016 was received at 15.2 °C which is outside of the EPA recommended 0 to 6 °C range.
    - The Jul. 6, 2016 and Jul. 5, 2016 samples were received in the 0 to 6 °C range.

- Following receipt, the samples were stored in the dark at 0 to 6 °C until test solutions were prepared and tested.
- All testing was initiated within the EPA recommended 8 week holding time from sample collection.

SAMPLE PREPARATION

Samples used during these tests were:

- Homogenized prior to use with all large material (~ 1 inch +) removed.

DATA ANALYSIS

The statistical analyses performed for the acute tests were those outlined in *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates*, Second Edition, EPA 600/R-99/064

- The specific statistical analysis and CETIS version used for each endpoint evaluation is listed with the statistical outputs included with each test in Appendix A.
- If any additional analysis methods were also used, an explanation of the rationale and reference to the source method is included with the presentation of those results below.

RESULTS AND DISCUSSION

The raw data sheets for all tests are presented in Appendix A.

ACUTE BIOASSAYS

Table 1 summarizes the survival data for the amphipod test.

Table 1
Amphipod (*H. azteca*) Bioassay Data

Sample Concentration (%)	10 day % Survival	10 day Dry Weight (mg)
Control	96.3	0.0914
Lower Sherman Creek	95.0	0.0929
East Fork Slate Creek	91.3	0.0990
Lower Johnson Creek	91.3	0.0917
Lower Slate Creek	90.0	0.0976
Upper Slate Creek	85.0	0.0929

Statistical analysis in accordance with the EPA protocol results no statistically significant reduction in survival or growth for the following samples:

- Lower Sherman Creek
- East Fork Slate Creek
- Lower Johnson Creek
- Lower Slate Creek
- Upper Slate Creek

Daily mean test temperatures remained at 23±1°C, and instantaneous temperatures remained at 23±3°C, for the tests. The dissolved oxygen levels in the tests remained above the EPA recommended minimum 2.5 mg/L throughout the test period.

The *H. azteca* test meets Test Acceptability Criteria (TAC) of a minimum 80 percent control survival and measureable growth (initial dry weights were 0.0645 mg). Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. The testing should be considered "valid".

Table 2 summarizes the survival data for the chironomid test.

Table 2
Chironomid (*C. tentans*) Bioassay Data

Sample Concentration (%)	10 day % Survival	10 day Ash- Free Dry Weight (mg)
Control	100	1.473
Lower Sherman Creek	83.8 [a]	1.420
East Fork Slate Creek	93.8	1.409
Lower Johnson Creek	97.5	1.499
Lower Slate Creek	96.3	1.470
Upper Slate Creek	95.0	1.403

[a] Indicates a statistically significant reduction from control at p equal to 0.05 using Equal Variance t Two-Sample test.

Statistical analysis in accordance with the EPA protocol results in no statistically significant reduction in survival or growth for the following samples:

- East Fork Slate Creek
- Lower Johnson Creek
- Lower Slate Creek
- Upper Slate Creek

Statistical analysis in accordance with the EPA protocol did result in a statistically significant reduction in survival or growth for the following samples:

- Lower Sherman Creek

Daily mean test temperatures remained at 23±1°C, and instantaneous temperatures remained at 23±3°C, for the tests. The dissolved oxygen levels in the tests remained above the EPA recommended minimum 2.5 mg/L throughout the test period.

The *C. tentans* test meets Test Acceptability Criteria (TAC) of a minimum 70 percent control survival and minimum Ash-free dry weight (AFDW) of 0.48 mg. Unless referenced above, the tests proceeded without any noted deviations or interruptions that could have affected test results. The testing should be considered "valid".

REFERENCE TOXICANT TESTS

Reference toxicant (reftox) testing is performed to document both initial and ongoing laboratory performance of the test method(s). While the health of the test organisms is primarily evaluated by the performance of the laboratory control, reftox test results also may be used to assess the health and sensitivity of the test organisms. Reftox test results within their respective cumulative summary (Cusum) chart limits are indicative of consistent laboratory performance and normal test organism sensitivity.

The results of the reftox tests indicate that the test organisms were within their respective cusum chart limits based on EPA guidelines. This demonstrates ongoing laboratory proficiency of the test methods and suggests normal test organism sensitivity in the associated client testing.

The *H. azteca* and *C. tentans* reftox tests were conducted using potassium chloride. The data sheets for the reference toxicant tests are provided in Appendix B.

Table 3 summarizes the reference toxicant test results and Cusum chart limits.

Table 3
Reference Toxicant Tests (g/L)

Species	LC_{50}	Control Chart
H. azteca	0.309	0.280 to 0.439
C. tentans	6.12	1.71 to 7.24

APPENDIX A

RAW DATA SHEETS

CH2M HILL TOXICITY TEST ORGANISM AND WATER QUALITY DATA

Client: Kensington — Test Initiation: Date 8-22-16 — Test Termination: Date 9-1-16

Contact: — Technician:

Test Species/ID: *Hyallela azteca* / AMP 86

Sample Information								Test Species Information	ID# AMP 86	ID#	ID#	ID#
Sample ID Number	Field ID	Collected Date	Collected Time	Total Residual Chlorine (mg/l) As Received / As Dechlor.	Ammonia NH_3-N mg/l	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$					
B3584-01	East Fork Slate Creek	7-6-16	1300	- / -	See Titration and Ammonia sheet			Chronic				
B3584-02	Upper Slate Creek	7-6-16	1500	- / -				Organism Age at Initiation: 7 to 14 days (1 day range)				
B3584-03	Lower Sherman Creek	7-6-16	1000	- / -	-	-	-	Test Container Size: 300 ml				
B3584-04	Lower Slate Creek	7-5-16	0900	- / -	-	-	-	Test Volume: 100 ml sample, 175 ml overlying water				
B3584-05	Lower Johnson Creek	8-8-16	1530	- / -	-	-	-	Feeding: Type: 1 ml YCT; Amount: daily				
				/					-			
				/				Aeration: Began: none; Amount: —				
				/								
				/				Dilution Water ID#: 4380, 4397				
				/				Acclimation Period: 3 days				
				/				Test Location: # 10				
				/				Initial Size (mg/org): 0.0645				

Dilution Water	ID#	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$	Initial pH
Dilution Sediment: Beaver Creek	4380	-	-	-
Recon MH (FHM)	4397	90	66	8.2
	4401	90	70	8.9
	4402	98	66	8.2
	4403	92	64	8.1
	4407	94	66	8.6

Comments: ☑ Indicates the following action was taken, (☐ Indicates action not taken):

8-21-16 - Sediment added to jars → dilution water added MJS/JW 1400

Water Quality Meters Used/ID#

Dissolved Oxygen #24 pH #311 Conductivity #2

ROG MC 8-22-16

Hyallela RANDOMIZATION SHEET

Client: **Kensington** **Test Start Date:**

Laboratory ID:	Field ID:	Alternate ID / Dilutions:	Replicate ID:	Random Number	Test Chamber Number:
Sediment Control	Beaver Creek	Control	D	0.96386	3
Sediment Control	Beaver Creek	Control	A	0.87687	7
Sediment Control	Beaver Creek	Control	B	0.84599	10
Sediment Control	Beaver Creek	Control	E	0.78946	14
Sediment Control	Beaver Creek	Control	F	0.64025	19
Sediment Control	Beaver Creek	Control	C	0.57624	22
Sediment Control	Beaver Creek	Control	H	0.11533	41
Sediment Control	Beaver Creek	Control	G	0.03380	45
B3584-05	Lower Johnson Creek		H	0.98837	2
B3584-05	Lower Johnson Creek		E	0.60252	21
B3584-05	Lower Johnson Creek		A	0.47825	28
B3584-05	Lower Johnson Creek		C	0.33275	33
B3584-05	Lower Johnson Creek		G	0.29038	34
B3584-05	Lower Johnson Creek		D	0.08595	42
B3584-05	Lower Johnson Creek		F	0.04697	44
B3584-05	Lower Johnson Creek		B	0.00317	48
B3584-04	Lower Slate Creek		F	0.99934	1
B3584-04	Lower Slate Creek		D	0.84256	11
B3584-04	Lower Slate Creek		H	0.77387	15
B3584-04	Lower Slate Creek		B	0.54258	24
B3584-04	Lower Slate Creek		E	0.50834	26
B3584-04	Lower Slate Creek		A	0.47836	27
B3584-04	Lower Slate Creek		G	0.45783	31
B3584-04	Lower Slate Creek		C	0.06878	43
B3584-03	Lower Sherman Creek		D	0.89121	5
B3584-03	Lower Sherman Creek		C	0.89107	6
B3584-03	Lower Sherman Creek		A	0.85573	9
B3584-03	Lower Sherman Creek		E	0.80200	13
B3584-03	Lower Sherman Creek		G	0.46815	29
B3584-03	Lower Sherman Creek		H	0.28869	35
B3584-03	Lower Sherman Creek		B	0.23766	37
B3584-03	Lower Sherman Creek		F	0.19028	39
B3584-02	Upper Slate Creek		H	0.94389	4
B3584-02	Upper Slate Creek		E	0.70720	16
B3584-02	Upper Slate Creek		A	0.66646	17
B3584-02	Upper Slate Creek		B	0.60460	20
B3584-02	Upper Slate Creek		D	0.53838	25
B3584-02	Upper Slate Creek		F	0.46329	30
B3584-02	Upper Slate Creek		G	0.27055	36
B3584-02	Upper Slate Creek		C	0.16596	40
B3584-01	East Fork Slate Creek		E	0.87374	8
B3584-01	East Fork Slate Creek		A	0.81221	12
B3584-01	East Fork Slate Creek		B	0.66528	18
B3584-01	East Fork Slate Creek		C	0.54494	23
B3584-01	East Fork Slate Creek		D	0.35681	32
B3584-01	East Fork Slate Creek		F	0.20421	38
B3584-01	East Fork Slate Creek		G	0.01514	46
B3584-01	East Fork Slate Creek		H	0.00640	47
			z		
			z		
			z		
			z		

TITRATION AND AMMONIA DATA

Client: Kensington — Species ID# AMP 86

Sample Description: See Randomization Sheet. — Start Date 2/22/11

Laboratory ID	Hardness (mg/L as $CaCO_3$)		Alkalinity (mg/L as $CaCO_3$)		Ammonia (mg/L as NH_3-N)	
	Initial	Final	Initial	Final	Initial	Final
Sediment Control	80	91	59	67	0.13	0.30
B3584-01	111	105	84	96	0.40	0.27
B3584-02	101	97	80	81	0.16	0.65
B3584-03	95	98	70	74	<0.10	0.20
B3584-04	93	97	69	68	<0.10	<0.10
B3584-05	88	95	63	66	0.16	0.30

Hyallela GROWTH DATA

Client: Kensington | Species ID#: AMP 86

Lab ID: see randomization sheet batch number: B3584 | Start Date: 8/22/2016

Sample Description: Weights of Amphipods at test initiation (= number of replicates as the test, 10 *Hyallela* each)

Technician:	MC	KJ
Date:	8/24/2016	8/18/2016
Balance Serial #:	50309851	50309851

Tin ID Number	Total Weight (mg) (after 60°C for 24 hr)	Tare Weight (mg) (after 60°C for 24 hr)	No. of Amphipods Surviving	No. of Amphipods in Tin
@ Initiation A	64.41	64.04	na	5
@ Initiation B	63.73	63.45	na	5
@ Initiation C	64.08	63.81	na	5
@ Initiation D	63.17	62.80	na	5
@ Initiation E			na	
@ Initiation F			na	
@ Initiation G			na	
@ Initiation H			na	

weigh to 0.01 mg

Average weight : 0.0645 mg / individual

GV 9/16/16

CH2M HILL

FRESHWATER TOXICITY TEST SURVIVAL AND WATER QUALITY DATA

Client: Kensington

Sample Description: See Randomization Sheet. Batch Number B 3584

Test Species: Hyallela azteca

ID#: 86

Amp

Beginning (Day 0), Date 8-22-16 Time 1430

Ending (Day 10), Date 9-1-2016 Time 0900

		Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
	Tech.	MC	[illegible]	DW/MC	DW	DW	MC	MC	[illegible]	DW	DW	DW
	Time	1430	0745	0630	0630	0630	0850	0820	[illegible]	0630	0700	0700
Therm # →		211		215	215	177	213	211	213	214	215	214
	Tech.	Day -1 [illegible]	Day 0 MC	Day 1 MC	Day 2 MC	Day 3 MC	Day 4 MC	Day 5 DW	Day 6 MC	Day 7 MC	Day 8 DW	Day 9 [illegible]	Day 10 [illegible]
	Time	Day -1 0900	Day 0 1655	Day 1 1630	Day 2 1550	Day 3 1540	Day 4 1425	Day 5 1615	Day 6 1430	Day 7 1530	Day 8 1615	Day 9 [illegible]	Day 10 0900
	Feeding: ✓ when done	Day 0 ✓	Day 1 ✓	Day 2 ✓	Day 3 ✓	Day 4 ✓	Day 5 ✓	Day 6 ✓	Day 7 ✓	Day 8 ✓	Day 9 ✓		

Beaker Number	Dissolved Oxygen (mg/l)											Temperature (°C)											pH		Conductivity (µmohs/cm)	
	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10	0	10	0	10
7	6.7	6.4	6.9	7.2	7.2	6.0	6.8	7.2	7.1	7.2	7.0	23.0	22.1	22.3	22.7	22.6	22.4	22.3	22.3	22.8	22.7	22.8	7.2	7.4	382	318
9	7.3	6.4	7.1	7.3	7.2	6.1	6.8	7.3	7.1	7.2	6.9	22.4	22.0	22.3	22.7	22.5	22.3	22.4	22.4	22.8	22.7	22.8	7.2	7.6	325	326
12	7.2	6.6	7.2	7.3	7.2	6.2	6.8	7.4	7.1	7.2	6.8	22.5	22.0	22.2	22.6	22.6	22.3	22.4	22.4	22.8	22.6	22.8	7.1	7.4	371	363
17	7.0	6.3	7.2	7.4	7.1	6.0	6.6	7.2	6.9	7.0	6.4	22.5	22.0	22.3	22.7	22.5	22.4	22.4	22.4	22.8	22.6	22.8	7.1	7.4	331	332
27	7.1	6.3	7.1	7.3	7.0	6.1	6.6	7.2	6.9	6.9	6.7	22.4	22.0	22.2	22.7	22.5	22.3	22.4	22.3	22.7	22.6	22.8	7.2	7.4	322	324
28	7.3	6.2	7.1	7.4	7.1	6.1	6.7	7.3	7.0	6.9	6.6	22.4	21.9	22.2	22.8	22.5	22.3	22.4	22.1	22.7	22.5	22.8	7.2	7.3	308	317

CH2M HILL

FRESHWATER TOXICITY TEST SURVIVAL AND WATER QUALITY DATA

Client: Kensington
Beginning, Date: 8-22-16 Time:
Sample Description: See Randomization Sheet(s). Batch number: B 3584
Ending, Date: 9-1-16 Time: 0830
Test Species: Hyallela azteca ID#: AMP 86

Test Initiation: Tech: Tech: BM Time: ~~0830~~ 1130 9/1/16 Test Termination: Tech: Tech: BM Time: 0830

Beaker Number	Start Count 0	# alive found 10	# dead found 10	Comments:
1	10	10	0	
2	10	10	0	
3	10	10	0	
4	10	3	0	
5	10	10	0	
6	10	10	0	
7	10	10	0	
8	10	10	0	
9	10	10	0	
10	10	10	0	
11	10	10	0	
12	10	9	0	
13	10	9	0	
14	10	9	0	
15	10	10	0	

Beaker Number	Start Count 0	# alive found 10	# dead found 10	Comments:
16	10	9	0	
17	10	9	0	
18	10	9	0	
19	10	10	0	
20	10	8	0	
21	10	9	0	
22	10	9	0	
23	10	9	0	
24	10	9	0	
25	10	10	0	
26	10	8	0	
27	10	8	0	
28	10	9	0	
29	10	10	0	
30	10	10	0	

CH2M HILL

FRESHWATER TOXICITY TEST SURVIVAL AND WATER QUALITY DATA

Client Kensington

Sample Description See Randomization Sheet(s). Batch number: B 3584

Test Species: Hyallela azteca ID#: AMP 86

Beginning, Date 8-22-16 Time

Ending, Date 9-1-16 Time 0930

Test Initiation: Tech: Tech: Bu Time: —

Test Termination: Tech: Tech: Bu Time: 0930

Beaker Number	Start Count 0	# alive found 10	# dead found 10	Comments:
31	10	9	0	
32	10	10	0	
33	10	9	0	
34	10	10	0	
35	10	9	0	
36	10	9	0	
37	10	8	0	
38	10	10	0	
39	10	10	0	
40	10	10	0	
41	10	9	0	
42	10	7	0	
43	10	8	0	
44	10	10	0	
45	10	10	0	

Beaker Number	Start Count 0	# alive found 10	# dead found 10	Comments:
46	10	8	0	
47	10	8	0	
48	10	9	0	

Hyallela GROWTH DATA

Client Kensington Species ID# AMP 86

Lab ID: see randomization sheet batch number: B3584 Start Date 8/22/2016

Sample Description:

Technician:	MC	MC
Date:	9/7/2016	8/30/2016
Balance Serial #:	50309851	50309851

Tin ID Number	Total Weight (mg) (after 60°C for 24 hr)	Tare Weight (mg) (after 60°C for 24 hr)	No. of Amphipods Surviving	No. of Amphipods in Tin
1	69.48	68.63	10	10
2	69.64	68.58	10	10
3	69.67	68.82	10	10
4	69.03	68.71	3	3
5	69.51	68.54	10	10
6	69.74	68.72	10	10
7	69.69	68.76	10	10
8	69.61	68.82	10	10
9	69.44	68.69	10	10
10	69.67	68.73	10	10
11	69.87	68.90	10	10
12	69.65	68.74	9	9
13	69.65	68.75	9	9
14	69.53	68.67	9	9
15	69.64	68.64	10	10
16	69.52	68.65	9	9
17	69.54	68.78	9	9
18	69.80	68.76	9	9
19	69.23	68.38	10	10
20	69.09	68.48	8	8
21	69.51	68.64	9	9
22	69.55	68.76	9	9
23	69.39	68.61	9	9
24	69.31	68.50	9	9
25	69.51	68.57	10	10
26	69.47	68.68	8	8
27	69.09	68.33	8	8
28	69.57	68.86	9	9
29	69.18	68.36	10	10
30	69.31	68.49	10	10

weigh to 0.01 mg

Hyallela GROWTH DATA

Client Kensington Species ID# AMP 86

Lab ID: see randomization sheet batch number: B3584 Start Date 8/22/2016

Sample Description:

Technician:	MC	MC
Date:	9/7/2016	8/30/2016
Balance Serial #:	50309851	50309851

Tin ID Number	Total Weight (mg) (after 60°C for 24 hr)	Tare Weight (mg) (after 60°C for 24 hr)	No. of Amphipods Surviving	No. of Amphipods in Tin
31	69.49	68.49	9	9
32	69.49	68.58	10	10
33	69.69	68.78	9	9
34	69.62	68.88	10	10
35	69.57	68.83	9	9
36	69.54	68.57	9	9
37	69.75	68.91	8	8
38	69.70	68.69	10	10
39	69.45	68.45	10	10
40	69.53	68.58	10	10
41	69.31	68.53	9	9
42	69.47	68.82	7	7
43	69.72	68.89	8	8
44	70.05	69.13	10	10
45	70.07	69.03	10	10
46	69.86	69.00	8	8
47	69.55	68.67	8	8
48	69.53	68.70	9	9

weigh to 0.01 mg

Hyallela GROWTH DATA

Client Kensington Species ID# AMP 26

Lab ID: see randomization sheet batch number: B 3584 Start Date 2-22-16

Sample Description:

Technician:		MC
Date:		8/30/2016
Balance Serial #:	50309851	50309851

Tin ID Number	Total Weight (mg) (after 60°C for 24 hr)	Tare Weight (mg) (after 60°C for 24 hr)	No. of Amphipods Surviving	No. of Amphipods in Tin
1		68.63	Same as →	10
2		68.58		10
3		68.82		10
4		68.71		3
5		68.54		10
6		68.72		10
7		68.76		10
8		68.82		10
9		68.69		10
10		68.73		10
11		68.90		10
12		68.74		9
13		68.75		9
14		68.67		9
15		68.64		10
16		68.65		9
17		68.78		9
18		68.76		9
19		68.38		10
20		68.48		5
21		68.64		9
22		68.76		9
23		68.61		9
24		68.50		9
25		68.57		10
26		68.68		5
27		68.33		5
28		68.86		9
29		68.36		10
30		68.49		10

weigh to 0.01 mg

Hyallela GROWTH DATA

Client Kensington Species ID# AMP 86

Lab ID: see randomization sheet batch number: B 3584 Start Date 9-22-16

Sample Description:

Technician:		MC
Date:		8/30/2016
Balance Serial #:	50309851	50309851

Tin ID Number	Total Weight (mg) (after 60°C for 24 hr)	Tare Weight (mg) (after 60°C for 24 hr)	No. of Amphipods Surviving	No. of Amphipods in Tin
31		68.49	Save →	9
32		68.58		10
33		68.78		9
34		68.88		10
35		68.83		9
36		68.57		9
37		68.91		8
38		68.69		10
39		68.45		10
40		68.58		10
41		68.53		9
42		68.82		7
43		68.89		8
44		69.13		10
45		69.03		10
46		69.00		9
47		68.67		8
48		68.70		9

weigh to 0.01 mg

CETIS Summary Report

Hyallela 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Batch ID:	15-6395-3015	**Test Type:**	Survival-Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Hyalella azteca	**Brine:**	
Duration:	10d 0h	**Source:**	Chesapeak Cultures, Nayes, Virginia	**Age:**	
Sample ID:	05-1582-8506	**Code:**	B3584-03	**Client:**	
Sample Date:	06 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	47d 0h	**Station:**	Lower Sherman Creek		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
03-9700-6627	Mean Dry Weight-mg	100	>100	NA	8.93%	1	Equal Variance t Two-Sample Test
14-1674-6543	Survival Rate	100	>100	NA	5.76%	1	Wilcoxon Rank Sum Two-Sample Test

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
14-1674-6543	Survival Rate	Control Resp	0.9625	0.8 - NL	Yes	Passes Acceptability Criteria

Mean Dry Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	0.09138	0.08588	0.09687	0.085	0.104	0.002325	0.006577	7.2%	0.0%
100		8	0.0929	0.08342	0.1024	0.075	0.105	0.004009	0.01134	12.21%	-1.67%

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	0.9625	0.9192	1	0.9	1	0.0183	0.05175	5.38%	0.0%
100		8	0.95	0.8868	1	0.8	1	0.02673	0.07559	7.96%	1.3%

Mean Dry Weight-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	0.085	0.093	0.094	0.09556	0.085	0.08778	0.08667	0.104
100		0.097	0.102	0.075	0.1	0.082	0.08222	0.105	0.1

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	0.9	1	0.9	0.9	1
100		1	1	1	0.9	1	0.9	0.8	1

Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	10/10	10/10	9/10	10/10	9/10	9/10	10/10
100		10/10	10/10	10/10	9/10	10/10	9/10	8/10	10/10

Hyallela 10-d Survival and Growth Sediment Test

CH2M HILL - ASL

Analysis ID:	03-9700-6627	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:17	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes
Batch ID:	15-6395-3015	**Test Type:**	Survival-Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Hyalella azteca	**Brine:**	
Duration:	10d 0h	**Source:**	Chesapeak Cultures, Nayes, Virginia	**Age:**	
Sample ID:	05-1582-8506	**Code:**	B3584-03	**Client:**	
Sample Date:	06 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	47d 0h	**Station:**	Lower Sherman Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	8.93%	Passes mean dry weight-mg

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	-0.3296	1.761	0.008	14	0.6267	CDF	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.3987	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	9.335101E-06	9.335101E-06	1	0.1087	0.7466	Non-Significant Effect
Error	0.00120286	8.591859E-05	14			
Total	0.001212195		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	2.973	8.885	0.1739	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9565	0.8408	0.5992	Normal Distribution

Mean Dry Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	0.09138	0.08588	0.09687	0.09039	0.085	0.104	0.002325	7.2%	0.0%
100		8	0.0929	0.08342	0.1024	0.0985	0.075	0.105	0.004009	12.21%	-1.67%

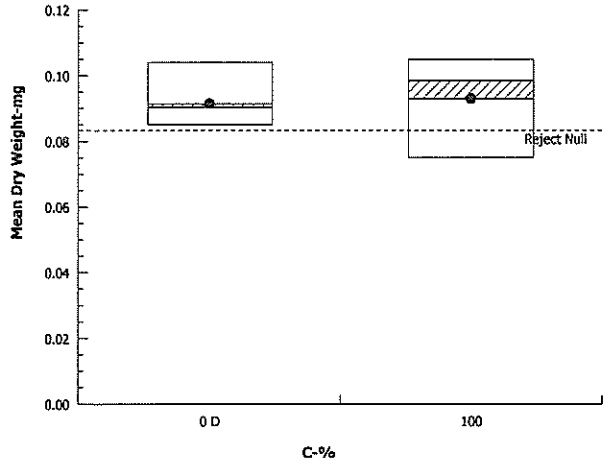
Mean Dry Weight-mg Detail

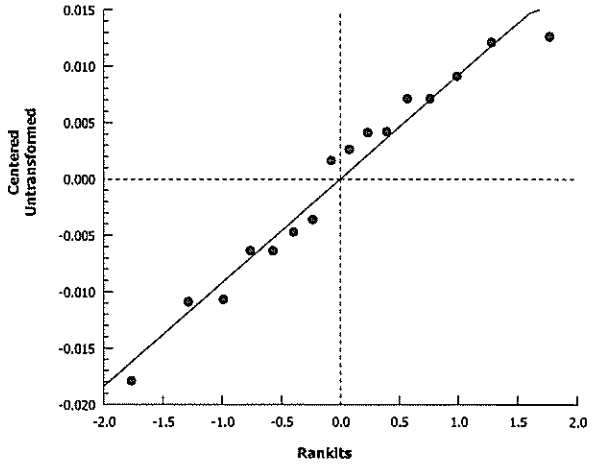
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	0.085	0.093	0.094	0.09556	0.085	0.08778	0.08667	0.104
100		0.097	0.102	0.075	0.1	0.082	0.08222	0.105	0.1

Hyallela 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	03-9700-6627	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:17	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Graphics





Hyallela 10-d Survival and Growth Sediment Test **CH2M HILL - ASL**

Analysis ID:	14-1674-6543	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:17	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes
Batch ID:	15-6395-3015	**Test Type:**	Survival-Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Hyalella azteca	**Brine:**	
Duration:	10d 0h	**Source:**	Chesapeak Cultures, Nayes, Virginia	**Age:**	
Sample ID:	05-1582-8506	**Code:**	B3584-03	**Client:**	
Sample Date:	06 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	47d 0h	**Station:**	Lower Sherman Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	5.76%	Passes survival rate

Wilcoxon Rank Sum Two-Sample Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	66.5	NA	2	14	0.5000	Exact	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.1964	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.001258423	0.001258423	1	0.1206	0.7336	Non-Significant Effect
Error	0.1461217	0.01043726	14			
Total	0.1473801		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	1.934	8.885	0.4037	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.756	0.8408	0.0008	Non-normal Distribution

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	0.9625	0.9192	1	1	0.9	1	0.0183	5.38%	0.0%
100		8	0.95	0.8868	1	1	0.8	1	0.02673	7.96%	1.3%

Angular (Corrected) Transformed Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.351	1.28	1.421	1.412	1.249	1.412	0.02982	6.24%	0.0%
100		8	1.333	1.235	1.431	1.412	1.107	1.412	0.04147	8.8%	1.31%

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	0.9	1	0.9	0.9	1
100		1	1	1	0.9	1	0.9	0.8	1

Angular (Corrected) Transformed Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.412	1.412	1.412	1.249	1.412	1.249	1.249	1.412
100		1.412	1.412	1.412	1.249	1.412	1.249	1.107	1.412

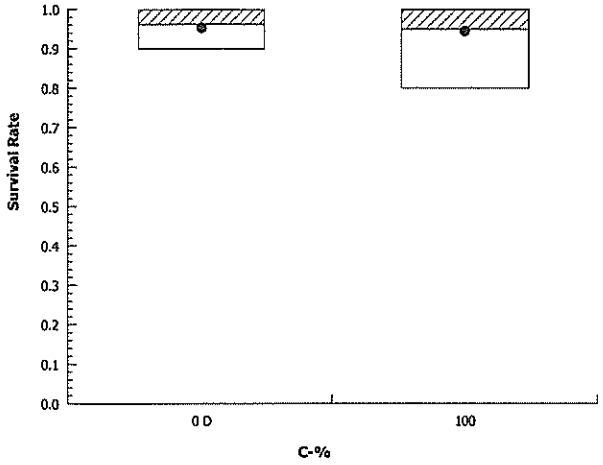
Survival Rate Binomials

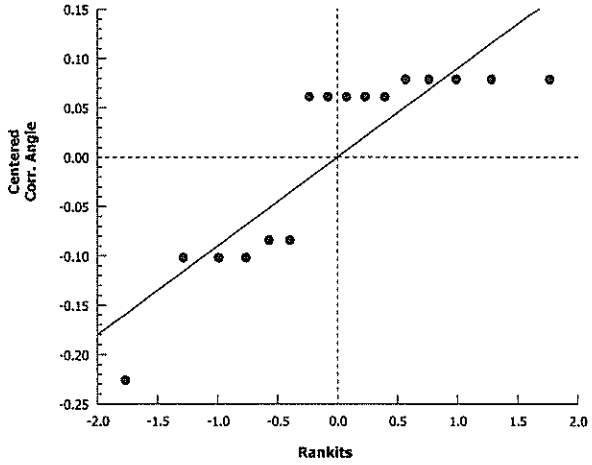
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	10/10	10/10	9/10	10/10	9/10	9/10	10/10
100		10/10	10/10	10/10	9/10	10/10	9/10	8/10	10/10

Hyallela 10-d Survival and Growth Sediment Test **CH2M HILL - ASL**

Analysis ID:	14-1674-6543	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:17	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Graphics





CETIS Summary Report

Hyallela 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Batch ID:	15-6395-3015	**Test Type:**	Survival-Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Hyalella azteca	**Brine:**	
Duration:	10d 0h	**Source:**	Chesapeak Cultures, Nayes, Virginia	**Age:**	
Sample ID:	18-2203-5030	**Code:**	B3584-01	**Client:**	
Sample Date:	06 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	47d 0h	**Station:**	East Fork Slate Creek		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
00-6723-3050	Mean Dry Weight-mg	100	>100	NA	9.62%	1	Equal Variance t Two-Sample Test
12-0143-9665	Survival Rate	100	>100	NA	6.1%	1	Equal Variance t Two-Sample Test

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
12-0143-9665	Survival Rate	Control Resp	0.9625	0.8 - NL	Yes	Passes Acceptability Criteria ✓

Mean Dry Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	0.09138	0.08588	0.09687	0.085	0.104	0.002325	0.006577	7.2%	0.0%
100		8	0.09898	0.08854	0.1094	0.079	0.1156	0.004416	0.01249	12.62%	-8.32%

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	0.9625	0.9192	1	0.9	1	0.0183	0.05175	5.38%	0.0%
100		8	0.9125	0.8427	0.9823	0.8	1	0.0295	0.08345	9.15%	5.2%

Mean Dry Weight-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	0.085	0.093	0.094	0.09556	0.085	0.08778	0.08667	0.104
100		0.079	0.1011	0.1156	0.08667	0.091	0.101	0.1075	0.11

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	0.9	1	0.9	0.9	1
100		1	0.9	0.9	0.9	1	1	0.8	0.8

Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	10/10	10/10	9/10	10/10	9/10	9/10	10/10
100		10/10	9/10	9/10	9/10	10/10	10/10	8/10	8/10

Hyallela 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	12-0143-9665	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:12	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes
Batch ID:	15-6395-3015	**Test Type:**	Survival-Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Hyalella azteca	**Brine:**	
Duration:	10d 0h	**Source:**	Chesapeak Cultures, Nayes, Virginia	**Age:**	
Sample ID:	18-2203-5030	**Code:**	B3584-01	**Client:**	
Sample Date:	06 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	47d 0h	**Station:**	East Fork Slate Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	6.1%	Passes survival rate

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	1.406	1.761	0.095	14	0.0907	CDF	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.1964	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.02323603	0.02323603	1	1.978	0.1814	Non-Significant Effect
Error	0.1644872	0.01174908	14			
Total	0.1877232		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	2.303	8.885	0.2934	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9035	0.8408	0.0916	Normal Distribution

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	0.9625	0.9192	1	1	0.9	1	0.0183	5.38%	0.0%
100		8	0.9125	0.8427	0.9823	0.9	0.8	1	0.0295	9.15%	5.2%

Angular (Corrected) Transformed Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.351	1.28	1.421	1.412	1.249	1.412	0.02982	6.24%	0.0%
100		8	1.275	1.168	1.382	1.249	1.107	1.412	0.04525	10.04%	5.64%

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	0.9	1	0.9	0.9	1
100		1	0.9	0.9	0.9	1	1	0.8	0.8

Angular (Corrected) Transformed Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.412	1.412	1.412	1.249	1.412	1.249	1.249	1.412
100		1.412	1.249	1.249	1.249	1.412	1.412	1.107	1.107

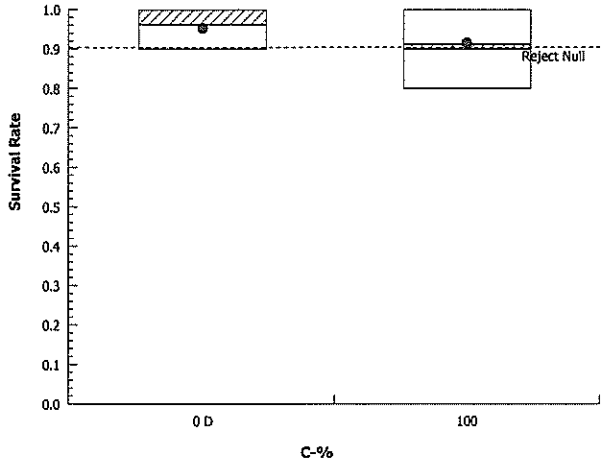
Survival Rate Binomials

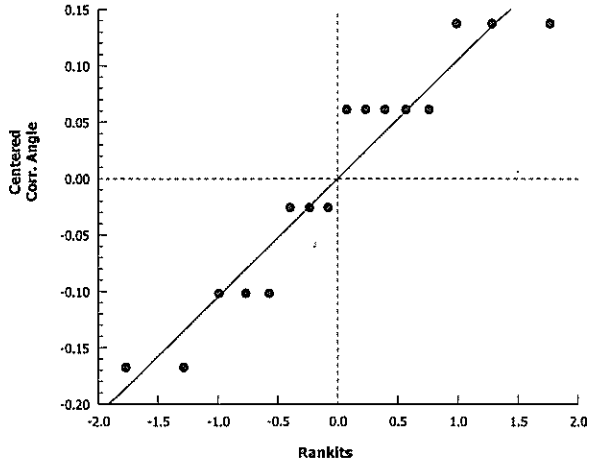
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	10/10	10/10	9/10	10/10	9/10	9/10	10/10
100		10/10	9/10	9/10	9/10	10/10	10/10	8/10	8/10

Hyallela 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	12-0143-9665	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:12	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Graphics





CETIS Analytical Report

Hyallela 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	00-6723-3050	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:15	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes
Batch ID:	15-6395-3015	**Test Type:**	Survival-Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Hyalella azteca	**Brine:**	
Duration:	10d 0h	**Source:**	Chesapeak Cultures, Nayes, Virginia	**Age:**	
Sample ID:	18-2203-5030	**Code:**	B3584-01	**Client:**	
Sample Date:	06 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	47d 0h	**Station:**	East Fork Slate Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	9.62%	Passes mean dry weight-mg

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	-1.524	1.761	0.009	14	0.9251	CDF	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.3987	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0002312942	0.0002312942	1	2.322	0.1498	Non-Significant Effect
Error	0.001394708	0.000099622	14			
Total	0.001626002		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	3.606	8.885	0.1123	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9804	0.8408	0.9670	Normal Distribution

Mean Dry Weight-mg Summary

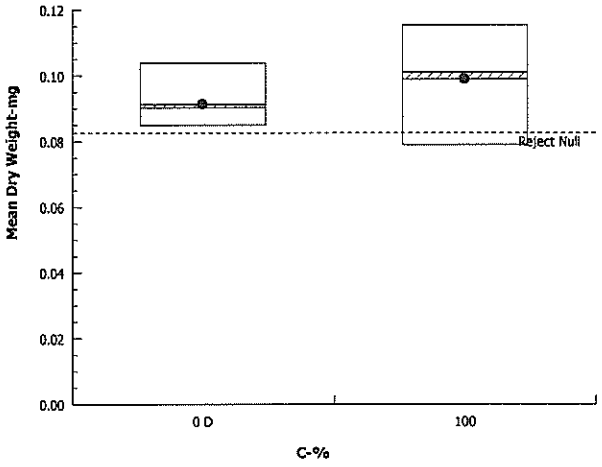
C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	0.09138	0.08588	0.09687	0.09039	0.085	0.104	0.002325	7.2%	0.0%
100		8	0.09898	0.08854	0.1094	0.1011	0.079	0.1156	0.004416	12.62%	-8.32%

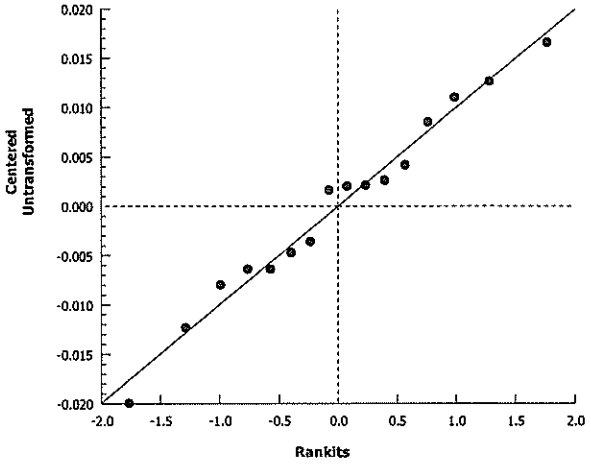
Mean Dry Weight-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	0.085	0.093	0.094	0.09556	0.085	0.08778	0.08667	0.104
100		0.079	0.1011	0.1156	0.08667	0.091	0.101	0.1075	0.11

