

Faro Mine 2014 Aquatic Study

Report Prepared For:
Government of Yukon

Prepared By:
Minnow Environmental Inc.
Georgetown, ON

August 2016

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2014 Aquatic Study

Report Prepared for:

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Whitehorse, YT

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L7G 3M9

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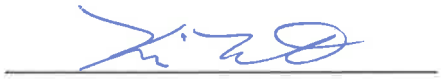
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LIST OF ACRONYMS AND ABBREVIATIONS

< – less than

≤ – less than or equal to

°C – degree Celsius

ANOVA – Analysis of Variance

BCMOE – British Columbia Ministry of the Environment

BGBM – Background Benchmark - defined as the 95th [upper] and 5th [lower] percentiles for each variable based on the pooled reference station data set

CABIN – Canadian Aquatic Biomonitoring Network

CCME – Canadian Council of Ministers of the Environment

CCREM – Canadian Council of Resource and Environment Ministers

CH2M HILL – CH2M HILL Canada Limited

CI – Control-Impact

CSQG – Canadian Sediment Quality Guidelines

CWQG – Canadian Water Quality Guidelines

DL – Detection Limit

DOC – Dissolved organic carbon

EDI – Environmental Dynamics Inc.

EPT – Ephemeroptera-Plecoptera-Trichoptera

EQuIS – Environmental Quality Information System

FMC – Faro Mine Complex

ha – hectare

km – kilometre

km^2 – square kilometre

m – metre

mg/L – milligram per litre

Minnow – Minnow Environmental Inc.

mm – millimetre

NFRC – North Fork Rose Creek

NTU – Nephelometric Tubidity Units

PEL – Probable Effect Level

RCD – Rose Creek Diversion

RCTA – Rose Creek Tailings Area

SFRC – South Fork Rose Creek

TDS – Total Dissolved Solids

TOC – Total Organic Carbon

TSS – Total suspended solids

WMEC – White Mountain Environmental Consulting

YG – Government of Yukon

1.0 INTRODUCTION

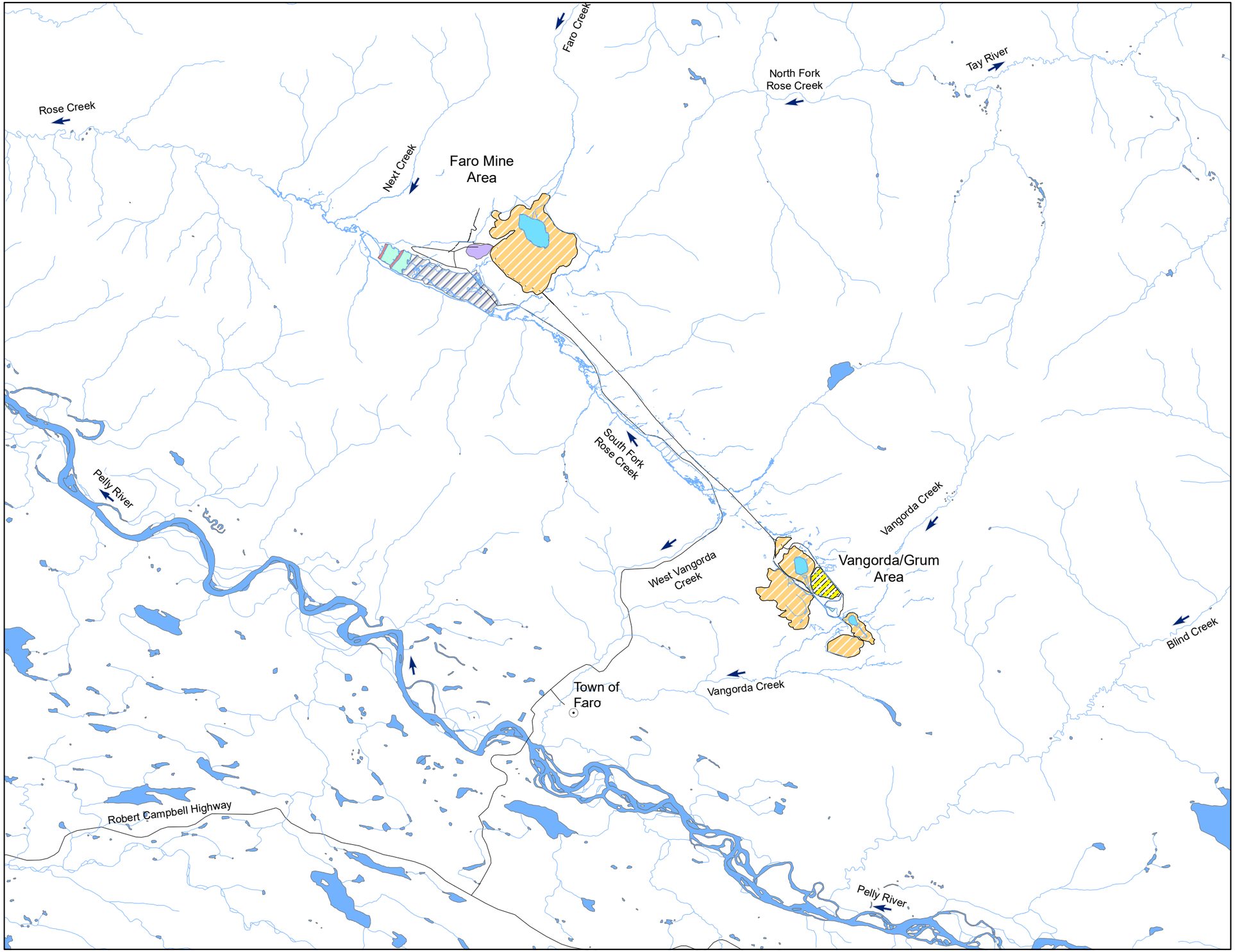
1.1 Background

The Faro Mine Complex (FMC), near Faro, Yukon, includes two areas of former mining activity: the Faro Mine and Mill (Faro Mine Area) and the Vangorda and Grum mines (Vangorda/Grum Area), which are located approximately 10 kilometres (km) apart (Figure 1.1). The FMC was formerly owned by the Anvil Range Mining Corporation, which produced lead and zinc concentrates that were extracted for lead, zinc, silver, and gold. The Faro Mine Area was mined between 1969 and 1992, while the Vangorda/Grum Area was developed and mined between 1986 and 1998. Milling continued at the Faro Mine Area until April 1998, when all operations at the FMC were terminated due to poor economic circumstances and projections, and the site went into receivership. Until early 2009, management of the mine property was under the direction of Deloitte and Touche Inc., acting as the court appointed Interim Receiver. Site Care and Maintenance responsibilities were transferred in 2009 to Government of Yukon (YG).

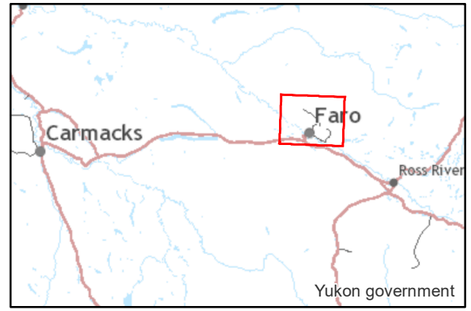
Minnow Environmental Inc. (Minnow) was retained to characterize surface water quality and the aquatic ecosystem conditions associated with the Faro Mine Area. Field work was conducted in August 2014, involving collection of water, sediment, vegetation, periphyton, benthic invertebrate, and fish samples (Table 1.1). Aquatic ecosystem conditions associated with the Vangorda/Grum Area were not characterized as part of this study.

1.2 Report Organization

Methods associated with field sampling and data analyses are described in Section 2.0. Sections 3.0 to 9.0 present the information for different aspects of the aquatic ecosystem near the FMC: habitat characteristics, water quality, sediment quality, macrophytes, periphyton, benthic invertebrates, and fish, respectively. A summary of the current aquatic conditions around the Faro Mine is presented in Section 10.0. References cited throughout the report are presented in Section 11.0.



VICINITY MAP



LEGEND

- Water Flow Direction

Mine Infrastructure:

- Open Pit
- Rock Dump
- Impoundment Area
- Overburden Dump
- Tailings Pond
- Dam
- Mill Area

* Mine Infrastructure and base data provided by CH2M Hill.

N

0 1 2 4 km

minnow environmental inc.

FIGURE 1.1

Faro Mine and Vangorda/Grum Areas

Project: 2531 Date: February 2016

Table 1.1: Sampling design and target sample numbers for the August 2014 Faro Mine Aquatic Study.

Reach	Areas	Nearest Water Quality Station(s)	Area Type[d]	Sample Type (and number of samples)																Habitat Characterization[c] and *in situ* Measurements
				Samples for Tissue Metals						Water/Sediment Chemistry/Toxicity				Biological Communities						
	Description			Forage Fish Whole Body[a] (Slimy Sculpin)	Grayling Whole Body[a,b]	Grayling Muscle Filet[a,b]	Composite Benthic Invertebrate Samples	Composite Macrophyte Samples	Composite Periphyton Samples	Water Chemistry	Sediment Metals, Non-Metals and Particle Size	Sediment Chronic Toxicity (*Hyalella* and *Chironomus*)	Early Life Stage Rainbow Trout Toxicity Test	Fish Abundance Estimate (tentative)	Fish Community Observations, fishing	Benthic Invertebrate Community (CABIN)	Benthic Invertebrate Biomass (Hess)	Periphyton Community	Chlorophyll-a and Ash-Free Dry Mass	
North Fork Rose Creek	Upstream of Faro Cr.	R7	Reference	5	3 fish, 2 samples each		3	3	3	1	5	5	1		✓	1	1	1	3	✓
	Faro Cr to Haul Road	R9, NF1	Exposed	3	3 fish, 2 samples each		3	3	3	1	5	5		1	✓	1	1	1	3	✓
	Haul Road to Access Road	NF2, X2	Exposed	3	2 fish, 2 samples each		2	2	2	1	5	5	1	1	✓	1	1	1	2	✓
	Acess Road to confluence (X3), including diversion, constructed ponds and Pumphouse Pond	X3	Exposed	3	3 fish, 2 samples each		3	3	3	3	5	5	1		✓	1	1	1	3	✓
South Fork Rose Creek	South Fork at Acess Road	Grum Corner	Minimally Exposed							1					✓	1		1		✓
	South Fork below former reservoir	R1	Minimally Exposed	3	3 fish, 2 samples each		3	3	3	1					✓	1	1	1	3	✓
Rose and Anvil Creeks	Diversion channel	X10	Exposed	3	3 fish, 2 samples each		3	3	3	3					✓	3	3	3	3	✓
	Downstream of final discharge	R2, X14	Exposed	3	3 fish, 2 samples each		3	3	3	1	5	5	1		✓	1	1	1	3	✓
	Rose Creek	R3	Exposed							1						1		1		✓
	Rose Creek	R4	Exposed							1						1		1		✓
	Anvil Creek upstream of Rose Cr.	R6	Reference							1						1		1		✓
	Anvil Creek downstream of Rose Cr.	R5	Exposed							1						1		1		✓
	Anvil Creek upstream of Pelly River	A1	Exposed							1						1		1		✓
Vangorda Creek	Vangorda Creek upstream	V1	Reference							1						1		1		✓
	West Fork Vangorda Creek upstream	VR	Reference							1						1		1		✓
Benthic reference areas (additonal areas on top of those identified above)										15						15		15		✓
Total Number of Samples				**26**	**56**		**20**	**20**	**20**	**34**	**25**	**25**	**4**	**2**	**8**	**32**	**9**	**32**	**20**	

[a] Aging structures will be collected from all sacrificed fish.

[b] To the extent feasible, samples will be collected by EDI by recapturing tagged grayling. Muscle versus whole body concentrations will be measured on the same fish.

[c] Areas in close proximity to the FMC (bolded, i.e., North Fork, South Fork, Diversion Channel) will be characterized in detail over entire reaches. Areas subject only to benthic invertebrate and periphyton sampling will only have habitat characterized for the immediate vicinity of the samples.

[d] Reference - No mine influence upstream from sampling area. Exposed - Area is located downstream from mine pits, rock dumps, mine-affected groundwater, site runoff, and/or seepages. Minimally Exposed - Area is downstream from the Haul Road and/or Access Road, but not the other disturbances associated with "exposed" stations.

2.0 METHODS

2.1 Study Area

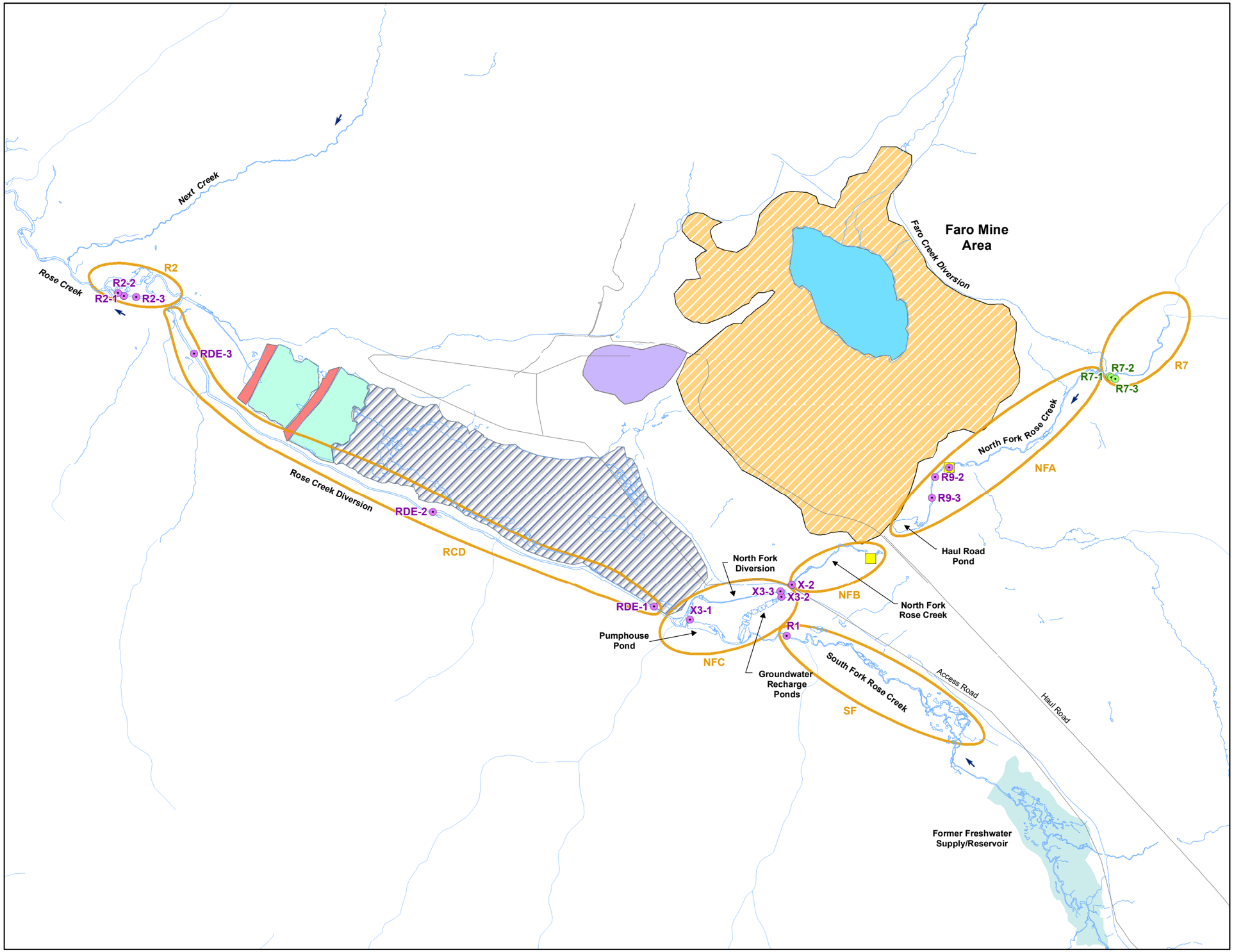
The 2014 study area included a wide range of sample locations. Water, sediment, macrophyte, periphyton, benthic invertebrate, and fish sampling occurred in the immediate vicinity of the mine (Table 1.1). Additional water, periphyton, and benthic invertebrate sampling was conducted downstream of the site in Rose and Anvil Creeks, while reference stations were located upstream of the site or in other watersheds (Table 1.1).

Near the Faro Mine, sections of Rose Creek were separated into smaller reaches, with focussed sampling occurring within each. These areas are shown on Figure 2.1, and include the North Fork of Rose Creek (NFRC) upstream from the Faro Creek Diversion (FCD) (labelled R7), the NFRC between the FCD and the Haul Road (labelled NFA), the NFRC between the Haul Road and the Access Road (labelled NFB), the NFRC between the Access Road and the Rose Creek Diversion (RCD), including the Groundwater Recharge Ponds, the Pumphouse Pond, and the North Fork Diversion (labelled NFC), the South Fork of Rose Creek (SFRC) between the former Freshwater Supply Reservoir and the confluence with the NFRC (labelled SF), the RCD (labelled RCD), and Rose Creek downstream of the Rose Creek Tailings Area (RCTA) (labelled R2).

2.2 Habitat

Stream habitats in the immediate vicinity of the Faro Mine Area were characterized in detail in August 2014 (Figure 2.1). Stream features, including widths, depths, substrate, morphology, cover, and vegetation, were recorded for pre-determined reaches to characterize habitat available for fish. Observed changes in habitat type were noted and used to define reach breaks. Habitats suitable for Arctic grayling and/or slimy sculpin spawning, rearing, foraging and overwintering were specifically noted as these are the most abundant species within Rose Creek. Other fish species are present in low densities or have not been captured recently. Also, habitat requirements of Arctic grayling and slimy sculpin generally overlap with those of other species that could be present (e.g., Chinook salmon). Additional features and areas were previously described in detail by Minnow (2014b) and historical information was incorporated into this report, as appropriate.

Pond habitat within the vicinity of the Faro Mine was also characterized as described in the previous paragraph. In addition, bathymetry of the Pumphouse Pond, Groundwater Recharge Ponds and the pond upstream of the Haul Road (the “Haul Road Pond”) was recorded using a Lowrance HDS depth sounder. A canoe was used to traverse the pond



VICINITY MAP



LEGEND

- Closed Station Electrofishing Location

Baseline Sampling Station

- Exposed
- Reference
- Sampling Areas
- Water Flow Direction

Mine Infrastructure:

- Open Pit
- Rock Dump
- Impoundment Area
- Tailings Pond
- Dam
- Mill Area

* Mine Infrastructure and base data provided by CH2M Hill.

N

0 0.25 0.5 1 km

minnow environmental inc.

FIGURE 2.1

Near Field Sampling Areas Subject to Detailed Investigation.

Project: 2531 Date: February 2016

along transects. Data were imported into Geographic Information System (GIS) software and bathymetry maps were generated for each pond. Water depths within both stream and pond habitat reflect those observed in August 2014, and would fluctuate seasonally based on flow conditions within the system.

For benthic invertebrate and periphyton community sampling, habitat was characterized using standard Canadian Aquatic Biomonitoring Network (CABIN) protocols (Environment Canada 2012a).

2.3 Water Quality

2.3.1 Routine Water Quality Monitoring

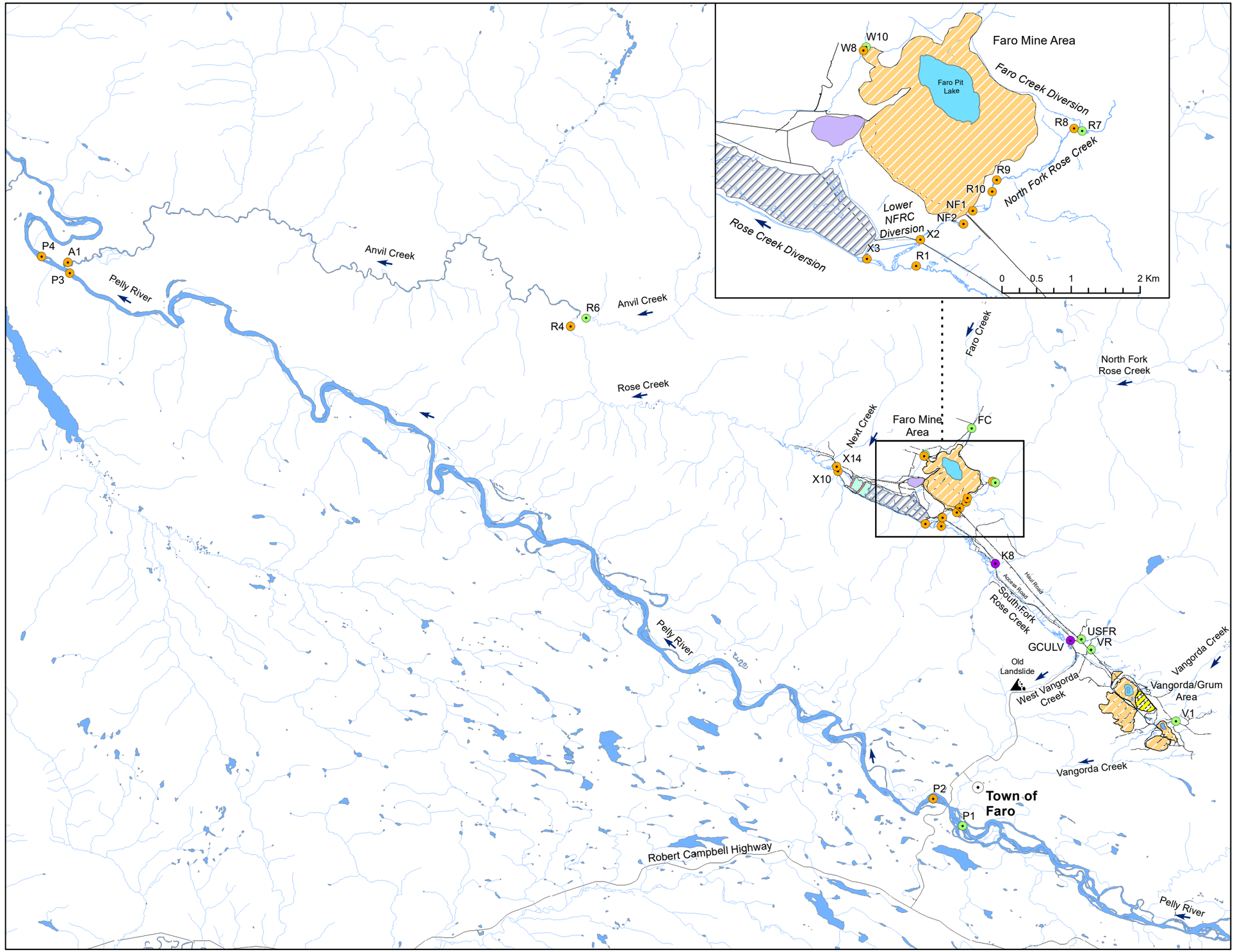
Data were provided by CH2M HILL for surface water stations and analytes requested by Minnow for the period 2010-2014, inclusive. This timeframe was selected to characterize conditions using the most recent data available, while also ensuring that the data represented a sufficient number of years to account for temporal variation.

The stations for which water data were acquired included (Figure 2.2):

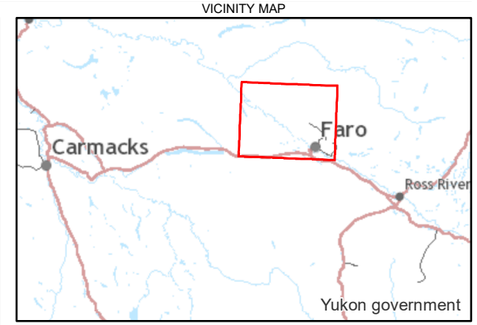
- Reference stations: W10, FC, R7, USFR, V1, VR, R6;
- Mine-exposed stations: R8, R9, R10, NF1, NF2, X2, R1, X3, X10, X14, R4, A1/R11 (same location), W8, V27, V4, VGMAIN, VW1, VW2, VW3, V5, V8;
- Pelly River stations: P1, P4; and
- First Nations traditional drinking water stations: GCULV, K8.

Data acquisition focused on analytes identified in past evaluations of surface water at the FMC to be most strongly indicative of mine-related influence on water quality (Minnow 2007, 2010) plus supporting variables that may contribute to water quality interpretation:

- Metals: cadmium, calcium, cobalt, iron, lead, magnesium, manganese, nickel, potassium, silver, sodium, strontium, uranium, zinc;
- Non-metals: alkalinity, ammonia, hardness, nitrate, sulphate, total organic carbon (TOC), dissolved organic carbon (DOC), total dissolved solids (TDS), total suspended solids (TSS), turbidity; and
- Field measurements: conductivity, pH.



VICINITY MAP



LEGEND

Sediment Station

- Mine-Exposed
- Reference
- Historical First Nations Drinking Water Location
- Landslide
- Water Flow Direction

Mine Infrastructure:

- Open Pit
- Rock Dump
- Impoundment Area
- Overburden Dump
- Tailings Pond
- Dam
- Mill Area

* Mine Infrastructure and base data provided by CH2M Hill.

N

0 1 2 4 km

minnow environmental inc.

FIGURE 2.2

Locations of Reference and Mine-Exposed Water Monitoring Stations

Project: 2531 Date: February 2016

The data were extracted from an Environmental Quality Information System (EQuIS) being managed by CH2M HILL and were emailed to Minnow by CH2M HILL on February 25, 2015. The data were received by Minnow in a Microsoft Excel spreadsheet matrix format organized by sample location and date (rows) versus analytes (columns).

2.3.2 August 2014 Water Quality

Water sampling was completed by Minnow Environmental Inc. during the August 2014 field program to support the biological sampling completed at that time. Samples were collected into containers provided by the laboratory, which were labelled with site codes, sampling date, and project number. Containers were filled directly with site water by submerging the bottle with the mouth facing upstream. Preservatives were added as required using vials provided by the lab. Samples were stored in fridges located at site prior to submission to ALS Laboratories in Whitehorse, YT. Multiple shipments of samples were sent during the field program to ensure holding time requirements were met. Field duplicate samples were collected to reflect approximately 10% of the total number of samples. Laboratory testing of samples included analysis of hardness, TSS, TDS, turbidity, alkalinity, ammonia, chloride, fluoride, nitrate, nitrite, phosphorus, sulphate, DOC, TOC, mercury and total metals.

2.3.3 Data Analyses

The routine monitoring data set was inspected for potential outliers that might confound summary statistics and data interpretation, focusing on identification of impossible or improbable values (e.g., values one or more orders of magnitude above all other values) and concentrations reported as being less than the analytical detection limit (<DL) when the detection limit was problematically high (e.g., <DL value that was above the majority of quantified results or a water quality guideline). Decisions to include or exclude values from summary statistics were made on a case-by-case basis using professional judgement, although values were generally excluded only if their retention was likely to bias results or interpretation. All values flagged as potential outliers are highlighted in raw data tables in Appendix C with footnotes indicating how each value was ultimately handled. When computing summary statistics for substances measured at both reference and exposed stations, half-DL values were used to derive means and standard deviations to minimize potential over-estimation of means. However, <DL values were used at the DL for computing the other summary statistics (e.g., minimum, median, percentiles).

2.3.3.1 Comparisons to Background Concentrations

All available data for reference stations monitored between 2010 and 2014 were pooled and used to compute summary statistics for each water quality analyte, including minimum, maximum, median, mean, standard deviation, and 5th and 95th percentiles. The 5th and 95th percentiles of the pooled reference data set were used to approximate the lower and upper range of background concentrations, respectively, for each analyte, and are referred to in this report as upper and lower "background benchmarks" (BGBM).

Data for mine-exposed areas were compared to the BGBM for each analyte to identify locations and analytes with concentrations outside of the background concentration range (i.e., indicative of mine-related influence on water quality). In most cases, the upper BGBM was used as the basis of comparison, because mine influence on water quality would usually be expected to increase concentrations relative to background levels. In the cases of pH and alkalinity, it was relevant to also consider potential decreases in concentration due to the acid-generating potential of waste rock dumps and stored tailings. In addition, potential reductions in organic carbon concentrations downstream of mining were evaluated because such occurrences could limit the mitigation capacity of the receiving environment with respect to metal effects on biota (i.e., resulting from complexation of metals with organic carbon). Therefore, for pH, alkalinity, TOC and DOC, concentrations at mine-exposed stations were compared to the lower BGBM (reference 5th percentile), as well as the upper BGBM (reference 95th percentile).

Approximately 5% of concentrations of a given analyte at any station could be expected to naturally occur above the upper BGBM (95th percentile) and 5% could naturally occur below the lower BGBM (5th percentile). However, on a station-by-station basis, some variability could be expected in the specific percentage of samples naturally falling outside of the background range. For greater certainty in identifying locations and analytes with concentrations outside of the background range, analytes having at least 10% of samples above (all analytes) or 10% below (alkalinity, pH, TOC, DOC) the background range were considered to be indicative of mine influence.

In addition to determining the percentage of samples at each station having concentrations outside of the background range, the magnitude of current mine-related influence on water quality was evaluated by computing the ratio of the median concentration of each analyte at each mine-exposed station to the background benchmark.

2.3.3.2 Comparisons to Water Quality Guidelines

For most surface water stations, observed concentrations were compared to guidelines for protection of aquatic life (Table 2.1). Canadian water quality guidelines (CWQG) were preferentially used if available (Canadian Council of Ministers of the Environment [CCME] 2016a); otherwise, an alternative federal water quality criterion was used (e.g., Environment Canada 2013a, for cobalt). In the absence of a federal guideline, a guideline from British Columbia was selected, if available (Table 2.1). An exception was that the newer British Columbia Ministry of the Environment (BCMOE) guideline (2008) for iron was used instead of the Canadian Council of Resource and Environment Ministers (CCREM) guideline (1987) because the former accounts for differences in toxicity associated with total versus dissolved iron forms.

Some water quality criteria vary on the basis of water hardness (sulphate, cadmium, copper, lead, manganese, nickel) (Table 2.2), so median hardness at each station was used to derive station-specific guidelines. This allowed for evaluation of samples for which hardness was not reported. Also, analyses were subsequently performed to verify that this approach did not result in overlooking guideline exceedances for samples with hardness less than the station median (i.e., instances where an analyte would have been flagged as exceeding the guideline, had the guideline been adjusted to the actual sample hardness rather than the median). Such instances were so rare that they had no influence on the overall patterns and interpretation of data. Water quality criteria for DOC, TOC, total suspended solids (TSS), and turbidity are expressed as a change relative to background means or medians; however, this resulted in guidelines that were well within the range of background concentrations. Therefore, concentrations at mine-exposed stations were not evaluated relative to guidelines for those substances.

The CWQG for ammonia is expressed as total ammonia and is pH and temperature dependent, however concentrations are often reported as ammonia-N. Total ammonia guideline values can be converted to ammonia-N values by multiplying the guideline value by 0.8224. Temperature and/or water pH data were not consistently reported among samples to support sample-specific calculations. Because the temperature and pH of surface waters near the FMC rarely rise above 15 degrees Celsius (°C) or 8.5, respectively, it was conservative to compare observed ammonia-N concentrations at each station to the total ammonia guideline corresponding to that temperature and pH (0.239 miligrams per litre [mg/L]), resulting in an ammonia-N guideline of 0.21 mg/L.

Exceptions to the above were stations GCULV and K8, which are locations of traditional drinking water used by local First Nations. For those stations, analyte concentrations were

Table 2.1: Water quality guidelines for protection of aquatic life that were used to evaluate surface water quality data (selected value is shaded). See Table 2.2 for site-specific adaptation of guidelines dependent on other water characteristics.

	Variable	Units	Canadian Water Quality Guidelines (for protection of aquatic life), CCME 2016a[a], unless otherwise footnoted	British Columbia Water Quality Guidelines (for protection of aquatic life), BCMOE 2006[b], 2016[c]
Non-Metals	Total Alkalinity	mg/L	-	less than 10 mg/L[c]
	Total Ammonia (as NH3-N)	mg/L	0.21 (pH and temperature dependent)	guideline expressed as total ammonia[c]
	Chloride	mg/L	120 (2011 update)	150[c]
	Fluoride (dissolved)	mg/L	0.120 (inorganic fluoride) (interim)	0.2 maximum at hardness <50 mg/L CaCO3; 0.3 maximum at hardness ≥50 mg/L CaCO3 (total fluoride)[c]
	Nitrate (as NO_3-N)	mg/L	3 (13.0 as whole ion)	3 (13.0 as whole ion)[c]
	Nitrite (as NO_2-N)	mg/L	0.06	0.02-0.2 depending on chloride concentrations[c]
	Dissolved oxygen	mg/L	9.0 or 6.5 (early or other life stages of coldwater species) 6.0 or 5.5 (early or other life stages of warmwater species)	8 or 11[c]
	Dissolved organic carbon	mg/L	-	30-day median ± 20% of the median background concentration (approved)[c]
	Total organic carbon	mg/L	-	30-day median ± 20% of the median background concentration[c]
	pH	pH units	6.5-9.0	6.5 - 9.0[c]
	Sulphate	mg/L	-	128 - 309 mg/L[c] (hardness dependent)
	Total suspended solids	mg/L	maximum average increase of 5 from background levels	mean of background plus 5 over 30 days if background is less than or equal to 25[c]
	Turbidity	NTU	maximum average increase of 2 from background levels	mean of background plus 2 over 30 days if background is ≤8 NTU[c]
Metals and Metalloids	Aluminum	mg/L	0.005 @ pH < 6.5 0.1 @ pH ≥ 6.5	0.05 (dissolved at pH ≥ 6.5)[c]
	Antimony	mg/L	-	0.02[b]
	Arsenic	mg/L	0.005	0.005[c]
	Barium	mg/L	-	1[b]
	Beryllium	mg/L	-	0.0053[b]
	Boron	mg/L	1.5 (2009 update)	1.2[c]
	Cadmium	mg/L	0.000013-0.000289 (hardness dependent)	guideline expressed as dissolved cadmium[c]
	Chromium	mg/L	0.001 (for hexavalent form) 0.0089 (for trivalent form)	0.001 (for hexavalent form)[b]
	Cobalt	mg/L	0.0025[d]	0.004[c]
	Copper	mg/L	0.001 - 0.004 (hardness dependent)	0.00004 - 0.002 (hardness dependent)[c]
	Iron	mg/L	0.3	1 (total), 0.35 (dissolved)[c]
	Lead	mg/L	0.003-0.011 (hardness dependent)	0.003 - 0.011 (hardness dependent)[c]
	Lithium	mg/L	-	0.014 (secondary chronic value) or 0.096 (final chronic value)[b]
	Manganese	mg/L	-	0.63-1.5 (hardness-dependent)[c]
	Mercury	**ug/L**	0.026 (inorganic)	0.02 (total mercury)[c]
	Molybdenum	mg/L	0.073	1[c]
	Nickel	mg/L	0.01-0.166 (hardness dependent)	0.025 - 0.15 (hardness dependent)[b]
	Potassium	mg/L	-	373[b]
	Selenium	**ug/L**	1	2[c]
	Silver	mg/L	0.00025	0.00005 - 0.0015 (hardness-dependent)[b]
	Thallium	mg/L	0.0008	0.0003[b]
	Titanium	mg/L	-	2[b]
	Uranium	mg/L	0.015	0.3[b]
	Vanadium	mg/L	-	0.006[b]
	Zinc	mg/L	0.03	0.033 - 0.115 (hardness dependent)[c]

[a] CCME (Canadian Council for Ministers of the Environment). 2016a. Canadian Water Quality Guidelines for the Protection of Aquatic Life. Accessed at http://st-ts.ccme.ca/, April 2016.

[b] BCMOE (British Columbia Ministry of the Environment). 2006. A Compendium of Working Water Quality Guidelines for British Columbia. Environmental Protection Division, Victoria, British Columbia.

[c] BCMOE (British Columbia Ministry of the Environment). 2016. British Columbia Approved Water Quality Guidelines. Environmental Protection Division, Victoria, British Columbia. Accessed at http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html, April 2016..

[d] Environment Canada. 2013a. Federal Environmental Quality Guidelines: Cobalt. February 2013.

Table 2.2: Explanation of guidelines that depend on other water characteristics.

Variable		Guideline			Comment
		Value	Units	Source	
Non-metals	Dissolved Oxygen	9.0	mg/L	CCME (2016a)[b]	The most conservative guideline of 9.0 mg/L was selected to be protective of all life stages of coldwater species.
	Total Ammonia (as NH3-N)	0.21	mg/L	CCME (2016a)[b]	The guideline depends on water pH and temperature. Toxicity is due to the un-ionized form which represents a greater proportion of the total ammonia as water pH and temperature increase. The guideline is 0.239 mg/L (whole ion) at pH 8.5 and temperature 15 oC. To convert this number to ammonia-N, a it tends to be reported by laboratories, the guideline is multiplied by 0.8824, making the guideline 0.21 mg/L (as NH3-N), which can be considered conservative because local surface water pH and temperature are usually lower than those used to select the guideline.
	Sulphate		mg/L	BCMOE (2016)[a]	Guideline depends on water hardness: 0-30 mg/L hardness = 128 mg/L, 31-75 mg/L hardness = 218 mg/L, 76-180 mg/L hardness = 309 mg/L, 181-250 mg/L hardness = 429 mg/L. Median station hardness was used for guideline selection.
Metals	Copper		mg/L	CCME (2016a)[b]	Guideline is hardness-dependent. Below 82 mg/L hardness, guideline is 0.002 mg/L; between 82 and 180 mg/L hardness, the equation $(0.2 \times e^{(0.8545[\ln(\text{hardness})]-1.465)})/1000$ is used; above 180 mg/L hardness, guideline is 0.004 mg/L. Median station hardness was used for guideline derivation.
	Cadmium		mg/L	CCME (2016a)[b]	Guideline is hardness-dependent and expressed as $(10^{0.83(\log\{\text{hardness}\})-2.46})/1000$ to an upper limit of 0.00037 mg/L for waters with hardness above 280 mg/L. Median station hardness was used for guideline derivation.
	Lead		mg/L	CCME (2016a)[b]	Guideline is hardness-dependent and expressed as $(3.31 + e^{(1.273\ln(\text{mean hardness})-4.704)})/1000$. Median station hardness was used for guideline derivation.
	Manganese		mg/L	BCMOE (2016)[a]	Guideline is hardness-dependent and expressed as (0.0044 x hardness) + 0.605. Median station hardness was used for guideline derivation.
	Nickel		mg/L	CCME (2016a)[b]	Guideline is hardness-dependent and expressed as $(e^{(0.76\ln(\text{mean hardness})+1.06)})/1000$. Median station hardness was used for guideline derivation.

[a] BCMOE (British Columbia Ministry of the Environment). 2016. British Columbia Approved Water Quality Guidelines. Environmental Protection Division, Victoria, British Columbia. Accessed at http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html, April 2016.

[b] CCME (Canadian Council for Ministers of the Environment). 2016a. Canadian Water Quality Guidelines for the Protection of Aquatic Life. Accessed at http://st-ts.ccme.ca/, April 2016.

compared to Health Canada drinking water guidelines, if available, otherwise to provincial guidelines (Table 2.3).

2.3.3.3 August 2014 Samples

Principal components analysis (PCA) was used to summarize the water quality data and thereby assist with the interpretation of general patterns in the data. The PCA defines new variables (referred to as principal components) that are linear combinations of all other variables. The principal components are defined to maximize the variability explained in the data set and each component is defined to be orthogonal (linearly independent) of the other components (McCune and Grace 2002). The first axis explains the largest amount of variation in water quality data among stations, and subsequent axes explain progressively less variation. Data were pre-screened to ensure that any analytes lacking variation (i.e., all values below the detection limit) were removed from the data matrix. PCA was conducted with PC-ORD v6.08 (McCune and Mefford 2011) using a correlation matrix of the water quality data presented in Table 4.7 and Appendix Table C.26, with the omission of water temperature.

2.3.4 Rainbow Trout Toxicity Testing

Water samples were collected from stations R7, X2, X3 and R2 to complete toxicity testing on rainbow trout embryo development during the August field survey. At each station, four 20 litre carboys were rinsed with site water three times prior filling to capacity. One water sample was also collected from each station to support interpretation of results. Water sample bottles were filled directly from the carboys, and were subsequently handled and analyzed in the same method as described above. Each carboy was stored in a cooler with ice. Samples were sent to Nautilus Environmental in Burnaby, BC by Air North Cargo to ensure samples arrived at the laboratory within 72 hours of collection.

Samples were tested according to procedures outlined by Environment Canada (1998) and Canaria et al. (1999) for the 7-day rainbow trout embryo test. Statistical analysis was completed using CETIS (Tidepool Scientific Software 2013). Toxicity test results for the samples collected were assessed relative to a control, as well as the other samples.

2.4 Sediment Quality and Toxicity Testing

Sediment samples were collected from five areas in the vicinity of the Faro Mine, including R7, Haul Road Pond, X2, Pumphouse Pond, and R2, with five samples collected from each area. The sediment samples were collected from depositional habitats located as near as

Table 2.3: Drinking water quality guidelines used to evaluate data for drinking water stations GCULV and K8 (selected value is shaded).

Variable		Units	Canadian Drinking Water Quality Guidelines, Health Canada 2010[a]	British Columbia (Drinking Water), BCMOE 2015, 2006[b,c]	Ontario Drinking Water Quality Standards, Objectives and Guidelines, OMOE 2006[d]
Non-Metals	Total Alkalinity	mg/L	-	-	30 -500 (operational guideline)
	Nitrate (as NO_3-N)	mg/L	10 (45 as whole ion)	10 (45 as whole ion)	10 (45 as whole ion) (maximum acceptable concentration)
	Dissolved organic carbon	mg/L	-	-	5 (aesthetic objective)
	Total organic carbon	mg/L	-	4 mg/L source water[c]	-
	pH	pH units	6.5-8.5 (aesthetic objective or operational guideline)	6.5 - 8.5 (aesthetic objective)[c]	6.5 - 8.5 (operational guideline)
	Sulphate	mg/L	500 (aesthetic objective or operational guideline)	500 (aesthetic objective)[c]	500 (aesthetic objective)
	Total dissolved solids	mg/L	500 (aesthetic objective or operational guideline)	500[c]	500 (aesthetic objective)
	Turbidity	NTU	0.1- 1.0 based on treatment type	mean of background plus1 if background ≤ 5; mean of background plus 5 if background ≤50; 10% of background if background >50[c]	5 (aesthetic objective)
Metals and Metalloids	Cadmium	mg/L	0.005 (maximum allowable concentration)	0.005 (maximum)[c]	0.005 (maximum acceptable concentration)
	Iron	mg/L	0.3 (aesthetic objective or operational guideline)	≤0.3 (aesthetic objective)[c]	0.3 (aesthetic objective)
	Lead	mg/L	0.01 (maximum allowable concentration)	0.01 (maximum)[c]	0.01 (maximum acceptable concentration)
	Magnesium	mg/L	-	100[c]	-
	Manganese	mg/L	0.05 (aesthetic objective or operational guideline)	≤0.05 (aesthetic objective)[c]	0.05 (aesthetic objective)
	Sodium	mg/L	200 (aesthetic objective or operational guideline)	-	200 (aesthetic objective) or 20 for individuals on sodium restricted diet
	Uranium	mg/L	0.02 (interim maximum allowable concentration)	0.02 (maximum)[c]	0.02 (maximum acceptable concentration)
	Zinc	mg/L	5 (aesthetic objective or operational guideline)	≤ 5 (aesthetic objective)[c]	5 (aesthetic objective)

[a] Health Canada. 2010. Guidelines for Canadian Drinking Water Quality

[b] BCMOE (British Columbia Ministry of the Environment). 2015. British Columbia Approved Water Quality Guidelines. Environmental Protection Division, Victoria, British Columbia. Accessed at http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html, February 2015.

[c] BCMOE (British Columbia Ministry of the Environment). 2006. A Compendium of Working Water Quality Guidelines for British Columbia. Environmental Protection Division, Victoria, British Columbia.

[d] OMOE (Ontario Ministry of the Environment). 2006. Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines. PIBS 4449e01. June 2006.

possible to the routine water monitoring locations identified by the same location code. Samples were collected using a petite ponar grab sampler. A composite sample was created by collecting the surficial three centimetres of sediment from the ponar grabs with a stainless steel spoon until sufficient volume was collected for toxicity and metal analysis requirements. Sediment was transferred into polyethylene bags for metals analysis, while sediment for toxicity testing was transferred to glass containers. Samples were stored in refrigerators prior to submission to their respective laboratories.

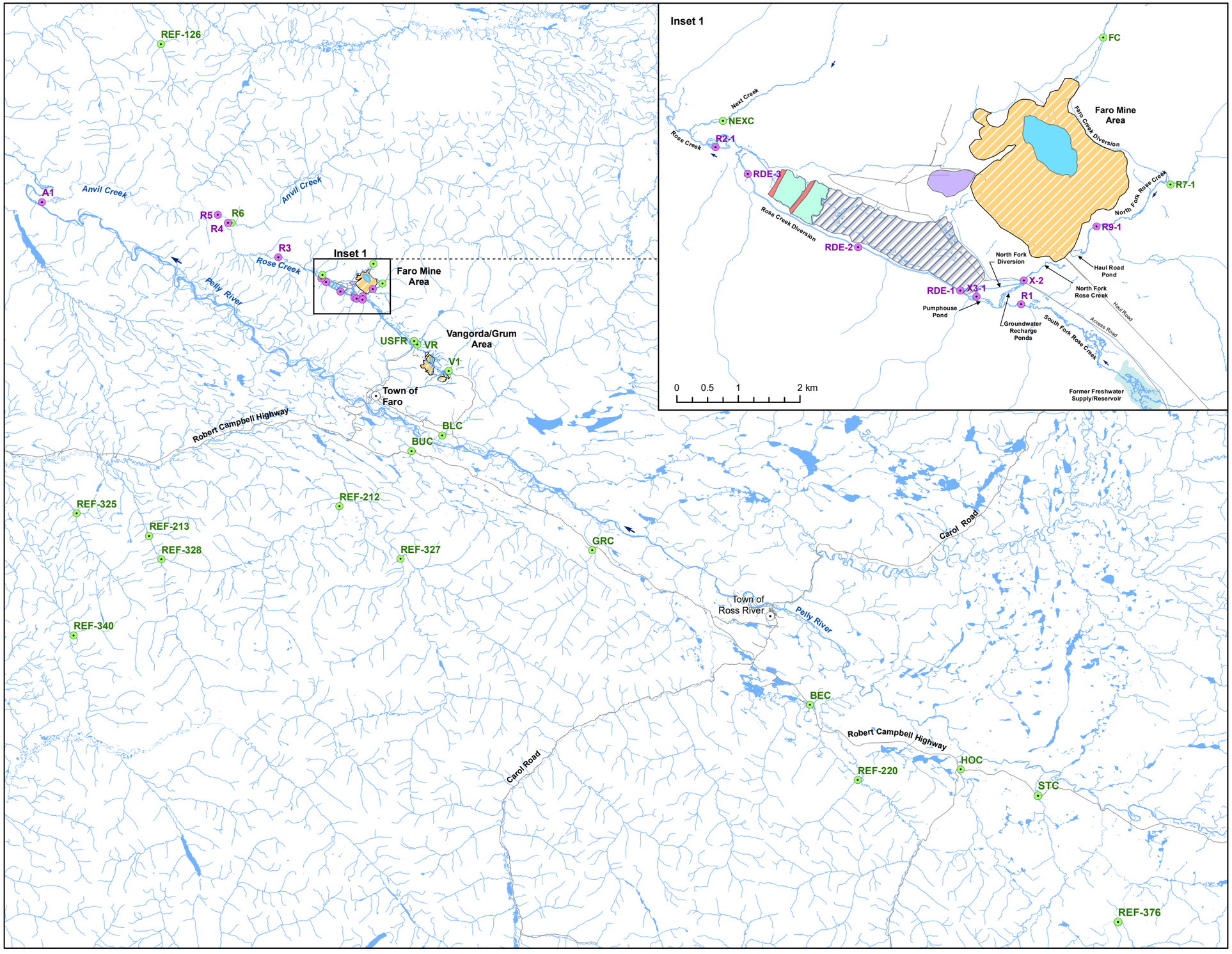
Sediment samples submitted to ALS in Whitehorse, YT were analyzed for particle size, total Kjeldhal nitrogen, total organic carbon, and total metals. Samples submitted to Nautilus Environmental in Burnaby, BC tested toxicity to benthic invertebrates *Hyalella azteca* (amphipod) and *Chironomus dilutus* (midge) using Environment Canada protocols (1997 and 2013b). Both *Hyalella* and *Chironomus* have widespread distribution and common occurrence associated with freshwater sediments, and are commonly used to evaluate potential sediment toxicity because standard test protocols are available. Metal concentrations in each area were evaluated relative to Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CSQG, CCME 2016b), British Columbia Sediment Quality Guidelines (BCSQG, BCMOE 2006), or Ontario Provincial Sediment Quality Guidelines (PSQG, OMOE 1994), which are numerical criteria that are designed to be protective of sediment-dwelling organisms based on long-term exposure. Samples collected in 2014 were also compared to whole sample data available for those locations, as available, collected in 2008 (Minnow 2009).

2.5 Macrophyte

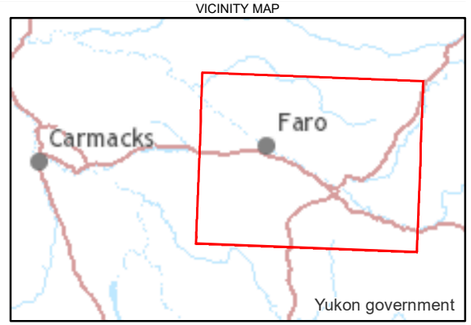
Aquatic macrophyte samples were collected from the limited areas of the Rose Creek system that supported such growth (i.e., macrophytes are typically associated with slow-flowing or stagnant habitats rather than the erosional habitats of streams around the Faro Mine). Samples were collected by hand and were transferred into labelled Whirl Pak™ bags. Vegetation type and location were recorded on field sheets. Samples were stored in a cooler bag prior to transferring to a freezer. Vegetation samples were submitted frozen to ALS in Whitehorse, YT for analysis of total metals and percent moisture in tissue.

2.6 Periphyton

Periphyton samples were collected from 17 mine-exposed areas and 22 reference areas for assessment of community characteristics and biomass (Figures 2.2 and 2.3). Ash free dry mass (AFDM), chlorophyll-a content, and tissue metal concentrations were assessed in



VICINITY MAP



LEGEND

Periphyton and Benthic Invertebrate Station

- Exposed
- Reference
- Water Flow Direction
- Open Pit
- Rock Dump
- Impoundment Area
- Tailings Pond
- Dam
- Mill Area

* Mine Infrastructure and base data provided by CH2M Hill.

N

0 2.25 4.5 9 km

minnow environmental inc.

FIGURE 2.3

Periphyton and Benthic Invertebrate Community Sampling Locations

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periphyton samples collected in the reaches studied in detail around the Faro Mine Area (Figure 2.1).

2.6.1 Substrate Selection for Sampling

Periphyton was collected in riffle areas having uniform, wetted substrate. Rocks that were selected for periphyton sampling were (to the extent possible) relatively flat, of similar texture, exposed to similar light (open canopy) and velocity conditions (0.1 – 0.2 m/s), and large enough that each required sample type could be taken from the same rock. Rocks judged to be unsuitable for sample collection included those that were too angular, covered in silt, or could not be dislodged from the river bed. Other than seeking rocks of suitable size and morphology for sampling, the rocks were selected randomly, regardless of relative periphyton abundance. Each sample represented a composite of five scrapings from five different rocks.

2.6.2 Community Sample Collection and Laboratory Analysis

Individual rocks selected for periphyton community sampling were extracted from the riverbed and brought to shore for sampling. A thin template with a 16-cm^2 opening in the middle was placed firmly on the rock, and the area within the template was scraped clean using a scalpel. The material on the scalpel was then rinsed into a small pre-labelled plastic jar. The process was repeated with four additional rocks, and all five scrapings were composited to provide a single, composite sample per station. Additional water was added to each sample, as necessary, to cover the tissue and provide adequate sample volume for preservation.

Immediately following collection of the sample, a minimum of 1 ml of Lugol's solution was added to every 250 ml of total sample volume for preservation of community samples. If the periphyton was particularly dense, extra Lugol's solution was added to darken the solution to a "weak tea" colour. The sample was mixed with the Lugol's solution by gently tipping the jar twice. The samples were maintained at room temperature until shipment to the laboratory for analysis.

Periphyton community samples were submitted to Plankton R Us in Winnipeg, MB, where samples were analyzed to the lowest practical level of taxonomy. Cell densities and biomass were determined based on the known area sampled (80 cm^2).

2.6.3 AFDM, Chlorophyll-a and Tissue Sample Collection and Analysis

Samples for analysis of AFDM and chlorophyll-a were collected in the same manner and from the same rocks as described above for community samples. The five rock scrapings comprising a single sample for AFDM were rinsed from the scalpel directly into a small pre-labelled plastic jar and stored in a cooler with ice packs until transfer to a freezer at the end of each day. The five scrapings for chlorophyll-a were wiped onto a wetted Whatman GF/F glass fibre filter (90 mm diameter, 0.7 µm average pore size), which was subsequently folded in half twice and then tightly wrapped with aluminum foil. The foil-wrapped sample was then placed in a labelled Whirl-Pak™ bag and stored in a cooler with ice packs until it could be transferred to a freezer later in the day. Periphyton tissue samples were collected by scraping the sample from the same five rocks used for the previous samples until sufficient mass was collected for laboratory analysis (approximately 1 g wet weight). The sample was transferred directly to a labelled Whirl Pak™ bag and stored in a cooler with ice packs until it could be transferred to a freezer later in the day.

At the completion of each sampling program, frozen AFDM and chlorophyll-a samples were shipped in coolers with ice to ALS Environmental in Whitehorse, YT for analysis. Analysis of AFDM followed procedures modified from America Public Health Association (APHA) method 10300 C. Total AFDM was calculated as the difference between the dried sample weight and the ash weight, both of which are determined gravimetrically. Dry weight was determined by drying the sample at 105°C, and the ash weight was subsequently determined by ashing the dried sample at 500°C. Analysis of chlorophyll-a was completed using procedures adapted from EPA Method 445.0. Chlorophyll-a was determined by routine acetone extraction followed by fluorescence detection using a non-acidification procedure (a method which is not subject to interferences from chlorophyll-b). Area-based AFDM and chlorophyll-a were then calculated by dividing the total AFDM and chlorophyll-a reported for each sample by the area that was sampled (80 cm^2).

Periphyton tissue samples were submitted to the University of Missouri Research Reactor in Columbia, Missouri, for analysis of total metals, mercury, and percent moisture. Prior to ICP-MS metals analysis, samples were freeze dried to determine moisture content.

2.6.4 Data Analysis

A modified Reference Condition Approach (Bailey et al. 2004) was utilized for both periphyton and benthic invertebrate community analyses. Reference areas were selected

based on a range of elevation (800 to 1,000 m above sea level) and stream order (3rd and 4th) that reflected the characteristics of the majority of mine-exposed areas.

Supporting Environmental Variables

A total of 104 environmental variables were quantified (Appendix Table D.6). Habitat characteristics pertaining to each sampling station and its upstream catchment area were derived using the GIS software package ArcGIS® 10.3 (ESRI 2014) and the Spatial Analyst extension. The following databases were used in derivation of GIS variables: Water Features, Bedrock Geology, Fire History and Forest Inventory obtained from GeoYukon (Geomatics Yukon 2015) and the Land Cover and Digitial Elevation Model (DEM) from GeoBase (GeoGratis 2015).

The underlying geologic nature of the study areas included eight geologic classes. Additionally, 20 land cover classes were quantified using ArcGIS and converted from total area (m^2) to a percentage of the upstream catchment area (Appendices B.6, B.7 and D.6).

Eighteen GIS variables describing aspects of the station or upstream catchment were derived using a DEM and the Water Features database (Appendix Tables B.6, B.7 and D.6). A total of 13 habitat variables were measured *in situ* following the CABIN protocol (Appendix Tables D.1, D.2 and E.6; Environment Canada 2012a).

A total of 53 water quality variables were measured. Even though the concentrations of many water quality variables often correlate with each other, all were retained for further analysis on the basis that their mode of effect, if any, on reference benthic invertebrate communities may differ (Table 4.7 and Appendix Table C.26).

Reference Community Evaluation

Analyses of periphyton community data sets began with the assessment of reference area communities to identify any outlier areas warranting exclusion from further analyses. Non-metric multidimensional scaling (NMS) was employed to help detect possible outlier reference areas and to determine the strongest environmental correlates with each data set using PC-ORD v6.08 (McCune and Mefford 2011). Rare taxa (i.e., those that occurred at only one area) were omitted from community data sets when conducting NMS analysis as they can obscure detection of community gradients (Bailey et al. 2004, McCune and Grace 2002). For each NMS, the following were reported: number of dimensions of solution, overall stress of solution, % of explained variance of the original input matrix, Monte Carlo

randomization tests to determine whether each axis results in lower stress than by chance alone ($p < 0.10$), and whether a stable solution was found (McCune and Grace 2002). All NMS used Bray-Curtis distance and were run using the "slow and thorough" settings of maximum iterations = 400, instability criterion = 0.00001, number of real runs 40, and number of randomized runs 50 (McCune and Grace 2002). Using SPSS version 12 (SPSS 2003), environmental variables (Appendix Table D.6) were indirectly correlated (Spearman r-value) against NMS ordination axis scores for each area to identify the habitat characteristics potentially having strongest influence on community structure. NMS biplots were visually inspected and areas on the periphery of the group of reference areas were evaluated further. Although reference areas showed a wide range of periphyton and habitat characteristics, no evidence-based justification was found to exclude any areas from the reference group (e.g., no evidence of distinctly different habitat or confirmation of upstream anthropogenic disturbance).

Selection of Community Endpoints

The following endpoints were calculated for each periphyton sample at the lowest practical taxonomic level (LPL): total organism density (cells/cm^2), total richness, Simpson's diversity, Simpson's evenness, dominant taxa (occuring at cell densities greater than 40% of sample: *Chamaesiphon incrustans*, *Heteroleibenia profunda*, *Homoeothrix varians*, *Achnanthes minutissima*, *Diatoma vulgare*, and *Synedra ulna*), and major algal groups (Cyanophyta - blue-green algae, Chlorophyta - green algae, Chrysophyta - golden algae, Diatoms – hard algae, and Rhodophyta - red algae). Dominant taxa and major algal groups were calculated as absolute abundance (cell/cm^2) and relative abundance (proportion, %); both data sets are presented in Appendix D but only results for absolute abundance are discussed in the text as the sampling method was quantitative and inspection of results indicated no differences between the two data sets that would affect conclusions. In addition, NMS was used to summarize overall community characteristics as "axes" following the same procedure outlined above. Simpson's diversity and evenness results were not used in detailed evaluation of mine-exposed communities because they tend to be redundant with one or more of the other community endpoints that was/were assessed (i.e., (contribute little or no unique information relative to density/abundance, taxon richness, ordination axes) (Kilgour et al. 2004).

Periphyton community endpoints for the reference areas were evaluated for normality using histogram plots (Appendix Figure D.1). Various transformations were utilized in an attempt to improve normality, including Logit, Log_e, $\text{Log}_{e(x-1)}$ and square root. If one of the transformations improved the data distribution toward normality, the transformed data set

was used for defining the reference condition; otherwise analyses were performed on the untransformed data. Results for both transformed and untransformed data sets are presented in Appendix Tables D.15 to D.20.

Statistical Evaluations

To determine if a single non-randomly chosen 'test' area is different from a set of reference areas, the most appropriate statistical approach involves one-sample, non-central, equivalence and interval tests (Kilgour et al. 1998). A critical effect size of 1.654 reference standard deviations was used to define the middle 90% of reference communities for each endpoint (alpha=0.05). The reference endpoint values associated with non-central p-values (ncP) of 0.05 and 0.95 were identified for each community endpoint (Appendix Tables D.13 and D.14) and provided the basis for determining if a mine-exposed area was different from the reference condition (i.e. outside the range of reference values). The analysis tested two null hypotheses: H_O1 – the absolute value of the reference mean minus the test site value is ≥ 1.645 reference standard deviations (equivalence test), and H_O2 – the absolute value of the reference mean minus the test value is ≤ 1.645 reference standard deviations (interval test) (Kilgour et al. 1998). This resulted in three possible outcomes: (1) a non-central p-value (ncP) < 0.05 (Interval test), indicating a community endpoint that was outside of the reference condition; (2) a ncP > 0.95 (Equivalence test), indicating a community endpoint that was within the reference condition; and (3) a ncP value between 0.05 and 0.95, which was deemed inconclusive with respect to potential difference from the reference condition (Kilgour et al. 1998).

Before evaluating mine-exposed communities, community endpoints for each reference area were statistically compared to results for the overall group of reference areas. This was done because individual reference stations may show some community endpoints that are outside of, or inconclusive with respect to the overall (group) reference condition; therefore, having an understanding of the potential for individual reference areas to differ from the reference condition provides an important basis for evaluating results for mine-exposed areas. The maximum number of community endpoints among reference areas that were statistically different (ncP < 0.05) from the overall reference group or inconclusive (ncP between 0.05 – 0.95) was identified. Mine exposed areas having fewer different or inconclusive community endpoints than observed among individual reference areas were considered unaffected by the Faro Mine. Mine-exposed areas having the same number or more community endpoints that were different from or inconclusive with respect to the reference condition were interpreted as potentially mine-affected, which prompted a designation of 'more investigation' to further evaluate data. Additionally, mine-exposed

areas were also designated for 'more investigation' if any endpoint had a value larger than the maximum value or less than the minimum value observed among reference areas. More investigation involved detailed examination of NMS ordination results and review of the scientific literature for taxa that most strongly accounted for differences in community structure among areas.

In addition, 5th and 95th percentiles were calculated for each community endpoint along with the respective upper or lower tolerance interval (alpha=0.05) for the normal distribution following methods described by the National Institute of Standards and Technology (NIST 2014). These results are analogous to the non-central tests described above in terms of characterizing the middle 90% of the reference population endpoints with 95% confidence. The data are presented in appendices to provide an alternative (and perhaps more familiar) set of statistical results for comparative purposes, but were not used in detailed evaluation of potential mine-related effects on biota.

Influence of Water Quality and other Environmental Variables

As described in section 2.3.3.3, a PCA was conducted using water quality variables of all reference and exposed areas. Pearson correlation was conducted in SPSS version 12 (SPSS 2003) to determine significant ($p < 0.05$) relationships between water quality PCA axes and the final biotic endpoints used in evaluating the potential for ecological impact.

2.7 Benthic Invertebrate Community, Biomass and Tissue

Benthic invertebrate samples for assessment of community characteristics were collected from 17 exposed areas and 22 reference areas (Figure 2.3). Additionally, benthic invertebrate biomass and tissue metal concentrations were assessed at each of the reaches studied in detail in the immediate vicinity of the Faro Mine Area (Figure 2.1).

2.7.1 Community Sampling

Benthic invertebrate sampling followed the CABIN protocol (Environment Canada 2012a), which involves a 3-minute travelling kick into a net with a triangular aperture measuring 36-cm per side and mesh having 400 µm openings. During sampling, the field technician moved across the stream channel (from bank to bank, dependant on stream depth and width) in an upstream direction. With the net being held immediately downstream of the technician's feet, the detritus and invertebrates disturbed from the substrate were passively collected in the kick-net by the stream current. After three minutes of sampling time, the sampler stopped and returned to the stream bank with the sample. The kick-net was rinsed

with water to move all debris and invertebrates into the collection cup at the bottom of the net. The collection cup was then removed so the contents could be poured into a labelled plastic jar and preserved in a 10% buffered formalin solution. A single sample was collected in each area. Consistent with the requirements of the CABIN sampling protocol, supporting information was collected concurrent with benthic sampling, including details about each sampling location, stream characteristics, and any additional samples collected (e.g., water).

2.7.2 Biomass Sampling

Benthic invertebrate biomass samples were collected using a 0.1 m^2 Hess Sampler outfitted with a 500-µm mesh collection net from the stream reaches around the Faro Mine Area (Figure 2.1). One sample representing a composite of three sub-samples (i.e., 0.3 m^2 total area) was collected to ensure that each sample was representative of the benthic invertebrate community at each area. Each sub-sample was collected by carefully inserting the base of the Hess sampler into undisturbed substrate to a depth of approximately 10 cm. All coarse material contained within the sampler was carefully washed, allowing the current to carry dislodged organisms into the collection net. After all substrate within the sampler was completely washed and all organisms rinsed into the collection net, the sampler was moved to the next sub-sample location and the above procedure was repeated. Following collection of the third sub-sample, all material and organisms retained in the collection net were carefully transferred into one-litre wide-mouth plastic jars containing external and internal area identification labels. All samples were then preserved in a 10% buffered formalin solution.

2.7.3 Tissue Sampling

Composite-taxa benthic invertebrate tissue samples were collected using a kick-net from the stream reaches around the Faro Mine Area (Figure 2.1). Collected material was transferred to a 500 µm mesh sieve pan for sorting and organisms were removed from the debris using tweezers and transferred to labelled Whirl Pak™ bags until approximately 1 g wet weight of tissue was collected. Samples were stored in cooler bags with ice packs and transferred to a freezer at the end of the day.

2.7.4 Laboratory analysis

Benthic invertebrate community samples were sent to Cordillera Consulting in Summerland, BC, for sorting and taxonomic identification. Organisms were identified to the lowest

practical level (LPL) (typically genus or species) using up-to-date taxonomic keys. Sorting requirements provided to the laboratory included that a minimum of 325 organisms be identified, and that a minimum of 5% of the sample be sorted. Following identification, representative specimens of each taxon were placed in separate vials to create a reference collection for the project. For QA/QC purposes, sorting efficiency and sub-sampling accuracy and precision were assessed for a minimum of 10% of samples (Environment Canada 2012b).

Biomass samples were also submitted to Cordillera Consulting in Summerland, BC. Samples were sorted such that a minimum of 5% of the sample had been sorted. Wet biomass of each of the dominant taxa representing up to 75% of the total biomass was measured, and the remaining taxa were listed but grouped as 'other' for weight measurement. Biomass per m^2 was then calculated based on the known area sampled (0.3 m^2).

Benthic invertebrate tissue samples were submitted to the University of Missouri Research Reactor in Columbia, Missouri for analysis of total metals, mercury, and percent moisture. Prior to ICP-MS metals analysis, samples were freeze dried to determine moisture content

2.7.4 Data Analysis

The following endpoints were calculated for each benthic invertebrate sample at the family level of taxonomy: total abundance (# per 3-minute sample), total family richness, Simpson's diversity, Simpson's evenness, and percent community composition of the following taxonomic groups; Ephemoptera, Plecoptera, Trichoptera, EPT (the sum of Ephemeroptera, Plecoptera, and Trichoptera), Chironomidae, Oligocheata, Trombidiformes, Mollusca, and NMS community Axes 1 and 2 (Appendix Tables E.10 to E.14). Organism abundance was not used for evaluation of mine-exposed communities because the CABIN (kick-net) sampling method (Environment Canada 2012a) is based on sample collection over a standardized time period rather than sampling area. Simpson's diversity and evenness were not used because they tend to be redundant (contribute little or no unique information) relative to one or more of the other community metrics that was assessed (e.g., density/abundance, taxon richness, ordination axes) (Kilgour et al. 2004). Percentage of Mollusca and Oligocheata were also not used because these organisms were not found at more than 50% of reference areas. Statistical analyses of benthic invertebrate community endpoints followed the methods presented above for periphyton communities (Section 2.6.4). Corresponding data tables and figures are presented in Appendix E

Benthic communities around the Faro Mine Area were also sampled via kick-net in studies completed in 2008 and 2010 (Minnow 2014b), allowing for temporal comparisons of family richness, and percent Ephemeroptera, Plecoptera, Chironomidae and EPT.

2.8 Fish Community and Tissue

2.8.1 Field Collection

The fish community in the vicinity of the Faro Mine was sampled using backpack electrofishing, minnow trapping and gill netting in August 2014 (Figure 2.1). Electrofishing was completed by an operator using a Smith-Root LR-24 backpack electrofisher, along with a single netter. Fish captured during electrofishing were temporarily transferred to a holding bucket. Gill nets were set for short durations (i.e., less than 7 hours) in select ponded areas near the Faro Mine, including the Pumphouse Pond, one of the Groundwater Recharge Ponds, the Haul Road Pond, and in the vicinity of the wetlands along the SFRC. Set and lift time and location (i.e., GPS coordinates) were recorded for each set. Minnow traps were also set in the Pumphouse Pond, with set and catch information collected in a similar fashion to gill netting. For each capture method, fish captured were identified, enumerated, and subjected to length and weight measurements (described below). Fish not retained for collection of age and tissue chemistry samples were released in the vicinity where they were captured.

Quantitative fish community sampling was conducted at two enclosed stations on NFRC located upstream and downstream of the Haul Road, respectively (Figure 2.1). Stop nets (3/8" mesh) were erected at the upstream and downstream ends of each station within the creek to prevent immigration or emigration from the area during sampling. An electrofishing team, consisting of the electrofisher operator and a single netter, then employed a multiple pass removal method at each station whereby one upstream and downstream electrofishing pass (or "sweep") of the enclosed reach was repeated to yield a fish removal pattern (i.e., diminishing catches) that allowed for estimation of fish density. Fish captured during each sweep were placed in aerated buckets of water. At the conclusion of each sweep, total shocking effort (electrofishing seconds) was recorded. All captured fish were identified, enumerated and retained for subsequent physiological measurements, including fork length, total length, and total body weight. In order to minimize stress and mortality, all fish were anesthetized using a dilute clove oil solution prior to measurements. Following all measurements, fish were placed into a recovery bucket and, following completion of the quantitative sampling, were subsequently returned alive to the area from which they were captured. The dimensions (length and width) of each enclosed station were measured with

a measuring tape and water depth was measured at a minimum of four transects using a meter stick. In addition, latitude and longitude co-ordinates were recorded at the upstream and downstream boundary of each station.

2.8.2 Processing

For each fish captured during both community and closed station sampling, total and fork length were measured to the nearest millimetre and total weight was measured using a Pesola™ spring scale accurate to ± 1% with measurements recorded on field sheets. A subset of fish were sacrificed for analysis of age and tissue chemistry (approximately three slimy sculpin and three Arctic grayling per reach). For Arctic grayling, scales and otoliths were removed and transferred to labelled envelopes. For slimy sculpin, whole heads were transferred to labelled Whirl Pak™ bags for subsequent otolith removal at the laboratory. For Arctic grayling, a skinless, dorsal muscle tissue sample was removed using a fillet knife and transferred to a labelled Whirl Pak™ bag. The remaining carcass was transferred to a labelled Ziploc bag. For slimy sculpin, the remaining body (minus head collected for aging) was transferred to a labelled Whirl Pak™ bag.

2.8.3 Laboratory Analysis

Muscle and carcass samples collected for tissue chemistry analysis were stored in cooler bag with ice packs and transferred later in the day to a freezer. All frozen samples were submitted on ice to ALS laboratories in Whitehorse, YT for analysis of total metals, mercury and percent moisture. Aging structures were submitted to North Shore Environmental Services in Thunder Bay, Ontario. Otoliths were prepared using a “crack and burn” method, with each otolith sample mounted on a glass slide using a mounting medium and read under a compound microscope using transmitted light. For each structure, age and edge condition were recorded along with a confidence rating for the age determination.

2.8.4 Density and Biomass Estimations

Fish community data collected from closed station electrofishing areas on the NFRC were summarized based on the estimated total fish density (N) and estimated total fish biomass (number of fish or total biomass per unit area fished), determined using Microsoft Excel based Moran-Zippin calculations (Ricker 1975). The estimated fish density and biomass were determined separately for Arctic grayling and slimy sculpin as well as for the combined total of catch or biomass.

3.0 HABITAT DESCRIPTION

3.1 Watershed Areas

The entire Rose-Anvil Creek watershed has an area of 980 square kilometres (km^2), and is a tributary to the Pelly River. By comparison, the Pelly River watershed has a total drainage area of approximately 49,000 km^2, so the Rose-Anvil Creek drainage represents approximately 2% of the total Pelly River drainage area. The Pelly River represents about 6% of the total basin area and flow to the Yukon River.

3.2 Rose and Anvil Creeks

The North Fork (NFRC) and South Fork (SFRC) comprise the upper reaches of Rose Creek and converge just upstream from the RCTA (Figures 2.1, 3.1). Several physical alterations to stream courses have occurred over time to accommodate mine features, including the Faro Creek Diversion, the North Fork Rock Drain, the lower NFRC diversion, the constructed Groundwater Recharge Ponds along the lower NFRC, the creation of the Pumphouse Pond on SFRC, the creation and removal of the freshwater reservoir on the SFRC, the RCD, and numerous road crossings (Figure 3.1); these features are described, as applicable below. Natural aquatic habitat in the vicinity of the Faro Mine Area was characterized in detail in August 2014 and is described below. Reference to stream and pond depths reflect observations recorded at that time, and would vary dependent on season and weather conditions. Supplementary details have been included and referenced, as appropriate, from past reports.

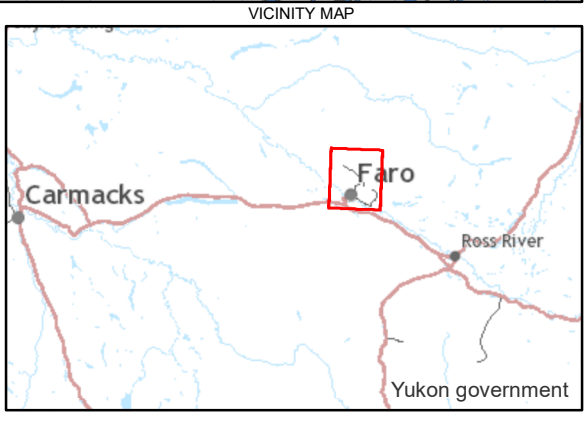
3.2.1 North Fork Rose Creek

The NFRC originates approximately 15 km to the northeast of the mine site in a wetland area that also drains east into the Tay River (WMEC 2005; Figure 3.1). From there, the creek flows southwest toward the Faro Mine through predominantly riffle habitat with boulder and cobble substrate, wetted width of 4 to 7 m, and average depth of approximately 0.7 m (up to 1.2 m deep, Table 3.1).

North of the Faro Mine Area, Faro Creek has been diverted from its original flow path so that it now flows around the northeast side of the Faro Pit and into the NFRC. Just upstream from the confluence with the Faro Creek Diversion, the NFRC channel is approximately 1.2 m deep with mainly boulder/cobble substrate, though small areas of sand are also present (Figure 3.2 Photo 1, Table 3.1). Undercut banks are prevalent within this section, which provide cover for fish (eg. Arctic grayling, slimy sculpin). Immediately downstream of the

Faro Creek
Steep Channel, Complete Barrier
North Fork Rose Creek
NFRC Headwater Ponds
Tay River
Next Creek
Faro Mine Area
Rose Creek
Steep Channel, Partial Barrier
Faro Creek Diversion
Rose Creek Diversion
Rock Drain, Complete Barrier
Culvert, Partial Barrier
Pumphouse Pond
North Fork Diversion
Constructed Groundwater Recharge Ponds
Former Freshwater Supply Reservoir
Access Road
Haul Road
Dixon Lake
South Fork Rose Creek
Culvert, Complete Barrier
Culvert, Complete Barrier
Vangorda Creek
Vangorda/Grum Area
West Vangorda Creek
Culvert, Complete Barrier
Waterfall, Complete Barrier
Vangorda Creek
Town of Faro
Pelly River

VICINITY MAP



LEGEND

- Barrier to Fish Migration
- Water Flow Direction
- Landslide

Mine Infrastructure:

- Open Pit
- Rock Dump
- Impoundment Area
- Overburden Dump
- Tailings Pond
- Dam
- Mill Area

N

0 0.5 1 2 km

minnow environmental inc.

* Mine Infrastructure and base data provided by CH2M Hill.

FIGURE 3.1
Natural and Altered Waterbodies Around the Faro Mine Complex
Project: 2531 Date: February 2016

Table 3.1: Habitat characteristics observed in August, 2014, for reaches of Rose and Anvil Creeks in the vicinity of the Faro Mine. Italicized entries represent data summarized in Minnow (2014).

Area		Length (m)	Gradient (%)	Average Wetted Width[a] (m)	Depth Range[a] (m)	Dominant Substrate
North Fork Rose Creek	Above Faro Creek	*15 km*	*0.2 - 2.0*	*7.6*	-	*Boulder/Cobble*
		246	1.42	3.0	0.7 - 1.2	Boulder
		97	0.10	4.0	1.2	Boulder/Cobble
	Faro Creek to Haul Road Pond	552	0.59	8.0	0.4	Cobble
		414	2.21	4.0	0.2 - 0.7	Boulder
		1,088	0.92	4.5	0.2 - 1.5	Cobble/Boulder
		182	0.76	7.0	0.05 - 0.6	Cobble/Gravel
	Haul Road to Access Road	615	1.50	7.0	0.1 - 1.2	Cobble/Boulder
		265	1.92	7.0	0.2 - 0.7	Boulder/Cobble
	Groundwater Recharge Ponds	104	0.96	4.3	0.1 - 0.5	Gravel/Cobble/Sand
		282	2.12	ponds and short rapids		
		157	1.28	4.1	0.15 - 0.6	Gravel/Cobble/Sand
	North Fork Diversion	644	1.92	7.7	0.1 - 0.45	Boulder/Cobble
		151	0.32	4.7	0.05 - 0.3	Gravel/Cobble/Sand
South Fork Rose Creek	*Upstream from Haul Road*	*5 km*	*4.8 - 20*	*7.7*	-	*Boulder/Cobble*
	Haul Road to former dam	*7 km*	*0.2 - 2.5*	*4.2 - 6.9*	-	*Boulder/Cobble*
	Downstream from former reservoir	490	1.69	4.0	0.4 - 0.6	Cobble
	Near ponds	630	0.02	7.0	0.5 - 1.0+	Sand
	Downstream of ponds to NFRC	1,076	0.58	6.5	0.4 - 1.0+	Boulder/Sand
		409	0.57	6.5	0.2 - 1.1	Cobble
		481	1.33	6.5 / 9.0	0.1 -0 .8	Cobble
		69	0.42	19	0.2 - 0.6	Cobble/Gravel/Sand
Rose Creek Diversion	Upstream to downstream	34	0.58	12	0.1 - 0.45	Cobble/Boulder
		36	0.55	25	1.0 - 1.5	Cobble
		117	0.09	9.9	0.15 - 0.5	Gravel/Cobble
		756	0.09	18	0.1 - 0.6	Cobble
		93	0.00	12	1.5 - 2.5	Boulder
		378	0.29	7.0	0.15 - 0.1	Cobble/Boulder
		341	0.03	12	0.1 - 1.5	Cobble
		1,990	0.19	11	0.1 - 0.8	Cobble/Boulder
		590	4.81	11	0.4 - 1.0	Boulder
		231	0.13	14	0.3 - 0.5	Cobble
		170	4.93	11	0.4 - 1.0	Boulder
		74	0.40	12	0.2 - 0.45	Cobble
		211	0.08	13	0.1 - 1.5	Gravel/Cobble
Rose Creek downstream from Faro Mine Complex		*21 km*	*0.5 - 1.5*	*15 - 25*	-	*Cobble/Gravel*
Anvil Creek downstream of Rose Creek		*43 km*	*0.7 - 1.9*	*35 - 80*	-	*Boulder/Cobble*

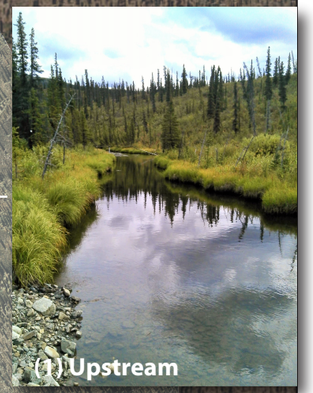
[a] Widths and depths presented reflect observations made in August 2014.





















Faro Creek Diversion

R8

R7

Rock Dump

North Fork Rose Creek

R9

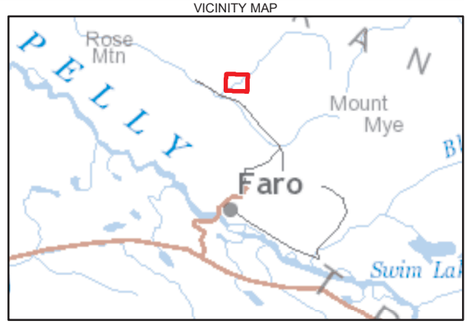
R10

NF1

North Fork Pond

Haul Road

VICINITY MAP



LEGEND

- Routine Water Monitoring Station
- Water Flow Direction

Mine Infrastructure:

- Rock Dump

Mine Infrastructure and base data provided by CH2M Hill

N

0 0.05 0.1 0.2 0.3 km

minnow environmental inc.

FIGURE 3.2

Habitat of the North Fork of Rose Creek Upstream from the Haul Road

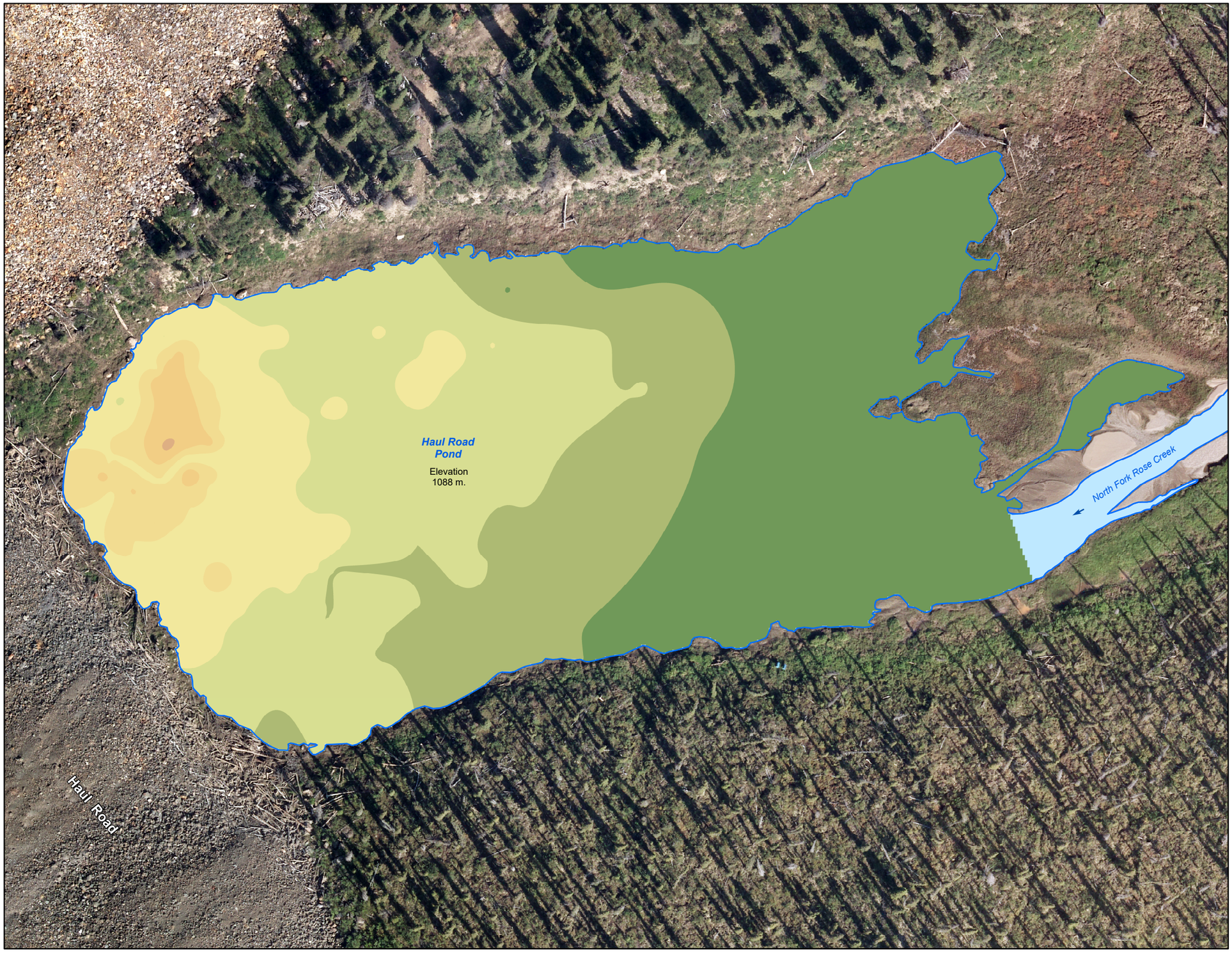
Project: 2531 Date: February 2016

Faro Creek Diversion, the NFRC is mainly riffle habitat with cobble substrate, wetted width of approximately 8 m, average depth of 0.4 m, and a gradient of 0.6% (Table 3.1, Figure 3.2 Photo 2). Approximately 450 m downstream of the Faro Creek Diversion, the channel narrows for a distance of about 330 m to widths ranging from 3 to 5 m and a gradient of 2.2% (Table 3.1, Figure 3.2 Photo 3), resulting in a series of rapids over boulder substrate.

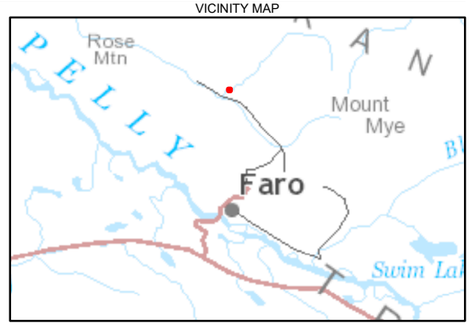
Farther downstream, NFRC flows through a stretch of approximately 1 km composed of riffle-run segments with predominantly cobble substrate and a gradient of 0.9% (Table 3.1, Figure 3.2 Photos 5 and 6). Riffles generally have wetted widths of 4 m, average depth around 0.35 m, and larger (~20-cm diameter) cobble substrate, while runs are slightly wider (5 m) and shallower (0.25 m) with smaller cobbles (~10-cm diameter). Creek bends within this reach have depths up to 1 m, and there is also one 20-m-long pooled area with depths up to 1.5 m (Figure 3.2 Photo 4). Undercut banks were prevalent through this reach, likely providing good cover for fish.

The inlet of the Haul Road Pond is a low gradient (0.75%) shallow riffle with small cobble/gravel substrate (Table 3.1, Figure 3.2 Photos 8 and 9). Wetted widths range from 6 to 10 m, and the depth is generally around 0.2 m, although outside bends are slightly deeper (0.5 m). Most of the Haul Road Pond was shallow (<0.5m) during the August 2014 survey, with limited areas having depths greater than 1 m. The maximum depth observed was 1.5 m (Figure 3.3). However, water levels increase during high flow events, such as spring freshet, when depths of 4 m have been reported (WMEC 2005). Woody debris stranded along the North Fork Rock Drain was 7 m above the observed pond elevation, possibly deposited during spring movement of surface ice against the North Fork Rock Drain.

The NFRC emerges downstream from the North Fork Rock Drain as two channels that converge 12 m farther downstream (Figure 3.4 Photos 1 to 4). The western channel is narrow (2 m) and relatively deep (1 m) with some undercut banks and silt overlying cobble and boulder substrate. The eastern channel is wedge-shaped, with 1 m depth and an undercut bank along the eastern edge, and shallow, small-cobble/gravel substrate on the western edge. Another shallow riffle is present approximately 150 m downstream from the North Fork Rock Drain (Figure 3.4 Photo 5). NFRC morphology alternates between riffle/rapids and runs for about the next 600 m downstream with an average gradient of 1.5 % and wetted widths of 6 m in the riffle/rapid segments to 8 m in the run segments (Table 3.1, Figure 3.4 Photos 7 and 8). Undercut banks provide cover for fish along some of the run habitat. Below the riffle-run series, the NFRC flows through a 260-m section of rapids



VICINITY MAP



LEGEND

- Waterbody
- Water Flow Direction

Bathymetry (m)

- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1
- 1 - 1.25
- 1.25 - 1.5
- 1.5 - 1.75

* Mine Infrastructure and base data provided by CH2M Hill.

N

0 5 10 20 m

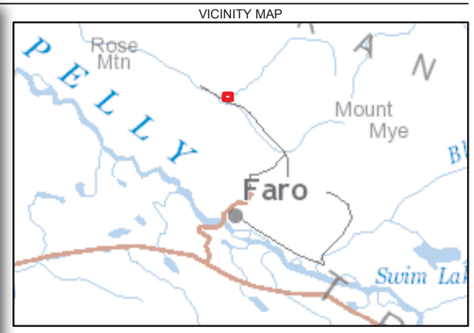
minnow environmental inc.

FIGURE 3.3

Bathymetry of the Haul Road Pond, August 2014.

Project: 2531 Date: February 2016





LEGEND

- Routine Water Monitoring Station
- Water Flow Direction

Mine Infrastructure:

- Rock Dump

Mine Infrastructure and base data provided by CH2M Hill

N

0 0.025 0.05 0.075 0.1 km

minnow environmental inc.

FIGURE 3.4

Habitat of the North Fork of Rose Creek Between the Haul Road and Access Road

Project: 2531 Date: February 2016

with a 1.9% gradient (Table 3.1, Figure 3.4 Photo 9). Typically, rapids have boulder substrate while the substrate in runs is predominantly cobble.

Downstream from the Access Road, NFRC splits into two channels that flow to separate confluences with the SFRC (Figure 3.5). Under low-flow conditions, most flow passes into the eastern-most channel and through a series of man-made ponds; however, field crews in August 2014 observed a higher proportion of flow passing through the North Fork Diversion, to the west, after a substantial rainfall event[1].

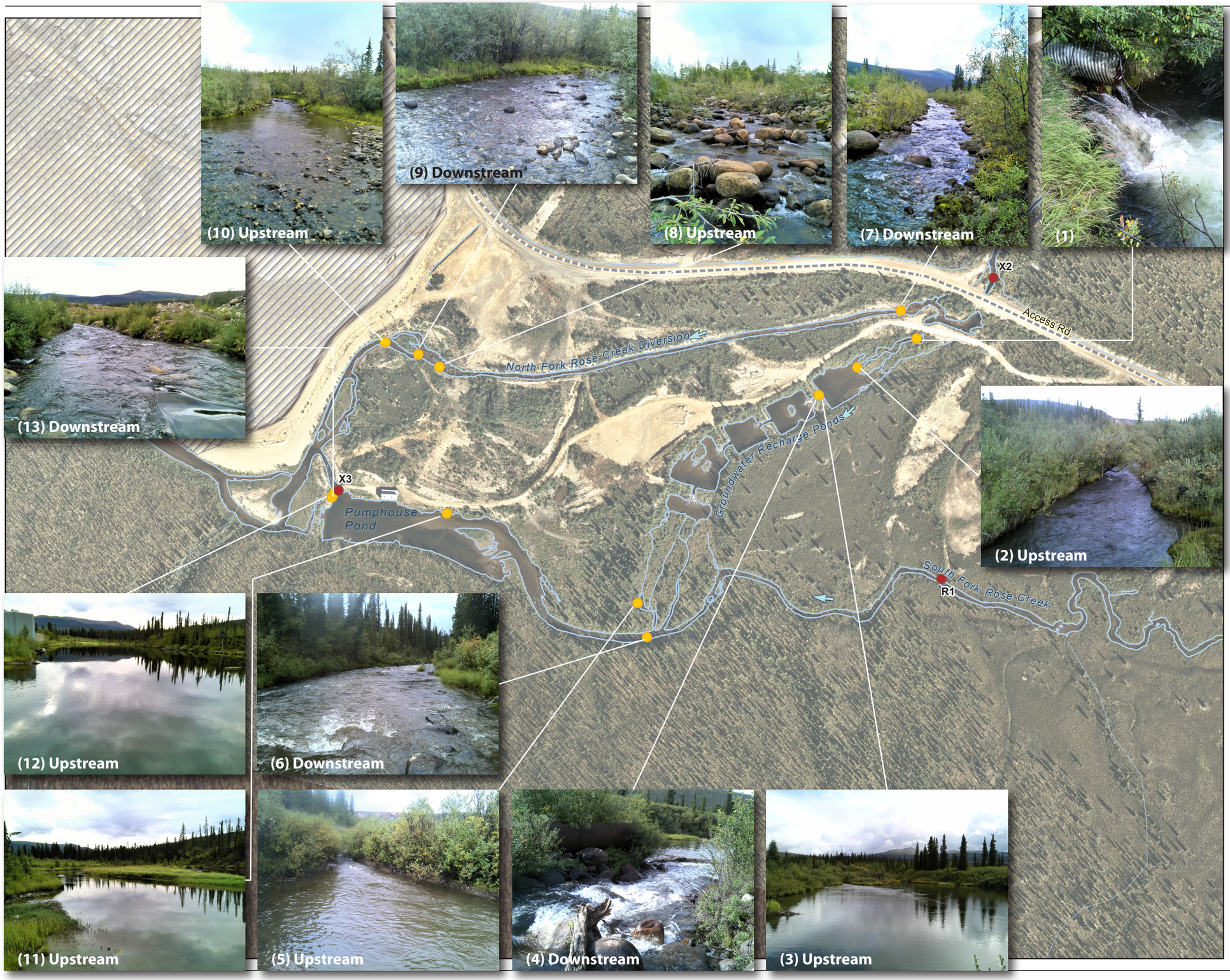
The upper length of the eastern channel has riffle habitat with cobble/gravel substrate. Wetted widths range from 4 to 5 m, and depths are generally less than 0.3 m, although some deeper areas (0.5 m) are present, and the gradient is 1% (Table 3.1, Figure 3.5 Photo 2). The five Groundwater Recharge ponds along this reach vary in size and depth (Figures 3.5 and 3.6). Although all ponds were mainly shallow (<0.75m), all but the most downstream pond had maximum depth of 1 m or more (Figure 3.6). While not abundant, aquatic vegetation (e.g., *Chara sp*. and byrophytes) was present within the ponds. The ponds are connected by short (15- to 20-m) reaches of rapids, with gradients of approximately 4% and boulder substrate (Figure 3.5 Photo 4). Downstream from the ponds, the NFRC becomes braided, flowing through numerous small channels under low riparian vegetation for approximately 160 m before meeting the SFRC (Table 3.1, Figure 3.5).

The North Fork Diversion is approximately 650 m in length, with mostly riffle habitat, boulder and cobble substrate, and a gradient of 1.9% (Table 3.1, Figure 3.5 Photo 7). Wetted width of most of the diversion is approximately 6 m. The lower 150 m of the diversion flows through braided, shallow (<0.3m) channels with gravel substrate and a gradient of 0.3% (Table 3.1, Figure 3.5 Photo 10).

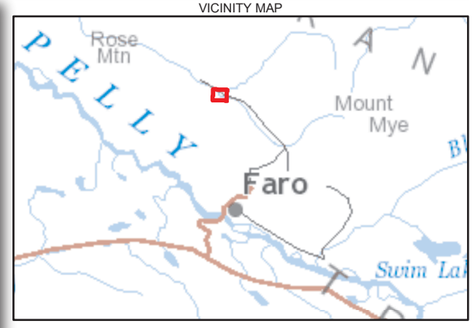
3.2.2 South Fork Rose Creek

The SFRC originates upstream of Dixon Lake between the Faro and Vangorda/Grum properties (Figure 3.1). The upper sections flow through predominantly riffle habitat with gradients ranging from 4.8 to 20% (Table 3.1). Downstream from the Access Road, the majority of the creek flows through riffle habitat with gradients of approximately 2%, though low gradient areas are present, such as an old beaver pond approximately 400 m downstream from the Access Road and also in the vicinity of the former Freshwater Supply

[1] A flow control device situated at the upstream end of the eastern channel may have been used previously to direct flow away from the eastern channel and into the North Fork Diversion. This has not been confirmed nor is it known if this device is still used for water management.



VICINITY MAP



LEGEND

- Routine Water Monitoring Station
- Water Flow Direction

Mine Infrastructure:

- Impoundment Area

Mine Infrastructure and base data provided by CH2M Hill

N

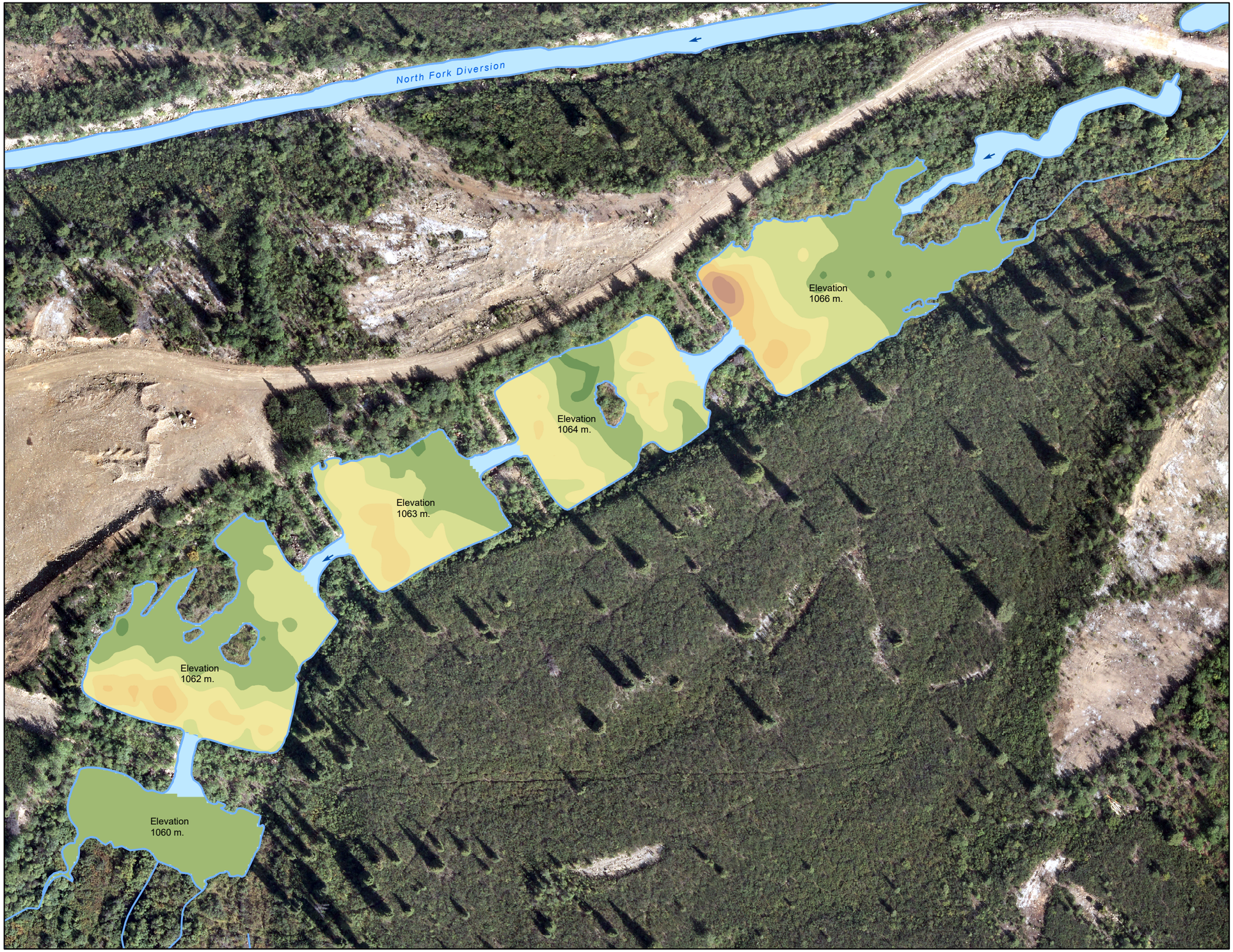
0 0.05 0.1 0.15 km

minnow environmental inc.

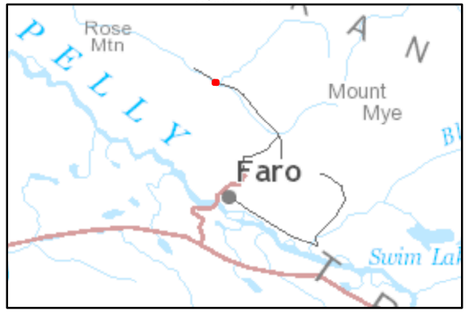
FIGURE 3.5

Habitat of the Groundwater Recharge Ponds, Pumphouse Pond and North Fork Diversion

Project: 2531 Date: February 2016



VICINITY MAP



LEGEND

- Waterbody
- Water Flow Direction

Bathymetry (m)

- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1.0
- 1.0 - 1.25
- 1.25 - 1.5
- 1.5 - 1.75
- 1.75 - 2.0

* Mine Infrastructure and base data provided by CH2M Hill.

N

0 10 20 40 m

minnow environmental inc.

FIGURE 3.6
Bathymetry of the Groundwater Recharge Ponds, August 2014.
Project: 2531 Date: February 2016

Reservoir. The reservoir dam was breached in 2003, returning the creek to its original channel, with gradient of approximately 0.2%, meandering morphology, and predominantly gravel and sand substrate. Downstream from the former dam, the SFRC flows through a 4-m-wide, continuous, cobble riffle for approximately 400 m at a gradient of 1.7% (Table 3.1, Figure 3.7 Photos 1 and 2). A large area with slow-moving flow (0.02% gradient) and sandy substrate is found downstream from this riffle, along with numerous wetland areas with abundant aquatic vegetation, some of which are connected to the main channel (Figure 3.7 Photos 3 to 6). Average summer depths within both the main channel and the wetland are approximately 0.5 m, but areas with depths greater than 1 m are common (Table 3.1).

Downstream from the pond complex, SFRC flows for approximately 1 km at a gradient of 0.6% (Table 3.1) through a series of boulder-riffle and sandy, slow-moving run segments (Figure 3.7 Photos 7 to 10). Undercut banks are common through this reach. Wetted widths range from 5 to 8 m and depths range from 0.4 m in riffle habitat to 0.6 m in run habitat, although depths greater than 1 m were present. Below this boulder-riffle/sand-run section, SFRC flows through a 350-m reach of riffle-run habitat (0.7% gradient), with predominantly cobble substrate and some sand along the margins (Figure 3.7 Photos 11 and 12). Riffle depths were approximately 0.2 m, while the run sections had depths up to 1.1 m (Table 3.1). Wetted widths in this section were between 6 and 7 m. Some undercut banks were present, providing cover for fish. Below this segment, the creek flows approximately 450 m along a continuous rapid/riffle section of similar width to upstream, with a gradient of 1.3 % and cobble and boulder substrate (Table 3.1, Figure 3.5 Photo 6). The eastern fork of the lower NFRC joins the SFRC for the last 160 m of this riffle section, widening the combined channel to approximately 9 m. For 150 m upstream from the Pumphouse Pond, the channel has run habitat with low gradient (0.4%, Table 3.1) and sand substrate, portions of which likely become deeper pools when high-flow events raise the water elevation in Pumphouse Pond.

The water depth of the Pumphouse Pond was generally less than 0.5 m, but depths of more than 1 m were recorded in several areas (Figure 3.8). Near the dam at the downstream end, a maximum depth of 2.5 m was observed. As the deeper pockets are separated by shallow areas, the connectivity may be limited by ice in winter. With the exception of the inlet, which has sandy substrate, the majority of the pond has silt substrate. Aquatic vegetation (*Chara sp.*, *Cladophora sp.*, *Potomogeton sp.*) was abundant throughout most of the pond. Water flows out of the Pumphouse Pond through a channel north of the dam (Figure 3.5 Photo 13), extending approximately 50 m through a cobble/boulder riffle until it is joined by the North Fork Diversion channel and becomes the Rose Creek Diversion.

























R1

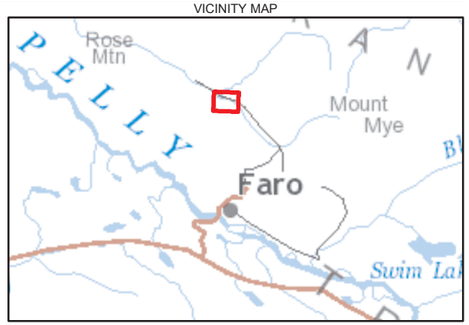
Access Road

South Fork Rose Creek

Haul Road

Former Freshwater
Supply Reservoir

VICINITY MAP



LEGEND

- Routine Water Monitoring Stations
- Former Freshwater Reservoir
- Water Flow Direction

Mine Infrastructure and base data provided by CH2M Hill

N

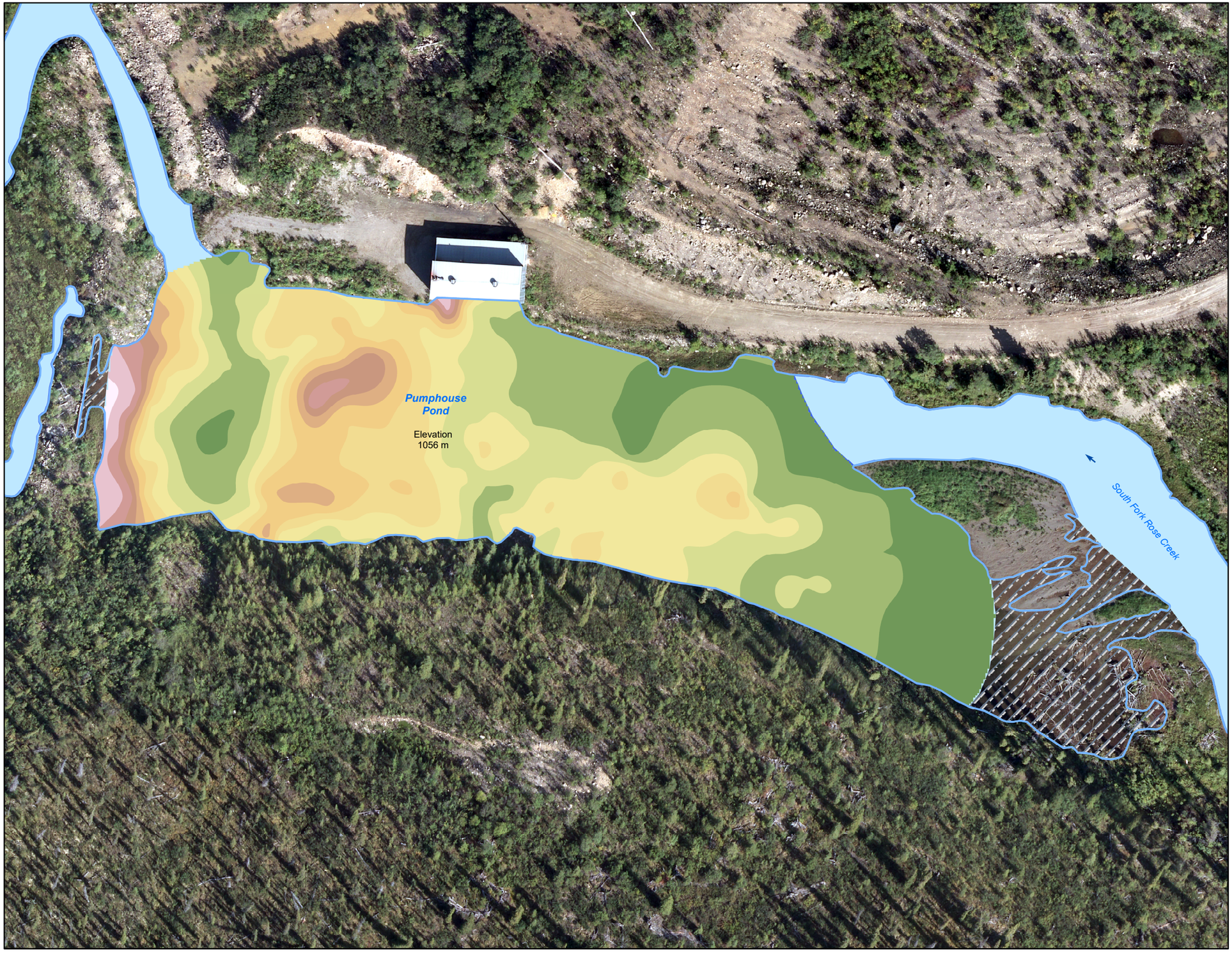
0 0.1 0.2 0.3 0.4 km

minnow environmental inc.

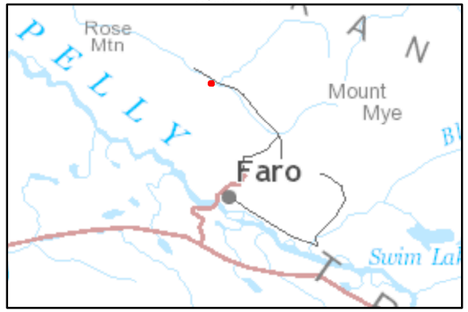
FIGURE 3.7

Habitat of the South Fork of Rose Creek, Downstream from the Former Freshwater Supply Reservoir

Project: 2531 Date: February 2016



VICINITY MAP



LEGEND

- No Water (August 2014)
- Waterbody
- Water Flow Direction

Bathymetry (m)

- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 0.75
- 0.75 - 1.0
- 1.0 - 1.25
- 1.25 - 1.5
- 1.5 - 1.75
- 1.75 - 2.0
- 2.0 - 2.25
- 2.25 - 2.5
- 2.5 - 2.75

* Mine Infrastructure and base data provided by CH2M Hill.

N

0 5 10 20 m

minnow environmental inc.

FIGURE 3.8
Bathymetry of the Pumphouse Pond, August 2014.
Project: 2531 Date: February 2016

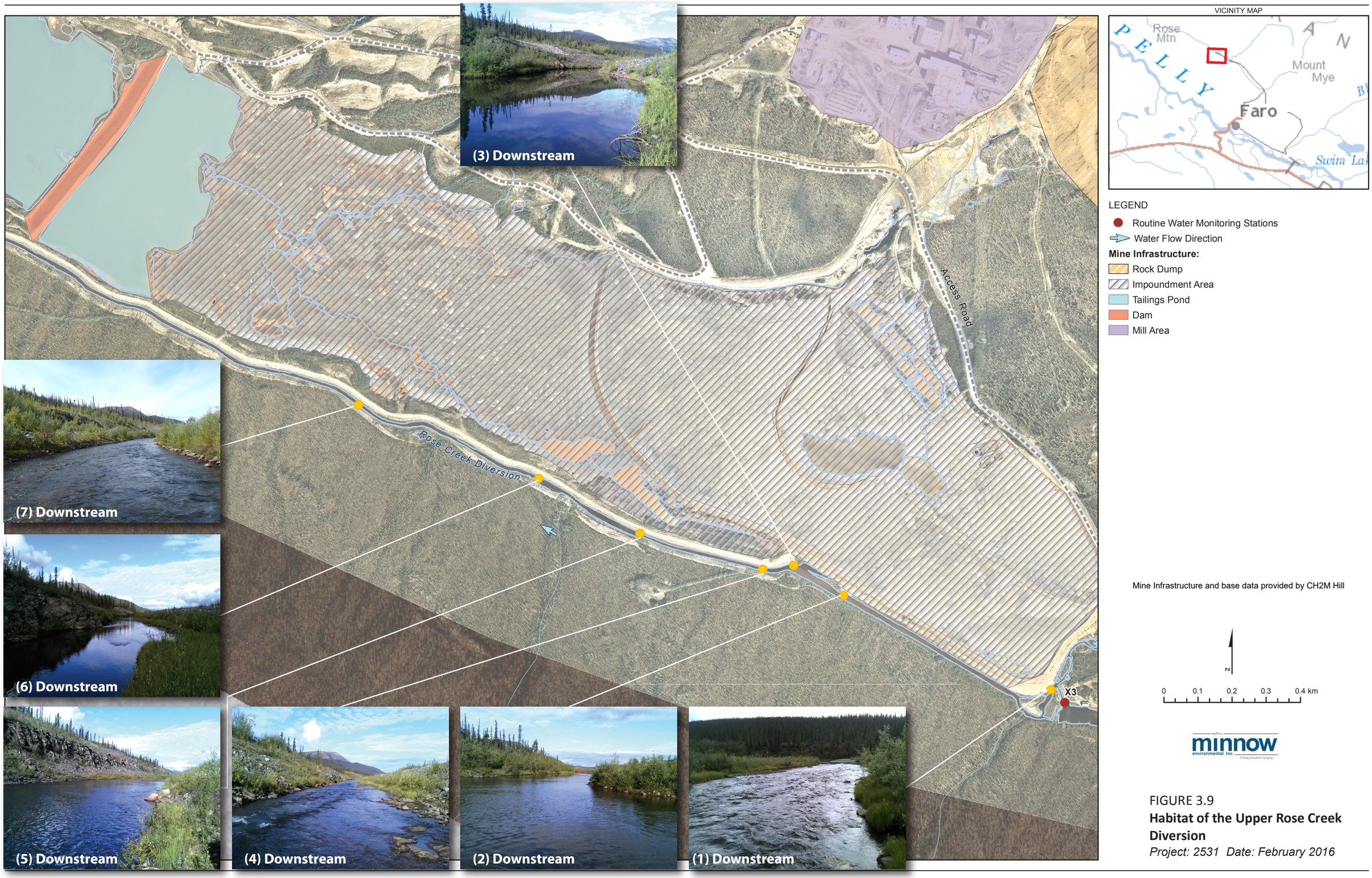
3.2.3 Rose Creek Diversion

Downstream from the confluence of the North Fork Diversion and the Pumphouse Pond outlet channel, the RCD flows through a low gradient (0.6%, Table 3.1) cobble/boulder riffle for 40 m (Figure 3.9 Photo 1) and then into a large, pooled, back-eddy area (approximately 25 m across). Most of the pool is approximately 1 m deep, but it was slightly deeper (1.5 m) in the middle. The RCD then flows along a gradual bend for 115 m with a width of approximately 10 m, average depth of 0.4 m, and a gradient of 0.1% (Table 3.1). Substrate on the inside of the bend is mostly gravel, while the outside has cobble substrate. The RCD straightens out as it flows along a 750-m run adjacent the tailings area at a 0.1% gradient (Table 3.1, Figure 3.9 Photo 2). Wetted widths range from 16 to 20 m and the average depth is approximately 0.3 m, although small areas with depths greater than 1 m are present. Sand and gravel are the predominant substrates, although overlying silt was common through the reach. Downstream from this long run is a deep pool with average depth of about 1.5 m and maximum depth of about 2.5 m (Table 3.1, Figure 3.9 Photo 3).

The RCD then flows through a series of riffles and runs, with widths of approximately 7 m, riffle depths averaging 0.5 m, run depths up to 1 m deep, and a gradient of 0.3% (Figure 3.9 Photos 4 and 5). Substrate through this reach is mostly cobble. The RCD widens to 12 m below this riffle-run series, first into a series of pooled areas (0.03% gradient) over a distance of 330 m (Figure 3.9 Photo 6), with depths from 1 to 1.5 m, and then into a 2-km-long run (0.2% gradient, Table 3.1, Figure 3.9 Photo 7). The run has average depth of 0.6 m with shallower margins (<0.2 m), a deeper mid-channel area, and predominately cobble and boulder substrate.

Downstream from this long run, the RCD flows through two, steep boulder-rapids separated by a shallow run (Figure 3.10). The average gradients of the upper and lower rapids are 4.8% and 4.9%, respectively (Table 3.1). However, the channel has been constructed as a series of step pools (each 15 to 20 m long), so gradients of individual steps are as much as 5.5% (de Graff 2013). Average depth is approximately 0.4 m, though depths between the boulders can be 1 m or greater. The run segment between the two rapids is 14 m wide, has a gradient of 0.1%, has consistent depth of approximately 0.4 m, and substrate that is a mix of cobble and gravel (Table 3.1, Figure 3.10 Photos 4 and 5)

Downstream from the rapid segments, the channel flows through an 11-m wide cobble riffle (0.4% gradient), with average depth of 0.25 m, and subsequently into a wider (15m) pooled back-eddy area (gradient 0.1%), with depths of 1 to 1.5 m and silt overlying gravel substrate (Table 3.1). The lower portion of the RCD flows through two bends with cobble substrate,



VICINITY MAP

LEGEND

- Routine Water Monitoring Stations
- Water Flow Direction

Mine Infrastructure:

- Rock Dump
- Impoundment Area
- Tailings Pond
- Dam
- Mill Area

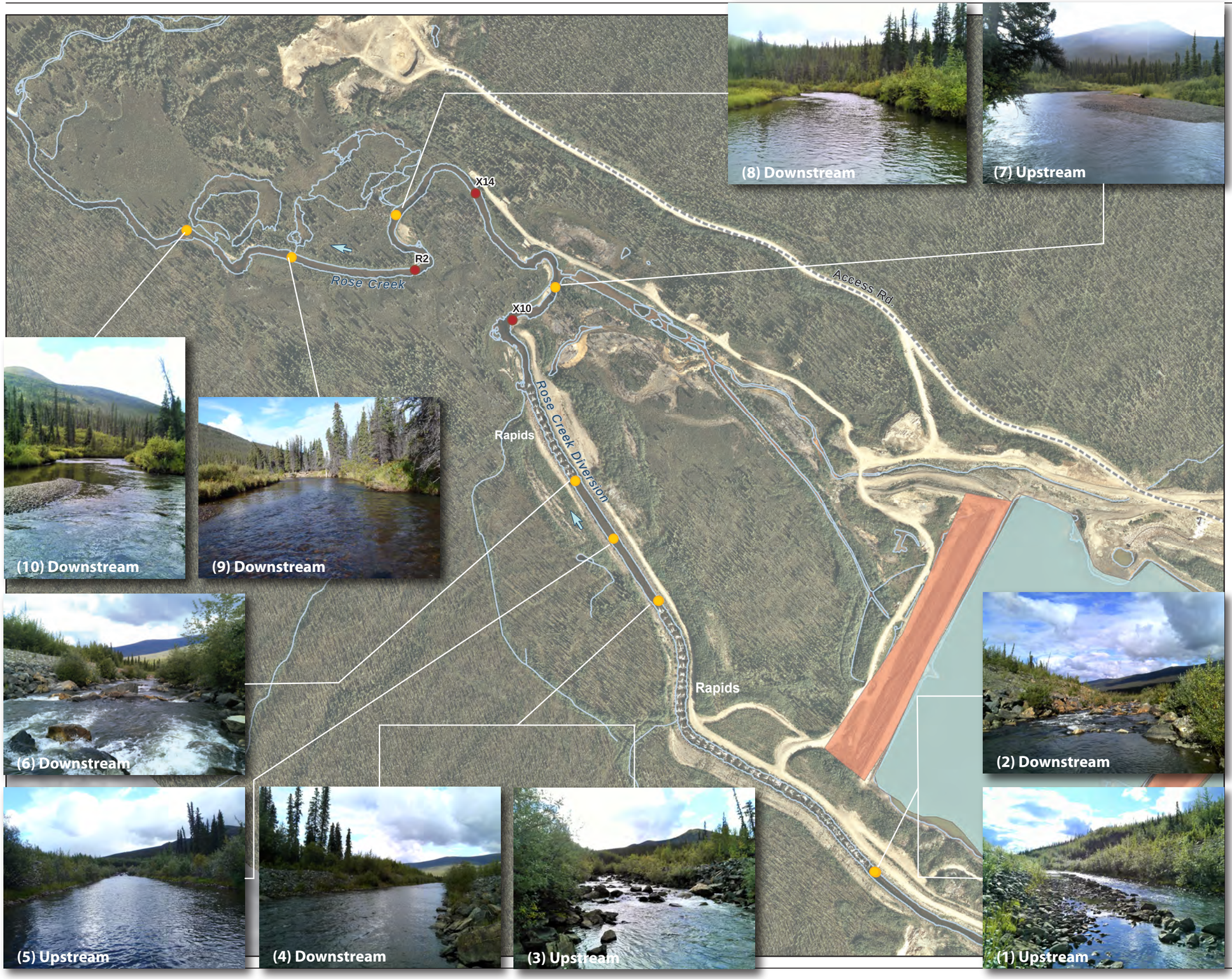
Mine Infrastructure and base data provided by CH2M Hill

N

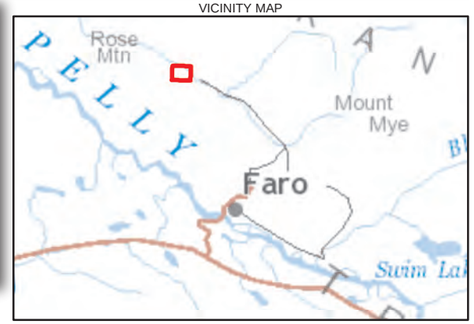
0 0.1 0.2 0.3 0.4 km

minnow environmental inc.

FIGURE 3.9
Habitat of the Upper Rose Creek Diversion
Project: 2531 Date: February 2016



VICINITY MAP



LEGEND

- Routine Water Monitoring Stations
- Water Flow Direction

Mine Infrastructure:

- Tailings Pond
- Dam

Mine Infrastructure and base data provided by CH2M Hill

N

0 0.05 0.1 0.15 0.2 0.25 km

minnow environmental inc.

FIGURE 3.10
Habitat of the Lower Rose Creek Diversion and Rose Creek downstream from the Faro Mine.
Project: 2531 Date: February 2016

outside depths of approximately 1 m, undercut banks, and some large woody debris cover (Figure 3.10 Photo 7), before joining the original Rose Creek channel downstream from the RCTA

3.2.4 Lower Rose Creek and Anvil Creek

Downstream from the Faro Mine Area, Rose Creek flows approximately 20 km (river distance) to its confluence with Anvil Creek. The substrate of this portion of Rose Creek is predominately cobble/gravel, with gradients from 0.5 to 1.5% (Table 3.1). Channel widths range from 15 to 25 m. Instream cover is provided by pools, boulders and undercut banks (WMEC 2008).

Thereafter, Rose Creek converges with Anvil Creek, which flows another 40 km (river distance) to the Pelly River, with creek width ranging from 35 to 80 m, and gradients from 0.7 to 1.9% (Table 3.1). Substrate is predominantly boulder and cobble.

4.0 WATER QUALITY

Characterization of water quality focused on substances identified in previous studies as being elevated in surface waters downstream from the FMC (Minnow 2007, 2010) or having the potential to be elevated in the future based on concentrations in sources such as pit water and waste rock seeps (Minnow 2010) (see methods in Section 2.0). Concentrations of other water quality analytes were shown to be within the range of surface water concentrations observed in local reference streams and are therefore not discussed.

Data for reference areas were compiled for relevant analytes and compared to concentrations measured at stations located downstream from mine disturbances to identify the locations, frequency, and magnitude of measurable mine-related effects on water quality (Section 4.1). Concentrations of mine-related analytes were then compared to water quality guidelines for protection of aquatic life to determine the extent to which biota may currently be affected by historical mine-related disturbances (Section 4.2).

4.1 Background Water Quality

Background water quality was characterized using data from reference stations located upstream from the FMC on Guardhouse Creek (W10), Faro Creek (FC), North Fork Rose Creek (R7), South Fork Rose Creek (USFR), West Vangorda Creek (VR), and Vangorda Creek (V1), as well as at Anvil Creek upstream from the confluence with Rose Creek (R6) (Figure 2.2). As described in Section 2.3.1, the data for all reference stations were pooled so the data set would reflect the range of water concentrations naturally occurring among streams in the area. The 5th and 95th percentiles of the pooled data set were used to define the lower and upper range of background concentrations, respectively (Table 4.1).

Summary statistics for the pooled data set indicate that reference streams tend to be slightly basic, with median pH of 7.8 (range 5.2-8.8). Water hardness is relatively low (median 51 mg/L as $CaCO_3$), but can range up to 168 mg/L for reference stations that are routinely monitored (and higher values have been observed among other regional reference streams, see Appendix Table C.26). Organic carbon content is also low (median TOC of 2.3 mg/L) and is mainly in dissolved form (i.e., dissolved and total carbon concentrations are approximately equal). Total suspended solids and turbidity also tend to be low (<1 mg/L and 0.6 Nephelometric Tubidity Units [NTU], respectively) but can range up to 85 mg/L and 14.3 NTU, respectively, with highest concentrations typically being associated with spring snow melt and/or large rain events. Metal concentrations are also variable (Table 4.1).

Table 4.1: Water quality summary statistics for pooled reference station data (V1, VR, USFR, R7, FC, R6, W10)[a], Faro Mine, Yukon.

Analyte		Units	n	Minimum	Maximum	Median	Mean [b]	Standard deviation [b]	Lower Background Benchmark (5th percentile)	Upper Background Benchmark (95th percentile)
Non-Metals	Alkalinity, Total	mg/L	150	4.4	160	43.6	56.9	40.6	10.5	134.6
	Ammonia-N	mg/L	155	<0.005	0.36	0.014	0.021	0.035	-	0.056
	Conductivity, Field	µS/cm	126	10.6	365	125.5	139	78	-	278
	Hardness, Total ($CaCO_3$)	mg/L	164	4.89	168	51.2	63.9	43.2	-	141
	Nitrate-N	mg/L	121	<0.002	0.22	0.03	0.06	0.06	-	0.19
	Organic carbon, Dissolved	mg/L	132	<0.5	30.3	2.3	4.1	5.5	0.8	14.2
	Organic carbon, Total	mg/L	139	<0.5	27.8	2.3	4.0	5.0	0.8	11.9
	pH, Field	pH units	132	5.23	8.83	7.78	7.76	0.41	7.2	8.4
	Sulfate	mg/L	162	0.3	24	8.3	8.1	4.9	-	17.8
	Total dissolved solids	mg/L	159	10	200	68	83	45	-	170
	Total suspended solids	mg/L	159	<1	85	<1	3	10	-	13
	Turbidity, Lab	NTU	106	<0.05	14.3	0.62	0.94	1.64	-	2.87
Metals	Cadmium, Total	mg/L	163	<0.000005	0.000348	0.0000100	0.0000226	0.0000441	-	0.000105
	Calcium, Total	mg/L	157	1.53	49.1	15.6	19.1	12.4	-	41.4
	Cobalt, Total	mg/L	155	0.000009	0.00204	0.0000350	0.0000845	0.000227	-	0.000193
	Iron, Total	mg/L	158	0.003	3.65	0.1115	0.19	0.43	-	0.45
	Lead, Total	mg/L	161	0.000008	0.017	0.000144	0.000570	0.00173	-	0.00204
	Magnesium, Total	mg/L	157	0.392	11.3	2.67	3.76	2.85	-	9.0
	Manganese, Total	mg/L	159	0.000118	0.212	0.00855	0.0147	0.0273	-	0.0404
	Nickel, Total	mg/L	158	0.00015	0.00614	0.00030	0.00048	0.00069	-	0.0010
	Potassium, Total	mg/L	148	0.14	2.18	0.57	0.69	0.38	-	1.31
	Sodium, Total	mg/L	156	0.55	3.55	1.9	1.90	0.65	-	3.14
	Strontium, Total	mg/L	156	0.0111	0.205	0.0728	0.0825	0.0463	-	0.175
	Uranium, Total	mg/L	155	0.000069	0.00559	0.000761	0.001034	0.000848	-	0.00254
	Zinc, Total	mg/L	157	0.00024	0.0374	0.0017	0.0033	0.0054	-	0.013

[a] Data for individual reference stations are summarized in Appendix Tables C.2 - C.8.

[b] Values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation of mean and standard deviation.

4.2 Downstream Water Quality Relative to Background Levels

Water concentrations measured in mine-exposed areas were compared to background levels. For substances having the potential to be reduced by mine-related disturbances, such as pH and organic carbon, monitoring data indicated that concentrations at mine-exposed stations are rarely below the lower (5th percentile) background benchmark (Appendix Tables C.9 to C.23); therefore, the comparisons subsequently focused on identifying locations and analytes having concentrations above the 95th percentile of background concentrations (i.e., above the upper BGBM). Analytes observed at concentrations above the corresponding BGBM in more than 10% of samples collected at one or more mine-exposed stations are shown in Table 4.2. All substances previously identified as having concentrations that were elevated relative to background levels (Minnow 2010) continued to be elevated in more than 10% of samples collected at one or more stations downstream of mine disturbances in 2010 to 2014, inclusive, with the exception of DOC, TOC and pH, which had insufficient data (Table 4.2).

Table 4.3 presents the median concentrations measured at mine-exposed stations compared to the median and upper range of background concentrations, with shading used to highlight locations and analytes having median concentrations above the BGBM. Median concentrations of most analytes are above background levels at most stations in the Rose-Anvil Creek system upstream from X14; however, concentrations at X14 are often more than double those observed at upstream stations. Elevated median hardness, sulphate, cobalt, manganese, nickel, and potassium concentrations persist to A1, at the mouth of Anvil Creek (Table 4.3).[2]

For most variables, the ratio of the station median to the upper BGBM is less than three (Table 4.4), indicating a relatively modest magnitude of mine-related influence on water quality relative to background concentrations.

4.3 Comparisons to Water Quality Guidelines

Water quality data from mine-exposed stations in the Rose-Anvil drainage was also compared to water quality guidelines for protection of aquatic life. The percent of samples at each station having concentrations above the respective guidelines is shown in Table 4.5, to indicate frequencies of guideline exceedances. The ratio of the median concentration to

[2] Although median turbidity is also elevated above background levels at A1, relatively lower concentrations at stations closer to the FMC indicate that there is a source of suspended solids between X14 and A1 that is not mine-related.

Table 4.2: Analytes with concentrations above the corresponding upper background benchmark (95th percentile of reference data) in more than 10% of samples[a] at mine-exposed stations, 2010 - 2014. Blank cells represent variables for which <10% of samples were elevated relative to the upper background benchmark.

Analyte		Percent of Samples > Background Benchmark									
		NFRC upstream from Haul Road			NFRC downstream from Haul Road		SFRC	Pumphouse Pond Outlet	Rose Creek Diversion	Rose Creek downstream of RCTA	Anvil Creek at Pelly River
		R8	R9	R10	NF2	X2	R1	X3	X10	X14	A1
Non-metals	Alkalinity, Total		11%	11%	15%	16%	10%	12%	19%	31%	27%
	Ammonia-N						22%	18%		65%	
	Conductivity, Field	11%	18%	23%	25%	24%		29%	30%	82%	
	Hardness, Total (CaCO3)	10%	24%	24%	26%	30%	30%	36%	38%	78%	60%
	Nitrate-N		36%	37%	56%	42%		38%	38%	13%	25%
	Organic carbon, Dissolved						ID				ID
	Organic carbon, Total						ID				ID
	pH, Field										ID
	Sulfate		33%	39%	55%	51%	50%	62%	68%	98%	83%
	Total dissolved solids			16%	24%	23%	ID	26%	33%	82%	50%
	Total suspended solids						30%				50%
	Turbidity, Lab					11%	ID			34%	ID
Metals	Cadmium, Total				23%	24%	ID	12%	10%	18%	17%
	Calcium, Total	11%	26%	18%	19%	28%	ID	37%	36%	77%	50%
	Cobalt, Total				47%	64%	ID	24%	28%	100%	58%
	Iron, Total					10%	ID		13%	45%	55%
	Lead, Total				18%	26%	30%			13%	18%
	Magnesium, Total		14%	14%	28%	41%		35%	47%	81%	58%
	Manganese, Total				49%	66%	ID	64%	40%	100%	67%
	Nickel, Total				36%	39%	30%	21%	24%	100%	58%
	Potassium, Total				12%	16%	ID	15%	11%	58%	60%
	Sodium, Total	14%	13%	19%	24%	28%		29%		71%	20%
	Strontium, Total	13%	26%	25%	33%	33%	40%	43%	45%	69%	10%
	Uranium, Total	11%	20%	17%	22%	19%	ID	24%	28%	31%	
	Zinc, Total			13%	67%	74%	30%	60%	91%	96%	25%

ID - insufficient data (n<10 samples)

[a] And station median was above background median.

Table 4.3: Median analyte concentrations at mine-exposed stations compared to the upper background benchmark (2010-2014). Shaded values indicate median concentration was greater than the upper background benchmark (95th percentile of reference stations).

	Analyte	Units	Reference		NFRC upstream from Haul Road			NFRC downstream from Haul Road		SFRC	Pumphouse Pond Outlet	Rose Creek Diversion	Rose Creek downstream of RCTA	Anvil Creek at Pelly River
			Median	95th Percentile	R8	R9	R10	NF2	X2	R1	X3	X10	X14	A1
Non-metals	Alkalinity, Total	mg/L	43.6	134.6	96	103	100	99	97	90	103	113	99	114
	Ammonia-N	mg/L	0.014	0.056	0.018	0.020	0.018	0.017	0.018	0.041[a]	0.023	0.021	0.071	0.008
	Conductivity, Field	µS/cm	126	278	181	211	208	220	208	162	230	228	463	208[a]
	Hardness, Total (CaCO3)	mg/L	51.2	141	102	115	112	116	106	89	117	135	230	146
	Nitrate-N	mg/L	0.03	0.19	0.09	0.14	0.14	0.20	0.15	0.05	0.16	0.16	0.05	0.06
	Organic carbon, Dissolved	mg/L	2.3	14.2	2.0	2.0	2.1	2.0	2.1	5.0[a]	2.3	2.2	2.7	6.1[a]
	Organic carbon, Total	mg/L	2.3	11.9	2.35	2.18	2.40	2.2	2.2	5.97[a]	2.5	2.44	2.9	6.39[a]
	pH, Field	pH units	7.78	8.4	7.7	7.8	7.7	7.5	7.5	7.9[a]	7.6	7.7	7.7	8.2[a]
	Sulfate	mg/L	8.3	17.8	8.9	14.7	15.3	18.9	18.9	18.7	23.1	25.3	139.0	40.5
	Total dissolved solids	mg/L	68	170	116	130	134	140	138	122[a]	139	150	300	171
	Total suspended solids	mg/L	<1	13	1.0	1.0	1.0	1.0	1.4	4.0	1.0	1.0	2.0	14.2
	Turbidity, Lab	NTU	0.62	2.87	0.8	0.7	0.8	0.9	1.1	2.2[a]	0.9	1.0	2.2	16.2[a]
Metals	Cadmium, Total	mg/L	0.00001	0.00011	0.000009	0.000010	0.000015	0.000029	0.000028	0.000015[a]	0.000018	0.000018	0.000058	0.000064
	Calcium, Total	mg/L	15.6	41.4	31.0	34.0	33.0	33.3	32.4	26.2[a]	34.2	37.7	67.3	40.9
	Cobalt, Total	mg/L	0.000035	0.000193	0.00004	0.00004	0.00005	0.00016	0.00022	0.0001[a]	0.00012	0.00011	0.00216	0.00053
	Iron, Total	mg/L	0.1115	0.45	0.16	0.15	0.15	0.19	0.21	0.5[a]	0.18	0.25	0.43	0.63
	Lead, Total	mg/L	0.000144	0.00204	0.00022	0.00020	0.00024	0.00079	0.00078	0.00065	0.00040	0.00031	0.00055	0.00062
	Magnesium, Total	mg/L	2.67	9.0	6.27	7.30	7.25	7.51	7.46	5.51[a]	7.48	8.8	14.95	9.73
	Manganese, Total	mg/L	0.00855	0.0404	0.0171	0.0184	0.0212	0.0384	0.0720	0.103[a]	0.0508	0.0352	1.585	0.0705
	Nickel, Total	mg/L	0.00030	0.0010	0.0003	0.0003	0.0004	0.0008	0.0009	0.0005	0.0006	0.0007	0.0035	0.0024
	Potassium, Total	mg/L	0.57	1.31	0.79	0.85	0.85	0.90	0.93	1.06[a]	1.01	1.01	1.44	1.38
	Sodium, Total	mg/L	1.9	3.14	2.4	2.4	2.6	2.6	2.2	2.0	2.5	2.5	4.3	2.1
	Strontium, Total	mg/L	0.0728	0.175	0.135	0.140	0.143	0.149	0.138	0.144	0.161	0.169	0.236	0.131
	Uranium, Total	mg/L	0.00076	0.00254	0.0015	0.0016	0.0018	0.0017	0.0015	0.0015[a]	0.0018	0.0018	0.0015	0.0016
	Zinc, Total	mg/L	0.0017	0.013	0.0017	0.0016	0.0069	0.0216	0.0229	0.0068	0.0146	0.0319	0.0512	0.0078

[a] Limited data (n<10 samples)

Table 4.4: Ratio of median analyte values at mine-exposed stations to the upper background benchmark (95th percentile of reference data)[a]. Highlighted values indicate median concentrations that were at least 3 times higher than the upper background benchmark, to accentuate stations and variables reflecting greatest mine-related influence.

	Analyte	NFRC upstream from Haul Road			NFRC downstream from Haul Road		SFRC	Pumphouse Pond Outlet	Rose Creek Diversion	Rose Creek downstream of RCTA	Anvil Creek at Pelly River
		R8	R9	R10	NF2	X2	R1	X3	X10	X14	A1
Non-Metals	Alkalinity, Total	0.7	0.8	0.7	0.7	0.7	0.7	0.8	0.8	0.7	0.8
	Ammonia-N	0.3	0.3	0.3	0.3	0.3	0.7	0.4	0.4	1.3	0.1
	Conductivity, Field	0.6	0.8	0.7	0.8	0.7	0.6 [b]	0.8	0.8	1.7	0.7 [b]
	Hardness, Total (CaCO3)	0.7	0.8	0.8	0.8	0.8	0.6	0.8	1.0	1.6	1.0
	Nitrate-N	0.5	0.8	0.7	1.0	0.8	0.3	0.8	0.8	0.3	0.3
	Organic Carbon, Dissolved	0.1	0.1	0.1	0.1	0.1	0.3 [b]	0.2	0.2	0.2	0.4 [b]
	Organic Carbon, Total	0.2	0.2	0.2	0.2	0.2	0.5 [b]	0.2	0.2	0.2	0.5 [b]
	pH, Field	0.9	0.9	0.9	0.9	0.9	0.9 [b]	0.9	0.9	0.9	1.0 [b]
	Sulfate	0.5	0.8	0.9	1.1	1.1	1.1	1.3	1.4	7.8	2.3
	Total dissolved solids	0.7	0.8	0.8	0.8	0.8	0.7 [b]	0.8	0.9	1.8	1.0
	Total suspended solids	0.1	0.1	0.1	0.1	0.1	0.3	0.1	0.1	0.1	1.0
	Turbidity, Lab	0.3	0.3	0.3	0.3	0.4	0.8 [b]	0.3	0.3	0.8	5.6 [b]
Metals	Cadmium, Total	0.1	0.1	0.1	0.3	0.3	0.1 [b]	0.2	0.2	0.6	0.6
	Calcium, Total	0.7	0.8	0.8	0.8	0.8	0.6 [b]	0.8	0.9	1.6	1.0
	Cobalt, Total	0.2	0.2	0.3	0.8	1.2	0.5 [b]	0.6	0.6	11.2	2.7
	Iron, Total	0.3	0.3	0.3	0.4	0.5	1.1 [b]	0.4	0.5	0.9	1.4
	Lead, Total	0.1	0.1	0.1	0.4	0.4	0.3	0.2	0.2	0.3	0.3
	Magnesium, Total	0.7	0.8	0.8	0.8	0.8	0.6 [b]	0.8	1.0	1.7	1.1
	Manganese, Total	0.4	0.5	0.5	1.0	1.8	2.6 [b]	1.3	0.9	39.3	1.7
	Nickel, Total	0.3	0.3	0.4	0.8	0.9	0.5	0.6	0.7	3.4	2.3
	Potassium, Total	0.6	0.6	0.7	0.7	0.7	0.8 [b]	0.8	0.8	1.1	1.1
	Sodium, Total	0.8	0.8	0.8	0.8	0.7	0.6	0.8	0.8	1.4	0.7
	Strontium, Total	0.8	0.8	0.8	0.8	0.8	0.8	0.9	1.0	1.3	0.7
	Uranium, Total	0.6	0.6	0.7	0.7	0.6	0.6 [b]	0.7	0.7	0.6	0.6
	Zinc, Total	0.1	0.1	0.5	1.7	1.8	0.5	1.1	2.5	4.0	0.6

[a] Median values that were reported as less than the detection limit (DL) were used at the DL for calculation.

[b] Limited data (n<10)

Table 4.5: Percentage of samples collected from mine-exposed stations with analyte values above water quality guidelines. Highlighted values indicate more than 10% of samples had analyte concentrations above the guideline.

	Analyte	NFRC upstream from Haul Road			NFRC downstream from Haul Road		SFRC	Pumphouse Pond Outlet	Rose Creek Diversion	Rose Creek downstream of RCTA	Anvil Creek at Pelly River
		R8	R9	R10	NF2	X2	R1	X3	X10	X14	A1
Non-metals	Ammonia-N	0%	0%	0%	0%	0%	0%[a]	4%	0%	15%	0%
	Nitrate-N	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	pH, Field	0%	0%	0%	0%	0%	0%[a]	0%	0%	0%	0%[a]
	Sulfate	0%	0%	0%	0%	0%	0%	0%	0%	31%	0%
Metals	Cadmium, Total	0%	0%	0%	21%	16%	13%[a]	8%	7%	0%	0%
	Cobalt, Total	0%	0%	0%	17%	6%	0%[a]	4%	0%	45%	0%
	Iron, Total	0%	0%	0%	0%	1%	44%[a]	2%	2%	12%	27%
	Lead, Total	0%	0%	0%	4%	0%	10%	0%	0%	1%	0%
	Manganese, Total	0%	0%	0%	0%	0%	0%[a]	0%	0%	49%	0%
	Nickel, Total	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Potassium, Total	0%	0%	0%	0%	0%	0%[a]	0%	0%	0%	0%
	Uranium, Total	0%	0%	0%	0%	0%	0%[a]	0%	0%	0%	0%
	Zinc, Total	0%	0%	6%	42%	38%	0%	25%	52%	73%	8%

[a] Limited data (n<10 samples)

the guideline is shown in Table 4.6 to indicate relative magnitudes of guideline exceedances among stations and analytes.

4.3.1 Non-metals

Approximately 16% of samples collected at X14 over the 2010 – 2014 period had concentrations of ammonia that were above the guideline for protection of aquatic life (Section 2.3.1.2, Table 4.5), which resulted from using conservative assumptions of temperature and pH to select the total ammonia guideline (Table 2.2). When sample-specific temperature and pH values are taken into account, ammonia concentrations do not appear to be of concern in surface waters downstream of the FMC. Sulphate concentrations were greater than the water quality guideline at mine-exposed station X14 in approximately 31% of samples (Table 4.5), but median concentrations were below the guideline (Table 4.6), and samples collected at other stations had sulphate concentrations that were consistently less than the guideline (Table 4.5). This information indicates that non-metal variables discharged by the FMC currently pose little risk of effects to aquatic biota.

4.3.2 Metals

Concentrations of mine-related metals that were measured at stations downstream from the FMC were also compared to guidelines for protection of aquatic life. Cadmium, cobalt, iron, lead, manganese, and zinc concentrations were above the guidelines in more than 10% of samples collected at one or more stations downstream of mine disturbances (Table 4.5). Of these, the relatively more frequent elevations of iron at R1, which is relatively undisturbed, and at A1, well downstream of the Faro Mine Area, indicate sources other than the FMC; Figure 4.1 shows that iron concentrations are positively related to TSS concentrations at these stations, with elevated levels of both likely being associated with mobilization of particulate matter during snowmelt and rain events.

Of the remaining mine-related metals, zinc was most often measured at concentrations above the guideline for protection of aquatic life at stations located downstream from mine sources (Table 4.5). Cadmium concentrations were above the guideline at stations NF2 (21% of samples) and X2 (16% of samples), and less frequently at stations located further downstream (Table 4.5). At station X14, concentrations of cobalt (45% of samples), iron (12%), manganese (49%), and zinc (73%) were sometimes also above guidelines (Table 4.5; Figure 4.2). However, guidelines were infrequently exceeded at Anvil Creek near the Pelly River (A1) (Table 4.5).

Table 4.6: Ratio of median analyte values at mine-exposed stations to water quality guideline values [a,b]. Highlighted values indicate median concentrations that were above the respective water quality guideline (ratio >1).

	Analyte	NFRC upstream from Haul Road			NFRC downstream from Haul Road		SFRC	Pumphouse Pond Outlet	Rose Creek Diversion	Rose Creek downstream of RCTA	Anvil Creek at Pelly River
		R8	R9	R10	NF2	X2	R1	X3	X10	X14	A1
Non-metals	Ammonia-N	0.1	0.1	0.1	0.1	0.1	0.2[c]	0.1	0.1	0.4	0.0
	Nitrate-N	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.0	0.0
	pH, Field	0.9	0.9	0.9	0.8	0.8	0.9[c]	0.8	0.9	0.9	0.9[c]
	Sulfate	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.6	0.2
Metals	Cadmium, Total	0.1	0.1	0.1	0.2	0.2	0.1[c]	0.1	0.1	0.2	0.3
	Cobalt, Total	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.9	0.2
	Iron, Total	0.2	0.2	0.2	0.2	0.2	0.5[c]	0.2	0.2	0.4	0.6
	Lead, Total	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.1
	Manganese, Total	0.0	0.0	0.0	0.0	0.1	0.1[c]	0.0	0.0	1.0	0.1
	Nickel, Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Potassium, Total	0.0	0.0	0.0	0.0	0.0	0.0[c]	0.0	0.0	0.0	0.0
	Uranium, Total	0.1	0.1	0.1	0.1	0.1	0.1[c]	0.1	0.1	0.1	0.1
	Zinc, Total	0.1	0.1	0.2	0.7	0.8	0.2	0.5	1.1	1.7	0.3

[a] For pH, the upper value of the guideline range was used to calculate the ratio.

[b] Median values that were reported as less than the detection limit (DL) were used at the DL for calculation.

[c] Limited data (n<10 samples)

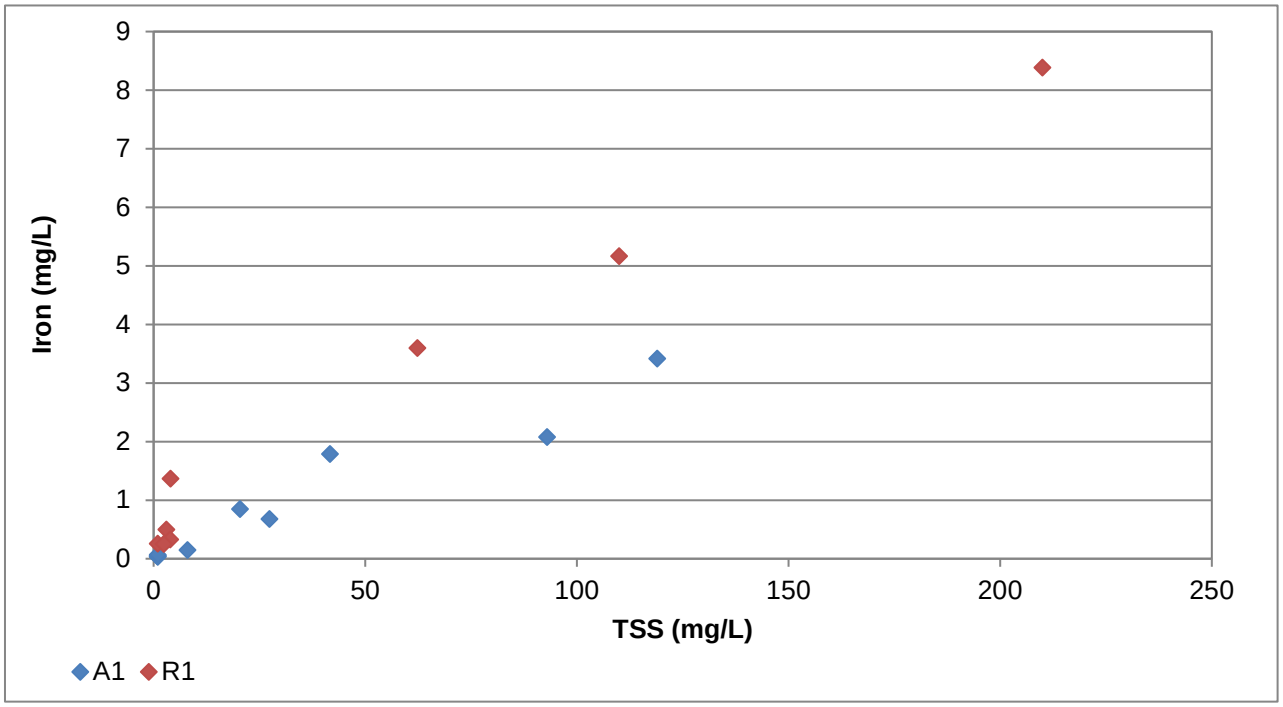


Figure 4.1: Water concentrations of total iron relative to TSS at relatively undisturbed station R1 (South Fork Rose Creek) and at station A1 (the mouth of Anvil Creek).

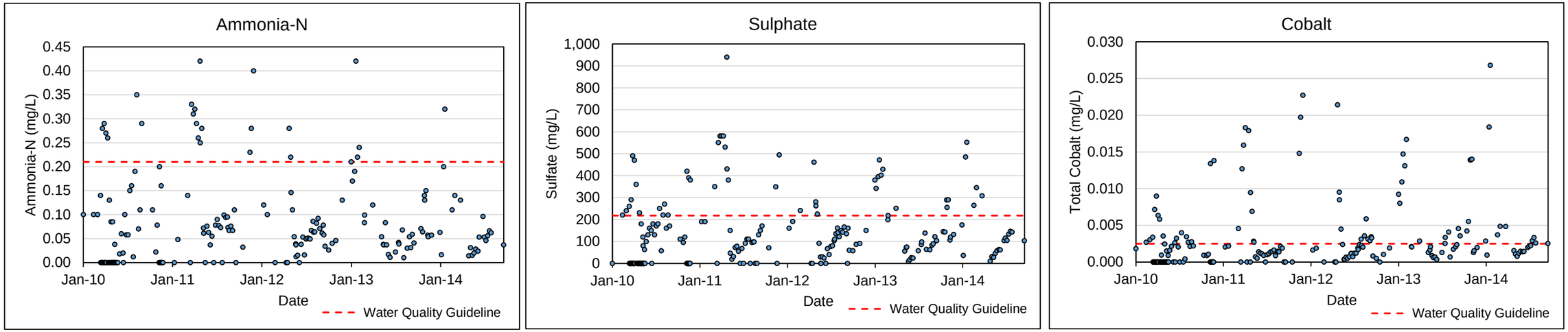


Figure 4.2: Concentrations of water quality analytes over time (2010-2014) at routine water quality monitoring station X14 relative to water quality guidelines (see Tables 2.1 and 2.2).

Zinc concentrations have historically been stable within Rose Creek downstream from the Haul Road, however, concentrations spiked in late 2013 at station NF2, with elevated concentrations observed here and farther downstream through X14 (Figure 4.3). The increased concentrations were associated with seepage entering the western portion of the Haul Road Pond from the waste rock piles.

4.4 August 2014 Water Quality

Water concentrations from samples collected at stations downstream of mine disturbances during the August 2014 field survey were compared to the 95th percentile of concentrations measured at benthic invertebrate and periphyton reference stations sampled during the same survey, and to selected water quality guidelines (Table 4.7). Few non-metals from exposed stations had concentrations greater than the August 2014 reference 95th percentile, with the exception of turbidity, which had slightly higher NTU measurements (Table 4.7). Metal analytes with concentrations elevated above the August 2014 reference 95th percentile were similar to those identified previously as indicative of mine-related influence, including cadmium, cobalt, iron, lead, manganese, nickel and zinc (Table 4.7). Relative to water quality guidelines, iron and zinc concentrations most frequently exceeded respective guidelines, while select other metals exceeded guidelines at a limited number of stations (Table 4.7).

Principal components analysis (PCA) was used to summarize the water quality data (Section 2.3.3.3) and thereby assist with the interpretation of general patterns in the data. PCA of water quality data for samples collected in August 2014 resulted in the first 4 axes explaining more variation than by chance alone (Appendix Figure C.1 and Tables C.27 and C.28). PCA Axis 1 (PCA-1) separated areas having high versus low concentrations of variables such as total dissolved solids, hardness, and specific conductance (Appendix Figure C.1); however, all mine-exposed areas were bounded by reference areas, with the exception of area A1, indicating that water quality at time of sampling was not outside reference conditions. Principal component Axis 2 (PCA-2) primarily separated exposed areas X2 and A1 from the rest of the areas, based on relatively greater turbidity, total suspended solids, silver, iron, aluminium, and/or copper concentrations from the rest of the areas (Appendix Figure C.1). Principal component analysis axes PCA-3 and PCA-4 separated reference areas only and are therefore not of interest in the context of potential mine related impacts.

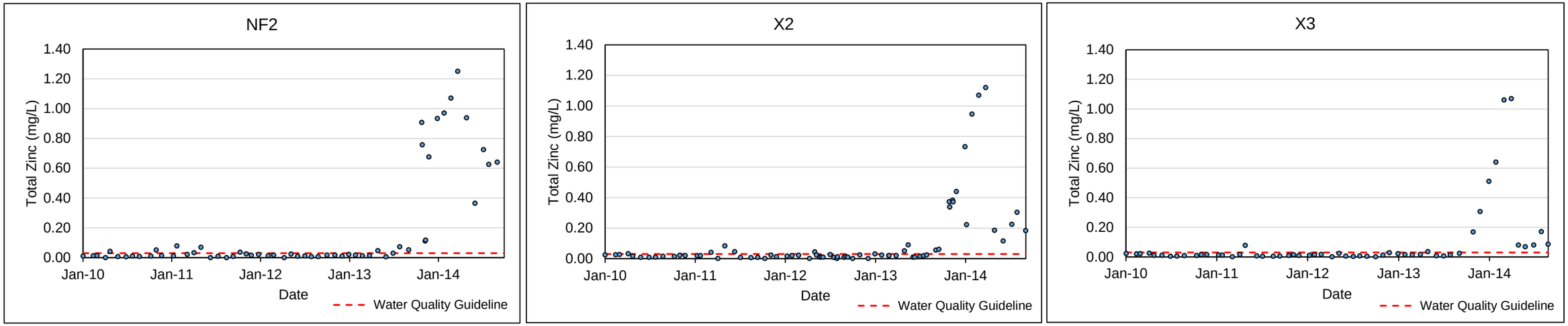


Figure 4.3: Total zinc concentrations over time (2010-2014) at routine monitoring stations located downstream of the North Fork Rock Drain.

Table 4.7: Water chemistry at stations exposed to mine-related disturbances, August 2014. Bold font indicates value is greater than the August 2014 reference 95th percentile. Shading indicates value is greater than selected water quality criterion.

	Analytes	Units	August Reference 95th Percentile[a]	Selected Water Quality Criterion[b,c]	Potentially Impacted		Rose and Anvil Creek Stations														
					South Fork Rose Creek		North Fork Rose Creek					Rose Creek Diversion			Rose Creek downstream from RCTA					Anvil Creek	
					R1	GRUM	R9	X2	X3-1	X3-2	X3-3	RDE-1	RDE-2	RDE-3	R2-1	R2-2	R2-3	R3	R4	R5	A1
					20-AUG-14	21-AUG-14	24-AUG-14	20-AUG-14	21-AUG-14	21-AUG-14	21-AUG-14	22-AUG-14	22-AUG-14	23-AUG-14	23-AUG-14	23-AUG-14	23-AUG-14	22-AUG-14	22-AUG-14	22-AUG-14	22-AUG-14
in-situ measurements	Temperature	°C			9.10	7.32	5.50	6.50	7.30	7.40	7.50	6.30	8.00	9.60	7.20	8.30	8.50	8.30	4.40	7.01	6.79
	Dissolved Oxygen (mg/L)	mg/L	15.8	9	11.17	10.51	12.04	11.78	12.42	12.92	12.07	13.08	13.00	10.75	11.65	11.45	11.00	18.29	18.45	11.83	11.45
	Dissolved Oxygen (%)	% saturation	128		109.7	87.3	108.8	108.5	116.1	121.1	113.2	119.1	123.7	106.0	108.1	109.0	105.6	155.7	142.2	97.3	93.8
	Specific Conductance	µS/cm	841		184.2	57.0	176.7	190.4	188.3	188.3	188.7	207.0	207.9	212.6	318.4	315.9	314.4	343.0	340.0	276.0	253.0
	pH	pH units	7.49-8.52	6.5 - 9.0	8.29	**6.84**	8.01	7.79	7.99	7.76	7.74	7.77	7.91	8.32	8.00	8.04	7.96	8.28	8.25	8.04	8.07
Physical Tests	Hardness (as CaCO3)	mg/L	545		99.2	25.7	94.8	91.0	99.7	101	101	107	110	115	175	165	166	159	159	158	144
	Total Suspended Solids	mg/L	4.0		<3	4.0	<3	**6.7**	<3	<3	<3	<3	<3	<3	<3	<3	**5.3**	<3	<3	<3	**33.3**
	Total Dissolved Solids	mg/L	697		121	48	124	126	121	125	121	134	131	136	208	211	206	212	199	192	180
	Turbidity	NTU	1.51		0.78	1.0	0.87	1.50	0.88	1.27	1.0	**2.18**	1.13	1.17	1.40	1.39	**2.15**	1.39	0.74	0.84	**46.3**
Anions and Nutrients	Alkalinity, Total (as CaCO3)	mg/L	286	10	81.8	23.0	84.3	84.8	81.8	80.5	80.3	87.3	93.8	95.4	105	103	104	105	105	119	109
	Ammonia, Total (as N)	mg/L	0.006	0.21	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	**0.0197**	**0.0184**	**0.0201**	0.0061	<0.005	<0.005	0.0055
	Chloride (Cl)	mg/L	2.50	120	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
	Fluoride (F)	mg/L	0.328	0.12	0.101	0.060	0.099	0.102	0.105	0.106	0.105	0.108	0.109	0.110	0.111	0.112	0.110	0.105	0.103	0.086	0.089
	Nitrate (as N)	mg/L	0.103	3	0.0112	0.0067	0.0396	0.0428	0.0288	0.0361	0.0351	0.0341	0.0283	0.0226	0.0322	0.0299	0.0282	0.0451	0.0552	0.0487	0.0334
	Nitrite (as N)	mg/L	0.005	0.06	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Phosphorus (P)-Total	mg/L	0.0065		0.0051	0.0055	0.0020	**0.0173**	0.0044	0.0048	0.0061	0.0051	**0.0069**	0.0045	**0.073**	<0.02	<0.02	0.0039	<0.002	0.0040	**0.0577**
	Sulfate (SO4)	mg/L	242.9	128-309	14.9	5.52	11.6	16.3	15.7	16.4	16.4	19.8	18.7	18.8	59.2	58.8	58.9	51.0	48.2	34.9	31.9
Carbon	Dissolved Organic Carbon	mg/L	1.27-4.07		3.01	2.72	2.74	2.55	2.72	2.73	2.54	2.65	2.49	2.59	2.41	2.60	2.35	2.54	2.81	2.51	3.25
	Total Organic Carbon	mg/L	1.22-4.12		3.24	2.82	2.89	2.76	2.86	2.65	2.70	2.54	2.46	2.66	2.44	2.52	2.57	2.76	2.79	2.54	**4.27**
Total Metals	Aluminum (Al)-Total	mg/L	0.0524	0.1	0.0154	0.0338	0.0250	**0.291**	0.0203	0.0369	0.0480	0.0172	0.0169	0.0185	0.0187	0.0299	**0.0955**	0.0117	0.0114	0.0154	**1.78**
	Antimony (Sb)-Total	mg/L	0.00023	0.02	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00011	**0.00033**
	Arsenic (As)-Total	mg/L	0.00077	0.005	0.00044	0.00035	0.00075	**0.00117**	0.00058	0.00073	0.00075	0.00056	0.00054	0.00056	0.00055	0.00055	0.00067	0.00041	0.00041	0.00045	**0.00206**
	Barium (Ba)-Total	mg/L	0.0998	1	0.0433	0.0273	0.0501	0.0537	0.0466	0.0488	0.0498	0.0508	0.0499	0.0537	0.0562	0.0544	0.0570	0.0554	0.0601	0.0643	**0.117**
	Beryllium (Be)-Total	mg/L	<0.0001	0.0053	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Bismuth (Bi)-Total	mg/L	<0.0005		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Boron (B)-Total	mg/L	<0.01	1.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Cadmium (Cd)-Total	mg/L	0.000108	0.00025-0.00037	<0.00001	<0.00001	<0.00001	**0.000262**	0.000107	**0.000208**	**0.000210**	**0.000132**	**0.000119**	0.000104	**0.000121**	**0.000109**	**0.000121**	0.000075	0.000053	0.000030	**0.000131**
	Calcium (Ca)-Total	mg/L	115.4		30.8	8.15	28.5	26.3	29.8	29.4	29.7	31.5	32.5	33.4	50.7	48.2	48.2	46.5	46.8	45.4	41.7
	Chromium (Cr)-Total	mg/L	0.00025	0.001	0.00010	0.00012	0.00015	**0.00069**	0.00013	0.00014	0.00017	0.00012	0.00012	0.00013	0.00013	0.00014	**0.00032**	0.00016	0.00015	0.00017	**0.00317**
	Cobalt (Co)-Total	mg/L	0.00010	0.0025	<0.0001	<0.0001	<0.0001	**0.00171**	**0.00057**	**0.00115**	**0.00115**	**0.00071**	**0.00061**	**0.00045**	**0.00097**	**0.00097**	**0.00116**	**0.00051**	**0.00026**	**0.00014**	**0.00093**
	Copper (Cu)-Total	mg/L	0.00096	0.001-0.004	<0.0005	<0.0005	0.00054	**0.00119**	0.00054	0.00059	0.00063	0.00054	0.00054	0.00063	0.00059	0.00068	0.00078	0.00065	0.00070	0.00065	**0.00450**
	Iron (Fe)-Total	mg/L	0.191	0.3	**0.240**	0.135	**0.220**	**0.911**	**0.237**	**0.319**	**0.332**	**1.07**	**0.490**	**0.454**	**0.560**	**0.535**	**0.759**	**0.347**	**0.264**	**0.209**	**2.29**
	Lead (Pb)-Total	mg/L	0.000101	0.004-0.01	0.000052	**0.000107**	**0.000192**	**0.00456**	**0.000306**	**0.000708**	**0.000676**	**0.000297**	**0.000268**	**0.000364**	**0.000512**	**0.000759**	**0.00130**	**0.000163**	**0.000166**	**0.000129**	**0.00157**
	Lithium (Li)-Total	mg/L	0.0057		0.00188	0.00101	0.00341	0.00413	0.00257	0.00307	0.00310	0.00244	0.00230	0.00246	0.00316	0.00339	0.00332	0.00261	0.00240	0.00184	0.00407
	Magnesium (Mg)-Total	mg/L	61.1		5.44	1.29	5.75	6.15	6.16	6.64	6.61	6.95	7.10	7.72	11.8	10.9	11.0	10.4	10.3	10.7	9.64
	Manganese (Mn)-Total	mg/L	0.0196	0.72-1.38	**0.0207**	0.00799	**0.0241**	**0.144**	**0.0523**	**0.0874**	**0.0885**	**0.0857**	**0.0747**	**0.0572**	**0.884**	**0.864**	**0.929**	**0.540**	**0.316**	**0.154**	**0.0910**
	Mercury (Hg)-Total	mg/L	<0.00001	0.000026	<0.00001	<0.00001	<0.00001	**0.000031**	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Molybdenum (Mo)-Total	mg/L	0.00255	0.073	0.000244	0.000249	0.000548	0.000508	0.000415	0.000503	0.000518	0.000440	0.000428	0.000513	0.000552	0.000528	0.000535	0.000502	0.000598	0.000876	0.00115
	Nickel (Ni)-Total	mg/L	0.0042	0.034-0.146	<0.0005	<0.0005	<0.0005	0.00274	0.00121	0.00206	0.00209	0.00143	0.00136	0.00134	0.00257	0.00240	0.00272	0.00176	0.00139	0.00089	**0.00426**
	Phosphorus (P)-Total	mg/L	<0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.058**
	Potassium (K)-Total	mg/L	1.31	373	0.84	0.12	0.64	0.60	0.71	0.64	0.65	0.73	0.70	0.74	1.02	0.96	0.96	0.96	1.04	1.05	**1.71**
	Selenium (Se)-Total	mg/L	0.005	0.001	0.00012	<0.0001	0.00023	0.00023	0.00019	0.00022	0.00023	0.00020	0.00020	0.00026	0.00026	0.00025	0.00023	0.00030	0.00046	0.00056	0.00063
	Silicon (Si)-Total	mg/L	6.05		4.11	3.40	5.10	5.00	4.68	5.19	5.18	4.67	4.59	4.61	4.92	4.63	4.74	4.77	4.87	4.61	**8.32**
	Silver (Ag)-Total	mg/L	<0.00001	0.00025	<0.00001	<0.00001	<0.00001	**0.000023**	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	**0.000043**
	Sodium (Na)-Total	mg/L	4.88		2.01	1.54	2.09	2.06	2.13	2.16	2.21	2.18	2.18	2.18	3.02	2.98	2.99	2.76	2.65	2.21	2.37
	Strontium (Sr)-Total	mg/L	0.573		0.148	0.0513	0.118	0.113	0.131	0.116	0.117	0.138	0.141	0.145	0.183	0.178	0.179	0.168	0.166	0.144	0.138
	Sulfur (S)-Total	mg/L	82.3		5.26	2.06	4.20	5.37	5.50	5.84	5.75	6.94	6.46	6.59	21.0	20.1	20.4	18.1	16.6	11.9	10.9
	Thallium (Tl)-Total	mg/L	<0.00001	0.0008	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	**0.000040**
	Tin (Sn)-Total	mg/L	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Titanium (Ti)-Total	mg/L	<0.01	2	<0.01	<0.01	<0.01	**0.011**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.048**
	Uranium (U)-Total	mg/L	0.0120	0.015	0.00138	0.000417	0.000976	0.00105	0.00118	0.00101	0.00104	0.00124	0.00125	0.00129	0.00152	0.00148	0.00151	0.00134	0.00133	0.00151	0.00162
	Vanadium (V)-Total	mg/L	<0.001	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**0.0074**
	Zinc (Zn)-Total	mg/L	0.0068	0.03	<0.003	0.0030	<0.003	**0.317**	**0.157**	**0.292**	**0.296**	**0.234**	**0.180**	**0.156**	**0.171**	**0.156**	**0.165**	**0.0970**	**0.0632**	**0.0294**	**0.0282**

[a] Reference data and 95th percentile calculation presented in Table C.26.

[b] Selected water quality criterion from Table 2.1.

[c] Observed hardness at each station was used for adapting hardness-based guidelines.

4.5 Pelly River

Water concentrations observed downstream from Anvil Creek (P4; Figure 2.2) did not differ significantly ($p<0.05$) from those observed farther upstream on the Pelly River (P1) (Table 4.8). A previous evaluation of water quality also showed no significant differences ($p<0.05$) in concentrations of alkalinity, sulphate, manganese, or zinc at stations on the Pelly River downstream of FMC disturbance relative to upstream (Minnow 2014b).

4.6 Traditional Drinking Water Stations

Two water monitoring stations are traditional locations of drinking water taking by First Nations: GCULV (Grum culvert) and K8 (Figure 2.3). Water quality at these stations was compared to drinking water quality guidelines. Organic carbon, turbidity, iron, and/or manganese concentrations were occasionally above the guidelines between 2010 and 2014 (Table 4.9).

4.7 Rainbow Trout Toxicity Testing

Early life stage (ELS) toxicity testing was completed using rainbow trout for samples collected at R7 reference and exposed stations X2, X3, and R2. No effects to ELS rainbow trout were observed at exposed stations, while limited effects were observed in the sample collected at the R7 reference area (EC25 of 84%, Table 4.10). Water chemistry at each site was representative of the larger data set discussed previously (Table 4.11, see Sections 4.2, 4.3). Laboratory control tests conducted simultaneously during testing failed to meet the required criteria (≥70% embryo viability). However, the reference toxicant EC50 result was within the range of organism performance (see lab results, Appendix G). Overall, test results should be interpreted with caution.

4.8 Summary

Water quality data collected from 2010 through 2014 indicate that concentrations of a variety of non-metals and metals are elevated in surface waters downstream from disturbances at the Faro Mine Area relative to the typical range of background (reference station) concentrations. Ammonia, conductivity, hardness, sulphate, total dissolved solids, calcium, cobalt, magnesium, manganese, nickel, potassium, sodium, strontium, and zinc occur at concentrations above the background range in approximately half or more of samples collected downstream of the Faro Mine Area (X14).

Concentrations of non-metal analytes are below those expected to have adverse effects on aquatic biota. However, water concentrations of cadmium and cobalt are sometimes above

Table 4.8: Mean analyte concentrations at stations on the Pelly River (2011-2014). Statistical comparison completed for analytes that had median concentrations greater than background at station X14 downstream of the Faro Mine (see Table 4.3). Full summary statistics presented in Appendix Tables C.22 and 23.

Analyte		Units	Pelly River Upstream from Vangorda Creek (P1)		Pelly River Downstream from Anvil Creek (P4)		ANOVA comparison
			n	mean	n	mean	p-value
Non-metals	Alkalinity, Total	mg/L	6	97	6	94	-
	Ammonia-N	mg/L	6	0.011	6	0.014	0.735
	Hardness, Total (CaCO3)	mg/L	6	138	4	134	0.915
	Nitrate-N	mg/L	6	0.01	6	0.05	-
	Organic carbon, Dissolved	mg/L	4	7.6	4	8.5	-
	Organic carbon, Total	mg/L	6	7.5	6	8.7	-
	pH, Field	pH units	1	7.97	1	7.90	-
	Sulfate	mg/L	6	50.9	6	48	0.823
	Total dissolved solids	mg/L	5	196	6	182	0.743
	Total suspended solids	mg/L	6	70	5	73	-
	Turbidity, Lab	NTU	3	9.46	3	10.55	-
Metals	Cadmium, Total	mg/L	5	0.00035	6	0.00041	-
	Calcium, Total	mg/L	5	33.9	6	35.7	0.789
	Cobalt, Total	mg/L	6	0.00097	6	0.00152	0.510
	Iron, Total	mg/L	6	1.79	5	2.96	-
	Lead, Total	mg/L	6	0.0014	5	0.0026	-
	Magnesium, Total	mg/L	6	12.2	6	11.7	0.867
	Manganese, Total	mg/L	6	0.1035	6	0.315	0.345
	Nickel, Total	mg/L	6	0.0091	6	0.0088	0.949
	Potassium, Total	mg/L	4	0.91	5	1.2	0.326
	Sodium, Total	mg/L	6	1.42	6	1.49	0.784
	Strontium, Total	mg/L	6	0.157	6	0.152	0.872
	Uranium, Total	mg/L	6	0.00137	6	0.00137	-
	Zinc, Total	mg/L	6	0.036	6	0.039	0.877

Table 4.9: Water quality summary statistics and the percentage of samples exceeding current drinking water quality guidelines for drinking water stations GCULV and K8, Faro Mine, Yukon.

	Analyte	Units	Drinking water quality criterion [a]	n	Minimum	Maximum	Median	Standard deviation [b]	% > current drinking water quality criterion
				GCULV					
Non-Metals	Alkalinity, Total	mg/L	30 - 500	7	10.1	30	19.2	7.8	0%
	Nitrate-N	mg/L	10	7	0.0067	0.04	0.02	0.01	0%
	Organic carbon, Dissolved	mg/L	5	4	2.6	24	4	10.2	25%
	Organic carbon, Total	mg/L	4	6	2.47	25	5.3	8.6	50%
	pH, Field	pH units	6.5 - 8.5	2	6.99	7.66	7.3	0.5	0%
	Sulfate	mg/L	500	7	<0.50	7.69	5.3	2.9	0%
	Total dissolved solids	mg/L	500	7	29.3	64	34	14	0%
	Turbidity, Lab	NTU	0.1 - 1.0	4	0.18	2.61	2.2	1.10	75%
Metals	Cadmium, Total	mg/L	0.005	7	<0.000005	0.000077	0.000011	0.000028	0%
	Iron, Total	mg/L	0.3	6	0.07	1.6	0.26	0.59	50%
	Lead, Total	mg/L	0.01	6	0.00003	0.00195	0.000088	0.00085	0%
	Magnesium, Total	mg/L	100	7	0.793	1.71	1.27	0.30	0%
	Manganese, Total	mg/L	0.05	7	0.01	0.12	0.0334	0.042	29%
	Sodium, Total	mg/L	200	7	0.73	1.87	1.45	0.43	0%
	Uranium, Total	mg/L	0.02	7	0.00045	0.00131	0.00055	0.00031	0%
	Zinc, Total	mg/L	5	7	0.001	0.0104	0.003	0.004	0%
				K8					
Non-Metals	Alkalinity, Total	mg/L	30 - 500	7	11.5	55.5	33.4	15.4	0%
	Nitrate-N	mg/L	10	6	0.007	0.12	0.04	0.04	0%
	Organic carbon, Dissolved	mg/L	5	4	2.18	17.7	3.9	7.3	25%
	Organic carbon, Total	mg/L	4	5	2.04	15.7	4.6	5.7	60%
	pH, Field	pH units	6.5 - 8.5	2	7.4	7.91	7.7	0.4	0%
	Sulfate	mg/L	500	7	2.29	14	11.0	3.8	0%
	Total dissolved solids	mg/L	500	7	28.3	88	74	23	0%
	Turbidity, Lab	NTU	0.1 - 1.0	3	0.63	2.23	1.14	0.82	67%
Metals	Cadmium, Total	mg/L	0.005	7	0.000006	0.00007	0.00001	0.000023	0%
	Iron, Total	mg/L	0.3	6	0.006	0.553	0.028	0.22	17%
	Lead, Total	mg/L	0.01	7	0.000052	0.00543	0.000119	0.0020	0%
	Magnesium, Total	mg/L	100	7	0.594	2.89	1.62	0.81	0%
	Manganese, Total	mg/L	0.05	7	0.00023	0.0166	0.0009	0.0060	0%
	Sodium, Total	mg/L	200	7	0.539	2.01	1.77	0.55	0%
	Uranium, Total	mg/L	0.02	7	0.000555	0.00214	0.000954	0.00060	0%
	Zinc, Total	mg/L	5	7	0.0006	0.017	0.003	0.006	0%

[a] Refer to Table 2.3 for information regarding the source of drinking water quality guidelines.

[b] Values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation.

Table 4.10: Rainbow trout early-life-stage toxicity test results, Faro Mine, August 2014.

Test endpoint[a]	North Fork Rose Creek		Pumphouse Pond Outlet (X3)	Rose Creek downstream from RCTA (R2)
	Reference (R7)	Downstream from Haul Road (X2)		
	% (95% confidenc limit)	%	%	%
Test				
EC25	86.4 (39.7 – 100)	>100	>100	>100
EC50	>100	>100	>100	>100

[a] EC – the concentration that causes effective response to 25 or 50 percent of the test organisms

Table 4.11: Water chemistry concentrations associated with rainbow trout toxicity test samples collected August, 2014. Bold font indicates value is greater than the reference background benchmark. Shading indicates value is greater than selected water quality criterion.

Analytes		Units	August Reference 95th Percentile[a]	Selected Water Quality Criterion[b,c]	North Fork Rose Creek		Pumphouse Pond Outlet (X3)	Rose Creek downstream from RCTA (R2)
					Reference (R7)	Downstream from Haul Road (X2)		
in-situ measurements	Temperature	°C	9.50		6.50	6.50	7.30	7.20
	Dissolved Oxygen (mg/L)	mg/L	15.8	9	13.71	11.78	12.42	11.65
	Dissolved Oxygen (%)	% saturation	128		128.4	108.5	116.1	108.1
	Specific Conductance	µS/cm	841		167.3	190.4	188.3	318.4
	pH	pH units	7.49-8.52	6.5 - 9.0	7.97	7.79	7.99	8.00
Physical Tests	Hardness (as CaCO3)	mg/L	545		86.5	92.9	99.1	165
	Total Suspended Solids	mg/L	4.0		<3.0	4.0	<3.0	4.7
	Total Dissolved Solids	mg/L	697		127	127	133	230
	Turbidity	NTU	1.51		0.96	1.51	0.88	**1.76**
Anions and Nutrients	Alkalinity, Total (as CaCO3)	mg/L	286	10	86.2	85.3	84.1	105
	Ammonia, Total (as N)	mg/L	0.006	0.21	<0.0050	<0.0050	<0.0050	**0.0161**
	Chloride (Cl)	mg/L	2.50	120	<0.50	<0.50	<0.50	<0.50
	Fluoride (F)	mg/L	0.328	0.12	0.095	0.104	0.112	0.108
	Nitrate (as N)	mg/L	0.103	3	<0.0050	0.0459	0.0378	0.0282
	Nitrite (as N)	mg/L	0.005	0.06	<0.0010	<0.0010	<0.0010	<0.0010
	Phosphorus (P)-Total	mg/L	0.0065		<0.0020	**0.0066**	0.0026	0.0039
	Sulfate (SO4)	mg/L	242.9	128-309	6.96	16.7	16.4	58.4
Carbon	Dissolved Organic Carbon	mg/L	1.27-4.07		2.56	2.88	2.49	2.57
	Total Organic Carbon	mg/L	1.22-4.12		2.48	2.89	2.66	3.09
Total Metals	Aluminum (Al)-Total	mg/L	0.0524	0.1	0.0381	**0.0910**	0.0214	**0.0941**
	Antimony (Sb)-Total	mg/L	0.00023	0.02	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Total	mg/L	0.00077	0.005	**0.00083**	**0.00081**	0.00057	0.00062
	Barium (Ba)-Total	mg/L	0.0998	1	0.0508	0.0492	0.0468	0.0594
	Beryllium (Be)-Total	mg/L	<0.0001	0.0053	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Total	mg/L	<0.0005		<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Total	mg/L	<0.01	1.5	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Total	mg/L	0.000108	0.00025-0.00037	0.000011	**0.000210**	**0.000117**	**0.000124**
	Calcium (Ca)-Total	mg/L	115.4		26.2	26.8	29.4	47.6
	Chromium (Cr)-Total	mg/L	0.00025	0.001	0.00019	**0.00027**	0.00013	**0.00026**
	Cobalt (Co)-Total	mg/L	0.00010	0.0025	<0.00010	**0.00135**	**0.00057**	**0.00100**
	Copper (Cu)-Total	mg/L	0.00096	0.001-0.004	0.00050	0.00074	0.00057	**0.00122**
	Iron (Fe)-Total	mg/L	0.191	0.3	**0.267**	**0.447**	**0.235**	**0.640**
	Lead (Pb)-Total	mg/L	0.000101	0.004-0.01	0.000069	**0.00146**	**0.000357**	**0.00515**
	Lithium (Li)-Total	mg/L	0.0057		0.00325	0.00357	0.00272	0.00352
	Magnesium (Mg)-Total	mg/L	61.1		5.12	6.30	6.23	11.2
	Manganese (Mn)-Total	mg/L	0.0196	0.72-1.38	**0.0253**	**0.107**	**0.0563**	**0.851**
	Mercury (Hg)-Total	mg/L	<0.00001	0.000026	<0.000010	<0.000010	<0.000010	<0.000010
	Molybdenum (Mo)-Total	mg/L	0.00255	0.073	0.000529	0.000499	0.000386	0.000519
	Nickel (Ni)-Total	mg/L	0.0042	0.034-0.146	<0.00050	0.00217	0.00129	0.00246
	Phosphorus (P)-Total	mg/L	<0.05		<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Total	mg/L	1.31	373	0.57	0.64	0.72	0.97
	Selenium (Se)-Total	mg/L	0.005	0.001	0.00022	0.00022	0.00020	0.00024
	Silicon (Si)-Total	mg/L	6.05		4.82	5.14	4.63	4.82
	Silver (Ag)-Total	mg/L	<0.00001	0.00025	<0.000010	<0.000010	<0.000010	0.000011
	Sodium (Na)-Total	mg/L	4.88		2.01	2.12	2.06	2.79
	Strontium (Sr)-Total	mg/L	0.573		0.109	0.119	0.135	0.181
	Sulfur (S)-Total	mg/L	82.3		2.59	5.82	5.82	20.0
	Thallium (Tl)-Total	mg/L	<0.00001	0.0008	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Total	mg/L	<0.0001		<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Total	mg/L	<0.01	2	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Total	mg/L	0.0120	0.015	0.000925	0.000958	0.00115	0.00145
	Vanadium (V)-Total	mg/L	<0.001	0.006	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)-Total	mg/L	0.0068	0.03	<0.0030	**0.310**	**0.169**	**0.153**

[a] Reference data and 95th percentile calculation presented in Table C.26.

[b] Selected water quality criterion from Table 2.1.

[c] Observed hardness at each station was used for adapting hardness-based guidelines.

guidelines for protection of aquatic life in samples collected at NF2 and X2, on the NFRC downstream from the Haul Road. Zinc concentrations are frequently greater than the guideline at stations between NFRC station NF2 and Rose Creek station X14, just downstream of the Faro Mine Area. Cobalt and manganese are also found at concentrations above water quality guidelines for protection of aquatic life in up to 40% of samples collected at X14, but median concentrations for all metals but zinc are below the guidelines. Water quality guidelines are infrequently exceeded at stations farther downstream in Anvil Creek (A1) indicating that mine related effects on biota, if any, are localized around the Faro Mine Area. Mine-related effects on water quality do not extend into the Pelly River.

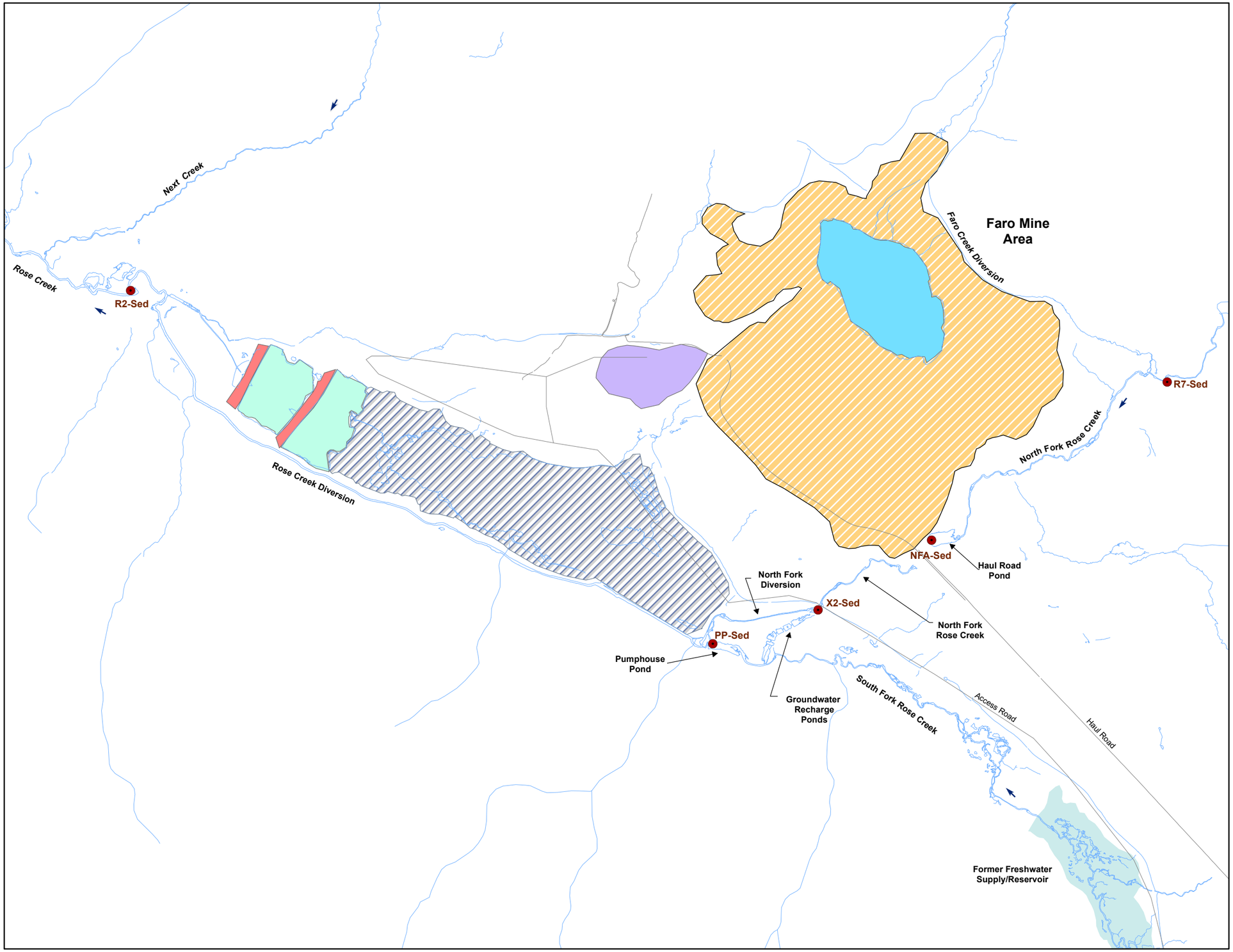
5.0 SEDIMENT QUALITY

Sediment samples were collected from locations in the vicinity of NRFC at R7 (upstream reference), NFRC in the Haul Road Pond, NFRC at X2 (back eddy downstream of Access Road)[3], Pumphouse Pond, and in Rose Creek downstream from the RCTA (R2) (Figure 5.1) as sediment deposition does not occur at the established water sampling locations. The lotic (flowing) habitats (R7 and R2) were dominated by sand, which represented greater than 90% of particles at each station (Table 5.1); this is typical of fast-flowing, upper perennial creek habitats (Cowardin et. al. 1979). The Haul Road Pond had the highest proportion of silt, resulting from slowing of water at the North Fork Rock Drain, which allows finer particles to settle. Samples collected at X2 were roughly 50% sand and 50% silt or clay, while sediment at the Pumphouse Pond (X3) had higher proportions of sand than silt (Table 5.1). Total organic carbon and total Kjeldahl nitrogen concentrations in sediments were low at all areas (Table 5.1).

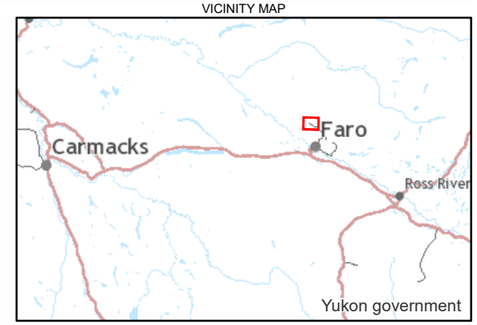
Sediment metal concentrations at R7 were less than sediment quality guideline probable effect levels (PEL) for all variables (Table 5.1). Most sediment metal concentrations were higher at mine-exposed areas relative to those measured at the R7 reference area (Table 5.1). Concentrations of arsenic, lead, manganese, and zinc were above guideline PELs at some mine-exposed areas, with highest concentrations observed at X2 (Table 5.1). No variables were elevated above guideline PELs in the Pumphouse Pond (Table 5.1).

Sediment chemistry data from 2008 were available for three of the five areas sampled in 2014. Relative to sediment samples collected in 2008, sediment concentrations of arsenic, cadmium, copper, lead, manganese and zinc were similar at the reference area (R7) in 2014, while concentrations of the same metals were higher at station X2 in 2014 (Figure 5.2). Concentrations of zinc at X2 were much higher in 2014 relative to 2008, which is consistent with the increased concentrations of zinc observed in water in recent years at this location (see Section 4.3.2). Concentrations of each of these metals were similar between years downstream of the RCTA (R2) (Figure 5.2).

[3] As noted in Section 2.4, sediment samples were collected from depositional habitats located as near as possible to the routine water monitoring locations identified by the same location code. For example, water sampling is done north of the Access Road, but the nearest suitable sediment sampling location was downstream of the Access Road. Both samples are considered to represent conditions in the general X2 area of North Fork Rose Creek even though they were not precisely co-located.



VICINITY MAP



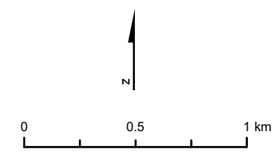
LEGEND

- Sediment Chemistry and Toxicity Sample Location
- Water Flow Direction

Mine Infrastructure:

- Open Pit
- Rock Dump
- Impoundment Area
- Tailings Pond
- Dam
- Mill Area

* Mine Infrastructure and base data provided by CH2M Hill.



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FIGURE 5.1

Sediment Chemistry and Toxicity Sample Collection Locations.

Project: 2531 Date: February 2016

Table 5.1: Mean[a] sediment concentrations measured at representative areas around the Faro Mine, August, 2014. Shading indicates selected guideline and concentration is greater than selected guideline[b].