Analysis ID:	00-6723-3050	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:15	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Graphics





CETIS Summary Report

Hyallela 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Batch ID:	15-6395-3015	**Test Type:**	Survival-Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Hyalella azteca	**Brine:**	
Duration:	10d 0h	**Source:**	Chesapeak Cultures, Nayes, Virginia	**Age:**	
Sample ID:	02-9733-1775	**Code:**	B3584-05	**Client:**	
Sample Date:	08 Aug-16	**Material:**	Sediment	**Project:**	
Receive Date:	11 Aug-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	14d 0h	**Station:**	Lower Johnson Creek		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
19-7018-2435	Mean Dry Weight-mg	100	>100	NA	8.54%	1	Equal Variance t Two-Sample Test
20-4344-5400	Survival Rate	100	>100	NA	6.53%	1	Equal Variance t Two-Sample Test

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
20-4344-5400	Survival Rate	Control Resp	0.9625	0.8 - NL	Yes	Passes Acceptability Criteria ✓

Mean Dry Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	0.09138	0.08588	0.09687	0.085	0.104	0.002325	0.006577	7.2%	0.0%
100		8	0.09172	0.0828	0.1006	0.074	0.106	0.003772	0.01067	11.63%	-0.38%

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	0.9625	0.9192	1	0.9	1	0.0183	0.05175	5.38%	0.0%
100		8	0.9125	0.8296	0.9954	0.7	1	0.03504	0.0991	10.86%	5.2%

Mean Dry Weight-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	0.085	0.093	0.094	0.09556	0.085	0.08778	0.08667	0.104
100		0.106	0.09667	0.07889	0.1011	0.074	0.09286	0.092	0.09222

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	0.9	1	0.9	0.9	1
100		1	0.9	0.9	0.9	1	0.7	1	0.9

Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	10/10	10/10	9/10	10/10	9/10	9/10	10/10
100		10/10	9/10	9/10	9/10	10/10	7/10	10/10	9/10

Hyallela 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	19-7018-2435	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:19	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes
Batch ID:	15-6395-3015	**Test Type:**	Survival-Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Hyalella azteca	**Brine:**	
Duration:	10d 0h	**Source:**	Chesapeak Cultures, Nayes, Virginia	**Age:**	
Sample ID:	02-9733-1775	**Code:**	B3584-05	**Client:**	
Sample Date:	08 Aug-16	**Material:**	Sediment	**Project:**	
Receive Date:	11 Aug-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	14d 0h	**Station:**	Lower Johnson Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	8.54%	Passes mean dry weight-mg

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	-0.07751	1.761	0.008	14	0.5303	CDF	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.3987	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	4.719144E-07	4.719144E-07	1	0.006008	0.9393	Non-Significant Effect
Error	0.001099612	7.854368E-05	14			
Total	0.001100083		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	2.632	8.885	0.2250	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9743	0.8408	0.9019	Normal Distribution

Mean Dry Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	0.09138	0.08588	0.09687	0.09039	0.085	0.104	0.002325	7.2%	0.0%
100		8	0.09172	0.0828	0.1006	0.09254	0.074	0.106	0.003772	11.63%	-0.38%

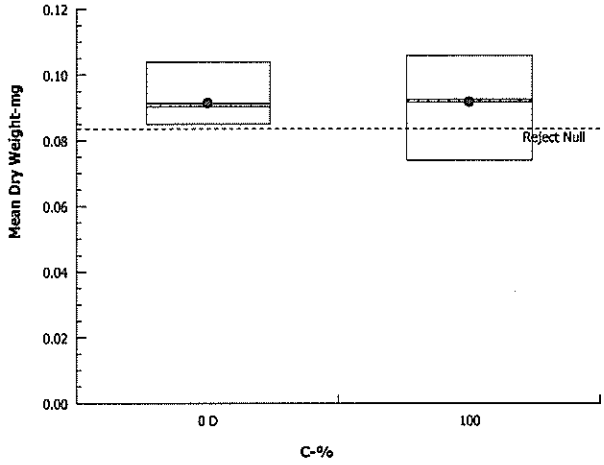
Mean Dry Weight-mg Detail

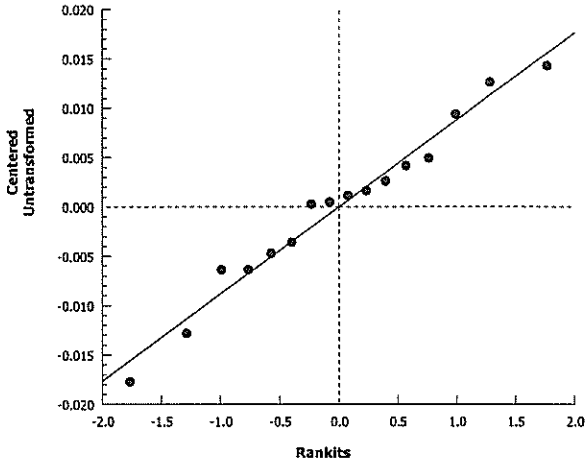
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	0.085	0.093	0.094	0.09556	0.085	0.08778	0.08667	0.104
100		0.106	0.09667	0.07889	0.1011	0.074	0.09286	0.092	0.09222

Hyalleia 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	19-7018-2435	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:19	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Graphics





Hyallela 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	20-4344-5400	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:19	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes
Batch ID:	15-6395-3015	**Test Type:**	Survival-Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Hyalella azteca	**Brine:**	
Duration:	10d 0h	**Source:**	Chesapeak Cultures, Nayes, Virginia	**Age:**	
Sample ID:	02-9733-1775	**Code:**	B3584-05	**Client:**	
Sample Date:	08 Aug-16	**Material:**	Sediment	**Project:**	
Receive Date:	11 Aug-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	14d 0h	**Station:**	Lower Johnson Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	6.53%	Passes survival rate

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	1.255	1.761	0.102	14	0.1150	CDF	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.1964	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.02130358	0.02130358	1	1.575	0.2300	Non-Significant Effect
Error	0.1893122	0.0135223	14			
Total	0.2106158		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	2.802	8.885	0.1975	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8908	0.8408	0.0573	Normal Distribution

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	0.9625	0.9192	1	1	0.9	1	0.0183	5.38%	0.0%
100		8	0.9125	0.8296	0.9954	0.9	0.7	1	0.03504	10.86%	5.2%

Angular (Corrected) Transformed Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.351	1.28	1.421	1.412	1.249	1.412	0.02982	6.24%	0.0%
100		8	1.278	1.16	1.396	1.249	0.9912	1.412	0.04991	11.05%	5.4%

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	0.9	1	0.9	0.9	1
100		1	0.9	0.9	0.9	1	0.7	1	0.9

Angular (Corrected) Transformed Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.412	1.412	1.412	1.249	1.412	1.249	1.249	1.412
100		1.412	1.249	1.249	1.249	1.412	0.9912	1.412	1.249

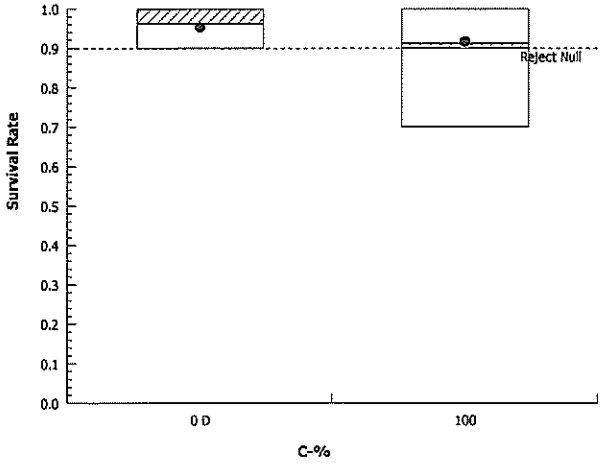
Survival Rate Binomials

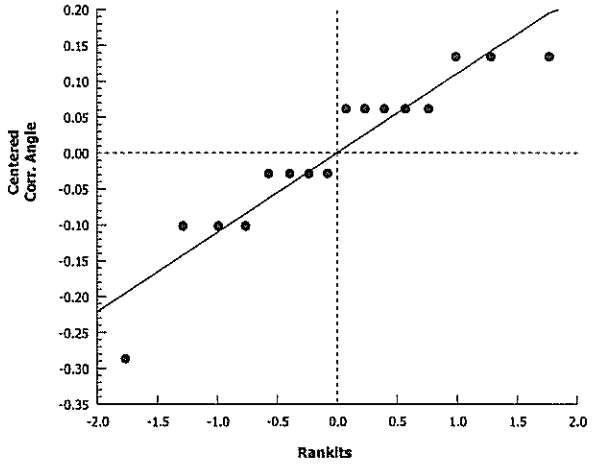
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	10/10	10/10	9/10	10/10	9/10	9/10	10/10
100		10/10	9/10	9/10	9/10	10/10	7/10	10/10	9/10

Hyallela 10-d Survival and Growth Sediment Test **CH2M HILL - ASL**

Analysis ID:	20-4344-5400	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:19	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Graphics





CETIS Summary Report

Hyallela 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Batch ID:	15-6395-3015	**Test Type:**	Survival-Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Hyalella azteca	**Brine:**	
Duration:	10d 0h	**Source:**	Chesapeak Cultures, Nayes, Virginia	**Age:**	
Sample ID:	10-0448-9482	**Code:**	B3584-04	**Client:**	
Sample Date:	05 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	48d 0h	**Station:**	Lower Slate Creek		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
20-0902-1284	Mean Dry Weight-mg	100	>100	NA	7.07%	1	Equal Variance t Two-Sample Test
02-7799-3698	Survival Rate	100	>100	NA	6.53%	1	Equal Variance t Two-Sample Test

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
02-7799-3698	Survival Rate	Control Resp	0.9625	0.8 - NL	Yes	Passes Acceptability Criteria

Mean Dry Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	0.09138	0.08588	0.09687	0.085	0.104	0.002325	0.006577	7.2%	0.0%
100		8	0.09758	0.09087	0.1043	0.085	0.1111	0.002838	0.008028	8.23%	-6.79%

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	0.9625	0.9192	1	0.9	1	0.0183	0.05175	5.38%	0.0%
100		8	0.9	0.8226	0.9774	0.8	1	0.03273	0.09258	10.29%	6.49%

Mean Dry Weight-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	0.085	0.093	0.094	0.09556	0.085	0.08778	0.08667	0.104
100		0.085	0.097	0.1	0.09	0.09875	0.095	0.1111	0.1038

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	0.9	1	0.9	0.9	1
100		1	1	1	0.9	0.8	0.8	0.9	0.8

Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	10/10	10/10	9/10	10/10	9/10	9/10	10/10
100		10/10	10/10	10/10	9/10	8/10	8/10	9/10	8/10

Hyallela 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	20-0902-1284	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:18	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes
Batch ID:	15-6395-3015	**Test Type:**	Survival-Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Hyalella azteca	**Brine:**	
Duration:	10d 0h	**Source:**	Chesapeak Cultures, Nayes, Virginia	**Age:**	
Sample ID:	10-0448-9482	**Code:**	B3584-04	**Client:**	
Sample Date:	05 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	48d 0h	**Station:**	Lower Slate Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	7.07%	Passes mean dry weight-mg

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	-1.69	1.761	0.006	14	0.9434	CDF	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.3987	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.000153829	0.000153829	1	2.857	0.1131	Non-Significant Effect
Error	0.0007538695	5.384782E-05	14			
Total	0.0009076985		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	1.49	8.885	0.6119	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9678	0.8408	0.8015	Normal Distribution

Mean Dry Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	0.09138	0.08588	0.09687	0.09039	0.085	0.104	0.002325	7.2%	0.0%
100		8	0.09758	0.09087	0.1043	0.09788	0.085	0.1111	0.002838	8.23%	-6.79%

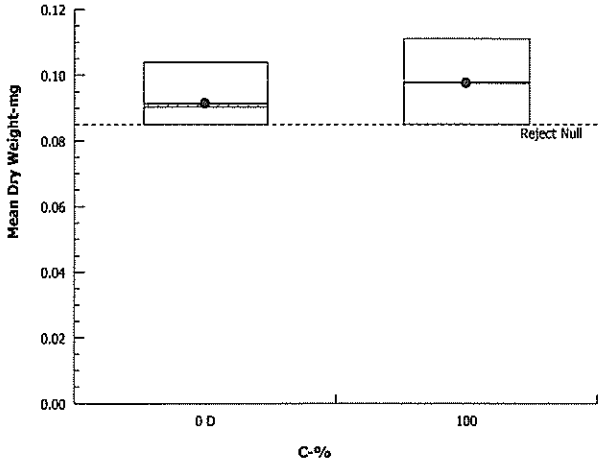
Mean Dry Weight-mg Detail

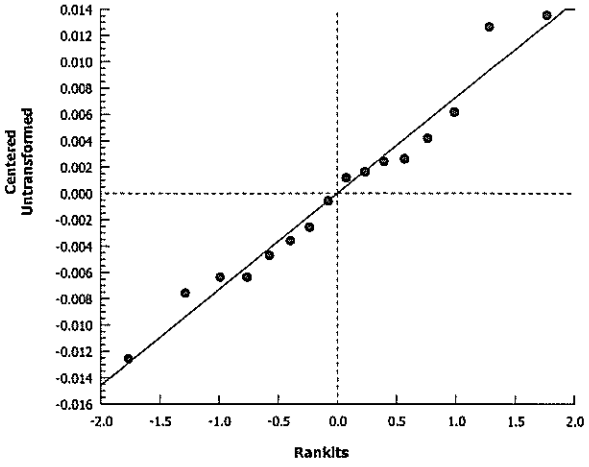
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	0.085	0.093	0.094	0.09556	0.085	0.08778	0.08667	0.104
100		0.085	0.097	0.1	0.09	0.09875	0.095	0.1111	0.1038

Hyallela 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	20-0902-1284	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:18	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Graphics





Hyalleia 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	02-7799-3698	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:18	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes
Batch ID:	15-6395-3015	**Test Type:**	Survival-Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Hyalella azteca	**Brine:**	
Duration:	10d 0h	**Source:**	Chesapeak Cultures, Nayes, Virginia	**Age:**	
Sample ID:	10-0448-9482	**Code:**	B3584-04	**Client:**	
Sample Date:	05 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	48d 0h	**Station:**	Lower Slate Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	6.53%	Passes survival rate

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	1.616	1.761	0.102	14	0.0642	CDF	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.1964	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.0353094	0.0353094	1	2.61	0.1285	Non-Significant Effect
Error	0.1893815	0.01352725	14			
Total	0.2246909		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	2.803	8.885	0.1973	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.8803	0.8408	0.0392	Normal Distribution

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	0.9625	0.9192	1	1	0.9	1	0.0183	5.38%	0.0%
100		8	0.9	0.8226	0.9774	0.9	0.8	1	0.03273	10.29%	6.49%

Angular (Corrected) Transformed Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.351	1.28	1.421	1.412	1.249	1.412	0.02982	6.24%	0.0%
100		8	1.257	1.139	1.375	1.249	1.107	1.412	0.04993	11.23%	6.96%

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	0.9	1	0.9	0.9	1
100		1	1	1	0.9	0.8	0.8	0.9	0.8

Angular (Corrected) Transformed Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.412	1.412	1.412	1.249	1.412	1.249	1.249	1.412
100		1.412	1.412	1.412	1.249	1.107	1.107	1.249	1.107

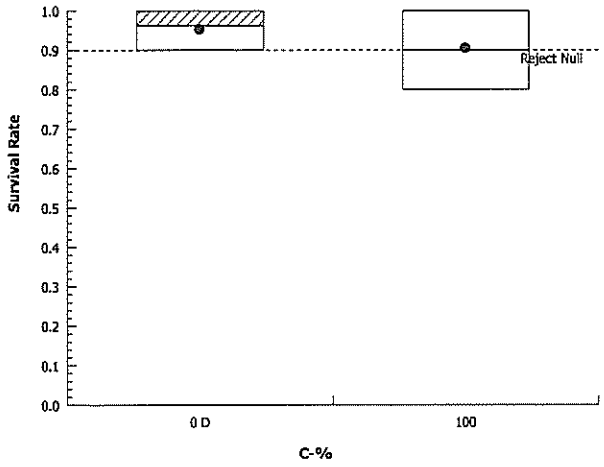
Survival Rate Binomials

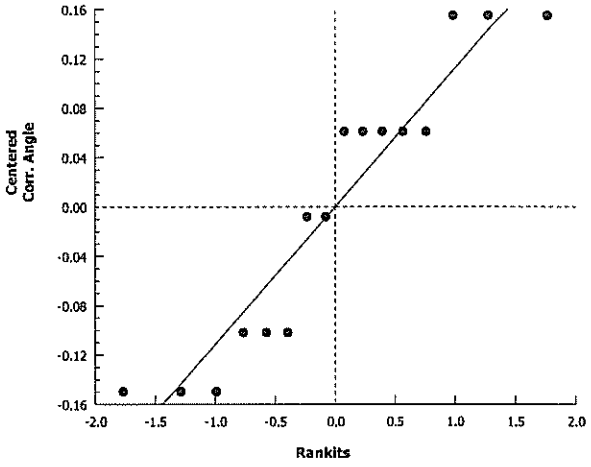
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	10/10	10/10	9/10	10/10	9/10	9/10	10/10
100		10/10	10/10	10/10	9/10	8/10	8/10	9/10	8/10

Hyallela 10-d Survival and Growth Sediment Test **CH2M HILL - ASL**

Analysis ID:	02-7799-3698	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:18	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Graphics





CETIS Summary Report

Hyallela 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Batch ID:	15-6395-3015	**Test Type:**	Survival-Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Hyalella azteca	**Brine:**	
Duration:	10d 0h	**Source:**	Chesapeak Cultures, Nayes, Virginia	**Age:**	
Sample ID:	13-2959-2362	**Code:**	B3584-02	**Client:**	
Sample Date:	06 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	47d 0h	**Station:**	Upper Slate Creek		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
11-0783-3458	Mean Dry Weight-mg	100	>100	NA	8.93%	1	Equal Variance t Two-Sample Test
10-2248-7243	Survival Rate	100	>100	NA	11.8%	1	Wilcoxon Rank Sum Two-Sample Test

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
10-2248-7243	Survival Rate	Control Resp	0.9625	0.8 - NL	Yes	Passes Acceptability Criteria

Mean Dry Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	0.09138	0.08588	0.09687	0.085	0.104	0.002325	0.006577	7.2%	0.0%
100		8	0.09285	0.08338	0.1023	0.07625	0.1078	0.004005	0.01133	12.2%	-1.62%

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	0.9625	0.9192	1	0.9	1	0.0183	0.05175	5.38%	0.0%
100		8	0.85	0.6552	1	0.3	1	0.08238	0.233	27.41%	11.69%