	Analyte	Units	Selected Guideline[b]		North Fork Rose Creek			Pumphouse Pond	Rose Creek Downstream from RCTA (R2)
			LEL	PEL	Reference (R7)	Haul Road Pond	Downstream from Haul Road (X2)		
Non-metals	Gravel	%			4.80	<0.10	0.67	12.3	2.23
	Sand	%			90.1	24.6	53.6	67.6	95.3
	Silt	%			4.62	68.0	40.5	18.1	2.16
	Clay	%			0.50	7.43	5.27	2.06	0.31
	Total Kjeldahl Nitrogen	%	0.55	4.8	0.03	0.20	0.17	0.08	0.03
	Total Organic Carbon	%	1	10	0.27	2.87	2.03	0.90	0.29
Metals	Aluminum (Al)	mg/kg			7,876	17,000	14,840	13,160	9,830
	Antimony (Sb)	mg/kg			0.32	1.22	1.48	0.33	0.75
	Arsenic (As)	mg/kg	5.9	17	8.71	19.7	32.9	9.86	9.09
	Barium (Ba)	mg/kg			102	314	370	165	113
	Beryllium (Be)	mg/kg			0.36	0.99	0.94	0.70	0.40
	Bismuth (Bi)	mg/kg			<0.20	0.95	1.70	0.25	<0.20
	Cadmium (Cd)	mg/kg	0.6	3.5	0.18	0.89	1.77	0.49	0.34
	Calcium (Ca)	mg/kg			2,674	5,718	5,490	4,566	4,168
	Chromium (Cr)	mg/kg	37.3	90	17.9	47.4	36.5	27.6	39.5
	Cobalt (Co)	mg/kg			5.8	13.6	22.7	11.9	12.0
	Copper (Cu)	mg/kg	35.7	197	6.65	38.6	48.4	14.8	19.2
	Iron (Fe)	mg/kg	21,200	43,766	15,800	31,400	39,300	23,300	21,440
	Lead (Pb)	mg/kg	35.0	91.3	7.11	198	377	33.1	47.2
	Lithium (Li)	mg/kg			16.7	33.1	26.5	26.2	16.7
	Magnesium (Mg)	mg/kg			3,310	7,006	6,134	5,494	6,400
	Manganese (Mn)	mg/kg	460	1,100	395	674	2,422	945	1,896
	Molybdenum (Mo)	mg/kg			0.63	1.59	1.91	0.59	1.29
	Nickel (Ni)	mg/kg	16	75	14.6	44.7	42.7	25.0	34.0
	Phosphorus (P)	mg/kg	600	2,000	538	954	817	606	547
	Potassium (K)	mg/kg			842	2,490	1,968	1,246	728
	Selenium (Se)	mg/kg	2		<0.20	0.93	0.99	0.36	0.26
	Silver (Ag)	mg/kg			<0.10	0.56	0.73	0.14	0.12
	Sodium (Na)	mg/kg			138	224	212	274	146
	Strontium (Sr)	mg/kg			29.0	42.6	42.7	51.2	30.7
	Thallium (Tl)	mg/kg			0.079	0.371	0.393	0.174	0.108
	Tin (Sn)	mg/kg			<2.0	<2.0	<2.0	<2.0	<2.0
	Titanium (Ti)	mg/kg			265	670	481	450	222
	Uranium (U)	mg/kg			0.78	2.80	2.67	1.80	0.94
	Vanadium (V)	mg/kg			20.4	52.3	42.8	28.0	24.5
	Zinc (Zn)	mg/kg	123	315	43.7	213	1,238	302	253

[a] Mean of 5 samples per area. Data for individual samples are presented in Appendix Table B.3.

[b] See Table B.3 for guideline source.

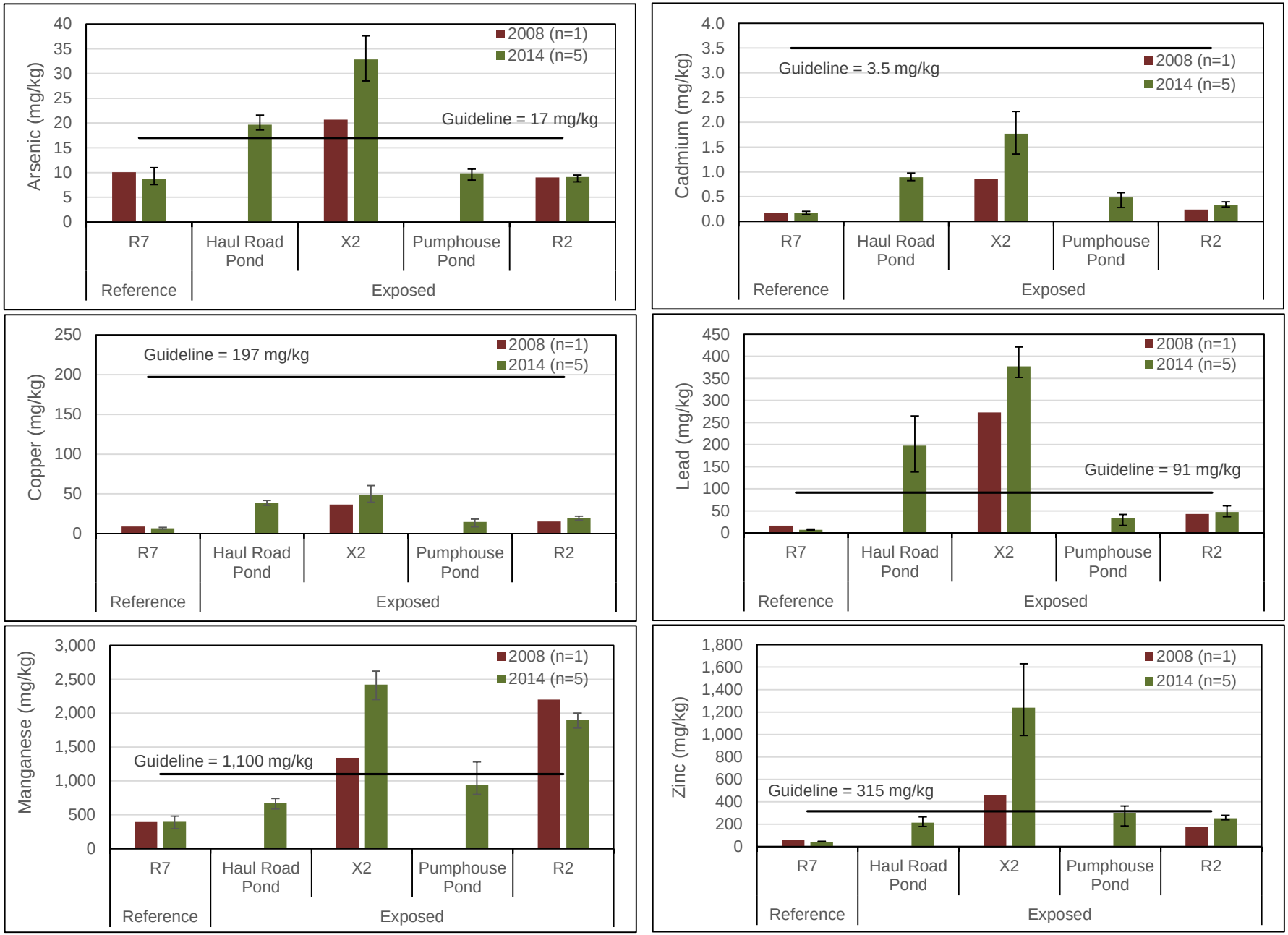


Figure 5.2: Temporal comparison of mean (± minimum and maximum) sediment metal concentrations for mine-related variables relative to Canadian Sediment Quality Guideline Probable Effect Levels at stations in the vicinity of the Faro Mine. 2008 data from Minnow (2010).

Sediment Toxicity

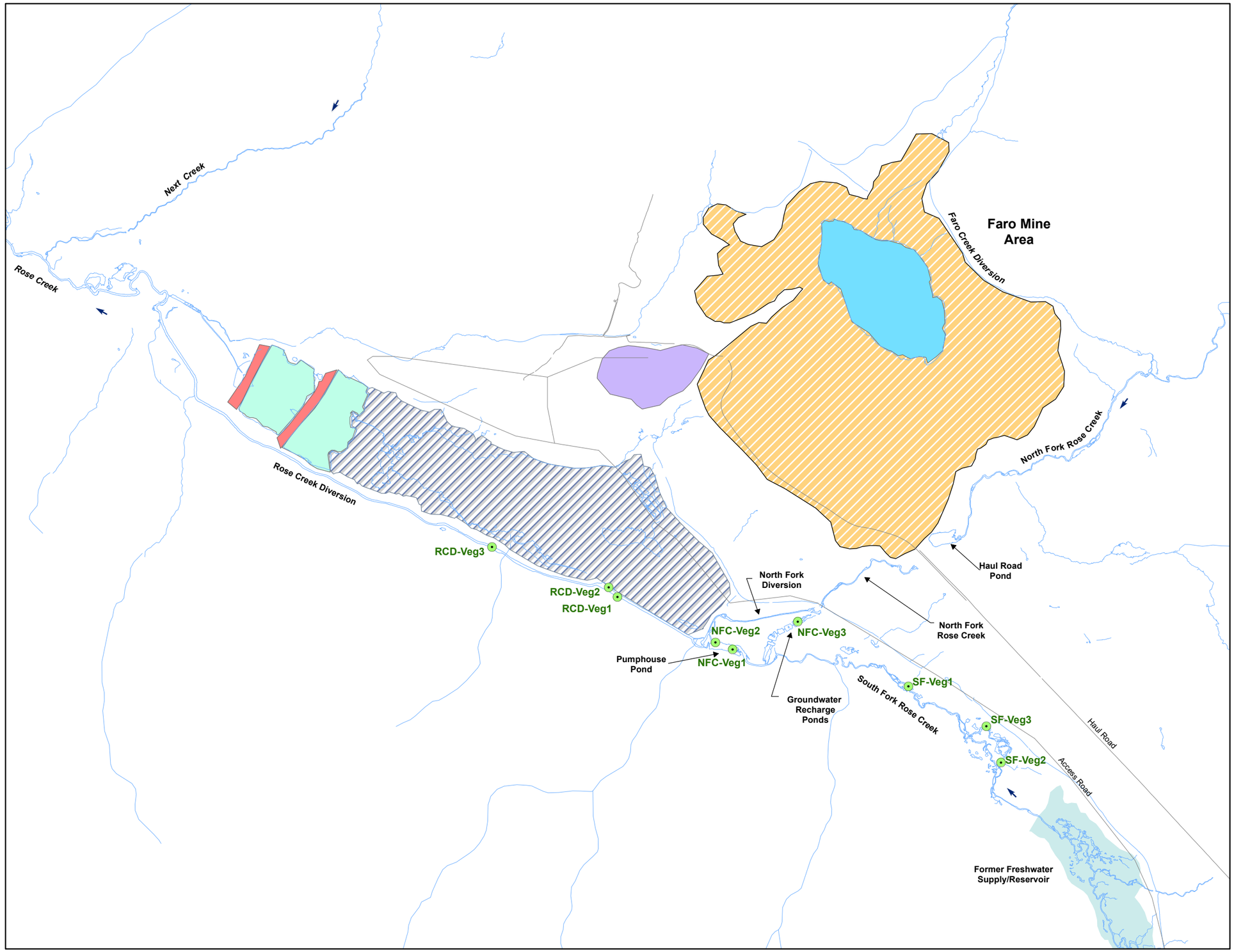
In laboratory toxicity tests, survival of *Hyalella azteca* was high for all samples (Table 5.2). Growth (dry weight) of *Hyalella* in sediments collected from mine-exposed areas was comparable to or higher than for the reference area (R7) sediment (Table 5.2). Survival of *Chironomus dilutus* was slightly lower, though not significantly different, for the sample collected downstream from the RCTA (R2) compared to the other samples (Table 5.2). Similar to *Hyalella*, growth of *Chironomus* exposed to sediments collected at mine-exposed stations was similar to or greater than for the reference area sediment (R7) (Table 5.2). Overall, the data provided no evidence of mine-related sediment toxicity.

Table 5.2: Sediment toxicity test results (mean ± SD) for samples collected near the Faro Mine, August 2014. Bold font indicates the test result was significantly different from that of the R7 reference sample (See Appendix Table B.4 for p-values).

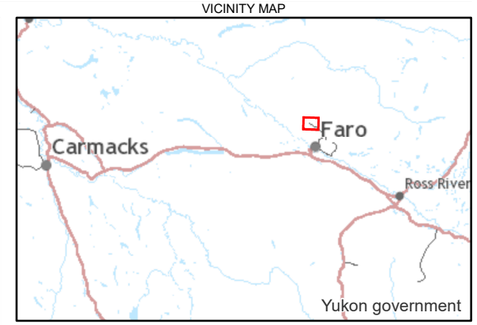
Sample		*Hyalella azteca*		*Chironomus dilutus*	
		Survival (%)	**Dry Weight (mg)**	**Survival (%)**	**Dry Weight (mg)**
Laboratory Control		96 (±5.5)	0.12 (±0.01)	92 (±8.4)	2.04 (±0.16)
NFRC - Reference (R7)		84 (±15.2)	0.05 (±0.02)	82 (±14.8)	2.29 (±0.37)
Mine-Exposed	NFRC - Haul Road Pond	98 (±4.5)	**0.12 (±0.01)**	80 (±7.1)	**2.80 (±0.26)**
	NFRC - Downstream from Haul Road (X2)	88 (±13.0)	0.07 (±0.03)	88 (±16.4)	2.58 (±0.47)
	Pumphouse Pond	98 (±4.5)	**0.09 (±0.03)**	78 (±8.4)	2.64 (±0.42)
	Rose Creek Downstream from RCTA (R2)	88 (±4.5)	**0.11 (±0.03)**	64 (±18.2)	2.46 (±0.25)

6.0 AQUATIC MACROPHYTES

Macrophytes were collected from three locations in the vicinity of the Faro Mine Area, including the ponds on SFRC downstream from the former Freshwater Supply Reservoir area, the Pumphouse and Groundwater Recharge Ponds (NFC), and the Rose Creek Diversion (Figure 6.1). Plant species collected included *Cladophora sp.* (mermaid hair), *Chara sp.*, *Potomogeton sp*., and *Myriophyllum sp*. (water milfoil). Metal concentrations in vegetation from the SFRC ponds were generally the lowest among each of the areas sampled (Table 6.1). Concentrations of nearly all metals were higher in the NFC and RCD areas, with several metals having concentrations greater than 1,000 times those observed in the SFRC, including cadmium, lead, mercury, and zinc (Table 6.1). Interpretation of the data with respect to potential effects on wildlife consumers was beyond the scope of this study.



VICINITY MAP



LEGEND

- Aquatic Macrophyte Tissue Sample Location
- Water Flow Direction

Mine Infrastructure:

- Open Pit
- Rock Dump
- Impoundment Area
- Tailings Pond
- Dam
- Mill Area

* Mine Infrastructure and base data provided by CH2M Hill.

N

0 0.5 1 km

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FIGURE 6.1

Aquatic Macrophyte Tissue Sample Collection Locations.

Project: 2531 Date: February 2016

Table 6.1: Aquatic macrophyte mean[a] tissue metal concentrations (dry weight) from samples collected in the vicinity of the Faro Mine, August 2014.

Analyte		Units	South Fork Rose Creek (SF)	North Fork Groundwater Recharge Ponds and Pumphouse Pond (NFC)	Rose Creek Diversion (RCD)
Moisture		%	79.1	81.2	82.5
ICP-Metals	Aluminum (Al)	mg/kg	2,328	10,140	9,520
	Antimony (Sb)	mg/kg	0.081	0.134	0.216
	Arsenic (As)	mg/kg	21.05	15.18	17.87
	Barium (Ba)	mg/kg	346	322	280
	Beryllium (Be)	mg/kg	0.156	0.713	0.566
	Bismuth (Bi)	mg/kg	0.053	0.339	0.289
	Boron (B)	mg/kg	4.7	19.4	16.5
	Cadmium (Cd)	mg/kg	0.22	5.51	2.39
	Calcium (Ca)	mg/kg	87,433	35,420	12,033
	Cesium (Cs)	mg/kg	0.48	2.28	2.10
	Chromium (Cr)	mg/kg	5.5	22.7	29.0
	Cobalt (Co)	mg/kg	5.0	28.4	17.7
	Copper (Cu)	mg/kg	5.9	21.6	27.3
	Iron (Fe)	mg/kg	20,065	19,117	21,050
	Lead (Pb)	mg/kg	6.8	104.9	92.2
	Lithium (Li)	mg/kg	3.9	15.9	17.1
	Magnesium (Mg)	mg/kg	4,477	4,697	5,520
	Manganese (Mn)	mg/kg	6,027	3,137	2,063
	Mercury (Hg)	mg/kg	0.013	0.159	0.121
	Molybdenum (Mo)	mg/kg	0.43	1.09	1.85
	Nickel (Ni)	mg/kg	7.3	27.0	29.2
	Phosphorus (P)	mg/kg	1,787	2,073	2,527
	Potassium (K)	mg/kg	11,170	11,453	19,210
	Rubidium (Rb)	mg/kg	9.7	22.8	24.8
	Selenium (Se)	mg/kg	0.61	1.30	0.77
	Sodium (Na)	mg/kg	1,521	1,401	2,327
	Strontium (Sr)	mg/kg	387	123	68
	Tellurium (Te)	mg/kg	0.033	0.036	0.020
	Thallium (Tl)	mg/kg	0.065	0.236	0.246
	Tin (Sn)	mg/kg	0.17	0.53	0.28
	Uranium (U)	mg/kg	1.40	2.68	2.16
	Vanadium (V)	mg/kg	6.2	28.3	28.6
	Zinc (Zn)	mg/kg	36	1,728	950
	Zirconium (Zr)	mg/kg	0.72	3.96	3.24

[a] Mean of 3 samples. Data for replicate samples presented in Appendix Table B.5.

7.0 PERIPHYTON

Periphyton samples were collected from 17 mine-exposed areas and 22 reference areas for assessment of community characteristics and biomass (Figures 2.2 and 2.3). AFDM, chlorophyll-a content, and tissue metal concentrations were assessed in periphyton samples collected in the reaches studied in detail around the Faro Mine Area (Figure 2.1).

7.1 Community

7.1.1 General Characteristics

Reference area periphyton communities were dominated by either cyanophytes (blue-green algae) or diatoms ("hard" algae) (Figure 7.1). Mine-exposed areas were all diatom-dominated with the exception of the minimally influenced area Grum, which was cyanophyte dominated (Figure 7.1). Overall, the relative proportions of major groups (Figure 7.1) and dominant taxa (Figure 7.2) varied considerably among both reference and exposed areas. While also common among many reference areas, all mine-exposed areas were dominated by the diatom *Achnanthes minutissima*, with the exception of the minimally influenced area Grum, which was dominated by the cyanophyte *Heteroleibeinia profunda* (Figure 7.2).

Nonmetric multidimensional scaling (NMS) of reference areas separated communities mainly along Axis-1 (which explained 52.3% of the variance) based on relative abundance of cyanophyte *Chamaesiphon incrustans* (positive axis scores) versus areas with high abundance of *A. minutissima* and/or *Diatom vulgare* (negative axis score), among others (Figure 7.3a). The second axis (NMS-2) represented relatively less community variation (15.6%) and separated reference areas having higher abundance of *H. profunda* (negative values; Figure 7.3a). Indirect correlation of one hundred and twelve supporting habitat variables (Appendix Table D.6) with NMS area scores identified that reference areas with positive Axis-1 scores tended to have larger proportion of their watershed composed of herbaceous land cover (Figure 7.3b). Negative values along NMS-1 represented areas with longer main stem channel length, and higher levels of water pH, alkalinity, specific conductance, and/or some metals (barium, calcium, strontium). Negative NMS-2 axis values identified reference areas having higher magnesium, nickel, selenium, strontium, cadmium, specific conductance, hardness, and/or total dissolved solids (Figure 7.3b). While variation in community composition was observed among the reference areas, none were considered to be outliers.

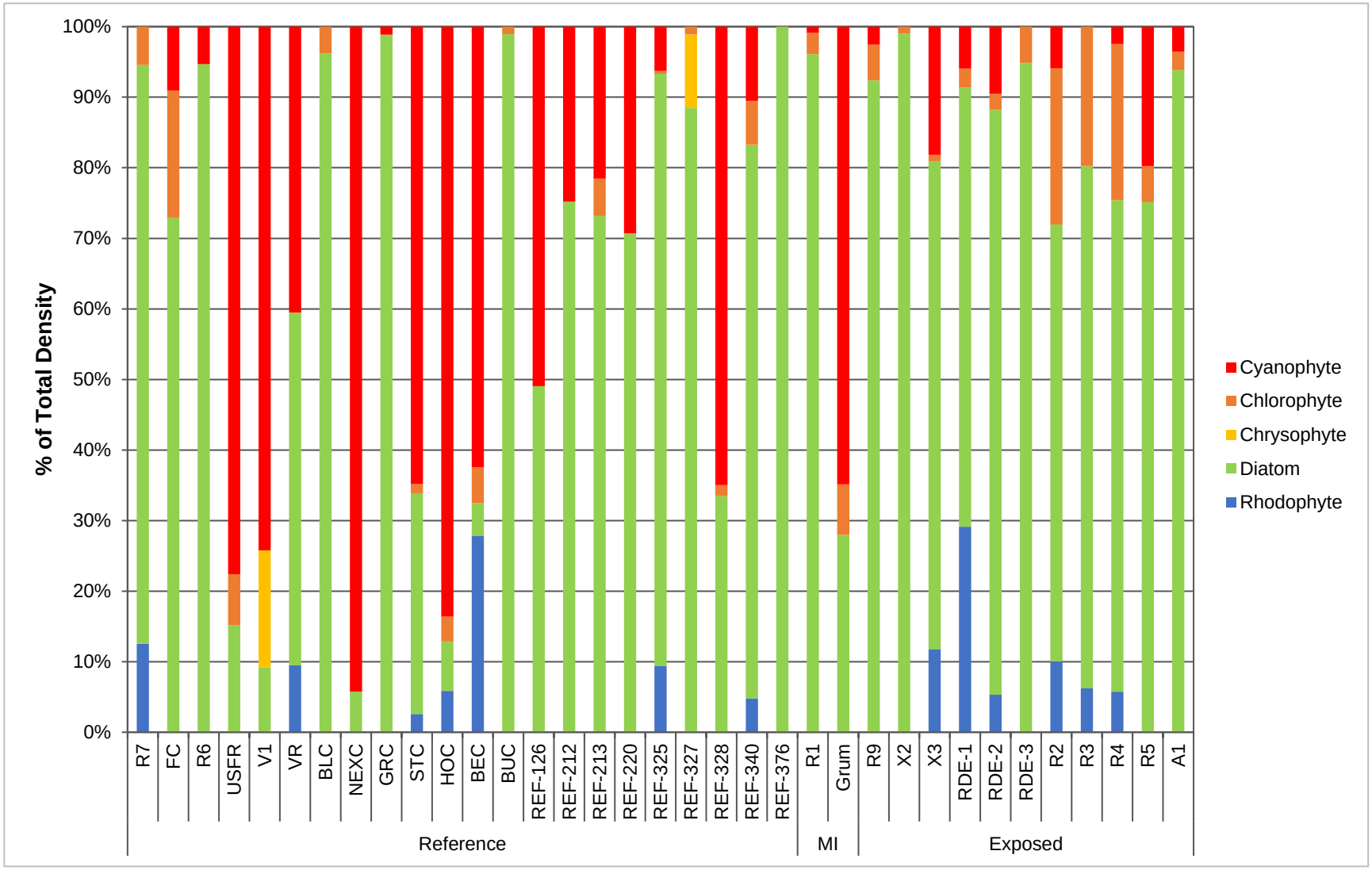


Figure 7.1: Relative abundance of major periphyton groups at individual reference (n = 22), minimally influenced (MI; n = 2), and exposed (n = 11) areas near Faro Mine, August 2014.

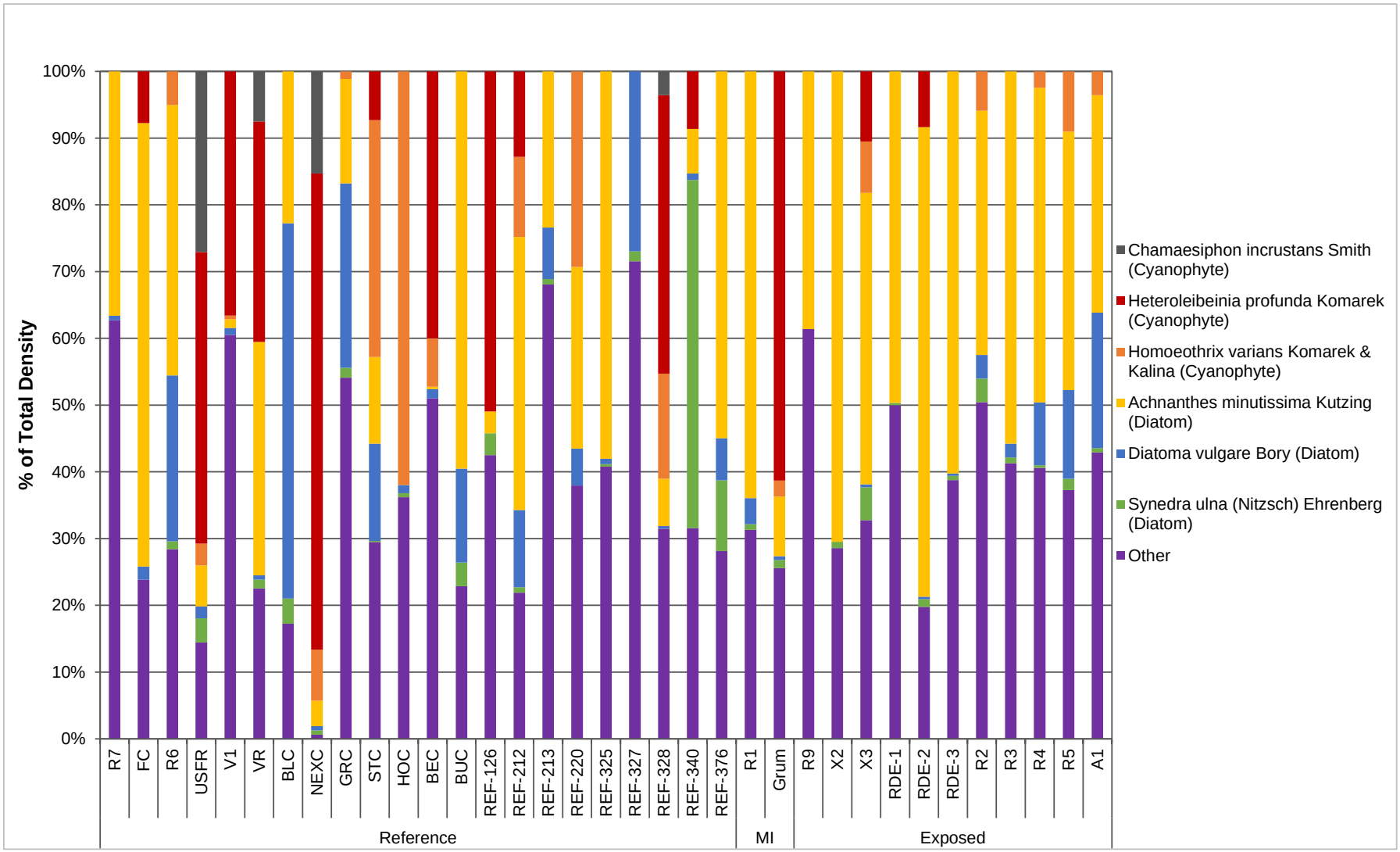


Figure 7.2: Relative abundance of dominant periphyton taxa at individual reference (n = 22), minimally influenced (MI; n = 2), and exposed (n = 11) areas near Faro Mine. Only taxa comprising at least 40% of the total number of individuals at one or more stations are depicted individually.

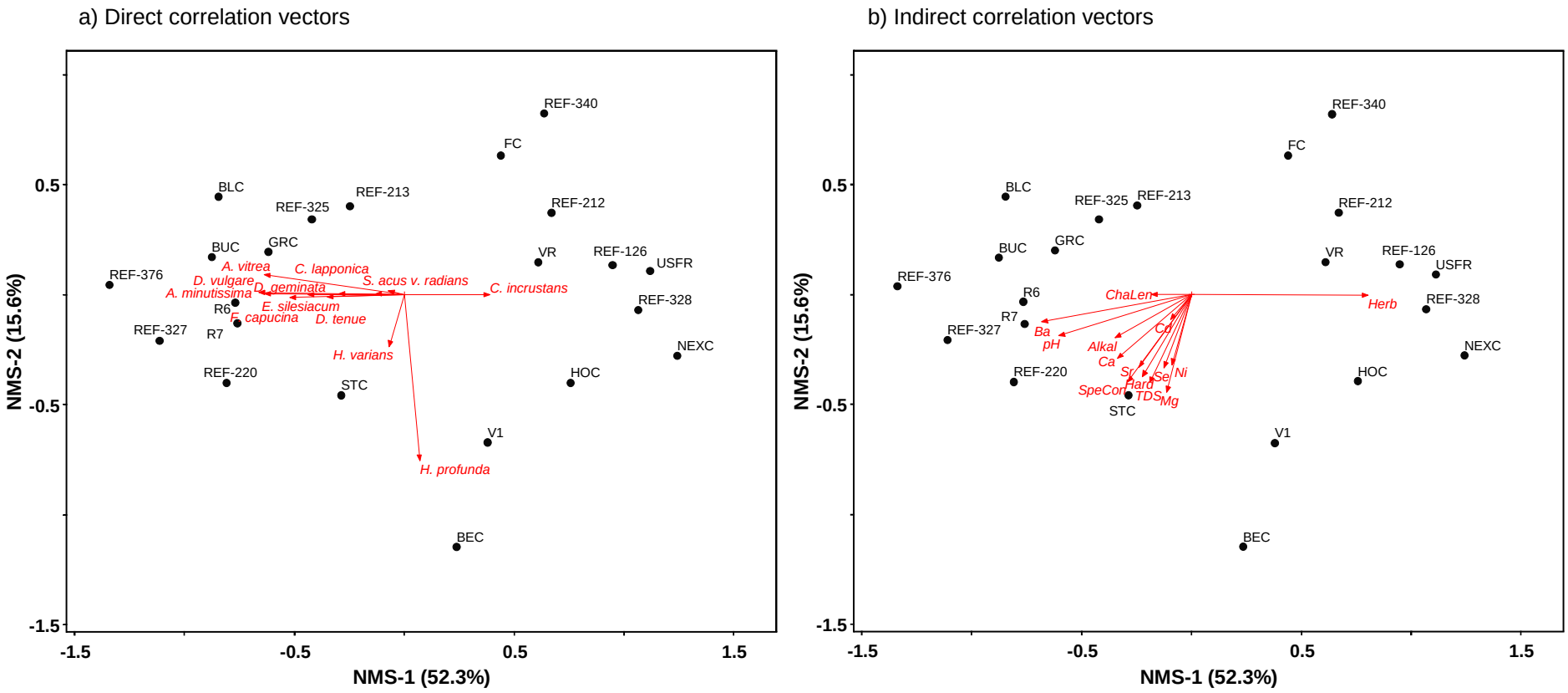


Figure 7.3: Nonmetric multidimensional scaling (NMS) biplot of periphyton community structure at 22 reference areas. Lowest practical level of taxonomy was employed excluding taxa that were not found in more than one area. Panel a) displays direct correlation vectors for taxa with area axis scores, panel b) displays indirect correlation vectors for environmental variables with area axis scores (see Appendix Table D.6 for list and descriptions of all variables). Displayed vectors have significant ($p < 0.05$) absolute Spearman correlation coefficient (r) greater than 0.50 with either NMS axis-1 or axis-2; vector length is proportional to correlation strength. A stable 3-dimensional solution was found with stress of 8.58.

NMS of reference and mine-exposed areas together reflected a similar pattern to that of the ordination for reference areas only, a separation between areas having communities with higher abundance of either *C. incrustans* (negative axis score) or *A. minutissima* (positive axis score) along NMS-1 (60.8% of explained variation; Figure 7.4a). With the exception of minimally influenced Grum, no mine-exposed areas ordinated toward higher relative abundance of *C. incrustans*, while *A. minutissima* was found at all exposed areas and all but two reference areas (HOC and REF-327; Appendix Tables D.2 and D.3). Similarly, NMS-2 (16.5% of explained variation) separated areas between those that had high (negative axis score) or low (positive axis score) abundance of *H. profunda* (Figure 7.4a).

Indirect correlation identified area elevation and six water quality variables as predictors of community structure (Figure 7.4b). Areas having higher elevation had negative scores for both NMS-1 and -2 axes. Areas having higher barium concentration had positive scores for both NMS-1 and -2 axes. Positive NMS-2 scores were also associated with higher molybdenum concentration, while areas having positive NMS-1 and negative NMS-2 axis values tended to have higher concentration of zinc, iron, manganese, and/or higher percent dissolved oxygen (Figure 7.4b).

7.1.2 Statistical Comparisons of Mine-Exposed to Reference Communities

Individual reference areas had up to two community endpoints that were significantly outside of the overall reference condition (ncP<0.05), and most reference areas had at least one and as many as three endpoints that were uncertain with respect to being inside or outside of the reference condition (ncP between 0.05 and 0.95; Table 7.1). Five of the mine-exposed areas (Grum, X2, RDE-2, R5, A1) had fewer community endpoints that were statistically different or uncertain relative to the reference condition than was observed among the individual reference areas and were thus concluded to be unaffected by mining (Table 7.1). Community endpoint values for these mine-exposed areas were also within the range of values observed among reference areas (i.e., between minimum and maximum; Table 7.1).

Five mine-exposed areas had more than two community endpoints that were significantly outside of the overall reference condition (ncP<0.05) or at least three endpoints that were uncertain with respect to being inside or outside of the reference condition (ncP between 0.05 and 0.95): R1, R9, X3, and RDE-1 and -3 (Table 7.1). An additional three mine-exposed areas (R2, R3, and R4) had one or more community endpoint values outside of the range(s) observed among the reference areas. These eight areas were identified as needing more investigation.

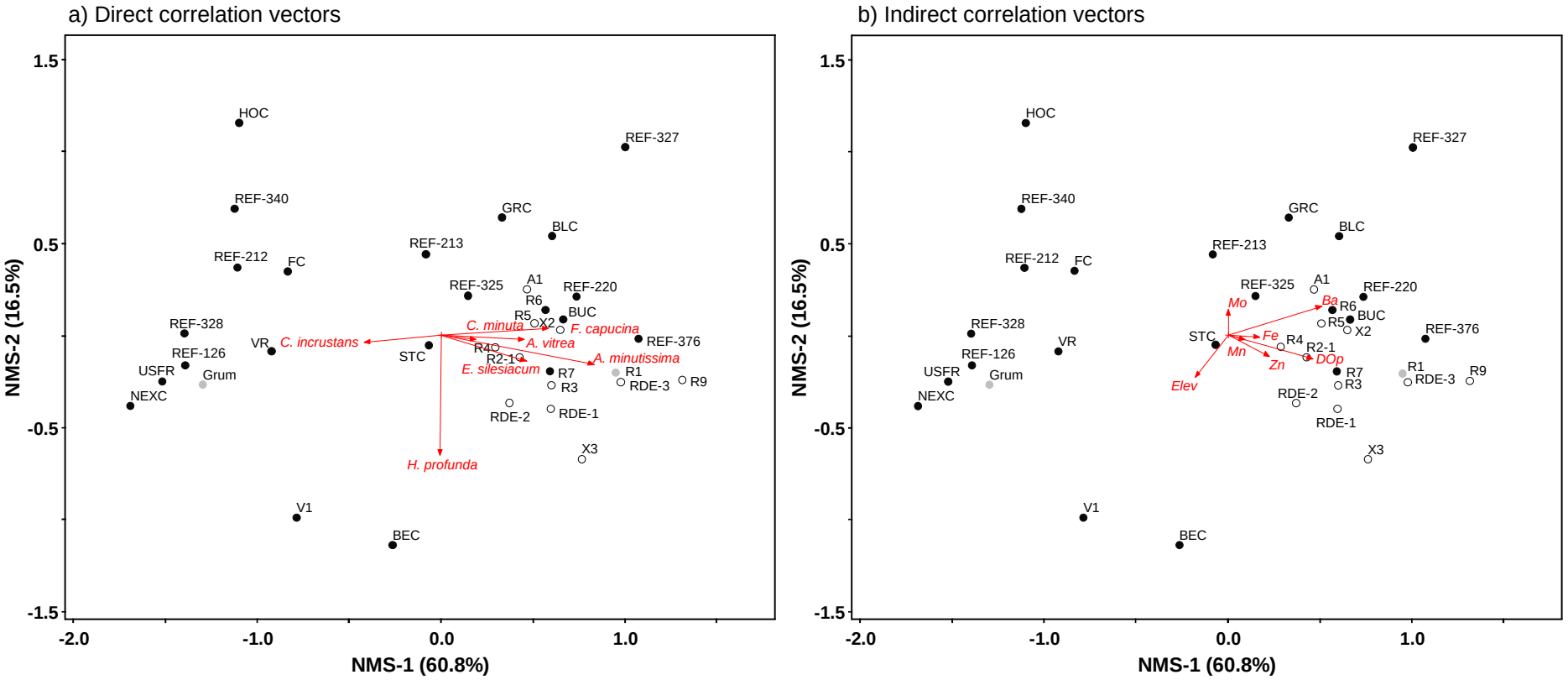


Figure 7.4: Nonmetric multidimensional scaling biplot of periphyton community structure at 22 reference (black circle), 11 exposed (white circle), and 2 minimally influenced areas (grey circle). Lowest practical level of taxonomy was employed excluding taxa that were not found in more than one area. Panel a) displays direct correlation vectors for taxa with area axis scores, panel b) displays indirect correlation vectors for environmental variables with area axis scores (see Appendix Table D.6 for list and descriptions of all variables). Displayed vectors have significant ($p < 0.05$) absolute Spearman correlation coefficient (r) greater than 0.50 with either NMS axis-1 or axis-2; vector length is proportional to correlation strength. A stable 2-dimensional solution was found with stress of 13.96.

Table 7.1: Peripyton community characteristics at reference and mine-exposed areas, August 2014. Orange highlight indicates values outside of the range represented by 90% of reference area values (non-central p-values ≤ 0.05). Yellow highlight indicates values that are uncertain with respect to being in the reference range (non-central p-values between 0.05 and 0.95).

Area Type	Endpoint Type	Lowest Practical Level (LPL) Richness	Total Density (# of cells/m^2)	Dominant Taxa (# of cells/m^2)			Major Groups (# of cells/m^2)			Community Structure		Evaluation		Community unaffected (<2 endpoints p<0.05 and <3 endpoints with 0.05<p<0.95) or needs more investigation	Conclusion
	Endpoint			*A. minutissima* (Diatom)	*D. vulgare* (Diatom)	*S. ulna* (Diatom)	Cyanophyte	Chlorophyte	Diatom	NMS-1[a]	NMS-2[a]	Tally of Endpoints			
	Transformation / Area ID	Log$_e$ (Back Transformed)	Square root (Back Transformed)	Square root (Back Transformed)		Untransformed		Square root (Back Transformed)	Log$_e$ (Back Transformed)	Untransformed		p < 0.05	0.05 < p < 0.95		
Reference	R7	15	63,523	23,256	431	0	0	3,445	52,110	0.99	1.00	0	1	not applicable	not applicable
	BEC	13	62,461	230	861	0	37,252	5,599	3,029	1.00	0.00	2	1		
	BLC	18	62,446	14,212	35,099	2,369	0	2,369	60,078	0.98	0.99	1	1		
	BUC	18	61,154	36,391	8,613	2,153	0	646	60,508	0.97	1.00	0	1		
	FC	8	4,450	2,957	86	0	402	804	3,244	1.00	0.68	0	2		
	GRC	12	46,167	7,235	12,748	689	517	0	45,650	1.00	1.00	0	0		
	HOC	9	4,680	0	57	29	4,106	172	115	1.00	1.00	0	2		
	NEXC	7	4,508	172	29	29	4,249	0	258	0.52	1.00	0	3		
	R6	19	72,782	29,500	18,088	861	3,876	0	68,906	0.99	1.00	0	2		
	REF-126	10	3,070	100	0	100	1,563	0	1,506	0.93	1.00	0	1		
	REF-212	16	3,124	1,278	361	26	775	0	2,350	1.00	1.00	0	0		
	REF-213	22	21,172	4,949	1,635	172	4,561	1,119	15,491	1.00	1.00	0	1		
	REF-220	11	99,318	27,024	5,508	0	29,090	0	70,228	0.99	1.00	0	2		
	REF-325	21	21,946	12,737	172	86	1,377	86	18,418	1.00	1.00	0	1		
	REF-327	12	92,605	0	24,959	1,377	0	1,033	81,933	0.74	1.00	0	3		
	REF-328	14	4,231	300	17	0	2,749	67	1,416	0.81	1.00	0	1		
	REF-340	19	5,139	344	49	2,680	541	320	4,033	1.00	0.17	0	2		
	REF-376	11	173,414	95,320	10,910	18,375	0	0	173,414	0.36	1.00	2	3		
	STC	14	63,722	8,262	9,295	103	41,311	826	19,932	1.00	0.98	1	0		
	USFR	14	4,768	293	86	172	3,701	344	723	0.74	1.00	0	2		
	V1	12	32,704	430	344	0	24,270	0	3,012	1.00	0.55	0	2		
	VR	16	7,524	2,631	49	98	3,049	0	3,762	1.00	1.00	0	0		
MI[b]	R1	17	158,738	101,454	6,211	1,380	1,380	4,831	152,527	0.74	1.00	2	3	More investigation	Potentially affected
	Grum	18	4,823	431	29	57	3,129	345	1,349	0.94	1.00	0	1	Unaffected	-
Exposed	R9	16	272,179	105,082	0	0	6,891	13,781	251,507	0.29	1.00	3	2	More investigation	Potentially affected
	X2	14	45,220	31,869	0	431	0	431	44,789	0.99	1.00	0	1	Unaffected	-
	X3	17	268,160	117,140	1,148	13,207	48,808	2,297	185,472	0.99	0.28	4	3	More investigation	Potentially affected
	RDE-1	16	86,707	43,066	0	287	5,168	2,297	53,976	1.00	0.76	0	3	More investigation	Potentially affected
	RDE-2	20	75,510	53,115	287	861	7,178	1,723	62,590	1.00	0.97	0	2	Unaffected	-
	RDE-3	18	134,367	80,965	431	861	0	6,891	127,476	0.80	0.99	2	3	More investigation	Potentially affected
	R2	18	72,997	26,701	2,584	2,584	4,307	16,150	45,220	1.00	1.00	1	0	More investigation	Potentially affected
	R3	19	72,997	40,698	1,507	646	0	14,427	54,048	0.99	1.00	1	2	More investigation	Potentially affected
	R4	19	42,033	19,811	3,962	172	1,034	9,302	29,285	1.00	1.00	1	1	More investigation	Potentially affected
	R5	18	76,227	29,500	10,121	1,292	15,073	3,876	57,278	1.00	1.00	0	1	Unaffected	-
	A1	19	53,402	17,399	10,853	345	1,895	1,378	50,129	1.00	1.00	0	1	Unaffected	-

[a] Non-central p-values presented for nonmetric multidimensional scaling axes because actual axis scores are specific to the group of areas included in the data set (i.e., different ordination for each mine-exposed area) and thus not comparable among areas.

[b] Minimally influenced

Areas Investigated Further

Of areas flagged for 'more investigation' of periphyton community health, R9, X3 (NFRC), R1 (SFRC), and RDE-3 (Rose Creek Diversion) showed a general pattern of higher densities of total cells, *A. minutissima*, and chlorophytes (Tables 7.1 and 7.2). Elevated total cell densities, where they occurred, were mainly attributable to high densities of *A. minutissima* (Appendix Tables D.2 and D.3). *Achnanthes*, especially *A. minutissima*, has previously been reported as the dominant diatom in streams affected by mining (Deniseger et al. 1986; Hill et al. 2000; Luis et al. 2009; Verb and Vis 2000) and is tolerant of a wide variety of environmental conditions (Ponader and Potapova 2007). *A. minutissima* has been observed in higher relative abundance in areas with elevated levels of copper, lead, and zinc (Yoshiaki et al. 2004). As a result, its presence is sometimes considered indicative of disturbed conditions (Sabater et al. 1998; Sabater 2000).

Areas farther downstream from the Faro Mine Area (R2, R3, and R4) had total cell densities and *A. minutissima* cell densities within the ranges observed at reference areas, but continued to have significantly higher chlorophyte cell densities than reference areas (Tables 7.1 and 7.2). Elevated chlorophyte densities at R1 to R4 were mainly or solely attributable to the genus *Stigeoclonium* sp., whereas *Ulothrix zonata* was the only chlorophyte found at R9 and RDE-3 (Table 7.2, Appendix Tables D.2 and D.3). The genus *Stigeoclonium* is ubiquitous in fast flowing waters but can be abundant in water with elevated concentrations of heavy metals (Wehr and Sheath 2003). *U. zonata* is reportedly sensitive to zinc at concentrations exceeding 0.1 mg/L (Say and Whitton 1981), but concentrations well above 0.1 mg/L were observed in some streams around the Faro Mine Area in late 2013 and early 2014, including the Rose Creek Diversion (X10 in Figure 4.3) near RDE-3 where this species was abundant.

The high density of cyanophytes at X3 was due to abundant *H. profunda* and *Homoeothrix varians* (Appendix Table D.3). Information regarding the environmental tolerance of these species is lacking in the literature, but similar densities of one or other species were observed at reference areas (e.g., STC, BEC, REF-220; Appendix Table D.2).

Also, NMS ordinations identified relatively high densities of the chlorophyte *Didymosphenia geminata* in two areas near the Faro Mine located upstream from most mine-related disturbances (R1, R9) and at reference area REF-376 (Table 7.2, Appendix Tables D.2 and D.3, Appendix Figures D.3 and D.4). This species is likely native to the Yukon, as its range occurs in mountainous areas within the circumboreal region, however it can proliferate into nuisance blooms that can have negative impacts on benthic invertebrates and fish (Blanco and Ector 2009). The rhodophyte *Audouinella* sp. also contributed to separation of

Table 7.2: Evaluation of periphyton communities at mine-exposed areas designated as needing more investigation, Faro Mine Aquatic Baseline, August 2014.

Stream	Area ID	Total Density	*Achnanthes minutissima* Density	Chlorophyte Density	NMS Ordination	Other Observations
South Fork Rose Creek	R1	Higher than at all but one reference area, 64% was *Achnanthes minutissima*	Greater than at all reference areas	Greater than at most reference areas. Solely *Stigeoclonium* sp. (4,831 cells/m^2), which was also found at one-third of reference areas (e.g., 4,953 cells/m^2 at BEC)	Relatively high density of chlorophyte *Didymosphenia geminata* (11,043 cells/m^2)	Located upstream of most mine-related disturbances
North Fork Rose Creek	R9	Greatest of all reference and mine-exposed areas sampled, 40% was *Achnanthes minutissima*	Greater than at all reference areas	Greater than at all reference areas. Solely *Ulothrix zonata*	Greater density of chlorophyte *Didymosphenia geminata* (20,672 cells/m^2) than all other areas (but also 17,801 cells/m^2 at REF-376)	Greatest or second greatest abundance of total cell density, Achnanthes minutissima, and *Didymospenia geminta* compared to all other area, despite minimal mine-related influence on water quality (Table 4.3)
	X3	Greater than at all reference areas, 44% was *Achnanthes minutissima*	Greater than at all reference areas	Unremarkable (*Closteriopsis* sp. and *Mougeotia* sp.)	Greatest density of rhodophyte *Audouinella* sp. (31,582 cells/m^2) among reference and mine-exposed areas	Greatest density of diatom *Synedra ulna* (13,207 cells/m^2) of all reference and mine-exposed areas except REF-376 (18,375 cells/m^2)
Rose Creek Diversion	RDE-1	Within reference condition	Moderate density	Unremarkable (*Stigeoclonium* sp. and *Cosmarium* sp.)	High density of rhodophyte *Audouinella* sp. (25,266 cells/m^2)	Community did not closely resemble those at upstream areas R1 or X3, nor was it clearly a hybrid of the upstream communities
	RDE-3	Greater than at most reference areas, 60% was *Achnanthes minutissima*	Greater than at most reference areas	Greater than at all reference areas. Solely *Ulothrix zonata*	Relative high density of *Encyonema silesiacum* (17,227 cells/m^2), which was also found at R1, R9, and X3 at densities >11,000 cells/m^2	-
Rose Creek Downstream Faro Mine Area	R2	Within reference condition	Moderate density	Greater than at all reference areas. Mainly *Stigeoclonium* sp. (13,135 cells/m^2)	Well within reference area ordination space	-
	R3	Within reference condition	Within reference condition	Greater than at all reference areas. Soley *Stigeoclonium* sp. (14,427 cells/m^2)	Well within reference area ordination space	-
	R4	Within reference condition	Within reference condition	Greater than at all reference areas. Mainly *Stigeoclonium* sp. (9,130 cells/m^2)	Well within reference area ordination space	-

communities at X3 and RDE-1 from reference communities in NMS ordinations (Appendix Figures D.5 and D.6). No information was found about the relative tolerance of this species to environmental disturbances, but rhodophtyes in general are often found in mildly acidic waters of pH 6-7 (Wehr and Sheath 2003).

The diatom *Synedra ulna*, which was found at relatively high density at X3, was also present at many of the reference areas and had highest cell density at reference area REF-376 (Table 7.1 and Appendix Tables D.2 and D.3). *S. ulna* has been reported as both sensitive to (Say and Whitton 1981) and tolerant of (Austin and Munteanu 1984) metals, so little can be concluded from its relative abundance among areas.

Overall, the pattern of data in Table 7.1 was suggestive of a mine-related influence on periphyton communities around the Faro Mine Area, with diminishing effects farther downstream in Anvil Creek (e.g., R5, A1). However, detailed evaluation showed lack of spatial corroboration of specific results that would be consistent with a mine-related water quality effect. For example, there were no effects to periphyton communities observed at mine-exposed areas X2 or RDE-2, even though communities both upstream and downstream of these areas had some characteristics that were outside of the reference condition. Also, the magnitude of periphyton community deviation from the reference condition did not correspond with the degree of mine-related influence on water quality data. For example, periphyton community characteristics at R9 were among the most different from reference communities, but median concentrations of zinc and other mine-related variables in water that were comparable to those observed at reference areas (Table 4.3). Pearson correlations involving water quality PCA axis results (Section 4.4) and periphyton community endpoints did not result in any significant correlations at a Bonferroni-adjusted p-value of 0.002 and revealed only two weak correlations (r of 0.40 and 0.34) at an unadjusted p-value of 0.05 (Appendix Table D.22). These results provided further indication that differences in periphyton communities among areas cannot be explained solely on the basis of differences in water quality. Therefore, in the absence of strong weight-of-evidence for either mine-related effect, or lack thereof, most of the periphyton communities in the immediate vicinity of the Faro Mine Area were concluded to be potentially affected by general mine-related disturbances.

7.2 Productivity

Periphyton AFDM and chlorophyll-a measurements were variable with no obvious pattern to indicate periphyton productivity is affected by mine influence on water quality (Figure 7.5

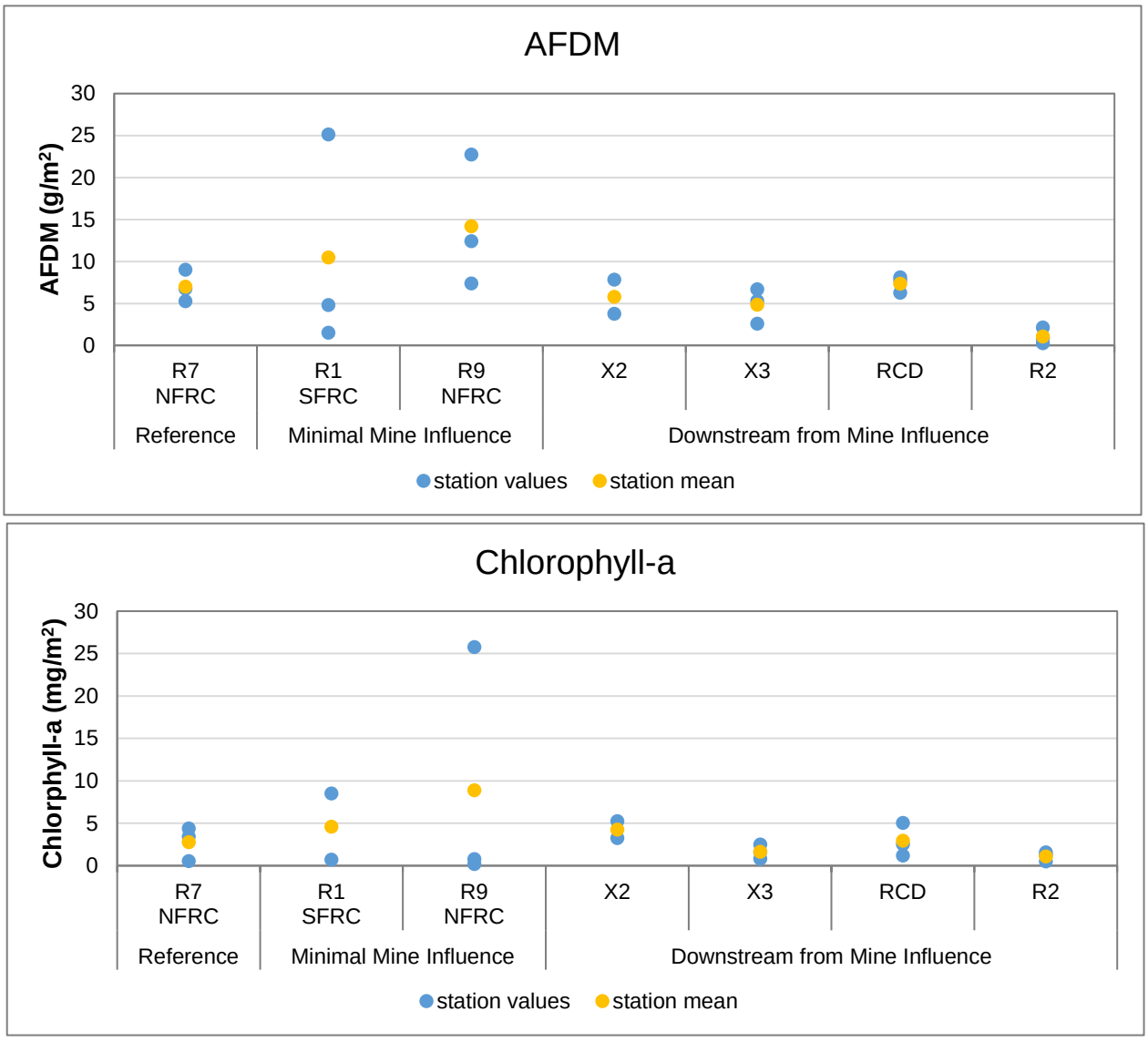


Figure 7.5: Periphyton ash free dry mass (AFDM) and chlorophyll-a densities at areas near the Faro Mine, August 2014.

and Appendix Table D.23). Chlorophyll-a measurements were all well below the BC MOE guideline of 100 mg/m^2 (BCMOE 2001).

7.3 Tissue Concentrations

Periphyton tissue was collected for analysis of metal concentrations and is presented in Table 7.3 and Appendix Table D.24. Tissue concentrations of some metals, most notably cadmium, cobalt, and zinc, were higher at mine-exposed areas (Table 7.3). However, as noted in Section 7.1, the evidence for mine-related effect on periphyton community characteristics was conflicting.

Table 7.3: Mean[a] metal concentrations (mg/kg dw) in periphyton tissue, Faro Mine Aquatic Baseline, August 2014.

Analyte	Reference	Minimally Influenced	Exposed				
	North Fork Rose Creek Reference (R7)	South Fork Rose Creek (R1)	North Fork Rose Creek upstream from Haul Road (R9)	North Fork Rose Creek downstream from Haul Road (X2)	Rose Creek Pumphouse Pond Outlet (X3)	Rose Creek Diversion (RDE)	Rose Creek Downstream from Rose Creek Tailings Area (R2)
Aluminum (Al)	12,467	11,967	15,667	19,250	12,667	10,827	8,627
Antimony (Sb)	0.027	0.011	0.032	0.012	0.059	0.042	0.060
Arsenic (As)	20.0	15.5	26.3	27.5	56.1	40.3	26.5
Barium (Ba)	423	671	342	511	1875	1259	1620
Beryllium (Be)	0.668	0.675	0.765	1.088	0.998	0.822	0.563
Bismuth (Bi)	0.247	0.196	0.339	7.899	0.389	0.274	0.175
Boron (B)	8.77	13.02	44.60	5.76	6.89	5.94	7.50
Cadmium (Cd)	0.926	0.900	0.592	3.475	18.280	8.307	3.530
Calcium (Ca)	10,823	8,977	15,500	7,940	12,207	11,877	13,733
Cesium (Cs)	1.99	1.97	2.72	3.10	1.99	1.77	1.19
Chromium (Cr)	24.6	29.5	32.4	45.6	30.6	59.8	41.7
Cobalt (Co)	10.3	17.3	9.8	61.6	350.3	129.4	158.3
Copper (Cu)	14.1	12.4	20.1	30.9	29.1	26.9	29.0
Gallium (Ga)	4.82	5.08	5.34	7.28	7.26	4.88	5.56
Iron (Fe)	25,400	25,017	30,600	41,900	49,633	61,900	59,500
Lead (Pb)	9.94	16.83	78.20	350.50	200.57	123.10	130.20
Lithium (Li)	23.7	21.9	27.6	34.4	19.7	16.6	13.8
Magnesium (Mg)	4,020	4,607	4,943	6,505	4,810	6,120	5,130
Manganese (Mn)	5,383	12,435	2,360	5,655	60,667	25,783	68,100
Mercury (Hg)	0.0316	0.0234	0.0741	0.1840	0.1299	0.0777	0.0543
Molybdenum (Mo)	1.057	0.822	1.133	1.028	6.697	2.423	4.543
Nickel (Ni)	21.3	36.7	23.6	46.8	112.8	132.1	106.1
Phosphorus (P)	1,753	848	1,347	1,113	1,317	897	737
Potassium (K)	3,900	1,755	4,060	3,808	3,550	2,843	1,897
Rhenium (Re)	0.00085	0.00120	0.00106	0.00101	0.00087	0.00064	0.00048
Rubidium (Rb)	22.6	15.7	27.1	28.4	21.2	15.2	10.0
Selenium (Se)	3.28	2.89	3.49	4.23	5.78	3.87	3.03
Silver (Ag)	0.241	0.079	0.259	0.420	0.313	0.178	0.169
Sodium (Na)	345	330	439	487	392	338	191
Strontium (Sr)	68.9	84.2	72.5	53.6	110.1	100.8	114.7
Thallium (Tl)	0.179	0.228	0.240	0.360	0.378	0.267	0.556
Thorium (Th)	3.97	5.33	4.04	6.35	4.50	3.77	3.49
Tin (Sn)	0.236	0.286	0.474	0.329	0.372	0.257	0.152
Titanium (Ti)	388	383	516	455	387	314	233
Uranium (U)	1.53	1.88	1.80	2.30	2.41	1.93	3.13
Vanadium (V)	36.7	26.1	45.7	55.0	43.3	34.1	31.0
Yttrium (Y)	8.15	9.99	10.77	17.18	25.53	13.97	9.59
Zinc (Zn)	87	124	143	2,818	12,190	8,173	3,423
Zirconium (Zr)	7.05	7.77	9.85	10.13	8.83	8.55	6.11

[a] Mean of 3 samples per area. Raw data presented in Appendix Table D.27.

8.0 BENTHIC INVERTEBRATE COMMUNITIES

Benthic invertebrate samples for assessment of community characteristics were collected from 17 exposed areas and 22 reference areas (Figure 2.3). Additionally, benthic invertebrate biomass and tissue metal concentrations were assessed at each of the reaches studied in detail in the immediate vicinity of the Faro Mine Area (Figure 2.1).

8.1 Community

8.1.1 General Characteristics

Within both reference areas and mine-exposed areas, benthic invertebrate communities were dominated by Ephemeroptera (mayflies), Plecoptera (stoneflies), and/or Chironomidae (midges) groups (Figure 8.1). Specific proportions of each group varied considerably among areas (Appendix Tables E.11 and E.12).

In NMS ordinations of benthic invertebrate communities in reference areas only, Axis-1 explained much of the community variation (55.8%) and separated areas along a gradient between those that had high proportion of Heptageniidae (mayfly family) and Chloroperlidae (stonefly family) (positive NMS-1 values) and those with high proportion of Ceratopogonidae (biting midge family), Empididae (dance fly family), Baetidae (mayfly family), Sperchontidae (mite family), and/or Chironomidae (non-biting midge family) (negative NMS-1 values; Figure 8.2a). The second axis (NMS-2; 26.0% of explained variation) separated reference areas between those that had higher proportion of Nemouridae (stonefly family), Baetidae, and/or Perlodidae (stonefly family) (positive NMS-2 values) and those that had higher proportion of Chironomidae (negative NMS-2 values; Figure 8.2a).

Indirect correlation of environmental variables demonstrated that areas with positive NMS-1 values tended to have greater change in elevation from 100 meters upstream to 100 m downstream of the sampling location (i.e., local gradient), as well as larger proportion of land cover characterized as snow and ice (Figure 8.2b). Areas with negative NMS-1 values had greater scores for periphyton coverage, greater proportion of open conifer, wetted shrub, wetted treed, and wetted herbaceous land cover, larger proportion of metamorphic geology, and greater concentrations of a variety of water quality variables (arsenic, iron, manganese, lead, lithium, ammonium, fluoride, sodium, and total organic carbon). Axis NMS-2 did not result in any significant correlations with environmental variables (Appendix Table E.6). While variation in community composition was observed among the reference areas, none were considered to be outliers.

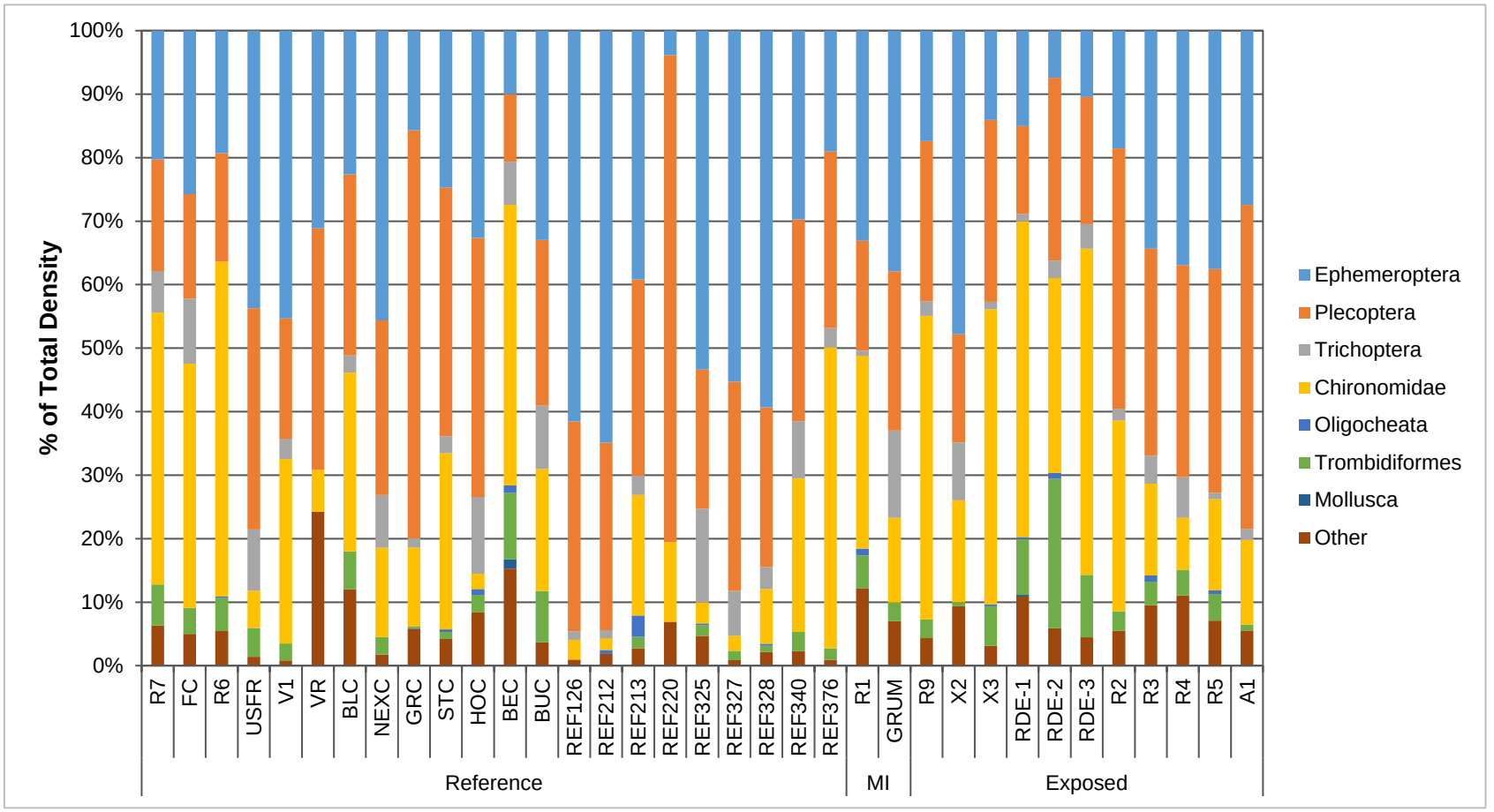


Figure 8.1: Relative abundance of major benthic invertebrate groups at individual reference (n = 22), minimally influenced (MI; n = 2), and exposed (n = 11) areas near Faro Mine, August 2014.

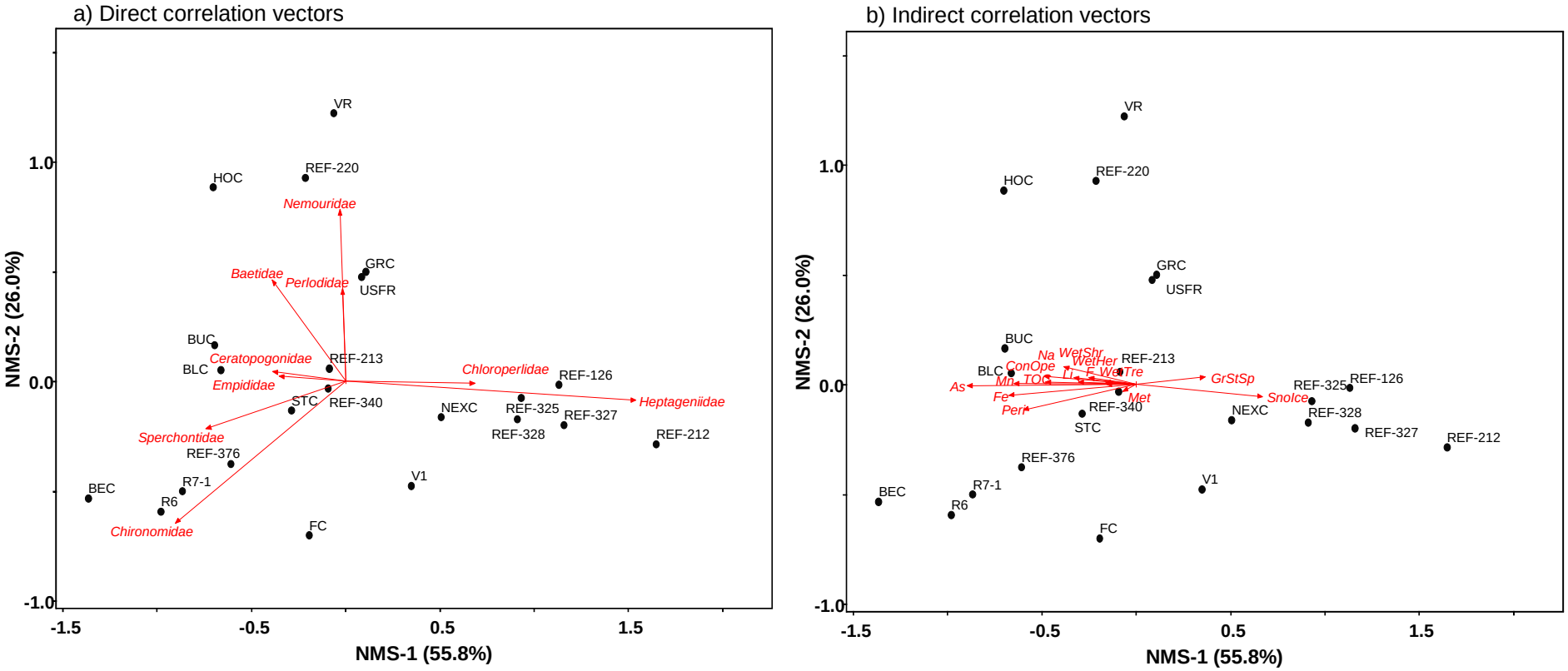


Figure 8.2: Nonmetric multidimensional scaling (NMS) biplot of benthic community structure at 22 reference areas. Lowest practical level of taxonomy was employed excluding taxa that were not found in more than one area. Panel a) displays direct correlation vectors for taxa with area axis scores, panel b) displays indirect correlation vectors for environmental variables with area axis scores (see Appendix Table D.6 for list and descriptions of all variables). Displayed vectors have significant ($p < 0.05$) absolute Spearman correlation coefficient (r) greater than 0.50 with either NMS axis-1 or axis-2; vector length is proportional to correlation strength. A stable 3-dimensional solution was found with stress of 9.16.

NMS of reference and exposed areas combined, demonstrated a similar pattern to that of reference areas only. Along axis NMS-1 (62.9% of explained variation), areas with communities having higher proportion of Heptageniidae and/or Chloroperlidae (positive NMS-1 values) separated from those with higher proportion of Sperchontidae and/or Chironomidae (negative NMS-1 values; Figure 8.3a). Similarly, NMS-2 (18.7% of explained variation) separated areas having higher abundance of Baetidae (positive NMS-2 values) from those with higher abundance of Chironomidae (negative NMS-2 values; Figure 8.3a). All mine-exposed areas, with the exception of R5, X2, A1, and the minimally-influenced area Grum, ordinated with communities having higher abundance of Chironomidae. Indirect correlation of environmental variables demonstrated that areas with positive NMS-1 tended to have greater change in elevation from 100 m upstream to 100 m downstream of the sampling location (Figure 8.3b). Negative NMS-1 values demonstrated significant indirect correlation with areas having higher periphyton cover scores as well as higher levels of some water quality variables (turbidity, ammonia, fluoride, arsenic, iron, and manganese) (Figure 8.3b). Axis NMS-2 did not result in any significant correlations with environmental variables (Appendix Table E.9).

8.1.2 Statistical Comparisons of Mine-Exposed to Reference Communities

Individual reference areas had up to one benthic invertebrate community endpoint that was significantly outside of the overall reference condition (ncP<0.05) and as many as six endpoints that were uncertain with respect to being inside or outside of the reference condition (ncP between 0.05 and 0.95; Table 8.1). Most mine-exposed areas had fewer endpoints that were different from or uncertain with respect to the reference condition than were observed among individual reference areas and were thus concluded to be unaffected by mining. Community endpoint values for all such mine-exposed areas were also within the range of (i.e., between minimum and maximum) values observed among reference areas. The exceptions were RDE-1 and RDE-2, which were identified as warranting more investigation (Table 8.1).

Areas Investigated Further

The areas flagged for ‘more’ investigation (RDE-1, and -2) were located along the RCD. Both areas showed a pattern of increased relative abundance of Trombidiformes (mites) and relatively low abundance of EPT (mayflies, stoneflies, and caddisflies), and the Ephemeroptera group of EPT (Table 8.1). Although not specifically flagged based on statistical results, RDE-3 reflected a similar community pattern. EPT taxa are generally considered to be sensitive indicators of environmental quality, including effects of metal

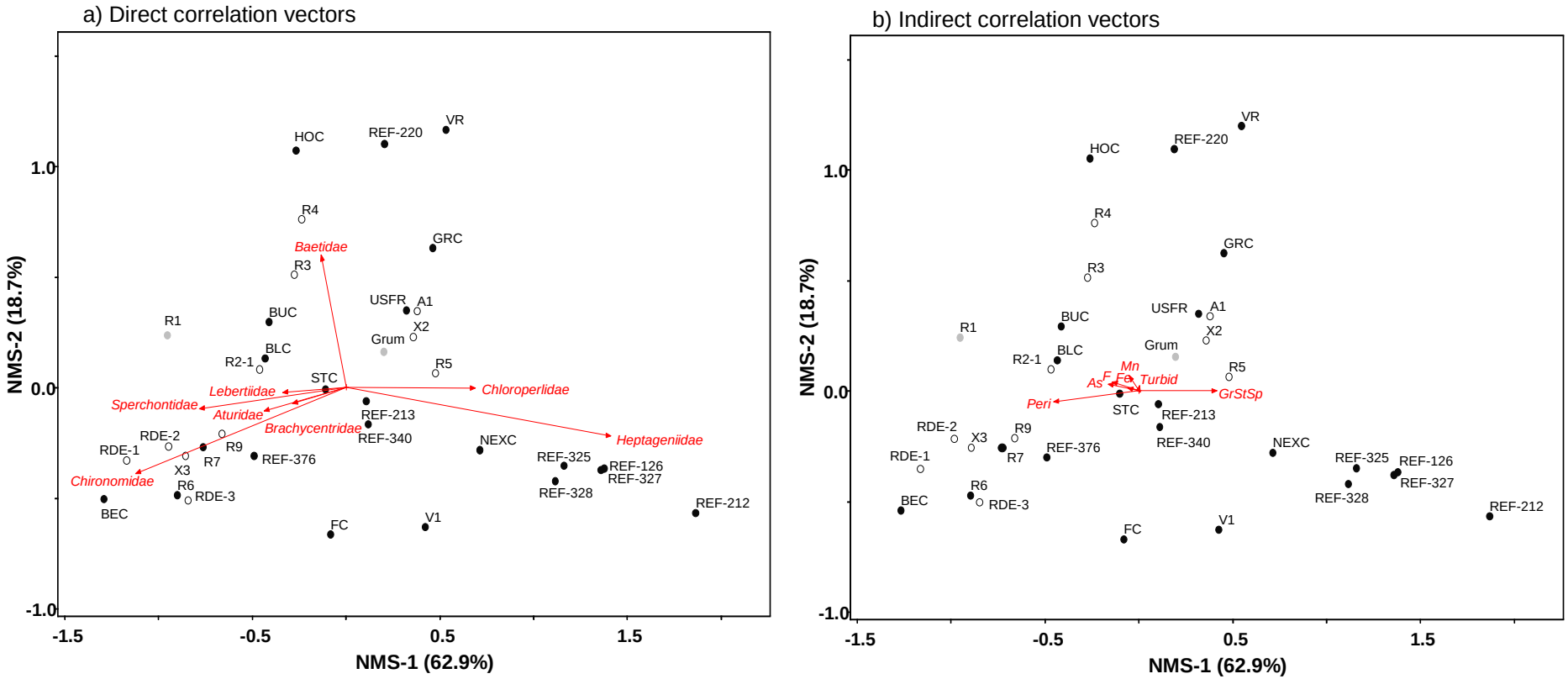


Figure 8.3: Nonmetric multidimensional scaling biplot of benthic community structure at 22 reference (black circle), 11 exposed (white circle), and 2 minimally influenced areas (grey circle). Lowest practical level of taxonomy was employed excluding taxa that were not found in more than one area. Panel a) displays direct correlation vectors for taxa with area axis scores, panel b) displays indirect correlation vectors for environmental variables with area axis scores (see Appendix Table D.6 for list and descriptions of all variables). Displayed vectors have significant ($p < 0.05$) absolute Spearman correlation coefficient (r) greater than 0.50 with either NMS axis-1 or axis-2; vector length is proportional to correlation strength. A stable 3-dimensional solution was found with stress of 10.45.

Table 8.1: Benthic invertebrate community characteristics at reference and mine-exposed areas, August 2014. Orange highlight indicates values outside of the range represented by 90% of reference area values (non-central p-values ≤ 0.05). Yellow highlight indicates values that are uncertain with respect to being in the reference range (non-central p-values between 0.05 and 0.95).

Area Type	Endpoint Type	Family Richness	Major Groups						Community Structure		Evaluation		Community unaffected (0 endpoints with p<0.05 and <6 endpoints with 0.05<p<0.95), or needs more investigation	Conclusion
	Endpoint		% EPT	% Ephemeroptera	% Plecoptera	% Trichoptera	% Chironomidae	% Trombidiformes	NMS-1[a]	NMS-2[a]	Tally of Endpoints			
	Transformation / Area ID	Log_e (Back Transformed)	Logit (Back Transformed)	Untransformed	Logit (Back Transformed)	Square Root (Back Transformed)	Untransformed	Square Root (Back Transformed)	Untransformed		p < 0.05	0.05 < p < 0.95		
Reference	R7	17	44.4	20.3	17.5	6.6	42.8	6.4	0.96	0.99	0	1	not applicable	not applicable
	FC	22	52.4	25.7	16.5	10.2	38.5	4.1	1.00	0.74	0	2		
	R6	18	36.4	19.3	17.1	0.0	52.7	5.2	0.87	0.93	0	4		
	USFR	19	88.2	43.7	34.8	9.6	5.9	4.5	1.00	1.00	0	0		
	V1	15	67.5	45.3	18.9	3.2	29.1	2.7	1.00	0.99	0	0		
	VR	11	69.2	31.1	38.1	0.0	6.6	0.0	1.00	0.01	1	1		
	BLC	24	53.8	22.6	28.5	2.7	28.1	6.0	1.00	1.00	0	1		
	NEXC	20	81.4	45.6	27.5	8.3	14.1	2.8	1.00	1.00	0	0		
	GRC	18	81.4	15.7	64.3	1.4	12.5	0.2	1.00	0.99	0	1		
	STC	18	66.5	24.7	39.2	2.7	27.8	1.1	1.00	1.00	0	0		
	HOC	22	85.5	32.7	40.8	12.1	2.4	2.8	1.00	0.28	0	3		
	BEC	15	27.4	10.0	10.7	6.8	44.2	10.4	0.25	0.98	0	6		
	BUC	18	69.0	33.0	26.1	10.0	19.2	8.1	1.00	1.00	0	1		
	REF-126	13	95.9	61.6	33.0	1.3	3.1	0.0	0.64	1.00	0	4		
	REF-212	12	95.7	64.9	29.5	1.2	1.9	0.0	0.04	1.00	1	3		
	REF-213	23	73.1	39.2	30.9	3.0	19.0	1.8	1.00	1.00	0	1		
	REF-220	14	80.5	3.9	76.7	0.0	12.5	0.0	1.00	0.20	1	2		
	REF-325	18	90.0	53.4	21.9	14.7	3.3	1.7	0.91	1.00	0	2		
	REF-327	19	95.3	55.3	32.9	7.1	2.4	1.5	0.59	1.00	0	3		
	REF-328	19	87.9	59.3	25.1	3.5	8.6	1.0	0.93	1.00	0	2		
	REF-340	19	70.5	29.7	31.8	9.0	24.2	3.0	1.00	1.00	0	0		
	REF-376	19	49.8	19.0	27.8	3.0	47.4	1.8	1.00	1.00	0	1		
MI[b]	R1	20	51.2	33.1	17.3	0.8	30.4	5.1	0.75	1.00	0	1	Unaffected	-
	Grum	23	76.7	37.9	25.1	13.7	13.4	2.9	1.00	1.00	0	2	Unaffected	-
Exposed	R9	19	44.9	17.4	25.2	2.3	47.8	2.9	0.99	1.00	0	1	Unaffected	-
	X2	18	74.0	47.8	17.1	9.1	16.1	0.6	1.00	1.00	0	0	Unaffected	-
	X3	20	43.9	14.0	28.7	1.2	46.5	6.2	0.93	1.00	0	3	Unaffected	-
	RDE-1	23	30.0	15.0	13.8	1.2	49.7	8.8	0.57	0.98	0	6	More investigation	Potentially affected
	RDE-2	21	39.0	7.4	28.8	2.8	30.7	23.5	0.58	1.00	1	3	More investigation	Potentially affected
	RDE-3	17	34.3	10.5	20.0	3.9	51.4	9.8	0.96	0.97	0	4	More investigation	Potentially affected
	R2	19	61.4	18.5	41.0	1.8	30.1	3.1	1.00	1.00	0	0	Unaffected	-
	R3	20	71.3	34.3	32.6	4.4	14.5	3.7	1.00	1.00	0	0	Unaffected	-
	R4	16	76.7	36.9	33.4	6.4	8.1	4.0	1.00	0.97	0	0	Unaffected	-
	R5	19	73.8	37.5	35.3	1.0	14.3	4.2	1.00	1.00	0	0	Unaffected	-
	A1	16	80.2	27.4	51.0	1.7	13.4	0.9	1.00	1.00	0	1	Unaffected	-

[a] Non-central p-values presented for nonmetric multidimensional scaling axes because actual axis scores are specific to the group of areas included in the data set (i.e., different ordination for each mine-exposed area) and thus not comparable among areas.

[b] Minimally influenced

mining (Malmqvist and Hoffsten 1999), so reduced proportions can indicate degraded aquatic environmental conditions. On the other hand, none of the mine-exposed areas had %EPT that was conclusively outside of the reference condition, nor was family richness reduced among mine-exposed areas, suggesting that mine-related effects, if any, within the RCD were minor.

NMS ordinations showed that RDE-1 and -3 had greater relative abundance of the trombidiform (mite) family Aturidae (Appendix Figures D.3 and D.5), while RDE-2 had greater relative abundance of Lebertiidae trombidiforms (Appendix Figure D.4). Information regarding the environmental tolerances for these mite families is lacking, however the Trombidiformes group is generally considered tolerant of extreme environmental conditions (Peckarski et al. 1990). Except at RDE-2, trombidiform proportions were within the overall range observed among reference areas (Table 8.1).

Pearson correlations involving water quality PCA axis results (Section 4.4) and benthic invertebrate community endpoints did not result in any significant correlations at a Bonferroni-adjusted p-value of 0.002 and revealed only three weak correlations (r of -0.40, -0.10 and -0.04) at an unadjusted p-value of 0.05 (Appendix Table E.17). These results suggest that differences in benthic invertebrate communities among areas cannot be explained solely on the basis of differences in water quality.

Overall, benthic invertebrate communities around the Faro Mine Area showed fewer differences from reference areas than did periphyton communities. This does not necessarily indicate that periphyton communities are more sensitive to mine influences than benthic invertebrate communities because the evidence was conflicting regarding the cause of periphyton community differences being mine-related, particularly with respect to potential water quality effects. That both periphyton and benthic invertebrates in the RCD had characteristics outside of the range of reference communities suggests that this is an area that may be adversely affected, although not strongly so based on continued presence of taxa considered to be relatively sensitive to disturbances (e.g., EPT) and family richness that was within the range observed at reference areas.

8.1.3 Temporal Evaluation of Reference and Mine-Exposed Communities

Percent community composition was extremely variable among years and stations, regardless of area type (Figure 8.4). No consistent temporal pattern was observed among areas or endpoints (Figure 8.4). The large spatial variation in reference area benthic invertebrate community characteristics (Figure 8.1) combined with large natural temporal

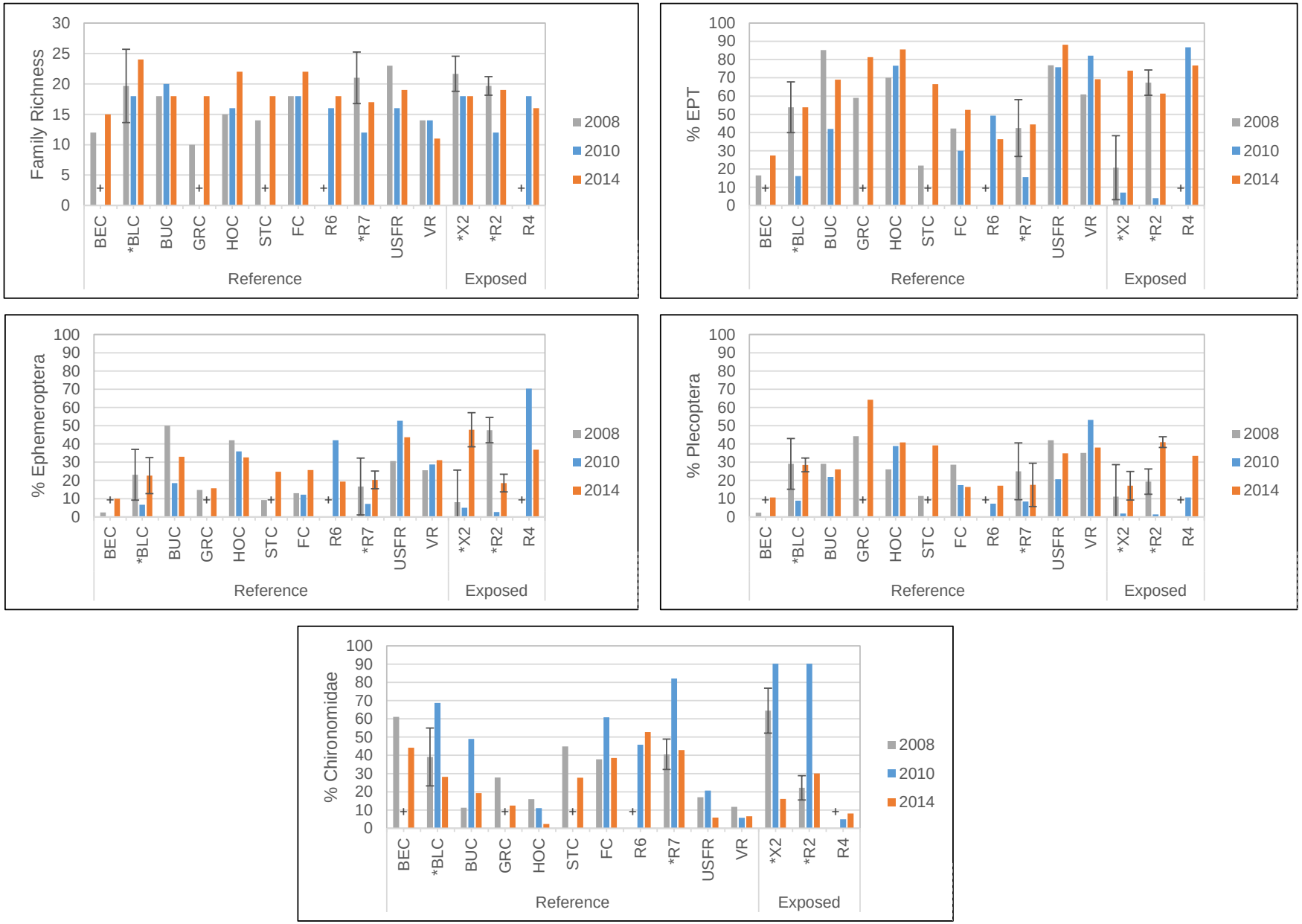


Figure 8.4: Benthic invertebrate community endpoints at reference and exposed areas near the Faro Mine sampled using a kick-net in 2008, 2010, and 2014. * In 2008 a duplicate sample was taken at R7 and triplicate samples were taken at areas BLC, R2, and X2 (mean ± standard deviation are displayed). + indicates that no sample was taken.

variation (Figure 8.4) confounds evaluation of potential mine-related effects near the Faro Mine. Continued sampling using consistent methods, and the resultant long-term dataset, will allow for more conclusive assessment of potential effects associated with the Faro Mine over time.

8.2 Biomass

Benthic invertebrate biomass was highest at the outlet of the Pumphouse Pond (X3), but, otherwise, mine-exposed areas had lower biomass than at the reference area (R7), minimally influenced R1, and R9 which is located upstream from most mine-related disturbances (Figure 8.5, Table 8.2). Higher biomass at X3 may reflect the influence of the lentic habitat in the Pumphouse Pond located immediately upstream.

Taxa representing the greatest weights among samples included *Chironomidae* at all stations, *Hydropsychidae* at stations on the NFRC, and *Nemouridae* at other stations (Table 8.2), though there was no clear pattern in proportional representation of taxa for biomass evident among sampling areas in the vicinity of the Faro Mine.

8.3 Tissue Concentrations

Benthic invertebrate tissue was collected for analysis of metal concentrations and is presented in Table 8.3 and Appendix Table E.3. Some metals had elevated concentrations in benthic invertebrate tissue collected downstream of mine-influence. Most notable were higher concentrations of copper, lead, nickel and zinc at the outlet of the Pumphouse Pond (X3), the RCD, and downstream of the RCTA (R2, Table 8.3). Despite this, benthic invertebrate community characteristics were not strongly indicative of mine-related effects, as noted in Section 8.1.

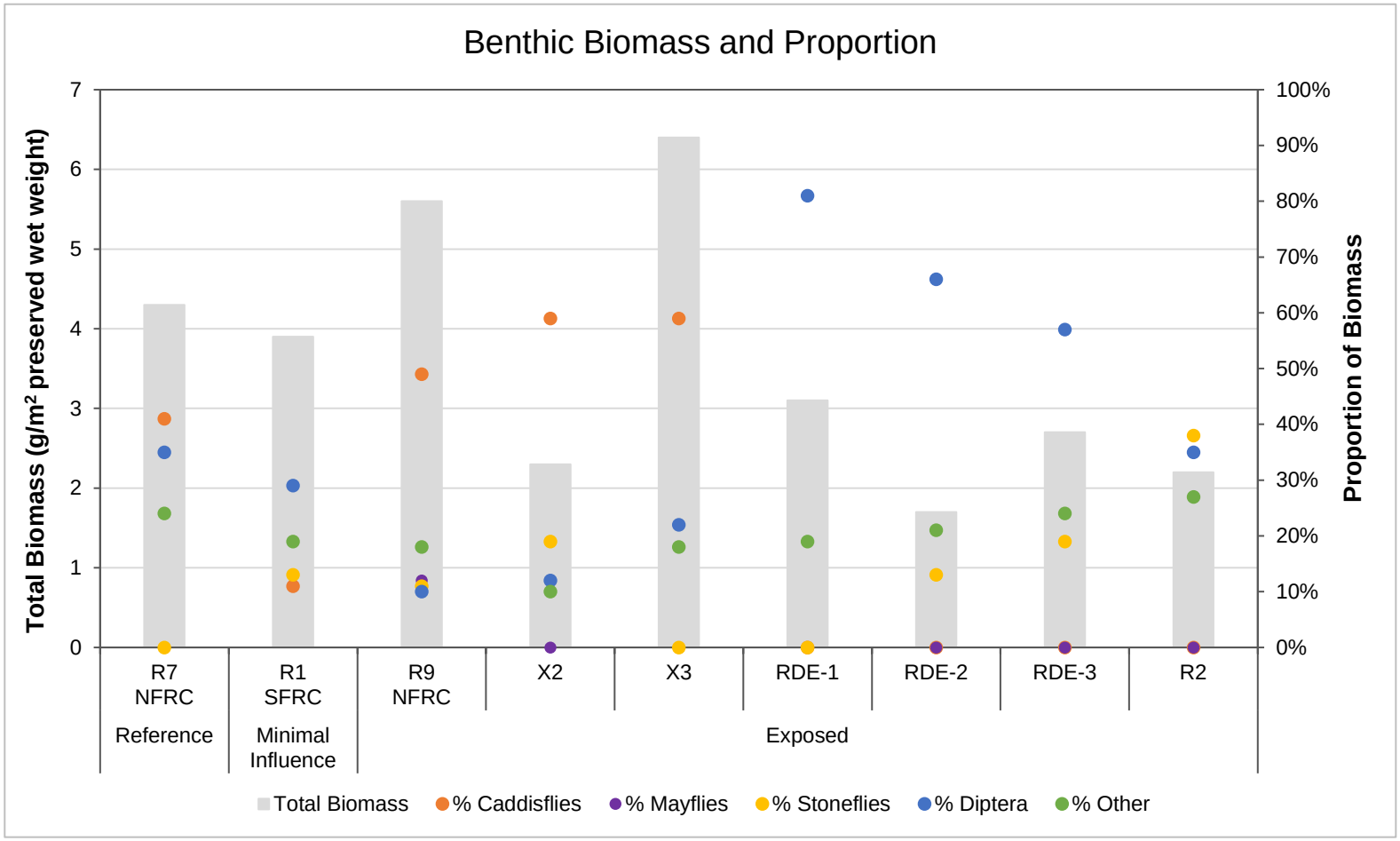


Figure 8.5: Total biomass and proportion of biomass represented by major benthic invertebrate groups at areas near the Faro Mine, August 2014.

Table 8.2: Total benthic invertebrate biomass and proportion of biomass represented by individual taxa for areas near the Faro Mine, August 2014.

Area	Type	Station	Total Biomass (preserved wet weight g/m^2)	Proportion of Total Biomass (%)									
				Caddisflies				Mayflies		Stoneflies	Diptera		Other Taxa
				Hydropsychidae	Brachycentridae	Rhyacophilidae	Limnephilidae	Heptageniidae	Ephemerellidae	Nemouridae	Chironomidae	Ceratopogonidae	
North Fork Rose Creek Upstream from Faro Creek Diversion	Reference	R7	4.3	41%							35%		24%
South Fork	Minimal Influence	R1	3.9			11%			29%	13%	19%	10%	19%
North Fork Rose Creek upstream from Haul Road	Exposed	R9	5.6	49%				12%		11%	10%		18%
North Fork Rose Creek downstream from Haul Road		X2	2.3	31%		11%	17%			19%	12%		10%
Rose Creek Pumphouse Pond Outlet		X3	6.4	30%	29%						22%		18%
Rose Creek Diversion		RDE-1	3.1								81%		19%
		RDE-2	1.7							13%	66%		21%
		RDE-3	2.7							19%	57%		24%
Downstream from Rose Creek Tailings Area		R2	2.2							38%	35%		27%

Table 8.3: Mean[a] metal concentrations (mg/kg dw) in benthic invertebrate tissue, Faro Mine Aquatic Baseline, August 2014.