Mean Dry Weight-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	0.085	0.093	0.094	0.09556	0.085	0.08778	0.08667	0.104
100		0.1067	0.09667	0.08444	0.07625	0.094	0.082	0.1078	0.095

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	0.9	1	0.9	0.9	1
100		0.3	0.9	0.9	0.8	1	1	0.9	1

Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	10/10	10/10	9/10	10/10	9/10	9/10	10/10
100		3/10	9/10	9/10	8/10	10/10	10/10	9/10	10/10

Hyallela 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	10-2248-7243	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:16	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes
Batch ID:	15-6395-3015	**Test Type:**	Survival-Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Hyalella azteca	**Brine:**	
Duration:	10d 0h	**Source:**	Chesapeak Cultures, Nayes, Virginia	**Age:**	
Sample ID:	13-2959-2362	**Code:**	B3584-02	**Client:**	
Sample Date:	06 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	47d 0h	**Station:**	Upper Slate Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	11.8%	Passes survival rate

Wilcoxon Rank Sum Two-Sample Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	57	NA	2	14	0.1508	Exact	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.1964	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.08083271	0.08083271	1	1.935	0.1859	Non-Significant Effect
Error	0.5847239	0.04176599	14			
Total	0.6655566		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	10.74	8.885	0.0057	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.7382	0.8408	0.0005	Non-normal Distribution

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	0.9625	0.9192	1	1	0.9	1	0.0183	5.38%	0.0%
100		8	0.85	0.6552	1	0.9	0.3	1	0.08238	27.41%	11.69%

Angular (Corrected) Transformed Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.351	1.28	1.421	1.412	1.249	1.412	0.02982	6.24%	0.0%
100		8	1.209	0.9776	1.44	1.249	0.5796	1.412	0.09774	22.87%	10.52%

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	0.9	1	0.9	0.9	1
100		0.3	0.9	0.9	0.8	1	1	0.9	1

Angular (Corrected) Transformed Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.412	1.412	1.412	1.249	1.412	1.249	1.249	1.412
100		0.5796	1.249	1.249	1.107	1.412	1.412	1.249	1.412

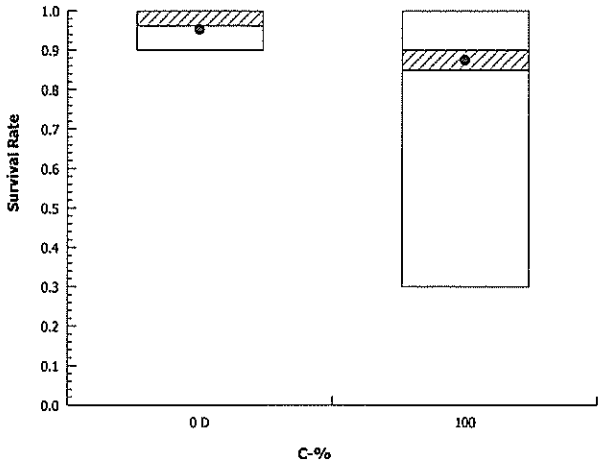
Survival Rate Binomials

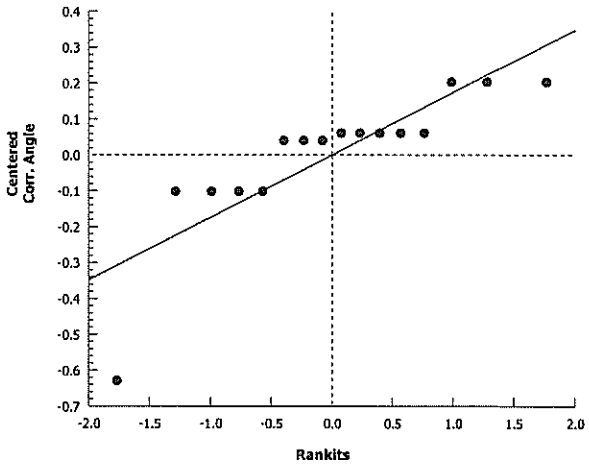
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	10/10	10/10	9/10	10/10	9/10	9/10	10/10
100		3/10	9/10	9/10	8/10	10/10	10/10	9/10	10/10

Hyallela 10-d Survival and Growth Sediment Test **CH2M HILL - ASL**

Analysis ID:	10-2248-7243	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:16	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Graphics





CETIS Analytical Report

Hyallela 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	11-0783-3458	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:16	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes
Batch ID:	15-6395-3015	**Test Type:**	Survival-Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Hyalella azteca	**Brine:**	
Duration:	10d 0h	**Source:**	Chesapeak Cultures, Nayes, Virginia	**Age:**	
Sample ID:	13-2959-2362	**Code:**	B3584-02	**Client:**	
Sample Date:	06 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	47d 0h	**Station:**	Upper Slate Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	8.93%	Passes mean dry weight-mg

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	-0.3186	1.761	0.008	14	0.6226	CDF	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.3987	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	8.708719E-06	8.708719E-06	1	0.1015	0.7547	Non-Significant Effect
Error	0.001200992	8.578517E-05	14			
Total	0.001209701		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	2.967	8.885	0.1747	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9607	0.8408	0.6736	Normal Distribution

Mean Dry Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	0.09138	0.08588	0.09687	0.09039	0.085	0.104	0.002325	7.2%	0.0%
100		8	0.09285	0.08338	0.1023	0.0945	0.07625	0.1078	0.004005	12.2%	-1.62%

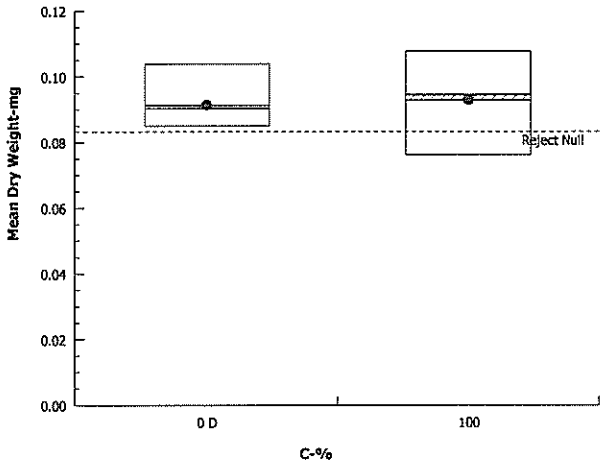
Mean Dry Weight-mg Detail

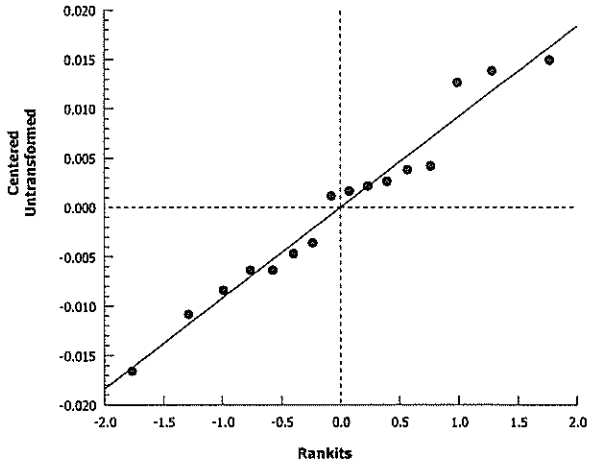
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	0.085	0.093	0.094	0.09556	0.085	0.08778	0.08667	0.104
100		0.1067	0.09667	0.08444	0.07625	0.094	0.082	0.1078	0.095

Hyallela 10-d Survival and Growth Sediment Test **CH2M HILL - ASL**

Analysis ID:	11-0783-3458	**Endpoint:**	Mean Dry Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:16	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Graphics





CH2M HILL TOXICITY TEST ORGANISM AND WATER QUALITY DATA

Client: Kensington | Test Initiation: Date 8-22-16 | Test Termination: Date 9-1-16

Contact: | Technician:

Test Species/ID: Chironomus tentans / CHI 026

Sample Information								Test Species Information	ID# CHI 26	ID#	ID#	ID#
Sample ID Number	Field ID	Collected Date	Collected Time	Total Residual Chlorine (mg/l) As Received / As Dechlor.	Ammonia NH_3-N mg/l	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$					
B3584-01	East Fork Slate Creek	7-6-16	1300	- / -	See Titration and Ammonia sheet			Chronic				
B3584-02	Upper Slate Creek	7-6-16	1500	- / -				Organism Age at Initiation	2nd to 3rd instar (~10 day old)			
B3584-03	Lower Sherman Creek	7-6-16	1000	- / -	-	-	-	Test Container Size	300 ml			
B3584-04	Lower Slate Creek	7-5-16	0900	- / -	-	-	-	Test Volume	100 ml sample, 175 ml overlying water			
B3584-05	Lower Johnson Creek	8-8-16	1530	- / -	-	-	-	Feeding: Type	1.5 ml of a 4 g/L			
				/				Amount	Tetrafin slurry daily			
				/					-			
				/				Aeration: Began	none			
				/				Amount	—			
				/				Dilution Water ID#	4380 4397			
				/				Acclimation Period	3 days			
				/				Test Location	# 10			
				/				Initial Size (mg/org)	—			

Dilution Water	ID#	Hardness mg/l as $CaCO_3$	Alkalinity mg/l as $CaCO_3$	Initial pH
Dilution Sediment	4380	-	-	-
Recon MH (FHM)	4397	90	66	8.2
	4401	90	70	7.9
	4402	98	66	8.2
	4403	92	64	8.1
	4407	94	66	8.6

Comments: ☑ Indicates the following action was taken, (☐ Indicates action not taken):

Water Quality Meters Used/ID#

Dissolved Oxygen #24 pH #11 Conductivity #2

RDL MC 8-22-16

TITRATION AND AMMONIA DATA

Client: Kensington — Species ID# CHI 26

Sample Description: See Randomization Sheet. — Start Date 8-22-16

Laboratory ID	Hardness (mg/L as $CaCO_3$)		Alkalinity (mg/L as $CaCO_3$)		Ammonia (mg/L as NH_3-N)	
	Initial	Final	Initial	Final	Initial	Final
Sediment Control	82	81	62	68	0.12	0.84
B3584-01	115	118	86	114	0.23	0.19
B3584-02	113	104	86	100	0.22	1.51
B3584-03	91	101	69	82	<0.10	0.48
B3584-04	91	90	66	73	<0.10	0.18
B3584-05	85	88	63	73	0.15	1.24

Chironomid GROWTH DATA

Client: Kensington Species ID#: CHI 26

Lab ID: see randomization sheet batch number: B3584 Start Date: 8/22/2016

Sample Description: Weights of Chironomids at test initiation (= number of replicates as the test, 10 Midge each)

Technician:	MC	KJ
Date:	8/24/2016	8/18/2016
Balance Serial #:	50309851	50309851

Tin ID Number	Total Dry Weight (mg) (including pan)	Tare Weight (mg)	No. of Amphipods Surviving	No. of Amphipods in Tin
@ Initiation A	63.93	62.90	na	5
@ Initiation B	63.64	62.99	na	5
@ Initiation C	64.30	63.73	na	5
@ Initiation D	63.97	63.20	na	5
@ Initiation E			na	
@ Initiation F			na	
@ Initiation G			na	
@ Initiation H			na	

weigh to 0.01 mg

CH2M HILL

FRESHWATER TOXICITY TEST SURVIVAL AND WATER QUALITY DATA

Client: Kensington

Sample Description: See Randomization Sheet. Batch Number B 3584

Beginning (Day 0), Date 8-22-16 Time 1440

Ending (Day 10), Date 9-1-2016 Time

Test Species: *Chironomus tentans* ROE MC 8-22-16

ID#: ~~Amp 06~~ CHI 26

		Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
	Tech.	BM	BM	DW/MC	DW	DW	MC	MC	BM	DW	DW	DW
	Time	1440	0745	0630	0630	0630	0850	0820	0815	0630	0700	0700
				216	215	177	213	211	213	214	215	214
Therm #	Tech. Day -1 BM	Day 0 MC	Day 1 MC	Day 2 MC	Day 3 MC	Day 4 MC	Day 5 MC	Day 6 MC	Day 7 MC	Day 8 MC	Day 9	Day 10
	Time Day -1 0900	Day 0 1655	Day 1 1630	Day 2 1550	Day 3 1540	Day 4 1475	Day 5 1615	Day 6 1430	Day 7 1530	Day 8 1615	Day 9 1600	Day 10
	Feeding: ✓ when done	Day 0 ✓	Day 1 ✓	Day 2 ✓	Day 3 ✓	Day 4 ✓	Day 5 ✓	Day 6 ✓	Day 7 ✓	Day 8 ✓	Day 9 ✓	

Beaker Number	Dissolved Oxygen (mg/l)											Temperature (°C)											pH		Conductivity (µmohs/cm)	
	0	1	2	3	4	5	6	7	8	9	10	0	1	2	3	4	5	6	7	8	9	10	0	10	0	10
56	7.5	6.4	7.0	7.4	7.1	5.0	5.5	6.0	5.7	5.4	5.7	22.4	21.8	22.2	22.7	22.5	22.3	22.4	22.1	22.6	22.7	22.7	7.3	7.3	311	332
59	7.6	6.4	6.8	7.1	6.7	5.1	5.4	6.0	5.6	5.3	5.2	22.5	22.0	22.2	22.7	22.5	22.3	22.4	22.1	22.5	22.7	22.7	7.3	7.1	307	324
62	7.6	5.9	6.6	7.0	6.4	4.9	5.1	5.8	5.2	5.3	4.8	22.4	21.7	22.1	22.6	22.5	22.3	22.3	22.3	22.5	22.6	22.7	7.3	7.1	320	317
70	7.5	5.5	6.5	6.8	6.1	5.0	4.9	4.9	4.6	4.5	4.2	22.3	21.8	22.2	22.7	22.5	22.3	22.3	22.3	22.5	22.7	22.7	7.2	7.4	372	379
81	7.2	5.2	6.3	6.4	6.1	5.1	4.9	4.7	4.1	4.2	4.1	22.3	21.7	22.2	22.7	22.4	22.3	22.3	22.2	22.4	22.7	22.6	7.2	7.3	333	346
94	7.2	5.2	6.1	6.5	6.0	4.9	4.7	4.9	4.2	4.2	4.4	22.3	21.6	22.3	22.8	22.3	22.3	22.3	22.2	22.3	22.7	22.6	7.3	7.1	319	321

* "88 on DAY7 AM: noted large (~2½" long) "worm" on sediment surface BM

Chironomid RANDOMIZATION SHEET

Client: **Kensington** **Test Start Date:**

Laboratory ID:	Field ID:	Alternate ID / Dilutions:	Replicate ID:	Random Number	Test Chamber Number:
Sediment Control	Beaver Creek	Control	F	0.90407	51
Sediment Control	Beaver Creek	Control	B	0.88971	52
Sediment Control	Beaver Creek	Control	C	0.76041	61
Sediment Control	Beaver Creek	Control	D	0.73942	66
Sediment Control	Beaver Creek	Control	G	0.63191	72
Sediment Control	Beaver Creek	Control	E	0.55508	73
Sediment Control	Beaver Creek	Control	H	0.45454	78
Sediment Control	Beaver Creek	Control	A	0.01631	94
B3584-05	Lower Johnson Creek		H	0.93879	50
B3584-05	Lower Johnson Creek		F	0.88696	53
B3584-05	Lower Johnson Creek		A	0.76600	59
B3584-05	Lower Johnson Creek		B	0.49618	75
B3584-05	Lower Johnson Creek		G	0.48773	76
B3584-05	Lower Johnson Creek		D	0.44359	79
B3584-05	Lower Johnson Creek		C	0.23540	87
B3584-05	Lower Johnson Creek		E	0.21939	88
B3584-04	Lower Slate Creek		D	0.77809	58
B3584-04	Lower Slate Creek		A	0.75842	62
B3584-04	Lower Slate Creek		C	0.74187	65
B3584-04	Lower Slate Creek		B	0.50409	74
B3584-04	Lower Slate Creek		H	0.43420	80
B3584-04	Lower Slate Creek		E	0.38522	82
B3584-04	Lower Slate Creek		G	0.14000	90
B3584-04	Lower Slate Creek		F	0.00219	96
B3584-03	Lower Sherman Creek		A	0.82549	56
B3584-03	Lower Sherman Creek		B	0.80014	57
B3584-03	Lower Sherman Creek		D	0.75695	63
B3584-03	Lower Sherman Creek		E	0.71313	67
B3584-03	Lower Sherman Creek		G	0.67422	71
B3584-03	Lower Sherman Creek		C	0.27353	85
B3584-03	Lower Sherman Creek		H	0.25418	86
B3584-03	Lower Sherman Creek		F	0.08580	92
B3584-02	Upper Slate Creek		H	0.94785	49
B3584-02	Upper Slate Creek		D	0.88528	54
B3584-02	Upper Slate Creek		B	0.76290	60
B3584-02	Upper Slate Creek		A	0.41629	81
B3584-02	Upper Slate Creek		F	0.37773	83
B3584-02	Upper Slate Creek		G	0.21876	89
B3584-02	Upper Slate Creek		E	0.10843	91
B3584-02	Upper Slate Creek		C	0.06515	93
B3584-01	East Fork Slate Creek		H	0.83515	55
B3584-01	East Fork Slate Creek		F	0.74752	64
B3584-01	East Fork Slate Creek		E	0.69883	68
B3584-01	East Fork Slate Creek		G	0.69883	69
B3584-01	East Fork Slate Creek		A	0.69417	70
B3584-01	East Fork Slate Creek		D	0.48029	77
B3584-01	East Fork Slate Creek		C	0.37157	84
B3584-01	East Fork Slate Creek		B	0.01058	95
			z		
			z		
			z		
			z		

CH2M HILL **FRESHWATER TOXICITY TEST SURVIVAL AND EMERGENCE DATA**

Client Kensington
Sample Description See Randomization Sheet(s). Batch number: B 3584
Test Species: *Chironomus tentans* ID#: CHI 26

Beginning, Date 8/22/16 Time —
Ending, Date 9-1-16 Time 0815

Survival = (total number of live pupae + live larvae + emerged adults) / Start count

Starting on the Day 7 evening water renewal, record the number of emerged adults in each container (can be left blank if there are none)

If Growth endpoint to be used, place only the live larvae collected @ Day 10 final into tin. (pupae and emerged adults are discarded)

Tech: ——— ——— ——— ——— ——— ——— ——— ——— ——— SW/MC

Beaker Number	Start Count	# emerged	# emerged	# emerged	# emerged	# emerged	# emerged	# emerged	# pupae alive	# larvae alive	# larvae dead
	0	Day 7 pm	Day 8 am	Day 8 pm	Day 9 am	Day 9 pm	Day 10 am	Day 10 final	Day 10 final	Day 10 final	Day 10 final
49	10									8	
50	10									10	
51	10									11	
52	10									11	
53	10									10	
54	10									10	
55	10									10	
56	10								1	9	
57	10									8	
58	10									9	
59	10									10	
60	10									10	
61	10									~~8~~ 11	pupae 9-1-16
62	10									10	
63	10									8	
64	10									11	
65	10									10	
66	10									10	
67	10								1	7	
68	10									11	
69	10									9	
70	10									7	
71	10									6	
72	10									10	
73	10									10	
74	10									9	
75	10									10	
76	10									10	
77	10									10	
78	10									10	