Analyte	Reference	Minimally Influenced		Exposed			
	North Fork Rose Creek Reference (R7)	South Fork Rose Creek (R1)	North Fork Rose Creek upstream from Haul Road (R9)	North Fork Rose Creek downstream from Haul Road (X2)	Rose Creek at Pumphouse Pond Outlet (X3)	Rose Creek Diversion (RDE)	Rose Creek Downstream from Rose Creek Tailings Area (R2)
Aluminum (Al)	1,750	1,827	2,077	2,045	1,854	2,867	3,280
Antimony (Sb)	0.0195	0.0117	0.0271	0.0169	0.0428	0.0354	0.0303
Arsenic (As)	3.98	2.83	5.18	7.24	4.62	5.16	5.52
Barium (Ba)	60.3	52.3	53.9	51.9	88.8	70.5	76.8
Beryllium (Be)	0.110	0.092	0.205	0.212	0.146	0.169	0.166
Bismuth (Bi)	0.0261	0.0230	0.1300	0.1822	0.0411	0.2720	0.0340
Boron (B)	1.01	1.35	1.37	0.95	1.09	0.61	0.61
Cadmium (Cd)	0.84	0.86	0.57	1.42	1.47	1.55	0.66
Calcium (Ca)	1,078	3,297	1,687	3,480	1,363	1,638	1,483
Cesium (Cs)	0.209	0.271	0.337	0.367	0.295	0.339	0.395
Chromium (Cr)	2.64	3.86	5.88	5.88	6.26	7.11	6.61
Cobalt (Co)	1.90	2.61	1.82	6.25	9.73	8.73	7.28
Copper (Cu)	16.9	30.2	15.7	16.9	15.6	13.4	13.2
Gallium (Ga)	0.717	0.678	0.763	1.051	0.745	1.050	1.288
Iron (Fe)	3,343	3,800	3,537	7,325	5,637	17,150	9,570
Lead (Pb)	1.25	2.04	7.57	57.70	20.50	12.68	11.75
Lithium (Li)	2.99	3.63	3.62	5.55	2.79	5.12	6.70
Magnesium (Mg)	1,317	2,237	1,680	2,130	2,260	2,387	2,043
Manganese (Mn)	926	762	397	399	521	605	1,623
Mercury (Hg)	0.0521	0.0369	0.0508	0.106	0.091	0.0434	0.0348
Molybdenum (Mo)	0.462	0.358	0.463	0.496	0.466	0.474	0.423
Nickel (Ni)	2.71	4.29	5.31	6.22	9.99	8.69	9.15
Phosphorus (P)	8,870	8,253	9,307	7,435	9,873	7,530	5,623
Potassium (K)	8,647	8,083	8,590	8,535	10,850	7,387	5,203
Rhenium (Re)	0.00023	0.00038	0.00022	0.00070	0.00018	0.00017	0.00028
Rubidium (Rb)	9.55	6.82	10.03	9.78	7.71	6.71	5.93
Selenium (Se)	3.12	2.25	3.25	3.63	3.19	2.64	2.13
Silver (Ag)	0.0874	0.0770	0.0791	0.1065	0.1064	0.0744	0.0777
Sodium (Na)	3,773	3,530	3,857	4,095	4,267	2,920	2,037
Strontium (Sr)	8.9	16.4	7.4	17.6	7.5	11.7	9.8
Thallium (Tl)	0.0243	0.0278	0.0446	0.0867	0.0433	0.0428	0.0453
Thorium (Th)	0.584	0.690	0.516	0.836	0.456	0.436	1.391
Tin (Sn)	0.0356	0.1566	0.0897	0.0243	0.0617	0.0433	0.0565
Titanium (Ti)	18.7	38.2	45.7	14.7	27.6	36.7	45.0
Uranium (U)	0.335	0.438	0.339	0.366	0.398	0.347	0.342
Vanadium (V)	4.55	3.93	6.52	5.72	4.73	7.74	7.76
Yttrium (Y)	0.958	1.141	1.223	3.860	2.977	2.357	2.103
Zinc (Zn)	155	178	170	1,060	839	1,431	548
Zirconium (Zr)	0.85	1.12	1.01	0.84	1.00	1.30	2.01

[a] Mean of 3 samples per area. Raw data presented in Appendix Table E.3.

9.0 FISH

9.1 Community

The fish community in the vicinity of the Faro Mine was previously characterized in detail by Minnow (2014b). In total, six species have been historically identified within Rose Creek near the Faro Mine, including Arctic grayling, slimy sculpin, burbot (*Lota lota*), round whitefish (*Prosopium cylindraceum*), juvenile Chinook salmon (*Ocnorhynchus tshawytscha*) and longnose sucker (*Catostomus catostomus*) (Table 9.1). Each of those species (except Chinook salmon) have been reported as inhabiting the NFRC reach upstream from the Haul Road, which is physically isolated from the rest of the system, although only Arctic grayling and slimy sculpin have been captured in recent surveys (Table 9.1). As there are currently only partial barriers in the system downstream from the Haul Road on NFRC (e.g., culverts at upstream end of Groundwater Recharge Ponds), species can move throughout the system downstream from the Haul Road, at least under some flow conditions. All six species, as well as lake chub (*Couesius plumbeus*), have also been found in the lower reaches of Anvil Creek and Vangorda Creek (Table 9.1).

Fishing conducted in 2014 confirmed the presence of slimy sculpin (*Cottus cognatus*) and Arctic grayling (*Thymallus arcticus*) in each of the reaches assessed (Table 9.2), with slimy sculpin having relatively greater abundance in each area.

9.2 Condition, Density and Biomass

Length and weight measurements were recorded for all fish captured during the community survey and closed station electrofishing. Condition (i.e., length versus weight) of slimy sculpin and Arctic grayling was plotted according to area, with linear relationships defined for any areas where data were available for 10 or more individuals (Figure 9.1a). Condition of smaller slimy sculpin (roughly < 5.0 cm) in the NFRC upstream from the Access Road (R7, NFA, and NFB) was slightly greater than for sculpin measured in other areas, although there was more overlap among larger individuals (> 5.0 cm, Figure 9.1a). Few slimy sculpin were captured in the length range between 4.8 and 5.3 cm (0.68 to 0.72 based on log scale shown in Figure 9.1a). The small sub-set of individuals sacrificed for analysis of age and tissue chemistry did not include individuals that small, however, previous work using slimy sculpin indicate fish in that size range would be 1 year old (Minnow 2014a), and therefore the gap may be the separation between young of the year and age 1 fish. Condition of slimy sculpin varied slightly among areas (Figure 9.1).

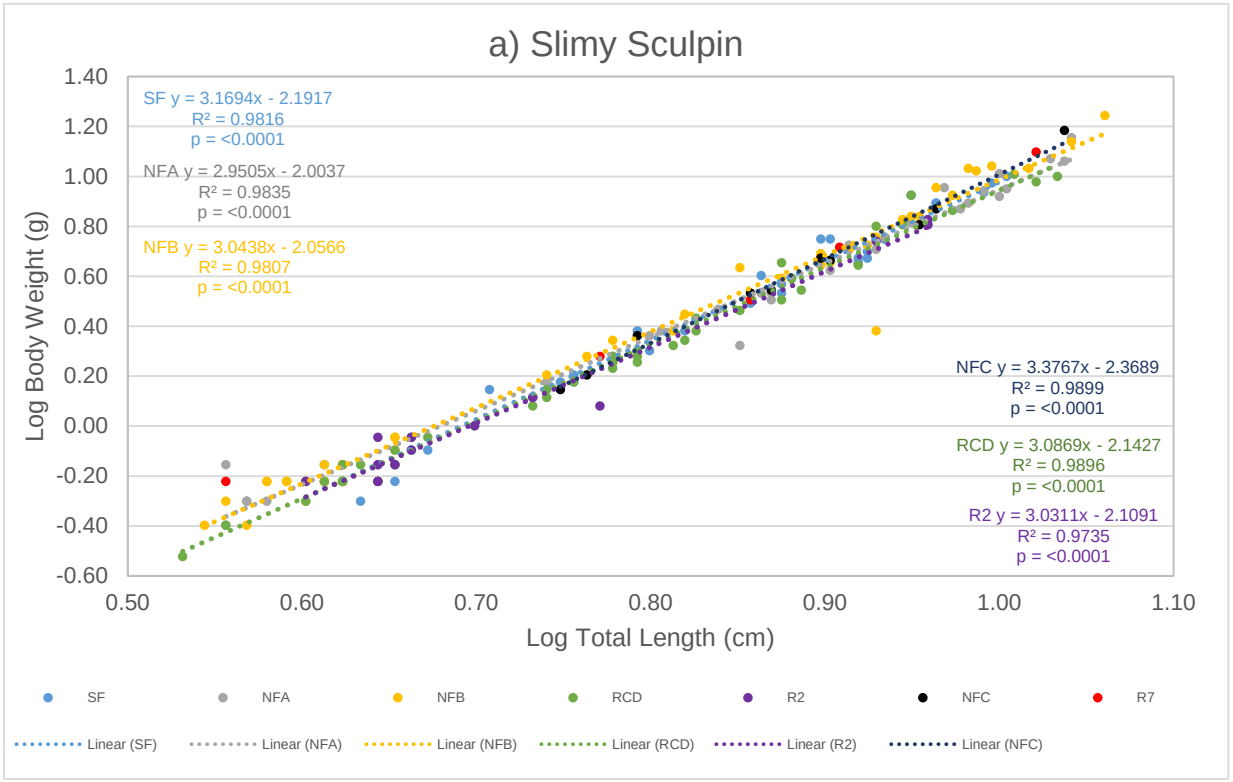
Table 9.1: Summary of fish species presence in the vicinity of the Faro Mine. Bold font indicates species that were captured in specified reaches between 2012 and 2014. (J - juvenile, A - adult)

Reach	Fish Species						
	Arctic Grayling (*Thymallus arcticus*)	**Juvenile Chinook Salmon (*Oncorhynchus tshawytscha*)**	**Slimy Sculpin (*Cottus cognatus*)**	**Burbot (*Lota lota*)**	**Round Whitefish (*Prosopium cylindraceum*)**	**Longnose Sucker (*Catostomus catostomus*)**	**Lake Chub (*Couesius plumbeus*)**
North Fork Rose Creek upstream from Haul Road	✓ **J, A**	Not Accessible	✓	✓	✓	✓	-
North Fork Rose Creek downstream from Haul Road	✓ **A**	-	✓	✓	✓	-	-
South Fork Rose Creek upstream from Haul Road	✓ **A**	-	✓	-	-	-	-
South Fork Rose Creek (Haul Road to confluence with North Fork)	✓ **J, A**	✓	✓	✓	✓	-	-
Rose Creek Diversion Channel	✓ **J, A**	✓	✓	✓	✓	-	-
Rose Creek downstream from Faro Mine Complex	✓ **J, A**	✓	✓	✓	✓	✓	-
Anvil Creek downstream of Rose Creek	✓	✓	✓	✓	✓	✓	✓

Table 9.2: Fish catch summary, Faro Mine aquatic study, August 2014.

Area	Method	Slimy Sculpin	Arctic Grayling
North Fork upstream from Faro Creek (R7)	Electrofish	5	-
	Gill Net	-	-
	Minnow Trap	-	-
North Fork upstream from Haul Road[a]	Electrofish	29	2
	Gill Net	4	3
	Minnow Trap	-	-
North Fork downstream from Haul Road[a]	Electrofish	51	13
	Gill Net	-	-
	Minnow Trap	-	-
North Fork Groundwater Recharge Ponds, Pumphouse Pond, and North Fork Diversion	Electrofish	9	-
	Gill Net	-	5
	Minnow Trap	1	-
South Fork downstream from former reservoir	Electrofish	28	5
	Gill Net	-	-
	Minnow Trap	-	-
Rose Creek Diversion	Electrofish	36	1
	Gill Net	-	-
	Minnow Trap	-	-
Rose Creek downstream from RCTA	Electrofish	14	1
	Gill Net	-	-
	Minnow Trap	-	-
	Total	177	30

[a] Results include closed-station electrofishing within the area.



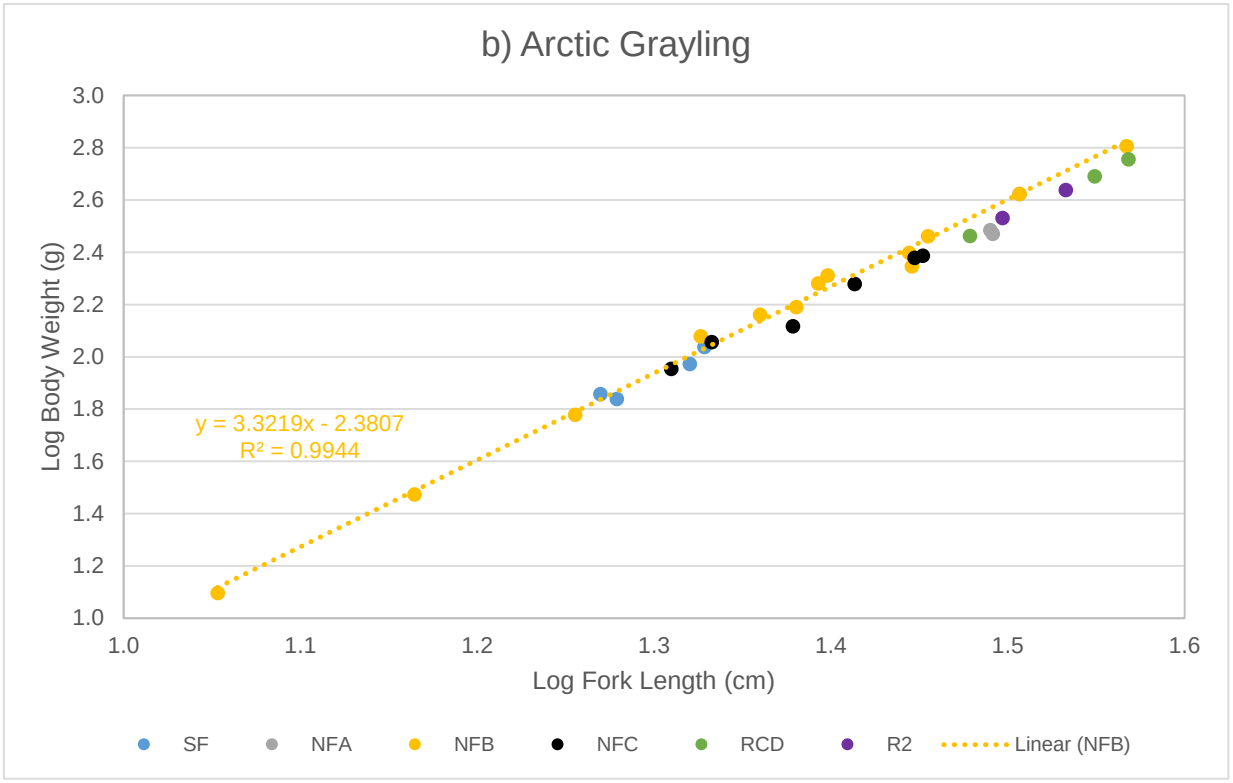


Figure 9.1: Slimy sculpin (a) and Arctic grayling (b) condition (fork length versus body weight) for fish sampled in the vicinity of the Faro Mine, August 2014. Linear relationships were presented for areas with 10 or more individuals. Area codes reflect those presented on Figure 2.1.

Too few Arctic grayling were captured at any areas except the NFRC downstream from the Haul Road (NFB) to compare relative condition among areas (Figure 9.1). Even if data were available, such comparisons would be confounded by the movement of individuals throughout the system (EDI 2015) (i.e., condition of individuals would not necessarily be indicative of environmental conditions at the location of capture).

Closed-station electrofishing on the NFRC upstream and downstream from the Haul Road provided rough estimates of fish densities and biomass that could be compared to should the populations be re-connected in the future (i.e., based on removal of the North Fork Rock Drain). Fish density and biomass estimates were much higher downstream from the Haul Road, at NFB compared to upstream at NFA (Table 9.3). The downstream area reflects the upstream extent to which Arctic grayling can move in the Rose Creek system; adult grayling have been recorded there on numerous occasions throughout the year, and spawning may also occur there (EDI 2014, De Graff 2013, WMEC 2005). Upstream from the Haul Road (NFA), recent attempts to capture Arctic grayling have had limited success (EDI 2015, De Graff 2013), suggesting low densities throughout the headwaters of the NFRC.

9.3 Habitat Utilization

9.2.1 Slimy Sculpin

Slimy sculpin was the most abundant fish species found in the vicinity of the Faro Mine (Table 9.1). Slimy sculpin inhabit a wide range of cool-water habitat, from lakes to streams with moderate to swift currents (McPhail 2007). Preferred substrate for all life stages (spawning, juvenile rearing, foraging, and overwintering) is gravel and cobble, though they can also be found over silt substrate (McPhail 2007). Slimy sculpin feed mainly on benthic invertebrates, though some have been noted to feed on salmon eggs (McPhail 2007). Rose Creek provides these habitat features and a benthic invertebrate food base, so all areas would be expected to support various life stages of slimy sculpin during the ice-free period, and also during winter at the locations having flowing water during winter months (i.e., locations that remain ice free, or have groundwater upwelling and/or sufficient depth).

9.2.2 Arctic Grayling

Spawning Habitat Requirements and Utilization

Upstream from the Haul Road, suitable spawning habitat (gravel and small cobble substrate, velocities from 0.34 to 1.46 m/s, Hubert et al. 1985) is found immediately

Table 9.3: Estimated fish density and biomass[a] in closed stations of the North Fork Rose Creek sampled by electrofishing, August 2014.

		Upstream from Haul Road (NFA, 126.4 m^2)			Downstream from Haul Road (NFB, 157.4 m^2)		
		Total	**Arctic Grayling**	**Slimy Sculpin**	**Total**	**Arctic Grayling**	**Slimy Sculpin**
Abundance	Total Population (N)[b]	15.0	1.0	14.0	64.4	13.9	54.0
	Density (N/100 m²)	11.9	0.8	11.1	40.9	8.8	34.3
Biomass	Total Biomass (g)	59.1	0.4	58.7	3,090	2,916	213
	Density (g/100 m²)	46.7	0.3	46.4	1,963	1,852	135

[a] Based on Moran-Zippin calculations (Ricker 1975). Total catch or biomass includes both Arctic grayling and slimy sculpin, but is calculated separately from the catch and biomass for the individual speicies, so the total does not necessarily equal the sum of values calculated for individual species.

[b] Total population within the closed station electrofishing area.

N - number

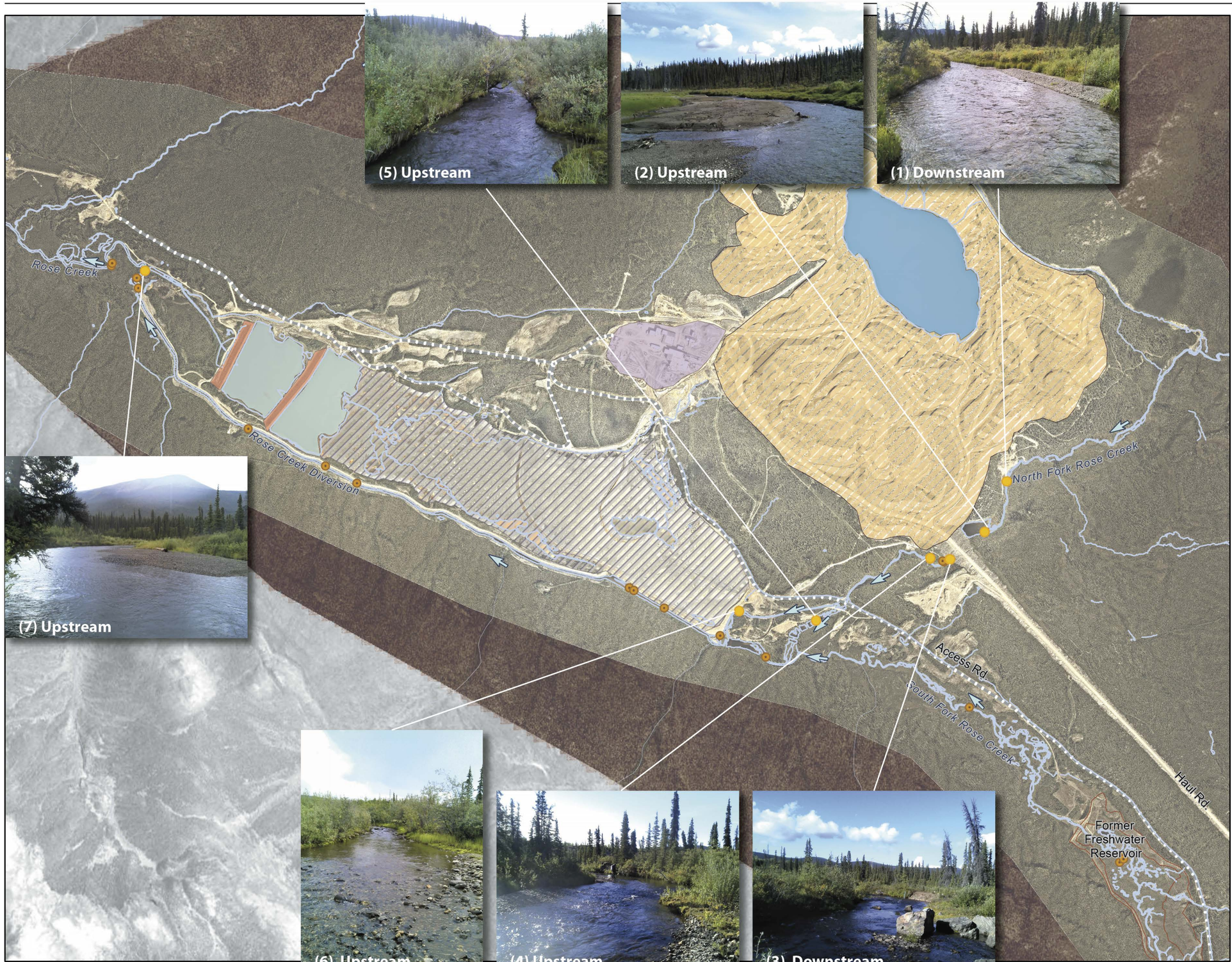
upstream from the Haul Road Pond (Figure 9.2, Photo 2), and may occur along margins and insides of some river bends between the Haul Road Pond and Faro Creek that also have gravel substrate (Figure 9.2, Photo 1), though these areas are limited in both size and number. Arctic grayling spawning has been observed along a gravel bar immediately downstream from the North Fork Rock Drain on the NFRC (WMEC 2005) and may also occur a short distance downstream at another shallow riffle area based on suitable spawning substrate (Figure 9.2, Photo 4). Upstream from the Groundwater Recharge Ponds (Figure 9.2, Photo 5) and at the lower portion of the North Fork Diversion (Figure 9.2, Photo 6) there are also cobble and gravel substrates that may provide suitable spawning habitat. Other than the specific areas mentioned, spawning may occur along various creek margins and river bends where suitable substrate is found (Figure 9.2, Photo 7), though water levels at spawning would dictate the functionality of those locations. Arctic grayling in apparent spawning condition were reported in all stream reaches in the immediate vicinity of the Faro Mine although specific spawning sites could not be visually confirmed (EDI 2015).

Fry and Juvenile Habitat Requirements and Utilization

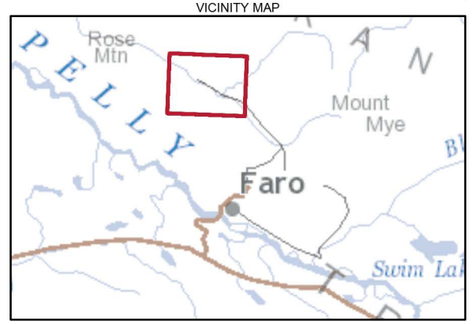
Arctic grayling fry utilize quiet back waters and protected areas (water velocity 0.07 to 0.16 m/s), while juveniles can occupy areas with faster flow (up to 0.8 m/s, typically 0.2 m/s, Hubert et al. 1985). Juvenile Arctic grayling feed primarily on aquatic invertebrates (McPhail 2007). With the exception of some steeper gradient areas found on the NFRC and in the RCD, Rose Creek, as a whole, has a wide range of velocities and suitable cover (i.e., undercut banks, pools, boulders), providing the required habitat for both of these early life stages (Figure 9.3, all photos). Juvenile Arctic grayling were captured during the current study in the NFRC upstream from and downstream from the Haul Road, the ponds on the SFRC downstream from the former Freshwater Supply Reservoir, the Pumphouse Pond, the RCD, and downstream from the RCTA (Appendix Tables F.8 to F.13).

Adult Foraging Habitat Requirements and Utilization

Adult Arctic grayling typically occupy pooled areas with water velocity of 0.21 m/s and gradient of 0.29%, though they may also move into riffle areas to feed (Hubert et al. 1985). The riffle-run sequences found within most of Rose Creek near the Faro Mine provide an abundance of this type of habitat for Arctic grayling (Figure 9.3, all photos). Adult Arctic grayling feed primarily on aquatic invertebrates, though larger fish may also consume small fish (McPhail 2007). Over 600 individual adult Arctic grayling were captured in the vicinity of the Faro Mine from 2012 through 2014 during a study of fish movements around the site



VICINITY MAP



LEGEND

- Suspected Spawning Location
- Water Flow Direction
- Former Freshwater Reservoir

Mine Infrastructure:

- Open Pit
- Rock Dump
- Impoundment Area
- Overburden Dump
- Tailings Pond
- Dam
- Mill Area

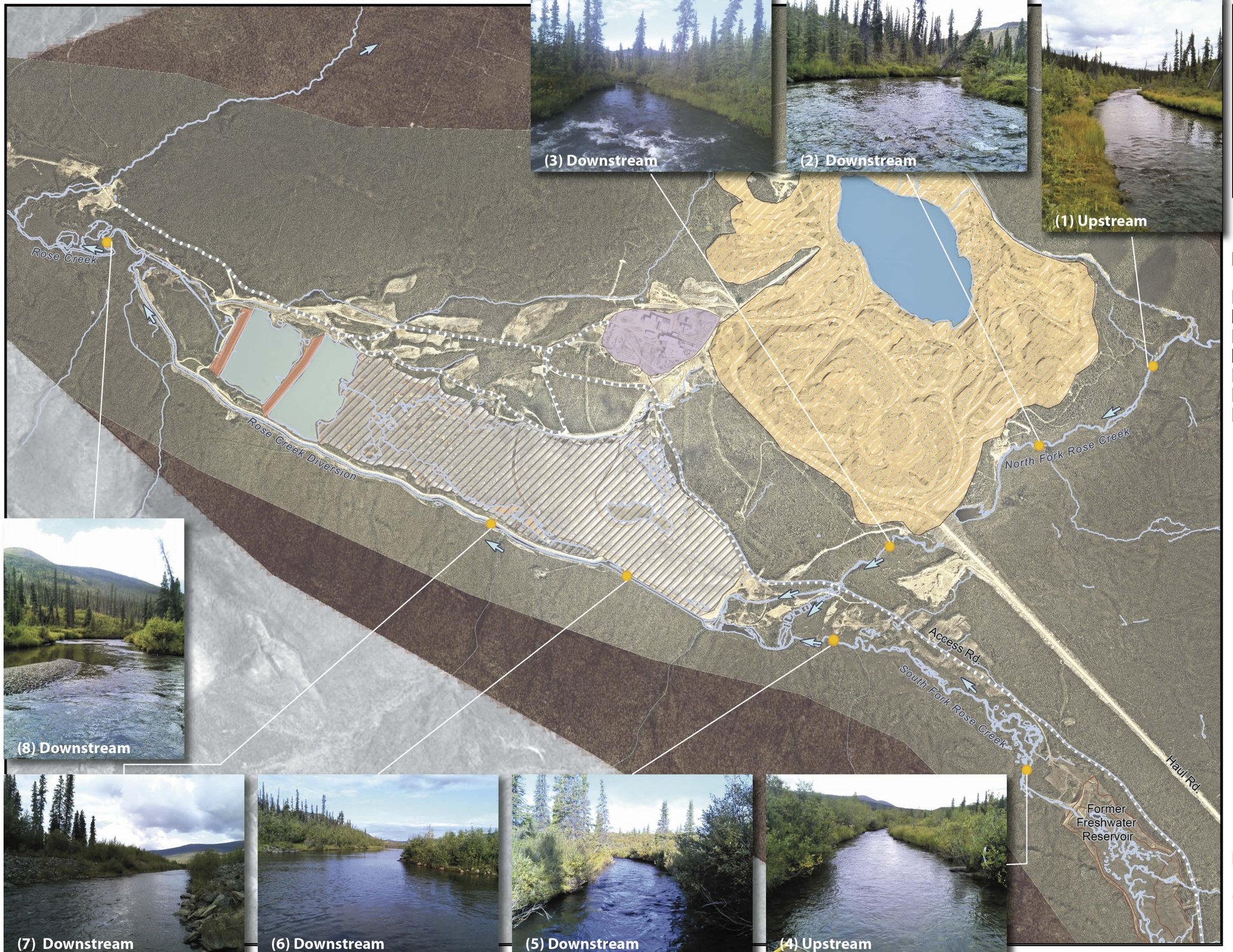
*Mine Infrastructure and base data provided by CH2M Hill

N

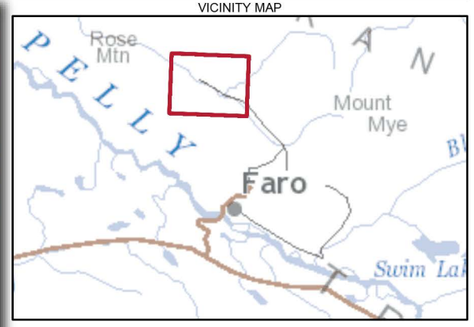
0 0.275 0.55 1.1 km

minnow environmental inc.

Figure 9.2
Potential Arctic grayling spawning habitat in the vicinity of the Faro Mine
Project: 2531 Date: February 2016



VICINITY MAP



LEGEND

- Water Flow Direction
- Former Freshwater Reservoir

Mine Infrastructure:

- Open Pit
- Rock Dump
- Impoundment Area
- Overburden Dump
- Tailings Pond
- Dam
- Mill Area

*Mine Infrastructure and base data provided by CH2M Hill

N

0 0.275 0.55 1.1 km

minnow environmental inc.
A Trinity Consultants Company

Figure 9.3
Examples of Arctic grayling fry/juvenile/rearing and adult foraging habitat in the vicinity of the Faro Mine
Project: 2531 Date: February 2016

(EDI 2015), indicating sufficient habitat and food base are present to support the community.

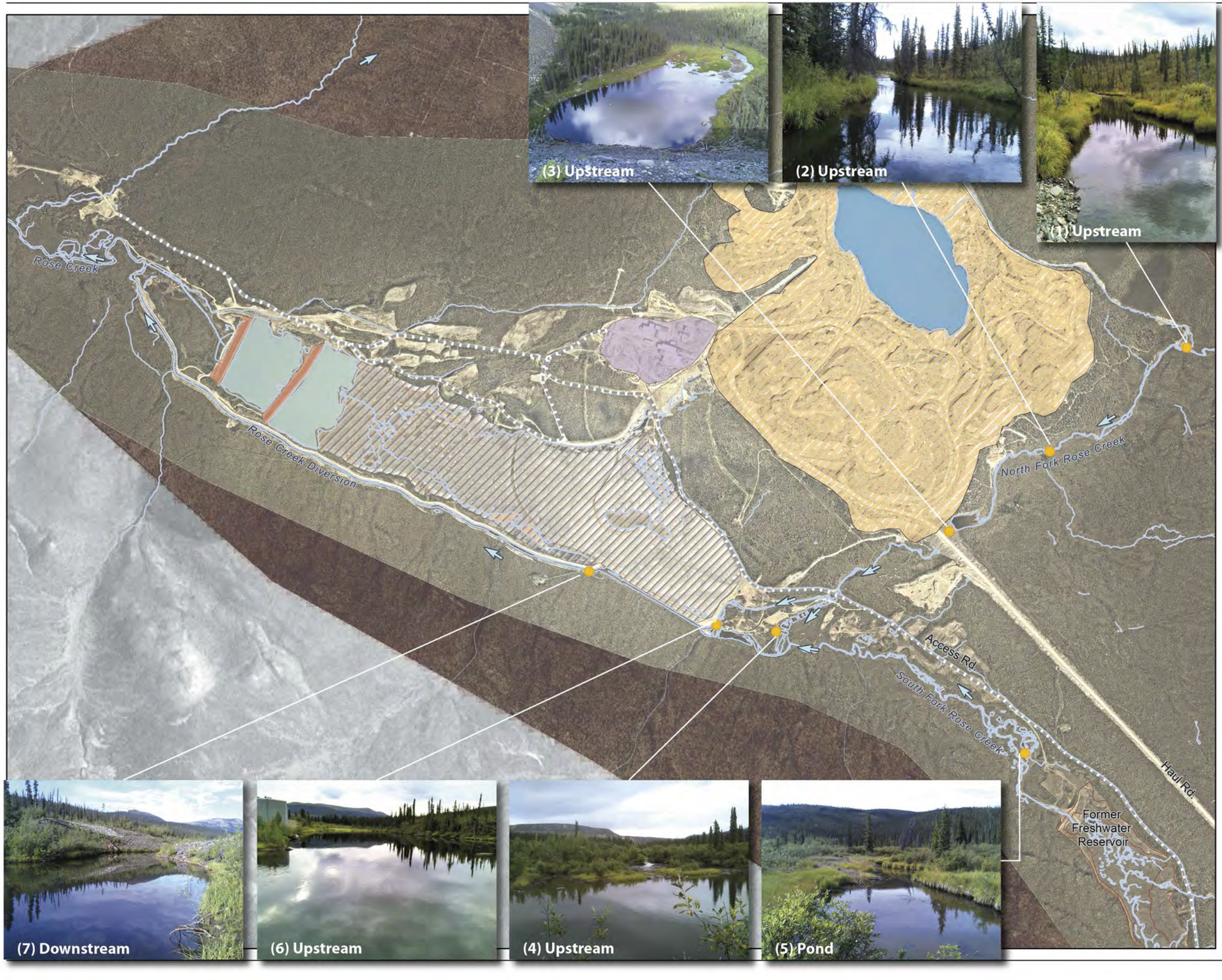
Overwintering Habitat Requirements and Utilization

Overwintering habitat requirements for Arctic grayling include depths greater than 1.4 m and low flow (less than 0.15 m/s, Hubert et al. 1985). Upstream from the Haul Road on the NFRC, Arctic grayling overwinter in the Haul Road Pond, although variable ice cover may influence the amount of useable habitat from year to year (EDI 2015). Deeper areas upstream from the Haul Road Pond, including an area upstream from station R9 (Figure 9.4, Photo 2), in the vicinity of R7 (Figure 9.4, Photo 1), and further upstream in the headwaters (EDI 2015), may also provide suitable overwintering habitat although overwinter use has not been confirmed.

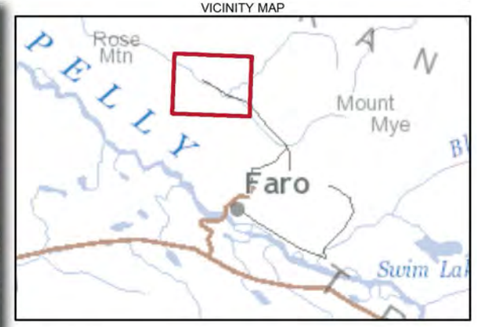
In the remaining sections of Rose Creek near the Faro Mine, Arctic grayling overwintering habitat is limited based on scarcity of water depths sufficient to prevent freezing to the bottom. EDI identified five locations near the mine that did not freeze over two sequential winters, including a boulder area at the base of the North Fork Rock Drain on the NFRC, a side-pool on the SFRC downstream from the former Freshwater Supply Reservoir, the water intake area of the Pumphouse Pond, and two locations in the RCD (EDI 2015). These locations were identified as potential overwintering areas based on presence of radio-tagged fish during the 2012-2013 winter and part of the 2013-2014 winter (Figure 9.4, Photos 4, 6, and 7, EDI 2015). The pool in the RCD where Arctic grayling were located during winter months has a maximum depth of 2.5 m and had temperatures that remained above freezing during 2013-2014. Many Arctic grayling tagged near the Faro Mine in fall months migrated downstream to the Pelly River to overwinter (EDI 2015), which suggests that overwintering habitats near the mine are too limited to support the number of grayling that use stream habitats around the mine during the ice-free period.

9.4 Tissue Metals

Whole-body slimy sculpin tissue metal concentrations at mine-exposed areas of Rose Creek were not substantially elevated compared to reference areas (Table 9.4). Slightly higher concentrations (<3-fold) of cadmium, cesium, cobalt, lead, mercury and zinc were observed at areas downstream from the Haul Road on the NFRC (Table 9.4). Whole body metal concentrations in Arctic grayling also differed to a limited degree among areas, but larger differences were observed for Arctic grayling muscle, with higher concentrations of barium, manganese, strontium, and zinc observed among fish captured downstream from the Haul Road (NFB) (Table 9.5).



VICINITY MAP



LEGEND

- Water Flow Direction
- Former Freshwater Reservoir

Mine Infrastructure:

- Open Pit
- Rock Dump
- Impoundment Area
- Overburden Dump
- Tailings Pond
- Dam
- Mill Area

* Mine Infrastructure base data provided by CH2M Hill

N

0 0.275 0.55 1.1 km

minnow environmental inc.

Figure 9.4
Potential and confirmed Arctic grayling overwintering habitat in the vicinity of the Faro Mine
Project: 2531 *Date: February 2016*

Table 9.4: Mean[a] whole body metal concentrations (mg/kg dry weight) in slimy sculpin sampled in the vicinity of the Faro Mine, August 2014.

Parameter		North Fork Reference	South Fork	North Fork Rose Creek			Rose Creek Diversion	Downstream of RCTA
		R7	SF	NFA	NFB	NFC	RCD	R2
% Moisture		75.0	75.9	77.4	74.2	74.8	73.6	77.1
ICP-Metals	Aluminum (Al)	188	80	139	68	81	203	97
	Antimony (Sb)	0.019	0.010	0.018	0.011	0.011	0.015	0.011
	Arsenic (As)	0.94	0.45	0.70	0.75	0.51	0.60	0.38
	Barium (Ba)	15.5	11.0	11.7	7.5	12.5	15.2	11.0
	Beryllium (Be)	0.013	0.010	0.010	0.011	0.010	0.013	0.010
	Bismuth (Bi)	0.011	0.010	0.012	0.010	0.010	0.011	0.010
	Boron (B)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Cadmium (Cd)	0.11	0.12	0.16	0.16	0.14	0.21	0.14
	Calcium (Ca)	38,500	42,567	42,433	25,967	34,267	33,967	52,733
	Cesium (Cs)	0.10	0.10	0.11	0.29	0.13	0.19	0.15
	Chromium (Cr)	0.50	0.19	0.55	0.32	0.32	0.45	0.33
	Cobalt (Co)	0.18	0.18	0.19	0.36	0.39	0.40	0.45
	Copper (Cu)	3.15	3.09	3.56	2.37	2.46	3.66	3.05
	Iron (Fe)	573	222	334	341	209	421	356
	Lead (Pb)	1.26	0.24	2.28	1.30	1.27	2.74	0.69
	Lithium (Li)	0.56	0.52	0.50	0.50	0.50	0.56	0.50
	Magnesium (Mg)	1,542	1,353	1,521	1,167	1,497	1,297	1,687
	Manganese (Mn)	99.9	67.0	38.0	51.2	47.3	34.4	180.0
	Mercury (Hg)	0.13	0.12	0.32	0.15	0.17	0.21	0.12
	Molybdenum (Mo)	0.13	0.08	0.11	0.07	0.13	0.12	0.12
	Nickel (Ni)	0.52	0.35	0.44	0.43	0.47	0.64	0.56
	Phosphorus (P)	24,980	29,667	30,733	20,067	25,067	22,733	36,733
	Potassium (K)	13,394	12,933	13,733	11,100	12,867	11,233	14,000
	Rubidium (Rb)	11.9	10.0	11.7	15.9	6.8	7.3	8.5
	Selenium (Se)	5.06	3.15	4.21	6.56	3.73	3.32	5.11
	Sodium (Na)	3,740	3,887	4,820	2,720	3,303	3,520	4,557
	Strontium (Sr)	48.1	62.4	44.0	27.6	41.1	40.3	47.4
	Tellurium (Te)	0.020	0.020	0.020	0.020	0.020	0.020	0.020
	Thallium (Tl)	0.016	0.023	0.038	0.029	0.020	0.027	0.026
	Tin (Sn)	0.10	0.10	0.10	0.11	0.10	0.10	0.10
	Uranium (U)	0.057	0.040	0.058	0.026	0.032	0.068	0.034
	Vanadium (V)	0.79	0.38	0.97	0.37	0.49	0.85	0.66
	Zinc (Zn)	100	122	141	184	215	268	205
	Zirconium (Zr)	0.21	0.20	0.20	0.20	0.21	0.20	0.20

[a] Mean of 3 to 5 samples per area. Raw data presented in Appendix Table F.16.

Table 9.5: Mean[a] muscle and whole body metal concentrations (mg/kg dry weight) in arctic grayling sampled in the vicinity of the Faro Mine, August 2014.

Parameter		Muscle						Whole Body					
		South Fork	North Fork Rose Creek			Rose Creek Diversion	Downstream from RCTA	South Fork	North Fork Rose Creek			Rose Creek Diversion	Downstream from RCTA
		SF	NFA	NFB	NFC	RCD	R2	SF	NFA	NFB	NFC	RCD	R2
% Moisture		76.7	75.1	72.3	79.3	77.0	74.9	73.4	70.5	71.0	74.8	74.7	72.5
ICP-Metals	Aluminum (Al)	5.0	9.7	3.7	15.8	11.2	18.4	12.7	40.2	79.5	29.0	806	114
	Antimony (Sb)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.027	0.012
	Arsenic (As)	0.070	0.081	0.264	0.109	0.106	0.149	0.263	0.223	0.360	0.181	0.518	0.321
	Barium (Ba)	0.19	0.28	1.59	0.44	1.66	3.29	3.76	3.26	3.65	4.01	15.35	6.31
	Beryllium (Be)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.031	0.011
	Bismuth (Bi)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.013	0.010	0.011	0.010
	Boron (B)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	Cadmium (Cd)	0.010	0.010	0.015	0.028	0.015	0.062	0.043	0.025	0.679	0.114	0.241	0.279
	Calcium (Ca)	897	610	18,450	855	13,526	22,780	23,600	17,533	19,300	24,575	31,400	27,580
	Cesium (Cs)	0.22	0.17	1.29	0.15	0.13	0.24	0.13	0.11	1.04	0.12	0.16	0.20
	Chromium (Cr)	0.20	0.20	0.53	2.18	0.49	0.72	0.10	0.16	0.22	0.20	4.87	0.78
	Cobalt (Co)	0.07	0.03	0.20	0.11	0.19	0.29	0.21	0.12	0.36	0.32	1.45	0.82
	Copper (Cu)	1.65	1.61	2.29	1.96	1.66	2.21	2.12	1.90	3.22	2.70	3.28	2.87
	Iron (Fe)	20.4	29.2	28.0	61.0	35.8	70.8	168	127	171	112	1,409	357
	Lead (Pb)	0.08	0.23	0.09	0.28	0.22	0.19	0.10	0.57	0.84	0.44	1.12	1.22
	Lithium (Li)	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.55	0.50
	Magnesium (Mg)	1,300	1,363	1,150	1,250	1,366	1,338	1,120	1,040	1,046	1,258	1,662	1,163
	Manganese (Mn)	1.24	1.72	8.7	1.9	10.4	63.6	22.3	18.0	21.9	24.6	155	108
	Mercury (Hg)	0.170	0.194	0.313	0.175	0.312	0.228	0.117	0.148	0.281	0.141	0.249	0.207
	Molybdenum (Mo)	0.040	0.040	0.066	0.079	0.062	0.105	0.030	0.026	0.073	0.044	0.407	0.126
	Nickel (Ni)	0.22	0.22	0.38	0.31	0.43	0.57	0.20	0.20	0.34	0.25	3.37	0.76
	Phosphorus (P)	10,580	10,270	17,700	10,453	16,680	21,133	20,933	17,267	18,100	22,575	24,840	21,860
	Potassium (K)	21,133	17,833	15,350	19,075	18,680	16,700	13,867	12,067	11,800	14,000	13,860	12,518
	Rubidium (Rb)	27.6	24.7	27.3	19.1	16.2	17.4	19.1	18.1	22.5	15.6	13.4	13.5
	Selenium (Se)	3.7	5.2	11.7	4.4	3.8	5.6	5.5	8.3	14.8	6.2	4.8	7.5
	Sodium (Na)	1,310	1,090	2,035	1,391	1,824	2,465	3,120	2,557	2,880	2,885	3,574	3,458
	Strontium (Sr)	0.69	0.34	14.8	0.72	11.2	17.6	25.0	14.9	16.1	24.9	27.6	21.3
	Tellurium (Te)	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020
	Thallium (Tl)	0.022	0.018	0.064	0.026	0.027	0.032	0.021	0.015	0.048	0.026	0.031	0.032
	Tin (Sn)	0.10	0.10	0.12	0.10	0.10	0.10	0.19	0.10	0.10	0.11	0.11	0.12
	Uranium (U)	0.0020	0.0020	0.0054	0.0022	0.0071	0.0115	0.0155	0.0228	0.0252	0.0119	0.0884	0.0452
	Vanadium (V)	0.10	0.10	0.17	0.10	0.10	0.17	0.18	0.21	0.46	0.13	2.43	0.66
	Zinc (Zn)	26.0	22.9	73.1	28.8	45.8	65.4	100	58.8	91.2	116	128	117
	Zirconium (Zr)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.37	0.20

[a] Mean of 2 to 5 samples per area. Raw data presented in Appendix Tables F.14, F.15.

10.0 SUMMARY

The Faro Mine Complex (FMC), near Faro, Yukon, was formerly owned by the Anvil Range Mining Corporation, and includes two areas of former mining activity: the Faro Mine and Mill (Faro Mine Area) and the Vangorda and Grum mines (Vangorda/Grum Area), which are located approximately 10 kilometres (km) apart. The mine produced lead and zinc concentrates that were extracted for lead, zinc, silver, and gold. Mine operations were terminated in April 1998 and the site went into receivership. Site Care and Maintenance responsibilities are being managed by contractors acting on behalf of the Government of Yukon (YG), while efforts continue towards development of the final scope and implementation of a final remediation plan. This study was completed to support on-going monitoring of aquatic environmental conditions around the Faro Mine Area, and summarizes current surface water quality and aquatic ecosystem conditions.

Habitat

The Faro Mine Area occupies a portion of the Rose Creek watershed, which flows into the Pelly River, which in turn is a major tributary to the Yukon River. Several physical alterations to stream courses have occurred over time around the FMC to accommodate mine features; these include several stream diversions and numerous road crossings, with some of the latter resulting in barriers to fish passage. Common natural habitat features among most reaches of the Rose Creek system include riffle and run habitats with boulder, cobble, and gravel substrates. Boulders and pools provide in-stream cover for resident fish species.

Water Quality

Water quality data collected from 2010 through 2014 showed that concentrations of a variety of non-metals and metals are elevated in surface waters around the Faro Mine relative to the typical range of background (i.e., regional reference station) concentrations. Ammonia, conductivity, hardness, sulphate, total dissolved solids, calcium, cobalt, magnesium, manganese, nickel, potassium, sodium, strontium, and zinc occur at concentrations above the background range in approximately half or more of samples collected at station X14 on Rose Creek immediately downstream from the Faro Mine Area.

Concentrations of non-metal analytes were less than those expected to have adverse effects on aquatic biota. Water concentrations of cadmium and cobalt were sometimes above water quality guidelines for protection of aquatic life in samples collected at NF2 and X2, on the NFRC downstream from the Haul Road. Zinc concentrations were frequently

above the guideline for protection of aquatic life at stations located between NF2 and X14. Cobalt and manganese were also found at concentrations above water quality guidelines for protection of aquatic life in up to 40% of samples collected at X14, but median concentrations for all metals except zinc were below the guidelines. Water quality guidelines were infrequently exceeded at stations farther downstream in Anvil Creek indicating that mine-related effects on biota, if any, are likely localized around the Faro Mine Area. Mine-related effects on water quality do not extend into the Pelly River.

Sediment Quality

Arsenic, lead, manganese, and zinc concentrations were elevated in sediment samples collected at near-field mine-exposed areas relative to sediment quality guidelines. However, laboratory tests of survival and growth of the invertebrates *Hyalella azteca* and *Chironomus dilutus* showed no impairment after 14-day exposures to sediments from mine-exposed areas compared to a reference sediment sample. Mine-related contaminants tend to be most strongly associated with fine sediment particles, which typically represent a small component of bottom substrates in the moderately- to swiftly-flowing aquatic habitats around and downstream from the FMC (i.e., sediment particles are mainly sand-sized or larger). Together the data indicate that exposure to mine-related contaminants in sediments represents a relatively minor pathway for potential effects to aquatic biota.

Periphyton

Many sampling areas around the Faro Mine reflected a general pattern of higher densities of total algal cells, *A. minutissima*, and/or chlorophytes compared to reference areas. Elevated total cell densities, where they occurred, were mainly attributable to high densities of *A. minutissima*. Elevated chlorophyte densities were mainly attributable to *Stigeoclonium* sp. or *Ulothrix zonata*. Overall, the pattern of data was suggestive of a mine-related influence on periphyton communities around the Faro Mine Area, with diminishing effects farther downstream in Anvil Creek. However, detailed evaluation of the spatial patterns of response relative to the degree of mine-related influence on water quality, and of the relative tolerances of taxa contributing to differences in community structure among areas, yielded conflicting evidence of a mine-related effect. In the absence of strong weight-of-evidence for either mine-related effect, or lack thereof, most of the periphyton communities in the immediate vicinity of the Faro Mine Area were concluded to be potentially affected by general mine-related disturbances.

Periphyton AFDM and chlorophyll-a measurements were highly variable among sampling areas with no obvious pattern to indicate that periphyton productivity is affected by mine influence on water quality. Chlorophyll-a measurements were all well below the British Columbia Ministry of Environment guideline of 100 mg/m^2. Periphyton tissue chemistry at areas X2 (NFRC) and X3 reflected elevated concentrations of barium, cadmium, cobalt, lead, manganese, nickel and zinc compared to the upstream (R7) reference area, with some concentrations remaining elevated in periphyton tissue sampled at station R2 downstream of the RCTA.

Benthic Invertebrate Communities

Benthic invertebrate communities within both the reference and exposed areas were dominated by Ephemeroptera (mayflies), Plecoptera (stoneflies), and chironomids (midges). As observed with periphyton, benthic invertebrate communities in the RCD had characteristics outside of the range of reference communities, suggesting a possible mine-related effect. However, as with periphyton, supporting information did not provide strong evidence that the cause was mine-related (i.e., lack of correlation of community response with the degree of mine-related effect on water quality). Also, all areas, including the RCD, had invertebrate communities that included taxa generally considered to be sensitive to disturbances (e.g., mayflies, stoneflies, and caddisflies) and also had family richness values (i.e., number of different invertebrate families) within the range observed at regional reference areas.

Fish

Slimy sculpin (*Cottus cognatus*), Arctic grayling (*Thymallus arcticus*), juvenile Chinook salmon (*Oncorhynchus tshawytscha*), burbot (*Lota lota*), round whitefish (*Prosopium cylindraceum*), and longnose sucker (*Catostomus catostomus*) have historically been reported in surface waters around and downstream from the FMC, but recent surveys have confirmed the presence of only Arctic grayling and slimy sculpin. Slimy sculpin tend to be more abundant. Both species utilize surface waters around the Faro Mine year-round, although overwinter habitat for grayling is limited and many migrate to the Pelly River for the winter. The fish community in the NFRC upstream from the Haul Road is physically isolated from the community in the rest of the Rose Creek system.

Overall Conclusions

The Rose Creek system downstream from disturbances associated with the Faro Mine reflects elevated concentrations of a number of metals, most notably cobalt, lead, nickel, and zinc in water, sediment, aquatic vegetation, periphyton tissue, benthic invertebrate tissue, and fish tissue compared to samples collected in local and regional reference areas. However, water quality guidelines were infrequently exceeded at stations farther downstream in Anvil Creek indicating that mine-related effects on biota, if any, are likely localized around the Faro Mine Area and do not extend into the Pelly River. Mine-related effects, if any, on periphyton and benthic invertebrate communities are minor and difficult to distinguish from naturally large spatial and temporal variations in community characteristics. Slimy sculpin and Arctic grayling were prevalent throughout the system.

11.0 REFERENCES

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APPENDIX A

DATA QUALITY CONTROL EVALUATION

APPENDIX A: DATA QUALITY CONTROL EVALUATION

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A1.0 INTRODUCTION

Data Quality Control Evaluation (DQCE) was conducted on data collected as part of this study. The objective of DQCE is to define the overall quality of the data presented in the report, and, by extension, the confidence with which the data can be used to derive conclusions.

A1.1 Background

A variety of factors can influence the chemical and biological measurements made in an environmental study and thus affect the accuracy and/or precision of the data. Inconsistencies in sampling or laboratory methods, use of instruments that are inadequately calibrated or which cannot measure to the desired level of accuracy or precision, and contamination of samples in the field or laboratory are just some of the potential factors that can lead to the reporting of data that do not accurately reflect actual environmental conditions. Depending on the magnitude of the problem, inaccuracy or imprecision have the potential to affect the reliability of any conclusions made from the data. Therefore, it is important to ensure that monitoring programs incorporate appropriate steps to control the non-natural sources of data variability (i.e., minimize the variability that does not reflect natural spatial and temporal variability in the environment) and thus assure the quality of the data.

Data quality as a concept is meaningful only when it relates to the intended use of the data. That is, one must know the context in which the data will be interpreted in order to establish a relevant basis for judging whether or not the data set is adequate. DQCE involves comparison of actual field and laboratory measurement performance to data quality objectives (DQOs) established for a particular study, such as evaluation of method detection limits, blank sample data, data precision (based on field and laboratory duplicate samples), and data accuracy (based on matrix spike recoveries and/or analysis of standards or certified reference materials).

DQOs were established at the outset of the field program that reflect reasonable and achievable performance expectations (Table A.1). Programs involving a large amount of samples and analytes usually result in some results that exceed the DQOs. This is particularly so for multi-element scans (e.g., ICP scans for metals) since the analytical conditions are not necessarily optimal for every element included in the scan. Generally, scan results may be considered acceptable if no more than 20% of the parameters fail to meet the DQOs. Overall, the intent of comparing data to DQOs was not to reject any measurement that did not meet the DQO, but to ensure any questionable data received

Table A.1: Data quality objectives for environmental samples.

Quality Control Measure	Quality Control Sample Type	Study Component				
		Water Quality	**Sediment Quality**	**Benthic Invertebrate Community**	**Periphyton**	**Tissue Quality**
Method Detection Limits (MDL)	Comparison actual MDL versus target MDL	MDL for each parameter should be at least as low as applicable guidelines, ideally ≤1/10th guideline value[a]	MDL for each parameter should be at least as low as applicable guidelines, ideally ≤1/10th guideline value[a]	n/a	n/a	MDL for each parameter should be at least as low as applicable guidelines, ideally ≤1/10th guideline value[a]
Blank Analysis	Field or Laboratory Blank	≤two-times the laboratory MDL	≤two-times the laboratory MDL	n/a	Chlorophyll a ≤two-times the laboratory MDL	n/a
Field Precision	Field Duplicates	≤25% RPD	n/a	n/a	n/a	n/a
Laboratory Precision	Laboratory Duplicates	≤25% RPD	≤35% RPD	n/a	≤40% RPD	≤30% RPD
	Sub-Sampling Error	n/a	n/a	≤20% RPD between sub-samples	n/a	n/a
	Accuracy	n/a	n/a	80-120% RPD from average fraction density	n/a	n/a
Accuracy	Recovery of Blank Spikes	80-120%	75-125%	n/a	Chlorphyll a 80-120%	75-125%
	Recovery of Matrix Spikes	75-125%	75-125%	n/a	n/a	75-125%
	Recovery of Certified Reference Material, QC Standards	80-120%	70-130%	n/a	70-130%	70-130%
	Organism Recovery	n/a	n/a	≥ 90%	n/a	n/a

[a] or below predictions, if applicable and no guideline exists for the substance
n/a - not applicable
RPD - Relative Percent Difference

more scrutiny to determine what effect, if any, this had on interpretation of results within the context of this project.

A1.2 Types of Quality Control Samples

Several types of quality control (QC) samples were assessed based on samples collected (or prepared) in the field and laboratory. These samples, and a description of each, include the following:

- **Blanks** are samples of de-ionized water and/or appropriate reagent(s) that are handled and analyzed the same way as regular samples. These samples will reflect any contamination of samples occurring in the field (in the case of field or trip blanks) or the laboratory (in the case of laboratory or method blanks). Analyte concentrations should be non-detectable although a data quality objective of twice the method detection limit allows for slight "noise" around the detection limit.

- **Field Duplicates** are replicate samples collected from a randomly selected field station using identical collection and handling methods that are then analyzed separately in the laboratory. The duplicate samples are handled and analyzed in an identical manner in the laboratory. The data from field replicate samples reflect natural variability, as well as the variability associated with sample collection methods, and therefore provide a measure of field precision.

- **Laboratory Duplicates** are replicate sub-samples created in the laboratory from randomly selected field samples which are sub-sampled and then analyzed independently using identical analytical methods. For fish tissue, laboratory duplicates represent separate aliquots of material collected after sample homogenization. The laboratory duplicate sample results reflect any variability introduced during laboratory sample handling and analysis and thus provide a measure of laboratory precision.

- **Spike Recovery Samples** are created in the laboratory by adding a known amount/concentration of a given analyte (or mixture of analytes) to a randomly selected test sample previously divided to create two sub-samples. The spiked and regular sub-samples are then analyzed in an identical manner. The spike recovery represents the difference between the measured spike amount (total amount in spiked sample minus amount in original sample) relative to the known spike amount (as a percentage). Two types of spike recovery samples are commonly analyzed. Spiked blanks (or blank spikes) are created using

laboratory control materials whereas matrix spikes are created using field-collected samples. The analysis of spiked samples provides an indication of the accuracy of analytical results.

- **Certified Reference Materials and QC Standards** are samples containing known chemical concentrations that are processed and analyzed along with batches of environmental samples. The sample results are then compared to target results to provide a measure of analytical accuracy. The results are reported as the percent of the known amount that was recovered in the analysis.

Two types of QC were applied to benthic invertebrate and periphyton community samples as follows:

- **Organism Recovery Checks** for community samples involve the re-processing of previously sorted material from a randomly selected sample to determine the number of organisms that were not recovered during the original sample processing. The reprocessing is conducted by an analyst not involved during the original processing to reduce any bias. This check allows the determination of accuracy through assessment of recovery efficiency.
- **Sub-Sampling Error** is assessed for studies in which community samples require sub-sampling (due to excessive sample volume and/or organism density). By comparing the numbers of organisms recovered between at least two sub-samples, this measure provides an evaluation of how effective the sub-sampling method was in evenly dividing the original sample. Therefore, sub-sampling error provides a measure of analytical accuracy and precision. The processing of entire community samples in representative sample fractions also allows an evaluation of sub-sampling accuracy.

A2.0 WATER SAMPLES

A2.1 Method Detection Limits

Target laboratory method detection limits (MDL) for water sample analyses were established at levels below all potentially applicable water quality guidelines (Table A.2). Most reported MDLs were at or below the target values with the exceptions of total suspended solids, and the following total metals: aluminum, beryllium, bismuth, copper, iron, magnesium, nickel, potassium, strontium, titanium, and zinc. In all cases, achieved MDLs were below pertinent water quality criteria, or the analyte had no guideline, meaning that sample data for this project could be reliably interpreted relative to the guidelines.

A2.2 Laboratory Blank Sample Analysis

All blank samples that were analyzed contained non-detectable analyte concentrations indicating no inadvertent contamination of samples within the laboratory during analysis (Table A.3).

A2.3 Data Precision

Field Duplicate Samples

Four sets of water samples were collected and split in the field, and showed good overall agreement in analyte concentrations (Table A.4). Results for total copper, lead, silver, and tin did not achieve the DQO for one of the samples (X2-TOX), representing only 2% of all parameters analyzed among samples. In two cases (X2-TOX silver and tin) concentrations were close to the MDL where precision and accuracy are usually less reliable. Overall, the data suggest that reported analytical data were reasonably precise based on the split samples submitted.

Laboratory Duplicate Samples

Close agreement was achieved between laboratory duplicate samples, indicating reported sample results were associated with excellent analytical precision for non-metals analyses (Table A.5). No laboratory duplicate sample data were reported by the lab for metals in water.

Table A.2: Laboratory method detection limits (MDLs) relative to targets and to water quality guidelines. Any highlighted values indicate MDLs that were above the target concentration.

	Analytes	Units	Method Detection Limit		Water quality criteria	
			Target	Achieved	Canadian Water Quality Guidelines (for protection of aquatic life), CCME 2016a[a], unless otherwise footnoted	British Columbia Water Quality Guidelines (for protection of aquatic life), BCMOE 2006[b], 2016[c]
						30-d (chronic)
Non -metals	Alkalinity	mg/L	2	2	-	less than 10 mg/L[c]
	Chloride	mg/L	0.5	0.5	120 (2011 update)	150[c]
	Dissolved Organic Carbon	mg/L	0.5	0.5	-	30-day median ± 20% of the median background concentration (approved)[c]
	Total Organic Carbon	mg/L	0.5	0.5	-	30-day median ± 20% of the median background concentration[c]
	Dissolved Sulphate (SO_4)	mg/L	1	0.5	-	309 mg/L[c] (hardness dependent)
	Fluoride	mg/L	0.02	0.02	0.120 (inorganic fluoride) (interim)	0.2 maximum at hardness <50 mg/L CaCO3; 0.3 maximum at hardness ≥50 mg/L CaCO3 (total fluoride)[c]
	Hardness (as $CaCO_3$)	mg/L	0.5	0.5	-	-
	Nitrate (N)	mg/L	0.1	0.005	3 (13.0 as whole ion)	3 (13.0 as whole ion)[c]
	Nitrite (N)	mg/L	0.01	0.001	0.06	0.02-0.2 depending on chloride concentrations
	Ammonia-N	mg/L	0.005	0.005	0.2 (pH and temperature dependent)	guideline expressed as total ammonia[c]
	Total Phosphorus (P)	mg/L	0.005	0.002	-	0.005-0.015 (lakes)[c]
	Total Dissolved Solids	mg/L	10	10	-	-
	Total Suspended Solids	mg/L	1	3	maximum average increase of 5 from background levels	mean of background plus 5 over 30 days if background is less than or equal to 25[c]
	Turbidity	NTU	0.1	0.1	maximum average increase of 2 from background levels	mean of background plus 2 over 30 days if background is ≤8 NTU[c]
ICP Metals	Total Aluminum (Al)	mg/L	0.0005	0.003	0.005 @ pH < 6.5 0.1 @ pH ≥ 6.5	0.05 (dissolved at pH ≥ 6.5)[c]
	Total Antimony (Sb)	mg/L	0.0001	0.0001	-	0.02[b]
	Total Arsenic (As)	mg/L	0.0001	0.0001	0.005	0.005[c]
	Total Barium (Ba)	mg/L	0.0005	0.00005	-	1[b]
	Total Beryllium (Be)	mg/L	0.00005	0.0001	-	0.0053[b]
	Total Bismuth (Bi)	mg/L	0.0001	0.0005	-	-
	Total Boron (B)	mg/L	0.05	0.01	1.5 (2009 update)	1.2[c]
	Total Cadmium (Cd)	mg/L	0.01	0.00001	0.000013-0.000289 (hardness dependent)	guideline expressed as dissolved cadmium[c]
	Total Calcium (Ca)	mg/L	0.05	0.05	-	-
	Total Chromium (Cr)	mg/L	0.0005	0.0001	0.001 (for hexavalent form) 0.0089 (for trivalent form)	0.001 (for hexavalent form)[b]
	Total Cobalt (Co)	mg/L	0.00005	0.0001	0.0025[d]	0.004[c]
	Total Copper (Cu)	mg/L	0.0001	0.0005	0.001 - 0.004 (hardness dependent)	0.00004 - 0.002 (hardness dependent)[c]
	Total Iron (Fe)	mg/L	0.005	0.01	0.3	1 (total), 0.35 (dissolved)[c]
	Total Lead (Pb)	mg/L	0.00005	0.00005	0.003-0.011 (hardness dependent)	0.003 - 0.011 (hardness dependent)[c]
	Total Lithium (Li)	mg/L	0.0005	0.0005	-	0.014 (secondary chronic value) or 0.096 (final chronic value)[b]
	Total Magnesium (Mg)	mg/L	0.05	0.1	-	-
	Total Manganese (Mn)	mg/L	0.0002	0.00005	-	0.63-1.5 (hardness-dependent)[c]
	Total Mercury (Hg)	mg/L	0.02	0.00001	0.026 (inorganic)	0.02 (total mercury)[c]
	Total Molybdenum (Mo)	mg/L	0.0001	0.00005	0.073	1[c]
	Total Nickel (Ni)	mg/L	0.0001	0.0005	0.01-0.166 (hardness dependent)	0.025 - 0.15 (hardness dependent)[b]
	Total Potassium (K)	mg/L	0.05	0.1	-	373[b]
	Total Selenium (Se)	mg/L	0.0002	0.0001	1	2[c]
	Total Silicon (Si)	mg/L	0.1	0.1	-	-
	Total Silver (Ag)	mg/L	0.00001	0.00001	0.0001	0.00005 - 0.0015 (hardness-dependent)[b]
	Total Sodium (Na)	mg/L	0.05	0.05	-	-
	Total Strontium (Sr)	mg/L	0.0001	0.0002	-	-
	Total Sulphur (S)	mg/L	3	0.5	-	-
	Total Thallium (Tl)	mg/L	0.000005	0.00001	0.0008	0.0003[b]
	Total Tin (Sn)	mg/L	0.0001	0.0001	-	-
	Total Titanium (Ti)	mg/L	0.0005	0.01	-	2[b]
	Total Uranium (U)	mg/L	0.00001	0.00001	0.0150	0.3[b]
	Total Vanadium (V)	mg/L	0.0002	0.001	-	0.006[b]
	Total Zinc (Zn)	mg/L	0.0005	0.003	0.030	0.033 - 0.115 (hardness dependent)[c]

achieved method detection limit greater than requested method detection limit

[a] CCME (Canadian Council for Ministers of the Environment). 2016a. Canadian Water Quality Guidelines for the Protection of Aquatic Life. Accessed at http://st-ts.ccme.ca/, April 2016.

[b] BCMOE (British Columbia Ministry of the Environment). 2006. A Compendium of Working Water Quality Guidelines for British Columbia. Environmental Protection Division, Victoria, British Columbia.

[c] BCMOE (British Columbia Ministry of the Environment). 2016. British Columbia Approved Water Quality Guidelines. Environmental Protection Division, Victoria, British Columbia. Accessed at http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html, April 2016.

[d] Environment Canada. 2013a. Federal Environmental Quality Guidelines: Cobalt. February 2013.

Table A.3: Laboratory blank results associated with analysis of water samples. Any highlighted data did not meet the data quality objective of ≤ 2x the method detection limit.

Analytes		Units	Method Detection Limit	ALS Job Number		
				L1506653	L1507247	L1508553
Non-metals	Alkalinity	mg/L	2	ND	ND	ND
	Chloride	mg/L	0.5	ND	ND	ND
	Dissolved Organic Carbon	mg/L	0.5	ND	ND	ND
	Total Organic Carbon	mg/L	0.5	ND	ND	ND
	Dissolved Sulphate (SO_4)	mg/L	0.5	ND	ND	ND
	Fluoride	mg/L	0.02	ND	ND	ND
	Nitrate (N)	mg/L	0.005	ND	ND	ND
	Nitrite (N)	mg/L	0.001	ND	ND	ND
	Ammonia	mg/L	0.005	ND	ND	ND
	Total Phosphorus (P)	mg/L	0.05	ND	ND	ND
	Total Dissolved Solids	mg/L	10	ND	ND	ND
	Total Suspended Solids	mg/L	3	ND	ND	ND
	Turbidity	NTU	0.1	ND	ND	ND
ICP Metals	Total Aluminum (Al)	mg/L	0.003	ND	ND	ND
	Total Antimony (Sb)	mg/L	0.0001	ND	ND	ND
	Total Arsenic (As)	mg/L	0.0001	ND	ND	ND
	Total Barium (Ba)	mg/L	0.00005	ND	ND	ND
	Total Beryllium (Be)	mg/L	0.0001	ND	ND	ND
	Total Bismuth (Bi)	mg/L	0.000500	ND	ND	ND
	Total Boron (B)	mg/L	0.01	ND	ND	ND
	Total Cadmium (Cd)	mg/L	0.00001	ND	ND	ND
	Total Calcium (Ca)	mg/L	0.05	ND	ND	ND
	Total Chromium (Cr)	mg/L	0.0001	ND	ND	ND
	Total Cobalt (Co)	mg/L	0.0001	ND	ND	ND
	Total Copper (Cu)	mg/L	0.0005	ND	ND	ND
	Total Iron (Fe)	mg/L	0.01	ND	ND	ND
	Total Lead (Pb)	mg/L	0.00005	ND	ND	ND
	Total Lithium (Li)	mg/L	0.0005	ND	ND	ND
	Total Magnesium (Mg)	mg/L	0.1	ND	ND	ND
	Total Manganese (Mn)	mg/L	0.00005	ND	ND	ND
	Total Mercury (Hg)	mg/L	0.00001	ND	ND	ND
	Total Molybdenum (Mo)	mg/L	0.00005	ND	ND	ND
	Total Nickel (Ni)	mg/L	0.0005	ND	ND	ND
	Total Potassium (K)	mg/L	0.1	ND	ND	ND
	Total Selenium (Se)	mg/L	0.0001	ND	ND	ND
	Total Silicon (Si)	mg/L	0.1	ND	ND	ND
	Total Silver (Ag)	mg/L	0.00001	ND	ND	ND
	Total Sodium (Na)	mg/L	0.05	ND	ND	ND
	Total Strontium (Sr)	mg/L	0.0002	ND	ND	ND
	Total Sulphur (S)	mg/L	0.5	ND	ND	ND
	Total Thallium (Tl)	mg/L	0.00001	ND	ND	ND
	Total Tin (Sn)	mg/L	0.0001	ND	ND	ND
	Total Titanium (Ti)	mg/L	0.01	ND	ND	ND
	Total Uranium (U)	mg/L	0.00001	ND	ND	ND
	Total Vanadium (V)	mg/L	0.001	ND	ND	ND
	Total Zinc (Zn)	mg/L	0.003	ND	ND	ND

ND - Non-Detectable. Indicates analyte concentrations that were less than the MDL during analysis.

Table A.4: Results for analysis of water samples that were split in the field. Highlighted values did not meet the data quality objective of ≤ 25% relative percent difference.

	Analytes	Units	GRUM			X2-TOX			R9			Ref-327		
			Replicate 1	Replicate 2	Relative Percent Difference[a]	Replicate 1	Replicate 2	Relative Percent Difference[a]	Replicate 1	Replicate 2	Relative Percent Difference[a]	Replicate 1	Replicate 2	Relative Percent Difference[a]
Non-metals	Alkalinity	mg/L	23	22.7	1.3	85.3	86.6	1.5	84.3	80.7	4.4	130	130	0.0
	Chloride	mg/L	<0.50	<0.50		<0.50	<0.50		<0.50	<0.50		<0.50	<0.50	
	Dissolved Organic Carbon	mg/L	2.72	2.52	7.6	2.88	2.61	9.8	2.74	2.7	1.5	1.26	1.51	18.1
	Total Organic Carbon	mg/L	2.82	2.86	1.4	2.89	2.74	5.3	2.89	2.81	2.8	1.11	1.19	7.0
	Dissolved Sulphate (SO_4)	mg/L	5.52	5.53	0.2	16.7	16.7	0.0	11.6	11.6	0.0	92.3	92.2	0.1
	Fluoride	mg/L	0.06	0.06	0.0	0.104	0.104	0.0	0.099	0.099	0.0	0.056	0.055	1.8
	Hardness (as $CaCO_3$)	mg/L	25.7	25.8	0.4	92.9	96.7	4.0	94.8	89.3	6.0	234	242	3.4
	Nitrate (N)	mg/L	0.0067	0.0064	4.6	0.0459	0.0459	0.0	0.0396	0.0402	1.5	0.0866	0.0863	0.3
	Nitrite (N)	mg/L	<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010	
	Ammonia	mg/L	<0.0050	<0.0050		<0.0050	<0.0050		<0.0050	<0.0050		<0.0050	<0.0050	
	Total Phosphorus (P)	mg/L	0.0055	0.0052	5.6	0.0066	0.003	75.0	0.002	<0.0020		0.003	0.0027	10.5
	Total Dissolved Solids	mg/L	48	50	4.1	127	129	1.6	124	124	0.0	288	288	0.0
	Total Suspended Solids	mg/L	4	4	0.0	4	<3.0	>29	<3.0	<3.0		<3.0	<3.0	
	Turbidity	NTU	1	1.04	3.9	1.51	1.89	22.4	124	124	0.0	0.68	0.62	9.2
ICP Metals	Total Aluminum (Al)	mg/L	0.0338	0.0299	12.2	0.091	0.094	3.2	0.025	0.0253	1.2	0.02	0.0207	3.4
	Total Antimony (Sb)	mg/L	<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010		0.00013	0.00013	0.0
	Total Arsenic (As)	mg/L	0.00035	0.00035	0.0	0.00081	0.0008	1.2	0.00075	0.00075	0.0	0.00018	0.00016	11.8
	Total Barium (Ba)	mg/L	0.0273	0.0275	0.7	0.0492	0.0499	1.4	0.0501	0.0481	4.1	0.087	0.0883	1.5
	Total Beryllium (Be)	mg/L	<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010		<0.00010	<0.00010	
	Total Bismuth (Bi)	mg/L	<0.00050	<0.00050		<0.00050	<0.00050		<0.00050	<0.00050		<0.00050	<0.00050	
	Total Boron (B)	mg/L	<0.010	<0.010		<0.010	<0.010		<0.010	<0.010		<0.010	<0.010	
	Total Cadmium (Cd)	mg/L	<0.000010	<0.000010		0.00021	0.000236	11.7	<0.000010	<0.000010		0.000028	0.000027	3.6
	Total Calcium (Ca)	mg/L	8.15	8.2	0.6	26.8	28.2	5.1	28.5	26.6	6.9	60	62.2	3.6
	Total Chromium (Cr)	mg/L	0.00012	0.00013	8.0	0.00027	0.00031	13.8	0.00015	0.00015	0.0	0.00016	0.00011	37.0
	Total Cobalt (Co)	mg/L	<0.00010	<0.00010		0.00135	0.00132	2.2	<0.00010	<0.00010		<0.00010	<0.00010	
	Total Copper (Cu)	mg/L	<0.00050	<0.00050		0.00074	0.0179	184.1	0.00054	0.00052	3.8	<0.00050	<0.00050	
	Total Iron (Fe)	mg/L	0.135	0.135	0.0	0.447	0.464	3.7	0.22	0.213	3.2	0.033	0.035	5.9
	Total Lead (Pb)	mg/L	0.000107	0.00009	17.3	0.00146	0.00213	37.3	0.000192	0.000188		<0.000050	<0.000050	
	Total Lithium (Li)	mg/L	0.00101	0.00102	1.0	0.00357	0.00363	1.7	0.00341	0.00325	4.8	0.00095	0.00082	14.7
	Total Magnesium (Mg)	mg/L	1.29	1.3	0.8	6.3	6.4	1.6	5.75	5.53	3.9	20.3	21	3.4
	Total Manganese (Mn)	mg/L	0.00799	0.00804	0.6	0.107	0.107	0.0	0.0241	0.0227	6.0	0.00121	0.00116	4.2
	Total Mercury (Hg)	mg/L	<0.000010	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010		<0.000010	<0.000010	
	Total Molybdenum (Mo)	mg/L	0.000249	0.000259	3.9	0.000499	0.000515	3.2	0.000548	0.000514	6.4	0.000733	0.000747	1.9
	Total Nickel (Ni)	mg/L	<0.00050	<0.00050		0.00217	0.00256	16.5	<0.00050	<0.00050		<0.00050	<0.00050	
	Total Potassium (K)	mg/L	0.12	0.13	8.0	0.64	0.67	4.6	0.64	0.6	6.5	0.62	0.67	7.8
	Total Selenium (Se)	mg/L	<0.00010	<0.00010		0.00022	0.00021	4.7	0.00023	0.00021	9.1	0.00072	0.00078	8.0
	Total Silicon (Si)	mg/L	3.4	3.43	0.9	5.1	5.17	0.6	5.1	4.91	3.8	2.5	2.63	3.9
	Total Silver (Ag)	mg/L	<0.000010	<0.000010		<0.000010	0.000033	>107	<0.000010	<0.000010		<0.000010	<0.000010	
	Total Sodium (Na)	mg/L	1.54	1.56	1.3	2.12	2.11	0.5	2.09	2.01	3.9	1.15	1.21	5.1
	Total Strontium (Sr)	mg/L	0.0513	0.0515	0.4	0.119	0.116	2.6	0.118	0.113	4.3	0.193	0.19	1.6
	Total Sulphur (S)	mg/L	2.06	2.02	2.0	5.82	5.86	0.7	4.2	4.1	2.4	30.9	32.6	5.4
	Total Thallium (Tl)	mg/L	<0.000010	<0.000010		<0.000010	0.000013		<0.000010	<0.000010		<0.000010	<0.000010	
	Total Tin (Sn)	mg/L	<0.00010	<0.00010		<0.00010	0.00045	>127	<0.00010	<0.00010		<0.00010	<0.00010	
	Total Titanium (Ti)	mg/L	<0.010	<0.010		<0.010	<0.010		<0.010	<0.010		<0.010	<0.010	
	Total Uranium (U)	mg/L	0.000417	0.000414	0.7	0.000958	0.000995	3.8	0.000976	0.000978	0.2	0.0025	0.00256	2.4
	Total Vanadium (V)	mg/L	<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010		<0.0010	<0.0010	
	Total Zinc (Zn)	mg/L	0.003	<0.0030		0.31	0.315	1.6	<0.0030	<0.0030		<0.0030	0.169	16.2

[a] The method detection limit (MDL) value was used in instances where one value less than the MDL was reported.

Table A.5: Laboratory duplicate results for water sample analyses. Any highlighted values did not meet data quality objective of ≤ 20% relative percent difference.

Analytes		Relative Percent Difference								
		ALS Job Number								
		L1506653		L1507247				L1508533		
		Batch 1	Batch 3	Batch 1	Batch 2	Batch 3	Batch 4	Batch 1	Batch 2	Batch 3
Non-metals	Alkalinity			0.4	0.0			1.9	1.9	
	Chloride	N/A		N/A	N/A			N/A		
	Dissolved Organic Carbon			1.7	0.2	2.1	5.4	7.6	3.1	1.3
	Total Organic Carbon	1.7	5.3	11	0.2	0.9	0.8	4.2	1.8	2.3
	Dissolved Sulphate (SO_4)	1.0		0.1	0.1			0.8		
	Fluoride	0.2		1.1	0.2			1.5		
	Nitrate (N)	N/A						0.0		
	Nitrate plus Nitrite (N)			1.2	0.5					
	Nitrite (N)	N/A		N/A	N/A			N/A		
	Total Phosphorus (P)	8.1								
	Total Dissolved Solids									
	Total Suspended Solids	0.0		18	N/A			N/A		
	Turbidity	2.2		2.5	5.9			1.1		

N/A - Not calculated by lab if concentration in one or both duplicates was below method detection limit.

A2.4 Data Accuracy

Analyte recoveries for spiked blank samples all met the data quality objective (Table A.6). Recoveries of all matrix spikes and certified reference materials were also within the corresponding DQO range (Tables A.7 and A.8). These data indicated excellent analytical accuracy associated with the analysis of water samples.

Table A.6: Laboratory spiked blank recoveries (%) for water sample analyses. Any highlighted values did not meet data quality objective of 80 - 120% recovery.

	Analytes	ALS Job Number																		
		L1506653								L1507247							L1508553			
		Batch 1	Batch 2	Batch 3	Batch 4	Batch 5	Batch 6	Batch 7	Batch 8	Batch 1	Batch 2	Batch 3	Batch 4	Batch 5	Batch 6	Batch 7	Batch 1	Batch 2	Batch 3	Batch 4
Non-metals	Alkalinity																			
	Chloride	101								100	100	100					100	101		
	Conductivity																			
	Cyanide (WAD)																			
	Dissolved Organic Carbon	98	98	97	95	95	100	99	97	95	100	99	99				99	100	102	
	Total Organic Carbon	100	98	92	97	94	98	100	96	97	101	102	104	102.9	100.7		105	98	99	100
	Dissolved Sulphate (SO_4)	101								101	100	101					101	101		
	Fluoride	102								102	103	103					102	102		
	Hardness (as $CaCO_3$)																			
	Nitrate (N)	100								100	100	100					100	100		
	Nitrate plus Nitrite (N)																			
	Nitrite (N)	107								107	104	107					106	105		
	pH, Soluble (2:1)																			
	Total Kjeldhal Nitrogen																			
	Ammonia																			
	Total Phosphorus (P)																			
	Total Dissolved Solids	101	100							104	100	104	103	100	100	101	100	103	101	103
	Total Suspended Solids	90	89	95	99					89	92						91	93		
	Turbidity	102								104	101						102			
ICP Metals	Total Mercury (Hg)	96	93							96							101	98		

Table A.7: Laboratory matrix spike recoveries (%) for water sample analyses. Any highlighted values did not meet data quality objective of 70 - 130% recovery.

Analytes		ALS Job Number																
		L1506653				L1507247					L1508553							
		Batch 1	Batch 2	Batch 3	Batch 4	Batch 1	Batch 2	Batch 3	Batch 4	Batch 5	Batch 1	Batch 2	Batch 3	Batch 4	Batch 5	Batch 6	Batch 7	Batch 8
Non-metals	Alkalinity																	
	Chloride	102				101	99	99			104	102						
	Dissolved Organic Carbon	102	104	106	98	104	106	101	108		106	108	107					
	Total Organic Carbon	98				104	102	104			105	104	106					
	Dissolved Sulphate (SO_4)	102				98	93	97			N/A	102						
	Fluoride	105				104	105	103			104	104						
	Nitrate (N)	102				101	99	98			103	101						
	Nitrate plus Nitrite (N)																	
	Nitrite (N)	109				110	107	108			110	109						
	Ammonia	101	102	104		104	103	99	99		75	75	84	88	89	106	102	104
	Total Phosphorus (P)	96	96	97		96	83	96	97	102								
	Total Dissolved Solids																	
	Total Suspended Solids																	
	Turbidity																	
ICP Metals	Total Mercury (Hg)	100				99	94				99	100	100	100				

N/A- not calculated by lab if spike amount was too small relative to sample concentration to permit quantification of spike recovery.

Table A.8: Certified reference material (CRM) recoveries (%) for water sample analyses. Any highlighted values did not meet data quality objective of 80 - 120% recovery.

	Analytes	ALS Job Number																								
		L1506653					L1507247											L1508553									
		Batch 1	Batch 2	Batch 3	Batch 4	Batch 5	Batch 1	Batch 2	Batch 3	Batch 4	Batch 5	Batch 6	Batch 7	Batch 8	Batch 9	Batch 10	Batch 11	Batch 1	Batch 2	Batch 3	Batch 4	Batch 5	Batch 6	Batch 7	Batch 8	Batch 9	Batch 10	Batch 11
Non-metals	Alkalinity	97	102	101			99	98	102	97	103	103	106	99				102	102	102								
	Chloride																											
	Dissolved Organic Carbon																											
	Total Organic Carbon																											
	Dissolved Sulphate (SO_4)																											
	Fluoride																											
	Nitrate (N)																											
	Nitrate plus Nitrite (N)																											
	Nitrite (N)																											
	Ammonia	107	106	105			109	107	101	111	103	102	112	111				97	113	102	110							
	Total Phosphorus (P)	97	97	105	95	102	95	102	101	103	97	97	105	87	101	97	97	87	89	95	92	96	92	104	108	95	99	99
	Total Dissolved Solids																											
	Total Suspended Solids																											
	Turbidity																											
ICP Metals	Total Aluminum (Al)	102					98	100	99									105	101									
	Total Antimony (Sb)	97					101	99	102									105	100									
	Total Arsenic (As)	100					97	96	98									105	99									
	Total Barium (Ba)	97					98	99	99									104	102									
	Total Beryllium (Be)	98					97	96	97									104	102									
	Total Bismuth (Bi)	97					97	98	99									100	102									
	Total Boron (B)	91					85	85	87									95	96									
	Total Cadmium (Cd)	97					98	99	99									103	98									
	Total Calcium (Ca)	100					101	99	95									101	103									
	Total Chromium (Cr)	99					99	97	100									104	99									
	Total Cobalt (Co)	97					95	95	95									101	100									
	Total Copper (Cu)	97					95	97	94									100	98									
	Total Iron (Fe)	98					96	95	93									97	100									
	Total Lead (Pb)	99					98	99	103									101	103									
	Total Lithium (Li)	97					94	94	95									101	101									
	Total Magnesium (Mg)	102					99	96	98									103	101									
	Total Manganese (Mn)	99					96	96	98									103	99									
	Total Mercury (Hg)																											
	Total Molybdenum (Mo)	98					98	95	98									102	101									
	Total Nickel (Ni)	96					95	96	95									103	99									
	Total Potassium (K)	102					99	97	94									99	104									
	Total Selenium (Se)	100					99	100	99									103	102									
	Total Silicon (Si)	99					99	98	96									99	102									
	Total Silver (Ag)	95					97	97	98									101	96									
	Total Sodium (Na)	99					98	102	99									106	100									
	Total Strontium (Sr)	98					99	98	100									103	103									
	Total Sulphur (S)	100					101	99	98									102	103									
	Total Thallium (Tl)	100					100	98	101									102	104									
	Total Tin (Sn)	97					100	100	101									104	99									
	Total Titanium (Ti)	100					99	98	96									109	96									
	Total Uranium (U)	101					99	98	101									104	104									
	Total Vanadium (V)	99					99	99	99									105	101									
	Total Zinc (Zn)	95					95	120	94									102	97									

A3.0 SEDIMENT SAMPLES

A3.1 Method Detection Limits

Target laboratory method detection limits (MDL) for sediment sample analyses were established at levels below all potentially applicable sediment quality guidelines (Table A.9). Reported MDLs were at or below the target concentrations, with the exceptions of total phosphorus, beryllium, bismuth, lead, manganese, molybdenum, silver, and strontium (Table A.9). This did not compromise interpretation of samples, because the achieved MDLs were all below respective guidelines, or the sediment quality analyte did not have an associated guideline.

A3.2 Laboratory Blank Sample Analysis

All method blank samples analyzed contained non-detectable analyte concentrations, indicating no inadvertent contamination of samples within the laboratory during analysis (Table A.10).

A3.3 Data Precision

Laboratory Duplicate Samples

The laboratory reported duplicate sample results for only three sediment variables. In all cases, close agreement was achieved indicating good precision (Table A.11).

A3.4 Data Accuracy

Recoveries of all analytes in spiked blank samples and QC standards met the respective data quality objectives (Table A.12). These data indicated excellent analytical accuracy associated with the analysis of sediment samples.

Table A.9: Laboratory method detection limits (MDL) for sediment samples relative to targets and to guidelines. Highlighted values indicate target MDL was not achieved.

	Analytes	Units	Target MDL	Achieved MDL	Sediment Quality Guidelines					
					Canada[a]		British Columbia[b]		Ontario[e]	
					ISQG[c]	PEL[d]	ISQG[c]	PEL[d]	LEL[f]	SEL[g]
Non-metal	Total Kjeldahl Nitrogen (TKN)	%	5	0.02					55	480
	Total Phosphorus (P)	mg/kg	10	50					600	2000
	% Gravel (>2mm)	%	0.1	0.1						
	% Sand (2.0mm - 0.063mm)	%	0.1	0.1						
	% Silt (0.063mm - 4um)	%	0.1	0.1						
	% Clay (<4um)	%	0.1	0.1						
	Total Organic Carbon	%	0.5	0.1					10	100
ICP Metals	Total Aluminum (Al)	mg/kg	100	50						
	Total Antimony (Sb)	mg/kg	0.1	0.1						
	Total Arsenic (As)	mg/kg	0.2	0.05	5.9	17	5.9	17	6	33
	Total Barium (Ba)	mg/kg	0.1	0.5						
	Total Beryllium (Be)	mg/kg	0.1	0.2						
	Total Bismuth (Bi)	mg/kg	0.1	0.2						
	Total Cadmium (Cd)	mg/kg	0.05	0.05	0.6	3.5	0.6	3.5	0.6	10
	Total Calcium (Ca)	mg/kg	100	50						
	Total Chromium (Cr)	mg/kg	1	0.5	37.3	90	37.3	90	26	110
	Total Cobalt (Co)	mg/kg	0.3	0.1						
	Total Copper (Cu)	mg/kg	0.5	0.5	35.7	197	35.7	197	16	110
	Total Iron (Fe)	mg/kg	100	50			21,200	43,766	20,000	40,000
	Total Lead (Pb)	mg/kg	0.1	0.5	35.0	91.3	35	91	31	250
	Total Lithium (Li)	mg/kg	5	5						
	Total Magnesium (Mg)	mg/kg	100	20						
	Total Manganese (Mn)	mg/kg	0.2	1					460	1,100
	Total Molybdenum (Mo)	mg/kg	0.1	0.5						
	Total Nickel (Ni)	mg/kg	0.8	0.5			16	75	16	75
	Total Phosphorus (P)	mg/kg	10	50					600	2,000
	Total Potassium (K)	mg/kg	100	100						
	Total Selenium (Se)	mg/kg	0.5	0.2			2			
	Total Silver (Ag)	mg/kg	0.05	0.1			0.5			
	Total Sodium (Na)	mg/kg	100	100						
	Total Strontium (Sr)	mg/kg	0.1	0.5						
	Total Thallium (Tl)	mg/kg	0.05	0.05						
	Total Tin (Sn)	mg/kg	5	2						
	Total Titanium (Ti)	mg/kg	1	1						
	Total Uranium (U)	mg/kg	0.05	0.05						
	Total Vanadium (V)	mg/kg	2	0.2						
	Total Zinc (Zn)	mg/kg	1	1	123	315	123	315	120	820

[a] CCME (Canadian Council of Ministers of the Environment). 2015b. Sediment Quality Guidelines for Protection of Aquatic Life. Accessed at http://st-ts.ccme.ca/, February 2015.

[b] BCMOE (British Columbia Ministry of Environment). 2006. A compendium of Working Water Quality Guidelines for British Columbia. Updated August 2006.)

[c] Interim sediment quality guideline

[d] Probable effect level

[e] OMOE (Ontario Ministry of Environment). 1993. Guidelines For The Protection and Management Of Aquatic Sediment Quality In Ontario. August 1993, Reprinted October, 1996. MOE (1993).

[f] Lowest effect level.

[g] Severe effect level.

Table A.10: Laboratory blank results associated with analyses of sediment samples. Highlighted values did not meet the data quality objective of ≤ 2x the method detection limit.

Analytes		Units	ALS Job Number L1509120	
			Method Detection Limit	Method Blank
Non-metal	Total Kjeldahl Nitrogen (TKN)	%	0.02	ND
	Total Phosphorus (P)	mg/kg	50	ND
	% Gravel (>2mm)	%	0.1	
	% Sand (2.0mm - 0.063mm)	%	0.1	
	% Silt (0.063mm - 4um)	%	0.1	
	% Clay (<4um)	%	0.1	
	Total Organic Carbon	%	0.1	ND
ICP Metals	Total Aluminum (Al)	mg/kg	50	ND
	Total Antimony (Sb)	mg/kg	0.1	ND
	Total Arsenic (As)	mg/kg	0.05	ND
	Total Barium (Ba)	mg/kg	0.5	ND
	Total Beryllium (Be)	mg/kg	0.2	ND
	Total Bismuth (Bi)	mg/kg	0.2	ND
	Total Cadmium (Cd)	mg/kg	0.05	ND
	Total Calcium (Ca)	mg/kg	50	ND
	Total Chromium (Cr)	mg/kg	0.5	ND
	Total Cobalt (Co)	mg/kg	0.1	ND
	Total Copper (Cu)	mg/kg	0.5	ND
	Total Iron (Fe)	mg/kg	50	ND
	Total Lead (Pb)	mg/kg	0.5	ND
	Total Lithium (Li)	mg/kg	5	ND
	Total Magnesium (Mg)	mg/kg	20	ND
	Total Manganese (Mn)	mg/kg	1	ND
	Total Molybdenum (Mo)	mg/kg	0.5	ND
	Total Nickel (Ni)	mg/kg	0.5	ND
	Total Phosphorus (P)	mg/kg	50	ND
	Total Potassium (K)	mg/kg	100	ND
	Total Selenium (Se)	mg/kg	0.2	ND
	Total Silver (Ag)	mg/kg	0.1	ND
	Total Sodium (Na)	mg/kg	100	ND
	Total Strontium (Sr)	mg/kg	0.5	ND
	Total Thallium (Tl)	mg/kg	0.05	ND
	Total Tin (Sn)	mg/kg	2	ND
	Total Titanium (Ti)	mg/kg	1	ND
	Total Uranium (U)	mg/kg	0.05	ND
	Total Vanadium (V)	mg/kg	0.2	ND
	Total Zinc (Zn)	mg/kg	1	ND

ND - Non-Detectable. Indicates analyte concentrations that were less than the MDL during analysis.

Table A.11: Laboratory duplicate results for analysis of sediment samples. Highlighted values did not meet the data quality objective of ≤ 25% relative percent difference.

Analytes		ALS Job Number L1509120
		Relative Percent Difference
Non-metal	Total Kjeldahl Nitrogen (TKN)	10
	Total Phosphorus (P)	
	% Gravel (>2mm)	0.0
	% Sand (2.0mm - 0.063mm)	
	% Silt (0.063mm - 4um)	
	% Clay (<4um)	
	Total Organic Carbon	1.5

Table A.12: Recoveries of spiked blanks and quality control (QC) standards associated with sediment analyses. Highlighted values indicate data quality objective of 70 - 130% recovery was not met.

Analytes		ALS Job Number L1509120		
		Recoveries of Spiked blanks (%)	Recoveries of QC standards (%)	
		Batch 1	Batch 1	Batch 2
Non-metal	Total Kjeldahl Nitrogen (TKN)			
	Total Phosphorus (P)			
	% Gravel (>2mm)			
	% Sand (2.0mm - 0.063mm)		97	94
	% Silt (0.063mm - 4um)		105	108
	% Clay (<4um)		96	96
	Total Organic Carbon			
ICP Metals	Total Aluminum (Al)	99	102	95
	Total Antimony (Sb)	96	109	98
	Total Arsenic (As)	101	105	91
	Total Barium (Ba)	101	107	92
	Total Beryllium (Be)	97	108	96
	Total Bismuth (Bi)	95	110	101
	Total Cadmium (Cd)	96	111	106
	Total Calcium (Ca)	97	104	85
	Total Chromium (Cr)	100	104	88
	Total Cobalt (Co)	97	105	95
	Total Copper (Cu)	95	107	101
	Total Iron (Fe)	99	105	96
	Total Lead (Pb)	96	107	107
	Total Lithium (Li)	96	101	93
	Total Magnesium (Mg)	96	106	96
	Total Manganese (Mn)	96	105	98
	Total Molybdenum (Mo)	100	103	100
	Total Nickel (Ni)	96	106	95
	Total Phosphorus (P)	110	105	89
	Total Potassium (K)	100	98	81
	Total Selenium (Se)	101	102	80
	Total Silver (Ag)	90	107	100
	Total Sodium (Na)	90	108	79
	Total Strontium (Sr)	100	100	82
	Total Thallium (Tl)	99	102	93
	Total Tin (Sn)	96	85	
	Total Titanium (Ti)	99	90	78
	Total Uranium (U)	94		94
	Total Vanadium (V)	100	101	86
	Total Zinc (Zn)	95	106	95

A4.0 BENTHIC MACROINVERTEBRATE SAMPLES

A4.1 Organism Recovery

The DQO of ≥ 90% organism recovery was met for all re-sorted samples, with an average recovery of 99.1% (Table A.13), indicating effectiveness with respect to laboratory recovery of organisms from samples.

A4.2 Subsampling Error

Precision and accuracy of the sub-sampled benthic invertebrate community samples generally met the DQOs of ≤20% and 80% to 100%, respectively (Table A.13). The Precision DQO was not met for two samples, while the accuracy DQO was not met for one (Table A.13). Both results indicate variability within the sample splitting process for those two samples. Overall these data indicated adequate precision and accuracy associated with the analysis of benthic invertebrate samples.

Table A.13: Benthic invertebrate QC results for subsampling error and percent recovery, and fractions sorted per sample. Highlighted cells exceeded the corresponding data quality objectives.

Subsampling Error						
	HOC	X3-1b	R2-1b	V1	RDE-3b	R9-1
Whole Organisms[a]	0	0	0	0	0	0
Number of Organisms in Fraction 1	416	380	381	377	382	345
Number of Organisms in Fraction 2	463	364	378	362	317	311
Number of Organisms in Fraction 3				291		268
Number of Organisms in Fraction 4				343		360
Number of Organisms in Fraction 5				436		309
Number of Organisms in Fraction 6						303
Number of Organisms in Fraction 7						343
Number of Organisms in Fraction 8						329
Number of Organisms in Fraction 9						313
Number of Organisms in Fraction 10						349
Actual Density	879	744	759	1809	699	3230
Precision (min and max RPD, DQO ≤20%)	**10.7**	**4.3**	**0.8**	**4.1** **33.3**	**18.6**	**0.6** **29.3**
Accuracy[a] (min and max percent recovery, DQO 80%-100%)	**94.7** **105.3**	**97.8** **102.2**	**99.6** **100.4**	**79.5** **119.6**	**90.7** **109.3**	**88.5** **117.0**
Percent Recovery of Sample Re-sorts (DQO ≥ 90%)						
	V1	R4	R9-1b	X3-1b	A1	
Number of Organisms Recovered	378	342	343	340	345	
Number of Organisms in Re-sort	385	344	346	343	346	
Percent Recovery	**98.2%**	**99.4%**	**99.1%**	**99.1%**	**99.7%**	
Average % Recovery	**99.1%**					

[a] Accuracy was assessed only for samples sorted in their entirety.

Station	Fraction Sorted	Station	Fraction Sorted
VR	19%	X3-1	12%
V1	100%	X3-1b	100%
R1	9%	REF126	28%
R1b	20%	REF212	100%
R2-1	12%	REF213	9%
R2-1b	100%	REF220	16%
R3	20%	REF325	13%
R4	17%	REF327	100%
R5	31%	REF328	26%
R6	5%	REF340	10%
R7-1	40%	REF376	20%
R7-1b	42%	A1	40%
R9-1	100%	BEC	5%
R9-1b	40%	BLC	15%
RDE-1	13%	BUC	17%
RDE-1b	35%	FC	17%
RDE-2	12%	GRC	100%
RDE-2b	36%	GRUM	17%
RDE-3	12%	HOC	100%
RDE-3b	100%	NEXC	21%
X-2	40%	STC	100%
X-2b	100%	USFR	45%

A5.0 FISH SAMPLES

A5.1 Method Detection Limits

Reported MDLs were at or below the target concentrations, with the exception of total aluminum, arsenic, lead, mercury, nickel, strontium, and zinc (Table A.14). This did not compromise interpretation of samples, as the samples were being compared spatially rather than against consumption guidelines.

A5.2 Laboratory Blank Sample Analysis

Laboratory blank samples contained non-detectable concentrations for all samples (Table A.15). These results indicate no inadvertent contamination of samples within the laboratory during analysis.

A5.3 Data Precision

Laboratory Duplicate Samples

Analysis of laboratory duplicates met the DQOs for all of the samples with exception of single values each for chromium and iron (Table A.16), which represented only 0.9% of all reported results. Overall, these results indicate good precision for analyses of fish tissue samples.

A5.4 Data Accuracy

Recoveries of quality control standards and recoveries of analytes in matrix spikes met DQO for nearly all samples with the exception of single cadmium, cobalt, molybdenum, and vanadium results (Table A.17). However, these represented only 1.1% of all results reported. These data indicated excellent analytical accuracy associated with the analysis of fish tissue samples.

Table A.14: Laboratory method detection limits (MDL) for fish tissue samples relative to targets. Highlighted values indicate target MDL was not achieved.

Analytes	Units	Target MDL	Achieved MDL
Total Aluminum (Al)	mg/kg	1	2.0 - 6.0
Total Antimony (Sb)	mg/kg	0.1	0.01 - 0.03
Total Arsenic (As)	mg/kg	0.1	0.2 - 0.6
Total Barium (Ba)	mg/kg	0.3	0.05 - 0.1
Total Beryllium (Be)	mg/kg	0.1	0.01 - 0.03
Total Bismuth (Bi)	mg/kg	0.1	0.01 - 0.03
Total Boron (B)	mg/kg	5	1.0 - 3.0
Total Cadmium (Cd)	mg/kg	0.01	0.005 - 0.01
Total Calcium (Ca)	mg/kg	-	20 - 60
Total Cesium (Cs)	mg/kg		0.005 - 0.015
Total Chromium (Cr)	mg/kg	0.5	0.05 - 0.2
Total Cobalt (Co)	mg/kg	0.1	0.02 - 0.06
Total Copper (Cu)	mg/kg	0.5	0.1 - 0.3
Total Iron (Fe)	mg/kg	10	3.0 - 9.0
Total Lead (Pb)	mg/kg	0.03	0.02 - 0.06
Total Lithium (Li)	mg/kg		0.5 - 1.5
Total Magnesium (Mg)	mg/kg	-	2.0 - 6.0
Total Manganese (Mn)	mg/kg	0.3	0.05 - 0.1
Total Mercury (Hg)	mg/kg	0.005	0.005 - 0.01
Total Molybdenum (Mo)	mg/kg	0.1	0.02 - 0.06
Total Nickel (Ni)	mg/kg	0.1	0.2 - 0.6
Total Phosphorus (P)	mg/kg	-	10 - 30
Total Potassium (K)	mg/kg	-	20 - 60
Total Rubidium (Rb)	mg/kg		0.05 - 0.1
Total Selenium (Se)	mg/kg	0.1	0.05 - 0.1
Total Sodium (Na)	mg/kg	-	20 - 60
Total Strontium (Sr)	mg/kg	0.1	0.05 - 0.15
Total Tellurium (Te)	mg/kg		0.02 - 0.06
Total Thallium (Tl)	mg/kg	0.05	0.002 - 0.006
Total Tin (Sn)	mg/kg	0.3	0.1 - 0.3
Total Uranium (U)	mg/kg	0.05	0.002 - 0.006
Total Vanadium (V)	mg/kg	2	0.1 - 0.3
Total Zinc (Zn)	mg/kg	0.3	0.5 - 1.5
Total Zirconium (Zn)	mg/kg		0.2 - 0.6

Table A.15: Laboratory method blank results associated with analyses of fish tissue samples, Highlighted values did not meet the data quality objective of less than or equal to two times the method detection limit.

Analytes		Units	Method Detection Limit	ALS Job Number																		
				L1509056																		
				Batch 1	Batch 2	Batch 3	Batch 4	Batch 5	Batch 6	Batch 7	Batch 8	Batch 9	Batch 10	Batch 11	Batch 12	Batch 13	Batch 14	Batch 15	Batch 16	Batch 17	Batch 18	Batch 19	Batch 20	Batch 21
	% Moisture	%																				
ICP Metals	Total Aluminum (Al)	mg/kg	2.0 - 6.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Antimony (Sb)	mg/kg	0.01 - 0.03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Arsenic (As)	mg/kg	0.2 - 0.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Barium (Ba)	mg/kg	0.05 - 0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Beryllium (Be)	mg/kg	0.01 - 0.03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Bismuth (Bi)	mg/kg	0.01 - 0.03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Boron (B)	mg/kg	1.0 - 3.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Cadmium (Cd)	mg/kg	0.005 - 0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Calcium (Ca)	mg/kg	20 - 60	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Cesium (Cs)	mg/kg	0.005 - 0.015	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Chromium (Cr)	mg/kg	0.05 - 0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Cobalt (Co)	mg/kg	0.02 - 0.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Copper (Cu)	mg/kg	0.1 - 0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Iron (Fe)	mg/kg	3.0 - 9.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Lead (Pb)	mg/kg	0.02 - 0.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Lithium (Li)	mg/kg	0.5 - 1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Magnesium (Mg)	mg/kg	2.0 - 6.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Manganese (Mn)	mg/kg	0.05 - 0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Mercury (Hg)	mg/kg	0.005 - 0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Molybdenum (Mo)	mg/kg	0.02 - 0.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Nickel (Ni)	mg/kg	0.2 - 0.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Phosphorus (P)	mg/kg	10 - 30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Potassium (K)	mg/kg	20 - 60	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Rubidium (Rb)	mg/kg	0.05 - 0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Selenium (Se)	mg/kg	0.05 - 0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Sodium (Na)	mg/kg	20 - 60	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Strontium (Sr)	mg/kg	0.05 - 0.15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Tellurium (Te)	mg/kg	0.02 - 0.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Thallium (Tl)	mg/kg	0.002 - 0.006	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Tin (Sn)	mg/kg	0.1 - 0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Uranium (U)	mg/kg	0.002 - 0.006	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Vanadium (V)	mg/kg	0.1 - 0.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Zinc (Zn)	mg/kg	0.5 - 1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	Total Zirconium (Zn)	mg/kg	0.2 - 0.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

ND - Non-Detectable. Indicates analyte concentrations that were less than the MDL during analysis.

Table A.16: Laboratory duplicate results for fish muscle analyses. Data expressed as Relative Percent Difference (RPD) Highlighted values did not meet the data quality objective of ≤40% RPD for tissue metals and ≤20% for moisture content.

Analytes		Units	MDL	ALS Job Number						
				L1509056						
				Batch 1	Batch 2	Batch 3	Batch 4	Batch 5	Batch 6	Batch 7
	% Moisture	%		1.4	2.4	0.6	4.4	1.5	0.8	0.6
ICP Metals	Total Aluminum (Al)	mg/kg	2.0 - 6.0	13	N/A	20	18	5	8.9	
	Total Antimony (Sb)	mg/kg	0.01 - 0.03	N/A	N/A	N/A	0.03	11	N/A	
	Total Arsenic (As)	mg/kg	0.2 - 0.6	4.2	5.1	2.2	3.6	13	17	
	Total Barium (Ba)	mg/kg	0.05 - 0.1	11	23	13	14	6.5	12	
	Total Beryllium (Be)	mg/kg	0.01 - 0.03	N/A	N/A	N/A	0.6	3.6	N/A	
	Total Bismuth (Bi)	mg/kg	0.01 - 0.03	N/A	N/A	N/A	N/A	11	N/A	
	Total Boron (B)	mg/kg	1.0 - 3.0	N/A	N/A	N/A	N/A	3	N/A	
	Total Cadmium (Cd)	mg/kg	0.005 - 0.01	1.4	N/A	17	2.7	3.2	1.6	
	Total Calcium (Ca)	mg/kg	20 - 60	20	0.4	8.1	11	5.4	32	
	Total Cesium (Cs)	mg/kg	0.005 - 0.015	1.5	8.9	2.5	1.7	4.4	0.1	
	Total Chromium (Cr)	mg/kg	0.05 - 0.2	18	N/A	13	54	5.2	14	
	Total Cobalt (Co)	mg/kg	0.02 - 0.06	1.7	0.8	0	11	5.6	2.2	
	Total Copper (Cu)	mg/kg	0.1 - 0.3	3.9	8.4	6.7	1.3	3	7.1	
	Total Iron (Fe)	mg/kg	3.0 - 9.0	9.6	9.6	5.3	24	44	5.8	
	Total Lead (Pb)	mg/kg	0.02 - 0.06	0.9	1.5	0.4	19	28	17	
	Total Lithium (Li)	mg/kg	0.5 - 1.5	N/A	N/A	N/A	10	21	N/A	
	Total Magnesium (Mg)	mg/kg	2.0 - 6.0	4.4	16	1.9	13	4.5	8.8	
	Total Manganese (Mn)	mg/kg	0.05 - 0.1	14	8.2	2.9	2.6	2.4	22	
	Total Mercury (Hg)	mg/kg	0.005 - 0.01	9.8	2.4	0.4	4.2	20	19	
	Total Molybdenum (Mo)	mg/kg	0.02 - 0.06	14	N/A	5.9	19	7.8	8.2	
	Total Nickel (Ni)	mg/kg	0.2 - 0.6	N/A	N/A	3.2	17	7.8	0.1	
	Total Phosphorus (P)	mg/kg	10 - 30	15	2	3.9	3.5	1.4	20	
	Total Potassium (K)	mg/kg	20 - 60	0.2	3.2	3.4	2.4	5.4	0.7	
	Total Rubidium (Rb)	mg/kg	0.05 - 0.1	0.4	3.4	3.1	2.3	4.4	0.3	
	Total Selenium (Se)	mg/kg	0.05 - 0.1	0.2	1.3	1.1	0.3	5.3	2.9	
	Total Sodium (Na)	mg/kg	20 - 60	1.4	3.5	5.1	1.5	2.4	1	
	Total Strontium (Sr)	mg/kg	0.05 - 0.15	19	16	12	7.1	1.3	30	
	Total Tellurium (Te)	mg/kg	0.02 - 0.06	N/A	N/A	N/A	N/A	N/A	N/A	
	Total Thallium (Tl)	mg/kg	0.002 - 0.006	7.5	2.2	4.4	9.7	1	14	
	Total Tin (Sn)	mg/kg	0.1 - 0.3	10	N/A	N/A	17	16	5.9	
	Total Uranium (U)	mg/kg	0.002 - 0.006	1.7	N/A	8.5	31	2.3	22	
	Total Vanadium (V)	mg/kg	0.1 - 0.3	32	N/A	25	21	12	13	
	Total Zinc (Zn)	mg/kg	0.5 - 1.5	4.7	7.4	7.6	3.5	3.7	12	
	Total Zirconium (Zn)	mg/kg	0.2 - 0.6	N/A	N/A	N/A	3	19	N/A	

N/A = Not calculated by lab if concentration in both duplicates was below method detection limit.

Table A.17: Certified Reference Material laboratory matrix spike recoveries (%) for fish tissue samples. Any highlighted values did not meet data quality objective of 70 - 130% recovery.

Analytes		ALS Job Number																		
		L1509056																		
		Batch 1	Batch 2	Batch 3	Batch 4	Batch 5	Batch 6	Batch 7	Batch 8	Batch 9	Batch 10	Batch 11	Batch 12	Batch 13	Batch 14	Batch 15	Batch 16	Batch 17	Batch 18	Batch 19
	% Moisture																			
ICP Metals	Total Aluminum (Al)			85				111					110							
	Total Antimony (Sb)		109	100	N/A		N/A	95		N/A		N/A	85	N/A		N/A		N/A		N/A
	Total Arsenic (As)	109	108	100	90	115	103	90	127	96	107	102	74	100	114	100	108	83	103	104
	Total Barium (Ba)		92	100	85		85	95		84		84	99	82		82		88		84
	Total Beryllium (Be)																			
	Total Bismuth (Bi)																			
	Total Boron (B)		120	96	116		106	99		120		110	99	96		96		115		113
	Total Cadmium (Cd)	99	112	100	121	101	104	90	100	112	96	103	225	100	103	100	123		89	106
	Total Calcium (Ca)		107	107	103		101	99		104		98	98	94		94		109		104
	Total Cesium (Cs)																			
	Total Chromium (Cr)	95		76		95		70	71		93		72		98		76		81	
	Total Cobalt (Co)	103	107	68	81	105	100	93	86	83	101	102	90	96	105	96	83	77	94	101
	Total Copper (Cu)	91	107	80	105	91	99	92	99	108	91	100	92	98	96	98	106	126	86	99
	Total Iron (Fe)	95	105	86	100	96	97	89	93	94	93	96	83	94	98	94	99	106	86	97
	Total Lead (Pb)	89	102	98	88	94	97	89	78	91	85	92	89	93	91	93	79	97	81	101
	Total Lithium (Li)																			
	Total Magnesium (Mg)		109	88	96		102	94		102		98	96	96		96		115		98
	Total Manganese (Mn)	95	107	103	120	99	99	92	113	117	95	101	92	96	97	96			88	100
	Total Mercury (Hg)	120	97	118	94	99	90	96	86	95	106	91							91	95
	Total Molybdenum (Mo)	99		67		99		83	122		96		88		100		96		94	
	Total Nickel (Ni)	96	104	71	82	99	99	71	86	84	93	108	90	96	99	96	87	87	87	97
	Total Phosphorus (P)			89				108					103							
	Total Potassium (K)		106	88	88		102	96		94		101	96	96		96		107		101
	Total Rubidium (Rb)		107	95	95		98	91		88		99	91	98		98		96		98
	Total Selenium (Se)	97	110	92	95	101	101	93	94	98	90	99	104	101	101	101	88	97	92	107
	Total Sodium (Na)		101	117	86		95	117		95		94	133	93		93		110		95
	Total Strontium (Sr)	95	103	115	121	95	95	97	115	119	94	95	99	92	99	92	123		94	100
	Total Tellurium (Te)																			
	Total Thallium (Tl)																			
	Total Tin (Sn)																			
	Total Uranium (U)		106		129		100			127		97	88	95		95				106
	Total Vanadium (V)	100	102		72	104	95	82	118	72	97	91	65	91	104	91		76	91	96
	Total Zinc (Zn)	92	103	77	93	96	97	94	89	92	89	97	93	95	95	95	112	106	83	96
	Total Zirconium (Zn)																			

A6.0 PERIPHYTON SAMPLES

A6.1 Periphyton Community (Duplicate Sampling)

Analysis of laboratory duplicates for periphyton cell densities met the DQOs for 71% of the values analyzed (Table A.18). The high degree of variability between the laboratory duplicates is partially attributable to low organism densities, with many of the comparisons failing the DQO because one of the sub-samples completely lacked the specific organism. This can result from incomplete homogenization of the sample prior to sub-sampling, and/or may be because only a very small portion of a collected sample was assessed (e.g., 2 mL sub-sample). Overall, these results emphasize the need for establishing QA/QC procedures for periphyton community analysis which includes reporting of sub-sampling errors (such data are not routinely provided by algal taxonomists unless specifically requested).

A6.2 Tissue Chemistry

Precision

Analysis of laboratory duplicates met the DQOs for nearly all of the periphyton samples, with exception of two results for antimony, and one result for each of the following: bismuth, boron, calcium, lead, strontium, and zinc, however these represented only 10% of all samples analyzed (Table A.19). These results indicated that the laboratory maintained an acceptable degree of analytical precision in analyses of periphyton tissue chemistry.

Data Accuracy

Accuracy of elemental concentration data was determined by comparing achieved values to a recovery target of 70 – 130% of the certified value for NIST SRM 1577 (bovine liver) and NRC CRM DOLT-4 (dogfish liver; Table A.20). Some elements listed on the certificates of analysis are lower-confidence values or unconfirmed results presented for informational purposes, rather than certified values (i.e., the target value may not necessarily be correct, and may be subject to significant statistical error). These values were also provided for comparison purposes, but were not used to judge acceptability of data. Matrix spikes were not performed on periphyton samples.

Only four metals were recovered at concentrations slightly outside of the acceptable range in one of the two certified reference materials (i.e., zinc in DOLT-4 and arsenic, chromium, and mercury in NIST 1577; Table A.20). Lead in DOLT-4 had a particularly

Table A.18: Laboratory duplicate results for analysis of periphyton cell densities (cells/cm^2) by species. Highlighted cells indicate the DQO of <40% was not met.

Species Name	A1	A1-R	Relative Percent Difference	GRC	GRC-R	Relative Percent Difference	R7-1	R7-1-R	Relative Percent Difference	REF-327	REF-327-R	Relative Percent Difference
Achnanthes minutissima Kutzing	17399	18949	9%	7235	9647	29%	23256	27562	17%	-	-	-
Anomoenies vitrea Ross	345	345	0%	345	172	67%	215	0	200%	172	0	200%
Audouinella / Chantransia stage. Red alga	-	-	-	-	-	-	7967	6460	21%	-	-	-
Closteriopsis sp.	0	172	200%	-	-	-	861	861	0%	-	-	-
Cocconies disculus Schum.	172	0	200%	-	-	-	-	-	-	-	-	-
Cymbella lapponica	0	172	200%	-	-	-	0	215	200%	-	-	-
Cymbella microcephala Grunow	517	689	29%	1034	1034	0%	-	-	-	-	-	-
Cymbella minuta Kutzing	1378	1034	29%	-	-	-	6460	7752	18%	172	172	0%
Cymbella prostrata (Berkeley) Cleve	-	-	-	-	-	-	215	0	200%	-	-	-
Cymbella turgida (Gregory) Cleve	-	-	-	-	-	-	-	-	-	0	172	200%
Diatoma tenue Agardh	2239	1723	26%	1550	861	57%	-	-	-	14114	12221	14%
Diatoma vulgare Bory	10853	12059	11%	12748	11714	8%	431	861	67%	24959	23237	7%
Didymosphenia geminata Schmidt	-	-	-	-	-	-	2369	2153	10%	-	-	-
Encyonema silesiacum (Bleisch) D.G. Mann	3445	3790	10%	0	517	200%	3015	2584	15%	344	516	40%
Eunotia pectinalis (Kutzing) Rabenhorst	-	-	-	172	0	200%	-	-	-	3443	4647	30%
Fragilaria capucina Grunow	6891	6202	11%	1206	1206	0%	1292	1507	15%	29262	27885	5%
Fragilaria construens (Ehrenberg) Grunow	-	-	-	-	-	-	2153	2153	0%	-	-	-
Fragilaria pinata Ehrenberg	517	345	40%	-	-	-	-	-	-	-	-	-
Frustulia rhomboides (Ehrenberg) de Toni	172	172	0	-	-	-	-	-	-	-	-	-
Gomphonema lagerheimii Hustedt	345	345	0	-	-	-	-	-	-	-	-	-
Gomphonema minutum	3962	4307	8%	1895	1378	32%	431	215	67%	-	-	-
Gomphonema truncatum Ehrenberg	-	-	-	-	-	-	0	431	200%	-	-	-
Hannaea arcus Patrick	-	-	-	1034	1034	0%	12274	12274	0%	6024	7229	18%
Heteroleibeinia profunda Komarek	-	-	-	0	517	200%	-	-	-	-	-	-
Homoeothrix varians Komarek & Kalina	1895	1550	20%	517	517	0%	-	-	-	-	-	-
Hydrurus sp. Agardh	-	-	-	-	-	-	-	-	-	9639	12221	24%
Mougeotia sp.	-	-	-	-	-	-	646	431	40%	1033	689	40%
Navicula minima Grunow	172	345	67%	-	-	-	-	-	-	-	-	-
Navicula radiosa Kutzing	345	172	67%	-	-	-	-	-	-	-	-	-
Pseudoanabaena sp.	-	-	-	0	1895	200%	0	2153	200%	-	-	-
Synedra acus Kutzing	-	-	-	-	-	-	-	-	-	0	3098	200%
Synedra acus v. radians (Kutzing) Hustedt	1034	689	40%	17743	17399	2%	-	-	-	2066	0	200%
Synedra ulna (Nitzsch) Ehrenberg	345	172	67%	689	345	67%	-	-	-	1377	1549	12%
Ulothrix zonata Kutzing	1378	1034	29%	-	-	-	1938	3015	43%	-	-	-

Table A.19: Laboratory duplicate results for periphyton tissue sample analyses. Highlighted values did not meet data quality objective of ≤ 30% relative percent difference.

Analyte	Units	R1-1 rep 1	R1-1 rep 2	Relative Percent Difference	X2-2 rep 1	X2-2 rep 2	Relative Percent Difference
Aluminum (Al)	mg/kg dw	14,200	15,000	5%	17,000	16,600	2%
Antimony (Sb)	mg/kg dw	0.00847	0.0132	44%	0.0133	0.0278	71%
Arsenic (As)	mg/kg dw	9.61	12.1	23%	34.5	33.1	4%
Barium (Ba)	mg/kg dw	280	328	16%	576	508	13%
Beryllium (Be)	mg/kg dw	0.701	0.832	17%	1.07	1	7%
Bismuth (Bi)	mg/kg dw	0.214	0.264	21%	0.575	0.819	35%
Boron (B)	mg/kg dw	8.55	52.3	144%	5.85	5.19	12%
Cadmium (Cd)	mg/kg dw	0.339	0.432	24%	4.79	4.31	11%
Calcium (Ca)	mg/kg dw	7,220	14,800	69%	8,300	8,080	3%
Cesium (Cs)	mg/kg dw	2.25	2.56	13%	2.64	2.64	0%
Chromium (Cr)	mg/kg dw	29.4	36.9	23%	40	40.2	0%
Cobalt (Co)	mg/kg dw	10.4	11.4	9%	84.5	81	4%
Copper (Cu)	mg/kg dw	10.5	13.7	26%	28	28.7	2%
Gallium (Ga)	mg/kg dw	5.47	5.58	2%	6.69	6.35	5%
Iron (Fe)	mg/kg dw	24,900	31,600	24%	44,200	43,200	2%
Lead (Pb)	mg/kg dw	15.9	21.9	32%	294	310	5%
Lithium (Li)	mg/kg dw	25.5	26.2	3%	30.1	30.1	0%
Magnesium (Mg)	mg/kg dw	5,140	5,820	12%	6,100	5,960	2%
Manganese (Mn)	mg/kg dw	3,560	4,130	15%	7,980	7,540	6%
Molybdenum (Mo)	mg/kg dw	0.428	0.41	4%	1.46	1.57	7%
Nickel (Ni)	mg/kg dw	22.9	25.2	10%	49.5	48.1	3%
Phosphorus (P)	mg/kg dw	763	812	6%	1,170	1,180	1%
Potassium (K)	mg/kg dw	1,760	2,050	15%	4,000	3,710	8%
Rhenium (Re)	mg/kg dw	0.00045	0.00034	28%	0.0009	0.0009	0%
Rubidium (Rb)	mg/kg dw	18.1	20.1	10%	25.5	24.9	2%
Selenium (Se)	mg/kg dw	2.81	3.17	12%	4.43	4.14	7%
Silver (Ag)	mg/kg dw	0.0789	0.0929	16%	0.346	0.399	14%
Sodium (Na)	mg/kg dw	395	397	1%	437	409	7%
Strontium (Sr)	mg/kg dw	69.8	103	38%	56	53.5	5%
Thallium (Tl)	mg/kg dw	0.167	0.194	15%	0.344	0.328	5%
Thorium (Th)	mg/kg dw	5.86	5.92	1%	5.18	5.08	2%
Tin (Sn)	mg/kg dw	0.288	0.345	18%	0.478	0.464	3%
Titanium (Ti)	mg/kg dw	427	432	1%	557	598	7%
Uranium (U)	mg/kg dw	1.51	2.01	28%	2.11	2.1	0%
Vanadium (V)	mg/kg dw	28.7	31.7	10%	51.4	50.8	1%
Yttrium (Y)	mg/kg dw	9.08	12.2	29%	19.4	18.3	6%
Zinc (Zn)	mg/kg dw	73.1	85.1	15%	3,840	3,550	8%
Zirconium (Zr)	mg/kg dw	8.04	11.5	35%	9.07	9.26	2%

Table A.20: Certified reference material (CRM) recoveries (%) for periphyton tissue sample analyses. Highlighted values did not meet data quality objective of 70 - 130% recovery.

Analyte	Units	Certified Reference Material						
		Certified Value	Informational Value	Measured	Value within Certified or Informational Range?	% Recovery Relative to Certified Value	% Recovery Relative to Informational Value	Reference Material
Aluminum (Al)	µg/g dw	-	1.2 (0.7 - 1.7)	1.9	No	-	158%	30A SRM 1577 Bovine Liver
		-	200	102	-	-	51%	31A CRM DOLT-4
Antimony (Sb)	µg/g dw	-	0.009 (0.004 - 0.014)	0.007	Yes	-	80%	30A SRM 1577 Bovine Liver
		-	-		-	-	-	31A CRM DOLT-4
Arsenic (As)	µg/g dw	0.055 (0.050 - 0.060)	0.054 (0.048 - 0.060)	0.073	No	133%	136%	30A SRM 1577 Bovine Liver
		9.66 (9.04 - 10.28)	-	9.69	Yes	100%	-	31A CRM DOLT-4
Cadmium (Cd)	µg/g dw	0.27 (0.23 - 0.31)	0.283 (0.26 - 0.306)	0.303	Yes	112%	107%	30A SRM 1577 Bovine Liver
		24.3 (23.5 - 25.1)	-	22.9	Yes	94%	-	31A CRM DOLT-4
Calcium (Ca)	µg/g dw	124 (118 - 130)	121 (107 - 135)	128	Yes	103%	96%	30A SRM 1577 Bovine Liver
		-	680	767	-		113%	31A CRM DOLT-4
Cesium (Cs)	µg/g dw	-	0.015 (0.011 - 0.019)	0.012	Yes	-	80%	30A SRM 1577 Bovine Liver
		-	-		-	-	-	31A CRM DOLT-4
Chromium (Cr)	µg/g dw	0.088 (0.076 - 0.10)	0.11 (0.06 - 0.16)	0.14	Yes	160%	128%	30A SRM 1577 Bovine Liver
		-	1.4	1.5	-	-	106%	31A CRM DOLT-4
Cobalt (Co)	µg/g dw	-	0.22 (0.18 - 0.26)	0.30	No	-	135%	30A SRM 1577 Bovine Liver
		-	0.25	0.26	-	-	106%	31A CRM DOLT-4
Copper (Cu)	µg/g dw	193 (183 - 203)	190 (180 - 200)	203	Yes	105%	107%	30A SRM 1577 Bovine Liver
		31.2 (30.1 - 32.3)	-	32.9	No	105%	-	31A CRM DOLT-4
Iron (Fe)	µg/g dw	268 (260 - 276)	263 (241 - 285)	293	No	109%	111%	30A SRM 1577 Bovine Liver
		1,833 (1,758 - 1,908)	-	2,020	No	110%	-	31A CRM DOLT-4
Lead (Pb)	µg/g dw	0.34 (0.26 - 0.42)	0.34 (0.30 - 0.38)	0.37	Yes	107%	107%	30A SRM 1577 Bovine Liver
		0.16 (0.12 - 0.20)	-	0.62	No	389%	-	31A CRM DOLT-4
Magnesium (Mg)	µg/g dw	604 (595 - 613)	608 (577 - 639)	679	No	112%	112%	30A SRM 1577 Bovine Liver
		-	1,500	1,530	-	-	102%	31A CRM DOLT-4
Manganese (Mn)	µg/g dw	10.3 (9.3 - 11.3)	10.2 (9.5 - 10.9)	11.8	No	115%	116%	30A SRM 1577 Bovine Liver
		-	-		-	-	-	31A CRM DOLT-4
Mercury (Hg)	µg/g dw	0.016 (0.014 - 0.018)	0.016 (0.015 - 0.017)	0.023	No	143%	143%	30A SRM 1577 Bovine Liver
		2.58 (2.36 - 2.80)	-	2.6	Yes	99%	-	31A CRM DOLT-4
Molybdenum (Mo)	µg/g dw	-	3.2 (2.8 - 3.6)	4.0	No	-	125%	30A SRM 1577 Bovine Liver
		-	1.0	1.1	-	-	113%	31A CRM DOLT-4
Nickel (Ni)	µg/g dw	-	0.18 (0.10 - 0.26)	0.04	No	-	25%	30A SRM 1577 Bovine Liver
		0.97 (0.86 - 1.08)	-	1.02	Yes	105%	-	31A CRM DOLT-4
Phosphorus (P)	µg/g dw	-	11,200 (10,100 - 12,300)	13,400	No	-	120%	30A SRM 1577 Bovine Liver
		-	-		-	-	-	31A CRM DOLT-4
Potassium (K)	µg/g dw	9,700 (9,100 - 10,300)	9,700 (9,100 - 10,300)	11,400	No	118%	118%	30A SRM 1577 Bovine Liver
		-	9,800	11,300	-	-	115%	31A CRM DOLT-4
Rubidium (Rb)	µg/g dw	18.3 (17.3 - 19.3)	18.2 (16.9 - 19.5)	20.1	No	110%	110%	30A SRM 1577 Bovine Liver
		-	-		-	-	-	31A CRM DOLT-4
Selenium (Se)	µg/g dw	1.1 (1.0 - 1.2)	1.09 (1.02 - 1.16)	1.28	No	116%	117%	30A SRM 1577 Bovine Liver
		8.30 (6.96 - 9.64)	-	8.59	Yes	103%	-	31A CRM DOLT-4
Silver (Ag)	µg/g dw	-	0.062 (0.051 - 0.073)	0.058	Yes	-	93%	30A SRM 1577 Bovine Liver
		0.93 (0.86 - 1.00)	-	0.85	No	92%	-	31A CRM DOLT-4
Sodium (Na)	µg/g dw	2,430 (2,300 - 2,560)	2,390 (2,230 - 2,550)	2,740	No	113%	115%	30A SRM 1577 Bovine Liver
		-	6,800	7,610	-		112%	31A CRM DOLT-4
Strontium (Sr)	µg/g dw	-	0.16 (0.13 - 0.19)	0.16	Yes	-	97%	30A SRM 1577 Bovine Liver
		-	5.5	5.9	-	-	106%	31A CRM DOLT-4
Tin (Sn)	µg/g dw	-	0.016 (0.012 - 0.020)	0.010	No	-	64%	30A SRM 1577 Bovine Liver
		-	0.17	0.15	-	-	90%	31A CRM DOLT-4
Vanadium (V)	µg/g dw	-	0.058 (0.052 - 0.064)	0.076	No	-	132%	30A SRM 1577 Bovine Liver
		-	0.6	0.74	-	-	124%	31A CRM DOLT-4
Zinc (Zn)	µg/g dw	130 (117 - 143)	131 (123 - 139)	147	No	113%	112%	30A SRM 1577 Bovine Liver
		116 (110 - 122)	-	177	No	153%	-	31A CRM DOLT-4

high percent recovery value, potentially from inadvertent laboratory contamination of the sample. Recoveries of all matrix spikes were also within the DQO range (Table A.21), with the exception of two antimony results, however these only represented 9.5% of all samples analyzed for matrix spikes. These data indicated good analytical accuracy associated with the analysis of periphyton tissue samples.

A6.3 Chlorophyll-a

Laboratory Blank Sample Analysis

All blank samples that were analyzed contained non-detectable chlorophyll-a concentrations indicating no inadvertent contamination of samples within the laboratory during analysis (Table A.22).

A6.4 Data Accuracy

Recoveries of matrix spikes met the DQO for the few samples assessed (Tables A.23). These data indicated adequate analytical accuracy associated with the analysis of periphyton chlorophyll-a.

Table A.21: Laboratory matrix spike recoveries (%) for periphyton tissue samples. Highlighted values did not meet data quality objective of 70 - 130% recovery.

Analyte	Percent Recovery	
	R1-1	X2-2
Antimony (Sb)	2%	2%
Beryllium (Be)	98%	101%
Bismuth (Bi)	92%	94%
Boron (B)		92%
Cadmium (Cd)	90%	94%
Molybdenum (Mo)	92%	93%
Rhenium (Re)	104%	106%
Selenium (Se)	77%	82%
Silver (Ag)	86%	81%
Thallium (Tl)	99%	104%
Uranium (U)	97%	109%

Table A.22: Laboratory method blank results associated with analyses of chlorophyll-a, Highlighted values did not meet the data quality objective of less than or equal to two times the method detection limit.

Analytes		ALS Job Number L1509100	
		Batch 1	Batch 2
Physical Tests	Dry Weight	ND	
	Ash Weight	ND	
	Ash Free Dry Weight	ND	
Plant Pigments	Chlorophyll a	ND	ND

Table A.23: Recoveries of spiked blanks associated with chlorophyll-a analyses. Highlighted values indicate data quality objective of 80 - 120% recovery was not met.

Analytes		ALS Job Number L1509100	
		Batch 1	Batch 2
Physical Tests	Dry Weight		
	Ash Weight		
	Ash Free Dry Weight		
Plant Pigments	Chlorophyll a	98.5	93.0

A7.0 DATA QUALITY STATEMENT

The quality of data for this project was adequate to serve the project objectives.

APPENDIX B

HABITAT, SEDIMENT CHEMISTRY AND VEGETATION TISSUE CHEMISTRY

Table B.1: Habitat information associated with reference areas sampled during the Faro Mine Aquatic Study, August 2014.

Station ID	R7-1	FC	R6	USFR	V1	VR	BLC	NEXC	GRC	STC[b]	HOC	BEC
Waterbody	North Fork Rose Creek	Faro Creek	Rose Creek	Upper South Fork Rose Creek	Vangorda Creek	West Fork Vangorda	Blind Creek	Next Creek	Grew Creek	Star Creek	Horton Creek	Beautiful Creek
Date Sampled	25-Aug-14	20-Aug-14	21-Aug-14	21-Aug-14	20-Aug-14	20-Aug-14	21-Aug-14	20-Aug-14	24-Aug-14	24-Aug-14	24-Aug-14	24-Aug-14
Zone 8v UTMs - E	586447	585353	568180	590252	594435	590679	563669	579169	611834	349222	656453	638207
Zone 8v UTMs - N	6914347	6916735	6921708	6907390	6903741	6906914	6895952	6915382	6882072	6851621	6855508	6863348
Elevation (m)		1311	935	1249	1163	1245	650	1031	735	876	824	813
Samplers' Initials	CR, JL	JT,LB	MW, AN	JT, LB	MW, AN	MW, AN	MW, AN	JT, LB	MW, AN	MW, AN	JT, LB	JT, LB
Habitat Characteristics												
Surrounding Land Use	mining	mining	forest	mining, road	forest	forest	forest	forest, mining	forest	forest	forest	forest
Length of Reach Assessed (m)	50	30	100	30	50	30	50	30	50	100	50	50
% Riffle	50	100	40	70	40	80	30	95	60	40	75	40
% Run	50	0	40	0	10	0	40	0	10	20	20	55
% Rapids	0	0	20	25	50	20	0	0	30	40	0	0
% Pool/Back Eddy	0	0	0	5	0	0	30	5	0	0	5	5
% Bedrock	0	0	0	0	0	0	0	0	0	0	0	0
% Boulder	40	15	20	30	20	10	0	20	10	10	5	5
% Cobble	30	65	40	50	50	40	20	55	30	60	45	60
% Pebble	10	5	20	10	20	40	20	15	30	20	15	10
% Gravel	10	5	10	5	10	10	0	5	20	10	25	10
% Sand/Finer	10	10	10	5	0	0	60	5	10	0	10	10
% Organic	0	0	0	0	0	0	0	0	0	0	0	5
Streamside Vegetation (most dominant first)	coniferous, shrubs, ferns/grasses	shrubs, coniferous, ferns/grasses	shrubs, coniferous, ferns/grasses	shrubs, coniferous, ferns/grasses	shrubs, deciduous, coniferous, ferns/grasses	shrubs, ferns/grasses	shrubs, deciduous, coniferous, ferns/grasses	shrubs, deciduous, coniferous, ferns/grasses	shrubs, deciduous, coniferous, ferns/grasses	shrubs, coniferous, ferns/grasses	shrubs, deciduous, coniferous, ferns/grasses	shrubs, deciduous, coniferous, ferns/grasses
Canopy Coverage (%)	1-25	0	1-25	26-50	1-25	1-25	1-25	51-75	1-25	1-25	1-25	1-25
Macrophyte Coverage (%)	0	1-25	0	0	0	0	0	0	0	0	0	26-50
Periphyton Coverage	2	1	3	1	2	2	3	2	2	2	1	5
Bank Stability	unstable	stable	moderate	moderate	moderate	moderate	moderate	moderate	unstable	moderate	stable	moderate
Water Colour & Clarity	clear-brown/clear	colourless/clear	colourless/clear	colourless/clear	colourless/clear	colourless/clear	colourless/clear	colourless/clear	colourless / slight turbidity	colourless/clear	colourless/clear	colourless/clear
Bankfull Width (m)	4.4	6.6	9.5	10.33	4.8	2.15	17	8.69	10.6	15	12.39	6.99
Wetted Width (m)	4.4	4.52	9.5	6.82	4.6	1.45	16	4.73	7.6	9.2	9.75	3.86
Bankfull-Wetted Depth (cm)	90	79.1	35	74.9	24	28	40	54.2	60	50	30	20
Gradient (%)	1.5	0.5	1	1.75	2	2	1	1.5	2	2	0.25	0.5
Benthic Invertebrate Sampling												
Total Kick Distance (m)	10	22	16	13	16	16	18	20	20	18	15	13
# of Transects (if complete)	2.5	4	2	1.25	3+		2.5	2	3.5	3	1.75	1.25
Kick Time for Tissue Sample (min)	3	3	3	3	3	3	3	3	3	3	3	3

[a] Station located in UTM Zone 9.

Table B.1: Habitat information associated with reference areas sampled during the Faro Mine Aquatic Study, August 2014.

Station ID	BUC	REF-126	REF-212	REF-213	REF-220	REF-325	REF-327	REF-328	REF-340	REF-376[a]
Waterbody	Buttle Creek	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown	unknown
Date Sampled	21-Aug-14	22-Aug-14	23-Aug-14	23-Aug-14	24-Aug-14	23-Aug-14	23-Aug-14	23-Aug-14	23-Aug-14	24-Aug-14
Zone 8v UTMs - E	589947	559596	581220	558172	643996	549389	588635	559663	549042	357492
Zone 8v UTMs - N	6894046	6943301	6887386	6883774	6854240	6886489	6881006	6880950	6871745	6835508
Elevation (m)	706	1140	917	906	897	809	1017	1003	1001	950
Samplers' Initials	JT, LB	JT, LB	JT, LB	MW, AN	MW, AN	MW, AN	MW, AN	JT, LB	JT, LB	JT, LB
Habitat Characteristics										
Surrounding Land Use	forest, road	forest	forest	forest	forest	forest	forest	forest	forest	forest
Length of Reach Assessed (m)	30	30	100	50	50	50	100	50	50	100
% Riffle	85	70	95	60	80	30	30	50	60	100
% Run	10	0	0	10	20	30	20	0	40	0
% Rapids	0	25	0	20	0	40	40	45	0	0
% Pool/Back Eddy	5	5	5	10	0	0	10	5	0	0
% Bedrock	0	0	0	0	0	0	0	0	0	0
% Boulder	5	10	10	20	5	30	30	45	5	25
% Cobble	50	70	45	60	50	40	40	50	70	65
% Pebble	20	5	25	15	30	20	10	5	15	5
% Gravel	10	10	10	5	10	10	10	5	5	5
% Sand/Finer	15	5	10	0	5	0	0	0	5	0
% Organic	0	0	0	0	0	0	0	0	0	0
Streamside Vegetation (most dominant first)	shrubs, coniferous, ferns/grasses	shrubs, deciduous, coniferous, ferns/grasses	shrubs, deciduous, coniferous, ferns/grasses	shrubs, ferns/grasses, coniferous	deciduous	shrubs, deciduous, coniferous	shrubs, deciduous, coniferous	coniferous, shrubs, ferns/grasses	shrubs, ferns/grasses	shrubs, deciduous, coniferous, ferns/grasses
Canopy Coverage (%)	1-25	51-75	1-25	1-25	1-25	26-50	1-25	76-100	0	51-75
Macrophyte Coverage (%)	1-25	0	0	0	0	0	0	0	1-25	1-25
Periphyton Coverage	1	1	1	1	2	1	1	1	1	5
Bank Stability	moderate	stable	moderate	moderate	moderate	moderate	moderate	moderate	stable	stable
Water Colour & Clarity	colourless/clear	colourless/clear	colourless/clear	colourless/clear	colourless/clear	colourless/clear	colourless/clear	colourless/clear	colourless/clear	colourless/clear
Bankfull Width (m)	5.53	7.42	36	6.5	8.6	5.3	24	6.9	13.75	9.23
Wetted Width (m)	4	3.96	18.29	5.7	5.1	5	8.1	5.23	9.7	5.65
Bankfull-Wetted Depth (cm)	39.3	43	50	10	45	20	25	65.1	32	36.7
Gradient (%)	1	1.5	0.5	2	2.5	3	3	1.5	0.5	0.5
Benthic Invertebrate Sampling										
Total Kick Distance (m)	19	6	12	14	18	14	14	13	11	14
# of Transects (if complete)	1.5	2	0.75	2.5	3.4	3	2.5	2.25	<1	2
Kick Time for Tissue Sample (min)	3	3	3	3	3	3	3	3	3	3

[a] Station located in UTM Zone 9.

Table B.2: Habitat information associated with mine-exposed areas sampled during the Faro Mine Aquatic Study, August 2014.

Station ID	R1	Grum	R9	X2	X3-1	RDE-1	RDE-2	RDE-3	R2	R3	R4	R5	A1
Waterbody	South Fork Rose Creek	South Fork Rose Creek	North Fork Rose Creek	North Fork Rose Creek	Rose Creek	Rose Creek Diversion	Rose Creek Diversion	Rose Creek Diversion	Rose Creek	Rose Creek	Rose Creek	Anvil Creek	Anvil Creek
Date Sampled	20-Aug-14	21-Aug-14	24-Aug-14	20-Aug-14	21-Aug-14	22-Aug-14	22-Aug-14	23-Aug-14	20-Aug-14	22-Aug-14	22-Aug-14	22-Aug-14	22-Aug-14
Zone 8v UTMs - E	584022	589811	585242	584061	583295	583025	581366	579572	579045	573828	567737	566481	545213
Zone 8v UTMs - N	6912399	6907397	6913662	6912782	6912519	6912620	6913330	6914517	6914953	6917490	6921637	6922635	6924197
Elevation (m)	1068	1208	1101	1082	1055	1060	1050	1028	1005	975	930	912	624
Samplers' Initials	CR, JL	JT, LB	CR, JL	CR, JL	CR, JL	CR, JL	CR, JL	CR, JL	CR, JL	MW, AN	MW, AN	JT, LB	JT, LB
Habitat Characteristics													
Surrounding Land Use	mining	road	mining	mining	mining	mining	mining	mining	mining	forest	forest	forest, mining	forest, mining
Length of Reach Assessed (m)	50	30	50	100	75	50	100	100	100		100	100	100
% Riffle	50	95	60	60	20	80	70	50	70	40	50	95	65
% Run	50	0	0	0	0	20	30	50	30	50	20	0	35
% Rapids	0	0	20	20	80	0	0	0	0	10	20	0	0
% Pool/Back Eddy	0	5	20	20	0	0	0	0	0	0	10	5	0
% Bedrock	0	0	0	0	0	0	0	0	0	0	0	0	0
% Boulder	20	15	10	10	40	10	15	5	0	20	20	30	5
% Cobble	60	70	60	80	40	60	40	60	10	40	35	45	60
% Pebble	15	15	20	10	15	20	10	20	80	30	35	10	15
% Gravel	0	5	5	0	0	0	0	10	0	10	10	10	5
% Sand/Finer	5	5	5	0	5	10	20	5	10	0	0	5	15
% Organic	0	0	0	0	0	0	15	0	0	0	0	0	0
Streamside Vegetation (most dominant first)	shrubs, coniferous, ferns/grasses	shrubs, coniferous, ferns/grasses	shrubs, deciduous coniferous, ferns/grasses	shrubs, deciduous, coniferous, ferns/grasses	shrubs, deciduous, ferns/grasses	shrubs, deciduous coniferous, ferns/grasses	shrubs, deciduous coniferous, ferns/grasses	shrubs, deciduous coniferous, ferns/grasses	shrubs, coniferous, ferns/grasses	shrubs, coniferous, ferns/grasses	shrubs, coniferous, ferns/grasses	shrubs, coniferous, ferns/grasses	deciduous, shrubs, coniferous, ferns/grasses
Canopy Coverage (%)	1-25	26-50	1-25	1-25	0	1-25	1-25	1-25	1-25	0	1-25	1-25	76-100
Macrophyte Coverage (%)	1-25	0	0	0	0	0	0	0	0	0	0	0	1-25
Periphyton Coverage	2	1	2	3	3	2	2	2	1	2	1	1	1
Bank Stability	moderate	stable	moderate	moderate	moderate	moderate	moderate	moderate	moderate	moderate	moderate	moderate	unstable
Water Colour & Clarity	clear-brown/clear	colourless/clear	brown/clear	brown/clear	brown/clear	reddish-brown / clear	brown/clear	brown/clear	colourles/clear	colourless/clear	colourless/clear	colourless/clear	slight tea /very high turbidity
Bankfull Width (m)	7.1	8.8	8.8	9	10	23	18	16.6	7.2	17.5	17.8	50	50
Wetted Width (m)	6.45	4.45	6.7	6.5	8.3	12.1	9	13.8	11.65	17.5	16.15	34	20
Bankfull-Wetted Depth (cm)	150	38.8	90	750	200	2.5	1	150	97	25	30	75	1
Gradient (%)	0.5	1	2.5	1	2	1	0.5-1	0.5-1	0.5-1	2	2	0.5	0.5
Benthic Invertebrate Sampling													
Total Kick Distance (m)	6	13	21	10	6.5	15	13.5	15	31.61	16	18	13	12
# of Transects (if complete)	1	1.25	1	2		1.3	1.5	1.3	2.75	1.2	1.5	<1	0.75
Kick Time for Tissue Sample (min)	3	3	3	3	3	3	3	3	3	3	3	3	3

Table B.3: Sediment chemistry at stations where sediment toxicity samples were collected in the vicinity of the Faro Mine, August 2014.

	Analyte	Units	Sediment Quality Guidelines						NFRC upstream from Faro Creek (R7 Reference) (8V 586482 6914347)							NFRC - Haul Road Pond (8V 584836 6913230)							NFRC downstream from Haul Road (X2) (8V 584042 6912736)						
			Canadian[a]		British Columbia[b]		Ontario[c]																						
			ISQG[d]	PEL[e]	ISQG[d]	PEL[e]	LEL[f]	SEL[g]	R7-TOX1	R7-TOX2	R7-TOX3	R7-TOX4	R7-TOX5	Mean	Std. Dev.	NFA-TOX1	NFA-TOX2	NFA-TOX3	NFA-TOX4	NFA-TOX5	Mean	Std. Dev.	X2-TOX1	X2-TOX2	X2-TOX3	X2-TOX4	X2-TOX5	Mean	Std. Dev.
Non-metals	Gravel	%							<0.10	<0.10	8.34	2.18	13.3	**4.80**	**5.83**	<0.10	<0.10	<0.10	<0.10	<0.10	**<0.10**	**0**	<0.10	1.34	0.62	0.59	0.71	**0.67**	**0.44**
	Sand	%							87.1	95.6	87.1	95.9	84.9	**90.1**	**5.2**	29.4	23.7	43.9	14.4	11.7	**24.6**	**12.9**	43.0	54.2	58.0	56.2	56.6	**53.6**	**6.1**
	Silt	%							11.9	3.88	3.98	1.81	1.54	**4.62**	**4.22**	63.8	69.0	50.7	77.3	79.3	**68.0**	**11.5**	51.1	39.1	36.1	38.7	37.5	**40.5**	**6.0**
	Clay	%							1.00	0.53	0.56	0.14	0.29	**0.50**	**0.33**	6.87	7.34	5.51	8.37	9.04	**7.43**	**1.37**	5.99	5.37	5.32	4.47	5.22	**5.27**	**0.54**
	Total Kjeldahl Nitrogen	%					0.55	4.8	0.04	0.03	0.03	0.02	0.02	**0.03**	**0.01**	0.20	0.18	0.17	0.23	0.21	**0.20**	**0.02**	0.23	0.17	0.16	0.17	0.15	**0.17**	**0.03**
	Total Organic Carbon	%					1	10	0.48	0.26	0.23	0.21	0.17	**0.27**	**0.12**	2.71	2.47	2.39	4.04	2.76	**2.87**	**0.67**	2.47	1.98	1.89	1.86	1.93	**2.03**	**0.25**
ICP-Metals	Aluminum (Al)	mg/kg							8,230	7,990	7,440	7,730	7,990	**7,876**	**301**	17,400	17,000	16,100	17,200	17,300	**17,000**	**524**	15,200	14,300	15,200	14,200	15,300	**14,840**	**541**
	Antimony (Sb)	mg/kg							0.39	0.31	0.28	0.29	0.31	**0.32**	**0.04**	1.20	1.06	1.14	1.33	1.37	**1.22**	**0.13**	1.44	1.40	1.67	1.56	1.31	**1.48**	**0.14**
	Arsenic (As)	mg/kg	5.9	17	5.9	17	6	33	11.0	7.57	7.97	8.53	8.49	**8.71**	**1.34**	18.6	18.7	19.5	20.0	21.6	**19.7**	**1.2**	35.3	29.5	37.6	33.4	28.5	**32.9**	**3.8**
	Barium (Ba)	mg/kg							157	89.5	104	76.9	81.1	**102**	**33**	314	309	300	323	323	**314**	**10**	366	344	393	361	386	**370**	**20**
	Beryllium (Be)	mg/kg							0.39	0.33	0.35	0.33	0.41	**0.36**	**0.04**	1.00	0.88	1.01	1.00	1.04	**0.99**	**0.06**	0.96	0.90	0.96	0.92	0.97	**0.94**	**0.03**
	Bismuth (Bi)	mg/kg							<0.20	<0.20	<0.20	<0.20	<0.20	**<0.20**	**0**	1.12	0.73	1.03	0.86	0.99	**0.95**	**0.15**	0.85	0.93	4.37	1.18	1.19	**1.70**	**1.50**
	Cadmium (Cd)	mg/kg	0.6	3.5	0.6	3.5	0.6	10	0.195	0.139	0.165	0.188	0.203	**0.18**	**0.03**	0.847	0.829	0.825	0.976	0.978	**0.89**	**0.08**	2.22	1.96	1.84	1.47	1.36	**1.77**	**0.35**
	Calcium (Ca)	mg/kg							2,690	2,420	2,610	3,170	2,480	**2,674**	**297**	6,170	5,120	5,800	5,840	5,660	**5,718**	**383**	6,180	5,380	5,310	5,310	5,270	**5,490**	**388**
	Chromium (Cr)	mg/kg	37.3	90	37.3	90	26	110	19.2	18.4	15.8	14.9	21.2	**17.9**	**2.6**	50.6	47.1	46.8	46.5	46.2	**47.4**	**1.8**	37.7	35.6	37.0	34.9	37.3	**36.5**	**1.2**
	Cobalt (Co)	mg/kg							6.71	5.31	5.13	5.43	6.35	**5.8**	**0.7**	14.2	13.8	13.3	13.1	13.4	**13.6**	**0.4**	28.3	24.7	21.7	19.8	19.1	**22.7**	**3.8**
	Copper (Cu)	mg/kg	35.7	197	35.7	197	16	110	7.81	6.03	5.66	6.86	6.91	**6.65**	**0.84**	38.5	35.7	35.6	41.5	41.7	**38.6**	**3.0**	60.4	39.4	49.8	46.2	46.2	**48.4**	**7.7**
	Iron (Fe)	mg/kg			21,200	43,766	20,000	40,000	17,400	15,100	14,800	15,300	16,400	**15,800**	**1,079**	31,800	31,000	30,400	31,300	32,500	**31,400**	**797**	41,600	38,200	39,700	40,000	37,000	**39,300**	**1,764**
	Lead (Pb)	mg/kg	35.0	91.3	35	91	31	250	8.66	6.47	6.83	7.14	6.46	**7.11**	**0.91**	157	138	172	257	265	**198**	**59**	356	356	421	402	352	**377**	**32**
	Lithium (Li)	mg/kg							17.7	16.6	16.1	15.3	17.8	**16.7**	**1.1**	34.6	29.7	32.5	34.1	34.7	**33.1**	**2.1**	27.9	25.2	26.6	25.2	27.7	**26.5**	**1.3**
	Magnesium (Mg)	mg/kg							3,580	3,310	3,100	2,860	3,700	**3,310**	**343**	7,250	6,980	6,770	7,000	7,030	**7,006**	**171**	6,310	6,010	6,230	5,820	6,300	**6,134**	**213**
	Manganese (Mn)	mg/kg					460	1,100	405	294	343	455	480	**395**	**77**	713	736	740	597	586	**674**	**76**	2,590	2,460	2,620	2,240	2,200	**2,422**	**194**
	Molybdenum (Mo)	mg/kg							0.66	0.56	<0.50	0.76	0.65	**0.63**	**0.10**	1.66	1.37	1.60	1.63	1.69	**1.59**	**0.13**	1.89	1.63	2.14	1.98	1.90	**1.91**	**0.18**
	Nickel (Ni)	mg/kg			16	75	16	75	15.6	14.0	14.0	13.2	16.3	**14.6**	**1.28**	46.9	44.4	42.8	45.3	44.0	**44.7**	**1.5**	45.7	40.7	45.6	39.9	41.8	**42.7**	**2.7**
	Phosphorus (P)	mg/kg					600	2,000	574	500	508	649	459	**538**	**75**	1,020	971	852	942	985	**954**	**64**	942	873	755	760	757	**817**	**86**
	Potassium (K)	mg/kg							940	840	800	770	860	**842**	**65**	2,620	2,480	2,400	2,470	2,480	**2,490**	**80**	2,070	1,920	2,020	1,860	1,970	**1,968**	**82**
	Selenium (Se)	mg/kg			2				<0.20	<0.20	<0.20	0.21	<0.20	**<0.20**	**0**	0.93	0.85	0.89	0.97	1.00	**0.93**	**0.06**	1.12	0.85	1.03	0.99	0.98	**0.99**	**0.10**
	Silver (Ag)	mg/kg							<0.10	<0.10	<0.10	<0.10	<0.10	**<0.10**	**0**	0.48	0.53	0.47	0.64	0.67	**0.56**	**0.09**	0.74	0.57	0.88	0.72	0.74	**0.73**	**0.11**
	Sodium (Na)	mg/kg							120	150	120	160	140	**138**	**18**	230	220	210	230	230	**224**	**9**	200	210	220	210	220	**212**	**8**
	Strontium (Sr)	mg/kg							24.7	32.6	23.2	37.6	27.1	**29.0**	**6.0**	46.1	38.4	42.8	43.8	42.1	**42.6**	**2.8**	45.0	42.7	44.3	39.7	41.7	**42.7**	**2.1**
	Thallium (Tl)	mg/kg							0.093	0.080	0.076	0.070	0.077	**0.079**	**0.009**	0.376	0.318	0.349	0.406	0.404	**0.371**	**0.038**	0.385	0.343	0.459	0.356	0.423	**0.393**	**0.048**
	Tin (Sn)	mg/kg							<2.0	<2.0	<2.0	<2.0	<2.0	**<2.0**	**0**	<2.0	<2.0	<2.0	<2.0	<2.0	**<2.0**	**0**	<2.0	<2.0	<2.0	<2.0	<2.0	**<2.0**	**0**
	Titanium (Ti)	mg/kg							318	267	279	233	227	**265**	**37**	712	680	661	653	645	**670**	**27**	485	478	492	469	480	**481**	**9**
	Uranium (U)	mg/kg							0.829	0.741	0.702	0.935	0.688	**0.78**	**0.10**	2.83	2.42	2.76	2.98	3.02	**2.80**	**0.24**	2.71	2.38	2.74	2.74	2.76	**2.67**	**0.16**
	Vanadium (V)	mg/kg							22.9	19.4	20.1	19.0	20.4	**20.4**	**1.5**	54.1	51.9	52.2	52.2	51.1	**52.3**	**1.1**	44.7	41.7	42.6	42.1	43.1	**42.8**	**1.2**
	Zinc (Zn)	mg/kg	123	315	123	315	120	820	47	43	43	43	43	**43.7**	**2.1**	182	179	181	265	259	**213**	**45**	1,630	1,330	1,240	1,000	990	**1,238**	**265**

[a] CCME (Canadian Council of Ministers of the Environment). 2016b. Sediment Quality Guidelines for Protection of Aquatic Life. Accessed at http://st-ts.ccme.ca/, April 2016.
[b] BCMOE (British Columbia Ministry of Environment). 2006. A Compendium of Working Water Quality Guidelines for British Columbia. (Updated August 2006)
[c] OMOE (Ontario Ministry of Environment). 1993. Guidelines For The Protection and Management Of Aquatic Sediment Quality In Ontario. August 1993, Reprinted October, 1996. MOE (1993).
[d] Interim sediment quality guideline
[e] Probable effect level
[f] Lowest effect level.
[g] Severe effect level.

Table B.3: Sediment chemistry at stations where sediment toxicity samples were collected in the vicinity of the Faro Mine, August 2014.

	Analyte	Units	Sediment Quality Guidelines						Pumphouse Pond (8V 583375 6912489)							Rose Creek downstream from RCTA (R2) (8V 579260 6914984)						
			Canadian[a]		British Columbia[b]		Ontario[c]															
			ISQG[d]	PEL[e]	ISQG[d]	PEL[e]	LEL[f]	SEL[g]	X3-TOX1	X3-TOX2	X3-TOX3	X3-TOX4	X3-TOX5	Mean	Std. Dev.	R2-TOX1	R2-TOX2	R2-TOX3	R2-TOX4	R2-TOX5	Mean	Std. Dev.
Non-metals	Gravel	%							6.15	7.24	0.64	35.1	12.3	**12.3**	**13.4**	1.77	2.19	3.07	2.94	1.17	**2.23**	**0.80**
	Sand	%							70.0	74.1	69.8	55.4	68.6	**67.6**	**7.1**	96.3	94.9	93.3	95.3	96.9	**95.3**	**1.4**
	Silt	%							21.2	16.8	26.6	8.71	17.1	**18.1**	**6.6**	1.79	2.67	3.33	1.67	1.33	**2.16**	**0.82**
	Clay	%							2.59	1.86	3.01	0.78	2.04	**2.06**	**0.85**	0.17	0.27	0.34	0.11	0.65	**0.31**	**0.21**
	Total Kjeldahl Nitrogen	%					0.55	4.8	0.09	0.07	0.11	0.06	0.08	**0.08**	**0.02**	0.03	0.03	0.03	0.03	0.02	**0.03**	**0.00**
	Total Organic Carbon	%					1	10	1.01	0.73	1.31	0.53	0.91	**0.90**	**0.29**	0.27	0.46	0.24	0.26	0.23	**0.29**	**0.10**
ICP-Metals	Aluminum (Al)	mg/kg							13,900	13,800	14,300	11,000	12,800	**13,160**	**1,328**	9,900	10,100	9,690	10,200	9,260	**9,830**	**374**
	Antimony (Sb)	mg/kg							0.38	0.37	0.37	0.21	0.30	**0.33**	**0.07**	0.65	1.10	0.66	0.71	0.64	**0.75**	**0.20**
	Arsenic (As)	mg/kg	5.9	17	5.9	17	6	33	9.86	10.3	10.7	8.48	9.94	**9.86**	**0.84**	9.50	9.35	9.38	9.09	8.13	**9.09**	**0.56**
	Barium (Ba)	mg/kg							165	166	181	158	157	**165**	**10**	109	112	145	98.4	103	**113**	**18**
	Beryllium (Be)	mg/kg							0.75	0.80	0.80	0.47	0.70	**0.70**	**0.14**	0.39	0.42	0.39	0.45	0.36	**0.40**	**0.03**
	Bismuth (Bi)	mg/kg							0.26	0.29	0.30	<0.20	0.22	**0.25**	**0.04**	<0.20	0.21	<0.20	<0.20	<0.20	**<0.20**	**0**
	Cadmium (Cd)	mg/kg	0.6	3.5	0.6	3.5	0.6	10	0.536	0.579	0.528	0.279	0.505	**0.49**	**0.12**	0.395	0.338	0.346	0.320	0.291	**0.34**	**0.04**
	Calcium (Ca)	mg/kg							4,960	4,710	5,170	3,460	4,530	**4,566**	**664**	4,020	4,720	4,100	3,800	4,200	**4,168**	**342**
	Chromium (Cr)	mg/kg	37.3	90	37.3	90	26	110	29.4	29.6	29.8	22.6	26.4	**27.6**	**3.1**	34.2	35.7	36.2	34.4	56.8	**39.5**	**9.73**
	Cobalt (Co)	mg/kg							12.4	12.6	13.3	9.41	11.8	**11.9**	**1.5**	12.3	11.8	12.4	11.5	11.8	**12.0**	**0.4**
	Copper (Cu)	mg/kg	35.7	197	35.7	197	16	110	14.8	16.3	16.2	8.59	18.2	**14.8**	**3.7**	19.7	19.2	18.2	21.9	17.0	**19.2**	**1.8**
	Iron (Fe)	mg/kg			21,200	43,766	20,000	40,000	24,100	24,400	25,100	20,100	22,800	**23,300**	**1,974**	22,300	21,200	21,200	22,600	19,900	**21,440**	**1,069**
	Lead (Pb)	mg/kg	35.0	91.3	35	91	31	250	38.4	40.3	41.7	16.9	28.0	**33.1**	**10.5**	40.3	48.6	61.4	49.1	36.6	**47.2**	**9.6**
	Lithium (Li)	mg/kg							26.3	28.0	28.3	22.7	25.6	**26.2**	**2.3**	17.8	17.4	15.6	17.3	15.4	**16.7**	**1.1**
	Magnesium (Mg)	mg/kg							5,590	5,650	5,840	5,140	5,250	**5,494**	**291**	6,260	5,900	6,270	6,820	6,750	**6,400**	**383**
	Manganese (Mn)	mg/kg					460	1,100	851	882	910	801	1,280	**945**	**192**	2,000	1,820	1,970	1,780	1,910	**1,896**	**94**
	Molybdenum (Mo)	mg/kg							0.55	0.63	0.62	0.59	0.57	**0.59**	**0.03**	1.24	1.06	1.78	1.20	1.17	**1.29**	**0.28**
	Nickel (Ni)	mg/kg			16	75	16	75	26.7	26.7	27.7	20.7	23.4	**25.0**	**2.9**	34.1	31.9	34.0	32.8	37.4	**34.0**	**2.1**
	Phosphorus (P)	mg/kg					600	2,000	725	597	691	411	606	**606**	**122**	589	592	529	512	512	**547**	**41**
	Potassium (K)	mg/kg							1,350	1,350	1,440	930	1,160	**1,246**	**204**	730	770	740	650	750	**728**	**46**
	Selenium (Se)	mg/kg			2				0.41	0.42	0.45	0.23	0.30	**0.36**	**0.09**	0.24	0.24	0.25	0.32	0.26	**0.26**	**0.03**
	Silver (Ag)	mg/kg							0.13	0.14	0.14	<0.10	0.17	**0.14**	**0.03**	0.12	0.12	0.16	<0.10	<0.10	**0.12**	**0.02**
	Sodium (Na)	mg/kg							300	280	310	210	270	**274**	**39**	150	170	140	140	130	**146**	**15**
	Strontium (Sr)	mg/kg							58.0	54.1	59.0	35.4	49.4	**51.2**	**9.6**	27.9	34.5	29.3	29.9	31.9	**30.7**	**2.6**
	Thallium (Tl)	mg/kg							0.200	0.191	0.199	0.110	0.171	**0.174**	**0.038**	0.108	0.101	0.112	0.111	0.107	**0.108**	**0.004**
	Tin (Sn)	mg/kg							<2.0	<2.0	<2.0	<2.0	<2.0	**<2.0**	**0**	<2.0	<2.0	<2.0	<2.0	<2.0	**<2.0**	**0**
	Titanium (Ti)	mg/kg							513	475	525	307	429	**450**	**88**	219	261	219	201	210	**222**	**23**
	Uranium (U)	mg/kg							1.97	2.03	2.11	1.11	1.80	**1.80**	**0.40**	0.975	0.965	0.947	0.959	0.861	**0.94**	**0.05**
	Vanadium (V)	mg/kg							30.1	29.8	31.2	22.9	26.2	**28.0**	**3.4**	26.3	23.7	24.0	24.5	24.0	**24.5**	**1.0**
	Zinc (Zn)	mg/kg	123	315	123	315	120	820	317	349	362	184	299	**302**	**71**	279	242	250	257	239	**253**	**16**

[a] CCME (Canadian Council of Ministers of the Environment). 2016b. Sediment Quality Guidelines for Protection of Aquatic Life. Accessed at http://st-ts.ccme.ca/, April 2016.
[b] BCMOE (British Columbia Ministry of Environment). 2006. A Compendium of Working Water Quality Guidelines for British Columbia. (Updated August 2006)
[c] OMOE (Ontario Ministry of Environment). 1993. Guidelines For The Protection and Management Of Aquatic Sediment Quality In Ontario. August 1993, Reprinted October, 1996. MOE (1993).
[d] Interim sediment quality guideline
[e] Probable effect level
[f] Lowest effect level.
[g] Severe effect level.

Table B.4: Statistical comparison (t-test) of reference versus exposed sediment toxicity test results. Bold values indicate significant difference (α=0.05).

Area		*Hyalella azteca*				*Chironomus dilutus*			
		Survival		Dry Weight		Survival		Dry Weight	
		% (± SD)	p-value	% (± SD)	p-value	% (± SD)	p-value	% (± SD)	p-value
Reference (R7)		84 (±15.2)	-	0.05 (±0.02)	-	82 (±14.8)	-	2.29 (±0.37)	-
Exposed	NFRC - Haul Road Pond	98 (±4.5)	0.052	**0.12 (±0.01)**	**0.002**	80 (±7.1)	0.828	**2.80 (±0.26)**	**0.010**
	NFRC - X2	88 (±13.0)	0.749	0.07 (±0.03)	0.308	88 (±16.4)	0.553	2.58 (±0.47)	0.386
	Pumphouse Pond	98 (±4.5)	0.135	**0.09 (±0.03)**	**0.018**	78 (±8.4)	0.541	2.64 (±0.42)	0.345
	Rose Cr downstream from RCTA - R2	88 (±4.5)	0.587	**0.11 (±0.03)**	**0.035**	64 (±18.2)	0.221	2.46 (±0.25)	0.470

Table B.5: Aquatic macrophyte tissue metal concentrations measured in samples collected in the vicinity of the Faro Mine, August 2014.

Sample ID	Dry Weight Units	South Fork Rose Creek - downstream from former Freshwater Reservoir					Groundwater Recharge Ponds and Pumphouse Pond (NFC)					Rose Creek Diversion (RCD)				
		SF-VEG-01	SF-VEG-02	SF-VEG-03	Mean	Standard Deviation	NFC-VEG-01	NFC-VEG-02	NFC-VEG-03	Mean	Standard Deviation	RCD-VEG-01	RCD-VEG-02	RCD-VEG-03	Mean	Standard Deviation
	UTM	584675 6912194	585325 6911659	585229 6911904			583443 6912453	583322 6912502	583899 6912648			582635 6912819	582572 6912887	581754 6913172		
% Moisture	%	79.9	67.6	89.7	79.1	11.1	84.8	80.3	78.6	81.2	3.2	89.2	75.8	82.6	82.5	6.7
Metals (dry weight)																
Aluminum (Al)	mg/kg	1,540	154	5,290	2,328	2,657	4,620	10,200	15,600	10,140	5,490	4,060	11,500	13,000	9,520	4,788
Antimony (Sb)	mg/kg	0.061	0.051	0.130	0.081	0.043	0.086	0.117	0.200	0.134	0.059	0.304	0.135	0.210	0.216	0.085
Arsenic (As)	mg/kg	4.51	1.63	57.00	21.05	31.17	3.95	10.60	31.00	15.18	14.10	20.70	13.60	19.30	17.87	3.76
Barium (Ba)	mg/kg	341	319	378	346	30	228	258	480	322	138	230	296	313	280	44
Beryllium (Be)	mg/kg	0.101	0.016	0.350	0.156	0.174	0.284	0.685	1.170	0.713	0.444	0.327	0.653	0.717	0.566	0.209
Bismuth (Bi)	mg/kg	0.032	<0.010	0.116	0.053	0.056	0.087	0.273	0.657	0.339	0.291	0.229	0.374	0.263	0.289	0.076
Boron (B)	mg/kg	4.2	<1.0	8.8	4.7	3.9	6.5	42.3	9.5	19.4	19.9	11.0	30.0	8.4	16.5	11.8
Cadmium (Cd)	mg/kg	0.19	0.10	0.36	0.22	0.13	1.29	10.30	4.93	5.51	4.53	1.32	4.43	1.43	2.39	1.76
Calcium (Ca)	mg/kg	117,000	126,000	19,300	87,433	59,177	79,700	17,500	9,060	35,420	38,579	11,900	13,200	11,000	12,033	1,106
Cesium (Cs)	mg/kg	0.35	0.03	1.06	0.48	0.53	0.98	2.32	3.54	2.28	1.28	1.70	2.36	2.24	2.10	0.35
Chromium (Cr)	mg/kg	3.7	1.6	11.3	5.5	5.1	10.1	22.6	35.5	22.7	12.7	17.9	25.1	44.1	29.0	13.5
Cobalt (Co)	mg/kg	4.3	1.1	9.5	5.0	4.2	9.4	22.0	53.8	28.4	22.9	14.3	14.1	24.8	17.7	6.1
Copper (Cu)	mg/kg	5.2	1.2	11.3	5.9	5.1	8.5	20.0	36.4	21.6	14.0	23.9	31.8	26.3	27.3	4.1
Iron (Fe)	mg/kg	3,990	804	55,400	20,065	30,643	7,250	17,100	33,000	19,117	12,993	9,050	21,100	33,000	21,050	11,975
Lead (Pb)	mg/kg	2.9	1.7	15.8	6.8	7.8	13.1	46.6	255.0	104.9	131.1	75.8	129.0	71.9	92.2	31.9
Lithium (Li)	mg/kg	2.6	0.7	8.3	3.9	4.0	7.7	16.1	23.8	15.9	8.1	13.2	18.1	20.1	17.1	3.6
Magnesium (Mg)	mg/kg	3,480	4,610	5,340	4,477	937	3,670	4,860	5,560	4,697	956	4,330	4,570	7,660	5,520	1,857
Manganese (Mn)	mg/kg	6,520	1,260	10,300	6,027	4,540	1,450	2,080	5,880	3,137	2,397	1,670	1,630	2,890	2,063	716
Mercury (Hg)	mg/kg	0.008	0.006	0.024	0.013	0.010	0.029	0.098	0.351	0.159	0.169	0.127	0.164	0.071	0.121	0.047
Molybdenum (Mo)	mg/kg	0.66	0.04	0.59	0.43	0.34	0.87	0.88	1.52	1.09	0.37	2.55	1.22	1.79	1.85	0.67
Nickel (Ni)	mg/kg	5.1	3.4	13.5	7.3	5.4	10.8	24.0	46.3	27.0	17.9	19.3	24.6	43.7	29.2	12.8
Phosphorus (P)	mg/kg	2,570	612	2,180	1,787	1,036	2,900	2,320	1,000	2,073	974	3,880	1,770	1,930	2,527	1,175
Potassium (K)	mg/kg	15,100	5,010	13,400	11,170	5,402	19,000	9,870	5,490	11,453	6,893	31,600	9,630	16,400	19,210	11,251
Rubidium (Rb)	mg/kg	15.4	1.8	11.9	9.7	7.0	18.9	19.7	29.7	22.8	6.0	26.4	21.5	26.4	24.8	2.8
Selenium (Se)	mg/kg	0.17	0.14	1.53	0.61	0.80	0.26	1.19	2.45	1.30	1.10	0.63	0.94	0.75	0.77	0.16
Sodium (Na)	mg/kg	1,580	343	2,640	1,521	1,150	1,340	2,470	393	1,401	1,040	3,080	2,560	1,340	2,327	893
Strontium (Sr)	mg/kg	414	627	121	387	254	238	77	55	123	100	78	61	65	68	9
Tellurium (Te)	mg/kg	<0.020	<0.020	<0.060	0.033	0.023	<0.040	<0.020	0.047	0.036	0.014	<0.020	<0.020	<0.020	0.020	0.000
Thallium (Tl)	mg/kg	0.091	0.008	0.095	0.065	0.049	0.103	0.206	0.400	0.236	0.151	0.202	0.273	0.263	0.246	0.038
Tin (Sn)	mg/kg	<0.10	<0.10	<0.30	0.17	0.12	<0.20	0.44	0.95	0.53	0.38	0.18	0.34	0.32	0.28	0.09
Uranium (U)	mg/kg	2.44	0.64	1.13	1.40	0.93	0.89	2.51	4.63	2.68	1.88	1.59	2.82	2.06	2.16	0.62
Vanadium (V)	mg/kg	3.7	0.9	14.0	6.2	6.9	10.8	25.2	48.8	28.3	19.2	20.4	30.8	34.7	28.6	7.4
Zinc (Zn)	mg/kg	30	14	64	36	26	823	1,910	2,450	1,728	829	779	852	1,220	950	236
Zirconium (Zr)	mg/kg	0.49	<0.20	1.47	0.72	0.67	1.06	4.80	6.03	3.96	2.59	2.90	3.10	3.72	3.24	0.43

Table B.6: Geographic Information System (GIS) derived environmental variables for reference areas, August 2014. Full description of variable abbreviations in Appendix Table D.6.

GIS variable		R7	FC	R6	USFR	V1	VR	BLC	NEXC	GRC	STC	HOC	BEC	BUC	REF-126	REF-212	REF-213	REF-220	REF-325	REF-327	REF-328	REF-340	REF-376
% Geologic	Met	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	8.4	7.7	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
	Plu	66.0	98.0	34.2	98.9	79.5	97.6	23.9	57.3	0.1	0.0	0.0	0.0	35.6	38.8	14.2	41.2	0.0	80.5	24.3	17.3	18.4	0.0
	Sed	28.0	2.0	35.0	1.1	20.5	2.4	64.9	42.7	99.6	57.0	15.7	85.0	61.4	34.1	85.8	58.8	88.9	19.5	75.4	82.7	16.3	0.0
	SedVol	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Ult	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	UltMet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	55.1	0.0
	Uncon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.5	75.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Vol	6.0	0.0	30.6	0.0	0.0	0.0	10.8	0.0	0.3	2.6	1.4	14.0	0.0	27.1	0.0	0.0	11.1	0.0	0.3	0.0	10.1	0.0
% Land Cover	F8013	0.0	0.0	0.0	0.0	0.0	0.0	15.6	0.0	0.0	2.3	48.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
	Shadow	0.2	0.0	0.1	1.6	0.2	0.0	0.3	0.0	0.5	2.3	0.6	1.5	0.0	0.2	1.6	0.3	1.7	0.0	1.2	0.4	0.0	0.0
	Water	0.1	0.0	0.1	1.5	0.0	0.0	2.5	0.0	0.1	0.7	1.3	1.8	1.1	0.1	0.4	0.5	0.0	0.2	0.0	0.5	0.1	0.1
	SnoIce	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0
	RocRub	0.2	0.2	0.8	7.4	6.7	0.3	0.8	0.1	0.4	4.5	2.5	1.3	0.1	1.9	5.8	1.9	1.4	0.3	6.1	2.3	0.3	0.0
	ExpLan	5.3	0.3	4.1	16.5	19.4	9.5	3.1	0.6	1.2	7.5	3.5	2.5	1.2	9.2	17.6	8.5	3.4	2.4	23.8	7.6	0.3	0.6
	ShrTal	5.1	12.7	6.6	8.3	7.0	1.9	4.5	8.2	2.4	7.0	2.4	7.7	1.5	8.5	4.5	12.2	11.3	11.2	7.1	13.5	9.3	0.3
	ShrLow	47.9	52.5	45.5	27.0	26.5	31.6	30.3	41.0	33.7	10.0	21.3	23.7	25.0	36.3	31.6	23.8	25.0	41.2	34.8	31.2	36.1	28.1
	WetTre	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	WetShr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
	WetHer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Herb	15.5	21.7	14.8	29.4	29.5	27.0	10.4	26.7	3.1	11.0	20.9	6.6	3.0	27.6	13.2	19.1	14.3	12.5	14.0	22.7	12.5	0.7
	ConDen	1.3	0.1	1.5	0.6	0.3	0.0	2.2	0.2	3.5	6.2	2.6	6.6	6.9	1.4	0.8	4.5	6.2	2.8	0.4	2.0	2.2	0.7
	ConOpe	7.8	2.2	11.3	1.6	3.0	11.3	23.2	9.8	29.1	33.5	21.2	29.1	29.1	6.4	5.4	19.2	23.8	13.6	3.6	10.8	19.5	44.8
	ConSpa	11.8	2.3	11.5	1.8	2.7	15.7	18.8	5.1	25.4	12.6	22.3	16.8	30.3	2.8	16.8	4.1	8.9	7.3	7.4	3.2	13.8	24.1
	BroDen	1.4	3.4	0.9	2.6	2.3	1.2	1.7	3.2	0.4	3.7	1.0	2.0	0.1	1.7	1.2	3.7	3.7	6.3	0.4	4.1	2.9	0.0
	BroOpe	1.0	3.0	1.2	0.9	0.7	0.0	0.2	2.2	0.0	0.0	0.0	0.0	0.1	1.1	0.5	0.6	0.1	0.2	0.8	0.9	0.5	0.0
	MixOpe	2.4	1.5	1.6	0.7	1.6	1.5	1.9	2.9	0.0	0.7	0.2	0.2	0.5	2.8	0.3	1.4	0.3	2.0	0.1	0.6	2.4	0.7
	MixSpa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
	Logged	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Basin and Stream Character	Smin (Degree)	0.00	0.00	0.00	0.00	0.00	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Smax (Degree)	47.30	26.89	46.17	46.92	42.72	24.36	46.48	33.26	42.28	47.61	47.97	55.16	39.81	46.53	56.79	42.79	53.10	39.83	51.18	46.56	38.77	22.48
	Smean (Degree)	11.31	7.51	13.73	16.17	16.23	10.01	10.00	10.98	17.59	15.88	7.96	16.55	11.75	16.25	17.40	20.87	23.30	10.74	21.01	14.84	10.93	4.42
	Amin (Degree)	-1.00	-1.00	-1.00	-1.00	-1.00	1.64	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00
	Amax (Degree)	359.73	357.51	359.77	359.76	359.27	356.19	359.77	358.96	359.67	359.69	359.68	359.74	359.62	359.63	359.75	359.64	359.79	359.61	359.71	359.66	359.60	359.09
	Amean (Degree)	209.18	163.23	187.14	197.53	205.40	253.23	181.92	203.15	175.15	175.57	137.83	150.34	150.54	181.95	170.45	154.33	161.75	182.10	168.83	156.81	168.84	217.09
	East (UTM)	586447	585353	568180	590252	594435	590679	593669	579169	611834	349222	656453	638207	589947	559596	581220	558172	643996	549389	588635	559663	549042	357492
	North (UTM)	6914347	6916735	6921708	6907390	6903741	6906914	6895952	6915382	6882072	6851621	6855508	6863348	6894046	6943301	6887386	6883774	6854240	6886489	6881006	6880950	6871745	6835508
	Elev (m)	1131.858	1314	920	1259.082	1174.741	1249.122	666	1029.829	743	846	823	814	712	1140	900	907	891	804	1007	991	998	943
	SouEle (m)	1650	1577	1662	1723	1662	1682	1581	1660	1392	1586	1177	1677	1318	1744	1704	1334	1595	1573	1773	1334	1493	1397
	EleCha (m)	518.142	263	742	463.918	487.2585	432.8782	915	630.1713	649	740	354	863	606	604	804	427	704	769	766	343	495	454
	ChaLen (m)	19195.0	6022.3	188757.1	8981.3	8740.9	3413.0	67039.1	8275.5	16402.5	43607.8	26230.6	21572.9	33234.6	8689.7	31778.2	16069.9	15278.5	17954.7	23702.3	12496.7	14431.7	14853.3
	GrMaCh (m)	0.026994	0.043671	0.003931	0.051654	0.055745	0.126832	0.013649	0.076149	0.039567	0.016969	0.013496	0.040004	0.018234	0.069508	0.0253	0.026571	0.046078	0.04283	0.032317	0.027447	0.0343	0.030566
	GrStSp (m)	0.010	0.045	0.005	0.050	0.065	0.080	0.000	0.020	0.020	0.020	0.015	0.010	0.010	0.005	0.040	0.015	0.020	0.045	0.030	0.095	0.030	0.020
	BaArea (km^2)	93.32	13.15	321.23	24.62	19.22	2.48	596.00	21.30	86.51	214.41	159.66	81.83	145.71	33.08	207.75	90.98	66.71	81.51	78.88	60.03	66.26	51.45
	StrOrd (Strahler)	3	2	4	2	2	1	4	3	4	4	5	3	4	3	4	4	4	3	3	3	3	3
	SuStLe (m)	62.0	6.1	275.6	13.6	12.4	3.4	427.6	12.2	74.2	194.1	122.0	67.6	143.1	36.5	171.6	82.8	43.2	73.5	60.1	49.0	76.1	27.9
	DraDen (km/m^2)	0.6644	0.4604	0.8579	0.5514	0.6457	1.3777	0.7175	0.5729	0.8580	0.9052	0.7643	0.8265	0.9818	1.1022	0.8259	0.9101	0.6482	0.9016	0.7616	0.8162	1.1480	0.5417

Table B.7: Geographic Information System (GIS) derived environmental variables for exposed areas, August 2014. Full description of variable abbreviations in Appendix Table D.6.

GIS variable		Grum*	R1*	R9	X2	X3	RDE-1	RDE-2	RDE-3	R2	R3	R4	R5	A1
% Geologic	Met	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Plu	98.9	51.5	62.0	61.4	61.2	55.4	54.3	52.4	49.1	43.1	39.8	37.1	38.8
	Sed	1.1	45.3	33.5	34.1	34.3	40.0	40.9	42.4	46.0	51.3	52.9	44.2	48.6
	SedVol	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
	Ult	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	UltMet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Uncon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Vol	0.0	3.2	4.6	4.5	4.5	4.6	4.9	5.1	5.0	5.6	7.3	18.5	12.6
% Land Cover	F8013	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Shadow	1.6	0.7	0.5	0.5	0.5	0.6	0.6	0.5	0.6	0.5	0.6	0.4	0.3
	Water	1.5	1.2	0.2	0.2	0.2	0.5	0.5	0.5	0.8	0.6	0.5	0.3	0.3
	SnoIce	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	RocRub	7.3	2.6	0.6	0.6	0.6	1.3	1.3	1.2	1.4	1.1	1.0	0.9	0.8
	ExpLan	16.7	9.1	6.1	6.5	6.6	7.4	7.4	7.2	8.5	7.0	6.5	5.3	4.6
	ShrTal	8.2	3.8	5.6	5.6	5.6	4.8	4.8	4.7	4.5	4.8	4.8	5.6	6.7
	ShrLow	27.0	28.0	45.6	45.2	45.1	37.8	37.2	36.5	34.8	33.1	31.9	38.3	34.4
	WetTre	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	WetShr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	WetHer	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Herb	29.1	17.0	14.4	14.3	14.2	14.8	14.5	14.1	13.4	13.6	12.4	13.5	12.2
	ConDen	0.5	0.2	1.0	1.0	1.0	0.7	0.7	0.7	0.7	1.1	1.6	1.5	2.5
	ConOpe	1.6	12.1	8.3	8.3	8.3	10.9	11.7	13.0	13.6	15.2	17.4	14.6	17.2
	ConSpa	2.2	22.7	12.7	12.9	12.9	17.2	17.6	17.6	18.0	18.2	18.4	15.2	15.4
	BroDen	2.5	1.0	1.6	1.6	1.6	1.3	1.3	1.3	1.2	1.5	1.4	1.2	1.7
	BroOpe	0.9	0.5	1.1	1.1	1.1	0.9	0.8	0.8	0.8	0.8	0.7	1.0	0.9
	MixOpe	0.8	1.1	2.3	2.2	2.2	1.8	1.8	1.8	1.8	2.5	2.8	2.2	3.1
	MixSpa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Logged	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Basin and Stream Character	Smin (Degree)	0.00	0.00	0.00	0.48	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Smax (Degree)	46.92	40.23	47.30	11.45	10.61	34.85	40.23	46.92	46.92	43.92	47.30	47.30	57.44
	Smean (Degree)	16.09	9.87	10.67	5.42	4.26	8.73	9.61	11.73	10.64	13.15	12.02	12.87	14.74
	Amin (Degree)	-1.00	-1.00	-1.00	0.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00	-1.00
	Amax (Degree)	359.76	359.26	359.73	356.99	296.57	359.37	359.37	359.76	359.76	359.75	359.76	359.77	359.73
	Amean (Degree)	197.91	183.56	206.46	223.04	225.53	162.69	183.25	173.78	191.31	165.64	185.19	186.06	184.91
	East (UTM)	589811	584022	585242	584061	583295	583025	581366	579572	579045	573828	567737	566481	545213
	North (UTM)	6907397	6912399	6913662	6912782	6912519	6912620	6913330	6914517	6914953	6917490	6921637	6922635	6924197
	Elev (m)	1221.3	1066.583	1116.59	1070.509	1063.037	1060.134	1050.865	1025.356	1010.34	983	917	907	609
	SouEle (m)	1723	1723	1650	1650	1650	1650	1650	1650	1650	1650	1650	1662	1662
	EleCha (m)	501.7003	656.4175	533.4099	579.4911	586.9628	589.8658	599.1345	624.6439	639.6595	667	733	755	1053
	ChaLen (m)	9437.7	23396.1	20826.1	22824.8	23789.4	24009.5	25826.9	28090.9	29361.2	37492.8	53853.6	191675.2	236637.7
	GrMaCh (m)	0.053159	0.028057	0.025613	0.025389	0.024673	0.024568	0.023198	0.022237	0.021786	0.01779	0.013611	0.003939	0.00445
	GrStSp (m)	0.040	0.000	0.020	0.030	0.005	0.010	0.010	0.005	0.000	0.065	0.005	0.005	0.000
	BaArea (km2)	24.92	72.65	121.84	123.00	123.33	203.68	208.02	215.27	230.12	296.24	337.15	663.24	983.89
	StrOrd (Strahler)	2	4	3	3	4	4	4	1	4	4	4	5	5
	SuStLe (m)	14.0	52.0	80.1	81.6	81.8	142.7	146.1	152.0	162.3	221.8	261.4	540.4	795.6
	DraDen (km/m2)	0.5631	0.7156	0.6572	0.6635	0.6635	0.7007	0.7023	0.7059	0.7052	0.7486	0.7754	0.8148	0.8087

* Minimally influenced exposed area.

APPENDIX C

WATER QUALITY DATA
(ON CD ATTACHED TO BACK COVER)

Table C.1: Water quality data and summary statistics for all reference stations (V1, VR, USFR, R7, FC, R6, W10), Faro Mine, Yukon.

Station	Date	Non-metals												Metals	
		Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
	Units	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	pH units	mg/L	mg/L	mg/L	NTU	mg/L	mg/L
V1	7-Jan-10	45	< 0.01	140	53.4		1	0.8	7.76	10	68	< 4		< 0.000005	< 0.000005
V1	18-Feb-10	49	0.03	80	50.8		0.8	< 0.5	8.34	11	68	< 1		< 0.000005	< 0.000005
V1	29-Mar-10		< 0.01	122	51.5		1.6	1.4	7.91	12		< 1		< 0.000005	0.000006
V1	20-Apr-10	46	0.02	101	48		1.5	1	7.9	12	46	< 1		0.000007	0.000006
V1	12-May-10	39	< 0.01	99	44.3			4.5	7.94	7.6	62	< 1		0.000008	0.000011
V1	16-Jun-10	17	< 0.05	54	20.1		2.2	1.8	7.16	5.5	30	2		0.000012	0.000042
V1	14-Jul-10	26	< 0.05	60	27.2		1.1	1.8	8.2	6.8	38	< 1		0.000008	0.000024
V1	4-Aug-10	35	< 0.05		37.3		1.6	1.7	8.29	10	64	< 1		0.000008	0.000014
V1	7-Sep-10	29		30	33.7		1.8	1.8	8.38	9.1	62	< 1	0.2	0.000008	0.000007
V1	5-Oct-10	34	0.36	103	39.9	0.03	1.1	1.7	5.23	9.6	82	< 1	0.2	0.000007	0.000015
V1	1-Nov-10	38	0.008		39.1	0.04	1	0.9	8.67	12	60		0.15	0.000011	< 0.000005
V1	1-Dec-10	39	< 0.05	140	48.5	0.07	< 0.5	< 0.5		13	56		1	0.000014	
V1	24-Jan-11	47	0.036	192	59.7	0.12	27.1	0.7	7.93	11	62	< 1	< 0.25	0.000013	0.000038
V1	17-Feb-11	45	< 0.005	134	49	0.13	0.9	1.1	7.84	11	62	< 4	< 0.25	< 0.000005	0.000007
V1	22-Mar-11	45	0.013	137	50.7	0.15	0.7	0.6	8.03	12	66	< 1		0.00001	< 0.000005
V1	21-Apr-11	46	0.019	90	56.5	0.15	0.8	0.7	8.52	15	64	< 1	< 0.25	< 0.000005	0.000017
V1	17-May-11	36		88	40.7	< 0.02	12.1	11.7	8.08	7.5	42	< 1	0.5	0.000018	0.000022
V1	15-Jun-11	14	0.024	38	17.6	< 0.02	3	2.3	7.62	6.9		< 1	< 0.25	< 0.000005	0.000006
V1	13-Jul-11	24	0.02		30.2	< 0.02	1.9	2.3	7.65	9.2	48	< 1		0.000008	0.000009
V1	10-Aug-11	26	< 0.005	73	31.3	< 0.02	2.5	2.3	7.68	7.9	64	< 1	0.34	0.000011	0.000007
V1	13-Sep-11	26	0.047	61	30.6	< 0.02	2.2	1.8	7.75		44	< 1	0.17	0.000008	0.000018
V1	18-Oct-11	36	0.032	110	41.8	< 0.02	1.6	1.5	7.78	10.8	54	< 1	< 0.1		0.000008
V1	23-Nov-11	40.1	0.028	127	53.9		2.34	1.28	8.41	17.9	58	< 1	< 0.1	< 0.000005	0.000014
V1	8-Dec-11	42.8	0.071	104	47.7	0.073	1.04	1.23	7.89	13.4	64	< 4	< 0.1	0.000006	0.000006
V1	25-Jan-12	47.7	0.055	90	49.6	0.12	1.17	1.08	8.04	11.6	76	< 1		0.000016	0.000019
V1	27-Feb-12	46	0.023	125	54.1	0.121		0.91	7.97	11.1	64	< 1	0.12	0.00001	< 0.000005
V1	7-Mar-12	47.4	0.023	113	51.6	0.137	< 0.5	0.65	7.71	11.9	84	< 1	< 0.1	< 0.000005	0.000006
V1	26-Apr-12			147									0.26		
V1	22-May-12	39.6	0.022	179	46.7	0.026	9.3	7.37	8.29	8.04	74	< 1		0.000021	0.0000232
V1	2-Jun-12	27.8	< 0.005		37.7	0.0067	< 6.06			7.43		2.2		0.0000114	< 0.0000101
V1	19-Jun-12	14.2	0.0097		17.3	< 0.02	3.94	3.43	7.59	4.3	26	1.2		0.0000109	0.0000224
V1	18-Jul-12		0.015	65	27.9	< 0.02	3.2	2.63		6.41	40	< 1	0.33	0.000009	0.0000131
V1	14-Aug-12	22.1	0.0057	92	27			2.27	7.69	6.2	60	< 1	0.25	0.000006	
V1	12-Sep-12	23.9	0.0066	85	29.3	< 0.02	2.38	2.47	7.6	8.77	50	< 1		< 0.000005	0.000006
V1	23-Sep-12	20.8			26.4	0.0136	2.34			9.28	41	< 1	-3.8	< 0.00001	< 0.00001
V1	15-Oct-12	28.7	0.01	56	34	0.03	1.93	1.6	8.22	9.59	42	< 1	0.16		< 0.000005
V1	13-Nov-12		0.008		43.1	0.055	1.96	0.62	8.01	10.5	74	< 1	0.12		0.000006
V1	11-Dec-12	42.4	0.0069	137	53.9	0.088	0.97		7.7	10.9	88	< 1	0.16	< 0.000005	0.000009
V1	17-Jan-13	41.3	0.01	87	49.9	0.072	1.28	1.43	8.11	10.7	56	< 1	0.14	0.000007	0.000009
V1	12-Feb-13	50.1	< 0.005	121	53.6	0.117	0.8	0.98	8.01	12.2	110	< 1	0.75	0.000007	0.000006
V1	6-Mar-13	48.1	< 0.005	8214	58.9	0.127	1.38		7.22	11.4	76	< 1		< 0.00001	< 0.00001
V1	12-Mar-13	48.3	0.019	105	60.9	0.128	0.89	1.35	7.39	11.7	72	< 1	0.48	0.00001	< 0.000005
V1	15-Apr-13	50.6	0.015	135	55	0.135	1.05	1.66	7.78	10.7	104	< 1	0.13	0.000011	0.00001
V1	14-May-13	30.9	0.015	81	37.2	< 0.02	12.8	14.3	7.2	< 0.5	80	< 1	14.3	0.000023	0.00002
V1	18-Jun-13	12	0.0084	62	16	< 0.02	3.42	3.46	8.02	4.38	< 10	2.7	0.71	0.000007	0.00003
V1	15-Jul-13	29.3	0.011	20	32.4	< 2	2.14	2.21	7.53	8.68	96	< 1	0.19	0.000007	0.000006
V1	13-Aug-13	33.9	0.0096	70	49	< 2	1.86	2.42	7.68	8.07	62	< 1	< 0.05	0.000014	0.000009
V1	18-Sep-13	22.3	0.012	59	26.1	< 2	2.19	2.58	7.53	10.1	34	2.9	< 0.05	0.000015	0.000007
V1	9-Oct-13			67					7.34						
V1	18-Nov-13	40.8	0.019	105	48.1	< 2	1.58	0.79	7.47	11.4	54	< 1	0.06	0.000007	0.000007
V1	10-Dec-13	42.9	0.013	94	49.1	< 2	1.22	1.28	7.74	13.9	60	< 1	0.05	< 0.000005	0.000009

Table C.1: Water quality data and summary statistics for all reference stations (V1, VR, USFR, R7, FC, R6, W10), Faro Mine, Yukon.