Comments:

One other sp of worm found. SW
One other sp of worm found SW
One other sp worm found SW
One other sp worm found. SW

CH2M HILL

FRESHWATER TOXICITY TEST SURVIVAL AND EMERGENCE DATA

Client: Kensington

Sample Description: See Randomization Sheet(s). Batch number: B 3584

Test Species: *Chironomus tentans* ID#: CHI 26

Beginning, Date: 8/22/16 Time: –

Ending, Date: 9/6/16 Time: –

Survival = (total number of live pupae + live larvae + emerged adults) / Start count

If Growth endpoint to be used, place only the live larvae collected @ Day 10 final into tin. (pupae and emerged adults are discarded)

Starting on the Day 7 evening water renewal, record the number of emerged adults in each container (can be left blank if there are none)

Tech: ____ ____ ____ ____ ____ ____ ____ ____ ____

Beaker Number	Start Count	# emerged	# emerged	# emerged	# emerged	# emerged	# emerged	# emerged	# pupae alive	# larvae alive	# larvae dead
	0	Day 7 pm	Day 8 am	Day 8 pm	Day 9 am	Day 9 pm	Day 10 am	Day 10 final	Day 10 final	Day 10 final	Day 10 final
79	10									8	
80	10									10	
81	10									10	
82	10									10	
83	10									10	
84	10									9	
85	10									9	
86	10									9	
87	10									10	
88	10									10	
89	10									10	
90	10									10	
91	10									9	
92	10									9	
93	10									9	
94	10									10	
95	10									10	
96	10									9	

Comments:

Chironomus tentans GROWTH DATA

Client: Kensington | Species ID#: CHI 26

Lab ID: see randomization sheet | batch number: B3584 | Start Date: 8/22/2016

Sample Description:

Technician:	MC	MC
Date:	9/7/2016	9/8/2016
Balance Serial #:	50309851	50309851

Note: Empty tins should be ashed (550°C for 2 hrs) prior to use to allow for any oxidation to occur. NO TARE weights needed

Tin ID Number	Total Dry Weight (mg) (including pan)	Total Ashed Weight (mg) (including pan)	No. of Chironomids Surviving (larval+pupae+adult)	No. of larval Chironomids in Tin
49	82.29	71.45	8	8
50	91.27	74.93	10	10
51	88.48	73.01	11	11
52	87.99	72.19	11	11
53	88.78	75.17	10	10
54	84.53	70.57	10	10
55	87.29	70.81	10	10
56	85.83	72.86	10	9
57	84.21	71.84	8	8
58	88.52	73.62	9	9
59	92.65	78.05	10	10
60	83.08	71.11	10	10
61	87.11	71.63	11	11
62	86.92	72.03	10	10
63	81.84	71.40	8	8
64	84.66	70.85	11	11
65	89.29	74.57	10	10
66	87.73	71.76	10	10
67	81.92	71.24	8	7
68	83.68	70.20	11	11
69	83.67	70.47	9	9
70	81.37	70.25	7	7
71	80.74	71.62	6	6
72	87.42	71.62	10	10
73	87.78	72.61	10	10
74	87.01	72.74	9	9
75	94.53	78.83	10	10
76	89.27	75.25	10	10
77	85.00	70.77	10	10
78	87.77	71.84	10	10

weigh to 0.01 mg

Chironomus tentans GROWTH DATA

Client: Kensington Species ID#: CHI 26

Lab ID: see randomization sheet batch number: B3584 Start Date: 8/22/2016

Sample Description:

Technician:	MC	MC	Note: Empty tins should be ashed (550°C for 2 hrs) prior to use to allow for any oxidation to occur. NO TARE weights needed
Date:	9/7/2016	9/8/2016	
Balance Serial #:	50309851	50309851	

Tin ID Number	Total Dry Weight (mg) (including pan)	Total Ashed Weight (mg) (including pan)	No. of Chironomids Surviving (larval+pupae+adult)	No. of larval Chironomids in Tin
79	88.97	75.60	8	8
80	86.04	71.97	10	10
81	85.12	71.33	10	10
82	84.38	71.60	10	10
83	85.67	70.54	10	10
84	82.84	70.38	9	9
85	84.05	71.60	9	9
86	83.79	71.54	9	9
87	90.29	75.36	10	10
88	88.02	74.01	10	10
89	85.68	71.17	10	10
90	87.07	72.41	10	10
91	83.81	70.55	9	9
92	85.49	73.97	9	9
93	84.35	71.23	9	9
94	84.42	71.96	10	10
95	83.58	70.79	10	10
96	85.63	73.00	9	9

weigh to 0.01 mg

Chironomus tentans GROWTH DATA

Client Kensington Species ID# CHI

Lab ID: see randomization sheet batch number: B 3584 Start Date 4-22-16

Sample Description:

Technician:
Date:
Balance Serial #: 50309851 50309851

Note: Empty tins should be ashed (550°C for 2 hrs) prior to use to allow for any oxidation to occur. NO TARE weights needed

Tin ID Number	Total Dry Weight (mg) (including pan)	Total Ashed Weight (mg) (including pan)	No. of Chironomids Surviving (larval+pupae+adult)	No. of larval Chironomids in Tin
49			9	8
50			10	10
51			11	11
52			11	11
53			10	10
54			10	10
55			10	10
56			9	9
57			8	8
58			9	9
59			10	10
60			10	10
61			11	11
62			10	10
63			8	8
64			11	11
65			10	10
66			10	10
67			8	7
68			11	11
69			9	9
70			9	7
71			6	6
72			10	10
73			10	10
74			9	9
75			10	10
76			10	10
77			10	10
78			10	10

weigh to 0.01 mg

Chironomus tentans GROWTH DATA

Client Kensington Species ID# CHI

Lab ID: see randomization sheet batch number: B 3584 Start Date 9.22-16

Sample Description:

Technician: _____ _____
Date: _____ _____
Balance Serial #: 50309851 50309851

Note: Empty tins should be ashed (550°C for 2 hrs) prior to use to allow for any oxidation to occur. NO TARE weights needed

Tin ID Number	Total Dry Weight (mg) (including pan)	Total Ashed Weight (mg) (including pan)	No. of Chironomids Surviving (larval+pupae+adult)	No. of larval Chironomids in Tin
79			8	8
80			10	10
81			10	10
82			10	10
83			10	10
84			9	9
85			9	9
86			9	9
87			10	10
88			10	10
89			10	10
90			10	10
91			9	9
92			9	9
93			9	9
94			10	10
95			10	10
96			9	9

weigh to 0.01 mg

CETIS Summary Report

Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Batch ID:	08-6381-0778	**Test Type:**	Survival-AF Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Chironomus tentans	**Brine:**	
Duration:	10d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	05-1582-8506	**Code:**	B3584-03	**Client:**	
Sample Date:	06 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	47d 0h	**Station:**	Lower Sherman Creek		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
07-7096-6286	Mean AF Weight-mg	100	>100	NA	6.78%	1	Equal Variance t Two-Sample Test
03-9500-1344	Survival Rate	<100	100	NA	6.63%	>1	Unequal Variance t Two-Sample Test

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
03-9500-1344	Survival Rate	Control Resp	1	0.7 - NL	Yes	Passes Acceptability Criteria ✓

Mean AF Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	1.473	1.371	1.575	1.246	1.597	0.04326	0.1224	8.31%	0.0%
100		8	1.42	1.334	1.507	1.28	1.546	0.03664	0.1036	7.3%	3.57%

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	1	1	1	1	1	0	0	0.0%	0.0%
100		8	0.8375	0.7382	0.9368	0.6	1	0.04199	0.1188	14.18%	16.25%

Mean AF Weight-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.246	1.436	1.407	1.597	1.517	1.406	1.58	1.593
100		1.441	1.546	1.383	1.305	1.526	1.28	1.52	1.361

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	1	1	1	1	1
100		1	0.8	0.9	0.8	0.8	0.9	0.6	0.9

Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	11/11	11/11	10/10	10/10	11/11	10/10	10/10
100		10/10	8/10	9/10	8/10	8/10	9/10	6/10	9/10

CETIS Analytical Report

Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	07-7096-6286	**Endpoint:**	Mean AF Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:38	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes
Batch ID:	08-6381-0778	**Test Type:**	Survival-AF Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Chironomus tentans	**Brine:**	
Duration:	10d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	05-1582-8506	**Code:**	B3584-03	**Client:**	
Sample Date:	06 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	47d 0h	**Station:**	Lower Sherman Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	6.78%	Passes mean af weight-mg

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	0.9271	1.761	0.1	14	0.1848	CDF	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.1788	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.01105025	0.01105025	1	0.8595	0.3696	Non-Significant Effect
Error	0.1799895	0.01285639	14			
Total	0.1910397		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	1.394	8.885	0.6725	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9116	0.8408	0.1236	Normal Distribution

Mean AF Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.473	1.371	1.575	1.477	1.246	1.597	0.04326	8.31%	0.0%
100		8	1.42	1.334	1.507	1.412	1.28	1.546	0.03664	7.3%	3.57%

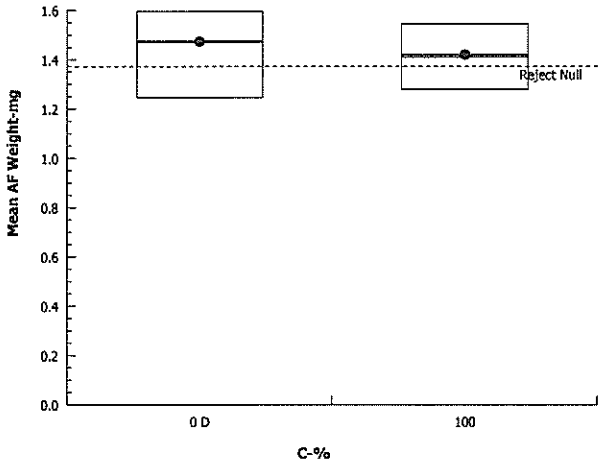
Mean AF Weight-mg Detail

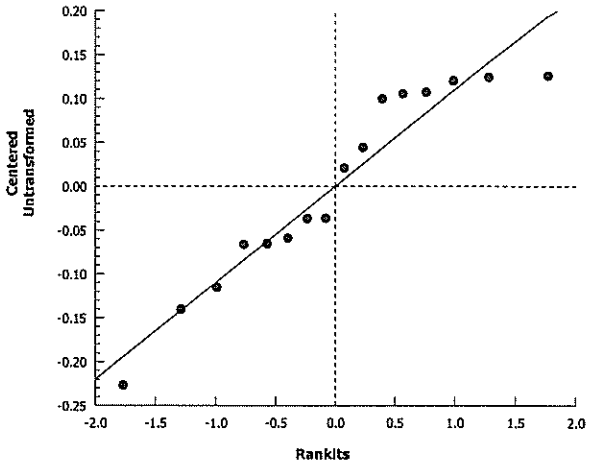
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.246	1.436	1.407	1.597	1.517	1.406	1.58	1.593
100		1.441	1.546	1.383	1.305	1.526	1.28	1.52	1.361

Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	07-7096-6286	**Endpoint:**	Mean AF Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:38	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Graphics





Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	03-9500-1344	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:38	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes
Batch ID:	08-6381-0778	**Test Type:**	Survival-AF Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Chironomus tentans	**Brine:**	
Duration:	10d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	05-1582-8506	**Code:**	B3584-03	**Client:**	
Sample Date:	06 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	47d 0h	**Station:**	Lower Sherman Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	6.63%	Fails survival rate

Unequal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100*	4.43	1.895	0.104	7	0.0015	CDF	Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			1.0000	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.238094	0.238094	1	19.62	0.0006	Significant Effect
Error	0.169878	0.01213414	14			
Total	0.4079719		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	1632	8.885	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.8416	0.8408	0.0103	Normal Distribution

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1	1	1	1	1	1	0	0.0%	0.0%
100		8	0.8375	0.7382	0.9368	0.85	0.6	1	0.04199	14.18%	16.25%

Angular (Corrected) Transformed Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.415	1.412	1.418	1.412	1.412	1.419	0.001366	0.27%	0.0%
100		8	1.171	1.041	1.301	1.178	0.8861	1.412	0.05506	13.3%	17.24%

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	1	1	1	1	1
100		1	0.8	0.9	0.8	0.8	0.9	0.6	0.9

Angular (Corrected) Transformed Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.412	1.419	1.419	1.412	1.412	1.419	1.412	1.412
100		1.412	1.107	1.249	1.107	1.107	1.249	0.8861	1.249

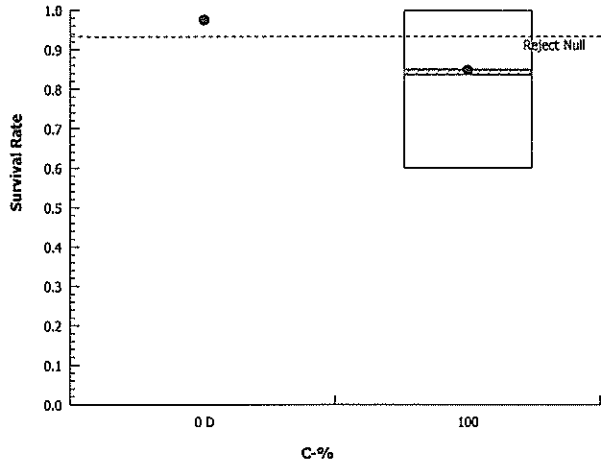
Survival Rate Binomials

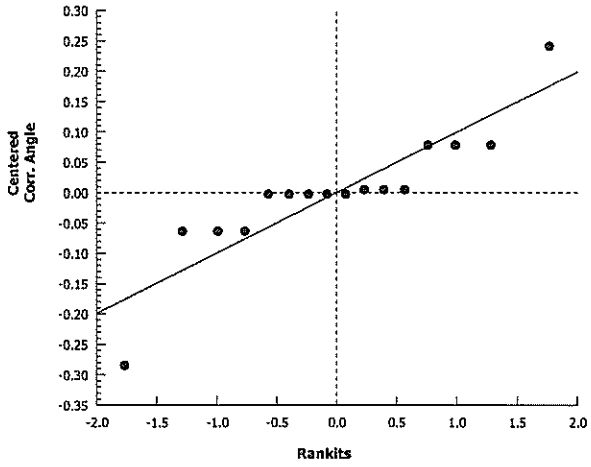
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	11/11	11/11	10/10	10/10	11/11	10/10	10/10
100		10/10	8/10	9/10	8/10	8/10	9/10	6/10	9/10

Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	03-9500-1344	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:38	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Graphics





CETIS Summary Report

Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Batch ID:	08-6381-0778	**Test Type:**	Survival-AF Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Chironomus tentans	**Brine:**	
Duration:	10d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	18-2203-5030	**Code:**	B3584-01	**Client:**	
Sample Date:	06 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	47d 0h	**Station:**	East Fork Slate Creek		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
18-2377-4367	Mean AF Weight-mg	100	>100	NA	8.34%	1	Equal Variance t Two-Sample Test
16-8056-7322	Survival Rate	100	>100	NA	6.18%	1	Wilcoxon Rank Sum Two-Sample Test

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
16-8056-7322	Survival Rate	Control Resp	1	0.7 - NL	Yes	Passes Acceptability Criteria

Mean AF Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	1.473	1.371	1.575	1.246	1.597	0.04326	0.1224	8.31%	0.0%
100		8	1.409	1.279	1.538	1.225	1.648	0.05472	0.1548	10.99%	4.35%

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	1	1	1	1	1	0	0	0.0%	0.0%
100		8	0.9375	0.8488	1	0.7	1	0.0375	0.1061	11.31%	6.25%

Mean AF Weight-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.246	1.436	1.407	1.597	1.517	1.406	1.58	1.593
100		1.589	1.279	1.384	1.423	1.225	1.255	1.467	1.648

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	1	1	1	1	1
100		0.7	1	0.9	1	1	1	0.9	1

Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	11/11	11/11	10/10	10/10	11/11	10/10	10/10
100		7/10	10/10	9/10	10/10	11/11	11/11	9/10	10/10

Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	18-2377-4367	**Endpoint:**	Mean AF Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:36	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes
Batch ID:	08-6381-0778	**Test Type:**	Survival-AF Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Chironomus tentans	**Brine:**	
Duration:	10d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	18-2203-5030	**Code:**	B3584-01	**Client:**	
Sample Date:	06 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	47d 0h	**Station:**	East Fork Slate Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	8.34%	Passes mean af weight-mg

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	0.9183	1.761	0.123	14	0.1870	CDF	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.1788	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.01641002	0.01641002	1	0.8432	0.3740	Non-Significant Effect
Error	0.2724487	0.01946063	14			
Total	0.2888588		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	1.6	8.885	0.5503	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9796	0.8408	0.9605	Normal Distribution

Mean AF Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.473	1.371	1.575	1.477	1.246	1.597	0.04326	8.31%	0.0%
100		8	1.409	1.279	1.538	1.404	1.225	1.648	0.05472	10.99%	4.35%

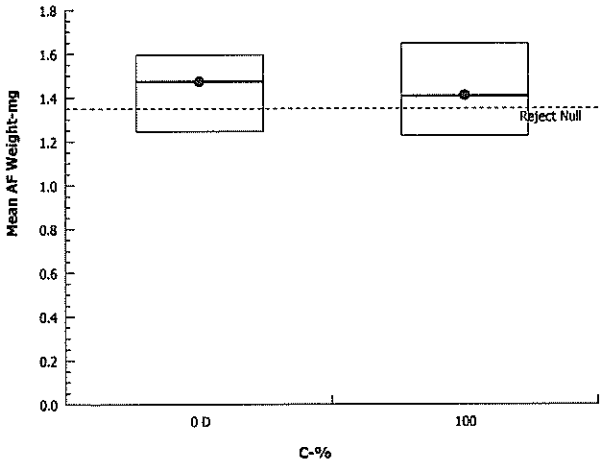
Mean AF Weight-mg Detail

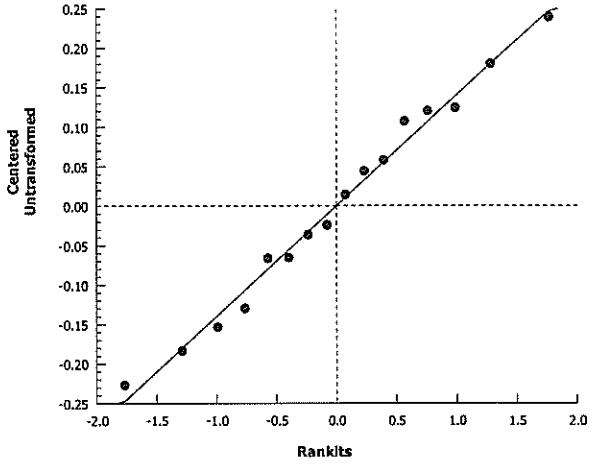
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.246	1.436	1.407	1.597	1.517	1.406	1.58	1.593
100		1.589	1.279	1.384	1.423	1.225	1.255	1.467	1.648

Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	18-2377-4367	**Endpoint:**	Mean AF Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:36	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Graphics





Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	16-8056-7322	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:36	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes
Batch ID:	08-6381-0778	**Test Type:**	Survival-AF Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Chironomus tentans	**Brine:**	
Duration:	10d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	18-2203-5030	**Code:**	B3584-01	**Client:**	
Sample Date:	06 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	47d 0h	**Station:**	East Fork Slate Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	6.18%	Passes survival rate

Wilcoxon Rank Sum Two-Sample Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	56	NA	1	14	0.1000	Exact	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			1.0000	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.03555561	0.03555561	1	3.045	0.1029	Non-Significant Effect
Error	0.1634957	0.01167827	14			
Total	0.1990513		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	1571	8.885	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.7362	0.8408	0.0004	Non-normal Distribution

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1	1	1	1	1	1	0	0.0%	0.0%
100		8	0.9375	0.8488	1	1	0.7	1	0.0375	11.31%	6.25%

Angular (Corrected) Transformed Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.415	1.412	1.418	1.412	1.412	1.419	0.001366	0.27%	0.0%
100		8	1.321	1.193	1.448	1.412	0.9912	1.419	0.05402	11.57%	6.66%

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	1	1	1	1	1
100		0.7	1	0.9	1	1	1	0.9	1

Angular (Corrected) Transformed Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.412	1.419	1.419	1.412	1.412	1.419	1.412	1.412
100		0.9912	1.412	1.249	1.412	1.419	1.419	1.249	1.412

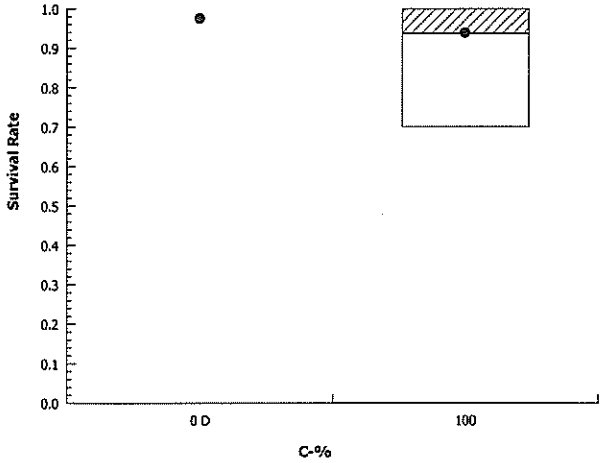
Survival Rate Binomials

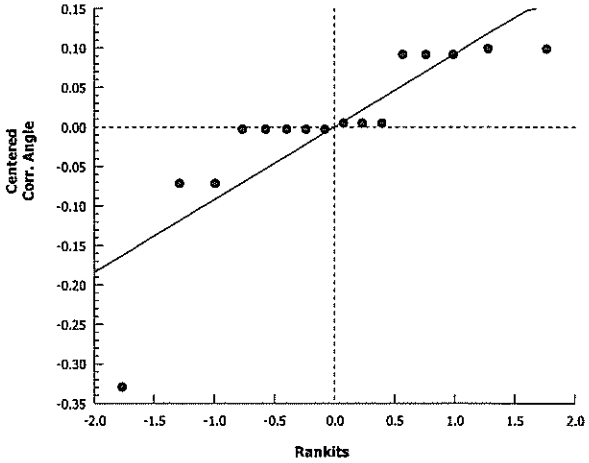
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	11/11	11/11	10/10	10/10	11/11	10/10	10/10
100		7/10	10/10	9/10	10/10	11/11	11/11	9/10	10/10

Chironomus 10-d Survival and Growth Sediment Test **CH2M HILL - ASL**

Analysis ID:	16-8056-7322	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:36	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Graphics





CETIS Summary Report

Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Batch ID:	08-6381-0778	**Test Type:**	Survival-AF Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Chironomus tentans	**Brine:**	
Duration:	10d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	02-9733-1775	**Code:**	B3584-05	**Client:**	
Sample Date:	08 Aug-16	**Material:**	Sediment	**Project:**	
Receive Date:	11 Aug-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	14d 0h	**Station:**	Lower Johnson Creek		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
17-6869-3558	Mean AF Weight-mg	100	>100	NA	7.1%	1	Equal Variance t Two-Sample Test
12-7074-1598	Survival Rate	100	>100	NA	4.9%	1	Wilcoxon Rank Sum Two-Sample Test

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
12-7074-1598	Survival Rate	Control Resp	1	0.7 - NL	Yes	Passes Acceptability Criteria ✓

Mean AF Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	1.473	1.371	1.575	1.246	1.597	0.04326	0.1224	8.31%	0.0%
100		8	1.499	1.403	1.595	1.361	1.671	0.04065	0.115	7.67%	-1.78%

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	1	1	1	1	1	0	0	0.0%	0.0%
100		8	0.975	0.9159	1	0.8	1	0.025	0.07071	7.25%	2.5%

Mean AF Weight-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.246	1.436	1.407	1.597	1.517	1.406	1.58	1.593
100		1.46	1.57	1.493	1.671	1.401	1.361	1.402	1.634

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	1	1	1	1	1
100		1	1	1	0.8	1	1	1	1

Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	11/11	11/11	10/10	10/10	11/11	10/10	10/10
100		10/10	10/10	10/10	8/10	10/10	10/10	10/10	10/10

CETIS Analytical Report

Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	17-6869-3558	**Endpoint:**	Mean AF Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:39	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes
Batch ID:	08-6381-0778	**Test Type:**	Survival-AF Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Chironomus tentans	**Brine:**	
Duration:	10d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	02-9733-1775	**Code:**	B3584-05	**Client:**	
Sample Date:	08 Aug-16	**Material:**	Sediment	**Project:**	
Receive Date:	11 Aug-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	14d 0h	**Station:**	Lower Johnson Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	7.1%	Passes mean af weight-mg

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	-0.4406	1.761	0.105	14	0.6669	CDF	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.1788	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.002736575	0.002736575	1	0.1941	0.6662	Non-Significant Effect
Error	0.1973427	0.01409591	14			
Total	0.2000793		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	1.132	8.885	0.8740	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.955	0.8408	0.5724	Normal Distribution

Mean AF Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.473	1.371	1.575	1.477	1.246	1.597	0.04326	8.31%	0.0%
100		8	1.499	1.403	1.595	1.476	1.361	1.671	0.04065	7.67%	-1.78%

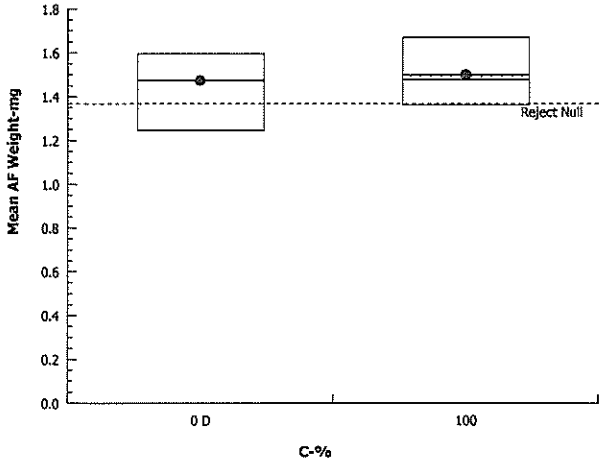
Mean AF Weight-mg Detail

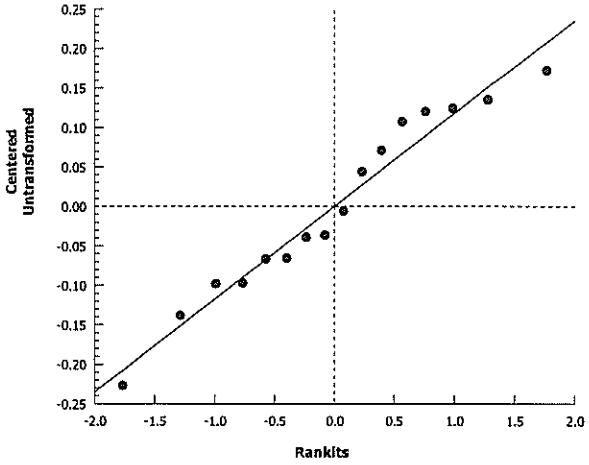
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.246	1.436	1.407	1.597	1.517	1.406	1.58	1.593
100		1.46	1.57	1.493	1.671	1.401	1.361	1.402	1.634

Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	17-6869-3558	**Endpoint:**	Mean AF Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:39	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Graphics





Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	12-7074-1598	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:39	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes
Batch ID:	08-6381-0778	**Test Type:**	Survival-AF Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Chironomus tentans	**Brine:**	
Duration:	10d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	02-9733-1775	**Code:**	B3584-05	**Client:**	
Sample Date:	08 Aug-16	**Material:**	Sediment	**Project:**	
Receive Date:	11 Aug-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	14d 0h	**Station:**	Lower Johnson Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	4.9%	Passes survival rate

Wilcoxon Rank Sum Two-Sample Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	64	NA	1	14	0.5000	Exact	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			1.0000	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.006691654	0.006691654	1	1.15	0.3016	Non-Significant Effect
Error	0.08143011	0.005816436	14			
Total	0.08812177		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	782	8.885	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.4807	0.8408	<0.0001	Non-normal Distribution

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1	1	1	1	1	1	0	0.0%	0.0%
100		8	0.975	0.9159	1	1	0.8	1	0.025	7.25%	2.5%

Angular (Corrected) Transformed Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.415	1.412	1.418	1.412	1.412	1.419	0.001366	0.27%	0.0%
100		8	1.374	1.284	1.464	1.412	1.107	1.412	0.03811	7.85%	2.89%

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	1	1	1	1	1
100		1	1	1	0.8	1	1	1	1

Angular (Corrected) Transformed Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.412	1.419	1.419	1.412	1.412	1.419	1.412	1.412
100		1.412	1.412	1.412	1.107	1.412	1.412	1.412	1.412

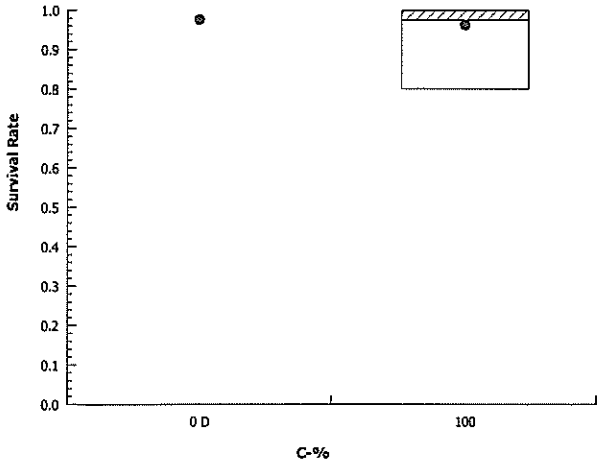
Survival Rate Binomials

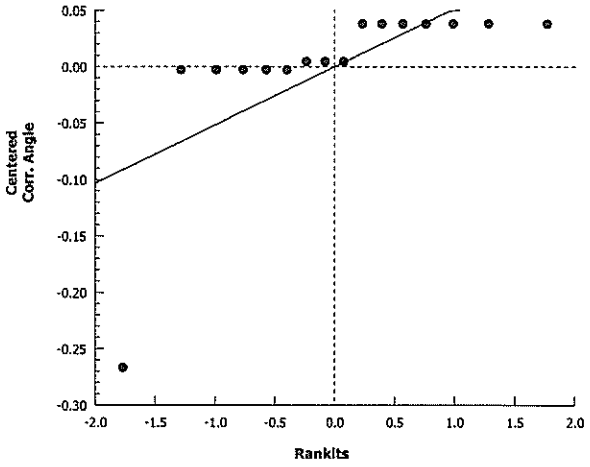
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	11/11	11/11	10/10	10/10	11/11	10/10	10/10
100		10/10	10/10	10/10	8/10	10/10	10/10	10/10	10/10

Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	12-7074-1598	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:39	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Graphics





CETIS Summary Report

Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Batch ID:	08-6381-0778	**Test Type:**	Survival-AF Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Chironomus tentans	**Brine:**	
Duration:	10d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	10-0448-9482	**Code:**	B3584-04	**Client:**	
Sample Date:	05 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	48d 0h	**Station:**	Lower Slate Creek		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
19-0870-1575	Mean AF Weight-mg	100	>100	NA	7.11%	1	Equal Variance t Two-Sample Test
17-1479-8981	Survival Rate	100	>100	NA	4.29%	1	Wilcoxon Rank Sum Two-Sample Test

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
17-1479-8981	Survival Rate	Control Resp	1	0.7 - NL	Yes	Passes Acceptability Criteria ✓

Mean AF Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	1.473	1.371	1.575	1.246	1.597	0.04326	0.1224	8.31%	0.0%
100		8	1.47	1.373	1.566	1.278	1.656	0.04085	0.1155	7.86%	0.23%

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	1	1	1	1	1	0	0	0.0%	0.0%
100		8	0.9625	0.9192	1	0.9	1	0.0183	0.05175	5.38%	3.75%

Mean AF Weight-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.246	1.436	1.407	1.597	1.517	1.406	1.58	1.593
100		1.489	1.586	1.472	1.656	1.278	1.403	1.466	1.407

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	1	1	1	1	1
100		1	0.9	1	0.9	1	0.9	1	1

Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	11/11	11/11	10/10	10/10	11/11	10/10	10/10
100		10/10	9/10	10/10	9/10	10/10	9/10	10/10	10/10

Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	19-0870-1575	**Endpoint:**	Mean AF Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:39	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes
Batch ID:	08-6381-0778	**Test Type:**	Survival-AF Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Chironomus tentans	**Brine:**	
Duration:	10d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	10-0448-9482	**Code:**	B3584-04	**Client:**	
Sample Date:	05 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	48d 0h	**Station:**	Lower Slate Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	7.11%	Passes mean af weight-mg

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	0.05579	1.761	0.105	14	0.4781	CDF	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.1788	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	4.407637E-05	4.407637E-05	1	0.003113	0.9563	Non-Significant Effect
Error	0.1982333	0.01415952	14			
Total	0.1982774		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	1.121	8.885	0.8837	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9511	0.8408	0.5068	Normal Distribution

Mean AF Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.473	1.371	1.575	1.477	1.246	1.597	0.04326	8.31%	0.0%
100		8	1.47	1.373	1.566	1.469	1.278	1.656	0.04085	7.86%	0.23%

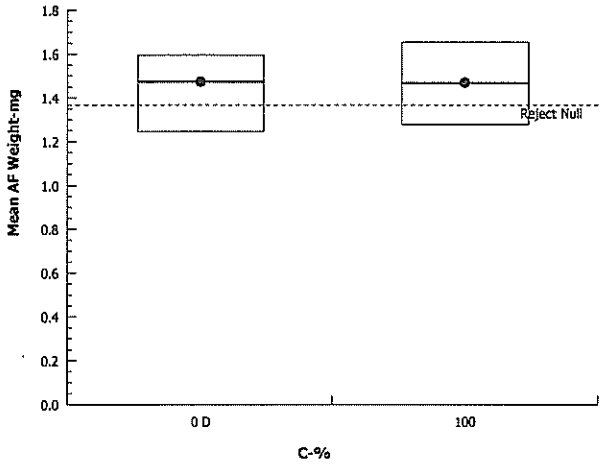
Mean AF Weight-mg Detail

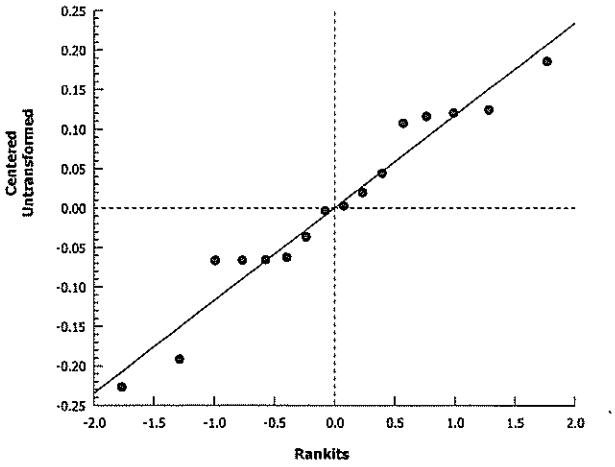
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.246	1.436	1.407	1.597	1.517	1.406	1.58	1.593
100		1.489	1.586	1.472	1.656	1.278	1.403	1.466	1.407

Chironomus 10-d Survival and Growth Sediment Test **CH2M HILL - ASL**

Analysis ID:	19-0870-1575	**Endpoint:**	Mean AF Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:39	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Graphics





Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	17-1479-8981	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:39	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes
Batch ID:	08-6381-0778	**Test Type:**	Survival-AF Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Chironomus tentans	**Brine:**	
Duration:	10d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	10-0448-9482	**Code:**	B3584-04	**Client:**	
Sample Date:	05 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	48d 0h	**Station:**	Lower Slate Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	4.29%	Passes survival rate

Wilcoxon Rank Sum Two-Sample Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	56	NA	1	14	0.1000	Exact	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			1.0000	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.01633628	0.01633628	1	4.583	0.0504	Non-Significant Effect
Error	0.04990274	0.003564482	14			
Total	0.06623902		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	478.8	8.885	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.802	0.8408	0.0029	Non-normal Distribution

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1	1	1	1	1	1	0	0.0%	0.0%
100		8	0.9625	0.9192	1	1	0.9	1	0.0183	5.38%	3.75%

Angular (Corrected) Transformed Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.415	1.412	1.418	1.412	1.412	1.419	0.001366	0.27%	0.0%
100		8	1.351	1.28	1.421	1.412	1.249	1.412	0.02982	6.24%	4.52%

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	1	1	1	1	1
100		1	0.9	1	0.9	1	0.9	1	1

Angular (Corrected) Transformed Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.412	1.419	1.419	1.412	1.412	1.419	1.412	1.412
100		1.412	1.249	1.412	1.249	1.412	1.249	1.412	1.412

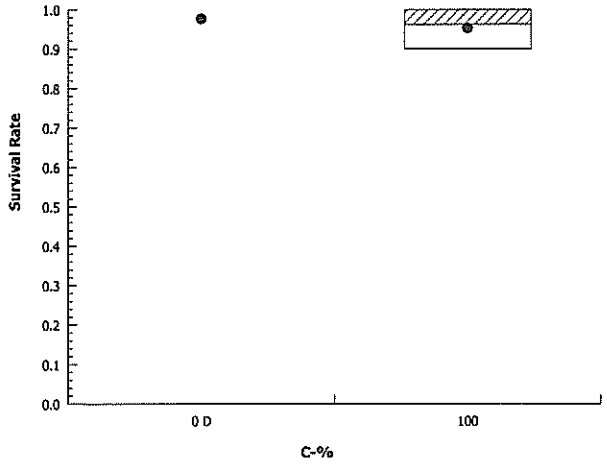
Survival Rate Binomials

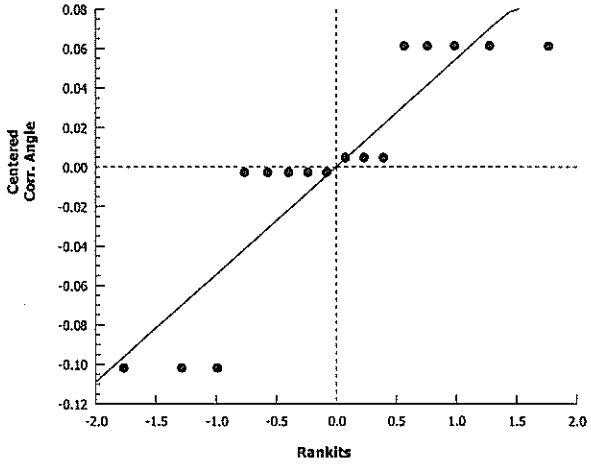
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	11/11	11/11	10/10	10/10	11/11	10/10	10/10
100		10/10	9/10	10/10	9/10	10/10	9/10	10/10	10/10

Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	17-1479-8981	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:39	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Graphics





CETIS Summary Report

Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Batch ID:	08-6381-0778	**Test Type:**	Survival-AF Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Chironomus tentans	**Brine:**	
Duration:	10d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	13-2959-2362	**Code:**	B3584-02	**Client:**	
Sample Date:	06 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	47d 0h	**Station:**	Upper Slate Creek		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
08-2648-1221	Mean AF Weight-mg	100	>100	NA	6.64%	1	Equal Variance t Two-Sample Test
17-8188-8523	Survival Rate	100	>100	NA	5.16%	1	Wilcoxon Rank Sum Two-Sample Test

Test Acceptability

Analysis ID	Endpoint	Attribute	Test Stat	TAC Limits	Overlap	Decision
17-8188-8523	Survival Rate	Control Resp	1	0.7 - NL	Yes	Passes Acceptability Criteria ✓

Mean AF Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	1.473	1.371	1.575	1.246	1.597	0.04326	0.1224	8.31%	0.0%
100		8	1.403	1.321	1.485	1.197	1.513	0.03477	0.09835	7.01%	4.76%

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	8	1	1	1	1	1	0	0	0.0%	0.0%
100		8	0.95	0.8868	1	0.8	1	0.02673	0.07559	7.96%	5.0%

Mean AF Weight-mg Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.246	1.436	1.407	1.597	1.517	1.406	1.58	1.593
100		1.379	1.197	1.458	1.396	1.473	1.513	1.451	1.355

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	1	1	1	1	1
100		1	1	0.9	1	0.9	1	1	0.8

Survival Rate Binomials

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	11/11	11/11	10/10	10/10	11/11	10/10	10/10
100		10/10	10/10	9/10	10/10	9/10	10/10	10/10	8/10

CETIS Analytical Report

Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	08-2648-1221	**Endpoint:**	Mean AF Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:37	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes
Batch ID:	08-6381-0778	**Test Type:**	Survival-AF Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Chironomus tentans	**Brine:**	
Duration:	10d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	13-2959-2362	**Code:**	B3584-02	**Client:**	
Sample Date:	06 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	47d 0h	**Station:**	Upper Slate Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Untransformed	NA	C > T	NA	NA	6.64%	Passes mean af weight-mg

Equal Variance t Two-Sample Test

Control	vs	C-%	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	1.263	1.761	0.098	14	0.1136	CDF	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			0.1788	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.01966227	0.01966227	1	1.596	0.2271	Non-Significant Effect
Error	0.1725082	0.01232201	14			
Total	0.1921705		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	1.548	8.885	0.5787	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9016	0.8408	0.0854	Normal Distribution

Mean AF Weight-mg Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.473	1.371	1.575	1.477	1.246	1.597	0.04326	8.31%	0.0%
100		8	1.403	1.321	1.485	1.424	1.197	1.513	0.03477	7.01%	4.76%

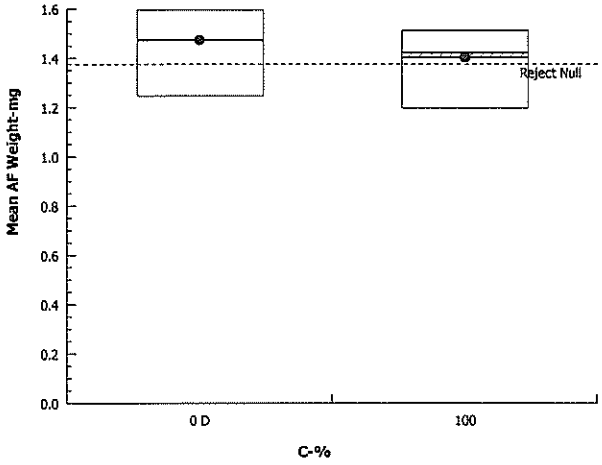
Mean AF Weight-mg Detail

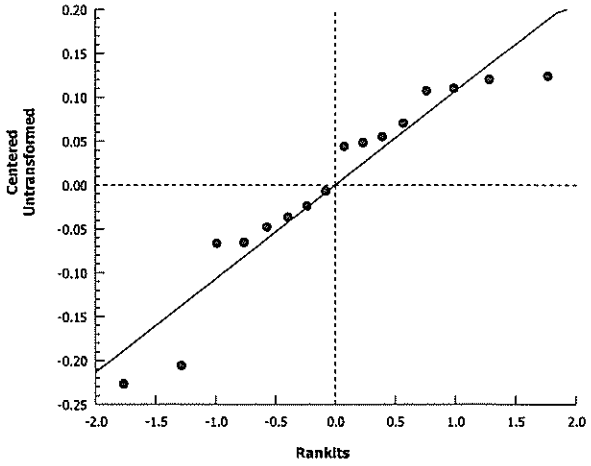
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.246	1.436	1.407	1.597	1.517	1.406	1.58	1.593
100		1.379	1.197	1.458	1.396	1.473	1.513	1.451	1.355

Chironomus 10-d Survival and Growth Sediment Test **CH2M HILL - ASL**

Analysis ID:	08-2648-1221	**Endpoint:**	Mean AF Weight-mg	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:37	**Analysis:**	Parametric-Two Sample	**Official Results:**	Yes

Graphics





Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	17-8188-8523	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:37	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes
Batch ID:	08-6381-0778	**Test Type:**	Survival-AF Growth	**Analyst:**	Brett Muckey
Start Date:	22 Aug-16	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Mod-Hard Synthetic Water
Ending Date:	01 Sep-16	**Species:**	Chironomus tentans	**Brine:**	
Duration:	10d 0h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	13-2959-2362	**Code:**	B3584-02	**Client:**	
Sample Date:	06 Jul-16	**Material:**	Sediment	**Project:**	
Receive Date:	13 Jul-16	**Source:**	Kensington Gold Mine (AK0050571)		
Sample Age:	47d 0h	**Station:**	Upper Slate Creek		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	5.16%	Passes survival rate

Wilcoxon Rank Sum Two-Sample Test

Control	vs	C-%	Test Stat	Critical	Ties	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		100	56	NA	1	14	0.1000	Exact	Non-Significant Effect

Auxiliary Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:5%)
Control Trend	Mann-Kendall Trend			1.0000	Non-significant Trend in Controls

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	0.02666287	0.02666287	1	3.871	0.0693	Non-Significant Effect
Error	0.09642693	0.006887638	14			
Total	0.1230898		15			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F Test	926.2	8.885	<0.0001	Unequal Variances
Distribution	Shapiro-Wilk W Normality	0.8003	0.8408	0.0027	Non-normal Distribution

Survival Rate Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1	1	1	1	1	1	0	0.0%	0.0%
100		8	0.95	0.8868	1	1	0.8	1	0.02673	7.96%	5.0%

Angular (Corrected) Transformed Summary

C-%	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	8	1.415	1.412	1.418	1.412	1.412	1.419	0.001366	0.27%	0.0%
100		8	1.333	1.235	1.431	1.412	1.107	1.412	0.04147	8.8%	5.77%

Survival Rate Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1	1	1	1	1	1	1	1
100		1	1	0.9	1	0.9	1	1	0.8

Angular (Corrected) Transformed Detail

C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	1.412	1.419	1.419	1.412	1.412	1.419	1.412	1.412
100		1.412	1.412	1.249	1.412	1.249	1.412	1.412	1.107

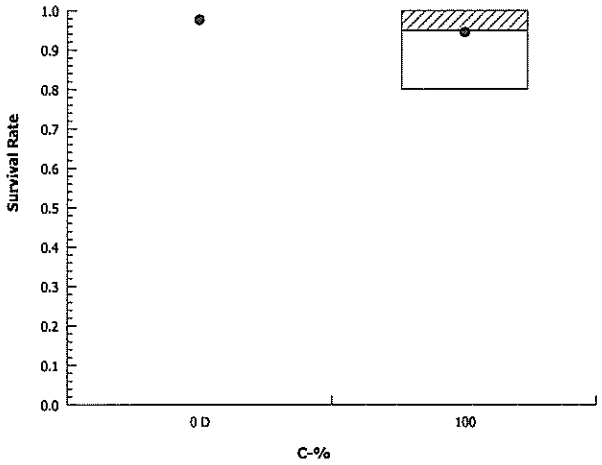
Survival Rate Binomials

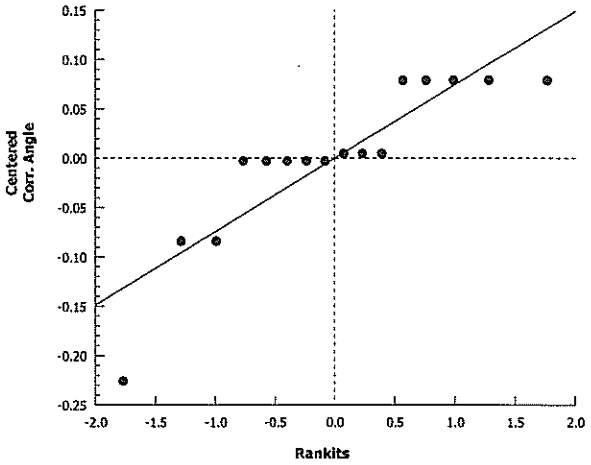
C-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8
0	Dilution Water	10/10	11/11	11/11	10/10	10/10	11/11	10/10	10/10
100		10/10	10/10	9/10	10/10	9/10	10/10	10/10	8/10

Chironomus 10-d Survival and Growth Sediment Test — **CH2M HILL - ASL**

Analysis ID:	17-8188-8523	**Endpoint:**	Survival Rate	**CETIS Version:**	CETISv1.8.8
Analyzed:	15 Sep-16 16:37	**Analysis:**	Nonparametric-Two Sample	**Official Results:**	Yes

Graphics





APPENDIX B

REFERENCE TOXICANT DATA SHEETS

REFERENCE TOXICANT DATA SHEET

Client: QA/QC
Test Organism: *Hyallela azteca*
Source: Cheasepeake Cultures
ID#: AMP 86
Age: 8-9 days
Feeding: 0.1 ml YCT on Day 0 & 48 hrs.
Test Chamber Size: 30 ml
Volume per Replicate: 20 ml
*10 reps. w/1 organism per test chamber

Reference Toxicant: KCl
Solvent: Milli-Q water Stock Solution: 50 g/L
Reagent Log ID #: ZB060-02
*Dilution Water: Recon MH ID#: 4397
Total Hardness as $CaCO_3$: 90
Total Alkalinity as $CaCO_3$: 66
Conductivity (µmhos/cm) / ~~Salinity (ppt)~~: 305
Temperature: 23° C ± 2° C

Test Begin: Date 8-22-16 Time 1505
Test End: Date 8-26-16 Time 1250

	0 hr	24 hr	48 hr	72 hr	96 hr
Technician	MC	MC/JW	BM	MC	BM
Time	1505	1416	1330	0955	1250
Therm. ID #	186	186	159	159	136
Food I.D. #	1104	NONE	1104	NONE	NONE

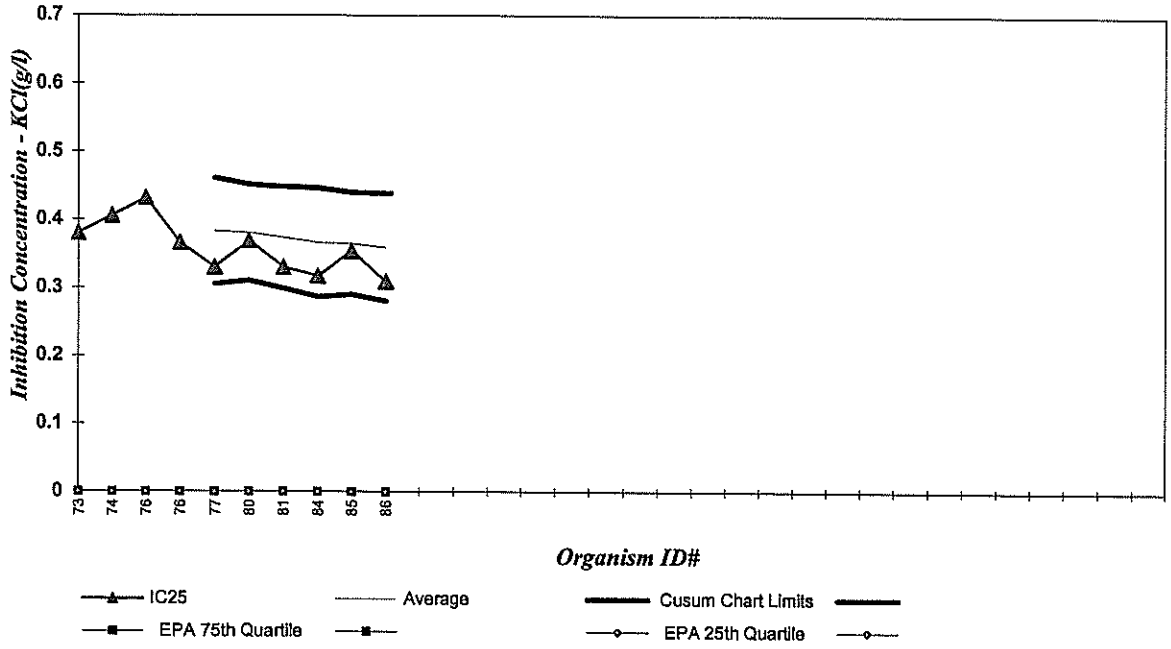
Toxicant Concen. g/L	Test Chamber Number	Number of Live Organisms Surviving					Dissolved Oxygen (mg/l)					pH					Temperature °C					Cond.	
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
Cont	A	10	10	10	10	10	8.0	-	-	-	7.6	7.2	-	-	-	7.6	21.7	22.0	22.7	22.3	23.1	310	415
0.125	A	10	10	10	10	10	8.1	-	-	-	7.7	7.3	-	-	-	7.7	21.7	22.1	22.7	22.4	22.9	530	733
0.250	A	10	10	9	9	7	8.1	-	7.9	-	7.8	7.3	-	7.9	-	7.5	21.7	22.3	22.7	22.5	22.9	747	751
0.500	A	10	5	~~2~~ BM 8/25/16 2	1	1	8.2	7.6	8.0	7.5	7.8	7.3	8.2	8.0	7.3	7.9	21.7	22.1	22.5	22.5	22.4	1170	1536
1.00	A	10	0	BM 8/25/16 0	-	-	8.3	7.7	-	-	-	7.4	8.1	-	-	-	21.8	22.3	-	-	-	2010	2030
2.00	A	10	0	0	-	-	8.4	7.8	-	-	-	7.5	8.1	-	-	-	21.8	22.0	-	-	-	3670	3720
Test Acceptability Limits:		Survival in Controls: > or = 90%					For Hyallela (at 23°C): >4.0 and <8.6					pH: > 6.0 and < 9.0					Temperature ± 2°C PBA 9-7-16						

*Dilution Water Code
Recon. - reconstituted water
S - soft
MH - moderately hard
H - hard
Art. Sea - Artificial Sea Water

96 hr LC50: 0.309
Cusum Chart Limits: 0.280 TO 0.439
Statistical Method: Probits

We verify this data is true and correct.
Task Manager: Doug Winn
Project Manager: Ed Murray
QA Officer: Ginger Collins

REFERENCE TOXICANT CUMLATIVE SUMMARY (CUSUM) CHART
Hyallala azteca Acute Survival - LC50 Values



***Hyallela azteca* - acute**

POTASIUM CHLORIDE (g/L)

Endpoint: 96 hour Survival

Stats Method: Probit, Spearman-Karber, Linear Interpolation

Test Conditions: Recon MH, 23 oC

From EPA 833-R-00-003:

10th Quartile CV (*control limit*) = na

25th Quartile CV (*warning limit*) = na

75th Quartile CV (*warning limit*) = na

90th Quartile CV (*control limit*) = na

As per EPA 833-R-00-003, section B.2.1, the quartiles listed above are from just a few labs (5) and therefore not to be considered typical or representative. Cusum limits are based on ASL data only.