Station	Date	Metals													
		Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
	Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
V1	7-Jan-10	15.5	0.000012	0.007	0.00014	2.53	0.00024	0.00026	0.5	< 0.000005	1.97	0.0774	0.00105	0.0008	0.0024
V1	18-Feb-10	16.3	0.000012	0.005	0.000087	2.68	0.00028	0.00021	0.54	< 0.000005	2	0.0743	0.00125	0.0008	0.0007
V1	29-Mar-10	15.4	0.000012	0.003	0.000104	2.77	0.00022	0.00018	0.51	< 0.000005	2.13	0.0761	0.00147	0.001	0.0011
V1	20-Apr-10	14.6	0.000019	0.007	0.000373	2.43	0.00064	0.00018		< 0.000005	1.76	0.0793		0.0008	0.0026
V1	12-May-10	13.9		0.111	0.000107		0.00188	0.00052	0.78	< 0.000005	1.74	0.07	0.00064	0.0034	0.0061
V1	16-Jun-10	6.39	0.00003	0.032	0.000977	1	0.00258	0.00027	0.31	< 0.000005	1.29		0.000331	0.0046	0.0414
V1	14-Jul-10	7.76	0.000017	0.022	0.000087	1.07	0.00114	0.00018	0.29		1.22	0.0436	0.00029	0.0008	0.0145
V1	4-Aug-10		0.000034	0.011	0.000108	1.79		0.00025	0.41	< 0.000005	1.81	0.0608	0.000391	0.0059	0.005
V1	7-Sep-10	11	0.000011	0.024	0.000091	1.5	0.00064	0.00016	0.33	< 0.000005	1.69	0.0564	0.000328	0.0011	0.0034
V1	5-Oct-10	12.3	0.000017	0.016	0.000105	1.9	0.00076	0.0002	0.42	< 0.000005	1.94	0.0601	0.000526	0.0008	0.0075
V1	1-Nov-10		0.000015	0.008	0.000962	2.15	0.00053	0.0002	0.42	< 0.000005	1.94	0.0687	0.000556	0.0021	
V1	1-Dec-10	14.9	0.000033		0.00138	2.47	0.00328	0.00029	0.52	< 0.000005	2.04	0.0767	0.000761	0.0064	0.002
V1	24-Jan-11	17.6	0.000018	0.009	0.000514	2.85	0.00063	0.00024	0.64	0.000014		0.0829		0.0021	0.0103
V1	17-Feb-11	15	0.00001	0.004	0.000062	2.84	0.00026	0.00023			2.18	0.0818			0.0004
V1	22-Mar-11	14.5	0.000011	0.006	0.000278	2.94	0.00142		0.58	< 0.000005	2.22	0.0842	0.00155	0.0029	0.0022
V1	21-Apr-11	17.9	0.000014	0.007	0.000605	2.88	0.00057	0.0013	0.54	< 0.000005	2.18	0.0857	0.00172	0.0005	0.0045
V1	17-May-11	12.5	0.000059	0.081	0.000215	2.15	0.00385		1.12		1.45	0.0598	0.000673	0.0017	0.0017
V1	15-Jun-11	5.65	0.000023	0.03	0.000087	0.83	0.001	0.00025	0.31	< 0.000005	1.13	0.0312	0.000325	0.0004	0.0043
V1	13-Jul-11	9.7		0.027	0.000109		0.00113		0.36	< 0.000005	1.56	0.0511	0.00032	0.0005	0.0007
V1	10-Aug-11	10	0.000022	0.027	0.000299	1.51	0.00069	0.0003		< 0.000005	1.62	0.0523	0.000333	0.0028	0.0019
V1	13-Sep-11		0.00002	0.025	0.000591	1.44	0.00121	0.00027	0.38		1.61	0.0534	0.000376	0.002	0.0056
V1	18-Oct-11	13.3	0.000016			2.09	0.00042	0.00024	0.46	< 0.000005	1.84	0.0658	0.000618	0.0008	0.0018
V1	23-Nov-11	17.3	0.000019	0.009	0.000182	2.6	0.00059	0.00022	0.53	< 0.000005	2.14		0.000798	0.0008	0.003
V1	8-Dec-11	14.8	0.000013	0.006	0.000009	2.58	0.00034	0.0002	0.54	< 0.000005		0.0781	0.000905	0.0012	0.0011
V1	25-Jan-12	15.3	0.00001	0.004	0.000093	2.76	0.00021	0.0003	0.57	< 0.000005	2.11	0.0795	0.00112	0.0016	0.0022
V1	27-Feb-12	17	0.000018	0.015		2.87	0.00065	0.00027		< 0.000005	2.2	0.0819	0.00136	0.0028	0.0014
V1	7-Mar-12	15.6	0.000978	0.02	0.000128	2.65	0.00044		0.55	< 0.000005	2.17	0.0819		0.0009	
V1	26-Apr-12														
V1	22-May-12	14.7	0.0000357	0.0384	0.0000478	2.36	0.00183	0.000549		< 0.000005	1.91	0.0721		0.00068	0.00666
V1	2-Jun-12	10.5	0.0000468	0.117	0.000116	1.59	0.00495		0.843	< 0.000005		0.0478	0.000401		< 0.00371
V1	19-Jun-12	5.74	0.0000456	0.068	0.000396	0.726	0.00226	0.000356	0.372	0.0000092	0.915		0.000318		0.00658
V1	18-Jul-12	9	0.0000371	0.0382	0.000123	1.31	0.00128	0.000284	0.312	< 0.000005	1.31	0.0453	0.000339	0.00098	0.00221
V1	14-Aug-12	8.04	0.000019	0.0288	0.000047	1.23	0.00104	0.000234	0.281	< 0.000005	1.44	0.0529	0.00045	0.00035	0.197
V1	12-Sep-12	9.58			0.000018	1.29	0.00167	0.000283	0.308	< 0.000005	1.54	0.0472	0.000373	0.00047	0.0009
V1	23-Sep-12			0.034	< 0.00005	1.23		< 0.0005	0.323	< 0.00001	1.64	0.0464	0.000316	0.0053	0.0014
V1	15-Oct-12	10.1	0.000022	0.0167	0.000061	1.67	0.000606	0.000213		< 0.000005	1.7	0.0555	0.000412	0.00072	0.00092
V1	13-Nov-12	13.6	0.000017	0.0071		2.26	0.000188	0.000236	0.484	< 0.000005	1.94	0.074	0.0007	0.00076	0.00058
V1	11-Dec-12	16.6	0.000011		0.000078	2.73	0.000224	0.000289	0.555	< 0.000005	2.09	0.0783	0.000903	0.00083	0.00087
V1	17-Jan-13	15.8	0.000015	0.0358	0.00004	2.55	0.000347	0.000259	0.636	< 0.000005	2.05	0.0765	0.000941	0.00057	0.00487
V1	12-Feb-13	16.8	0.000009	0.0036	0.000068	2.84	0.00033	0.000211	0.65	< 0.000005	2.25	0.0869	0.00141	0.00123	0.00172
V1	6-Mar-13	18.6	< 0.0001	< 0.03	< 0.00005	3.16	0.000118	< 0.0005	0.598	< 0.00001	2.25	0.0846	0.00148	< 0.003	< 0.001
V1	12-Mar-13	19.3	0.000012	0.0031	0.000026	3.07	0.00014	0.000227	0.596	< 0.000005	2.37	0.084	0.00159	0.00049	0.0019
V1	15-Apr-13	16.5	0.000014	0.0055	0.000037	2.9	0.000352	0.000304	0.66	< 0.000005	2.18	0.084	0.00156	0.0016	0.0101
V1	14-May-13	11.8	0.000091	0.25	0.000152	1.9	0.002	0.00102	1.79	< 0.000005	1.28	0.0569	0.000657	0.00167	0.00193
V1	18-Jun-13	5.03	0.000063	0.126	0.000197	0.693	0.00472	0.000396	0.381	< 0.000005	0.997	0.0266	0.000411	0.00256	0.0188
V1	15-Jul-13	10.4	0.000021	0.0221	0.000045	1.57	0.0012	0.00167	0.472	< 0.000005	1.63	0.0537	0.000372	0.00225	0.00042
V1	13-Aug-13	10.9	0.000114	0.0471	0.000556	1.72	0.0062	0.000372	0.427	< 0.000005	1.75	0.0608	0.000374	0.0374	0.00739
V1	18-Sep-13	8.24	0.000058	0.0559	0.000663	1.25	0.00366	0.000397	0.371	< 0.000005	1.66	0.0468	0.000338	0.00866	0.00359
V1	9-Oct-13														
V1	18-Nov-13	15.2	0.000022	0.0097	0.000042	2.46	0.000494	0.000251	0.514	< 0.000005	2.15	0.0732	0.000648	0.00129	0.00116
V1	10-Dec-13	15.6	0.000015	0.0059	0.000008	2.49	0.000194	0.000219	0.533	< 0.000005	2.03	0.0763	0.000786	0.00024	0.00149

Table C.1: Water quality data and summary statistics for all reference stations (V1, VR, USFR, R7, FC, R6, W10), Faro Mine, Yukon.

Station	Date	Non-metals												Metals	
		Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
	Units	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	pH units	mg/L	mg/L	mg/L	NTU	mg/L	mg/L
V1	15-Jan-14	44.2	0.0076	105	51.9	< 2	1.01	2.2	7.62	11.8	82	< 1	0.05	< 0.000005	0.000008
V1	17-Feb-14	48.3	0.014	136	53.3	< 2	0.7	0.82	7.81	12.8	64	< 1	0.06	0.000007	< 0.000005
V1	13-Mar-14	47.6	0.016	133	54.8	< 2	0.95	1.17	7.59	13.2	66	< 1	0.09	0.000006	0.000008
V1	9-Apr-14	48.7	0.015	109	56.1	< 2	1.71	0.96	7.56	15.2	84	< 1	0.07	0.000007	0.000009
V1	13-May-14	20.4	0.066	39	22.7	< 2	5.75	6.24	7.15	2.71	54	1.3	0.63	0.000015	0.000016
V1	12-Jun-14	6.48	0.011	24	14.7	< 2	2.32	3.31	7.92	5.95	28	1.2	0.43	0.000017	0.000007
V1	15-Jul-14	27.1	0.012	60	29.8	< 0.02	1.85	1.98	7.71	8.25	48	< 1	0.1	0.000008	0.000006
V1	12-Aug-14	27.8	0.017	90	34.4	< 0.02	1.83	2.56	8.12	9.33	38	1.8	0.13	0.000011	0.000013
V1	15-Sep-14	23.1	0.02	66	30.1	< 0.02	< 0.5	1.87	7.53	7.91	46	< 1	0.12	< 0.000005	< 0.000005
VR	21-Jan-10	39	0.022	52.9	41.5	0.07				6.2		14		0.00008	0.000028
VR	24-Feb-10	41	0.124	60.6	44.8	0.09			8.4	6.1	78	200		0.000348	0.000023
VR	30-Mar-10	40	< 0.005	55.9	44.4	0.08			7.84	7.1	48	46		0.000108	0.000022
VR	3-Nov-10	35	0.014	44.6	34.8	0.02			7.3	6.1	58	< 4		0.000008	0.000005
VR	18-May-11	11	0.025		18.3	< 0.02	25	24.5	6.77	< 0.5	28	9	2.02	0.00013	0.000107
VR	30-May-12	16.9			19.2	0.0314		9.98		0.5	40	4.7	1.21	0.0000345	
VR	30-Aug-12				28.6									0.00001	0.000008
VR	23-Oct-12	29.9	0.013			0.0154				5.96	54	< 1	0.3		
VR	5-Jun-13	10	0.0068		12.9	< 0.005	8.18	8.5		2.34	38.8	1.7		0.00002	0.000011
VR	13-Aug-13	27.6	< 0.005		28.8	< 0.005	3.56	3.64		5	53	< 1		0.000011	0.000013
VR	19-Nov-14	25.5	< 0.005		27.5	< 0.005	3.47	3.41		5.7	36.4	20.8	4.8	0.000014	0.00001
USFR	24-May-08	7.6	0.16		15.3	< 0.02	6.6	6.7		< 0.5	34	20		0.000033	
USFR	19-Aug-08	17	< 0.01		21.5	< 0.02	3.7			4.4	50	< 1		0.000009	0.000007
USFR	3-Nov-10		0.015	30.2	30.8	0.04			7.39	7.2	58	< 4		< 0.000005	< 0.000005
USFR	18-May-11	16	0.034		20.3	< 0.02	26.8	27.8	7.03	5	32	11		0.000071	0.00006
USFR	30-May-12	14.5	0.012		16.8	0.0183				2.5	24		2.25	0.0000235	0.0000115
USFR	30-Aug-12				22.6									< 0.000005	< 0.000005
USFR	24-Oct-12	26.3	0.016			0.0157		1.63		7.38	42	< 1			
USFR	5-Jun-13	9.2	< 0.005		9.76	< 0.005	4.84	4.8		2.17	72.7	13.7		0.000018	< 0.00001
USFR	13-Aug-13	25	< 0.005		25.3	< 0.005	2.86	2.87		5.16	43.1	2.8		< 0.00001	< 0.00001
USFR	19-Nov-14	18.7	< 0.005		22	0.0059	3.16	3.27		6.49	31	1.4	1.12	< 0.00001	< 0.00001
R7	11-Jan-10		0.02	235	131		0.7	0.9	7.21	11	130	< 1		0.00001	< 0.000005
R7	23-Feb-10		< 0.01	260	138		0.8	0.9	7.95	9.7	160	< 1		< 0.000005	< 0.000005
R7	10-Mar-10	130	< 0.01	239	140		1.1	1.3	7.78	9.7	190	< 1		< 0.000005	< 0.000005
R7	11-Apr-10	140	< 0.01	240	139				7.78	9.9	150	< 1		< 0.000005	0.000009
R7	3-May-10		0.014	91	56.3		16	13.4	7.66	0.3	68	4		0.000034	0.000027
R7	5-Jun-10	52	< 0.05	97	55.2			2.9	7.85	4.5	62	4		0.000012	0.000019
R7	8-Jul-10	64	< 0.05	123			3.5	4	8.04	6.4	76	2		0.000012	0.00002
R7	3-Aug-10	91	< 0.05	183	86			2.2	7.37	6.3	100	< 1		< 0.000005	0.000009
R7	1-Sep-10		0.12	186	87.6	< 0.02	3	2.7	7.84	7.5		< 1	0.9	< 0.000005	0.000021
R7	19-Oct-10	96	0.026		103	0.07	2.5	1.6	7.2	8.1		< 1	1	0.000008	0.000017
R7	10-Nov-10	110	< 0.005	215	118	0.09	1.4	1.5	7.9	10	120	< 1	0.66	0.000009	0.000013
R7	1-Dec-10	120	< 0.05	100	123	0.09	0.9	0.8	7.12	10	120	< 4	1	0.00001	0.000006
R7	20-Jan-11	130	< 0.05	292	149	0.15	1	0.9	7.64	10	150	< 1	0.69	0.00001	< 0.000005
R7	15-Feb-11	130	0.018	285	123	0.16	1.1	1.1	8.01		140	< 1	0.58	0.000009	0.000007
R7	16-Mar-11	140	0.021	281	139	0.19	1.4	1	7.73		170	< 1	0.48	0.000014	
R7	12-Apr-11			284	144	0.18	2.5	2.8	8.03	9.2	150		0.53	0.000018	0.000009
R7	9-May-11	95	0.062	217	85.2	0.07	12.1	9.3	7.8	4.2	130	2	2.17	0.000029	0.000021
R7	22-Jun-11	43	0.038	94	46.5		5.4	5.3	7.98		64	6	1.16	0.000014	0.000014
R7	21-Jul-11	59	0.035	123	63.8	< 0.02	5.3	4.7	8.83	6	90	2	0.54	0.00001	
R7	24-Aug-11	68	0.039	140	71.6	< 0.02		3.2	7.6	8.9	86	2	0.34	0.000006	0.000097
R7	22-Sep-11	78	0.037	192	82.1	< 0.02	2.5	1.7	7.52	11	130	< 1	0.63	0.00001	0.000012

Table C.1: Water quality data and summary statistics for all reference stations (V1, VR, USFR, R7, FC, R6, W10), Faro Mine, Yukon.

Station	Date	Metals													
		Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
	Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
V1	15-Jan-14	16.5	0.000013	0.0054	0.000033	2.57	0.000232	0.000231	0.567	0.000006	2.07	0.0838	0.00106	0.0004	0.00056
V1	17-Feb-14	16.8	0.000012	0.0043	0.000015	2.79	0.000289	0.000239	0.598	< 0.000005	2.26	0.0804	0.00118	0.00062	0.00042
V1	13-Mar-14	17.3	0.000012	0.0046	0.000015	2.83	0.000271	0.000233	0.603	< 0.000005	2.21	0.0896	0.00135	0.00052	0.00096
V1	9-Apr-14	17.7	0.000016	0.0042	0.000015	2.89	0.000264	0.000213	0.616	< 0.000005	2.2	0.0899	0.00145	0.00055	0.00221
V1	13-May-14	7.24	0.000062	0.162	0.000082	1.11	0.00757	0.00062	1.17	< 0.000005	0.973	0.0389	0.000479	0.00129	0.00223
V1	12-Jun-14	4.74	0.000067	0.121	0.000264	0.689	0.00851	0.000344	0.324	< 0.000005	1.09	0.029	0.000419	0.00319	0.00119
V1	15-Jul-14	9.63	0.000028	0.03	0.000167	1.4	0.002	0.000266	0.38	0.000006	1.58	0.0508	0.00031	0.00218	0.00094
V1	12-Aug-14	11.1	0.000022	0.032	0.000399	1.65	0.00129	0.000245	0.42	< 0.000005	1.83	0.0584	0.00034	0.00292	0.00607
V1	15-Sep-14	9.81	0.000019	0.0361	0.000032	1.35	0.000964	0.000298	0.37	< 0.000005	1.75	0.0513	0.000364	0.00041	0.0006
VR	21-Jan-10	12.6	0.000097	0.176	0.00204	2.42	0.0267	0.00045	0.52	< 0.000005	1.83	0.0643	0.000789	0.0153	0.0124
VR	24-Feb-10	13.8	0.000869	1.31	0.0125	2.52	0.212	0.0016	0.79	0.000026	2.18	0.0685	0.00559	0.0309	0.011
VR	30-Mar-10	13.6	0.000274	0.438	0.0026	2.55	0.0469	0.00067	0.57	0.000024	1.78	0.0693	0.00164	0.0108	0.004
VR	3-Nov-10	10.5	0.000017	0.018	0.000083	2.12	0.00135	0.00016	0.34	< 0.000005	1.73	0.0569	0.000457	0.0012	0.0008
VR	18-May-11	5.62	0.000095	0.175	0.00102	1.04	0.0165	0.0006	1.31	0.000011	0.59	0.029	0.000554	0.0124	0.0135
VR	30-May-12	5.9	0.0000833	0.117	0.000584	1.08		0.000455	0.575	0.0000131	1.07	0.0332	0.000727	0.00243	0.00317
VR	30-Aug-12	8.71	0.000017	0.0217	0.000051	1.66	0.000924	0.000196	0.339	< 0.000005	1.51	0.0455	0.000317	0.00074	0.00052
VR	23-Oct-12														
VR	5-Jun-13	4.15	< 0.0001	0.075	0.000213	0.783	0.00195	0.00059	0.444	0.000016	1.02	0.0222	0.000699	0.0035	0.0019
VR	13-Aug-13	9.31	< 0.0001	0.02	< 0.00005	1.76	0.000809	< 0.0005		< 0.00001	1.58	0.05	0.000386	< 0.003	0.0012
VR	19-Nov-14	8.87	< 0.0001	0.062	0.000227	1.5	0.00261	< 0.0005	0.369	< 0.00001	1.53	0.049	0.000387	< 0.003	0.0071
USFR	24-May-08	4.98	0.000144	0.44	0.000719	0.7	0.0445	0.00052		0.000006		0.0293	0.000871	0.0089	
USFR	19-Aug-08	6.81	0.00003	0.119	0.000108	1.1	0.00728	0.00033	0.23		1.49	0.0422			0.0017
USFR	3-Nov-10	9.61	0.000028	0.087	0.000032	1.64	0.011	0.00016	0.32	< 0.000005	1.86	0.0598	0.000464	0.0003	0.001
USFR	18-May-11	6.07	0.000208	0.474	0.000396	1.24	0.0939		2.08	< 0.000005	0.73	0.0345	0.000819	0.0062	0.0085
USFR	30-May-12	5.24	0.0000766	0.295	0.000215	0.894	0.0353	0.000402		0.0000061	1.12	0.0365			0.00085
USFR	30-Aug-12	7.22	0.000022	0.119	0.000057	1.1	0.00925	0.000901	0.26	< 0.000005	1.41	0.0422	0.000352	0.00041	0.00033
USFR	24-Oct-12														
USFR	5-Jun-13	3.25	0.00019	0.515	0.000446	0.57	0.025	0.00063	0.766	0.000011	0.699	0.0232	0.000651	0.0035	0.0021
USFR	13-Aug-13	8.23	< 0.0001	0.2	0.000144	1.31	0.01	< 0.0005		< 0.00001	1.49	0.05	0.000438	< 0.003	< 0.001
USFR	19-Nov-14	8.79	< 0.0001	0.116	0.000056	1.09	0.00855	0.00298	0.283	< 0.00001	1.52	0.058	0.000481	< 0.003	0.0029
R7	11-Jan-10	39.6	0.000021	0.091	0.000058	7.81	0.0149	0.00018	0.93	< 0.000005	3.05	0.161	0.00226	0.0006	0.0004
R7	23-Feb-10		0.000011	0.079	0.00001	8.31	0.0101	0.00015	0.95		3.27		0.00262	0.0003	
R7	10-Mar-10	41.2	0.000016	0.082	0.00005	8.09	0.00987	0.00017	0.96	< 0.000005	3.23	0.175	0.00279	0.0004	0.0003
R7	11-Apr-10	42.4	0.000014	0.028	0.000079	8.06	0.00749	0.00018	1.04	< 0.000005	3.3	0.177	0.00282	0.0008	0.0011
R7	3-May-10	16.5	0.000097	0.409	0.000517		0.0399	0.00108	1.3	< 0.000005		0.0724	0.000736	0.004	0.0053
R7	5-Jun-10	16.1	0.00005	0.168	0.00033	3.44	0.0151	0.00044	0.52	< 0.000005		0.0637		0.0029	0.0044
R7	8-Jul-10	16.8	0.00005	0.142	0.000592	4.01	0.0164	0.0004	0.41	< 0.000005	1.61	0.0791	0.000714	0.002	0.0052
R7	3-Aug-10	25.4	0.000026	0.168	0.000391	5.52	0.0134	0.00028	0.56	< 0.000005	2.01	0.107	0.0011	0.0019	0.0021
R7	1-Sep-10	26.5		0.208	0.000105	5.22		0.00025	0.54	< 0.000005	2.02	0.109	0.00107	0.0006	0.0197
R7	19-Oct-10	29.6	0.000034	0.181	0.000281	6.04	0.0196	0.00028	0.64		2.3	0.127		0.0016	0.0072
R7	10-Nov-10	35.4		0.124	0.000454	7.2	0.0173		0.79	< 0.000005	2.74	0.146	0.00171	0.006	0.0213
R7	1-Dec-10	36.9	0.000024	0.145	0.000056	7.2	0.0181	0.00019	0.82	< 0.000005	2.73		0.00183	0.0009	0.0029
R7	20-Jan-11	39.6	0.000022	0.097	0.000545	7.68	0.0112		0.97	< 0.000005	2.83	0.188	0.00251	0.0049	0.0013
R7	15-Feb-11	35.8	0.000036	0.092	0.000272	8.15	0.0101	0.00023		< 0.000005	3.15	0.176	0.00249		0.0021
R7	16-Mar-11	41		0.074	0.000645	8.87	0.00938		1.12	< 0.000005	3.55	0.194		0.0068	0.0065
R7	12-Apr-11	40.4	0.000021	0.208	0.00114	8.03	0.00696	0.00034	1.03	< 0.000005	3.14	0.177	0.00271	0.0023	0.003
R7	9-May-11		0.000048	0.453	0.000264	5.43	0.0231	0.0006	1.54	< 0.000005	2.04	0.117	0.00127	0.0025	0.0103
R7	22-Jun-11	13.9	0.000066	0.186	0.000242	2.85	0.0166	0.00069	0.36	< 0.000005	1.18		0.00045	0.0011	0.0023
R7	21-Jul-11	19.3	0.000046			3.78	0.0171	0.0004	0.33	< 0.000005	1.43	0.0696	0.000532	0.0016	0.0116
R7	24-Aug-11		0.000037	0.145	0.000165	4.09	0.0179	0.00043	0.4		1.53		0.000683	0.0018	
R7	22-Sep-11	24.8	0.000045	0.16	0.000102	4.94	0.0206	0.00031	0.58	< 0.000005	1.82	0.097	0.000981		0.0011

Table C.1: Water quality data and summary statistics for all reference stations (V1, VR, USFR, R7, FC, R6, W10), Faro Mine, Yukon.

Station	Date	Non-metals												Metals	
		Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
	Units	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	pH units	mg/L	mg/L	mg/L	NTU	mg/L	mg/L
R7	19-Oct-11	93		170	101	0.06	1.5	1.9	7.89	8.7		< 1	0.65	0.000015	0.000009
R7	15-Nov-11	105	0.014	220	103	0.124	2.6	2.29	7.36	9.63	116	< 1	0.61	0.000015	0.000019
R7	6-Dec-11	107	0.033	223	110	0.113	2.04	1.46		9.23	120	< 1	1.01	< 0.000005	0.000013
R7	11-Jan-12	114	0.022		112		1.83	1.27	8.25	9.61	130	< 1	0.83	< 0.000005	< 0.000005
R7	14-Feb-12	125	0.021	266	136	0.166	1.64	1.99		8.92	146	< 1	0.87	0.000008	0.000013
R7	6-Mar-12		0.023	241	140	0.18	1.53	1.1	7.84	8.52	146	< 1	1.14	0.00001	0.000007
R7	19-Apr-12			274					7.92				1.08		
R7	17-May-12	83.4	0.03	173	84.8	0.055	7.73	8.37	7.92	2.92	118	2.3		0.0000268	0.0000215
R7	31-May-12	34.7	< 0.005		37.9	0.0089	9.04			2.95	66	7		0.0000254	< 0.0000172
R7	13-Jun-12	39.9	0.012	40	40.9	< 0.02	5.16		7.45	5	60	17.3		0.0000281	0.0000102
R7	11-Jul-12	47.7	0.034	184	53.1	< 0.02	5.37	5.93	7.88	4.06	70	7.4	1.24	0.0000145	0.0000199
R7	8-Aug-12	82.4		140	87.7	< 0.02	3.34	2.78	7.9	7.42	94	< 1	0.56	0.000007	0.000014
R7	6-Sep-12			196	83.8	< 0.02	2.93	2.43	7.72	7.3	110	< 1	0.69	< 0.000005	< 0.000005
R7	20-Sep-12	79.1	< 0.005		86.3	0.005	3.09			7.39	106	1.3		0.000011	< 0.000026
R7	11-Oct-12				85.7	0.053	2.43	2.13	7.9	8.8	126	< 1	0.44	0.000007	0.00003
R7	6-Nov-12		0.018	279	114	0.1	1.19	1.06	7.82	9.54	132	1.3	0.7	0.000011	0.000006
R7	5-Dec-12		0.017	243	134	0.167	1.6	1.9	7.78	10.1	138	< 1	0.68	0.000006	< 0.000005
R7	7-Jan-13	126	< 0.05	261	129	0.178	1.88	2.03	7.45	9.8	152	< 1	0.76	< 0.000005	< 0.000005
R7	6-Feb-13	129	0.012	291	131	0.201	1.42	1.7	7.62	11.4	138	< 1	0.52	< 0.000005	< 0.000005
R7	5-Mar-13	127	< 0.005	365	130	0.176	1.77	2.28	7.45	9.02	150	< 1	0.7	< 0.000005	0.000011
R7	3-Apr-13	135	0.017	261	140	0.181	1.42	1.9	7.61	9.58	154	< 1	0.65	0.000007	< 0.000005
R7	5-May-13	119	0.014	228	126	0.149	2.59	4.31	7.45	9.08	144	< 1	1.4	0.00001	0.000015
R7	11-Jun-13	37.9	0.0078	125	39.9	< 0.2	3.56	4.56	7.73	2.07	62	10.8	2.58	0.000019	0.000017
R7	8-Jul-13	76.2	0.007	171	74.8	< 0.2	2.59	2.72	7.86	8.4	110	6.2	0.84	0.000009	0.000024
R7	6-Aug-13	83	0.0068	180	88	< 2	2.51	2.76	7.75	7.71	94	< 1	0.65	0.000007	0.000013
R7	12-Sep-13	65.5	0.008	136	69.7	< 2	3.39	3.64	7.89	7.04	98	2.1	0.51	0.000009	0.000006
R7	8-Oct-13			147					7.67						
R7	5-Nov-13	95.3	0.008	191	103	< 2	2.11	2.03	7.67	9.69	124	1.2	0.84	0.000016	0.000007
R7	17-Dec-13	111	0.026	242	114	< 2	2.01	3.66	7.81	10.5	166	< 1	1.1	0.000008	< 0.000005
R7	9-Jan-14	116	0.023	250	123	< 2	1.95	2.04	7.87	9.76	126	< 1	1.16	0.000006	0.000006
R7	6-Feb-14	125	0.016	224	128	< 2	2.38	2.69	7.92	11.9	154	< 1	1.09	< 0.000005	< 0.000005
R7	11-Mar-14	133	0.011	276	141	< 2	1.32	1.37	7.61	10.9	156	< 1	1.13	0.000006	< 0.000005
R7	2-Apr-14	134	0.015	263	135	< 2	0.76	1.53	7.74	11.7	172	< 1	0.65	< 0.000005	< 0.000005
R7	1-May-14	94.4	0.019	189	100	< 2	6.73	7.31	7.67	5.14	126	2	1.56	0.000019	0.000015
R7	4-Jun-14	59.4	0.058	126	64.7	< 2	3.05	3.44	7.83	7.54	88	2.7	1.09	0.000237	0.000014
R7	7-Jul-14	62.5	0.012	134	66.2	< 0.02	3.01	2.24	8.03	9.02	90	1.4	0.58	0.000013	0.000012
R7	11-Aug-14	85	0.03	182	95.2	< 0.02	2.17	3.38	7.98	8.06	116	1.1	0.63	0.000007	0.00002
R7	15-Sep-14	76.3	0.014	149	84.7	< 0.02	2.11	2.71	8.09	7.67	102	1.1	0.47	0.000007	0.000016
FC	21-Jan-10	21	< 0.005	24.7	17.7	0.06				2	42	< 1		0.000008	0.000007
FC	24-Feb-10	21	0.009	25.5	18.5	0.06			8.08	1.5	42	< 1		0.000008	0.000008
FC	30-Mar-10	25	0.013	24.6	18.8	0.08			8.18	2	26	11		0.000025	0.000011
FC	19-May-10	9.1	< 0.005	10.6	8.7	< 0.02			7.47	< 0.5	16	6		0.000045	
FC	3-Aug-10		< 0.005	31.8	16.8	< 0.02			7.39	1.5	30	< 1		0.00001	
FC	3-Nov-10		0.013	22.3	15.7	< 0.02			7.5	1.7	36	< 4		0.000011	0.00001
FC	18-May-11	10	0.03		14.2	< 0.02	20.7	22.9	6.68	< 0.5	28	< 1	0.86	0.00012	0.000112
FC	30-May-12	7	0.0095		9.91	0.0048		10.8			32	10.9	4.54	0.0000706	0.0000505
FC	28-Aug-12				13.6										0.000016
FC	24-Oct-12	16.4	0.013			0.0115		2.38		1.51			0.45		
FC	4-Jun-13	4.4	0.0129		4.89	< 0.005	9.02	9.53		< 0.5	27	12		0.000031	0.000022
FC	13-Aug-13	17.3	< 0.005		15.4	< 0.005	2.93	2.71		1.6	37.8	< 1		0.000013	0.000012
FC	19-Nov-14	12.2	< 0.005		12.1	< 0.005	4.37	5.52		1.9	21	3	1.39	0.000011	0.000014

Table C.1: Water quality data and summary statistics for all reference stations (V1, VR, USFR, R7, FC, R6, W10), Faro Mine, Yukon.

Station	Date	Metals													
		Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
	Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
R7	19-Oct-11	28.1	0.000056	0.177	0.000834	5.83	0.0252	0.00028	0.61	0.000036	2.29	0.118	0.00151	0.0103	0.0017
R7	15-Nov-11	30.1			0.000373		0.0167	0.0003	0.78	< 0.000005		0.141	0.0017	0.0034	0.0042
R7	6-Dec-11	33.3		0.176	0.00004	6.45	0.0181	0.00019		< 0.000005	2.46	0.137	0.00181	0.0004	0.0061
R7	11-Jan-12		0.000022	0.149	0.000045	7.23	0.0122	0.00018	0.82	< 0.000005	2.74	0.155	0.002	0.0003	0.0036
R7	14-Feb-12	40.2	0.000018	0.116		7.46	0.0113	0.00021	0.99	< 0.000005	2.96	0.163	0.00209	0.0013	0.0035
R7	6-Mar-12	39.6	0.000028	0.111	0.00016	7.85		0.00044		< 0.000005		0.168	0.00229	0.0022	0.0022
R7	19-Apr-12														
R7	17-May-12	26	0.0000627	0.43	0.000757	4.84	0.021	0.000989	1.28	< 0.000005	1.97	0.105	0.0012	0.00625	0.00633
R7	31-May-12	11.8	0.00011	0.354	0.000246	2.11	0.0258	0.000719	0.957	0.0000052	0.998	0.0462	0.000367	0.00457	< 0.00454
R7	13-Jun-12	11.9	0.000144	0.329	0.000372		0.027	0.000585	0.545	0.0000064		0.0491	0.000401	0.00231	0.00072
R7	11-Jul-12	15.5	0.0000955	0.219	0.000352	3.31	0.0195	0.000598	0.325	< 0.000005	1.37	0.0607	0.000476	0.0033	0.00641
R7	8-Aug-12	26.4	0.000038	0.185	0.000041		0.0225	0.000254	0.495	< 0.000005	1.85		0.000979	0.00036	0.00897
R7	6-Sep-12	25.3	0.000037	0.176	0.000063	5.01	0.0238	0.000296	0.611	< 0.000005	2.05	0.0985	0.000977		0.00109
R7	20-Sep-12	24.5	< 0.0001	0.204	0.000487	4.76	0.026	< 0.0005	0.545	< 0.00001	1.92	0.0972	0.001	< 0.003	< 0.0328
R7	11-Oct-12	25.3	0.000036	0.14	0.000314	5.15	0.0244	0.000253	0.605		1.98	0.104	0.00122	0.00202	0.0297
R7	6-Nov-12	34.7	0.000063	0.187	0.000135		0.0275	0.000385	0.745	< 0.000005		0.139	0.00176	0.00191	0.00108
R7	5-Dec-12	40.6	0.000021	0.1	0.000034	7.85	0.0199	0.000242	0.914	< 0.000005	2.8	0.161	0.00211	0.00176	0.00146
R7	7-Jan-13	38.2	0.000024	0.11	0.000045	7.82	0.0158	0.000178	0.952	< 0.000005	2.97	0.163	0.00232	0.00047	0.00132
R7	6-Feb-13	38.8	0.00003	0.136	0.000049	7.53	0.0158	0.000216	0.966	< 0.000005	2.92	0.167	0.00239	0.00065	0.00356
R7	5-Mar-13	39.1	0.000019	0.0969	0.000035	7.43	0.0121	0.000156	0.949	< 0.000005	3	0.168	0.00244	0.00041	0.00537
R7	3-Apr-13	42.7	0.000021	0.0811	0.000018	8.15	0.0109	0.000154	1.17	< 0.000005	3.35	0.189	0.00271	0.00166	0.00146
R7	5-May-13	35	0.000036	0.191	0.000176	7.04	0.0125	0.000292	1.31	< 0.000005	2.92	0.159	0.00225	0.00154	0.012
R7	11-Jun-13	12	0.000124	0.305	0.000315	2.43	0.0253	0.000667	0.58	< 0.000005	1.01	0.0474	0.000499	0.00167	0.015
R7	8-Jul-13	21.5	0.000042	0.166	0.000203	4.91	0.0176	0.000293	0.405	< 0.000005	1.49	0.083	0.00081	0.00121	0.077
R7	6-Aug-13	26.5	0.000038	0.224	0.000069	5.27	0.0198	0.000265	0.505	< 0.000005	1.9	0.103	0.00108	0.00159	0.0121
R7	12-Sep-13	21	0.000059	0.239	0.000257	4.16	0.0264	0.000413	0.512	< 0.000005	1.9	0.0868	0.0008	0.00299	0.00271
R7	8-Oct-13														
R7	5-Nov-13	30.7	0.000046	0.263	0.000105	6.41	0.0525	0.000383	0.762	< 0.000005	2.53	0.129	0.00151	0.00135	0.00058
R7	17-Dec-13	34.4	0.000035	0.189	0.000192	6.82	0.027	0.00031	0.801	< 0.000005	2.68	0.144	0.00185	0.00106	0.0008
R7	9-Jan-14	36.9	0.000027	0.153	0.000028	7.54	0.0213	0.000189	0.844	< 0.000005	2.94	0.161	0.00199	0.00073	0.00074
R7	6-Feb-14	39	0.000026	0.15	0.000019	7.41	0.0186	0.000196	0.938	< 0.000005	2.97	0.171	0.00216	0.00042	0.00031
R7	11-Mar-14	42.3	0.000023	0.138	0.000019	8.6	0.0215	0.00018	1.14	< 0.000005	3.55	0.205	0.00284	0.00029	0.00048
R7	2-Apr-14	41.2	0.000024	0.115	0.00002	7.84	0.0157	0.000171	1.06	< 0.000005	3.17	0.184	0.00251	0.00043	0.0007
R7	1-May-14	30	0.00006	0.456	0.000203	6.12	0.027	0.000544	1.56	< 0.000005	2.27	0.135	0.00157	0.00274	0.00271
R7	4-Jun-14	19.6	0.000076	0.193	0.00209	3.92	0.0187	0.000497	0.633	< 0.000005	1.55	0.072	0.000734	0.00928	0.00177
R7	7-Jul-14	19.7	0.000047	0.187	0.00019	4.14	0.0226	0.000313	0.444	< 0.000005	1.65	0.0848	0.000723	0.00212	0.00307
R7	11-Aug-14	28.7	0.000034	0.203	0.000138	5.72	0.0219	0.000287	0.568	< 0.000005	2.04	0.114	0.000992	0.0008	0.00669
R7	15-Sep-14	25.9	0.000043	0.191	0.00004	4.86	0.0241	0.00032	0.55	< 0.000005	1.9	0.0961	0.00088	0.00111	0.00809
FC	21-Jan-10	5.28	0.000016	0.02	0.000076	1.1	0.00062	0.0002	0.18	< 0.000005	2.2	0.0306	0.000072	0.0012	0.0017
FC	24-Feb-10	5.22		0.044	0.00211	1.11	0.00257	0.00019		< 0.000005	2.22	0.0304	0.000083	0.0016	0.0017
FC	30-Mar-10	5.53	0.000099	0.469	0.00173	1.21	0.0111	0.00028	0.22	< 0.000005	2.33		0.000175	0.0071	0.0025
FC	19-May-10	2.62	0.000105	0.249	0.00105		0.0116	0.00058	0.56	< 0.000005	0.97	0.0173	0.000325	0.0076	
FC	3-Aug-10	5	0.000026	0.04	0.000504	1.05		0.00032	0.16	< 0.000005	2.1	0.0323	0.000115	0.0014	
FC	3-Nov-10	4.56	0.000016	0.021	0.000105			0.00024	0.14	< 0.000005	2.25	0.0293	0.00008	0.0022	0.0017
FC	18-May-11	4.18	0.000123	0.166	0.00252	0.92	0.0145	0.00086	1.36	0.000015	1.22	0.0282	0.000163	0.0304	0.0301
FC	30-May-12	2.95	0.000157		0.017	0.615	0.00925	0.00086	0.66	0.0000352	1.01	0.0191	0.000242	0.0148	0.0174
FC	28-Aug-12	4.02	0.000046	0.0772			0.00232	0.000467	0.156	< 0.000005	1.8	0.025	0.000149	0.00196	0.00194
FC	24-Oct-12														
FC	4-Jun-13	1.53	0.0002	0.414	0.00362	0.392	0.0108	0.0009	0.778	0.000017	0.573	0.0111	0.000224	0.0083	0.0051
FC	13-Aug-13	4.93	< 0.0001	0.1	0.00182	1.02	0.00415	< 0.0005		< 0.00001	1.94	0.03	0.000133	0.0038	0.0033
FC	19-Nov-14	3.76	< 0.0001	0.093	0.001	0.75	0.0023	< 0.0005	0.152	< 0.00001	1.67	0.0243	0.000177	0.0031	0.0021

Table C.1: Water quality data and summary statistics for all reference stations (V1, VR, USFR, R7, FC, R6, W10), Faro Mine, Yukon.

Station	Date	Non-metals												Metals	
		Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
	Units	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	pH units	mg/L	mg/L	mg/L	NTU	mg/L	mg/L
R6	21-Jan-10	150	0.007	178.4	168	0.22				22	200	1		0.000012	< 0.000005
R6	26-Feb-10	150	< 0.005	179.6	160	0.22			8.13	23	200	< 1		0.000008	0.000008
R6	30-Mar-10	150	< 0.005	178	165	0.21			8.34	24	170	< 1		0.000014	0.000036
R6	19-May-10	79	0.023	113	97.4	0.05			7.93	14	120	62		0.000152	
R6	3-Aug-10	160	< 0.005	211	153	0.02			8.46	21	170	< 1		0.000017	
R6	4-Nov-10		0.012	168.7	159	0.16			7.99	22	170	< 4		0.000007	0.000009
R6	19-May-11	43	0.025		47.5	0.04	22.2	22.9	7.5	< 0.5	74	85	6.2	0.000236	0.000055
R6	29-May-12	61.7				0.0518		10.2		8.74	98	8.4	3.4	0.0000615	0.0000283
R6	29-Aug-12				141									0.000015	0.000011
R6	23-Oct-12	147	0.03			0.175		2.17		22.7	192	< 1	0.52		
R6	4-Jun-13	48.6	0.0091		51.9	0.041	6.94	9.18		7.31	71.9	240		0.000157	0.00002
R6	12-Aug-13	130	< 0.005		148	0.03	2.33	2.12		21.5	163	< 1		0.000019	0.000016
R6	19-Nov-14	119	< 0.005		131	0.0835	3.58	3.64		19.7	144	3.2	2.97	0.000023	0.000014
W10	3-May-10	38	0.038	109	38.9		12.1	11.2	7.71	0.3	50	< 1		0.000064	
W10	5-Jun-10	38		68	35.8		5.2	5	7.76	1.9	60	< 1		0.000025	0.000032
W10	10-Jul-10	52		101	52.4		4.1	4	8.08	1	40	< 1		0.000016	0.000071
W10	19-May-11	16	0.019			< 0.02	30.3	27.8	7.4	< 0.5	46	1	0.67	0.000139	0.000141
W10	30-May-12	22.4	0.013		24.4			9.61		< 0.5	42	12.9	1.43	0.0000495	0.0000315
W10	28-Aug-12				63.4									0.000024	0.000016
W10	24-Oct-12	57.5	0.019			< 0.002		3.08		3.98	80		0.24		
W10	4-Jun-13	21.8	< 0.005		23.2	< 0.005	9.18	8.19		2.18	51.9	3.9		0.000036	0.000031
W10	13-Aug-13	60.4	< 0.005		58.1	< 0.005	3.9	3.63		3	85.2	< 1		0.000023	0.000022
W10	19-Nov-14	56	< 0.005		52.7	< 0.005	4.2	3.91		3.78	63.4	< 1	2.39	0.000019	0.00002
n		150	155	126	164	121	132	139	132	162	159	159	106	163	156
minimum		4.4	<0.005	10.6	4.89	<0.002	<0.5	<0.5	5.23	0.3	10	<1	<0.05	<0.000005	<0.000005
maximum		160	0.36	365	168	0.22	30.3	27.8	8.83	24	200	85	14.3	0.000348	0.000141
median		43.6	0.014	125.5	51.2	0.03	2.3	2.3	7.78	8.3	68	<1	0.62	0.0000100	0.00001015
mean [a]		56.9	0.021	139	63.9	0.06	4.1	4.0	7.76	8.1	83	3	0.94	0.0000226	0.000016
standard deviation (SD) [a]		40.6	0.035	78	43.2	0.06	5.5	5.0	0.41	4.9	45	10	1.64	0.0000441	0.000020
max detection limit		-	0.05	-	-	0.2	0.5	0.5	-	0.5	-	4	0.25	0.00001	0.000026
# < detection limit		-	45	-	-	48	3	2	-	9	-	105	10	32	34
% < detection limit		-	29%	-	-	40%	2%	1%	-	6%	-	66%	9%	20%	22%
95th percentile		134.6	0.056	278	141	0.19	14.2	11.9	8.4	17.8	170	13	2.87	0.000105	0.000044
5th percentile		10.5	<0.005	26.6	14.8	0.01	0.8	0.8	7.2	<0.5	28	<1	<0.1	<0.000005	<0.000005
background benchmark		10.5 - 134.6	0.056	278	141	0.19	0.8 -14.2	0.8 - 11.9	7.2 - 8.4	17.8	170	13	2.87	0.000105	0.000044
current water quality criterion [b]		-	0.21	-	-	3.0	-	-	6.5 - 9.0	218	-	-	-	0.000091	-
source [b]		-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion		-	1	-	-	0	-	-	0	0	-	-	-	9	-
% > current water quality criterion		-	1%	-	-	0%	-	-	0%	0%	-	-	-	6%	-
# < current water quality criterion		-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion		-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was at the 95th percentile of pooled reference station data; therefore the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.1: Water quality data and summary statistics for all reference stations (V1, VR, USFR, R7, FC, R6, W10), Faro Mine, Yukon.

Station	Date	Metals													
		Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
	Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
R6	21-Jan-10	49.1	0.000033	0.118	0.000016	11	0.0149	0.00026	1.31	< 0.000005	2.16	0.141	0.00233	0.0006	0.0008
R6	26-Feb-10	46.9	0.000026	0.112	0.000042	10.3	0.0106	0.00024	1.24	< 0.000005	2.02	0.142	0.00241	0.0007	0.0009
R6	30-Mar-10	48	0.000021	0.124	0.000025	11	0.00846	0.00019	1.3	< 0.000005	2.22		0.00261	0.0006	0.0022
R6	19-May-10	26.7	0.000985	2.2	0.00155	7.49	0.149	0.00315	1.16	< 0.000005	1.21	0.0804	0.0014	0.0114	
R6	3-Aug-10	42.9	0.000038	0.169	0.000053	11.3	0.0129	0.0004		< 0.000005	1.84	0.128		0.0003	
R6	4-Nov-10	45.2		0.083	0.000025	11.3		0.00032	1.14	< 0.000005	1.96	0.135	0.00223	0.0004	0.0014
R6	19-May-11	12.8	0.00127	3.15	0.00157	3.8	0.166	0.0046	1.8	0.000037	0.6	0.0418	0.000592	0.015	0.0063
R6	29-May-12	18.5	0.000145	0.369	0.000189	4.99	0.0337	0.00103	1.24	0.0000104	0.806	0.0571	0.000647	0.00208	0.0035
R6	29-Aug-12	38.9	0.000056	0.144	0.000033	10.5	0.0145	0.000579	1.08	< 0.000005	1.73	0.112	0.0015	0.00047	0.00044
R6	23-Oct-12														
R6	4-Jun-13	16.2	0.00204	3.65	0.00323	3.87	0.117	0.00614	1.02	0.000049	0.672	0.054	0.000964	0.019	< 0.001
R6	12-Aug-13	40.5	< 0.0001	0.14	< 0.00005	11.1	0.01	< 0.0005		< 0.00001	1.73	0.12	0.00173	< 0.003	< 0.001
R6	19-Nov-14	36.8	< 0.0001	0.212	0.000051	9.58	0.0185	0.00067	0.997	< 0.00001	1.65	0.112	0.0016	< 0.003	0.0012
W10	3-May-10	12.6			0.000755	1.83	0.00317	0.00065	1	0.000006	1.18	0.0431	0.000106	0.0148	0.0118
W10	5-Jun-10		0.000033		0.000717	1.72	0.00081	0.00061		< 0.000005	1.62	0.0406	0.000133	0.0036	0.0114
W10	10-Jul-10	14.4	0.000021	0.013	0.000196	2.21	0.00026	0.00038	0.43	< 0.000005	1.83	0.0575		0.0017	
W10	19-May-11	7.96	0.000098	0.145	0.00189	1.16	0.00558	0.00075	2.18	0.000024	0.55	0.0282	0.000069		0.0362
W10	30-May-12		0.0000697	0.119	0.000803	1.1	0.00251	0.000655	0.714			0.028	0.000162		0.00698
W10	28-Aug-12	21	0.000024	0.0358	0.000259	2.67	0.000941	0.000373	0.536	< 0.000005	1.92		0.000153	0.00157	
W10	24-Oct-12														
W10	4-Jun-13	7.76	< 0.0001	0.184	0.000899	1.01	0.00329	0.00092	0.596	0.000034	1.1	0.0275	0.000199	0.0078	0.0045
W10	13-Aug-13	18.9	< 0.0001	0.01	0.000078	2.49	0.000319	< 0.0005		< 0.00001	2.01	0.06	0.000135	0.0038	0.0015
W10	19-Nov-14	17.8	< 0.0001	0.028	0.000128	2.14	0.000572	< 0.0005	0.495	< 0.00001	1.82	0.0623	0.000153	< 0.003	0.0012
n		157	155	158	161	157	159	158	148	157	156	156	155	157	156
minimum		1.53	0.000009	0.003	0.000008	0.392	0.000118	0.00015	0.14	<0.000005	0.55	0.0111	0.000069	0.00024	0.0003
maximum		49.1	0.00204	3.65	0.017	11.3	0.212	0.00614	2.18	0.000049	3.55	0.205	0.00559	0.0374	0.197
median		15.6	0.0000350	0.1115	0.000144	2.67	0.00855	0.00030	0.57	<0.000005	1.9	0.0728	0.000761	0.0017	0.0022
mean [a]		19.1	0.0000845	0.19	0.000570	3.76	0.0147	0.00048	0.69	0.000005	1.90	0.0825	0.001034	0.0033	0.0065
standard deviation (SD) [a]		12.4	0.000227	0.43	0.00173	2.85	0.0273	0.00069	0.38	0.00001	0.65	0.0463	0.000848	0.0054	0.018
max detection limit		-	0.0001	0.03	0.00005	-	0	0.0005	0	0.00001	0	-	0	0.003	0.0328
# < detection limit		-	14	1	4	-	0	11	0	133	0	-	0	9	7
% < detection limit		-	9.0%	1%	2%	-	0%	7%	0%	85%	0.0%	-	0%	6%	4%
95th percentile		41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
5th percentile		4.48	0.000012	0.00494	0.000018	0.78	0.000239	0.000177	0.27	<0.000005	0.89	0.0273	0.0001344	0.00039	0.00047
background benchmark		41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
current water quality criterion [b]		-	0.0025	1	0.005	-	0.830	0.057	373	0.00025	-	-	0.015	0.03	-
source [b]		-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion		-	0	4	2	-	0	0	0	0	-	-	0	3	-
% > current water quality criterion		-	0%	3%	1%	-	0%	0%	0%	0%	-	-	0%	2%	-
# < current water quality criterion		-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion		-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was at the 95th percentile of pooled reference station data; therefore the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.2: Water quality data and summary statistics for station V1 (reference), Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	pH units	mg/L	mg/L	mg/L	NTU	mg/L	mg/L
7-Jan-10	45	< 0.01	140	53.4		1	0.8	7.76	10	68	< 4		< 0.000005	< 0.000005
18-Feb-10	49	0.03	80	50.8		0.8	< 0.5	8.34	11	68	< 1		< 0.000005	< 0.000005
29-Mar-10		< 0.01	122	51.5		1.6	1.4	7.91	12		< 1		< 0.000005	0.000006
20-Apr-10	46	0.02	101	48		1.5	1	7.9	12	46	< 1		0.000007	0.000006
12-May-10	39	< 0.01	99	44.3			4.5	7.94	7.6	62	< 1		0.000008	0.000011
16-Jun-10	17	< 0.05	54	20.1		2.2	1.8	7.16	5.5	30	2		0.000012	0.000042
14-Jul-10	26	< 0.05	60	27.2		1.1	1.8	8.2	6.8	38	< 1		0.000008	0.000024
4-Aug-10	35	< 0.05		37.3		1.6	1.7	8.29	10	64	< 1		0.000008	0.000014
7-Sep-10	29		30	33.7		1.8	1.8	8.38	9.1	62	< 1	0.2	0.000008	0.000007
5-Oct-10	34	0.36	103	39.9	0.03	1.1	1.7	5.23	9.6	82	< 1	0.2	0.000007	0.000015
1-Nov-10	38	0.008		39.1	0.04	1	0.9	8.67	12	60		0.15	0.000011	< 0.000005
1-Dec-10	39	< 0.05	140	48.5	0.07	< 0.5	< 0.5		13	56		1	0.000014	
24-Jan-11	47	0.036	192	59.7	0.12	27.1	0.7	7.93	11	62	< 1	< 0.25	0.000013	0.000038
17-Feb-11	45	< 0.005	134	49	0.13	0.9	1.1	7.84	11	62	< 4	< 0.25	< 0.000005	0.000007
22-Mar-11	45	0.013	137	50.7	0.15	0.7	0.6	8.03	12	66	< 1		0.00001	< 0.000005
21-Apr-11	46	0.019	90	56.5	0.15	0.8	0.7	8.52	15	64	< 1	< 0.25	< 0.000005	0.000017
17-May-11	36		88	40.7	< 0.02	12.1	11.7	8.08	7.5	42	< 1	0.5	0.000018	0.000022
15-Jun-11	14	0.024	38	17.6	< 0.02	3	2.3	7.62	6.9		< 1	< 0.25	< 0.000005	0.000006
13-Jul-11	24	0.02		30.2	< 0.02	1.9	2.3	7.65	9.2	48	< 1		0.000008	0.000009
10-Aug-11	26	< 0.005	73	31.3	< 0.02	2.5	2.3	7.68	7.9	64	< 1	0.34	0.000011	0.000007
13-Sep-11	26	0.047	61	30.6	< 0.02	2.2	1.8	7.75		44	< 1	0.17	0.000008	0.000018
18-Oct-11	36	0.032	110	41.8	< 0.02	1.6	1.5	7.78	10.8	54	< 1	< 0.1		0.000008
23-Nov-11	40.1	0.028	127	53.9		2.34	1.28	8.41	17.9	58	< 1	< 0.1	< 0.000005	0.000014
8-Dec-11	42.8	0.071	104	47.7	0.073	1.04	1.23	7.89	13.4	64	< 4	< 0.1	0.000006	0.000006
25-Jan-12	47.7	0.055	90	49.6	0.12	1.17	1.08	8.04	11.6	76	< 1		0.000016	0.000019
27-Feb-12	46	0.023	125	54.1	0.121		0.91	7.97	11.1	64	< 1	0.12	0.00001	< 0.000005
7-Mar-12	47.4	0.023	113	51.6	0.137	< 0.5	0.65	7.71	11.9	84	< 1	< 0.1	< 0.000005	0.000006
26-Apr-12			147									0.26		
22-May-12	39.6	0.022	179	46.7	0.026	9.3	7.37	8.29	8.04	74	< 1		0.000021	0.0000232
2-Jun-12	27.8	< 0.005		37.7	0.0067	< 6.06			7.43		2.2		0.0000114	< 0.0000101
19-Jun-12	14.2	0.0097		17.3	< 0.02	3.94	3.43	7.59	4.3	26	1.2		0.0000109	0.0000224
18-Jul-12		0.015	65	27.9	< 0.02	3.2	2.63		6.41	40	< 1	0.33	0.000009	0.0000131
14-Aug-12	22.1	0.0057	92	27			2.27	7.69	6.2	60	< 1	0.25	0.000006	
12-Sep-12	23.9	0.0066	85	29.3	< 0.02	2.38	2.47	7.6	8.77	50	< 1		< 0.000005	0.000006
23-Sep-12	20.8			26.4	0.0136	2.34			9.28	41	< 1	-3.8	< 0.00001	< 0.00001
15-Oct-12	28.7	0.01	56	34	0.03	1.93	1.6	8.22	9.59	42	< 1	0.16		< 0.000005
13-Nov-12		0.008		43.1	0.055	1.96	0.62	8.01	10.5	74	< 1	0.12		0.000006
11-Dec-12	42.4	0.0069	137	53.9	0.088	0.97		7.7	10.9	88	< 1	0.16	< 0.000005	0.000009
17-Jan-13	41.3	0.01	87	49.9	0.072	1.28	1.43	8.11	10.7	56	< 1	0.14	0.000007	0.000009
12-Feb-13	50.1	< 0.005	121	53.6	0.117	0.8	0.98	8.01	12.2	110	< 1	0.75	0.000007	0.000006
6-Mar-13	48.1	< 0.005	8214	58.9	0.127	1.38		7.22	11.4	76	< 1		< 0.00001	< 0.00001
12-Mar-13	48.3	0.019	105	60.9	0.128	0.89	1.35	7.39	11.7	72	< 1	0.48	0.00001	< 0.000005
15-Apr-13	50.6	0.015	135	55	0.135	1.05	1.66	7.78	10.7	104	< 1	0.13	0.000011	0.00001
14-May-13	30.9	0.015	81	37.2	< 0.02	12.8	14.3	7.2	< 0.5	80	< 1	14.3	0.000023	0.00002
18-Jun-13	12	0.0084	62	16	< 0.02	3.42	3.46	8.02	4.38	< 10	2.7	0.71	0.000007	0.00003
15-Jul-13	29.3	0.011	20	32.4	< 2	2.14	2.21	7.53	8.68	96	< 1	0.19	0.000007	0.000006
13-Aug-13	33.9	0.0096	70	49	< 2	1.86	2.42	7.68	8.07	62	< 1	< 0.05	0.000014	0.000009
18-Sep-13	22.3	0.012	59	26.1	< 2	2.19	2.58	7.53	10.1	34	2.9	< 0.05	0.000015	0.000007
9-Oct-13			67					7.34						

Table C.2: Water quality data and summary statistics for station V1 (reference), Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
7-Jan-10	15.5	0.000012	0.007	0.00014	2.53	0.00024	0.00026	0.5	< 0.000005	1.97	0.0774	0.00105	0.0008	0.0024
18-Feb-10	16.3	0.000012	0.005	0.000087	2.68	0.00028	0.00021	0.54	< 0.000005	2	0.0743	0.00125	0.0008	0.0007
29-Mar-10	15.4	0.000012	0.003	0.000104	2.77	0.00022	0.00018	0.51	< 0.000005	2.13	0.0761	0.00147	0.001	0.0011
20-Apr-10	14.6	0.000019	0.007	0.000373	2.43	0.00064	0.00018		< 0.000005	1.76	0.0793		0.0008	0.0026
12-May-10	13.9		0.111	0.000107		0.00188	0.00052	0.78	< 0.000005	1.74	0.07	0.00064	0.0034	0.0061
16-Jun-10	6.39	0.00003	0.032	0.000977	1	0.00258	0.00027	0.31	< 0.000005	1.29		0.000331	0.0046	0.0414
14-Jul-10	7.76	0.000017	0.022	0.000087	1.07	0.00114	0.00018	0.29		1.22	0.0436	0.00029	0.0008	0.0145
4-Aug-10		0.000034	0.011	0.000108	1.79		0.00025	0.41	< 0.000005	1.81	0.0608	0.000391	0.0059	0.005
7-Sep-10	11	0.000011	0.024	0.000091	1.5	0.00064	0.00016	0.33	< 0.000005	1.69	0.0564	0.000328	0.0011	0.0034
5-Oct-10	12.3	0.000017	0.016	0.000105	1.9	0.00076	0.0002	0.42	< 0.000005	1.94	0.0601	0.000526	0.0008	0.0075
1-Nov-10		0.000015	0.008	0.000962	2.15	0.00053	0.0002	0.42	< 0.000005	1.94	0.0687	0.000556	0.0021	
1-Dec-10	14.9	0.000033		0.00138	2.47	0.00328	0.00029	0.52	< 0.000005	2.04	0.0767	0.000761	0.0064	0.002
24-Jan-11	17.6	0.000018	0.009	0.000514	2.85	0.00063	0.00024	0.64	0.000014		0.0829		0.0021	0.0103
17-Feb-11	15	0.00001	0.004	0.000062	2.84	0.00026	0.00023			2.18	0.0818			0.0004
22-Mar-11	14.5	0.000011	0.006	0.000278	2.94	0.00142		0.58	< 0.000005	2.22	0.0842	0.00155	0.0029	0.0022
21-Apr-11	17.9	0.000014	0.007	0.000605	2.88	0.00057	0.0013	0.54	< 0.000005	2.18	0.0857	0.00172	0.0005	0.0045
17-May-11	12.5	0.000059	0.081	0.000215	2.15	0.00385		1.12		1.45	0.0598	0.000673	0.0017	0.0017
15-Jun-11	5.65	0.000023	0.03	0.000087	0.83	0.001	0.00025	0.31	< 0.000005	1.13	0.0312	0.000325	0.0004	0.0043
13-Jul-11	9.7		0.027	0.000109		0.00113		0.36	< 0.000005	1.56	0.0511	0.00032	0.0005	0.0007
10-Aug-11	10	0.000022	0.027	0.000299	1.51	0.00069	0.0003		< 0.000005	1.62	0.0523	0.000333	0.0028	0.0019
13-Sep-11		0.00002	0.025	0.000591	1.44	0.00121	0.00027	0.38		1.61	0.0534	0.000376	0.002	0.0056
18-Oct-11	13.3	0.000016			2.09	0.00042	0.00024	0.46	< 0.000005	1.84	0.0658	0.000618	0.0008	0.0018
23-Nov-11	17.3	0.000019	0.009	0.000182	2.6	0.00059	0.00022	0.53	< 0.000005	2.14		0.000798	0.0008	0.003
8-Dec-11	14.8	0.000013	0.006	0.000009	2.58	0.00034	0.0002	0.54	< 0.000005		0.0781	0.000905	0.0012	0.0011
25-Jan-12	15.3	0.00001	0.004	0.000093	2.76	0.00021	0.0003	0.57	< 0.000005	2.11	0.0795	0.00112	0.0016	0.0022
27-Feb-12	17	0.000018	0.015		2.87	0.00065	0.00027		< 0.000005	2.2	0.0819	0.00136	0.0028	0.0014
7-Mar-12	15.6	0.000978	0.02	0.000128	2.65	0.00044		0.55	< 0.000005	2.17	0.0819		0.0009	
26-Apr-12														
22-May-12	14.7	0.0000357	0.0384	0.0000478	2.36	0.00183	0.000549		< 0.000005	1.91	0.0721		0.00068	0.00666
2-Jun-12	10.5	0.0000468	0.117	0.000116	1.59	0.00495		0.843	< 0.000005		0.0478	0.000401		< 0.00371
19-Jun-12	5.74	0.0000456	0.068	0.000396	0.726	0.00226	0.000356	0.372	0.0000092	0.915		0.000318		0.00658
18-Jul-12	9	0.0000371	0.0382	0.000123	1.31	0.00128	0.000284	0.312	< 0.000005	1.31	0.0453	0.000339	0.00098	0.00221
14-Aug-12	8.04	0.000019	0.0288	0.000047	1.23	0.00104	0.000234	0.281	< 0.000005	1.44	0.0529	0.00045	0.00035	0.197
12-Sep-12	9.58			0.000018	1.29	0.00167	0.000283	0.308	< 0.000005	1.54	0.0472	0.000373	0.00047	0.0009
23-Sep-12			0.034	< 0.00005	1.23		< 0.0005	0.323	< 0.00001	1.64	0.0464	0.000316	0.0053	0.0014
15-Oct-12	10.1	0.000022	0.0167	0.000061	1.67	0.000606	0.000213		< 0.000005	1.7	0.0555	0.000412	0.00072	0.00092
13-Nov-12	13.6	0.000017	0.0071		2.26	0.000188	0.000236	0.484	< 0.000005	1.94	0.074	0.0007	0.00076	0.00058
11-Dec-12	16.6	0.000011		0.000078	2.73	0.000224	0.000289	0.555	< 0.000005	2.09	0.0783	0.000903	0.00083	0.00087
17-Jan-13	15.8	0.000015	0.0358	0.00004	2.55	0.000347	0.000259	0.636	< 0.000005	2.05	0.0765	0.000941	0.00057	0.00487
12-Feb-13	16.8	0.000009	0.0036	0.000068	2.84	0.00033	0.000211	0.65	< 0.000005	2.25	0.0869	0.00141	0.00123	0.00172
6-Mar-13	18.6	< 0.0001	< 0.03	< 0.00005	3.16	0.000118	< 0.0005	0.598	< 0.00001	2.25	0.0846	0.00148	< 0.003	< 0.001
12-Mar-13	19.3	0.000012	0.0031	0.000026	3.07	0.00014	0.000227	0.596	< 0.000005	2.37	0.084	0.00159	0.00049	0.0019
15-Apr-13	16.5	0.000014	0.0055	0.000037	2.9	0.000352	0.000304	0.66	< 0.000005	2.18	0.084	0.00156	0.0016	0.0101
14-May-13	11.8	0.000091	0.25	0.000152	1.9	0.002	0.00102	1.79	< 0.000005	1.28	0.0569	0.000657	0.00167	0.00193
18-Jun-13	5.03	0.000063	0.126	0.000197	0.693	0.00472	0.000396	0.381	< 0.000005	0.997	0.0266	0.000411	0.00256	0.0188
15-Jul-13	10.4	0.000021	0.0221	0.000045	1.57	0.0012	0.00167	0.472	< 0.000005	1.63	0.0537	0.000372	0.00225	0.00042
13-Aug-13	10.9	0.000114	0.0471	0.000556	1.72	0.0062	0.000372	0.427	< 0.000005	1.75	0.0608	0.000374	0.0374	0.00739
18-Sep-13	8.24	0.000058	0.0559	0.000663	1.25	0.00366	0.000397	0.371	< 0.000005	1.66	0.0468	0.000338	0.00866	0.00359
9-Oct-13														

Table C.2: Water quality data and summary statistics for station V1 (reference), Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
18-Nov-13	40.8	0.019	105	48.1	< 2	1.58	0.79	7.47	11.4	54	< 1	0.06	0.000007	0.000007
10-Dec-13	42.9	0.013	94	49.1	< 2	1.22	1.28	7.74	13.9	60	< 1	0.05	< 0.000005	0.000009
15-Jan-14	44.2	0.0076	105	51.9	< 2	1.01	2.2	7.62	11.8	82	< 1	0.05	< 0.000005	0.000008
17-Feb-14	48.3	0.014	136	53.3	< 2	0.7	0.82	7.81	12.8	64	< 1	0.06	0.000007	< 0.000005
13-Mar-14	47.6	0.016	133	54.8	< 2	0.95	1.17	7.59	13.2	66	< 1	0.09	0.000006	0.000008
9-Apr-14	48.7	0.015	109	56.1	< 2	1.71	0.96	7.56	15.2	84	< 1	0.07	0.000007	0.000009
13-May-14	20.4	0.066	39	22.7	< 2	5.75	6.24	7.15	2.71	54	1.3	0.63	0.000015	0.000016
12-Jun-14	6.48	0.011	24	14.7	< 2	2.32	3.31	7.92	5.95	28	1.2	0.43	0.000017	0.000007
15-Jul-14	27.1	0.012	60	29.8	< 0.02	1.85	1.98	7.71	8.25	48	< 1	0.1	0.000008	0.000006
12-Aug-14	27.8	0.017	90	34.4	< 0.02	1.83	2.56	8.12	9.33	38	1.8	0.13	0.000011	0.000013
15-Sep-14	23.1	0.02	66	30.1	< 0.02	< 0.5	1.87	7.53	7.91	46	< 1	0.12	< 0.000005	< 0.000005
n	55	55	52	58	36	54	54	55	57	55	56	42	55	56
minimum	6.48	<0.005	20	14.7	0.0067	<0.5	<0.5	5.23	<0.5	<10	<1	<0.05	<0.000005	<0.000005
maximum	50.6	0.36	192	60.9	0.15	27.1	14.3	8.67	17.9	110	4	14.3	0.000023	0.000042
median	38	0.015	93	43.7	0.03	1.6	1.7	7.78	10.1	62	<1	0.16	0.0000080	0.0000085
mean [a]	35	0.024	95	41.1	0.06	2.7	2.3	7.78	9.8	60	1	0.55	0.0000084	0.000011
standard deviation (SD) [a]	12	0.048	38	12.7	0.05	4.2	2.5	0.49	3.1	20	1	2.18	0.0000050	0.0000086
max detection limit	-	0.05	-	-	0.02	0.5	0.5	-	0.5	-	4	0.25	0.00001	0.0000101
# < detection limit	-	12	-	-	14	3	2	-	1	-	48	10	15	12
% < detection limit	-	22%	-	-	39%	6%	4%	-	2%	-	86%	24%	27%	21%
95th percentile	48.79	0.058	143	56.9	0.14	10.3	6.6	8.4	14.1	90	3	0.75	0.0000173	0.000026
5th percentile	14.1	<0.005	34	17.6	0.02	0.6	0.6	7.2	4.4	29	<1	<0.1	<0.000005	<0.000005
background benchmark	10.5 - 134.6	0.056	278	141	0.19	0.8 -14.2	0.8 - 11.9	7.2 - 8.4	17.8	170	13	2.87	0.000105	0.000044
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	218	-	-	-	0.000080	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	1	-	-	0	-	-	0	0	-	-	-	0	-
% > current water quality criterion	-	2%	-	-	0%	-	-	0%	0%	-	-	-	0%	-
# < current water quality criterion	-	-	-	-	-	-	-	1	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	2%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was at the 95th percentile of pooled reference station data; therefore the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.2: Water quality data and summary statistics for station V1 (reference), Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
18-Nov-13	15.2	0.000022	0.0097	0.000042	2.46	0.000494	0.000251	0.514	< 0.000005	2.15	0.0732	0.000648	0.00129	0.00116
10-Dec-13	15.6	0.000015	0.0059	0.000008	2.49	0.000194	0.000219	0.533	< 0.000005	2.03	0.0763	0.000786	0.00024	0.00149
15-Jan-14	16.5	0.000013	0.0054	0.000033	2.57	0.000232	0.000231	0.567	0.000006	2.07	0.0838	0.00106	0.0004	0.00056
17-Feb-14	16.8	0.000012	0.0043	0.000015	2.79	0.000289	0.000239	0.598	< 0.000005	2.26	0.0804	0.00118	0.00062	0.00042
13-Mar-14	17.3	0.000012	0.0046	0.000015	2.83	0.000271	0.000233	0.603	< 0.000005	2.21	0.0896	0.00135	0.00052	0.00096
9-Apr-14	17.7	0.000016	0.0042	0.000015	2.89	0.000264	0.000213	0.616	< 0.000005	2.2	0.0899	0.00145	0.00055	0.00221
13-May-14	7.24	0.000062	0.162	0.000082	1.11	0.00757	0.00062	1.17	< 0.000005	0.973	0.0389	0.000479	0.00129	0.00223
12-Jun-14	4.74	0.000067	0.121	0.000264	0.689	0.00851	0.000344	0.324	< 0.000005	1.09	0.029	0.000419	0.00319	0.00119
15-Jul-14	9.63	0.000028	0.03	0.000167	1.4	0.002	0.000266	0.38	0.000006	1.58	0.0508	0.00031	0.00218	0.00094
12-Aug-14	11.1	0.000022	0.032	0.000399	1.65	0.00129	0.000245	0.42	< 0.000005	1.83	0.0584	0.00034	0.00292	0.00607
15-Sep-14	9.81	0.000019	0.0361	0.000032	1.35	0.000964	0.000298	0.37	< 0.000005	1.75	0.0513	0.000364	0.00041	0.0006
n	54	54	54	55	56	56	53	52	54	55	55	53	55	56
minimum	4.74	0.000009	<0.003	<0.000008	0.689	<0.00012	0.00016	0.281	<0.000005	0.915	0.0266	0.00029	<0.0002	0.0004
maximum	19.3	0.000978	0.25	0.00138	3.16	0.00851	0.00167	1.79	0.000014	2.37	0.0899	0.00172	0.0374	0.197
median	14.2	0.000019	0.02	0.000104	2.205	0.00065	0.00026	0.51	<0.000005	1.84	0.0700	0.000618	0.0011	0.0021
mean [a]	12.9	0.0000447	0.03	0.000209	2.06	0.0014	0.00033	0.53	0.000003	1.80	0.0657	0.000744	0.0024	0.0074
standard deviation (SD) [a]	3.9	0.000131	0.05	0.000278	0.73	0.0018	0.0003	0.25	0.000002	0.38	0.0169	0.000445	0.0051	0.027
max detection limit	-	-	0.03	0.00005	-	0	0.0005	-	0.00001	-	-	0	0.003	0.00371
# < detection limit	-	-	1	2	-	0	2	-	50	-	-	0	1	2
% < detection limit	-	-	2%	4%	-	0%	4%	-	93%	-	-	0%	2%	4%
95th percentile	17.8	0.000094	0.12	0.00075	2.9	0.005	0.0008	0.97	0.000009	2.25	0.0861	0.00155	0.0061	0.016
5th percentile	5.71	0.000011	0.00386	0.000015	0.80	0.00019	0.00018	0.31	<0.000005	1.06	0.0366	0.000317	0.00040	0.00053
background benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
current water quality criterion [b]	-	0.0025	1	0.004	-	0.797	0.051	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	0	0	0	-	0	0	0	0	-	-	0	1	-
% > current water quality criterion	-	0%	0%	0%	-	0%	0%	0%	0%	-	-	0%	2%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was at the 95th percentile of pooled reference station data; therefore the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.3: Water quality data and summary statistics for station VR (reference), Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
21-Jan-10	39	0.022	52.9	41.5	0.07				6.2		14		0.00008	0.000028
24-Feb-10	41	0.124	60.6	44.8	0.09			8.4	6.1	78	200		0.000348	0.000023
30-Mar-10	40	< 0.005	55.9	44.4	0.08			7.84	7.1	48	46		0.000108	0.000022
3-Nov-10	35	0.014	44.6	34.8	0.02			7.3	6.1	58	< 4		0.000008	0.000005
18-May-11	11	0.025		18.3	< 0.02	25	24.5	6.77	< 0.5	28	9	2.02	0.00013	0.000107
30-May-12	16.9			19.2	0.0314		9.98		0.5	40	4.7	1.21	0.0000345	
30-Aug-12				28.6									0.00001	0.000008
23-Oct-12	29.9	0.013			0.0154				5.96	54	< 1	0.3		
5-Jun-13	10	0.0068		12.9	< 0.005	8.18	8.5		2.34	38.8	1.7		0.00002	0.000011
13-Aug-13	27.6	< 0.005		28.8	< 0.005	3.56	3.64		5	53	< 1		0.000011	0.000013
19-Nov-14	25.5	< 0.005		27.5	< 0.005	3.47	3.41		5.7	36.4	20.8	4.8	0.000014	0.00001
n	10	9	4	10	10	4	5	4	10	9	9	4	10	9
minimum	10	<0.005	44.6	12.9	<0.005	3.47	3.41	6.77	<0.5	28	<1	0.3	0.000008	0.000005
maximum	41	0.124	60.6	44.8	0.09	25	24.5	8.4	7.1	78	46	4.8	0.000348	0.000107
median	29	0.013	54	28.7	0.02	5.9	8.5	7.57	5.8	48	5	1.62	0.0000273	0.000013
mean [a]	28	0.024	54	30.1	0.03	10.1	10.0	7.58	4.5	48	11	2.08	0.0000764	0.000025
standard deviation (SD) [a]	12	0.039	7	11.2	0.03	10.2	8.6	0.70	2.5	15	15	1.94	0.0001053	0.000032
max detection limit	-	0.005	-	-	0.02	-	-	-	0.5	-	4	-	-	0
# < detection limit	-	3	-	-	4	-	-	-	1	-	3	-	-	0
% < detection limit	-	33%	-	-	40%	-	-	-	10%	-	33%	-	-	0%
95th percentile	40.55	0.084	60	44.6	0.09	22.5	21.6	8.3	6.7	70	36	4.38	0.000250	0.000075
5th percentile	10.5	<0.005	46	15.3	<0.01	3.5	3.5	6.8	<0.5	31	<1	0.44	0.0000089	0.0000062
background benchmark	10.5 - 134.6	0.056	278	141	0.19	0.8 -14.2	0.8 - 11.9	7.2 - 8.4	17.8	170	13	2.87	0.000105	0.000044
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	128	-	-	-	0.000056	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	0	-	-	0	-	-	0	0	-	-	-	4	-
% > current water quality criterion	-	0%	-	-	0%	-	-	0%	0%	-	-	-	40%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was at the 95th percentile of pooled reference station data; therefore the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.3: Water quality data and summary statistics for station VR (reference), Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
21-Jan-10	12.6	0.000097	0.176	0.00204	2.42	0.0267	0.00045	0.52	< 0.000005	1.83	0.0643	0.000789	0.0153	0.0124
24-Feb-10	13.8	0.000869	1.31	0.0125	2.52	0.212	0.0016	0.79	0.000026	2.18	0.0685	0.00559	0.0309	0.011
30-Mar-10	13.6	0.000274	0.438	0.0026	2.55	0.0469	0.00067	0.57	0.000024	1.78	0.0693	0.00164	0.0108	0.004
3-Nov-10	10.5	0.000017	0.018	0.000083	2.12	0.00135	0.00016	0.34	< 0.000005	1.73	0.0569	0.000457	0.0012	0.0008
18-May-11	5.62	0.000095	0.175	0.00102	1.04	0.0165	0.0006	1.31	0.000011	0.59	0.029	0.000554	0.0124	0.0135
30-May-12	5.9	0.0000833	0.117	0.000584	1.08		0.000455	0.575	0.0000131	1.07	0.0332	0.000727	0.00243	0.00317
30-Aug-12	8.71	0.000017	0.0217	0.000051	1.66	0.000924	0.000196	0.339	< 0.000005	1.51	0.0455	0.000317	0.00074	0.00052
23-Oct-12														
5-Jun-13	4.15	< 0.0001	0.075	0.000213	0.783	0.00195	0.00059	0.444	0.000016	1.02	0.0222	0.000699	0.0035	0.0019
13-Aug-13	9.31	< 0.0001	0.02	< 0.00005	1.76	0.000809	< 0.0005		< 0.00001	1.58	0.05	0.000386	< 0.003	0.0012
19-Nov-14	8.87	< 0.0001	0.062	0.000227	1.5	0.00261	< 0.0005	0.369	< 0.00001	1.53	0.049	0.000387	< 0.003	0.0071
n	10	10	10	10	10	9	10	9	10	10	10	10	10	10
minimum	4.15	0.000017	0.018	<0.00005	0.783	0.000809	0.00016	0.34	<0.000005	0.59	0.0222	0.000317	0.00074	0.00052
maximum	13.8	0.000869	1.31	0.0125	2.55	0.212	0.0016	1.31	0.000026	2.18	0.0693	0.00559	0.0309	0.0135
median	9.1	0.0000985	0.10	0.0004055	1.7	0.00261	0.000500	0.52	<0.000011	1.56	0.0495	0.000627	0.0033	0.0036
mean [a]	9.3	0.000160	0.24	0.00193	1.7	0.0344	0.000522	0.58	0.000011	1.48	0.0488	0.001155	0.0080	0.0056
standard deviation (SD) [a]	3.4	0.000260	0.40	0.00382	0.6	0.0684	0.00042	0.31	0.000009	0.47	0.0166	0.00160	0.0097	0.0051
max detection limit	-	-	-	-	-	-	-	0	0.00001	-	-	0	-	-
# < detection limit	-	-	-	-	-	-	-	0	5	-	-	0	-	-
% < detection limit	-	-	-	-	-	-	-	0%	50%	-	-	0%	-	-
95th percentile	13.7	0.000601	0.92	0.00804	2.5	0.1460	0.00118	1.10	0.00003	2.02	0.0689	0.00381	0.024	0.013
5th percentile	4.81	0.0000170	0.0189	0.0000505	0.9	0.000855	0.000176	0.34	<0.000005	0.78	0.0253	0.000348	0.00095	0.00065
background benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
current water quality criterion [b]	-	0.0025	1	0.004	-	0.731	0.037	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	0	1	1	-	0	0	0	0	-	-	0	1	-
% > current water quality criterion	-	0%	10%	10%	-	0%	0%	0%	0%	-	-	0%	10%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was at the 95th percentile of pooled reference station data; therefore the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.4: Water quality data and summary statistics for station USFR (reference), Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
3-Nov-10		0.015	30.2	30.8	0.04			7.39	7.2	58	< 4		< 0.000005	< 0.000005
18-May-11	16	0.034		20.3	< 0.02	26.8	27.8	7.03	5	32	11		0.000071	0.00006
30-May-12	14.5	0.012		16.8	0.0183				2.5	24		2.25	0.0000235	0.0000115
30-Aug-12				22.6									< 0.000005	< 0.000005
24-Oct-12	26.3	0.016			0.0157		1.63		7.38	42	< 1			
5-Jun-13	9.2	< 0.005		9.76	< 0.005	4.84	4.8		2.17	72.7	13.7		0.000018	< 0.00001
13-Aug-13	25	< 0.005		25.3	< 0.005	2.86	2.87		5.16	43.1	2.8		< 0.00001	< 0.00001
19-Nov-14	18.7	< 0.005		22	0.0059	3.16	3.27		6.49	31	1.4	1.12	< 0.00001	< 0.00001
n	6	7	1	7	7	4	5	2	7	7	6	2	7	7
minimum	9.2	<0.005	30.2	9.76	0.005	2.86	1.63	7.03	2.17	24	<1	1.12	<0.000005	<0.000005
maximum	26.3	0.034	30.2	30.8	0.04	26.8	27.8	7.39	7.38	72.7	13.7	2.25	0.000071	0.00006
median	17.35	0.012	30.2	22.0	<0.02	4.0	3.3	7.21	5.2	42	<3	1.685	<0.000010	<0.000010
mean [a]	18.3	0.012	30.2	21.1	0.01	9.4	8.1	7.21	5.1	43	5	1.685	0.0000182	0.000013
standard deviation (SD) [a]	6.5	0.011	-	6.6	0.01	11.6	11.1	0.25	2.1	17	6	0.799	0.0000247	0.000021
max detection limit	-	0.005	-	-	0.02	-	-	-	0	-	4	-	0.00001	0.00001
# < detection limit	-	3	-	-	3	-	-	-	0	-	2	-	4	5
% < detection limit	-	43%	-	-	43%	-	-	-	0%	-	33%	-	57%	71%
95th percentile	26.0	0.03	30.2	29.2	0.03	23.5	23.2	7.37	7.3	68.29	13	2.1935	0.0000568	0.000045
5th percentile	10.5	0.005	30.2	11.9	0.01	2.9	1.9	7.05	2.269	26.1	<1	1.1765	<0.000005	<0.000005
background benchmark	10.5 - 134.6	0.056	278	141	0.19	0.8 -14.2	0.8 - 11.9	7.2 - 8.4	17.8	170	13	2.87	0.000105	0.000044
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	128	-	-	-	0.000045	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	0	-	-	0	-	-	0	0	-	-	-	1	-
% > current water quality criterion	-	0%	-	-	0%	-	-	0%	0%	-	-	-	14%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was at the 95th percentile of pooled reference station data; therefore the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.4: Water quality data and summary statistics for station USFR (reference), Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
3-Nov-10	9.61	0.000028	0.087	0.000032	1.64	0.011	0.00016	0.32	< 0.000005	1.86	0.0598	0.000464	0.0003	0.001
18-May-11	6.07	0.000208	0.474	0.000396	1.24	0.0939		2.08	< 0.000005	0.73	0.0345	0.000819	0.0062	0.0085
30-May-12	5.24	0.0000766	0.295	0.000215	0.894	0.0353	0.000402		0.0000061	1.12	0.0365			0.00085
30-Aug-12	7.22	0.000022	0.119	0.000057	1.1	0.00925	0.000901	0.26	< 0.000005	1.41	0.0422	0.000352	0.00041	0.00033
24-Oct-12														
5-Jun-13	3.25	0.00019	0.515	0.000446	0.57	0.025	0.00063	0.766	0.000011	0.699	0.0232	0.000651	0.0035	0.0021
13-Aug-13	8.23	< 0.0001	0.2	0.000144	1.31	0.01	< 0.0005		< 0.00001	1.49	0.05	0.000438	< 0.003	< 0.001
19-Nov-14	8.79	< 0.0001	0.116	0.000056	1.09	0.00855	0.00298	0.283	< 0.00001	1.52	0.058	0.000481	< 0.003	0.0029
n	7	7	7	7	7	7	6	5	7	7	7	6	6	7
minimum	3.25	0.000022	0.087	0.000032	0.57	0.00855	0.00016	0.26	<0.000005	0.699	0.0232	0.000352	0.0003	0.00033
maximum	9.61	0.000208	0.515	0.000446	1.64	0.0939	0.00298	2.08	0.000011	1.86	0.0598	0.000819	0.0062	0.0085
median	7.22	0.0001	0.20	0.000144	1.1	0.0110	0.00057	0.32	<0.000006	1.41	0.0422	0.000473	0.0030	0.0010
mean [a]	6.92	0.0000892	0.26	0.000192	1.1	0.0276	0.00089	0.74	0.000005	1.26	0.0435	0.000534	0.0022	0.0023
standard deviation (SD) [a]	2.22	0.0000772	0.18	0.000169	0.3	0.0309	0.00106	0.78	0.000003	0.43	0.0133	0.000170	0.0023	0.0029
max detection limit	-	-	-	-	-	-	-	-	0.00001	-	-	-	-	-
# < detection limit	-	-	-	-	-	-	-	-	5	-	-	-	-	-
% < detection limit	-	-	-	-	-	-	-	-	71%	-	-	-	-	-
95th percentile	9.36	0.000203	0.50	0.000431	1.5	0.0763	0.00246	1.82	0.000011	1.76	0.0593	0.000777	0.0055	0.0068
5th percentile	3.85	0.0000238	0.0957	0.0000392	0.7	0.00876	0.00022	0.26	<0.000005	0.71	0.0266	0.000374	0.00033	0.00049
background benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
current water quality criterion [b]	-	0.0025	1	0.004	-	0.702	0.030	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	0	0	0	-	0	0	0	0	-	-	0	0	-
% > current water quality criterion	-	0%	0%	0%	-	0%	0%	0%	0%	-	-	0%	0%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was at the 95th percentile of pooled reference station data; therefore the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.5: Water quality data and summary statistics for station R7 (reference), Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	pH units	mg/L	mg/L	mg/L	NTU	mg/L	mg/L
11-Jan-10		0.02	235	131		0.7	0.9	7.21	11	130	< 1		0.00001	< 0.000005
23-Feb-10		< 0.01	260	138		0.8	0.9	7.95	9.7	160	< 1		< 0.000005	< 0.000005
10-Mar-10	130	< 0.01	239	140		1.1	1.3	7.78	9.7	190	< 1		< 0.000005	< 0.000005
11-Apr-10	140	< 0.01	240	139				7.78	9.9	150	< 1		< 0.000005	0.000009
3-May-10		0.014	91	56.3		16	13.4	7.66	0.3	68	4		0.000034	0.000027
5-Jun-10	52	< 0.05	97	55.2			2.9	7.85	4.5	62	4		0.000012	0.000019
8-Jul-10	64	< 0.05	123			3.5	4	8.04	6.4	76	2		0.000012	0.00002
3-Aug-10	91	< 0.05	183	86			2.2	7.37	6.3	100	< 1		< 0.000005	0.000009
1-Sep-10		0.12	186	87.6	< 0.02	3	2.7	7.84	7.5		< 1	0.9	< 0.000005	0.000021
19-Oct-10	96	0.026		103	0.07	2.5	1.6	7.2	8.1		< 1	1	0.000008	0.000017
10-Nov-10	110	< 0.005	215	118	0.09	1.4	1.5	7.9	10	120	< 1	0.66	0.000009	0.000013
1-Dec-10	120	< 0.05	100	123	0.09	0.9	0.8	7.12	10	120	< 4	1	0.00001	0.000006
20-Jan-11	130	< 0.05	292	149	0.15	1	0.9	7.64	10	150	< 1	0.69	0.00001	< 0.000005
15-Feb-11	130	0.018	285	123	0.16	1.1	1.1	8.01		140	< 1	0.58	0.000009	0.000007
16-Mar-11	140	0.021	281	139	0.19	1.4	1	7.73		170	< 1	0.48	0.000014	
12-Apr-11			284	144	0.18	2.5	2.8	8.03	9.2	150		0.53	0.000018	0.000009
9-May-11	95	0.062	217	85.2	0.07	12.1	9.3	7.8	4.2	130	2	2.17	0.000029	0.000021
22-Jun-11	43	0.038	94	46.5		5.4	5.3	7.98		64	6	1.16	0.000014	0.000014
21-Jul-11	59	0.035	123	63.8	< 0.02	5.3	4.7	8.83	6	90	2	0.54	0.00001	
24-Aug-11	68	0.039	140	71.6	< 0.02		3.2	7.6	8.9	86	2	0.34	0.000006	0.000097
22-Sep-11	78	0.037	192	82.1	< 0.02	2.5	1.7	7.52	11	130	< 1	0.63	0.00001	0.000012
19-Oct-11	93		170	101	0.06	1.5	1.9	7.89	8.7		< 1	0.65	0.000015	0.000009
15-Nov-11	105	0.014	220	103	0.124	2.6	2.29	7.36	9.63	116	< 1	0.61	0.000015	0.000019
6-Dec-11	107	0.033	223	110	0.113	2.04	1.46		9.23	120	< 1	1.01	< 0.000005	0.000013
11-Jan-12	114	0.022		112		1.83	1.27	8.25	9.61	130	< 1	0.83	< 0.000005	< 0.000005
14-Feb-12	125	0.021	266	136	0.166	1.64	1.99		8.92	146	< 1	0.87	0.000008	0.000013
6-Mar-12		0.023	241	140	0.18	1.53	1.1	7.84	8.52	146	< 1	1.14	0.00001	0.000007
19-Apr-12			274					7.92				1.08		
17-May-12	83.4	0.03	173	84.8	0.055	7.73	8.37	7.92	2.92	118	2.3		0.0000268	0.0000215
31-May-12	34.7	< 0.005		37.9	0.0089	9.04			2.95	66	7		0.0000254	< 0.0000172
13-Jun-12	39.9	0.012	40	40.9	< 0.02	5.16		7.45	5	60	17.3		0.0000281	0.0000102
11-Jul-12	47.7	0.034	184	53.1	< 0.02	5.37	5.93	7.88	4.06	70	7.4	1.24	0.0000145	0.0000199
8-Aug-12	82.4		140	87.7	< 0.02	3.34	2.78	7.9	7.42	94	< 1	0.56	0.000007	0.000014
6-Sep-12			196	83.8	< 0.02	2.93	2.43	7.72	7.3	110	< 1	0.69	< 0.000005	< 0.000005
20-Sep-12	79.1	< 0.005		86.3	0.005	3.09			7.39	106	1.3		0.000011	< 0.000026
11-Oct-12				85.7	0.053	2.43	2.13	7.9	8.8	126	< 1	0.44	0.000007	0.00003
6-Nov-12		0.018	279	114	0.1	1.19	1.06	7.82	9.54	132	1.3	0.7	0.000011	0.000006
5-Dec-12		0.017	243	134	0.167	1.6	1.9	7.78	10.1	138	< 1	0.68	0.000006	< 0.000005
7-Jan-13	126	< 0.05	261	129	0.178	1.88	2.03	7.45	9.8	152	< 1	0.76	< 0.000005	< 0.000005
6-Feb-13	129	0.012	291	131	0.201	1.42	1.7	7.62	11.4	138	< 1	0.52	< 0.000005	< 0.000005
5-Mar-13	127	< 0.005	365	130	0.176	1.77	2.28	7.45	9.02	150	< 1	0.7	< 0.000005	0.000011
3-Apr-13	135	0.017	261	140	0.181	1.42	1.9	7.61	9.58	154	< 1	0.65	0.000007	< 0.000005
5-May-13	119	0.014	228	126	0.149	2.59	4.31	7.45	9.08	144	< 1	1.4	0.00001	0.000015
11-Jun-13	37.9	0.0078	125	39.9	< 0.2	3.56	4.56	7.73	2.07	62	10.8	2.58	0.000019	0.000017
8-Jul-13	76.2	0.007	171	74.8	< 0.2	2.59	2.72	7.86	8.4	110	6.2	0.84	0.000009	0.000024
6-Aug-13	83	0.0068	180	88	< 2	2.51	2.76	7.75	7.71	94	< 1	0.65	0.000007	0.000013
12-Sep-13	65.5	0.008	136	69.7	< 2	3.39	3.64	7.89	7.04	98	2.1	0.51	0.000009	0.000006
8-Oct-13			147					7.67						
5-Nov-13	95.3	0.008	191	103	< 2	2.11	2.03	7.67	9.69	124	1.2	0.84	0.000016	0.000007

Table C.5: Water quality data and summary statistics for station R7 (reference), Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
11-Jan-10	39.6	0.000021	0.091	0.000058	7.81	0.0149	0.00018	0.93	< 0.000005	3.05	0.161	0.00226	0.0006	0.0004
23-Feb-10		0.000011	0.079	0.00001	8.31	0.0101	0.00015	0.95		3.27		0.00262	0.0003	
10-Mar-10	41.2	0.000016	0.082	0.00005	8.09	0.00987	0.00017	0.96	< 0.000005	3.23	0.175	0.00279	0.0004	0.0003
11-Apr-10	42.4	0.000014	0.028	0.000079	8.06	0.00749	0.00018	1.04	< 0.000005	3.3	0.177	0.00282	0.0008	0.0011
3-May-10	16.5	0.000097	0.409	0.000517		0.0399	0.00108	1.3	< 0.000005		0.0724	0.000736	0.004	0.0053
5-Jun-10	16.1	0.00005	0.168	0.00033	3.44	0.0151	0.00044	0.52	< 0.000005		0.0637		0.0029	0.0044
8-Jul-10	16.8	0.00005	0.142	0.000592	4.01	0.0164	0.0004	0.41	< 0.000005	1.61	0.0791	0.000714	0.002	0.0052
3-Aug-10	25.4	0.000026	0.168	0.000391	5.52	0.0134	0.00028	0.56	< 0.000005	2.01	0.107	0.0011	0.0019	0.0021
1-Sep-10	26.5		0.208	0.000105	5.22		0.00025	0.54	< 0.000005	2.02	0.109	0.00107	0.0006	0.0197
19-Oct-10	29.6	0.000034	0.181	0.000281	6.04	0.0196	0.00028	0.64		2.3	0.127		0.0016	0.0072
10-Nov-10	35.4		0.124	0.000454	7.2	0.0173		0.79	< 0.000005	2.74	0.146	0.00171	0.006	0.0213
1-Dec-10	36.9	0.000024	0.145	0.000056	7.2	0.0181	0.00019	0.82	< 0.000005	2.73		0.00183	0.0009	0.0029
20-Jan-11	39.6	0.000022	0.097	0.000545	7.68	0.0112		0.97	< 0.000005	2.83	0.188	0.00251	0.0049	0.0013
15-Feb-11	35.8	0.000036	0.092	0.000272	8.15	0.0101	0.00023		< 0.000005	3.15	0.176	0.00249		0.0021
16-Mar-11	41		0.074	0.000645	8.87	0.00938		1.12	< 0.000005	3.55	0.194		0.0068	0.0065
12-Apr-11	40.4	0.000021	0.208	0.00114	8.03	0.00696	0.00034	1.03	< 0.000005	3.14	0.177	0.00271	0.0023	0.003
9-May-11		0.000048	0.453	0.000264	5.43	0.0231	0.0006	1.54	< 0.000005	2.04	0.117	0.00127	0.0025	0.0103
22-Jun-11	13.9	0.000066	0.186	0.000242	2.85	0.0166	0.00069	0.36	< 0.000005	1.18		0.00045	0.0011	0.0023
21-Jul-11	19.3	0.000046			3.78	0.0171	0.0004	0.33	< 0.000005	1.43	0.0696	0.000532	0.0016	0.0116
24-Aug-11		0.000037	0.145	0.000165	4.09	0.0179	0.00043	0.4		1.53		0.000683	0.0018	
22-Sep-11	24.8	0.000045	0.16	0.000102	4.94	0.0206	0.00031	0.58	< 0.000005	1.82	0.097	0.000981		0.0011
19-Oct-11	28.1	0.000056	0.177	0.000834	5.83	0.0252	0.00028	0.61	0.000036	2.29	0.118	0.00151	0.0103	0.0017
15-Nov-11	30.1			0.000373		0.0167	0.0003	0.78	< 0.000005		0.141	0.0017	0.0034	0.0042
6-Dec-11	33.3		0.176	0.00004	6.45	0.0181	0.00019		< 0.000005	2.46	0.137	0.00181	0.0004	0.0061
11-Jan-12		0.000022	0.149	0.000045	7.23	0.0122	0.00018	0.82	< 0.000005	2.74	0.155	0.002	0.0003	0.0036
14-Feb-12	40.2	0.000018	0.116		7.46	0.0113	0.00021	0.99	< 0.000005	2.96	0.163	0.00209	0.0013	0.0035
6-Mar-12	39.6	0.000028	0.111	0.00016	7.85		0.00044		< 0.000005		0.168	0.00229	0.0022	0.0022
19-Apr-12														
17-May-12	26	0.0000627	0.43	0.000757	4.84	0.021	0.000989	1.28	< 0.000005	1.97	0.105	0.0012	0.00625	0.00633
31-May-12	11.8	0.00011	0.354	0.000246	2.11	0.0258	0.000719	0.957	0.0000052	0.998	0.0462	0.000367	0.00457	< 0.00454
13-Jun-12	11.9	0.000144	0.329	0.000372		0.027	0.000585	0.545	0.0000064		0.0491	0.000401	0.00231	0.00072
11-Jul-12	15.5	0.0000955	0.219	0.000352	3.31	0.0195	0.000598	0.325	< 0.000005	1.37	0.0607	0.000476	0.0033	0.00641
8-Aug-12	26.4	0.000038	0.185	0.000041		0.0225	0.000254	0.495	< 0.000005	1.85		0.000979	0.00036	0.00897
6-Sep-12	25.3	0.000037	0.176	0.000063	5.01	0.0238	0.000296	0.611	< 0.000005	2.05	0.0985	0.000977		0.00109
20-Sep-12	24.5	< 0.0001	0.204	0.000487	4.76	0.026	< 0.0005	0.545	< 0.00001	1.92	0.0972	0.001	< 0.003	< 0.0328
11-Oct-12	25.3	0.000036	0.14	0.000314	5.15	0.0244	0.000253	0.605		1.98	0.104	0.00122	0.00202	0.0297
6-Nov-12	34.7	0.000063	0.187	0.000135		0.0275	0.000385	0.745	< 0.000005		0.139	0.00176	0.00191	0.00108
5-Dec-12	40.6	0.000021	0.1	0.000034	7.85	0.0199	0.000242	0.914	< 0.000005	2.8	0.161	0.00211	0.00176	0.00146
7-Jan-13	38.2	0.000024	0.11	0.000045	7.82	0.0158	0.000178	0.952	< 0.000005	2.97	0.163	0.00232	0.00047	0.00132
6-Feb-13	38.8	0.00003	0.136	0.000049	7.53	0.0158	0.000216	0.966	< 0.000005	2.92	0.167	0.00239	0.00065	0.00356
5-Mar-13	39.1	0.000019	0.0969	0.000035	7.43	0.0121	0.000156	0.949	< 0.000005	3	0.168	0.00244	0.00041	0.00537
3-Apr-13	42.7	0.000021	0.0811	0.000018	8.15	0.0109	0.000154	1.17	< 0.000005	3.35	0.189	0.00271	0.00166	0.00146
5-May-13	35	0.000036	0.191	0.000176	7.04	0.0125	0.000292	1.31	< 0.000005	2.92	0.159	0.00225	0.00154	0.012
11-Jun-13	12	0.000124	0.305	0.000315	2.43	0.0253	0.000667	0.58	< 0.000005	1.01	0.0474	0.000499	0.00167	0.015
8-Jul-13	21.5	0.000042	0.166	0.000203	4.91	0.0176	0.000293	0.405	< 0.000005	1.49	0.083	0.00081	0.00121	0.077
6-Aug-13	26.5	0.000038	0.224	0.000069	5.27	0.0198	0.000265	0.505	< 0.000005	1.9	0.103	0.00108	0.00159	0.0121
12-Sep-13	21	0.000059	0.239	0.000257	4.16	0.0264	0.000413	0.512	< 0.000005	1.9	0.0868	0.0008	0.00299	0.00271
8-Oct-13														
5-Nov-13	30.7	0.000046	0.263	0.000105	6.41	0.0525	0.000383	0.762	< 0.000005	2.53	0.129	0.00151	0.00135	0.00058

Table C.5: Water quality data and summary statistics for station R7 (reference), Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
17-Dec-13	111	0.026	242	114	< 2	2.01	3.66	7.81	10.5	166	< 1	1.1	0.000008	< 0.000005
9-Jan-14	116	0.023	250	123	< 2	1.95	2.04	7.87	9.76	126	< 1	1.16	0.000006	0.000006
6-Feb-14	125	0.016	224	128	< 2	2.38	2.69	7.92	11.9	154	< 1	1.09	< 0.000005	< 0.000005
11-Mar-14	133	0.011	276	141	< 2	1.32	1.37	7.61	10.9	156	< 1	1.13	0.000006	< 0.000005
2-Apr-14	134	0.015	263	135	< 2	0.76	1.53	7.74	11.7	172	< 1	0.65	< 0.000005	< 0.000005
1-May-14	94.4	0.019	189	100	< 2	6.73	7.31	7.67	5.14	126	2	1.56	0.000019	0.000015
4-Jun-14	59.4	0.058	126	64.7	< 2	3.05	3.44	7.83	7.54	88	2.7	1.09	0.000237	0.000014
7-Jul-14	62.5	0.012	134	66.2	< 0.02	3.01	2.24	8.03	9.02	90	1.4	0.58	0.000013	0.000012
11-Aug-14	85	0.03	182	95.2	< 0.02	2.17	3.38	7.98	8.06	116	1.1	0.63	0.000007	0.00002
15-Sep-14	76.3	0.014	149	84.7	< 0.02	2.11	2.71	8.09	7.67	102	1.1	0.47	0.000007	0.000016
n	47	52	54	56	37	53	53	55	54	54	56	46	57	55
minimum	34.7	<0.005	40	37.9	0.005	0.7	0.8	7.12	0.3	60	<1	0.34	<0.000005	<0.000005
maximum	140	0.12	365	149	0.201	16	13.4	8.83	11.9	190	17.3	2.58	0.000237	0.000097
median	95	0.019	205.5	103	0.09	2.4	2.2	7.80	8.9	125	<1	0.70	0.0000090	0.000012
mean [a]	95	0.022	202	101	0.09	3.1	2.9	7.77	8.1	120	2	0.87	0.0000143	0.000013
standard deviation (SD) [a]	31	0.019	66	32	0.07	2.8	2.3	0.27	2.5	33	3	0.43	0.0000309	0.000014
max detection limit	-	0.05	-	-	0.02	-	-	-	0	-	4	-	0.000005	0.000026
# < detection limit	-	13	-	-	13	-	-	-	0	-	34	-	13	16
% < detection limit	-	25%	-	-	35%	-	-	-	0%	-	61%	-	23%	29%
95th percentile	135	0.054	287	140	0.20	8.3	7.7	8.1	11.1	167	7	1.52	0.0000283	0.000026
5th percentile	41	<0.005	96	45	0.02	0.9	0.9	7.3	2.9395	63.3	<1	0.4725	<0.000005	<0.000005
background benchmark	10.5 - 134.6	0.056	278	141	0.19	0.8 -14.2	0.8 - 11.9	7.2 - 8.4	17.8	170	13	2.87	0.000105	0.000044
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	309	-	-	-	0.000162	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	0	-	-	0	-	-	0	0	-	-	-	1	-
% > current water quality criterion	-	0%	-	-	0%	-	-	0%	0%	-	-	-	2%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was at the 95th percentile of pooled reference station data; therefore the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.5: Water quality data and summary statistics for station R7 (reference), Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
17-Dec-13	34.4	0.000035	0.189	0.000192	6.82	0.027	0.00031	0.801	< 0.000005	2.68	0.144	0.00185	0.00106	0.0008
9-Jan-14	36.9	0.000027	0.153	0.000028	7.54	0.0213	0.000189	0.844	< 0.000005	2.94	0.161	0.00199	0.00073	0.00074
6-Feb-14	39	0.000026	0.15	0.000019	7.41	0.0186	0.000196	0.938	< 0.000005	2.97	0.171	0.00216	0.00042	0.00031
11-Mar-14	42.3	0.000023	0.138	0.000019	8.6	0.0215	0.00018	1.14	< 0.000005	3.55	0.205	0.00284	0.00029	0.00048
2-Apr-14	41.2	0.000024	0.115	0.00002	7.84	0.0157	0.000171	1.06	< 0.000005	3.17	0.184	0.00251	0.00043	0.0007
1-May-14	30	0.00006	0.456	0.000203	6.12	0.027	0.000544	1.56	< 0.000005	2.27	0.135	0.00157	0.00274	0.00271
4-Jun-14	19.6	0.000076	0.193	0.00209	3.92	0.0187	0.000497	0.633	< 0.000005	1.55	0.072	0.000734	0.00928	0.00177
7-Jul-14	19.7	0.000047	0.187	0.00019	4.14	0.0226	0.000313	0.444	< 0.000005	1.65	0.0848	0.000723	0.00212	0.00307
11-Aug-14	28.7	0.000034	0.203	0.000138	5.72	0.0219	0.000287	0.568	< 0.000005	2.04	0.114	0.000992	0.0008	0.00669
15-Sep-14	25.9	0.000043	0.191	0.00004	4.86	0.0241	0.00032	0.55	< 0.000005	1.9	0.0961	0.00088	0.00111	0.00809
n	53	52	55	55	52	55	54	54	53	51	52	54	54	55
minimum	11.8	0.000011	0.028	0.00001	2.11	0.00696	0.00015	0.325	<0.000005	0.998	0.0462	0.000367	0.00029	0.0003
maximum	42.7	0.000144	0.456	0.00209	8.87	0.0525	0.00108	1.56	0.000036	3.55	0.205	0.00284	0.0103	0.077
median	30.0	0.0000365	0.17	0.000176	6.3	0.0186	0.00029	0.79	<0.000005	2.3	0.132	0.00154	0.0016	0.0031
mean [a]	29.8	0.0000438	0.18	0.000268	6.1	0.0193	0.00035	0.79	0.000003	2.37	0.128	0.00156	0.0022	0.0066
standard deviation (SD) [a]	9.5	0.0000280	0.09	0.000343	1.8	0.0078	0.00020	0.30	0.000005	0.70	0.0437	0.000771	0.0022	0.0114
max detection limit	-	0.0001	0	0	-	-	0.0005	-	0.00001	-	-	-	0.003	0.0328
# < detection limit	-	1	0	0	-	-	1	-	50	-	-	-	1	2
% < detection limit	-	1.9%	0%	0%	-	-	2%	-	94%	-	-	-	2%	4%
95th percentile	41.6	0.000105	0.42	0.00078	8.2	0.0272	0.0007	1.30	0.000006	3.33	0.188	0.00274	0.006	0.024
5th percentile	13.1	0.0000171	<0.08	0.000019	3.1	0.00972	0.000165	0.39	<0.000005	1.28	0.0555	0.000467	0.00034	0.00046
background benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
current water quality criterion [b]	-	0.0025	1	0.007	-	1.058	0.098	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	0	0	0	-	0	0	0	0	-	-	0	0	-
% > current water quality criterion	-	0%	0%	0%	-	0%	0%	0%	0%	-	-	0%	0%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was at the 95th percentile of pooled reference station data; therefore the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.6: Water quality data and summary statistics for station FC (reference), Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
21-Jan-10	21	< 0.005	24.7	17.7	0.06				2	42	< 1		0.000008	0.000007
24-Feb-10	21	0.009	25.5	18.5	0.06			8.08	1.5	42	< 1		0.000008	0.000008
30-Mar-10	25	0.013	24.6	18.8	0.08			8.18	2	26	11		0.000025	0.000011
19-May-10	9.1	< 0.005	10.6	8.7	< 0.02			7.47	< 0.5	16	6		0.000045	
3-Aug-10		< 0.005	31.8	16.8	< 0.02			7.39	1.5	30	< 1		0.00001	
3-Nov-10		0.013	22.3	15.7	< 0.02			7.5	1.7	36	< 4		0.000011	0.00001
18-May-11	10	0.03		14.2	< 0.02	20.7	22.9	6.68	< 0.5	28	< 1	0.86	0.00012	0.000112
30-May-12	7	0.0095		9.91	0.0048		10.8			32	10.9	4.54	0.0000706	0.0000505
28-Aug-12				13.6										0.000016
24-Oct-12	16.4	0.013			0.0115		2.38		1.51			0.45		
4-Jun-13	4.4	0.0129		4.89	< 0.005	9.02	9.53		< 0.5	27	12		0.000031	0.000022
13-Aug-13	17.3	< 0.005		15.4	< 0.005	2.93	2.71		1.6	37.8	< 1		0.000013	0.000012
19-Nov-14	12.2	< 0.005		12.1	< 0.005	4.37	5.52		1.9	21	3	1.39	0.000011	0.000014
n	10	12	6	12	12	4	6	6	11	11	11	4	11	10
minimum	4.4	<0.005	10.6	4.89	0.0048	2.93	2.38	6.68	<0.5	16	<1	0.45	0.000008	0.000007
maximum	25	0.03	31.8	18.8	0.08	20.7	22.9	8.18	2	42	12	4.54	0.00012	0.000112
median	14	0.0093	25	14.8	<0.02	6.7	7.5	7.49	1.5	30	<3	1.13	0.0000130	0.000013
mean [a]	14	0.0094	23	13.9	0.02	9.3	9.0	7.55	1.3	31	4	1.81	0.0000321	0.000026
standard deviation (SD) [a]	7	0.0081	7	4.3	0.03	8.1	7.6	0.54	0.7	8	5	1.86	0.0000351	0.000033
max detection limit	-	0.005	-	-	0.02	-	0	-	0.5	-	4	-	0	0
# < detection limit	-	5	-	-	7	-	0	-	3	-	6	-	0	0
% < detection limit	-	42%	-	-	58%	-	0%	-	27%	-	55%	-	0%	0%
95th percentile	23	0.021	30	18.6	0.07	18.9	19.9	8.2	2.0	42	12	4.07	0.0000953	0.000084
5th percentile	6	<0.005	14	7.0	0.00	3.1	2.5	6.9	<0.5	19	<1	0.51	0.000008	0.00000745
background benchmark	10.5 - 134.6	0.056	278	141	0.19	0.8 -14.2	0.8 - 11.9	7.2 - 8.4	17.8	170	13	2.87	0.000105	0.000044
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	128	-	-	-	0.000032	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	0	-	-	0	-	-	0	0	-	-	-	3	-
% > current water quality criterion	-	0%	-	-	0%	-	-	0%	0%	-	-	-	27%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was at the 95th percentile of pooled reference station data; therefore the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.6: Water quality data and summary statistics for station FC (reference), Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
21-Jan-10	5.28	0.000016	0.02	0.000076	1.1	0.00062	0.0002	0.18	< 0.000005	2.2	0.0306	0.000072	0.0012	0.0017
24-Feb-10	5.22		0.044	0.00211	1.11	0.00257	0.00019		< 0.000005	2.22	0.0304	0.000083	0.0016	0.0017
30-Mar-10	5.53	0.000099	0.469	0.00173	1.21	0.0111	0.00028	0.22	< 0.000005	2.33		0.000175	0.0071	0.0025
19-May-10	2.62	0.000105	0.249	0.00105		0.0116	0.00058	0.56	< 0.000005	0.97	0.0173	0.000325	0.0076	
3-Aug-10	5	0.000026	0.04	0.000504	1.05		0.00032	0.16	< 0.000005	2.1	0.0323	0.000115	0.0014	
3-Nov-10	4.56	0.000016	0.021	0.000105			0.00024	0.14	< 0.000005	2.25	0.0293	0.00008	0.0022	0.0017
18-May-11	4.18	0.000123	0.166	0.00252	0.92	0.0145	0.00086	1.36	0.000015	1.22	0.0282	0.000163	0.0304	0.0301
30-May-12	2.95	0.000157		0.017	0.615	0.00925	0.00086	0.66	0.0000352	1.01	0.0191	0.000242	0.0148	0.0174
28-Aug-12	4.02	0.000046	0.0772			0.00232	0.000467	0.156	< 0.000005	1.8	0.025	0.000149	0.00196	0.00194
24-Oct-12														
4-Jun-13	1.53	0.0002	0.414	0.00362	0.392	0.0108	0.0009	0.778	0.000017	0.573	0.0111	0.000224	0.0083	0.0051
13-Aug-13	4.93	< 0.0001	0.1	0.00182	1.02	0.00415	< 0.0005		< 0.00001	1.94	0.03	0.000133	0.0038	0.0033
19-Nov-14	3.76	< 0.0001	0.093	0.001	0.75	0.0023	< 0.0005	0.152	< 0.00001	1.67	0.0243	0.000177	0.0031	0.0021
n	12	11	11	11	9	10	12	10	12	12	11	12	12	10
minimum	1.53	0.000016	0.02	0.000076	0.392	0.00062	0.00019	0.14	<0.000005	0.57	0.0111	0.000072	0.0012	0.0017
maximum	5.53	0.0002	0.469	0.017	1.21	0.0145	0.0009	1.36	0.0000352	2.33	0.0323	0.000325	0.0304	0.0301
median	4.4	0.0001000	0.093	0.00173	1.0	0.00670	0.00048	0.20	<0.000005	1.87	0.0282	0.000156	0.0035	0.0023
mean [a]	4.1	0.0000807	0.15	0.00287	0.9	0.00692	0.00045	0.44	0.000008	1.69	0.0252	0.000162	0.0070	0.0068
standard deviation (SD) [a]	1.2	0.0000610	0.16	0.00481	0.3	0.00501	0.00028	0.40	0.000010	0.60	0.00674	0.0000748	0.0084	0.010
max detection limit	-	-	-	-	-	-	-	0	0.00001	0	-	0	-	-
# < detection limit	-	-	-	-	-	-	-	0	9	0	-	0	-	-
% < detection limit	-	-	-	-	-	-	-	0%	75%	0.0%	-	0%	-	-
95th percentile	5.4	0.000179	0.44	0.01031	1.2	0.0132	0.00088	1.10	0.000025	2.29	0.0315	0.000279	0.022	0.024
5th percentile	2.1	0.0000160	0.02	0.0000905	0.5	0.001376	0.00020	0.15	<0.000005	0.79	0.0142	0.0000764	0.0013	0.0017
background benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
current water quality criterion [b]	-	0.0025	1	0.004	-	0.670	0.022	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	0	0	2	-	0	0	0	0	-	-	0	1	-
% > current water quality criterion	-	0%	0%	18%	-	0%	0%	0%	0%	-	-	0%	8%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was at the 95th percentile of pooled reference station data; therefore the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.7: Water quality data and summary statistics for station R6 (reference), Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
21-Jan-10	150	0.007	178.4	168	0.22				22	200	1		0.000012	< 0.000005
26-Feb-10	150	< 0.005	179.6	160	0.22			8.13	23	200	< 1		0.000008	0.000008
30-Mar-10	150	< 0.005	178	165	0.21			8.34	24	170	< 1		0.000014	0.000036
19-May-10	79	0.023	113	97.4	0.05			7.93	14	120	62		0.000152	
3-Aug-10	160	< 0.005	211	153	0.02			8.46	21	170	< 1		0.000017	
4-Nov-10		0.012	168.7	159	0.16			7.99	22	170	< 4		0.000007	0.000009
19-May-11	43	0.025		47.5	0.04	22.2	22.9	7.5	< 0.5	74	85	6.2	0.000236	0.000055
29-May-12	61.7				0.0518		10.2		8.74	98	8.4	3.4	0.0000615	0.0000283
29-Aug-12				141									0.000015	0.000011
23-Oct-12	147	0.03			0.175		2.17		22.7	192	< 1	0.52		
4-Jun-13	48.6	0.0091		51.9	0.041	6.94	9.18		7.31	71.9	240		0.000157	0.00002
12-Aug-13	130	< 0.005		148	0.03	2.33	2.12		21.5	163	< 1		0.000019	0.000016
19-Nov-14	119	< 0.005		131	0.0835	3.58	3.64		19.7	144	3.2	2.97	0.000023	0.000014
n	11	11	6	11	12	4	6	6	12	12	11	4	12	10
minimum	43	<0.005	113	47.5	0.02	2.33	2.12	7.5	<0.5	71.9	<1	0.52	0.000007	<0.000005
maximum	160	0.03	211	168	0.22	22.2	22.9	8.46	24	200	85	6.2	0.000236	0.000055
median	130	0.007	178.2	148	0.07	5.3	6.4	8.06	21.3	166.5	<1	3.19	0.0000180	0.000015
mean [a]	113	0.011	171	129	0.11	8.8	8.4	8.06	17.2	148	15	3.27	0.0000601	0.000020
standard deviation (SD) [a]	45	0.010	32	44	0.08	9.2	7.9	0.34	7.8	46	30	2.33	0.0000773	0.00002
max detection limit	-	0.005	-	-	0	-	-	-	0.5	-	4	-	-	0.000005
# < detection limit	-	5	-	-	0	-	-	-	1	-	6	-	-	1
% < detection limit	-	45%	-	-	0%	-	-	-	8%	-	55%	-	-	10%
95th percentile	155	0.028	203	167	0.22	19.9	19.7	8.4	23.5	200	74	5.78	0.000193	0.000046
5th percentile	46	<0.005	127	50	<0.03	2.5	2.1	7.6	4.2	73	<1	0.8875	0.00000755	0.0000064
background benchmark	10.5 - 134.6	0.056	278	141	0.19	0.8 -14.2	0.8 - 11.9	7.2 - 8.4	17.8	170	13	2.87	0.000105	0.000044
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	309	-	-	-	0.000219	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	0	-	-	0	-	-	0	0	-	-	-	1	-
% > current water quality criterion	-	0%	-	-	0%	-	-	0%	0%	-	-	-	8%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was at the 95th percentile of pooled reference station data; therefore the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.7: Water quality data and summary statistics for station R6 (reference), Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
21-Jan-10	49.1	0.000033	0.118	0.000016	11	0.0149	0.00026	1.31	< 0.000005	2.16	0.141	0.00233	0.0006	0.0008
26-Feb-10	46.9	0.000026	0.112	0.000042	10.3	0.0106	0.00024	1.24	< 0.000005	2.02	0.142	0.00241	0.0007	0.0009
30-Mar-10	48	0.000021	0.124	0.000025	11	0.00846	0.00019	1.3	< 0.000005	2.22		0.00261	0.0006	0.0022
19-May-10	26.7	0.000985	2.2	0.00155	7.49	0.149	0.00315	1.16	< 0.000005	1.21	0.0804	0.0014	0.0114	
3-Aug-10	42.9	0.000038	0.169	0.000053	11.3	0.0129	0.0004		< 0.000005	1.84	0.128		0.0003	
4-Nov-10	45.2		0.083	0.000025	11.3		0.00032	1.14	< 0.000005	1.96	0.135	0.00223	0.0004	0.0014
19-May-11	12.8	0.00127	3.15	0.00157	3.8	0.166	0.0046	1.8	0.000037	0.6	0.0418	0.000592	0.015	0.0063
29-May-12	18.5	0.000145	0.369	0.000189	4.99	0.0337	0.00103	1.24	0.0000104	0.806	0.0571	0.000647	0.00208	0.0035
29-Aug-12	38.9	0.000056	0.144	0.000033	10.5	0.0145	0.000579	1.08	< 0.000005	1.73	0.112	0.0015	0.00047	0.00044
23-Oct-12														
4-Jun-13	16.2	0.00204	3.65	0.00323	3.87	0.117	0.00614	1.02	0.000049	0.672	0.054	0.000964	0.019	< 0.001
12-Aug-13	40.5	< 0.0001	0.14	< 0.00005	11.1	0.01	< 0.0005		< 0.00001	1.73	0.12	0.00173	< 0.003	< 0.001
19-Nov-14	36.8	< 0.0001	0.212	0.000051	9.58	0.0185	0.00067	0.997	< 0.00001	1.65	0.112	0.0016	< 0.003	0.0012
n	12	11	12	12	12	11	12	10	12	12	11	11	12	10
minimum	12.8	0.000021	0.083	0.000016	3.8	0.00846	0.00019	0.997	<0.000005	0.6	0.0418	0.000592	<0.0003	0.00044
maximum	49.1	0.00204	3.65	0.00323	11.3	0.166	0.00614	1.8	0.000049	2.22	0.142	0.00261	0.019	0.0063
median	39.7	0.0001	0.16	0.0000505	10.4	0.0149	0.00054	1.20	<0.000005	1.73	0.112	0.00160	0.0014	0.0011
mean [a]	35.2	0.000429	0.87	0.000567	8.9	0.0505	0.00149	1.23	0.000010	1.55	0.102	0.00164	0.0045	0.0018
standard deviation (SD) [a]	13.2	0.000690	1.32	0.001022	3.0	0.0614	0.00201	0.23	0.000016	0.58	0.0372	0.000706	0.0067	0.0019
max detection limit	-	-	-	0.00005	-	-	0.0005	-	0.00001	-	-	0	0.003	0.0010
# < detection limit	-	-	-	1	-	-	1	-	9	-	-	0	2	2
% < detection limit	-	-	-	8%	-	-	8%	-	75%	-	-	0%	17%	20%
95th percentile	48.5	0.001655	3.38	0.00232	11.3	0.1575	0.0053	1.58	0.000042	2.19	0.142	0.00251	0.0168	0.0050
5th percentile	14.7	0.0000235	0.099	0.0000210	3.8	0.00923	0.000218	1.01	<0.000005	0.64	0.0479	0.000620	0.00036	0.00060
background benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
current water quality criterion [b]	-	0.0025	1	0.009	-	1.256	0.129	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	0	3	0	-	0	0	0	0	-	-	0	0	-
% > current water quality criterion	-	0%	25%	0%	-	0%	0%	0%	0%	-	-	0%	0%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was at the 95th percentile of pooled reference station data; therefore the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.8: Water quality data and summary statistics for station W10 (reference), Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
3-May-10	38	0.038	109	38.9		12.1	11.2	7.71	0.3	50	< 1		0.000064	
5-Jun-10	38		68	35.8		5.2	5	7.76	1.9	60	< 1		0.000025	0.000032
10-Jul-10	52		101	52.4		4.1	4	8.08	1	40	< 1		0.000016	0.000071
19-May-11	16	0.019			< 0.02	30.3	27.8	7.4	< 0.5	46	1	0.67	0.000139	0.000141
30-May-12	22.4	0.013		24.4			9.61		< 0.5	42	12.9	1.43	0.0000495	0.0000315
28-Aug-12				63.4									0.000024	0.000016
24-Oct-12	57.5	0.019			< 0.002		3.08		3.98	80		0.24		
4-Jun-13	21.8	< 0.005		23.2	< 0.005	9.18	8.19		2.18	51.9	3.9		0.000036	0.000031
13-Aug-13	60.4	< 0.005		58.1	< 0.005	3.9	3.63		3	85.2	< 1		0.000023	0.000022
19-Nov-14	56	< 0.005		52.7	< 0.005	4.2	3.91		3.78	63.4	< 1	2.39	0.000019	0.00002
n	9	7	3	8	5	7	9	4	9	9	8	4	9	8
minimum	16	<0.005	68	23.2	<0.002	3.9	3.08	7.4	0.3	40	<1	0.24	0.000016	0.000016
maximum	60.4	0.038	109	63.4	0.02	30.3	27.8	8.08	3.98	85.2	12.9	2.39	0.000139	0.000141
median	38	0.013	101	45.7	<0.005	5.2	5.0	7.74	1.9	51.9	<1	1.05	0.0000250	0.0000313
mean [a]	40	0.014	93	43.6	0.00	9.9	8.5	7.74	1.8	58	3	1.18	0.0000439	0.0000456
standard deviation (SD) [a]	17	0.013	22	15.3	0.004	9.5	7.8	0.28	1.5	16	4	0.94	0.0000389	0.0000421
max detection limit	-	0.005	-	-	0.02	-	-	-	0.5	-	1	-	-	-
# < detection limit	-	3	-	-	5	-	-	-	2	-	5	-	-	-
% < detection limit	-	43%	-	-	100%	-	-	-	22%	-	63%	-	-	-
95th percentile	59	0.032	108	61.5	<0.02	24.8	21.2	8.0	3.9	83	10	2.25	0.000109	0.000117
5th percentile	18	<0.005	71	23.6	<0.00	4.0	3.3	7.4	0.38	40.8	<1	0.30	0.0000172	0.0000174
background benchmark	10.5 - 134.6	0.056	278	141	0.19	0.8 -14.2	0.8 - 11.9	7.2 - 8.4	17.8	170	13	2.87	0.000105	0.000044
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	218	-	-	-	0.000083	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	0	-	-	0	-	-	0	0	-	-	-	1	-
% > current water quality criterion	-	0%	-	-	0%	-	-	0%	0%	-	-	-	11%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was at the 95th percentile of pooled reference station data; therefore the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.8: Water quality data and summary statistics for station W10 (reference), Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
3-May-10	12.6			0.000755	1.83	0.00317	0.00065	1	0.000006	1.18	0.0431	0.000106	0.0148	0.0118
5-Jun-10		0.000033		0.000717	1.72	0.00081	0.00061		< 0.000005	1.62	0.0406	0.000133	0.0036	0.0114
10-Jul-10	14.4	0.000021	0.013	0.000196	2.21	0.00026	0.00038	0.43	< 0.000005	1.83	0.0575		0.0017	
19-May-11	7.96	0.000098	0.145	0.00189	1.16	0.00558	0.00075	2.18	0.000024	0.55	0.0282	0.000069		0.0362
30-May-12		0.0000697	0.119	0.000803	1.1	0.00251	0.000655	0.714			0.028	0.000162		0.00698
28-Aug-12	21	0.000024	0.0358	0.000259	2.67	0.000941	0.000373	0.536	< 0.000005	1.92		0.000153	0.00157	
24-Oct-12														
4-Jun-13	7.76	< 0.0001	0.184	0.000899	1.01	0.00329	0.00092	0.596	0.000034	1.1	0.0275	0.000199	0.0078	0.0045
13-Aug-13	18.9	< 0.0001	0.01	0.000078	2.49	0.000319	< 0.0005		< 0.00001	2.01	0.06	0.000135	0.0038	0.0015
19-Nov-14	17.8	< 0.0001	0.028	0.000128	2.14	0.000572	< 0.0005	0.495	< 0.00001	1.82	0.0623	0.000153	< 0.003	0.0012
n	7	8	7	9	9	9	9	7	8	8	8	8	7	7
minimum	7.76	0.000021	0.01	0.000078	1.01	0.00026	0.000373	0.43	<0.000005	0.55	0.0275	0.000069	0.00157	0.0012
maximum	21	0.0001	0.184	0.00189	2.67	0.00558	0.00092	2.18	0.000034	2.01	0.0623	<0.0002	0.0148	0.0362
median	14.4	0.00008385	0.0358	0.000717	1.8	0.000941	0.00061	0.60	<0.000008	1.72	0.0419	0.000144	0.0036	<0.007
mean [a]	14.3	0.000049	0.08	0.000636	1.8	0.00194	0.00054	0.85	0.000010	1.50	0.0434	0.000139	0.0050	0.0105
standard deviation (SD) [a]	5.2	0.000025	0.07	0.000570	0.6	0.00182	0.00023	0.62	0.000012	0.51	0.0149	0.0000388	0.0049	0.0121
max detection limit	-	-	0	0	-	0	0.0005	-	0.00001	-	-	0	0.003	0
# < detection limit	-	-	0	0	-	0	2	-	5	-	-	0	1	0
% < detection limit	-	-	0%	0%	-	0%	22%	-	63%	-	-	0%	14%	0%
95th percentile	20.4	0.00010	0.17	0.00149	2.6	0.00466	0.0009	1.83	0.00003	1.98	0.0615	<0.0002	0.013	0.0289
5th percentile	7.8	0.000022	0.011	0.000098	1.0	0.000284	0.00038	0.45	<0.000005	0.74	0.0277	0.0000820	0.00161	0.00129
background benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
current water quality criterion [b]	-	0.0025	1	0.004	-	0.806	0.053	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	0	0	0	-	0	0	0	0	-	-	0	0	-
% > current water quality criterion	-	0%	0%	0%	-	0%	0%	0%	0%	-	-	0%	0%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was at the 95th percentile of pooled reference station data; therefore the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.9: Water quality data and summary statistics for mine exposed station R8, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
11-Jan-10	130			130		1.6	1.3	6.91	10	170	< 1		< 0.000005	< 0.000005
23-Feb-10	130	< 0.01	220	141		1	1.2	7.94	9.6		< 1		< 0.000005	< 0.000005
10-Mar-10		0.02	244	138		1.1	1.2	7.84	11	140	< 1		< 0.000005	< 0.000005
11-Apr-10	140	< 0.01	230	144		0.7	0.8	7.73	9.2	140	< 1		< 0.000005	< 0.000005
3-May-10			87	54.3		14.6	12.1		< 0.5	82			0.000041	0.000034
5-Jun-10	44	< 0.05	89	48.7			3.3	7.92	5.1	64	2		0.000016	0.000014
8-Jul-10	63	< 0.05	121	57.8		2.9	3.2	8.09	5.8	70	2		0.000011	
3-Aug-10			177	84.1		2.3	2.3	7.26	6	90	2			< 0.000005
1-Sep-10	83		172	84.1	< 0.02	4.5	2.3	7.66	7	92	< 1	0.7	0.000007	0.000024
19-Oct-10	92	0.035	193	101	0.06	2	1.5		7.8	100	< 1	1.1	0.000006	0.000017
10-Nov-10		< 0.005	195	120	0.09	1.6	1.8	7.76	8.9	130	2		0.000008	0.000006
1-Dec-10	120	< 0.05	100	117	0.1	< 0.5	< 0.5	7.28	9.8	120		0.86	0.000007	0.000007
20-Jan-11	130	< 0.05	270	145	0.15	1.1		7.74	11	150	< 1	0.77	0.000008	0.000008
15-Feb-11	130	0.02	295	134	0.16	1.1	1.3	8	9.6	130		0.57	0.000015	0.000011
16-Mar-11	140	0.039	280	144		0.9	0.9		9.5	170	< 1	0.51	< 0.000005	0.000021
12-Apr-11	140	0.006	279	151	0.18	1.2	1.1	8.04	9.5	170	< 1	0.49	< 0.000005	0.000012
9-May-11	94		218	92.3	0.09	10.4	9.4	7.87	5.4	120	2	1.85		0.000017
22-Jun-11	37	0.018	85	41.6	< 0.02	5.7		7.69	6.4	64	6	1.22	0.000026	0.000121
21-Jul-11		0.026	113	57.7	< 0.02	4.9	5.1	7.9	5.4	88	< 1	0.6	0.000013	0.000017
24-Aug-11	62	0.026	123	62.2	< 0.02	3.1	3.5	7.56	6.3	82		0.46	0.000009	< 0.000005
22-Sep-11	71	0.07	180	75.5	< 0.02	2.7	2.6	7.64		96	< 1		0.000011	0.00001
19-Oct-11	86	0.018	160	95.1	0.06	2.4	2	7.76	8.2	92	< 1	0.57	0.000009	0.000014
15-Nov-11	101	0.024	200	100	0.101	3.86	2.35	7.63	9.45	116	< 1	0.76	0.000011	< 0.000005
6-Dec-11	105	0.036	212	108	0.112	1.69	1.35	7.66	9.08	118	< 1	1.07	0.000009	0.000006
11-Jan-12	110	0.029	220	108	0.129	1.22	1.31	8.13	8.86	118	< 1	1.04	< 0.000005	0.000006
14-Feb-12	122	0.027		130	0.166	1.28		7.18	9.11	136	< 1	0.88	< 0.000005	0.000017
6-Mar-12	124	0.022	237	145	0.177	1.29	1.21	7.88	8.44		< 1	0.82	0.000012	0.00001
19-Apr-12			264					7.93						
17-May-12	82.3	0.033	172	82.7	0.049	8.58	7.68			114	2.4		0.00003	0.000034
13-Jun-12	29.1	0.017	30	32.7	< 0.02		5.49	7.46		54	49.9		0.0000442	0.0000206
11-Jul-12	46.4	0.029	70	50	0.039	4.9	6.09	7.77	2.85	68	8.3	2.14	0.0000272	0.0000168
8-Aug-12	77.1	0.012	130	84.4	< 0.02	2.14	2.9	7.89	6.92	90	< 1	0.56	0.000012	0.00001
5-Sep-12	73.2	0.0053	154	76.1	< 0.02	3.44	2.82	8.02	6.82	100	< 1	0.45	0.000008	0.000013
9-Oct-12	72.6	0.0084	153	76.9	< 0.02	2.64	2.99	7.51	7.37		1.3	0.7	0.000009	0.00001
6-Nov-12	102	0.013	277	106	0.111	1.62	1.07	7.74	10.2		< 1	0.77	0.00001	0.000006
5-Dec-12		0.017	235	121	0.161	1.26	1.28	7.65	9.95	128	< 1	0.78	0.000007	0.000006
7-Jan-13	121	0.013	255	125	0.175	1.83	1.84	7.43	9.33	150	< 1	0.72	< 0.000005	< 0.000005
6-Feb-13	125	0.022	293	128	0.18	1.79	2.24	7.62	10.1	142	< 1	0.49	< 0.000005	< 0.000005
5-Mar-13	127		319	132	0.178	1.31	1.46	7.46	9.41	132	< 1	1.1	< 0.000005	< 0.000005
3-Apr-13	134	0.014	245	137	0.178	1.3	1.31	7.51	10.1	160	< 1	0.69	0.000007	< 0.000005
7-May-13	120	0.012	219	119	0.152	2.27	4.21	7.26	8.89	134	< 1	1.36	0.000006	0.000028
11-Jun-13	30.6	0.011	81	31.5	< 0.2	4.3	4.99	7.71	0.9	58	13.5	2.67	0.000022	0.000017
8-Jul-13	68.1	0.0064	158	68.2	< 0.2	2.63	3	7.73	7.96	110	15.8	1.04	0.000012	0.000014
6-Aug-13	52.4	0.0052	179	81.8	< 2	2.98	3	7.33	7.39	70	< 1	0.18	0.000021	0.000011
12-Sep-13	44.7	0.01	123	62	< 2	3.61	3.84	7.91	5.16	72	4.2	0.77	0.000012	0.000013
8-Oct-13			128					7.67						
5-Nov-13	88.2	0.011	178	98.3	< 2	1.99	2.25	7.73	8.44	84	< 1	0.81	0.000008	0.000015
7-Nov-13	84.6	0.01		93.1	< 2	1.6	2.12		7.75	120	< 1		0.000011	0.000011

Table C.9: Water quality data and summary statistics for mine exposed station R8, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
11-Jan-10	38.6	0.000019	0.09	0.000089	7.6	0.0148	0.00019	0.89	< 0.000005	2.95	0.157	0.00223	0.0007	0.0007
23-Feb-10	42.6	0.000016	0.077	0.000023	8.34	0.00995	0.00018	0.99	< 0.000005	3.25	0.177	0.00265	0.0004	0.0003
10-Mar-10	40.6	0.000013	0.074	0.000017	7.97	0.00916	0.00018	0.94		3.18	0.171	0.0027	0.0005	0.0004
11-Apr-10	43.5	0.000021	0.07	0.000026	8.25	0.0083	0.00026	1.05	< 0.000005	3.36	0.182	0.00283	0.0004	0.0006
3-May-10	16.1	0.000107	0.398	0.00168	3	0.0363	0.0017	1.27	< 0.000005		0.0694	0.000706	0.0086	0.0068
5-Jun-10		0.000061	0.167	0.000832	3.11	0.0137	0.00043	0.48	< 0.000005	1.58	0.0567	0.00057	0.0026	0.0041
8-Jul-10	16.6	0.00004	0.137	0.000407	3.72	0.0153	0.00037	0.4	< 0.000005	1.6	0.0725	0.000653	0.0015	0.0025
3-Aug-10	25	0.000035	0.168	0.000272	5.29	0.0156	0.00034	0.54	< 0.000005	2	0.103	0.00103	0.0026	0.0026
1-Sep-10	25.3	0.000029	0.188	0.000525	5.1	0.0165	0.00027	0.52		2.04	0.106	0.00107	0.0029	0.022
19-Oct-10	29.3	0.000029	0.176	0.000273	6.06	0.0195	0.00025	0.66	< 0.000005	2.4	0.121	0.00139	0.0015	0.0078
10-Nov-10	36.1	0.000044	0.147	0.000251	7.16	0.0171	0.00032		< 0.000005		0.145	0.00175	0.0016	0.0017
1-Dec-10	35.1	0.000027	0.128	0.000066	7	0.0154	0.00022	0.8	< 0.000005	2.65	0.146	0.00176	0.0035	0.0033
20-Jan-11	36	0.000021	0.088	0.000175	7.23	0.0104	0.0002	0.92	< 0.000005	2.67	0.177	0.00243	0.0025	0.0022
15-Feb-11	36.2	0.000027	0.086	0.000247	7.72	0.00792	0.00028	0.96	< 0.000005	2.99	0.174	0.00246	0.0021	0.0023
16-Mar-11	42.8	0.00002	0.08	0.000293	8.95	0.0096	0.00022	1.1	< 0.000005	3.54	0.19	0.00284	0.0037	0.0042
12-Apr-11	40.2	0.000017	0.076	0.00013	8.08	0.0067	0.00019	1	< 0.000005	3.12	0.171		0.0006	0.0027
9-May-11	25.4	0.000038	0.434				0.00057	1.53	0.000006	1.99	0.116	0.00125	0.0024	
22-Jun-11	12.5	0.000135	0.208	0.00322		0.0156	0.00167	0.36	0.000006	1.22	0.0522	0.00042	0.0039	0.0122
21-Jul-11	17.3	0.000051	0.135	0.000487	3.51	0.0143		0.32	< 0.000005	1.46	0.0648	0.000542	0.002	0.0043
24-Aug-11	18.6	0.000042	0.137	0.00114	3.68	0.0163	0.00048	0.39	< 0.000005	1.56	0.0757	0.000631	0.0015	0.0041
22-Sep-11	22.5	0.000044	0.155	0.000239	4.57	0.02	0.0004	0.56	< 0.000005	1.81		0.000901	0.0016	0.0019
19-Oct-11	27.8	0.000041	0.157	0.000079	5.45				< 0.000005	2.23	0.112	0.00141	0.0026	
15-Nov-11	29.9			0.000113			0.00024	0.78	< 0.000005	2.34	0.136	0.00156	0.0011	0.0009
6-Dec-11	32.8	0.000035	0.172	0.000054	6.43	0.0216	0.00026	0.8	< 0.000005	2.49	0.137	0.00173	0.001	0.0015
11-Jan-12	32.2	0.000027	0.142		6.74	0.0147	0.00026	0.79	< 0.000005	2.62	0.141	0.00177	0.0008	0.0051
14-Feb-12	37.1	0.000016	0.111	0.000029	7.24	0.0132	0.00022	0.96	< 0.000005	2.93	0.157	0.00209	0.0008	0.0081
6-Mar-12	39.2	0.000021	0.107	0.000167	8	0.0114	0.00031	1.02	< 0.000005	3.23	0.166	0.00218	0.0017	0.0024
19-Apr-12														
17-May-12	25.4	0.0000544	0.403	0.0011	4.69	0.0194	0.000719	1.23	0.0000059	1.96	0.0984	0.0012	0.00448	0.00323
13-Jun-12	9.61	0.000207	0.331	0.00325	2.12	0.0209	0.000933	0.489		0.998	0.0399	0.000377		0.00543
11-Jul-12	12.8	0.00013	0.235	0.00143	2.8	0.0167	0.000857	0.306	0.0000069	1.41		0.000458	0.00531	0.00704
8-Aug-12	24.6	0.000051	0.178	0.000239	4.82	0.0237	0.00042	0.494		1.83	0.101	0.000976		0.00092
5-Sep-12	23.1	0.000035	0.164	0.000112	4.5	0.0236	0.000349	0.555	< 0.000005	1.97	0.0917	0.000924	0.00172	0.00632
9-Oct-12		0.000042	0.165	0.000861	4.54	0.0229	0.000278		< 0.000005	1.89	0.0967	0.000989	0.00204	0.00607
6-Nov-12	31.4	0.000054	0.162	0.000169		0.0307	0.000422		< 0.000005	2.51		0.0017	0.00156	0.00057
5-Dec-12	36	0.000034	0.134	0.000049	7.51	0.026	0.000242	0.865	< 0.000005	2.76	0.151	0.00208	0.00191	0.00153
7-Jan-13	36.8	0.000021	0.114	0.000031	7.62	0.0192	0.000203	0.944	< 0.000005	2.97	0.159	0.00224	0.00045	0.00159
6-Feb-13	37.6	0.000024	0.109	0.000081	7.39	0.0163	0.000207	0.989	< 0.000005	2.99	0.165	0.00228	0.00125	0.00117
5-Mar-13	40.5	0.000017	0.102	0.000052	7.39	0.0143	0.000187	1.12	< 0.000005	2.99	0.172	0.00228	0.00185	0.00069
3-Apr-13	41.9	0.000022	0.0898	0.00012	7.92	0.0125	0.000217	1.19	< 0.000005	3.19	0.187	0.00255	0.00214	0.00322
7-May-13	35.7	0.000028	0.198	0.000134	7.17	0.014	0.000341	1.27	< 0.000005	2.93	0.162	0.00227	0.00083	0.0258
11-Jun-13	9.29	0.00014	0.295	0.00144	2.02	0.0185	0.000788	0.549	0.000007	0.97	0.0402	0.000453	0.00382	0.00608
8-Jul-13	19.5	0.000061	0.16	0.000465	4.5	0.0183	0.000412	0.399	< 0.000005	1.47	0.0749	0.00076	0.00175	0.0116
6-Aug-13	15.7	0.000035	0.0889	0.000297	2.97	0.00658	0.00109	0.712	< 0.000005	2.07	0.0683	0.000387	0.00422	0.0067
12-Sep-13	15.9	0.000066	0.201	0.000841	3.18	0.0194	0.000602	0.453	< 0.000005	1.8	0.0653	0.000653	0.00192	0.00555
8-Oct-13														
5-Nov-13	30.4	0.000037	0.162	0.0001	5.42	0.0242	0.00033	0.692	< 0.000005	2.24	0.116	0.00138	0.00062	0.01
7-Nov-13	27.5	0.000039	0.158	0.00022	5.92	0.0206	0.000402	0.694	< 0.000005	2.43	0.115	0.00136	0.00217	0.00515

Table C.9: Water quality data and summary statistics for mine exposed station R8, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
13-Nov-13												0.88		
14-Nov-13												1.65		
19-Nov-13	103	0.024		108	< 2	1.94	2.02		11.1	116	2.2		0.000012	0.000012
21-Nov-13	98.3	0.018		113	< 2	2.14	2.48		10.3	68	1.5		0.000008	0.000007
26-Nov-13												3.22		
28-Nov-13												1.58		
17-Dec-13	103	0.026	242	110	< 2	2.33	3.47	7.77	10.4	122	< 1	1.1	0.000009	< 0.000005
27-Dec-13												2.18		
9-Jan-14	110	0.02	229	118	< 2	1.38	2.5	7.65	9.58	140	< 1	1.15	0.000006	0.000006
14-Jan-14												2.15		
6-Feb-14	119	0.015	215	121	< 2	2.15	3.04	7.86	11.4	160	< 1	1.14	< 0.000005	< 0.000005
11-Mar-14	130	0.015	279	142	< 2	1.49	1.8	7.61	10.8	154	< 1	0.86	0.000008	0.000006
2-Apr-14	133	0.0092	274	137	< 2	1.12	1.17	7.71	11.5	166	< 1	0.71	< 0.000005	0.000006
1-May-14	93.7	0.013	177	102	< 2	6.81	7.25	7.09	5.87	128	1.5	1.72	0.000022	0.00002
10-Jun-14	47.1	0.0051	104	51.6	< 0.02	3.46	4.69	7.63	5.28	72	2.9	1.06	0.000019	0.000019
7-Jul-14	60	0.0096	106	61.4	< 0.02	3.56	3.92	7.86	7.72	86	1.3	0.6	0.000026	0.000081
11-Aug-14	80.9	0.018	181	86.8	< 0.02	2.07	2.83	7.75	7.92	96	3	0.62	0.000012	0.000016
15-Sep-14	66.4	0.012	137	74.8	< 0.02	1.71	3	8.16	6.39	70	1.1	0.59	0.000008	0.000006
15-Oct-14			171					7.49						
n	52	52	56	58	37	56	55	54	55	54	54	49	56	57
minimum	29.1	<0.005	30	31.5	<0.02	<0.5	<0.5	6.91	<0.5	54	<1	0.18	<0.000005	<0.000005
maximum	140	0.07	319	151	0.2	14.6	12.1	8.16	11.5	170	49.9	3.22	0.0000442	0.000121
median	96.15	0.018	181	102	<0.09	2.0	2.35	7.72	8.9	116	<1	0.82	0.0000090	0.000010
mean [a]	94	0.019	187	99	0.08	2.8	2.9	7.68	8.1	111	3	1.03	0.000011	0.000014
standard deviation (SD) [a]	32	0.012	68	33	0.07	2.5	2.2	0.26	2.4	33	7	0.61	0.000009	0.000019
max detection limit	-	0.05	-	-	2	0.5	0.5	-	0.5	-	1	-	0.000005	0.000005
# < detection limit	-	7	-	-	27	1	1	-	1	-	34	-	13	13
% < detection limit	-	13%	-	-	73%	2%	2%	-	2%	-	63%	-	23%	23%
upper background (BG) benchmark	134.6	0.056	278	141	0.19	14.2	11.9	8.4	17.8	170	13	2.87	0.000105	0.000044
% samples > upper BG benchmark	6%	2%	11%	10%	5%	2%	2%	0%	0%	0%	6%	2%	0%	4%
lower background (BG) benchmark	10.5	-	-	-	-	0.8	0.8	7.2	-	-	-	-	-	-
% samples < lower BG benchmark	0%	-	-	-	-	2%	0%	6%	-	-	-	-	-	-
background median	43.6	0.014	126	51.2	0.03	2.3	2.3	7.78	8.3	68	<1	0.62	0.000010	0.000010
station median > BG median	1	1	1	1	1	0	1	0	1	1	0	1	0	0
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	218	-	-	-	0.000160	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	0	-	-	0	-	-	0	0	-	-	-	0	-
% > current water quality criterion	-	0%	-	-	0%	-	-	0%	0%	-	-	-	0%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.9: Water quality data and summary statistics for mine exposed station R8, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
13-Nov-13														
14-Nov-13														
19-Nov-13	33.1	0.000048	0.174	0.000224	6.26	0.0246	0.000325	0.731	< 0.000005	2.56	0.141	0.00155	0.0017	0.00359
21-Nov-13	34.1	0.000035	0.142	0.00009	6.73	0.0241	0.000304	0.783	< 0.000005	2.62	0.139	0.00156	0.00067	0.00117
26-Nov-13														
28-Nov-13														
17-Dec-13	33	0.000046	0.194	0.000144	6.71	0.0293	0.000338	0.775	< 0.000005	2.67	0.134	0.00177	0.00267	0.00092
27-Dec-13														
9-Jan-14	35.5	0.000032	0.164	0.000027	7.1	0.0251	0.000241	0.83	< 0.000005	2.83	0.154	0.00193	0.00045	0.0013
14-Jan-14														
6-Feb-14	37.2	0.000027	0.154	0.000033	6.81	0.0221	0.000242	0.934	< 0.000005	2.85	0.166	0.00205	0.00055	0.00052
11-Mar-14	43	0.000029	0.149	0.000021	8.45	0.0214	0.000227	1.14	< 0.000005	3.61	0.205	0.00282	0.00082	0.00105
2-Apr-14	42.3	0.000029	0.121	0.000051	7.71	0.0162	0.000194	1.08	< 0.000005	3.23	0.181	0.00253	0.00096	0.0025
1-May-14	30.6	0.00007	0.464	0.000413	6.28	0.0275	0.000731	1.57	< 0.000005	2.35	0.135	0.00153	0.00357	0.00473
10-Jun-14	15.6	0.000056	0.145	0.00212	3.08	0.0119	0.000467	0.464	< 0.000005	1.32	0.0618	0.000629	0.0036	0.00302
7-Jul-14	18.3	0.00007	0.167	0.00143	3.84	0.0203	0.00043	0.453	< 0.000005	1.76	0.0799	0.000678	0.00838	0.0103
11-Aug-14	25.6	0.000057	0.23	0.000641	5.53	0.0243	0.000431	0.604	< 0.000005	2.29	0.114	0.000957	0.00458	0.0505
15-Sep-14	22.9	0.000045	0.18	0.000361	4.29	0.0226	0.000363	0.503	< 0.000005	2	0.0877	0.00079	0.00131	0.00328
15-Oct-14														
n	56	57	57	56	54	55	56	54	54	56	55	57	56	56
minimum	9.29	0.000013	0.07	0.000017	2.02	0.00658	0.00018	0.306	<0.000005	0.97	0.0399	0.000377	0.0004	0.0003
maximum	43.5	0.000207	0.464	0.00325	8.95	0.0363	0.0017	1.57	0.000007	3.61	0.205	0.00284	0.0086	0.0505
median	31.0	0.0000350	0.16	0.000222	6.3	0.0171	0.000323	0.7865	<0.000005	2.42	0.135	0.00153	0.001735	0.0032
mean [a]	29.4	0.000046	0.17	0.000489	5.8	0.0180	0.00042	0.79	0.000003	2.37	0.125	0.00150	0.0022	0.0053
standard deviation (SD) [a]	9.7	0.000035	0.09	0.00072	1.9	0.0063	0.00032	0.31	0.000001	0.67	0.0443	0.000756	0.0017	0.0078
max detection limit	-	-	0	0	-	-	0	-	0.000005	-	-	0	0	0
# < detection limit	-	-	0	0	-	-	0	-	49	-	-	0	0	0
% < detection limit	-	-	0%	0%	-	-	0%	-	91%	-	-	0%	0%	0%
upper background (BG) benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
% samples > upper BG benchmark	11%	2%	2%	5%	0%	0%	5%	4%	0%	14%	13%	11%	0%	5%
lower background (BG) benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% samples < lower BG benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
background median	15.6	0.0000350	0.1115	0.000144	2.67	0.00855	0.00030	0.57	<0.000005	1.9	0.0728	0.000761	0.0017	0.0022
station median > BG median	1	0	1	1	1	1	1	1	0	1	1	1	1	1
current water quality criterion [b]	-	0.0025	1	0.007	-	1.052	0.097	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	0	0	0	-	0	0	0	0	-	-	0	0	-
% > current water quality criterion	-	0%	0%	0%	-	0%	0%	0%	0%	-	-	0%	0%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.10: Water quality data and summary statistics for mine exposed station R9, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	pH units	mg/L	mg/L	mg/L	NTU	mg/L	mg/L
11-Jan-10	130	0.02	272	147		1.2	1.1	7.11	21	190	< 1		0.000015	< 0.000005
23-Feb-10	140	< 0.01	250	150		1.3	1.5	7.73	18	160	< 1			< 0.000005
10-Mar-10	140	< 0.01	262	151		1.4	1.3	7.88	19	150	< 1		< 0.000005	< 0.000005
11-Apr-10	140	< 0.01	230	155		1	1.1	7.81	17		< 1		0.00001	0.000008
3-May-10	54	0.1	95	57.8		14.3	10.8	7.78	< 0.5	94	3		0.000027	0.000032
5-Jun-10		< 0.05	101	53.8		3	3.2	8.05	6	58	2		0.000021	0.00002
8-Jul-10	47	< 0.05	127	64.3		3.2	3.4	8.01	7.9	78	3		0.000008	0.000011
3-Aug-10	91	< 0.05	194	91.2			2	7.47	9.3	100	< 1		0.000011	0.00001
1-Sep-10		0.13	187	92.1	0.04	1.9	1.7	7.81	11		< 1	0.7	0.00001	0.000017
19-Oct-10	96	0.017	211	113	0.13	1.7	1.4	7.6	14	110	< 1	1	0.000015	0.000015
10-Nov-10	110	< 0.005	254	131	0.19	2.1	2.8	7.87	18	130	< 1	0.64		0.000024
1-Dec-10		< 0.05	120	130		< 0.5	< 0.5	7.46	19	140	< 4	1	0.000009	0.000007
20-Jan-11		< 0.05	290	149	0.25	1.1	0.9	7.81	20	150	< 1	0.75	0.000008	0.000019
15-Feb-11	130	0.014	293	142	0.23	1	1	7.99	17	150	< 1	0.56	0.000006	< 0.000005
16-Mar-11	150	0.019	290	150	0.26	1	1	8.02	16	180	< 1	0.39	0.000014	0.000006
12-Apr-11	140	0.007	282	149	0.23	1.7	0.8	8.08	15	160	< 1	0.39	< 0.000005	0.00002
9-May-11	93	0.027	209	99.9	0.09	10.8		7.78	12	130	3	1.73	0.00002	
22-Jun-11		0.031	93	45.6	< 0.02	5.1	5.2	7.67	5	62	7	1.28	0.000022	0.000099
21-Jul-11	57	0.042	131	63.1	< 0.02	4.5	6	7.8	6.5	82	< 1	0.58	0.000016	0.00002
23-Aug-11	65	0.026		70	< 0.02	3.1	4.1	7.93	9.1	88	< 1	0.53	< 0.000005	0.000019
22-Sep-11	75	0.031	230	84.5	0.03	2.4	3.3	7.51	12		< 1	0.65	0.000018	0.000011
19-Oct-11	93	0.023	180	104		1.9	2.1	7.66	14		< 1	0.5	0.000014	0.000008
16-Nov-11	103	0.11	187	115	0.179	1.85	1.66	7.89	14.5	144	< 1	0.66	0.000015	0.000013
6-Dec-11	108	0.039	236	118	0.184	1.26	1.58	7.61	16	128	< 1	0.84	0.000012	0.000007
9-Jan-12	115	0.033		141	0.184	1.26	1.19	7.49	18.8	136	< 1	0.89	< 0.000005	0.00014
14-Feb-12	124	0.028	283	144	0.268	1.11	0.91		18.8	176	< 1	0.97	0.000012	0.000009
6-Mar-12	126	0.011	260	147	0.29	0.63	1.48	7.89	18.8	156	< 1	0.71	0.000011	0.000009
19-Apr-12			288					7.95				1.05		
17-May-12	83.5	0.043	191	90.4	0.1	8.3		7.8	13.3	118	5.9		0.0000348	
12-Jun-12	29.9	0.036	58	33.3	< 0.02	5.36		7.71	4.34	62			0.0000466	0.0000209
11-Jul-12	47.9	0.022	97	53	< 0.02	5.82		7.29	7.03	68	14.7	2.48	0.0000301	0.0000165
8-Aug-12	79.6	0.013	150	88.8	0.04	3.24	2.63		9.86	100		0.53	0.000009	0.000012
5-Sep-12	77.5	< 0.005		84.2	0.03	2.92	2.82	7.71	9.82	88	< 1		0.000006	0.000007
9-Oct-12	76		160	84.6	0.04	2.99	3.07	7.57	10.5	102	2.1	0.82	< 0.000005	0.000012
6-Nov-12	105	0.015	248	116	0.155	1.62	1.7	7.82	16.2	132	2.3	0.64	0.000011	0.000012
5-Dec-12	126	0.022	256	149	0.252	1.86		7.73	19.7	154	< 1	0.66	0.000009	0.000008
7-Jan-13	123	0.0083	239	138	0.256	1.71	1.78	7.28	17.6	112	< 1	0.64	0.000006	0.000007
6-Feb-13	121	0.013	290	138	0.273	1.64	1.67	7.62	18.1	154	< 1	0.45	0.000006	< 0.000005
5-Mar-13	127		308	141	0.257	1.97	2.45	7.35	17.6	116	< 1	0.6	< 0.000005	< 0.000005
3-Apr-13	138	0.018	262	154	0.268	1.23	1.61	7.81	19.9	166	< 1	0.73	0.000009	0.000007
7-May-13	119	0.014	232	127	0.218	1.9	3.25	7.97	17	144	< 1	1.33	0.000011	0.000016
11-Jun-13	33.3	0.0071	96	36.5	< 0.05	5.13	4.79	7.83	4.16	46	16.8	2.31	0.000022	0.000013
8-Jul-13	71	0.0072	167	73	< 0.2	2.69	3.08	8	10.1	112	5.9	0.9	0.000009	0.000015
6-Aug-13	83.5	0.0063	177	92.8	< 2	2.47	2.97	7.82	10.8	96	< 1	0.62	0.000011	0.00001
12-Sep-13	64.2	0.0099	140	69.1	< 2	3.72	3.85	7.91	9.86	52	2.6	0.65	0.000009	0.00001
8-Oct-13			157					7.72						
5-Nov-13	92.9	0.011	213	115	< 2	2.01	2.14	7.62	14.3	94	< 1	1.94	0.000013	0.000012
7-Nov-13	93.5	0.011		112	< 2	3.08	2.76		14.9	146	< 1		0.00001	0.00002

Table C.10: Water quality data and summary statistics for mine exposed station R9, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
11-Jan-10	43.5	0.000026	0.088	0.00025	9.25	0.017	0.00022	1.01		3.12	0.172	0.00249	0.0013	0.0016
23-Feb-10	44.5	0.000027	0.063	0.000119	9.57	0.0128	0.00022		< 0.000005	3.39	0.186	0.00282	0.0012	0.0011
10-Mar-10	42.7	0.000027	0.071	0.000193	8.88	0.0107	0.00023	1.02	< 0.000005	3.19	0.18	0.0029	0.0041	0.0036
11-Apr-10	46.8	0.000019	0.064	0.00013	9.35	0.00936	0.00023	1.14	< 0.000005	3.42	0.193	0.00309	0.0011	0.0007
3-May-10	15.2	0.000081	0.29	0.000912	3.01	0.0209		1.13		1.27		0.000619	0.004	0.004
5-Jun-10	15.1		0.183	0.00109		0.0167	0.0005	0.52	< 0.000005	1.6	0.0616	0.000617	0.0032	0.0056
8-Jul-10	19	0.000047	0.153	0.000505	4.08	0.0145	0.0004	0.44	< 0.000005		0.0812	0.000715		0.002
3-Aug-10	26.2	0.000041	0.152	0.00162	5.81	0.0138	0.00045	0.63	< 0.000005	2.11		0.00117	0.0067	0.0035
1-Sep-10	26.5		0.18	0.000131		0.0168	0.00028		< 0.000005	2.16	0.118	0.00116	0.0008	0.0108
19-Oct-10	31.7	0.000031	0.172	0.000163	7	0.0196			< 0.000005	2.42	0.133	0.00156	0.002	0.0044
10-Nov-10	38.7		0.11	0.0006	8.35	0.0171	0.00034	0.91	< 0.000005	2.84	0.161	0.00199	0.0058	0.0526
1-Dec-10	38.5	0.000043	0.156	0.000149	8.07	0.0227	0.00026	0.87	< 0.000005		0.16	0.00204	0.0019	0.0037
20-Jan-11	40	0.000026	0.089	0.000055	8.4	0.0126	0.00023	0.98	< 0.000005	2.75	0.186		0.0008	0.0012
15-Feb-11	42.2	0.000017	0.08	0.000081	8.89	0.00956	0.0002	1.03	< 0.000005	3.13	0.184	0.00268	0.0008	
16-Mar-11	44.4	0.000025	0.066	0.000612	9.56	0.0108	0.00022	1.15	< 0.000005			0.00306	0.0019	0.0007
12-Apr-11	40.7	0.000023	0.065	0.000103	8.68	0.00779	0.00022	1.04	< 0.000005	3.18	0.177	0.00282	0.0006	0.0085
9-May-11		0.000061	0.418	0.000609	5.57	0.0229	0.00066	1.6		2	0.121	0.00127	0.0049	0.0072
22-Jun-11	13.5	0.000092	0.191	0.00118	2.87	0.0181	0.00095	0.39		1.23	0.0593		0.0034	0.0106
21-Jul-11	18.2	0.00005		0.000932	3.74	0.0127	0.00049	0.36	< 0.000005	1.43	0.0711	0.000582	0.0018	0.0083
23-Aug-11	20.9	0.000053	0.148	0.000499	4.32	0.0176	0.00062	0.45	< 0.000005	1.73	0.0848	0.000707		
22-Sep-11	24.6	0.000041	0.147	0.000232	5	0.0206	0.00045	0.61	< 0.000005	1.85	0.101	0.000979	0.005	0.0014
19-Oct-11	30.1	0.000049	0.147	0.000284	6.26	0.0252	0.00045	0.71	< 0.000005	2.31	0.128	0.00157	0.0065	0.0035
16-Nov-11	34.5	0.000042	0.122	0.000984	6.98	0.0179	0.00054	0.8	< 0.000005	2.43	0.146	0.00188	0.0038	0.0057
6-Dec-11	35.4	0.000025	0.167	0.000092	7.17	0.0216	0.00027	0.84		2.49	0.145	0.00182	0.0009	0.0009
9-Jan-12	43	0.00003	0.157	0.000132	8.27	0.0175	0.00026			2.95	0.173			0.0176
14-Feb-12	43.3	0.000019	0.109	0.000081	8.7	0.0142	0.00036	1.06	< 0.000005	3.08	0.168	0.00227	0.002	0.0013
6-Mar-12	43.4			0.000226	9.32	0.0133	0.00028	1.13	< 0.000005		0.177	0.00245	0.0018	0.0009
19-Apr-12														
17-May-12	27.1	0.0000664	0.375	0.00137	5.52	0.0193	0.00091	1.29		1.96	0.114	0.0013	0.00862	0.00946
12-Jun-12	10	0.000357	0.596	0.00339	2.01			0.543	0.0000158	0.908	0.0413	0.000344	0.00663	0.00324
11-Jul-12	15.6	0.000138	0.268	0.00288	3.32	0.0183	0.000887	0.386	0.0000122	1.41	0.0637	0.000525	0.0111	0.00517
8-Aug-12	26.7	0.000044	0.178	0.000228	5.35			0.558	< 0.000005	1.92	0.109	0.00104	0.0012	0.00198
5-Sep-12	25.4	0.000043	0.166	0.00012	5.06	0.0234	0.000331	0.617		1.97		0.000987	0.00063	0.00183
9-Oct-12	25.5	0.000042	0.169	0.000162	5.07	0.0231	0.000309	0.638		1.91	0.106	0.00105		0.00488
6-Nov-12	34	0.000053	0.135	0.000239	7.6	0.0288	0.000419	0.835	< 0.000005	2.55	0.137	0.0018	0.00158	0.00458
5-Dec-12	44.9	0.000037	0.144	0.00008	8.92	0.0272	0.000375	0.985	< 0.000005	2.93	0.182	0.00255	0.00089	0.0006
7-Jan-13	40.6	0.000025	0.107	0.000115	8.85	0.0201	0.000248	1	< 0.000005	3.08	0.182	0.00263	0.00079	0.00159
6-Feb-13	40.7	0.00003	0.102	0.000054	8.67	0.0172	0.000311	1.06	< 0.000005	3.07	0.172	0.00251	0.00073	0.00082
5-Mar-13	42.4	0.000024	0.0964	0.000091	8.61	0.0152	0.00024	1.19	< 0.000005	3.09	0.183	0.00241	0.00089	0.00048
3-Apr-13	46.3	0.000025	0.0861	0.000056	9.34	0.0144	0.000186	1.29	< 0.000005	3.3	0.204	0.0029	0.00122	0.00056
7-May-13	37.1	0.000036	0.183	0.000163	8.33	0.0145	0.00042	1.35	< 0.000005	3.02	0.171	0.0024	0.00103	0.0145
11-Jun-13	10.7	0.000194	0.395	0.00162	2.38	0.0208	0.000971	0.605	0.000006	1.02	0.0461	0.000479	0.00324	0.00777
8-Jul-13	20.5	0.00005	0.153	0.000355	4.83	0.017	0.000347	0.437	< 0.000005	1.48	0.0838	0.000845	0.00091	0.00966
6-Aug-13	27.5	0.000043	0.204	0.000152	5.84	0.0212	0.000401	0.588	< 0.000005	2	0.106	0.00105	0.00084	0.00391
12-Sep-13	20.8	0.000072	0.219	0.000483	4.19	0.0251	0.000492	0.538	< 0.000005	1.79	0.0871	0.000779	0.00172	0.00296
8-Oct-13														
5-Nov-13	34.9	0.000044	0.147	0.000156	6.68	0.0247	0.000394	0.831	< 0.000005	2.44	0.134	0.00152	0.00855	0.00263
7-Nov-13	32.6	0.00004	0.138	0.000197	7.42	0.0239	0.000373	0.786	< 0.000005	2.62	0.136	0.00156	0.00157	0.0207

Table C.10: Water quality data and summary statistics for mine exposed station R9, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
12-Nov-13												1.41		
14-Nov-13												0.51		
19-Nov-13	106	0.026		114	< 2	1.75	2.54		19.2	136	1.2		0.00001	0.000007
21-Nov-13	103	0.026		118	< 2	2.12	2.18		18.5	170	< 1		0.000011	0.000009
26-Nov-13												2.01		
28-Nov-13												1.62		
17-Dec-13	108	0.017	274	125	< 2	2.39	4	7.71	18.6	158	< 1	0.93	0.000009	0.000006
27-Dec-13												1.33		
9-Jan-14	114	0.02	259	131	< 2	1.77	2.47	7.88	19	164	< 1	1.03	0.000009	0.000007
14-Jan-14												5.46		
6-Feb-14	127	0.029	238	139	< 2	2.26	3.18	7.83	23.3	170	< 1	1.13	0.000006	< 0.000005
10-Mar-14	132	0.0096	328	161	< 2	0.96	1.61	7.63	26.4	176	< 1	0.62	0.000009	0.000008
2-Apr-14	132	0.0074	320	154	< 2	1.17	0.58	7.58	23.6	184	< 1	0.61	0.000008	< 0.000005
1-May-14	96	0.023	211	109	< 2	5.94	7.35	7.83	13.9	142	2.1	1.8	0.00003	0.000019
3-Jun-14	46.2	< 0.005	95	52.5	0.03	4.33	3.72	7	7.2	64	< 4	1.06	0.000025	0.000028
7-Jul-14	63	0.0076	139	67.7	0.022	3.18	1.95	8.1	10	82	< 1	0.57	0.00001	0.000021
11-Aug-14	85	0.028	193	98.3	0.05	2.2	3.45	7.85	12.8	120	< 1	0.58	0.00001	0.000013
15-Sep-14	73.1	0.011	155	85.8	0.028	1.99	2.95	8.31	9.8	90	< 1	0.52	0.000009	0.000007
15-Oct-14			187					7.22						
n	53	56	55	58	36	57	53	56	58	54	56	51	56	56
minimum	29.9	<0.005	58	33.3	<0.02	<0.5	<0.5	7	<0.5	46	<1	0.39	<0.000005	<0.000005
maximum	150	0.13	328	161	0.29	14.3	10.8	8.31	26.4	190	16.8	5.46	0.0000466	0.00014
median	103	0.020	211	115	0.14	1.99	2.18	7.8	14.7	130	<1	0.73	0.0000100	0.0000105
mean [a]	98	0.024	207	109	0.13	2.8	2.6	7.74	14.2	124	2	1.03	0.0000126	0.000015
standard deviation (SD) [a]	31	0.024	69	36	0.10	2.4	1.8	0.25	5.5	39	3	0.81	0.0000086	0.000022
max detection limit	-	0.05	-	-	2	0.5	0.5	-	0.5	-	4	-	0.000005	0.000005
# < detection limit	-	11	-	-	19	1	1	-	1	-	42	-	6	8
% < detection limit	-	20%	-	-	53%	2%	2%	-	2%	-	75%	-	11%	14%
upper background (BG) benchmark	134.6	0.056	278	141	0.19	14.2	11.9	8.4	17.8	170	13	2.87	0.000105	0.000044
% samples > upper BG benchmark	11%	5%	18%	24%	36%	2%	0%	0%	33%	9%	4%	2%	0%	4%
lower background (BG) benchmark	10.5	-	-	-	-	0.8	0.8	7.2	-	-	-	-	-	-
% samples < lower BG benchmark	0%	-	-	-	-	2%	2%	4%	-	-	-	-	-	-
background median	43.6	0.014	126	51.2	0.03	2.3	2.3	7.78	8.3	68	<1	0.62	0.000010	0.000010
station median > BG median	1	1	1	1	1	0	0	1	1	1	0	1	0	1
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	218	-	-	-	0.000177	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	0	-	-	0	-	-	0	0	-	-	-	0	-
% > current water quality criterion	-	0%	-	-	0%	-	-	0%	0%	-	-	-	0%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.10: Water quality data and summary statistics for mine exposed station R9, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
12-Nov-13														
14-Nov-13														
19-Nov-13	32.3	0.000041	0.12	0.00017	8.01	0.0246	0.000318	0.835	< 0.000005	2.65	0.14	0.00161	0.0007	0.00087
21-Nov-13	34.3	0.000042	0.122	0.000117	7.83	0.0249	0.000301	0.905	< 0.000005	2.7	0.161	0.00179	0.00091	0.00086
26-Nov-13														
28-Nov-13														
17-Dec-13	36.8	0.000037	0.157	0.000196	8.1	0.0281	0.000378	0.862	< 0.000005	2.82	0.152	0.00204	0.00172	0.00114
27-Dec-13														
9-Jan-14	38.8	0.000033	0.149	0.000062	8.56	0.0245	0.000263	0.887	< 0.000005	2.92	0.171	0.00223	0.00063	0.00099
14-Jan-14														
6-Feb-14	42.2	0.000031	0.136	0.000076	8.18	0.022	0.000258	1.04	< 0.000005	2.99	0.188	0.0023	0.00149	0.0015
10-Mar-14	47.6	0.000029	0.121	0.000065	10.3	0.0223	0.000231	1.29	< 0.000005	3.64	0.226	0.00311	0.00676	0.00184
2-Apr-14	45.5	0.00003	0.114	0.000115	9.8	0.0184	0.00024	1.17	< 0.000005	3.3	0.189	0.0028	0.00093	0.0008
1-May-14	32.1	0.000089	0.463	0.0012	7.02	0.0294	0.000815	1.63	< 0.000005	2.37	0.14	0.00171	0.0128	0.00556
3-Jun-14	15.3	0.000073	0.16	0.00103	3.46	0.0132	0.00051	0.535	< 0.000005	1.37	0.0659	0.000623	0.0114	0.00692
7-Jul-14	20	0.00004	0.158	0.000528	4.31	0.0178	0.000345	0.474	< 0.000005	1.67	0.0904	0.000762	0.00074	0.00262
11-Aug-14	29	0.00005	0.211	0.00025	6.41	0.0226	0.000374	0.655	< 0.000005	2.27	0.12	0.00108	0.00146	0.0123
15-Sep-14	26.1	0.000051	0.207	0.00031	4.98	0.0304	0.000352	0.584	< 0.000005	1.98	0.0966	0.000905	0.00091	0.00078
15-Oct-14														
n	57	54	56	58	56	56	54	54	49	54	54	55	54	56
minimum	10	0.000017	0.063	0.000054	2.01	0.00779	0.000186	0.36	<0.000005	0.908	0.0413	0.000344	0.0006	0.00048
maximum	47.6	0.000357	0.596	0.0034	10.3	0.0304	0.000971	1.63	0.0000158	3.64	0.226	0.00311	0.0128	0.0526
median	34	0.0000410	0.15	0.0001965	7.295	0.0184	0.00035	0.85	<0.000005	2.44	0.140	0.00161	0.0016	0.0031
mean [a]	32.0	0.000052	0.17	0.000483	6.82	0.0190	0.00039	0.86	0.000003	2.39	0.136	0.00169	0.0029	0.0053
standard deviation (SD) [a]	10.7	0.000052	0.10	0.00065	2.22	0.0054	0.0002	0.31	0.000002	0.70	0.0461	0.000831	0.0030	0.0078
max detection limit	-	-	-	-	-	-	-	-	0.000005	-	-	-	-	-
# < detection limit	-	-	-	-	-	-	-	-	46	-	-	-	-	-
% < detection limit	-	-	-	-	-	-	-	-	94%	-	-	-	-	-
upper background (BG) benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
% samples > upper BG benchmark	26%	4%	4%	3%	14%	0%	0%	6%	0%	13%	26%	20%	0%	4%
lower background (BG) benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% samples < lower BG benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
background median	15.6	0.0000350	0.1115	0.000144	2.67	0.00855	0.00030	0.57	<0.000005	1.9	0.0728	0.000761	0.0017	0.0022
station median > BG median	1	1	1	1	1	1	1	1	0	1	1	1	0	1
current water quality criterion [b]	-	0.0025	1	0.007	-	1.109	0.106	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	0	0	0	-	0	0	0	0	-	-	0	0	-
% > current water quality criterion	-	0%	0%	0%	-	0%	0%	0%	0%	-	-	0%	0%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.11: Water quality data and summary statistics for mine exposed station R10, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	pH units	mg/L	mg/L	mg/L	NTU	mg/L	mg/L
11-Jan-10	130	0.03	241	146		1.3	1.5	7.06	20	180	< 1		0.00001	0.000008
23-Feb-10	140	< 0.01	235	151		1.7	1.9	7.87	19	190	< 1		0.00001	< 0.000005
10-Mar-10	140	< 0.01	259	154		1.3	1.1	7.79	19	190	< 1			0.000011
11-Apr-10	140	< 0.01	240	151		1.8	2.4	7.43	19	170	< 1		0.000025	0.000027
3-May-10	51	0.012	95	59.2		14.7	14.5	7.7	< 0.5	80	3		0.00004	0.000037
5-Jun-10		< 0.05	103	53.1		3.3	3.1	7.93	6.2	68	2		0.000018	0.000052
8-Jul-10	61	< 0.05	125	62.4		3.4	3.3	7.94	8.4	76	3		0.000013	0.000021
3-Aug-10	93	< 0.05	188	85.1		2.2	2.3	7.46	9.1	100	< 1		0.00001	0.000009
1-Sep-10		0.15	187	93.1	0.04	2.4	2.2	7.79	11	110		0.6	0.000009	0.000022
19-Oct-10	96	0.029	207	110	0.13	2.5	1.5	7.65	15	130	< 1	1.1	0.000015	0.000028
10-Nov-10	110	0.009	234	129	0.19	1.7	2.7	7.86	19	140	< 1	0.63	0.000017	0.000032
1-Dec-10	120	< 0.05	350	132	0.2		1.1	7.58	19	140	< 4	0.84	0.000013	0.000017
20-Jan-11		< 0.005	280	157	0.25	0.9	0.9	7.78	20	160	< 1	0.8	0.00001	0.00001
15-Feb-11	130	0.028	306	130	0.23	1	1.1	7.92		150	< 1	0.53	0.000012	0.000015
16-Mar-11	140	0.015	300	151	0.26	1.3	1.1	8.05	16	180	< 1	0.47	0.00001	0.000009
12-Apr-11		0.014	292	165	0.23	1.6	1.3	7.69	15	160	< 1	0.44	0.000017	0.000023
9-May-11	93	0.022	206	94	0.08	10.6	10.4	7.67		120	3	2.01	0.000123	0.000124
22-Jun-11	43	0.034	92	46.8	< 0.02		5.4	7.73	6.1	68	6	1.12	0.000026	0.00009
21-Jul-11	57	0.076	132	61.3	< 0.02	4.8	4.8	7.11	7.1	90	2	1.04		0.00002
23-Aug-11	64	0.024	188	68.9	< 0.02	3.7	3.6	8.15	8		< 1	0.51	0.000009	0.000045
22-Sep-11	77	0.064	208	82.2	< 0.02	2.6	2.5		9.4	110	< 1	0.53	0.000012	
19-Oct-11	93		180	104	0.1	1.9		7.5	14.8	110	< 1	0.52	0.000013	0.000014
16-Nov-11	103	0.049		113	0.185	3.14	5.15	7.82	16.7	144	1.1	0.59	0.000015	0.000024
6-Dec-11	109	0.033	239	117	0.185	1.53			16.9	126	< 1	0.84	0.000013	0.00001
9-Jan-12	117	0.04	305	128	0.185		1.3	8.13	18.9		< 1	0.88	0.000013	0.000018
14-Feb-12	125	0.024	270	145	0.291	1.36	0.97	7.22	19.5	142	< 1	0.83	0.000018	0.000019
6-Mar-12	127	0.025	262	154	0.291	1.83	1.43	7.65	19	172	< 1	0.82	0.000019	0.000021
19-Apr-12			300					7.65				1.12		
17-May-12	84.7		189	90.9	0.085	7.37	8.27	7.56	11.5	128	1.6		0.0000515	0.0000466
12-Jun-12	29.9	0.046	60	32.9	< 0.02	6.61	6.55	7.66	6.8	38	13.8		0.0000435	0.000036
11-Jul-12	48.3	0.026	99	52.8	< 0.02		5.43	7.22	5.42	66	12.3	2.71	0.0000218	0.0000331
8-Aug-12	79.2	0.016	150	88.5	0.027	2.67	2.76	7.89	9.76	100	< 1	0.78	0.000016	0.000013
5-Sep-12	77.2	0.0087	157	87.9	0.03	3.03	2.93	7.62	11	102	< 1		0.000012	0.000011
9-Oct-12	76.8	0.0055	172	82.7	0.041	3.42	2.82	8.01	10.6	104	1.2		0.000012	0.000013
6-Nov-12	106	0.013	229	118	0.151	2.44	1.57		16.6	144		0.59	0.000025	0.000023
5-Dec-12	129	0.022	253	148	0.248	1.98	2.07	7.51	19.7	156	< 1	0.7	0.000011	0.000012
7-Jan-13	126	0.0067	270	135	0.255	1.53	1.75	7.21	17.9	161	< 1	0.67	0.000013	0.000011
6-Feb-13	126	0.018	293	141	0.277	1.24	1.65	7.59	19.1	156	< 1	0.53	0.000011	0.000014
5-Mar-13	129		357	146	0.257	1.37	1.82	7.5	17.7	170	< 1	0.57	0.000011	0.000013
3-Apr-13	136	0.015	263	153	0.267	1.19	1.7	7.41	20.6	178	< 1	0.63	0.000015	0.00001
7-May-13	118	0.019	239	132	0.219	1.99	2.85	7.2	18.2	138	< 1	1.26	0.000096	0.000101
11-Jun-13	32.6	0.0083	108	38	< 0.05	4.88	5.19	7.73	4.92	48	13.5	2.2	0.000031	0.000028
8-Jul-13	96.3	0.009	158	73.9	< 0.2	2.65	3	7.83	9.88	102	5.5	0.89	0.000015	0.00003
6-Aug-13	82.8	0.0063	195	91.4	< 2	2.49	2.62	7.46	11.7	102	1.4	0.69	0.000015	0.000014
12-Sep-13	63.8	0.013	138	69.9	< 2	2.96	3.83	7.88	9.39	94	3.4	0.74	0.000013	0.00001
8-Oct-13			150					7.49						
5-Nov-13	94.1	0.0099	207	110	< 2	2.07	2.15	7.51	15.2	150	1.7	0.91	0.000016	0.000014
7-Nov-13	92.6	0.015		113	< 2	2.46	1.92		15.4	140	< 1		0.000015	0.000014
12-Nov-13												0.94		
14-Nov-13												0.77		

Table C.11: Water quality data and summary statistics for mine exposed station R10, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
11-Jan-10	43.1	0.000044	0.1	0.000227	9.24	0.0195		1	< 0.000005	3.15	0.174	0.00251	0.0069	0.0062
23-Feb-10	44.6	0.000042	0.078	0.000071	9.55		0.00027	1.05	< 0.000005	3.39	0.187	0.00285	0.0074	0.0069
10-Mar-10		0.000039	0.075	0.000837	8.96	0.0132	0.0003	1.05	< 0.000005	3.3	0.19	0.00302	0.0122	0.0126
11-Apr-10	39.3	0.000318	0.099	0.00047	7.85	0.0369	0.00053	1	< 0.000005	2.99	0.187	0.00297	0.0198	0.0218
3-May-10	17.9		0.36	0.00147	3.35	0.0324	0.00149	1.36	< 0.000005	1.43	0.0773	0.000699	0.0114	0.0101
5-Jun-10	15	0.000058	0.145	0.00101	3.55		0.00056	0.52	< 0.000005	1.59	0.061	0.000592	0.0066	0.0087
8-Jul-10	18.1	0.000048	0.147	0.000302	4.19	0.0146	0.00038		< 0.000005	1.65	0.0806	0.000726	0.004	0.0095
3-Aug-10	26.6	0.000042	0.152	0.000388	5.83	0.0139	0.00098	0.61		2.09		0.00115	0.0068	0.0043
1-Sep-10	26.3	0.000043	0.18	0.000116		0.0169	0.00031	0.58	< 0.000005	2.05	0.118	0.00119	0.0034	0.0173
19-Oct-10	31.8		0.176	0.000385	7.11	0.0213	0.00038	0.75	< 0.000005	2.48	0.133		0.006	0.0086
10-Nov-10	38	0.000035	0.109	0.0002	8.36	0.0166	0.00038	0.87	< 0.000005	2.79	0.16	0.00197	0.0161	0.0268
1-Dec-10	37		0.136	0.000174	8.22	0.0208		0.88	< 0.000005	2.76	0.157	0.00191	0.0052	0.0051
20-Jan-11	40.1		0.094	0.000092	8.22	0.0151	0.00026	0.97	< 0.000005	2.7	0.189		0.0049	
15-Feb-11	37.4		0.08	0.000147	8.95	0.0125	0.0003	1.05	< 0.000005	3.17	0.184	0.00266	0.0071	0.0071
16-Mar-11	42.8	0.000047	0.067	0.000207		0.015		1.2	< 0.000005	3.71	0.204	0.00303	0.0099	0.0092
12-Apr-11	41.1	0.000071		0.000207	9.17	0.0157	0.00038	1.08	< 0.000005	3.31	0.183	0.00258	0.0097	0.0123
9-May-11	28.8	0.000303	0.494	0.00243	5.9	0.0403	0.00101	1.82	0.000007	2.12	0.127	0.00135	0.0798	0.0784
22-Jun-11	13.8	0.000088	0.179	0.00131	2.97	0.0144	0.0008	0.4	< 0.000005	1.24	0.0609	0.000466	0.0039	0.0095
21-Jul-11	18.2	0.000085	0.154		3.83		0.00053	0.37	< 0.000005	1.49	0.0735	0.000588	0.0064	0.0087
23-Aug-11	20.5	0.000053	0.133	0.000392	4.28	0.0172	0.00048	0.44	< 0.000005	1.72	0.086	0.000717	0.006	
22-Sep-11	24	0.000055	0.151	0.000233	5.17			0.63	< 0.000005	1.89	0.1		0.0047	0.0041
19-Oct-11		0.000047	0.148	0.000077	6.15	0.0245	0.00035	0.69	< 0.000005	2.29		0.00156	0.0069	0.0065
16-Nov-11	33.4	0.000052	0.116	0.000378	7.29	0.0185	0.00085	0.8	< 0.000005	2.56	0.142	0.00178	0.0082	0.0101
6-Dec-11	35.1		0.162	0.0001	7.21	0.0223	0.00033	0.84	< 0.000005	2.51	0.146		0.0057	0.0048
9-Jan-12	38.7	0.000032	0.137	0.000052	7.73	0.0167	0.0003	0.89		2.74	0.158	0.00196	0.0063	0.0081
14-Feb-12	42.6	0.000033	0.108	0.000093	8.57	0.0159	0.00034	1.06	< 0.000005	3.01	0.17	0.00228		0.0105
6-Mar-12	43.3	0.000051	0.098	0.000406	9.21	0.0156	0.00035	1.11	< 0.000005	3.31	0.182	0.0025		0.0099
19-Apr-12														
17-May-12	27.4	0.0000976	0.371	0.00248	5.49	0.0207	0.000922	1.3	0.0000053		0.114	0.00129		0.0143
12-Jun-12	9.93	0.000206		0.00223	2.07	0.0191	0.00104	0.627	0.0000134	1.07	0.0413	0.000304	0.0106	0.00966
11-Jul-12	15.3		0.304	0.000912	3.36		0.000987	0.365	< 0.000005	1.38	0.0644	0.00052	0.00495	0.0148
8-Aug-12	26.5	0.000061	0.177	0.000325	5.43	0.0239	0.000436	0.562	< 0.000005	1.94	0.109	0.00104	0.00449	
5-Sep-12	26.9	0.000048	0.173	0.000281	5.02	0.0245	0.000426	0.616	< 0.000005	1.99	0.102			0.00602
9-Oct-12	24.8	0.000039	0.156	0.000188	5.02	0.0232	0.000482	0.634	< 0.000005	1.9	0.104			0.00631
6-Nov-12	34.8	0.000092	0.135	0.000454	7.62	0.0323	0.000441	0.806	< 0.000005	2.57	0.143	0.00184	0.0122	0.0142
5-Dec-12	40.5	0.000052	0.128	0.000127	9.08	0.0295	0.000409	1.02	< 0.000005	3.06	0.18	0.00254	0.00613	0.00542
7-Jan-13	39.3	0.000053	0.108	0.00006	8.95	0.0217	0.000284	1.01	< 0.000005	3.12	0.169	0.00245	0.0084	0.00878
6-Feb-13	41.7	0.000041	0.109	0.000069	8.54	0.0196	0.000323	1.02	< 0.000005	3.01	0.175	0.00251	0.00964	0.0106
5-Mar-13	43.6	0.000041	0.103	0.000106	8.95	0.0179	0.000318	1.22	< 0.000005	3.15	0.188	0.00248	0.00725	0.00705
3-Apr-13	45.9	0.000046	0.0889	0.00007	9.3	0.017	0.000293	1.25	< 0.000005	3.27	0.204	0.00298	0.008	0.00752
7-May-13	38.9	0.000168	0.196	0.000274	8.39	0.0186	0.000601	1.37	< 0.000005	3	0.172	0.0024	0.0532	0.0613
11-Jun-13	10.9	0.000163	0.286	0.00158	2.39	0.0228	0.000857	0.595	< 0.000005	1.04	0.0475	0.000512	0.00677	0.0228
8-Jul-13	21.3	0.000068	0.168	0.000348	5.01	0.0184	0.000456	0.452	< 0.000005	1.55	0.0848	0.000848	0.00381	0.0301
6-Aug-13	27.1	0.000054	0.206	0.000158	5.75	0.0217	0.000442	0.583	< 0.000005	2.03	0.109	0.00108	0.00691	0.00539
12-Sep-13	19.8	0.000065	0.216	0.000343	4.13	0.0246	0.000495	0.547	< 0.000005	1.85	0.083	0.000818	0.00388	0.00432
8-Oct-13														
5-Nov-13	33	0.000061	0.151	0.000176	6.65	0.0258	0.000439	0.807	< 0.000005	2.43	0.133	0.00157	0.00821	0.00802
7-Nov-13	32.9	0.000063	0.181	0.000239	7.49	0.0257	0.00047	0.838	< 0.000005	2.62	0.138	0.00157	0.00913	0.00963
12-Nov-13														
14-Nov-13														

Table C.11: Water quality data and summary statistics for mine exposed station R10, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
19-Nov-13	104	0.025		109	< 2	1.64	1.91		20.1	128	< 1		0.000022	0.000165
21-Nov-13	104	0.022		127	< 2	2.36	2.39		19.9	122	< 1		0.000021	0.000019
25-Nov-13												1.57		
26-Nov-13												1.82		
28-Nov-13												2.05		
17-Dec-13	108	0.024	328	122	< 2	2.08	2.87	7.46	19.8	138	< 1	1.01	0.000016	0.000013
27-Dec-13												1.2		
9-Jan-14	120	0.02	294	133	< 2	2.07	2.22	7.88	20.7	162	< 1	1.09	0.000017	0.000016
14-Jan-14												25.1		
6-Feb-14	124	0.011	251	137	< 2	1.68	3.15	7.58	26.5	160	1.1	1.19	0.000014	0.000012
10-Mar-14	135	0.011	329	158	< 2	1.22	1.76	7.4	25.1	176	< 1	0.67	0.000014	0.000017
2-Apr-14	133	0.0066	292	150	< 2	1.21	1.12	7.08	23.5	176	< 1	0.74	0.000013	0.000013
1-May-14	91.3	0.022	212	106	< 2	7.37	7.25	7.37	14.4	186	2.1	1.92	0.000117	0.000116
3-Jun-14	48.5	0.011	92	53.7	0.031	3.92	3.73	7.38	7.7	62	< 4	1.09	0.000017	0.000013
7-Jul-14	67.8	0.011	154	69.5	< 0.02	2.89	2.23	7.97	11.4	108	1.4	0.56	0.000014	0.000027
11-Aug-14	85.6	0.013	197	97.9	0.047	2.12	4.52	7.76	13.3	122	< 1	0.55	0.000013	0.000052
15-Sep-14	71.5	0.012	156	81.7	0.028	2.1	2.94	7.96	10.2	96	1.2	0.48	0.000011	0.00001
15-Oct-14			179					7.13						
n	54	55	57	58	38	54	56	55	56	56	56	51	56	57
minimum	29.9	<0.005	60	32.9	<0.02	0.9	0.9	7.06	<0.5	38	<1	0.44	0.000009	<0.000005
maximum	140	0.15	357	165	0.291	14.7	14.5	8.15	26.5	190	13.8	25.1	0.000123	0.000165
median	100	0.018	208	112	<0.14	2.11	2.395	7.65	15.3	134	<1	0.82	0.0000150	0.000017
mean [a]	98	0.023	214	108	0.13	2.9	3.1	7.63	14.6	129	2	1.43	0.0000218	0.000029
standard deviation (SD) [a]	31	0.023	73	36	0.10	2.4	2.5	0.28	5.7	39	3	3.42	0.0000233	0.000031
max detection limit	-	0.05	-	-	2	-	-	-	0.5	-	4	-	-	0.000005
# < detection limit	-	8	-	-	21	-	-	-	1	-	36	-	-	1
% < detection limit	-	15%	-	-	55%	-	-	-	2%	-	64%	-	-	2%
upper background (BG) benchmark	134.6	0.056	278	141	0.19	14.2	11.9	8.4	17.8	170	13	2.87	0.000105	0.000044
% samples > upper BG benchmark	11%	5%	23%	24%	37%	2%	2%	0%	39%	16%	4%	2%	4%	16%
lower background (BG) benchmark	10.5	-	-	-	-	0.8	0.8	7.2	-	-	-	-	-	-
% samples < lower BG benchmark	0%	-	-	-	-	0%	0%	7%	-	-	-	-	-	-
background median	43.6	0.014	126	51.2	0.03	2.3	2.3	7.78	8.3	68	<1	0.62	0.000010	0.000010
station median > BG median	1	1	1	1	1	0	1	0	1	1	0	1	1	1
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	218	-	-	-	0.000173	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	0	-	-	0	-	-	0	0	-	-	-	0	-
% > current water quality criterion	-	0%	-	-	0%	-	-	0%	0%	-	-	-	0%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.11: Water quality data and summary statistics for mine exposed station R10, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
19-Nov-13	31.4	0.000063	0.121	0.00025	7.42	0.0263	0.000455	0.813	< 0.000005	2.59	0.148	0.00178	0.0149	0.0158
21-Nov-13	37.6	0.000052	0.121	0.000165	8.07	0.0264	0.000448	0.904	< 0.000005	2.85	0.156	0.00175	0.0139	0.0136
25-Nov-13														
26-Nov-13														
28-Nov-13														
17-Dec-13	36.2	0.000047	0.169	0.000139	7.74	0.0304	0.000413	0.852	< 0.000005	2.72	0.154	0.00199	0.00847	0.00771
27-Dec-13														
9-Jan-14	39.1	0.000056	0.151	0.000062	8.68	0.0277	0.000322	0.909	< 0.000005	2.92	0.17	0.00216	0.0101	0.0107
14-Jan-14														
6-Feb-14	40.6	0.00006	0.174	0.000191	8.65	0.0273	0.000381	1.01	< 0.000005	2.98	0.18	0.00227	0.0114	0.0109
10-Mar-14	46.6	0.000047	0.118	0.000057	10	0.0253	0.000309	1.26	< 0.000005	3.68	0.211	0.00305	0.00623	0.0133
2-Apr-14	44.1	0.000053	0.122	0.000058	9.54	0.0207	0.00033	1.17	< 0.000005	3.32	0.193	0.00271	0.009	0.00916
1-May-14	31.3	0.000182	0.447	0.000796	6.81	0.0293	0.000898	1.66	< 0.000005	2.4	0.14	0.00165	0.0712	0.071
3-Jun-14	15.5	0.000118	0.151	0.000943	3.63	0.0218	0.000601	0.556	< 0.000005	1.45	0.066	0.000623	0.00515	0.00501
7-Jul-14	20.6	0.000052	0.154	0.000491	4.36	0.0186	0.000405	0.479	< 0.000005	1.7	0.0875	0.000747	0.00382	0.012
11-Aug-14	29	0.000042	0.185	0.000445	6.17	0.0212	0.000413	0.655	< 0.000005	2.21	0.122	0.00107	0.00461	0.0249
15-Sep-14	24.5	0.000047	0.17	0.000286	5.02	0.0245	0.00039	0.591	< 0.000005	2.09	0.0967	0.000879	0.0034	0.00521
15-Oct-14														
n	56	51	56	57	56	53	54	57	56	57	56	52	53	55
minimum	9.93	0.000032	0.067	0.000052	2.07	0.0125	0.00026	0.365	<0.000005	1.04	0.0413	0.000304	0.0034	0.0041
maximum	46.6	0.000318	0.494	0.00248	10	0.0403	0.00149	1.82	0.0000134	3.71	0.211	0.00305	0.0798	0.0784
median	32.95	0.0000530	0.15	0.000239	7.25	0.0212	0.00042	0.85	<0.000005	2.56	0.143	0.00177	0.0069	0.0095
mean [a]	31.3	0.000075	0.16	0.000457	6.71	0.0218	0.00051	0.87	0.000003	2.44	0.136	0.00170	0.011	0.014
standard deviation (SD) [a]	10.2	0.000061	0.09	0.00058	2.17	0.00605	0.00026	0.32	0.000002	0.70	0.046	0.000842	0.015	0.015
max detection limit	-	0	0	0	-	-	0	-	0.000005	-	-	-	0	0
# < detection limit	-	0	0	0	-	-	0	-	53	-	-	-	0	0
% < detection limit	-	0%	0%	0%	-	-	0%	-	95%	-	-	-	0%	0%
upper background (BG) benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
% samples > upper BG benchmark	18%	6%	2%	5%	14%	0%	4%	7%	0%	19%	25%	17%	13%	15%
lower background (BG) benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% samples < lower BG benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
background median	15.6	0.0000350	0.1115	0.000144	2.67	0.00855	0.00030	0.57	<0.000005	1.9	0.0728	0.000761	0.0017	0.0022
station median > BG median	1	1	1	1	1	1	1	1	0	1	1	1	1	1
current water quality criterion [b]	-	0.0025	1	0.007	-	1.096	0.104	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	0	0	0	-	0	0	0	0	-	-	0	3	-
% > current water quality criterion	-	0%	0%	0%	-	0%	0%	0%	0%	-	-	0%	6%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.12: Water quality data and summary statistics for mine exposed station NF1, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
23-Feb-10	140	0.02	240	160			1.8	7.77	19	240	12		0.000041	0.000033
10-Mar-10	140	< 0.01	269	155		1	1.1	7.84	20	180	< 1		0.00002	0.000009
11-Apr-10		0.04	260	168		3.2	3.2	7.37	20	170			0.000065	0.000032
3-May-10	49	< 0.005	90	53.3		13.5	13.3	7.43	0.8	74	2		0.000043	0.000038
5-Jun-10	46	< 0.05		53.6		3.1	3.2	7.84	6.1	70	2			0.00005
8-Jul-10	64	< 0.05	129	68.8		3.4	3.4	7.71	8	80			0.000021	0.000018
3-Aug-10	140	< 0.05	421	176		4.1	5.4		48	230	7		0.000203	0.000367
5-Nov-13	347	0.23		517	< 2	3.91	9.72		229	788	755		0.00379	0.00184
7-Nov-13	113	0.029		166	< 2	2.28	3.34		44.5	204	188		0.000591	0.000152
14-Jan-14												16.71		
n	8	9	6	9	0	8	9	6	9	9	7	1	8	9
minimum	46	<0.005	90	53.3	-	<1.0	1.1	7.37	0.8	70	<1	16.71	0.00002	0.000009
maximum	347	0.23	421	517	-	13.5	13.3	7.84	229	788	755	16.71	0.00379	0.00184
median	127	<0.040	250	160	-	3.3	3.34	7.7	20	180	7	16.71	0.0000540	0.000038
mean [a]	130	0.045	235	169	-	4.3	4.9	7.7	44	226	138	16.71	0.0005968	0.000282
standard deviation (SD) [a]	97	0.070	117	141	-	3.8	4.0	0.2	71	221	281	-	0.0013046	0.000595
max detection limit	-	0.05	-	-	-	0	-	-	-	-	1	-	-	0
# < detection limit	-	5	-	-	-	0	-	-	-	-	1	-	-	0
% < detection limit	-	56%	-	-	-	0%	-	-	-	-	14%	-	-	0%
upper background (BG) benchmark	134.6	0.056	278	141	0.19	14.2	11.9	8.4	17.8	170	13	2.87	0.000105	0.000044
% samples > upper BG benchmark	50%	11%	17%	67%	-	0%	11%	0%	67%	56%	29%	100%	38%	44%
lower background (BG) benchmark	10.5	-	-	-	-	0.8	0.8	7.2	-	-	-	-	-	-
% samples < lower BG benchmark	0%	-	-	-	-	0%	0%	0%	-	-	-	-	-	-
background median	43.6	0.014	126	51.2	0.03	2.3	2.3	7.78	8.3	68	<1	0.62	0.000010	0.000010
station median > BG median	1	1	1	1	-	1	1	0	1	1	1	-	1	1
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	218	-	-	-	0.000234	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	1	-	-	-	-	-	0	1	-	-	-	2	-
% > current water quality criterion	-	11%	-	-	-	-	-	0%	11%	-	-	-	25%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.12: Water quality data and summary statistics for mine exposed station NF1, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
23-Feb-10	47.4	0.000367	0.44	0.00149	10.1	0.0769	0.00075	1.21	< 0.000005	3.63	0.197	0.00293	0.0212	0.0171
10-Mar-10	46.3	0.000263	0.084	0.000128	9.47	0.0343	0.00047	1.11	< 0.000005		0.194	0.00299	0.0172	0.0178
11-Apr-10	42.9	0.000556	0.161	0.00175	8.76	0.111	0.00069	1.24	< 0.000005	3.34	0.201	0.00303	0.0282	0.0237
3-May-10	16.2		0.348	0.00173	3.1	0.0381		1.31	< 0.000005	1.27	0.0729	0.000641	0.0113	0.0142
5-Jun-10	15.5	0.000093	0.172		3.63		0.00102	0.55	< 0.000005	1.63	0.0605	0.000565	0.006	0.006
8-Jul-10	18.6	0.00008	0.151	0.000878	4.34	0.024	0.00048	0.48	< 0.000005		0.0807	0.000691	0.0068	0.0069
3-Aug-10	50.5	0.00317	3.29	0.00587	12.2	1.04	0.00842	1.34		3.52	0.222	0.00159	0.262	
5-Nov-13	137	0.125	35.2	0.0767	42.8	7.47	0.0748	4.05	0.000024	12.4	0.716	0.00413	2.73	2.2
7-Nov-13	46.1	0.00375	3.79	0.0599	12.4	0.466	0.011	1.38	0.000041	3.4	0.194	0.00257	0.458	0.338
14-Jan-14														
n	9	8	9	8	9	8	8	9	8	7	9	9	9	8
minimum	15.5	0.00008	0.084	0.000128	3.1	0.024	0.00047	0.48	<0.000005	1.27	0.0605	0.000565	0.006	0.006
maximum	137	0.125	35.2	0.0767	42.8	7.47	0.0748	4.05	0.000041	12.4	0.716	0.00413	2.73	2.2
median	46.1	0.000462	0.35	0.00174	9.47	0.0940	0.00089	1.24	<0.000005	3.4	0.194	0.00257	0.021	0.017
mean [a]	46.7	0.016660	4.85	0.01856	11.87	1.158	0.0122	1.41	0.000010	4.17	0.215	0.00213	0.393	0.328
standard deviation (SD) [a]	36.9	0.04380	11.47	0.03108	12.13	2.575	0.0256	1.05	0.000015	3.75	0.198	0.001295	0.890	0.765
max detection limit	-	0	-	0	-	-	0	-	0.000005	-	-	0	-	-
# < detection limit	-	0	-	0	-	-	0	-	6	-	-	0	-	-
% < detection limit	-	0%	-	0%	-	-	0%	-	75%	-	-	0%	-	-
upper background (BG) benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
% samples > upper BG benchmark	67%	75%	33%	38%	56%	63%	38%	33%	25%	71%	67%	56%	67%	38%
lower background (BG) benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% samples < lower BG benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
background median	15.6	0.0000350	0.1115	0.000144	2.67	0.00855	0.00030	0.57	<0.000005	1.9	0.0728	0.000761	0.0017	0.0022
station median > BG median	1	1	1	1	1	1	1	1	0	1	1	1	1	1
current water quality criterion [b]	-	0.0025	1	0.009	-	1.309	0.137	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	3	3	2	-	1	0	0	0	-	-	0	3	-
% > current water quality criterion	-	38%	33%	25%	-	13%	0%	0%	0%	-	-	0%	33%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.13: Water quality data and summary statistics for mine exposed station NF2, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	pH units	mg/L	mg/L	mg/L	NTU	mg/L	mg/L
12-Jan-10	130	< 0.01	266	147		1.5	0.9		22	190	< 1		0.000008	0.000013
23-Feb-10	140	< 0.01	230	158		2	1.9	7.71	19	160	< 1		0.000017	0.000012
10-Mar-10	140		267	149		1.1	1.2	7.62	20	180	< 1		0.000009	0.000008
14-Apr-10	150	< 0.01	270	153		1.8	1.4	7.48	21		< 1		0.000018	0.000017
3-May-10	52	< 0.005	97	57.1			13.9	7.29	< 0.5	88	3		0.000091	0.000041
4-Jun-10	42	< 0.05	81	48		3	3.2	7.86		56	4		0.000024	0.000046
8-Jul-10	65	< 0.05	154	65.1			3.6	8.18	9	78	3		0.000018	0.00001
3-Aug-10	93	< 0.05	193	88.9		2.3	2.1	7.5	10	110			0.000026	0.000009
1-Sep-10	89	0.16	222	95.9	0.05	2.6		8.1	12	120	< 1	0.7	0.00001	0.000012
18-Oct-10	96	< 0.005	200	111	0.14	1.5	1.8	7.46	15	130	< 1	1.1	0.000013	0.000014
9-Nov-10	110	0.019	252	122	0.19	< 0.5	1.5		21	170	< 4	0.83	0.000042	0.000021
1-Dec-10		0.14	120	131	0.21	1.4	1.3	7.41	20	150	< 4	0.82	0.000018	0.000015
19-Jan-11	130	< 0.05	220	156	0.3	1.2	1.1	7.91		180	< 1		0.000016	0.000008
2-Feb-11	140	< 0.05	302	144	0.24	1	1.4	7.78	19	150	< 1	0.83	0.000014	0.000019
16-Mar-11	160	0.016	300	188	0.56	1.5	1.3	7.68	38	220	< 1	0.82	0.000078	0.000138
13-Apr-11		0.014	316	161	0.22	2.5	1.5	7.73	17	170	< 1	0.69	0.000033	0.000036
12-May-11	89	0.036	227	90.5	0.28	9.9	9.8	8.1	16	140	< 1	1.67	0.000127	
20-Jun-11	48	0.015	103	49.8		3.2	3.2	6.19	6.9	72	6		0.000033	0.000017
21-Jul-11	56	0.072	118	63.1	< 0.02	4.5	4.5		7.8	88	< 1	0.7	0.000025	0.000018
25-Aug-11	66		136	70.7	< 0.02	2.9	4.2	7.48		100	< 1	0.49	0.000017	0.000016
21-Sep-11	80	0.058	184	90	< 0.02	2.7	2.2		12	120	< 1	0.85	0.000018	0.000024
20-Oct-11	100	0.028	210	113	0.13	2.1	2	7.14	19.1	120		2.63	0.000071	0.00002
14-Nov-11	107	0.027	203	112	0.194		2.87	7.54	20.4	148	1.6	0.81	0.000046	0.000023
5-Dec-11	109	0.039	250	121	0.192	2.89	1.65		17.2		< 1	0.89	0.000037	0.000014
4-Jan-12		0.015	302	133	0.204	1.9	1.68	7.58	18.5	158	< 1	0.83	0.000031	0.000017
13-Feb-12		0.025	310	147	0.28	1.91	1.25	7.93	20.2	182	< 1	0.88	0.000019	0.000028
6-Mar-12	127	0.013	254	147	0.292	1.99	1.45	7.4	21.6	172	< 1	0.8		0.00002
18-Apr-12			310					7.42				1.07		
16-May-12	90.7	0.031	216	98.1	0.098	6.69	7.07	7.85	13.4	134	2		0.0000523	0.0000498
12-Jun-12	28.6	0.11	63	31.7		6.09	5.71	7.39	3.75	40	3.4		0.0000291	0.0000253
12-Jul-12	47.8	0.026	96	53.4	< 0.02	5.65	5.87	7	6.69		4.5	1.98	0.0000292	0.0000162
8-Aug-12	80.2		160	92.2	0.041	2.73	2.81	7.64	11.5	110	< 1	0.58	0.000014	0.000011
5-Sep-12			233	86.1	0.04	2.9	2.97	7.35	15.9	100	< 1	0.45	0.000012	
11-Oct-12		0.01		91.8	0.079	1.95	2.26	7.49	15.6	130	1.2	0.57		0.000031
13-Nov-12	104	0.014	226	114	0.248	1.99	1.28	7.96	16.7	154	2.8	1.08	0.000027	0.000026
12-Dec-12	123	0.017	251	131		1.42	1.48	7.68	18.5	148	< 1	0.88	0.000016	0.000013
9-Jan-13	125	0.0092	298	139	0.26	1.15	1.37	7.69	20	198	< 1	0.74	0.000014	0.000016
5-Feb-13	126	0.015	313	139	0.241	1.36	1.41	7.96	19.1	164	< 1	0.83	0.000018	0.000017
6-Mar-13	131	0.024	315	140	0.258	1.16	2.51	7.59	19.5	178	< 2	0.65	0.000013	0.00002
4-Apr-13	138	0.014	296	158	0.26	1.58	1.75	7.48	21.7	200	< 1	0.79	0.000014	0.000012
8-May-13	124	0.014	122	135	0.22	1.58	2.26	7.01	19.7	150	< 1	1.46	0.000064	0.00007
11-Jun-13	32.4	0.011	95	36.3	< 0.2	4.6	5	7.6	3.38	50	3.7	2.21	0.00002	0.000018
10-Jul-13	73.8	0.0077	166	78.3	0.042	2.54	2.79	7.68	13.4	116	3.3	0.97	0.000023	0.000025
6-Aug-13	86.6	0.02	190	95.5	< 2	2.56	2.72	7.34	15.1	104	< 1	0.89	0.000034	0.000036
12-Sep-13	63.8	0.014	151	74.5	< 2	3.44	3.61	7.79	10.3	88	2.1	0.63	0.000023	0.000018
2-Oct-13			162					7.32						
5-Nov-13	97.7	0.02	276	124	< 2	1.9	2.19	7.04	28.6	150	4.9	0.86	0.000445	0.000431
7-Nov-13	95.7	0.018		122	< 2	1.57	1.67		28.5	166	4.1		0.000406	0.000354
12-Nov-13												1.82		
14-Nov-13												1.45		

Table C.13: Water quality data and summary statistics for mine exposed station NF2, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
12-Jan-10		0.000073	0.082	0.000266	9.28	0.0161	0.00041	1.01	< 0.000005	3.2	0.177	0.00252	0.0095	0.0095
23-Feb-10	46.9	0.000094	0.064	0.000147	9.95	0.0152	0.00039	1.1		3.52	0.198		0.0122	0.0118
10-Mar-10	43.8	0.000118	0.08		9.08		0.00038	1.05	< 0.000005	3.27	0.185	0.00293	0.0128	0.0131
14-Apr-10		0.000142	0.069	0.000321	8.43	0.0194	0.0005	1.04			0.196	0.00299		0.0172
3-May-10	17.3	0.000199	0.378	0.0038	3.35	0.032	0.00147	1.37	< 0.000005	3.07	0.0758	0.000625	0.0412	0.0136
4-Jun-10	13.7	0.000088	0.181	0.00169	3.26	0.0175	0.00095	0.54		1.54	0.0558	0.000497	0.0065	
8-Jul-10		0.000073	0.152	0.00129	4.4	0.0176	0.00046	0.48	< 0.000005	1.71		0.000729	0.0058	0.0045
3-Aug-10	26.1	0.000158	0.275	0.00479	5.8	0.0437	0.00057	0.65		2.1	0.116		0.0097	0.007
1-Sep-10	28		0.181	0.000292	5.86	0.026		0.62	< 0.000005	2.15	0.121		0.0077	0.0092
18-Oct-10	32.6	0.000116	0.209	0.000739	7.1	0.0434	0.00044	0.75	< 0.000005	2.5		0.00152	0.0099	
9-Nov-10	36.3	0.000252	0.228	0.00118	7.64	0.0762	0.0009	0.82	< 0.000005	2.57	0.157	0.00194	0.051	0.0247
1-Dec-10	38.1	0.000139	0.143	0.000379	8.31	0.0374	0.00047	0.91		2.83	0.163		0.0135	0.0159
19-Jan-11	40.6	0.0001	0.097	0.000206	8.88	0.0269		1.02		2.93	0.194	0.00265	0.0106	
2-Feb-11	42	0.000264	0.255	0.00047	9.42	0.0442	0.0007	1.09	< 0.000005	3.25	0.183	0.00263	0.0788	
16-Mar-11	54.6	0.000206	0.113	0.00129	12.7		0.00148	1.55	< 0.000005	5.59	0.239	0.00367	0.0218	0.0453
13-Apr-11	44	0.000094	0.109	0.000653	9.91	0.0429	0.00075	1.23	< 0.000005	3.72	0.206	0.00295	0.0332	0.0216
12-May-11	26.8		0.355	0.00213	5.75	0.0118	0.00138		< 0.000005	2.44	0.121		0.069	0.0687
20-Jun-11	13.8	0.000119	0.16	0.0021	3.36	0.0218	0.00058	0.42			0.0573	0.000523		0.0048
21-Jul-11	18.8	0.000086		0.00141	3.94	0.0146	0.0006	0.4	< 0.000005	1.54	0.0723	0.000561	0.009	0.014
25-Aug-11	21	0.000061	0.114	0.00113	4.45	0.0109	0.00052	0.47	< 0.000005	1.77		0.000708		
21-Sep-11	26.1		0.153	0.000342	5.13		0.00048	0.61	< 0.000005	1.89	0.109		0.007	0.033
20-Oct-11		0.000515	0.844	0.0216	6.81	0.158	0.00139	0.86	0.000029	2.52	0.142	0.0018	0.0356	0.0137
14-Nov-11	30.1	0.000175	0.181	0.00257	7.04	0.0545	0.0008	0.88	0.000006	2.47	0.148	0.00169	0.0248	0.0155
5-Dec-11	36	0.000097	0.167	0.00113	7.51	0.0307	0.00056	1.02	< 0.000005	2.84	0.147	0.00195	0.0151	0.0091
4-Jan-12	39.8		0.056	0.000308	8.25	0.0384		1.47	0.000021	3.05	0.161		0.0216	0.0098
13-Feb-12	43.6		0.132	0.000291	8.72		0.00037	1.08	< 0.000005	3.08	0.176		0.0134	0.0262
6-Mar-12	41.4	0.000149	0.117		9.6		0.00048	1.14	< 0.000005	3.39	0.186	0.0025	0.0168	0.0196
18-Apr-12														
16-May-12	29.4	0.000324	0.585	0.00159	5.98	0.0857	0.00103	1.34	0.0000065	2.1	0.122	0.00135	0.0234	0.0247
12-Jun-12	9.38	0.00012	0.188	0.00203	1.92	0.00917	0.00089	0.5	0.0000073	0.958	0.0407	0.000276	0.00821	
12-Jul-12	14.9	0.0001	0.194	0.0017	3.36	0.0119	0.000804	0.382	0.0000073		0.063	0.000494	0.0105	0.00793
8-Aug-12	26.1	0.000079	0.176	0.000642		0.0211	0.000859	0.569		1.96	0.11	0.00107	0.00626	0.00537
5-Sep-12	25.9	0.000063	0.161	0.000262	5.14	0.0202	0.000433	0.638	< 0.000005	2.09		0.001	0.006	0.00586
11-Oct-12	26.4	0.000212		0.000597	5.7	0.0742	0.000682	0.654	< 0.000005	2.08	0.113	0.00126	0.0165	0.0252
13-Nov-12	33.4	0.00016	0.221	0.00116	7.37	0.0529	0.000674	0.832	< 0.000005	2.55	0.149	0.00178	0.0162	0.0176
12-Dec-12	38.6	0.000071	0.121	0.000282	8.45	0.0299	0.00052	1.02	< 0.000005		0.172	0.00262	0.00952	0.0106
9-Jan-13	40.4	0.000148	0.125	0.000253	9.26	0.0321	0.000588	1.04	< 0.000005	3.2	0.174	0.00247	0.0207	0.0234
5-Feb-13	39.5	0.000136	0.115	0.000186	8.62	0.0329	0.000403	1.1	< 0.000005	3.03	0.178	0.0025	0.0167	0.0177
6-Mar-13	41.1	0.000112	0.125	0.00016	9.02	0.0319	0.000378	1.11	< 0.000005	3.33	0.188	0.00268	0.0119	0.0153
4-Apr-13	47.3	0.000118	0.129	0.000184	9.65	0.0384	0.00043	1.32	< 0.000005	3.44	0.21	0.00291	0.0131	0.012
8-May-13	38.3	0.00021	0.248	0.000494	8.64	0.0421	0.000679	1.41	< 0.000005	3.19	0.176	0.00246	0.0466	0.0665
11-Jun-13	10.6	0.000097	0.203	0.00136	2.36	0.00958	0.00079	0.606	< 0.000005	1.06	0.0457	0.000426	0.00563	0.00755
10-Jul-13	21.7	0.000243	0.18	0.000635	5.8	0.0247	0.00115	0.525	< 0.000005	1.88	0.0945	0.000953	0.0294	0.0317
6-Aug-13	27.4	0.000419	0.248	0.00187	6.55	0.0423	0.00171	0.652	< 0.000005	2.24	0.111	0.00109	0.0728	0.0817
12-Sep-13	21.4	0.000271	0.184	0.000578	4.32	0.0277	0.000979	0.588	< 0.000005	1.96	0.0894	0.000768	0.0522	0.0473
2-Oct-13														
5-Nov-13	35.1	0.00409	0.506	0.00676	8.81	0.262	0.00662	0.85	< 0.000005	2.59	0.146	0.00161	0.907	0.918
7-Nov-13	33.2	0.00373	0.536	0.00954	9.46	0.234	0.00594	0.903	0.000009	2.79	0.141	0.00167	0.757	0.718
12-Nov-13														
14-Nov-13														

Table C.13: Water quality data and summary statistics for mine exposed station NF2, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
19-Nov-13	105	0.028		118	< 2	1.83	2.83		21.5	140	3		0.000074	0.000069
21-Nov-13	105	0.018		128	< 2	2.1	2.3		21.2	118	1.6		0.000083	0.000078
25-Nov-13												2.12		
26-Nov-13												2.19		
28-Nov-13												2.6		
4-Dec-13	112	0.018	244	129	< 2	1.82	2.16	6.98	26.1	166	1.5	1.24	0.000407	0.00033
27-Dec-13												1.17		
8-Jan-14	116	0.015	283	144	< 2	1.93	1.98	7.23	34.3	212	< 1	1.26	0.000602	0.000787
14-Jan-14												19.34		
5-Feb-14	124	0.014	305	147	< 2	2.09	2.49	6.97	33.3	180	< 1	1.4	0.000548	0.000537
5-Mar-14	135	0.022	323	166	< 2	1.84	2.09	6.82	42.3	202	1.3	1.56	0.000686	0.000685
2-Apr-14	137	0.017	347	163	< 2	1.33	1.48	7.21	37.1	214	< 1	1.01	0.000711	0.000697
8-May-14	26.2	0.015	101	42.1	< 2	16.5	14.7	7.11	15.1	84	7.9	5.6	0.000576	0.000532
12-Jun-14	46.3	0.0079	119	58.4	< 2	2.63	3.29	7.83	13	74	4.4	1.12	0.000234	0.000247
17-Jul-14	74.4	0.015	179	88.9	< 2	1.83	3.01	7.74	18.9	104	2	0.88	0.000476	0.000492
7-Aug-14	81.7	0.014	185	98.5	< 2	2.1	3.59	7.14	22.8	114	1.7	1.04	0.000415	0.000482
11-Sep-14	70.1	0.014	185	86.5	0.039	3.26	3.02	7.75	15.8	92	1.9	0.69	0.000394	0.000556
9-Oct-14			218					7.28						
n	52	54	57	58	32	55	57	53	55	55	56	51	56	56
minimum	26.2	<0.005	63	31.7	<0.02	<0.5	0.9	6.19	<0.5	40	<1	0.45	0.000008	0.000008
maximum	160	0.16	347	188	0.56	16.5	14.7	8.18	42.3	220	7.9	19.34	0.000711	0.000787
median	99	0.017	220	116	<0.20	1.99	2.2	7.50	18.9	140	<1	0.89	0.0000292	0.000022
mean [a]	97	0.026	214	111	0.17	2.7	3.0	7.50	18.3	137	2	1.56	0.0001307	0.000130
standard deviation (SD) [a]	34	0.030	75	38	0.12	2.5	2.7	0.37	8.4	44	2	2.67	0.0002012	0.000214
max detection limit	-	0.05	-	-	2	0.5	-	-	0.5	-	4	-	-	-
# < detection limit	-	10	-	-	20	1	-	-	1	-	32	-	-	-
% < detection limit	-	19%	-	-	63%	2%	-	-	2%	-	57%	-	-	-
upper background (BG) benchmark	134.6	0.056	278	141	0.19	14.2	11.9	8.4	17.8	170	13	2.87	0.000105	0.000044
% samples > upper BG benchmark	15%	9%	25%	26%	56%	2%	4%	0%	55%	24%	0%	4%	23%	32%
lower background (BG) benchmark	10.5	-	-	-	-	0.8	0.8	7.2	-	-	-	-	-	-
% samples < lower BG benchmark	0%	-	-	-	-	0%	0%	19%	-	-	-	-	-	-
background median	43.6	0.014	126	51.2	0.03	2.3	2.3	7.78	8.3	68	<1	0.62	0.000010	0.000010
station median > BG median	1	1	1	1	1	0	0	0	1	1	0	1	1	1
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	218	-	-	-	0.000179	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	0	-	-	0	-	-	0	0	-	-	-	12	-
% > current water quality criterion	-	0%	-	-	0%	-	-	0%	0%	-	-	-	21%	-
# < current water quality criterion	-	-	-	-	-	-	-	1	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	2%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.13: Water quality data and summary statistics for mine exposed station NF2, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
19-Nov-13	33.9	0.000538	0.198	0.00141	8.12	0.0746	0.00133	0.875	< 0.000005	2.81	0.16	0.00177	0.111	0.106
21-Nov-13	37.2	0.000621	0.207	0.00121	8.63	0.0782	0.00124	0.932	< 0.000005	2.84	0.165	0.00186	0.117	0.113
25-Nov-13														
26-Nov-13														
28-Nov-13														
4-Dec-13	35.9	0.003	0.288	0.000833	9.62	0.175	0.00459	0.927	< 0.000005	2.86	0.16	0.00198	0.676	0.581
27-Dec-13														
8-Jan-14	40.6	0.00372	0.237	0.000331	10.4	0.194	0.00579	0.939	< 0.000005	3.02	0.18	0.00219	0.933	1.22
14-Jan-14														
5-Feb-14	41.6	0.00361	0.199	0.000269	10.5	0.204	0.00539	1.04	0.000009	3.04	0.191	0.00229	0.97	0.881
5-Mar-14	47.2	0.00448	0.227	0.000457	11.7	0.257	0.00647	1.13	< 0.000005	3.52	0.199	0.00268	1.07	1.11
2-Apr-14	44.7	0.00506	0.194	0.000256	12.5	0.3	0.00709	1.25	< 0.000005	3.54	0.206	0.0028	1.25	1.26
8-May-14	10.8	0.00381	0.682	0.00341	3.66	0.231	0.00607	1.67	0.000008	1.1	0.0497	0.00036	0.938	0.942
12-Jun-14	16	0.00141	0.22	0.00112	4.5	0.0814	0.00246	0.527	< 0.000005	1.47	0.0684	0.000609	0.364	0.354
17-Jul-14	24.3	0.00283	0.319	0.0014	6.85	0.17	0.00453	0.566	< 0.000005	2.13	0.107	0.00101	0.725	0.77
7-Aug-14	28.2	0.00233	0.348	0.00308	6.8	0.141	0.00377	0.607	< 0.000005	2.1	0.116	0.00104	0.625	0.731
11-Sep-14	24.3	0.00241	0.253	0.000561	6.26	0.144	0.00384	0.546	< 0.000005	2.13	0.0932	0.00083	0.64	0.712
9-Oct-14														
n	54	53	56	56	57	53	55	57	50	54	54	50	55	52
minimum	9.38	0.000061	0.056	0.000147	1.92	0.00917	0.00037	0.382	<0.000005	0.96	0.0407	0.000276	0.0056	0.0045
maximum	54.6	0.00506	0.844	0.0216	12.7	0.3	0.00709	1.67	0.000029	5.59	0.239	0.00367	1.25	1.26
median	33.3	0.000160	0.19	0.000786	7.51	0.0384	0.00080	0.903	<0.000005	2.58	0.149	0.00173	0.022	0.023
mean [a]	31.6	0.000903	0.22	0.00170	7.26	0.0742	0.00173	0.89	0.000004	2.59	0.141	0.00168	0.200	0.216
standard deviation (SD) [a]	11.0	0.001433	0.15	0.00318	2.55	0.0780	0.00199	0.32	0.000005	0.81	0.050	0.000901	0.349	0.372
max detection limit	-	-	-	0	-	-	0	-	0.000005	0	-	0	0	0
# < detection limit	-	-	-	0	-	-	0	-	41	0	-	0	0	0
% < detection limit	-	-	-	0%	-	-	0%	-	82%	0%	-	0%	0%	0%
upper background (BG) benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
% samples > upper BG benchmark	19%	47%	9%	18%	28%	49%	36%	12%	4%	24%	33%	22%	67%	52%
lower background (BG) benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% samples < lower BG benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
background median	15.6	0.0000350	0.1115	0.000144	2.67	0.00855	0.00030	0.57	<0.000005	1.9	0.0728	0.000761	0.0017	0.0022
station median > BG median	1	1	1	1	1	1	1	1	0	1	1	1	1	1
current water quality criterion [b]	-	0.0025	1	0.007	-	1.115	0.107	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	9	0	2	-	0	0	0	0	-	-	0	23	-
% > current water quality criterion	-	17%	0%	4%	-	0%	0%	0%	0%	-	-	0%	42%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.14: Water quality data and summary statistics for mine exposed station X2, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	pH units	mg/L	mg/L	mg/L	NTU	mg/L	mg/L
11-Jan-10	130	< 0.01	266	158		1.5	1.3	6.94	29	190	< 1		0.000021	0.000018
22-Feb-10	140	< 0.01	288	164		0.9	1.4	7.31	28	240	< 1		0.000017	0.00002
10-Mar-10	140		132	156		1.1	1.2	7.27	31	190	< 1		0.000015	0.000022
14-Apr-10	140	< 0.01	290	159		2.1	1.6	7.03	28	150	< 1		0.000026	0.000024
3-May-10	52	0.015	188	59.1		14.5	13.3	7.46	4.5	68	4		0.00005	0.00005
4-Jun-10	38	< 0.05	94	48.1		2.8	3.2	7.81	6.6	54	4		0.000022	
8-Jul-10			131	65.4		3.1	3.4	7.82	15	80	2		0.000018	0.000037
3-Aug-10	95	< 0.05	197	96.9		2.7	3	7.68	15	110			0.000015	0.000017
2-Sep-10		0.17	189	106	0.04	2.2	2	7.37	13	120	< 1	0.8	0.000014	0.00007
18-Oct-10	99	0.039	220	115	0.15	1.2	2	7.6	19	130	< 1	1.1	0.000018	0.000019
9-Nov-10	110	0.026	258	127	0.19	2	1.7	7.98	25	160	< 4	0.84	0.000023	0.000014
1-Dec-10	120	< 0.05	130	138	0.21	1.6	2.2	7.2	29	140	< 4	1.1	0.000037	
19-Jan-11	140	< 0.005	160	172	0.28	1.4	1.2	8.2	28	190	< 1	0.84	0.000031	0.000022
1-Feb-11	140	< 0.05	140	172	0.25	1.7	1.4	8.01	26	160	< 1	0.83	0.000026	0.000022
16-Mar-11	140	0.021	330	172	0.36	1.6		7.52	31	190	< 1	0.85	0.000044	0.000034
13-Apr-11	140	0.018	305	167	0.21	1.5	1	7.63	26	180	< 1	0.76	0.000025	0.000021
11-May-11	97	0.01	224	106	0.21	8.6	8.4	7.82	17	140		2.12	0.000143	0.00013
20-Jun-11		0.02	118	53.4	< 0.02	3.2	3.2	8.29	8.7	72	7	1.09	0.000064	0.000027
13-Jul-11	69	0.031	143	73.9	< 0.02		3.3	6.8		90	< 1	0.43	0.000014	0.00002
25-Aug-11	67	0.034	139	71.7	< 0.02	3.2	3.7	7.54	9.3	110	< 1	0.41	0.000018	< 0.000005
21-Sep-11	80	0.033	183	89.5	< 0.02	2.6	2.7	7.31	14	110		0.48	0.000019	0.000021
20-Oct-11	99	0.021	210	121	0.14		2.5	7.43	25.8	130	3	1.74	0.000034	0.000021
14-Nov-11	109	0.015	198	115	0.197	2.75	2.38	7.51	22.7	150	< 1	0.6	0.000033	0.000039
6-Dec-11	109	0.04	258	122		1.95	1.84	7.48	19.9	136	< 1	0.99	0.000026	0.000015
18-Jan-12	121	0.055	328	155	0.241	1.75	1.05	7.55	24.8	146		0.84	0.000026	< 0.000005
7-Feb-12	128	0.023	290	151	0.257	1.07	1.08	7.76	26.6	158	1.6	1.12	0.00002	0.000069
5-Mar-12	133	0.0097		151	0.279	1.21	0.83	7.69	25.4	170	< 1	1.13		0.000024
18-Apr-12			319					7.58				0.92		
9-May-12	91.5	0.0053		110	0.148				16.5	141	< 3	2.24	0.000071	
16-May-12	93.4	0.038		103		6.22	7.21	7.81	15.6	140	2.2			0.0000467
30-May-12	32.7	< 0.005		34.2	0.0093	10.2			3.68		3.1		0.000031	< 0.00004
5-Jun-12	27.4	< 0.005		26.3	0.0112				3.91	59	5	5.32	0.00004	0.000028
12-Jun-12	28.2		52	34.2	< 0.02	5.71	5.97	7.2		40	4.7		0.0000291	0.0000256
11-Jul-12	48.2	0.02	104	53.3	0.025	5.47	5.98	7.7	7.11	76		1.92	0.0000503	0.0000211
26-Jul-12	75.6	< 0.005		83.8						99	< 3	0.96	0.000017	< 0.000017
7-Aug-12	81.3	0.018	211	94.3	0.03	2.31	2.9	7.91	12.4	96	1.7	0.64	0.00002	0.000022
9-Aug-12	87.9	< 0.005		86.9	0.0322				12.3	96.5	6.6	3.29	0.00003	< 0.000017
5-Sep-12	78.6	< 0.005	232	88.7	0.03	2.49	2.51	7.62	12		1.4	0.48	0.000013	0.000018
13-Sep-12	76.1	< 0.005		89.2					11.8		< 3	1.02	0.000018	0.000018
20-Sep-12	75.7	< 0.005		86.2					11	101	< 1		0.000015	0.000013
10-Oct-12	88.1	0.011	237	96.5	0.066		2.64	7.7	17.2	110	3.2	1.13	0.000035	0.000026
8-Nov-12	105	0.019	265	122	0.185	1.85	1.51	7.51	18.7	160	4.7	1.49		0.000031
12-Dec-12	122		263	137	0.268	2.21	1.29	7.48	25.3	164	2	0.97	0.000024	0.000017
8-Jan-13	128	0.0073	278	150	0.246	1.52	1.88	7.49	24.6	186	1.1	0.96	< 0.000025	0.000038
5-Feb-13	129	0.013	318	147	0.245	1.8	1.84	7.83	24.4	170	< 1	1	0.000018	0.000013
5-Mar-13	139	< 0.005	296	158	0.255	3.31		7.13	25	182	< 1		0.000019	0.000018
6-Mar-13	131	0.018	323	149	0.257	1.54	2.2	7.53	25.9	182	< 1	0.82	0.000019	0.000019
4-Apr-13	141	0.019	307	166	0.265	1.24	1.49	7.47	28.9	192	< 1	1	0.000018	0.00002
8-May-13	120	0.025	259	142	0.213	1.77	1.84	7.04	24.7	154	< 1	1.86	0.000059	0.000064
23-May-13	49	< 0.005	103	61.9	0.0237			7.94	9.7	103	14	15.6	0.00013	0.000097
11-Jun-13	32.1	0.01	99	36.2	< 0.2	5.04	6.06	7.76	3.16	52	7.5	2.62	0.000036	0.000024
18-Jun-13	45	< 0.005	98	50	0.0283			7.75	7.77	76	12.9	1.91	0.000029	0.000013
10-Jul-13	73.2	< 0.005	164	78	0.03	2.52	2.62	7.54	12.1	116	2.5	0.76	0.00002	0.000018
24-Jul-13	67.1	< 0.005	147	72.8	0.0238			7.96	10.1		4	1.48	0.000022	0.000017
6-Aug-13	84.7	0.016	170	96.3	< 2	2.38	2.8	7	15.4	108	< 1	0.84	0.000023	0.000024

Table C.14: Water quality data and summary statistics for mine exposed station X2, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
11-Jan-10	45.3	0.000167	0.124	0.000318	10.3	0.0721		1.05	< 0.000005	3.35	0.182	0.00255	0.0237	0.0239
22-Feb-10	49.3	0.00019	0.11	0.000145	11.4	0.0769	0.00068	1.17	< 0.000005	3.67	0.202	0.0029	0.0247	0.0228
10-Mar-10	46.7	0.000206	0.138		10.5	0.0827	0.00074	1.1	< 0.000005	3.48	0.193	0.00292	0.0255	0.025
14-Apr-10	45.4	0.000256	0.156	0.00169	9.87	0.085	0.00133	1.14	< 0.000005		0.202	0.00296	0.0311	0.031
3-May-10	16.6	0.0002	0.393	0.00245	3.54	0.0459	0.00135	1.26	< 0.000005	1.41	0.0753	0.000653	0.016	0.0158
4-Jun-10	13.7	0.000161	0.253	0.00263	3.3		0.00061	0.53	< 0.000005	1.49	0.0567	0.000498	0.0082	0.0117
8-Jul-10	18.8	0.000097	0.175	0.00131	4.47	0.0253	0.00055	0.5		1.72	0.0841		0.0078	0.0231
3-Aug-10	28.1	0.000092	0.192	0.000856	6.47	0.0391	0.00078	0.71	< 0.000005	2.23	0.121	0.00119	0.0097	
2-Sep-10		0.000118	0.194	0.000388		0.0401	0.00048	0.65	< 0.000005		0.12	0.00112	0.0144	0.392
18-Oct-10	33.2	0.000181	0.215	0.000524	7.69	0.0746	0.00064		< 0.000005	2.59	0.141		0.0142	0.0144
9-Nov-10	36.8	0.000219	0.149	0.000833	8.38	0.0864	0.0008	0.87		2.72	0.161	0.00191	0.022	0.0226
1-Dec-10		0.000197	0.212	0.000605	9.05	0.0744	0.00079	0.94	< 0.000005	2.91	0.169	0.00192	0.0194	0.019
19-Jan-11	43.2		0.115	0.000191	9.48		0.00074	1.04	< 0.000005	2.95	0.2		0.0179	
1-Feb-11	51.7	0.0002	0.173	0.000528	10.4	0.0743	0.00061	1.15	< 0.000005	3.4	0.198	0.00262	0.0197	0.0204
16-Mar-11	48.7	0.000334	0.268		12.2	0.131	0.0009	1.27	< 0.000005	4.02	0.224	0.00321	0.0407	0.0285
13-Apr-11	45	0.000166	0.169	0.000223	11	0.087	0.0007	1.27	< 0.000005	3.77	0.214	0.00298		0.0384
11-May-11	30.1	0.000258	0.578	0.00205		0.0645	0.00127	1.66	< 0.000005	2.58	0.134	0.00158	0.083	0.0819
20-Jun-11	14.9	0.00023	0.215	0.0034	3.51	0.0355	0.0008	0.44	< 0.000005	1.36	0.0595		0.0451	0.0078
13-Jul-11	21.8	0.000065	0.125	0.000841	4.71	0.0171	0.00051	0.46	< 0.000005		0.0891	0.000716	0.0069	0.0065
25-Aug-11	21.3		0.117	0.000346		0.0165	0.00044	0.45	< 0.000005	1.65	0.0905	0.000718	0.0063	0.0084
21-Sep-11	26.4	0.000077	0.163	0.000461	5.44	0.0312	0.00051	0.65	< 0.000005	1.96	0.11	0.00109	0.0081	0.0304
20-Oct-11	35.1	0.000381	0.455	0.00395	7.34	0.16	0.00097		0.000006	2.59	0.141			0.0153
14-Nov-11	33.5	0.000154	0.108	0.00161	7.58	0.0664	0.00077	0.92	< 0.000005	2.52	0.155	0.00173	0.0232	0.026
6-Dec-11	35.9	0.00014	0.201	0.000602	7.94	0.0531	0.00053	0.86	< 0.000005			0.00198	0.0128	
18-Jan-12	42.6	0.000167	0.194	0.000563	9.56	0.0742	0.00057	1.03	< 0.000005	3.17	0.179	0.00238	0.0159	0.0045
7-Feb-12	42.8	0.00019	0.182	0.000309	9.79	0.0699	0.00062	1.06	< 0.000005	3.33	0.178	0.00252	0.0198	0.042
5-Mar-12	43.9			0.000251	10.2	0.0778	0.00068	1.14	< 0.000005	3.41	0.187	0.00251	0.0214	0.024
18-Apr-12														
9-May-12	32.4		0.515	0.00257	6.81		0.0012	< 2	< 0.00002	2.1			0.044	0.0419
16-May-12	30.8	0.00033		0.00111	6.37	0.0971	0.000986	1.34	< 0.000005	2.15	0.124	0.00134	0.0241	
30-May-12	10.8	0.00015	0.408	0.00324	2.14	0.0217	0.00105	0.801		0.934	0.0486	0.000361	0.0094	< 0.0264
5-Jun-12	8.27	< 0.0003	0.52	0.00544	1.68	0.0241	0.0014	< 2	0.000027	< 2		0.00032	0.0102	0.0059
12-Jun-12	9.73	0.000123	0.206	0.00318		0.0113	0.000955	0.498	0.0000162	0.893	0.0405	0.000273	0.00883	
11-Jul-12	15.7	0.000155	0.244	0.00651	3.42	0.0174	0.00108	0.417	0.0000308	1.48	0.0636	0.000464	0.0263	0.00957
26-Jul-12	24.7	< 0.0003	0.187	0.00078	5.22		< 0.001	< 2	< 0.00002	< 2		0.00086	0.0076	0.0061
7-Aug-12		0.00009	0.214	0.00115	5.65	0.0313		0.624		1.94	0.11	0.00102		0.0199
9-Aug-12		< 0.0003	0.446	0.00249	5.62	0.057	< 0.001	< 2		2		0.00098	0.0111	0.0068
5-Sep-12	26.4	0.000081	0.169	0.000412	5.52	0.0316	0.000535	0.655	< 0.000005	2.12	0.106	0.000989	0.00777	0.00795
13-Sep-12	26	< 0.0003	0.253	0.00083		0.037	< 0.001	< 2	< 0.00002	2.1		0.00098	0.0125	0.0087
20-Sep-12	24.2	< 0.0001	0.164	0.000361	5.14	0.0231	0.00051	0.562	< 0.00001	1.85	0.0994		0.0092	0.0076
10-Oct-12	27.7	0.000345	0.349	0.00137	6.02		0.000809	0.705	< 0.000005	2.17	0.119	0.00131		0.0164
8-Nov-12	35.9			0.00327	7.74		0.000838	0.905	0.000006	2.6	0.152	0.00182	0.0233	0.026
12-Dec-12	39.4	0.000163	0.206	0.000659	9.42	0.066	0.000708	1.1	< 0.000005	3.17		0.00254		0.0152
8-Jan-13	42.3	0.000223	0.192	0.000334	10.8	0.0739	0.00133	1.1	< 0.000025	3.54	0.189	0.0025	0.0309	0.0418
5-Feb-13	42.6	0.000218	0.181	0.000207	9.38	0.072	0.000664	1.16	< 0.000005	3.16	0.19	0.00248	0.0225	0.0164
5-Mar-13	47.5	0.00022	0.202	0.000199	10.2	0.0768	0.00064	1.11	< 0.00001	3.4	0.191	0.00266	0.0198	0.0184
6-Mar-13	43	0.000214	0.182	0.000175	10.1	0.0758	0.000633	1.17	< 0.000005	3.52	0.198	0.00269	0.0188	0.0173
4-Apr-13	49	0.00024	0.208	0.000219	10.6	0.0902	0.000722	1.38	< 0.000005	3.59	0.215	0.00294	0.0191	0.0189
8-May-13	39.2	0.000284	0.301	0.000519	9.33	0.0829	0.000879	1.43	< 0.000005	3.23	0.183	0.00245	0.0508	0.0558
23-May-13	17.8	0.00069	1.16	0.00302	4.21	0.0697	0.00253	1.91	0.000023	1.38	0.0842	0.000758	0.0892	0.0861
11-Jun-13	10.4	0.000222	0.428	0.00481	2.31	0.0384	0.00108	0.625	0.000012	1.03	0.0452	0.00044	0.00887	0.0169
18-Jun-13	14.9	0.00026	0.505	0.00247	3.62	0.0355	0.00126	0.71	0.000011	1.23	0.0622	0.000656	0.0092	0.0051
10-Jul-13	21.6	0.000141	0.195	0.000832	5.56	0.03	0.000738	0.513	< 0.000005	1.77	0.094	0.000942	0.0135	0.0157
24-Jul-13	21.6	0.00017	0.215	0.000807	4.7	0.0235	0.00094	0.54	< 0.00001	1.8	0.0963	0.000759	0.0187	0.0169
6-Aug-13	27.3	0.000169	0.202	0.00053	6.3	0.0355	0.000851	0.651	< 0.000005	2.11	0.114	0.0011	0.0236	0.0283

Table C.14: Water quality data and summary statistics for mine exposed station X2, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
22-Aug-13			190					7.7						
12-Sep-13	65.6	0.016	151	73.1	< 2	3.36	3.66	7.99	11.7	106	2	0.81	0.000022	0.000019
24-Sep-13	65.9	< 0.005	150	71.8	0.02			8.02	11.9	80.1	< 3	0.6	0.000021	0.00002
2-Oct-13			177					7.35						
5-Nov-13	97.8	0.014	250	127	< 2	2	2.19	7.33	24.2	146	1.4	1.68	0.00018	0.000166
7-Nov-13	96	0.018		124	< 2	2.26	2.18		22.6	156	< 1		0.000181	0.000164
12-Nov-13												1.1		
14-Nov-13												0.83		
19-Nov-13	107	0.02		123	< 2	1.58	1.83		31.3	158	< 1		0.000208	0.000215
21-Nov-13	106	0.021		136	< 2	1.98	2.04		29.1	100	< 1		0.000233	0.000235
26-Nov-13												4.95		
28-Nov-13												4.98		
4-Dec-13	114	0.018	250	135	< 2	1.69	2.15	7.01	28	172	< 1	1.42	0.000259	0.000255
27-Dec-13												1.33		
8-Jan-14	117	0.019	294	147	< 2	1.52	1.7	7.47	33	176	< 1	1.61	0.000463	0.000448
14-Jan-14	77.3	< 0.005		97.1	0.0311				15.4		3.3	17.98	0.00015	0.000144
5-Feb-14	126	0.018	315	151	< 2	1.93	2.79	6.56	41.8	194	< 1	1.98	0.000529	0.000508
5-Mar-14	138	0.022	364	174	< 2	< 0.5	1.91	7.26	44.6	220	< 1	1.8	0.000656	0.000647
2-Apr-14	139	0.0094	363	165	< 2	0.99	2.15	7.37	46	206	< 1	1.98	0.000651	0.000627
8-May-14	29	0.056	88	36.3	< 2	16.3	16.2	6.69	< 0.5	74	11.7	6.03	0.000172	0.000143
12-Jun-14	49.4	0.013	116	56.2	< 2	2.73	3.41	7.79	14.1	68	12.8	1.38	0.000084	0.000097
17-Jul-14	76.6	0.014	173	87.8	< 2	3.11	4.57	7.71	14.3	98	1.9	0.68	0.00015	0.00015
7-Aug-14	81.1	0.041	180	95.7	< 2	2.64	3.53	7.22	19.2	110	< 1	0.71	0.000209	0.000202
11-Sep-14	70	0.02	215	85.5	0.037	2.79	3.14	8.05	12.4	110	2.3	0.53	0.000131	0.00013
9-Oct-14			206					7.54						
n	68	67	62	71	43	57	57	64	68	66	66	61	68	68
minimum	27.4	<0.005	52	26.3	0.0093	0.5	0.83	6.56	0.50	40	<1	0.41	0.000013	<0.000005
maximum	141	0.17	364	174	0.36	16.3	16.2	8.29	46	240	14	17.98	0.000656	0.000647
median	97	0.018	208	106	0.15	2.1	2.2	7.54	18.9	138	<1	1.09	0.0000275	0.000024
mean [a]	95	0.019	212	109	0.13	3.0	3.1	7.53	19.5	132	2	1.96	0.0000867	0.000082
standard deviation (SD) [a]	34	0.023	78	42	0.11	3.0	2.7	0.36	9.9	46	3	3.00	0.0001389	0.000135
max detection limit	-	0.05	-	-	2	0.5	-	-	0.5	-	4	-	0.000025	0.00004
# < detection limit	-	22	-	-	21	1	-	-	1	-	37	-	1	5
% < detection limit	-	33%	-	-	49%	2%	-	-	1%	-	56%	-	1%	7%
upper background (BG) benchmark	134.6	0.056	278	141	0.19	14.2	11.9	8.4	17.8	170	13	2.87	0.000105	0.000044
% samples > upper BG benchmark	16%	3%	24%	30%	42%	4%	4%	0%	51%	23%	2%	11%	24%	32%
lower background (BG) benchmark	10.5	-	-	-	-	0.8	0.8	7.2	-	-	-	-	-	-
% samples < lower BG benchmark	0%	-	-	-	-	0%	0%	14%	-	-	-	-	-	-
background median	43.6	0.014	126	51.2	0.03	2.3	2.3	7.78	8.3	68	<1	0.62	0.000010	0.000010
station median > BG median	1	1	1	1	1	0	0	0	1	1	1	1	1	1
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	218	-	-	-	0.000166	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	0	-	-	0	-	-	0	0	-	-	-	11	-
% > current water quality criterion	-	0%	-	-	0%	-	-	0%	0%	-	-	-	16%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.14: Water quality data and summary statistics for mine exposed station X2, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
22-Aug-13														
12-Sep-13	21.3	0.000296	0.225	0.000781	4.63	0.0356	0.00106	0.605	< 0.000005	1.93	0.0919	0.000789	0.0552	0.0575
24-Sep-13	21.3	0.00034	0.18	0.000408	4.47	0.03	0.00103	0.56	< 0.00001	1.74	0.08	0.000811	0.06	0.06
2-Oct-13														
5-Nov-13	36.9	0.00178	0.315	0.00346	8.52	0.179	0.00327	0.876	< 0.000005	2.75	0.145	0.00158	0.372	0.365
7-Nov-13	34.9	0.00169	0.269	0.00259	9.03	0.154	0.00307	0.907	< 0.000005	2.83	0.142	0.00168	0.338	0.331
12-Nov-13														
14-Nov-13														
19-Nov-13	34	0.00166	0.143	0.000848	9.22	0.145	0.00312	0.919	< 0.000005	2.74	0.152	0.00167	0.382	0.375
21-Nov-13	38.6	0.00164	0.15	0.000735	9.74	0.15	0.00294	0.983	< 0.000005	2.94	0.167	0.00181	0.371	0.388
26-Nov-13														
28-Nov-13														
4-Dec-13	38.5	0.00195	0.294	0.000715	9.41	0.151	0.00328	0.931	< 0.000005	2.87	0.16	0.00196	0.439	0.437
27-Dec-13														
8-Jan-14	40.6	0.00287	0.256	0.000362	11	0.194	0.00462	0.989	< 0.000005	3.06	0.181	0.00221	0.733	0.71
14-Jan-14	26.4	0.00092	0.298	0.000905	6.2	0.0763	0.00183	0.61	< 0.00001	1.95	0.11	0.00101	0.222	0.222
5-Feb-14	43.5	0.00343	0.274	0.000345	10.4	0.231	0.00554	1.09	0.000009	3.17	0.185	0.00225	0.946	0.941
5-Mar-14	48.2	0.00429	0.293	0.000379	13	0.301	0.0067	1.21	< 0.000005	3.6	0.207	0.0027	1.07	1.05
2-Apr-14	45.2	0.00437	0.254	0.000291	12.8	0.32	0.00682	1.25	< 0.000005	3.55	0.218	0.00283	1.12	1.13
8-May-14	10.4	0.00112	0.755	0.00529	2.5	0.0913	0.00245	1.61	0.000009	1.02	0.0493	0.000349	0.185	0.187
12-Jun-14	16	0.000506	0.201	0.0016	3.93	0.0414	0.00111	0.529	< 0.000005	1.47	0.0678	0.000616	0.115	0.11
17-Jul-14	24.7	0.000895	0.23	0.00138	6.36	0.077	0.00188	0.594	< 0.000005	2.15	0.107	0.000996	0.224	0.237
7-Aug-14	27.5	0.00113	0.299	0.000544	6.54	0.0915	0.00207	0.606	< 0.000005	2.15	0.117	0.00105	0.303	0.3
11-Sep-14	24.8	0.000714	0.205	0.000619	5.74	0.0604	0.00142	0.558	< 0.000005	2.13	0.0962	0.000852	0.183	0.186
9-Oct-14														
n	67	66	68	69	66	65	69	69	66	67	64	64	66	66
minimum	8.27	0.000065	0.108	0.000145	1.68	0.0113	0.00044	0.417	<0.000005	0.893	0.0405	0.000273	0.0063	0.0045
maximum	51.7	0.00437	1.16	0.00651	13	0.32	0.00682	2	0.000031	4.02	0.224	0.00321	1.12	1.13
median	32.4	0.000223	0.21	0.000781	7.46	0.0720	0.00094	0.93	<0.000005	2.23	0.138	0.00146	0.023	0.025
mean [a]	31.2	0.000594	0.26	0.00139	7.36	0.0786	0.00138	0.91	0.000005	2.41	0.135	0.00159	0.124	0.129
standard deviation (SD) [a]	12.0	0.000937	0.17	0.00144	2.90	0.0620	0.00136	0.32	0.000006	0.85	0.053	0.000872	0.244	0.244
max detection limit	-	0.0003	-	-	-	-	0.001	2	0.000025	2	-	-	-	0.0264
# < detection limit	-	5	-	-	-	-	3	5	56	2	-	-	-	1
% < detection limit	-	8%	-	-	-	-	4%	7%	85%	3%	-	-	-	2%
upper background (BG) benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
% samples > upper BG benchmark	28%	64%	10%	26%	41%	66%	39%	16%	11%	28%	33%	19%	74%	59%
lower background (BG) benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% samples < lower BG benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
background median	15.6	0.0000350	0.1115	0.000144	2.67	0.00855	0.00030	0.57	<0.000005	1.9	0.0728	0.000761	0.0017	0.0022
station median > BG median	1	1	1	1	1	1	1	1	0	1	1	1	1	1
current water quality criterion [b]	-	0.0025	1	0.007	-	1.071	0.100	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	4	1	0	-	0	0	0	0	-	-	0	25	-
% > current water quality criterion	-	6%	1%	0%	-	0%	0%	0%	0%	-	-	0%	38%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.15: Water quality data and summary statistics for mine exposed station R1, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
21-Jan-10	120	0.047	161.8	145	0.14				29	170	4			
24-Feb-10	120	0.115	187.2	152	0.15				30	180	110		0.000081	0.000018
30-Mar-10	140			155	0.18			7.86	33	190	3		0.000018	0.000008
3-Nov-10	94	0.041	121.1	103	0.07			7.86	21		< 4		< 0.000005	< 0.000005
18-May-11	33	0.041		44.3	< 0.02	19.9	21.4	7.33	< 0.5	66	210	5.03	0.000171	0.000029
28-May-12	32.6	0.067		34.4	0.0138		11.8		< 0.5	70	3.9	2.8		0.0000095
30-Aug-12				84									0.000012	0.000015
24-Oct-12	103	0.023			0.0955		2.72		20.6	144	< 1	0.46		
4-Jun-13	32.2	0.007		34.5	0.0193	6.52	8.5		6.25	56.1	62.3		0.000078	< 0.00001
13-Aug-13	86.3	< 0.005		94.8	0.02	3.08	3.03		16.8	122	< 1		< 0.00001	< 0.00001
20-Nov-14	73.7	0.0055		83.3	0.0289	3.39	3.43		16.3	96.8	2.4	1.51	< 0.00001	< 0.00001
n	10	9	3	10	10	4	6	3	10	9	10	4	8	9
minimum	32.2	<0.005	121.1	34.4	0.0138	3.08	2.72	7.33	<0.5	56.1	<1	0.46	<0.000005	<0.000005
maximum	140	0.115	187.2	155	0.18	19.9	21.4	7.86	33	190	210	5.03	0.000171	0.000029
median	90	0.041	162	89	0.05	4.955	6.0	7.86	18.7	122	4	2.16	0.0000150	0.00001
mean [a]	83	0.039	157	93	0.07	8.2	8.5	7.68	17	122	40	2.45	0.0000466	0.000011
standard deviation (SD) [a]	40	0.036	33	47	0.06	7.9	7.3	0.31	12	52	70	1.97	0.0000598	0.000009
max detection limit	-	0.005	-	-	0.02	-	-	-	0.5	-	4	-	0.00001	0.00001
# < detection limit	-	1	-	-	1	-	-	-	2	-	3	-	3	4
% < detection limit	-	11%	-	-	10%	-	-	-	20%	-	30%	-	38%	44%
upper background (BG) benchmark	134.6	0.056	278	141	0.19	14.2	11.9	8.4	17.8	170	13	2.87	0.000105	0.000044
% samples > upper BG benchmark	10%	22%	0%	30%	0%	25%	17%	0%	50%	22%	30%	25%	13%	0%
lower background (BG) benchmark	10.5	-	-	-	-	0.8	0.8	7.2	-	-	-	-	-	-
% samples < lower BG benchmark	0%	-	-	-	-	0%	0%	0%	-	-	-	-	-	-
background median	43.6	0.014	126	51.2	0.03	2.3	2.3	7.78	8.3	68	<1	0.62	0.000010	0.000010
station median > BG median	1	1	1	1	1	1	1	1	1	1	1	1	1	0
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	218	-	-	-	0.000144	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	0	-	-	0	-	-	0	0	-	-	-	1	-
% > current water quality criterion	-	0%	-	-	0%	-	-	0%	0%	-	-	-	13%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.15: Water quality data and summary statistics for mine exposed station R1, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
21-Jan-10	45.4		1.37	0.00085		0.108	0.00056	1.32	< 0.000005	2.98	0.227	0.00267	0.0118	0.0067
24-Feb-10	47.8	0.000668	5.17	0.00302	7.87	0.396	0.00226	1.46	0.000008	3.12	0.237		0.0179	0.005
30-Mar-10	49.1	0.000108	0.5	0.000443	7.88		0.00048	1.48	< 0.000005	3.14	0.255	0.00321	0.0061	0.0019
3-Nov-10		0.000051		0.000036	5.95	0.0612	0.00033	0.89	< 0.000005	2.37	0.181	0.00174	0.0007	0.001
18-May-11	12.5	0.00244	8.39	0.00886	3.2	0.555	0.006	2	0.000042	0.7	0.0701	0.00138	0.029	0.0053
28-May-12	10.7		0.331	0.00198			0.000889	0.899	0.0000136	0.845	0.0485	0.000337	0.00756	0.00944
30-Aug-12	25.1	0.000057	0.156	0.000305	5.18		0.00048	0.611	< 0.000005	2.01	0.104	0.000933	0.00595	0.0057
24-Oct-12														
4-Jun-13	11.5	0.00176	3.6	0.00414	2.78	0.103	0.00424	1.06	0.000021	0.886	0.0644	0.00156	0.0156	0.001
13-Aug-13	28.8	< 0.0001	0.26	< 0.00005	5.59	0.02	< 0.0005		< 0.00001	2.04	0.15	0.00152	< 0.003	0.0016
20-Nov-14	26.2	< 0.0001	0.252	0.000116	5.43	0.024	< 0.0005	0.79	< 0.00001	1.96	0.138	0.00135	< 0.003	0.0028
n	9	8	9	10	8	7	10	9	10	10	10	9	10	10
minimum	10.7	0.000051	0.156	0.000036	2.78	0.02	0.00033	0.611	<0.000005	0.7	0.0485	0.000337	0.0007	0.001
maximum	49.1	0.00244	8.39	0.00886	7.88	0.555	0.006	2	0.000042	3.14	0.255	0.00321	0.029	0.00944
median	26.2	0.0001040	0.50	0.0006465	5.51	0.1030	0.00053	1.06	<0.000009	2.025	0.144	0.00152	0.0068	0.0039
mean [a]	28.6	0.000648	2.23	0.00198	5.49	0.181	0.00157	1.17	0.000010	2.01	0.148	0.00163	0.0098	0.0040
standard deviation (SD) [a]	15.7	0.000938	2.91	0.00280	1.86	0.209	0.0020	0.43	0.000013	0.94	0.076	0.000859	0.0090	0.0028
max detection limit	-	0.0001	-	0.00005	-	-	0.0005	-	0.00001	-	-	-	0.003	0
# < detection limit	-	2	-	1	-	-	2	-	6	-	-	-	2	0
% < detection limit	-	25%	-	10%	-	-	20%	-	60%	-	-	-	20%	0%
upper background (BG) benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
% samples > upper BG benchmark	33%	38%	56%	30%	0%	71%	30%	44%	20%	0%	40%	22%	30%	0%
lower background (BG) benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% samples < lower BG benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
background median	15.6	0.0000350	0.1115	0.000144	2.67	0.00855	0.00030	0.57	<0.000005	1.9	0.0728	0.000761	0.0017	0.0022
station median > BG median	1	1	1	1	1	1	1	1	1	1	1	1	1	1
current water quality criterion [b]	-	0.0025	1	0.006	-	0.998	0.088	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	0	4	1	-	0	0	0	0	-	-	0	0	-
% > current water quality criterion	-	0%	44%	10%	-	0%	0%	0%	0%	-	-	0%	0%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.16: Water quality data and summary statistics for mine exposed station X3, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
11-Jan-10		0.03	266	157		1.4	1.2	6.92	28	190	< 1		0.000021	0.000014
22-Feb-10		< 0.01	302	164		1.4	1.2	7.53	28	180	< 1		0.000012	0.000011
9-Mar-10	140		260	162		1.3	0.9	7.39	30	200	< 1		0.000013	0.000045
14-Apr-10	150	0.05	290	163		1.7	1.8	7.02	30	170	< 1		0.000019	0.000023
3-May-10	52	0.075	114	62.9		11.6	11.9	7.74	5.4	72	8		0.00003	0.000038
4-Jun-10	40	0.77	86	44.8		2.3	2.6	7.83	6.3	54	5		0.000018	0.000015
8-Jul-10	54	< 0.05	111	55.7		3.1	2.9	7.91	11	70	< 1		0.00001	0.000019
3-Aug-10	87	< 0.05	183	85		2	2.5	7.86	14		< 1		0.000008	0.00001
2-Sep-10		0.19	205	94.3	0.03	2.7	2.3	7.34	13	110	< 1	0.7	0.00001	0.000016
21-Oct-10	98	0.067	225	114	0.08	1.9	1.7	7.57	20	130		0.8	0.000015	0.000028
9-Nov-10	110	0.019	256	131	0.16	1.8	2	7.92	24	170	< 4	0.62	0.000022	0.000016
1-Dec-10	110	< 0.05	230	129	0.17	2	2	7.62	27	130	< 4	0.9	0.000014	
18-Jan-11	130		301	155	0.25	1.5	1.4	7.52	27	180	< 1	0.86	0.000013	0.000016
2-Feb-11	130	< 0.05	311	146	0.22	1	0.9	7.99	26	150	< 1	1.02	0.000015	0.00001
14-Mar-11		0.019		172	0.29	1.2	1	7.51	29	180	< 1		0.000012	0.000021
13-Apr-11	140	0.02	306	171	0.22	1.3	1.8			180	< 1	0.89	0.000019	0.000024
5-May-11	130	0.023	250	140	0.15	2.6	2.5	7.58	26	180	< 1	1.32		0.000105
20-Jun-11	46	0.027	104	47.1		2.8	3.1	7.55	7.8	68	9	1.08	0.000026	0.000016
13-Jul-11	69	0.025	157	77.8	< 0.02	2.6	3.5	6.86	13	90	< 1	0.5	0.00002	0.000008
25-Aug-11		0.038	147	74.8	< 0.02	2.8	4.1	7.76	12	92	2	0.44	0.000006	
21-Sep-11	86		207	96.8	0.03	2.8		7.42	14	120	< 1	0.4	0.000018	0.000014
27-Oct-11		0.016	230	115	0.14	2.9	1.9	7.6	19.3	120	< 1	0.92	0.00002	0.000068
15-Nov-11	103	0.03	200	117	0.172	2.21	2.28		22.2	144	< 1	0.53	0.000019	0.000021
7-Dec-11	118	0.059		129	0.19	1.55	1.86	7.56	25.5	162		1.04	0.000012	0.000013
18-Jan-12	118	0.072	278	143	0.218	1.7	3.11	7.65	26.5	160	1.3	0.85	0.000023	< 0.000005
7-Feb-12	128	0.076	310	150		1.46		7.6	27.7	168	< 1	1.05	0.00002	0.00007
5-Mar-12	130	0.017	308	153	0.272	1.25	1.16	7.79	27.8	174	< 1	0.88	0.000016	0.00002
18-Apr-12			347					7.63				1.05		
16-May-12	95.6		219	107	0.097	6.86	6.47	7.94	16.4	134				0.0000353
12-Jun-12	30.3	0.014	70	35	< 0.02	5.37	4.56	7.65	5.79	40	7.3		0.0000207	0.0000137
12-Jul-12	57.6		125	65.1	0.022	4.43	5.24		9.5	84	3.5	1.57	0.0000175	0.0000083
7-Aug-12	83.2	0.008	199	99.8		2.54	2.91	8.05	14.8	100	1.3	0.54	0.000016	0.000011
5-Sep-12	78.3	0.0062	246	89.6	0.024	3.3	3.17	7.74		116	< 1	0.57	0.000008	0.000008
10-Oct-12	85.8	0.013	248	95.5	0.057	2.45	2.6	8.07	17.4	116	< 1	0.7	0.000015	0.000013
8-Nov-12	104	0.019	252	110	0.156	2.97	2.06		20.6	158			0.000019	0.000018
4-Dec-12	122	0.32	274	145	0.241		1.21	7.3	26.1	154	< 1	0.93		0.000026
8-Jan-13	124	0.018	280	146	0.247	1.62	5.56	7.51	25.1	174	< 1	0.77	0.000013	0.000014
5-Feb-13	126	0.02	303	145	0.231	1.41	1.67	7.8	29.4	156	< 1	1.05	0.000016	0.000023
6-Mar-13	129	0.07	347	151	0.245	1.17	2.12	7.47	26.1	178	< 2	1.02	0.000014	0.000019
8-Apr-13	138	0.02		159	0.259	1.28	1.32		27	166	< 1		0.000016	0.000019
9-Apr-13			326					7.39				0.76		
8-May-13	116	0.026	250	139	0.195	2.18	4.02	7.01	25.8	162	< 1	1.87	0.000038	0.000042
11-Jun-13	36.5	0.015	111	41.4	< 0.05	3.7	4.64	7.73	7.06	56	7.8	2	0.000016	0.000013
10-Jul-13	72.3	0.006	162	78.8	0.026	2.75	2.86	7.79	12.7	108	1.2	0.61	0.000015	0.000011
6-Aug-13	86.5	0.0075	202	97.4	< 2	2.62	3.05	7.93	14.8	104	< 1	0.58	0.000014	0.000018
12-Sep-13	73.1	0.009	176	82.8	< 2	2.78	3.15	8.03	14	110	1.7	0.54	0.000013	0.000016

Table C.16: Water quality data and summary statistics for mine exposed station X3, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
11-Jan-10	45	0.000115	0.09	0.000264	10.2	0.051	0.00065	1.13	< 0.000005	3.22	0.185	0.00254	0.0219	0.0212
22-Feb-10	47.6	0.000118	0.072	0.00011	10.9	0.0504	0.00062	1.19		3.47	0.199	0.00278	0.02	0.02
9-Mar-10	47.5		0.075	0.000121	10.7		0.00067	1.19	< 0.000005	3.44	0.204	0.00299	0.021	0.159
14-Apr-10	45	0.000144	0.076	0.000454	9.73	0.053	0.00202			3.18	0.203	0.00298	0.025	0.0255
3-May-10	18.4	0.000136	0.427	0.00137	3.76	0.056	0.00146	1.24		1.39		0.000828	0.0111	0.0142
4-Jun-10	13		0.183	0.000747	2.95	0.02	0.00048		< 0.000005	1.47	0.0607	0.000534	0.0112	0.0045
8-Jul-10	16.4	0.000053	0.133	0.000694	3.6	0.0164	0.00041		< 0.000005	1.64	0.082	0.000683	0.004	0.0125
3-Aug-10		0.000047	0.227	0.000674	5.56	0.028	0.00045	0.7	< 0.000005	2.09	0.122	0.00119	0.0056	0.0068
2-Sep-10	26.7	0.000055	0.171	0.00041		0.024	0.00045	0.68	< 0.000005	2.11	0.124	0.00111	0.0087	0.0428
21-Oct-10	33.5	0.000093	0.223	0.000862	6.81	0.0533	0.00054	0.85	< 0.000005	2.34	0.158	0.00172	0.0095	0.03
9-Nov-10		0.000066	0.127	0.000706	7.58	0.0436	0.00056	0.93		2.52	0.166		0.014	0.014
1-Dec-10	37.9	0.000099	0.14	0.000268	7.84	0.0462	0.00047		< 0.000005	2.69	0.175	0.00193	0.0154	0.0116
18-Jan-11	40.5	0.000106	0.124	0.000207	9.7	0.0508	0.00062	1.12	0.000007	3.19	0.195	0.00265	0.0133	0.014
2-Feb-11		0.000093	0.116	0.000123	9.4	0.047		1.14	< 0.000005	3.06	0.192	0.00248	0.0124	0.0134
14-Mar-11	47.4	0.00012	0.11	0.00021	11.6	0.0709	0.00076		< 0.000005	3.74	0.216			0.0201
13-Apr-11	45.2	0.000104	0.15	0.000176	10.7	0.0612	0.00062	1.4		3.83		0.00293	0.0159	0.0171
5-May-11	42		0.302	0.00037	8.54	0.0677		1.38	< 0.000005	3.07	0.188	0.00261	0.0774	0.0773
20-Jun-11	14		0.324	0.00206	2.98	0.0282	0.00064	0.5	< 0.000005	1.36	0.0669		0.0065	0.0029
13-Jul-11	23.4	0.00005	0.143	0.0004	4.68	0.0203	0.00045	0.59	< 0.000005	1.64	0.111	0.00101	0.0036	0.0034
25-Aug-11	22.4	0.000066	0.2	0.000654	4.57	0.0252	0.00043	0.57	< 0.000005	1.7	0.108	0.000929	0.0045	0.0034
21-Sep-11	28.8	0.000057	0.177	0.000245	5.83	0.025	0.00051	0.75	< 0.000005		0.129	0.00134	0.0046	0.0062
27-Oct-11	34.3	0.000119	0.216	0.00162	7.2	0.0528			< 0.000005	2.48	0.155	0.0018	0.0101	0.0533
15-Nov-11	34.6	0.000096	0.123	0.000429	7.37	0.0483	0.00054	0.99	< 0.000005	2.46	0.165	0.00186	0.0138	0.0142
7-Dec-11	38.2	0.000096	0.207	0.00028	8.2	0.0505	0.00045	1	< 0.000005		0.177		0.0096	
18-Jan-12	42.8	0.000103	0.187	0.000464	8.78		0.00046		< 0.000005	3.05	0.185	0.0024	0.0113	
7-Feb-12	42.8	0.000116	0.172	0.000213	9.33	0.0548	0.00051	1.12	< 0.000005	3.21	0.186	0.00257	0.0146	0.0351
5-Mar-12	45.1	0.000133	0.152	0.000141	9.73	0.056	0.00056		< 0.000005	3.27	0.192	0.00253	0.0168	0.0173
18-Apr-12														
16-May-12	31.7		0.605	0.00118	6.78	0.0906	0.00108	1.46	< 0.000005	2.17	0.139	0.00162	0.0231	0.0203
12-Jun-12	10.7	0.000136	0.26	0.00114	2	0.0163	0.000681	0.564	0.0000076		0.0521	0.000516	0.00481	0.00546
12-Jul-12	18.7	0.0000684	0.173	0.000482	4.22	0.0138	0.000694	0.517	< 0.000005	1.5	0.0899	0.000796	0.00322	
7-Aug-12	30.6	0.000095	0.281	0.000951	5.7	0.0324	0.000599	0.769		1.98	0.13	0.00127	0.00583	0.00669
5-Sep-12	27.2	0.000049	0.171	0.000181	5.28	0.022	0.000365	0.724	< 0.000005	1.97	0.121	0.00113	0.004	0.00349
10-Oct-12	27.5	0.000113	0.216	0.000412	5.78	0.0486	0.000401	0.737	< 0.000005	2.02	0.126			0.00704
8-Nov-12	32.1	0.000123	0.158	0.000803	7.17	0.0548	0.000646		< 0.000005	2.44	0.16	0.00181	0.0125	0.0147
4-Dec-12	42.7	0.00022		0.00048	9.4	0.0788	0.000868	1.15	< 0.000005	3.24	0.189	0.00247	0.0286	0.0168
8-Jan-13	42.8	0.000133	0.0511	0.000056	9.52	0.0555	0.000631	1.14	< 0.000005	3.19	0.192	0.00259	0.0213	0.0212
5-Feb-13	42.7	0.000133	0.123	0.000071	9.02	0.0517	0.00057	1.21	< 0.000005	3.02	0.198	0.00252	0.0156	0.0169
6-Mar-13	44.6	0.00012	0.178	0.000134	9.6	0.0557	0.000587	1.21	< 0.000005	3.32	0.203	0.00281	0.0134	0.0155
8-Apr-13	47.1	0.000139	0.19	0.000261	9.99	0.0628	0.000567	1.32	< 0.000005	3.32	0.217	0.00297	0.0171	0.019
9-Apr-13														
8-May-13	38.5	0.000176	0.342	0.000511	8.63	0.0622	0.000715	1.66	< 0.000005	3.11	0.186	0.00243	0.0348	0.0529
11-Jun-13	12.4	0.000114	0.269	0.000817	2.52	0.015	0.000683	0.666	< 0.000005	1.02	0.0615	0.000702	0.00725	0.00636
10-Jul-13	22.5	0.000076	0.179	0.00046	5.22	0.0233	0.000578	0.628	< 0.000005	1.82	0.112	0.00115	0.0067	0.00818
6-Aug-13	28.9	0.000086	0.191	0.000215	6.13	0.0254	0.000662	0.718	< 0.000005	2.14	0.133	0.00129	0.0129	0.0171
12-Sep-13	24.1	0.000139	0.193	0.000391	4.82	0.0248	0.000672	0.693	< 0.000005	1.92	0.115	0.00108	0.0234	0.0438

Table C.16: Water quality data and summary statistics for mine exposed station X3, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
2-Oct-13			192					7.61						
6-Nov-13	94.6	0.015	229	120	< 2	1.77	1.84	6.97	24.7	52	< 1	0.93	0.000085	0.000079
4-Dec-13	115	0.025	253	133	< 2	1.84	1.99	7.06	34.5	176	< 1	1.2	0.000172	0.000161
8-Jan-14	116	0.028	292	146	< 2	1.82	2.01	7.5	34.1	168	< 1	1.46	0.000305	0.000303
5-Feb-14	126	0.025	315	147	< 2	2.35	2.64	7.05	38.1	176	< 1	1.67	0.000371	0.000365
10-Mar-14	136	0.014	387	184	< 2	2.38	2.61	7.3	45.3	202	< 1	0.82	0.000611	0.000573
8-Apr-14	138	0.015	396	174	0.29	1.4	1.06	7.22	47.5	228	< 1	0.76	0.000608	0.000603
7-May-14	34.5	0.022	72	44.6	< 2	13.1	14.1	7.25	< 0.5	68	14.7	2.82	0.000104	0.000068
3-Jun-14	51.3	0.011	112	60.9	0.029	3.28	3.69	7.03	10.2	66	1.7	0.88	0.000052	0.000041
7-Jul-14	69.7	0.0075	168	79.7	< 0.02	3.51	2.35	8.03	20.5	96	1.3	0.63	0.000058	0.000059
7-Aug-14	84.7	0.015	185	97.7	< 2	2.24	2.91	7.54	19.3	122	< 1	0.7	0.000111	0.000113
3-Sep-14	76.9	0.038	204	89.2	< 2	3.37	7.04	7.61	14.6	94	< 1	0.55	0.000062	0.000061
15-Oct-14			185					8.41						
n	49	50	56	55	34	54	53	54	52	54	51	44	52	53
minimum	30.3	0.006	70	35	<0.02	1	0.9	6.86	5.4	40	<1	0.4	0.000006	<0.000005
maximum	150	0.77	396	184	0.29	13.1	14.1	8.41	47.5	228	14.7	2.82	0.000611	0.000603
median	103	0.023	230	117	0.16	2.3	2.5	7.59	23	139	<1	0.87	0.0000180	0.000019
mean [a]	97	0.050	228	115	0.14	2.7	3.0	7.57	22	133	2	0.95	0.0000619	0.000064
standard deviation (SD) [a]	33	0.12	79	40	0.10	2.2	2.4	0.34	10	46	3	0.46	0.0001296	0.000124
max detection limit	-	0.05	-	-	2	-	-	-	-	-	4	-	-	0.000005
# < detection limit	-	5	-	-	15	-	-	-	-	-	37	-	-	1
% < detection limit	-	10%	-	-	44%	-	-	-	-	-	73%	-	-	2%
upper background (BG) benchmark	134.6	0.056	278	141	0.19	14.2	11.9	8.4	17.8	170	13	2.87	0.000105	0.000044
% samples > upper BG benchmark	12%	18%	29%	36%	38%	0%	4%	2%	62%	26%	2%	0%	12%	26%
lower background (BG) benchmark	10.5	-	-	-	-	0.8	0.8	7.2	-	-	-	-	-	-
% samples < lower BG benchmark	0%	-	-	-	-	0%	0%	15%	-	-	-	-	-	-
background median	43.6	0.014	126	51.2	0.03	2.3	2.3	7.78	8.3	68	<1	0.62	0.000010	0.000010
station median > BG median	1	1	1	1	1	1	1	0	1	1	0	1	1	1
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	218	-	-	-	0.000181	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	2	-	-	0	-	-	0	0	-	-	-	4	-
% > current water quality criterion	-	4%	-	-	0%	-	-	0%	0%	-	-	-	8%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.16: Water quality data and summary statistics for mine exposed station X3, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
2-Oct-13														
6-Nov-13	34.1	0.000745	0.21	0.00115	8.38	0.0897	0.00175	1.05	< 0.000005	2.7	0.161	0.0017	0.168	0.166
4-Dec-13	38.6	0.00113	0.209	0.000376	8.98	0.108	0.0023	1.01	< 0.000005	2.71	0.179	0.00214	0.306	0.292
8-Jan-14	41.9	0.00178	0.224	0.000223	10.1	0.138	0.00347	1.02	< 0.000005	2.95	0.189	0.00231	0.51	0.508
5-Feb-14	42.4	0.00221	0.223	0.000216	10.1	0.168	0.00409	1.11	< 0.000005	3.01	0.197	0.00242	0.64	0.653
10-Mar-14	50.9	0.00351	0.189	0.000296	13.8	0.275	0.0064	1.39	< 0.000005	3.97	0.237	0.00318	1.06	1.06
8-Apr-14	48.2	0.00374	0.176	0.000245	12.9	0.268	0.00655	1.28	< 0.000005	3.51	0.21	0.00283	1.07	1.05
7-May-14	13.1	0.000606	1.09	0.00471	2.85	0.081	0.00194	1.73	0.00001	1.07	0.0645	0.000524	0.0802	0.064
3-Jun-14	17.8	0.000258	0.191	0.000698	4.03	0.0273	0.000818	0.658	< 0.000005	1.53	0.0853	0.000839	0.0682	0.0536
7-Jul-14	23.3	0.000303	0.165	0.000395	5.2	0.0315	0.000859	0.624	< 0.000005	1.72	0.112	0.000918	0.0792	0.0821
7-Aug-14	28.5	0.000589	0.218	0.000273	6.46	0.0592	0.00135	0.726	< 0.000005	2.17	0.132	0.00125	0.17	0.167
3-Sep-14	26.2	0.000296	0.17	0.000255	5.8	0.0337	0.000953	0.652	< 0.000005	1.83	0.12	0.000949	0.0854	0.0851
15-Oct-14														
n	52	50	54	55	54	53	52	46	49	52	53	50	53	52
minimum	10.7	0.000047	0.0511	0.000056	2	0.0138	0.000365	0.5	<0.000005	1.02	0.0521	0.00052	0.00322	0.0029
maximum	50.9	0.00374	1.09	0.00471	13.8	0.275	0.00655	1.73	0.00001	3.97	0.237	0.00318	1.07	1.06
median	34.2	0.000119	0.18	0.000395	7.475	0.0508	0.00064	1.01	<0.000005	2.5	0.161	0.001805	0.015	0.018
mean [a]	33.1	0.000385	0.21	0.000576	7.38	0.0587	0.00109	0.98	0.000003	2.52	0.152	0.00181	0.092	0.098
standard deviation (SD) [a]	11.5	0.000785	0.15	0.000698	2.80	0.0518	0.00131	0.32	0.000001	0.77	0.048	0.000827	0.227	0.227
max detection limit	-	-	-	-	-	-	0	-	0.000005	-	-	0	-	-
# < detection limit	-	-	-	-	-	-	0	-	46	-	-	0	-	-
% < detection limit	-	-	-	-	-	-	0%	-	94%	-	-	0%	-	-
upper background (BG) benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
% samples > upper BG benchmark	37%	24%	4%	4%	35%	64%	21%	15%	0%	29%	43%	24%	60%	44%
lower background (BG) benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% samples < lower BG benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
background median	15.6	0.0000350	0.1115	0.000144	2.67	0.00855	0.00030	0.57	<0.000005	1.9	0.0728	0.000761	0.0017	0.0022
station median > BG median	1	1	1	1	1	1	1	1	0	1	1	1	1	1
current water quality criterion [b]	-	0.0025	1	0.007	-	1.120	0.108	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	2	1	0	-	0	0	0	0	-	-	0	13	-
% > current water quality criterion	-	4%	2%	0%	-	0%	0%	0%	0%	-	-	0%	25%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.17: Water quality data and summary statistics for mine exposed station X10, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
11-Jan-10		< 0.01	286	166		1	0.8	7.13	26	220	< 1	0.8	0.000016	
22-Feb-10	150	< 0.01	280	167		1.3	1.3	7.46	30	220	< 1	0.5	< 0.000005	
10-Mar-10	150	< 0.01	292	163		1.4	1.6	7.51	26	210	< 1		0.00001	0.00001
13-Apr-10	150	< 0.01	310	162		1		7.55	30	200			0.00002	0.000014
3-May-10	59	< 0.01	112	67.8		11.7		7.79	9.4	74	5		0.000039	0.000026
4-Jun-10	45	< 0.05	111	54.1		2.8	2.5	8.05	9	62	3		0.00001	0.000023
8-Jul-10	62	< 0.05	128	68.7		3	2.9	8.09	12	82	2		0.00001	0.000017
3-Aug-10	95	< 0.05	205	96.8		2.4	2.3	8.01	17	120	< 1		0.000008	0.000023
2-Sep-10	88	0.12	194	101	< 0.02	2.7	3	7.42	17	120	< 1	0.7	0.000008	0.000018
21-Oct-10	110	0.061	244	123	0.09	2	1.7	7.93	24	150	10	1.7	0.000027	0.000012
9-Nov-10	120	0.044	268	135	0.16	1.7	2.4	7.52	25	170	< 4	1.02	0.000024	0.000015
1-Dec-10	120		240	138	0.17	2	1.9	7.87	27	140	< 4		0.000013	
18-Jan-11	140		311	170	0.27	1.6	1.4	7.77	28	190	< 1	0.67	0.000016	0.00002
1-Feb-11	130	< 0.05	150	171	0.23	1.9	1.1	7.95	27	170	< 1	0.75	0.000011	
14-Mar-11	150	0.017	170	185	0.29	1	0.9	7.45	29	220	< 1	0.37	0.00002	0.000019
13-Apr-11	150	0.022	315	172	0.22	1.2			27	190	< 1	0.5	0.000018	0.000019
5-May-11	130	0.024	250	140		2.2	2.2	7.96	26	170	< 1	0.99	0.000027	0.000042
20-Jun-11	51	0.032	115	52.6	< 0.02	3.1	3		8.8	76	3	1.07	0.000024	0.000017
14-Jul-11	82	0.025	180	90.9	< 0.02		3.4	7.67	14	100	< 1	0.48	0.000015	0.000013
24-Aug-11	78	0.042	182	89.4	< 0.02	3.1	3.3	7.71	13	110	< 1	0.49	0.000006	
21-Sep-11	95		226	110	0.03	2.4		7.29	19	130	< 1	0.85	0.000022	0.000014
20-Oct-11	110	0.01		134	0.09	2	1.9	7.5	23.2	140	< 1	1.73	0.000015	0.000037
15-Nov-11	116	0.03	216	124	0.175	2.46	2.43	7.83	25.6	172		0.78	0.000017	
6-Dec-11	119	0.049	270	138	0.181	1.62	1.62	7.73	24	146		1.21	0.000015	0.000016
18-Jan-12	123	0.051	205	143	0.217	3.04	3.14	7.73	27.1	138		1	0.000014	0.000013
7-Feb-12	135	0.027	320	154	0.251	1.06	1	8.03	28.2	158	< 1	1.21	0.000016	0.000033
5-Mar-12	138	0.017		169	0.282	1.95	0.91	8.03	29.1	180	1.4		0.000014	0.00002
18-Apr-12			322					8.04				0.92		
15-May-12	88.2	0.05	210	104	0.07	7.18	7.64	8.31	15	132	1.1		0.000027	0.0000394
12-Jun-12	33.6		73	38.1