Event #	AMP ID #	Test Start Date	LC50	Running Average	Running SD	Cusum Chart Limits AVG-2SD	Cusum Chart Limits AVG+2SD	Intralab CV
1	73	9/17/2008	0.380	0.380				
2	74	4/24/2009	0.406	0.393				
3	76	1/28/2011	0.432	0.406	0.026			
4	76	1/28/2011	0.366	0.396	0.029			
5	77	3/27/2014	0.330	0.383	0.039	0.305	0.461	0.07
6	80	8/14/2014	0.369	0.381	0.035	0.310	0.451	0.10
7	81	11/12/2014	0.330	0.373	0.037	0.299	0.448	0.09
8	84	7/15/2015	0.317	0.366	0.040	0.286	0.446	0.10
9	85	2/17/2016	0.354	0.365	0.038	0.290	0.440	0.11
10	86	8/22/2016	0.309	0.359	0.040	0.280	0.439	0.10
11								
12								
13								
14								
15								
16								
17								
18								

REFERENCE TOXICANT DATA SHEET

Client: QA/QC
Test Organism: *Chironomus tentans*
Source: ABS
ID#: CHI 26
Age: 2nd instar
Feeding: 0.1 ml of 4 g/L Tetramin @ 0 & 48 hrs.
Test Chamber Size: 400 ml
Volume per Replicate: 250 ml

*1 rep. w/10 organism per test chamber

Reference Toxicant: KCl
Solvent: distilled water Stock Solution: 10 g/L
Reagent Log ID #: 2B 060-07
*Dilution Water: Recon MH ID#: 13977 (exp 8-22-16)
Total Hardness as CaCO3: 90
Conductivity (µmhos/cm) / ~~Salinity (ppt)~~: 365
Total Alkalinity as CaCO3: 66
Temperature: 23° C ± 2° C

Test Begin: Date 8-22-16 Time 1510
Test End: Date 8-26-16 Time 1255

		0 hr	24 hr	48 hr	72 hr	96 hr
Technician		BW/MC	MC/BW	BW	MC	[illegible]
Time		1510	1400	1320	1005	1255
Therm. ID #		186	186	159	159	186
Food I.D. #		1082	NONE	1107	NONE	NONE

Toxicant Concen. g/L	Test Chamber Number	Number of Live Organisms Surviving					Dissolved Oxygen (mg/l)					pH					Temperature °C					Cond.	
		0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
Cont	A	10	10	10	9	9	7.9	-	-	7.3	7.8	7.5	-	-	7.2	7.8	21.7	21.9	21.8	22.0	22.9	297	345
1.25	A	10	10	10	9	9	7.9	-	-	7.2	7.6	7.5	-	-	7.2	8.0	21.8	21.9	22.1	22.1	22.9	2390	2770
2.50	A	10	10	9	9	9	8.0	-	7.5	—	7.6	7.5	-	8.1	—	8.1	21.8	22.1	22.5	22.3	22.9	4330	4670
5.00	A	10	10	10	9	9	8.1	-	-	7.2	7.5	7.5	-	-	7.5	8.3	21.9	22.3	22.4	22.4	22.9	8390	8700
7.50	A	10	8	7	0	—	8.2	7.9	7.8	7.3	—	7.7	7.6 (8.7 after DO)	8.5	7.7	—	21.9	22.5	22.3	22.0	—	11950	~~11620~~ 11950
10.0	A	10	0	-	-	-	8.2	8.0	-	-	-	7.9	8.9	-	-	-	21.9	21.9	-	-	-	15930	16340
Test Acceptability Limits:		Survival in Controls: > or = 90%					For Hyallela (at 23°C): >4.0 and <8.6					pH: > 6.0 and < 9.0					Temperature ± 1 °C (exp 8-5-16) 2						

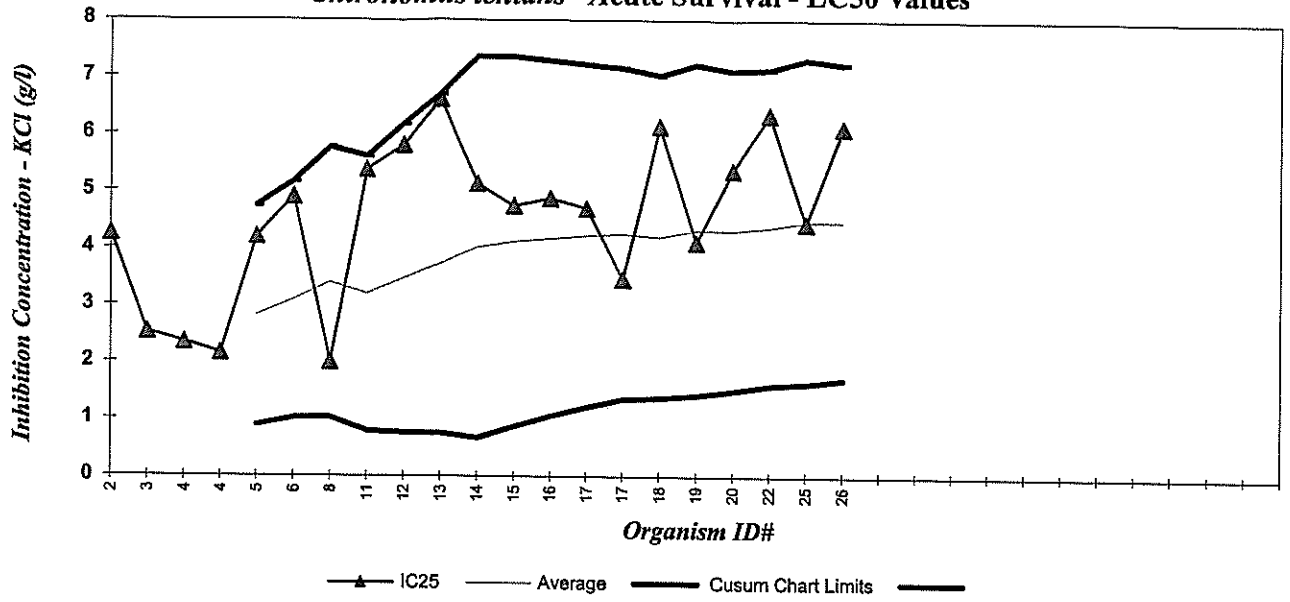
*Dilution Water Code
Recon. - reconstituted water
S - soft
MH - moderately hard
H - hard
Art. Sea - Artificial Sea Water

96 h LC50 6.12
Cusum Chart Limits 1.71 TO 7.24
Statistical Method Spearman Karber

We verify this data is true and correct.
Task Manager
Project Manager Doug Winn
QA Officer Ginger Collins

REFERENCE TOXICANT CUMLATIVE SUMMARY (CUSUM) CHART

Chironomus tentans - Acute Survival - LC50 Values



Chironomus tentans **- acute**

POTASSIUM CHLORIDE (g/L)

Endpoint: 96 hour Survival

Stats Method: Probit, Spearman-Karber, Linear Interpolation

Test Conditions: Recon MH, 25 oC

From EPA 833-R-00-003:

10th Quartile CV (*control limit*) = na

25th Quartile CV (*warning limit*) = na

75th Quartile CV (*warning limit*) = na

90th Quartile CV (*control limit*) = na

As per EPA 833-R-00-003, section B.2.1, the quartiles listed above are from just a few labs (4) and therefore not to be considered typical or representative. Cusum limits are based on ASL data only.

Event #	Chi ID #	Test Start Date	LC50	Running Average	Running SD	Cusum Chart Limits AVG-2SD	Cusum Chart Limits AVG+2SD	Intralab CV
1	2	9/10/1999	**4.24**					
2	3	10/5/1999	**2.52**					
3	4	10/12/1999	**2.34**					
4	4	10/12/1999	**2.16**					
5	5	10/20/1999	**4.20**	2.82	0.96	**0.89**	**4.74**	0.34
6	6	11/2/1999	**4.90**	3.09	1.04	**1.02**	**5.17**	0.34
7	8	7/29/2002	**2.00**	3.39	1.19	**1.02**	**5.77**	0.35
8	11	10/1/2004	**5.38**	3.19	1.20	**0.79**	**5.60**	0.38
9	12	4/26/2005	**5.80**	3.47	1.36	**0.76**	**6.18**	0.39
10	13	4/29/2005	**6.61**	3.73	1.49	**0.75**	**6.70**	0.40
11	14	5/6/2005	**5.13**	4.02	1.67	**0.67**	**7.36**	0.42
12	15	7/14/2006	**4.74**	4.12	1.62	**0.87**	**7.36**	0.39
13	16	7/20/2006	**4.87**	4.17	1.56	**1.05**	**7.28**	0.37
14	17	1/28/2011	**4.70**	4.22	1.50	**1.22**	**7.23**	0.36
15	17	1/28/2011	**3.46**	4.26	1.45	**1.36**	**7.16**	0.34
16	18	7/1/2014	**6.14**	4.20	1.41	**1.38**	**7.03**	0.34
17	19	8/19/2014	**4.11**	4.32	1.45	**1.43**	**7.22**	0.33
18	20	11/14/2014	**5.37**	4.31	1.40	**1.51**	**7.12**	0.33
19	22	7/21/2015	**6.35**	4.37	1.38	**1.60**	**7.14**	0.32
20	25	3/2/2016	**4.44**	4.47	1.42	**1.64**	**7.31**	0.32
21	26	8/22/2016	**6.12**	4.47	1.38	**1.71**	**7.24**	0.31
22								0.31

APPENDIX C

CHAIN OF CUSTODY

CH2MHILL
Applied Sciences Laboratory (ASL)

Sample Receipt Record

Batch Number: B3584A

Client/Project: Coeur Alaska / Alaska Dept. of Fish + Game

Date Received: 7/13/16 1050

Received By: RS

Were custody seals intact?			☒ Yes	☐ No ☐ N/A
Packing Material:			☒ Ice	☐ Blue Ice ☐ Box
Temp OK? (<6C) Therm ID: TH173 Exp. 7/16	4.2 °C		☐ Yes	☐ No ☐ N/A
Was a Chain of Custody (CoC) Provided?			☒ Yes	☐ No ☐ N/A
Was the CoC correctly filled out (If No, document below)			☒ Yes	☐ No ☐ N/A
Were the sample containers in good condition (not broken or leaking)?			☒ Yes	☐ No ☐ N/A
Are all samples within 36 hours of collection?			☐ Yes	☒ No ☐ N/A
Method of Shipment:	☐ Hand Delivered	☒ FedEx ☐ UPS ☐ Greyhound ☐ Other: _____		☐ N/A

Sample Exception Report (The following exceptions were noted)

Client was notified on: Client contact:

Resolution to Exception:

CH2MHILL **CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING**

Client Coeur Alaska / Alaska Dept. of Fish & Game NPDES# _____
Address 802 3rd St.
Douglas, AK 99824
Contact Person: Kate Kanouse
Phone: (907) 465-4290
E-mail: Kate.Kanouse@alaska.gov
CH2M HILL Project # / Purchase Order # _____

Composite Sample Information:
Initiated: Date _____ Time _____
Ended: Date _____ Time _____
Chilled During Collection ? Yes ___ No ✓
Dechlorinated prior to shipping ? Yes ___ No ✓

Ship Samples to:
CH2M HILL - Applied Sciences Laboratory
Attention: Bioasssay Lab
1100 NE Circle Blvd. Suite 300
Corvallis, OR 97330
Lab Phone: (541) 768-3160
Customer Service: (541) 768-3120

Analysis Required / Comments

	Sample ID	Date	Time	Sample Type: Comp.	Sample Type: Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Green Algae	Trout Acute	Sheepshead Acute	Sheepshead Chronic	Menidia Acute	Menidia Chronic	Mysid Acute	Mysid Chronic	Haz Waste	C. tentans chronic	H. azteca chronic		Concentration and/or Comments
1	East Fork Slate Creek	7/12/16	1300	X		3	-01														X	X		
2	Upper Slate Creek	7/12/16	1500	X		3	-02														X	X		

Sampled By & Title (Please sign and print name): Kate Kanouse, Habitat Biologist IV, Kate Kanouse	Date/Time: 7/12/16 1300-1500	Relinquished By (Please sign and print name): Kate Kanouse Kate Kanouse	Date/Time: 7/11/16 0800
Received By (Please sign and print name):	Date/Time:	Relinquished By (Please sign and print name):	Date/Time:
Received By (Please sign and print name):	Date/Time:	Relinquished By (Please sign and print name):	Date/Time:
Received By (Please sign and print name): Russell Southard Russell Southard	Date/Time: 7/13/16 1050	Shipped Via: UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name):	Remarks:		

B3584A

CH2MHILL **CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING**

Client Coeur Alaska / Alaska Dept. of Fish & Game NPDES# _____
Address 802 3rd St
Douglas, AK 99824

Contact Person: Kate Kanouse
Phone: (907) 465-4290
E-mail: kate.kanouse@alaska.gov

CH2M HILL Project # / Purchase Order # _____

Composite Sample Information:
Initiated: Date _____ Time _____
Ended: Date _____ Time _____
Chilled During Collection ? Yes ___ No ✓
Dechlorinated prior to shipping ? Yes ___ No ✓

Ship Samples to:
CH2M HILL - Applied Sciences Laboratory
Attention: Bioassay Lab
1100 NE Circle Blvd. Suite 300
Corvallis, OR 97330
Lab Phone: (541) 768-3160
Customer Service: (541) 768-3120

Analysis Required / Comments

	Sample ID	Date	Time	Sample Type: Comp.	Sample Type: Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Green Algae	Trout Acute	Sheepshead Acute	Sheepshead Chronic	Menidia Acute	Menidia Chronic	Mysid Acute	Mysid Chronic	Haz Waste	C. tentans Chronic	H. azteca Chronic		Concentration and/or Comments
53	Lower Sherman Creek	7/6/16	1000	X		3	-03														X	X		
54	Lower Slate Creek	7/5/16	0900	X		3	-04																	

Sampled By & Title (Please sign and print name): Kate Kanouse, Habitat Biologist IV, Kate Kanouse	Date/Time: 7/6/16 1000	Relinquished By (Please sign and print name): Kate Kanouse Kate Kanouse	Date/Time: 7/11/16 0800
Received By (Please sign and print name):	Date/Time:	Relinquished By (Please sign and print name):	Date/Time:
Received By (Please sign and print name):	Date/Time:	Relinquished By (Please sign and print name):	Date/Time:
Received By (Please sign and print name): Russell Southard	Date/Time: 7/13/16 1050	Shipped Via: UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #:
Work Authorized By (Please sign and print name):	Remarks: returned 2 unused & 1 used spare containers KK		

B3584A

Stanaway, Mike/CVO

From: Kanouse, Kate M (DFG) <kate.kanouse@alaska.gov>
Sent: Monday, August 15, 2016 8:17 PM
To: Stanaway, Mike/CVO
Subject: RE: B3610 Exceptions [EXTERNAL]

Sounds good, Mike. Thank you for letting me know.

From: Mike.Stanaway@CH2M.com [mailto:Mike.Stanaway@CH2M.com]
Sent: Thursday, August 11, 2016 1:54 PM
To: Kanouse, Kate M (DFG)
Cc: Brett.Muckey@CH2M.com
Subject: FW: B3610 Exceptions

Hi Kate,

We received the sample today. It was delivered a day late and the temperature was outside of the recommended temperature at sample receipt. ASTM recommends the temperature be below 6 C but it is not a requirement, so I think we are good to go on the testing and will just flag that sample, unless you tell us otherwise.

Thanks
Mike

Mike Stanaway
Biologist / Laboratory Project Manager
D 1 541 768 3161
M 1 503 551 1567

CH2M Applied Sciences Laboratory (ASL)
1100 NE Circle Blvd., Suite 300
Corvallis, OR 97330
USA
www.ch2m.com | LinkedIn | Twitter | Facebook

Subscribe to ASL News on the VO (My News)

From: Castro, Pierrette/CVO
Sent: Thursday, August 11, 2016 12:00 PM
To: Stanaway, Mike/CVO <Mike.Stanaway@CH2M.com>
Subject: B3610 Exceptions

Mike,

Attached is the exceptions report, along with the COC and shipping tag, for the Alaska shipment we received today.

Pierrette Castro
Laboratory Technician/Sample Receiving
D 541-768-3106

CH2M Applied Sciences Laboratory (ASL)
1100 NE Circle Blvd., Suite 300
Corvallis, OR 97330
www.ch2mlab.com

ORIGIN ID:JNUA (907) 465-4105
ADF&G
802 3RD ST

DOUGLAS, AK 99824
UNITED STATES US

SHIP DATE: 09AUG16
ACTWGT: 32.10 LB
CAD: 006994357/SSFE1704
DIMS: 24x13x14 IN

BILL THIRD PARTY

Part # 156297-435 RIT2 EXP 08/17

TO BIOASSAY LAB
CH2MHILL
1100 NE CIRCLE BLVD

CORVALLIS OR 97330
(541) 768-3120
INV:
PO: REF:
DEPT:

FedEx
Express

E

TRK# 0201 7837 8025 0675

WED - 10 AUG 10:30A
PRIORITY OVERNIGHT

XH CVOA

97330
OR-US PDX

CH2MHILL
Applied Sciences Laboratory (ASL)

Sample Receipt Record

Batch Number: _____ Date Received: _____

Client/Project: _____ Received By: _____

Were custody seals intact?	☐ Yes	☐ No	☐ N/A
Packing Material:	☐ Ice	☐ Blue Ice	☐ Box
Temp OK? (<6C) Therm ID: TH173 Exp. °C	☐ Yes	☐ No	☐ N/A
Was a Chain of Custody (CoC) Provided?	☐ Yes	☐ No	☐ N/A
Was the CoC correctly filled out (If No, document below)	☐ Yes	☐ No	☐ N/A
Were the sample containers in good condition (not broken or leaking)?	☐ Yes	☐ No	☐ N/A
Are all samples within 36 hours of collection?	☐ Yes	☐ No	☐ N/A

Method of Shipment: ☐ Hand Delivered ☐ FedEx ☐ UPS ☐ Greyhound ☐ Other: _____ ☐ N/A

Sample Exception Report (The following exceptions were noted)

Client was notified on: Client contact:

Resolution to Exception:

CH2MHILL CHAIN OF CUSTODY RECORD FOR NPDES COMPLIANCE BIOMONITORING

Client Coeur Alaska/Alaska Dept. of Fish & Game NPDES# _____

Address 802 3rd St.
Douglas, AK 99824

Contact Person: Kate Kanouse
Phone: (907) 465-4290
E-mail: Kate.Kanouse@alaska.gov

Composite Sample Information:
Initiated: Date _____ Time _____
Ended: Date _____ Time _____
Chilled During Collection ? Yes ___ No ✓
Dechlorinated prior to shipping ? Yes ___ No ✓

Ship Samples to:
CH2M HILL - Applied Sciences Laboratory
Attention: Bioasssay Lab
1100 NE Circle Blvd. Suite 300
Corvallis, OR 97330
Lab Phone: (541) 768-3160
Customer Service: (541) 768-3120

CH2M HILL Project # / Purchase Order # _____

Analysis Required / Comments

	Sample ID	Date	Time	Sample Type: Comp.	Sample Type: Grab	# of Containers	Lab ID#	Fathead Acute	Fathead Chronic	Cerio Acute	Cerio Chronic	Green Algae	Trout Acute	Sheepshead Acute	Sheepshead Chronic	Menidia Acute	Menidia Chronic	Mysid Acute	Mysid Chronic	Haz Waste	C. tentans Chronic	H. azteca Chronic		Concentration and/or Comments
~~1~~	~~Lower State Creek~~	~~7/5/16~~	~~0900~~	~~X~~		~~3~~															~~X~~	~~X~~		
~~2~~	~~Lower Johnson Creek~~	~~7/6/16~~	~~1000~~	~~X~~		~~3~~															~~X~~	~~X~~		
5	Lower Johnson Creek	8/8/16	1530	X		3	B3584-05	5													X	X		

Sampled By & Title (Please sign and print name): Kate Kanouse, Habitat Biologist IV, Kate Kanouse	~~7/5/16~~ 8/8/16	Relinquished By (Please sign and print name): Kate Kanouse Kate Kanouse	~~7/6/16~~ 8/9/16 0800
Received By (Please sign and print name):	Date/Time	Relinquished By (Please sign and print name):	Date/Time
Received By (Please sign and print name):	Date/Time	Relinquished By (Please sign and print name):	Date/Time
Received By (Please sign and print name): Tina Workman Tina Workman	Date/Time 8/11/16 11:40	Shipped Via: UPS ___ Bus ___ Fed-Ex ___ Hand ___ Other ___	Shipping #
Work Authorized By (Please sign and print name):	Remarks: 15.2C ~~B3610A~~ B3584 ROG JW 8/11/2016		

CH2MHILL
Applied Sciences Laboratory (ASL)

Sample Receipt Record

Rdc MC 9-20-16 ~~B3610A~~ B3584
Batch Number:

Date Received: 8/11/16

Client/Project: Coeur Alaska / Alaska Dept Fish & Game

Received By: TH

Were custody seals intact?			☒ Yes	☐ No ☐ N/A
Packing Material:			☐ Ice ☒ Blue Ice	☐ Box
Temp OK? (<6C) Therm ID: TH173 Exp. 10/16	15.2 °C		☐ Yes ☒ No	☐ N/A
Was a Chain of Custody (CoC) Provided?			☒ Yes	☐ No ☐ N/A
Was the CoC correctly filled out (If No, document below)			☒ Yes	☐ No ☐ N/A
Were the sample containers in good condition (not broken or leaking)?			☒ Yes	☐ No ☐ N/A
Are all samples within 36 hours of collection?			☐ Yes ☒ No	☐ N/A
Method of Shipment:	☐ Hand Delivered ☒ FedEx ☐ UPS ☐ Greyhound ☐ Other: _____			☐ N/A

Sample Exception Report (The following exceptions were noted)

1) Arrived 1 day late.

Client was notified on: Client contact:

Resolution to Exception: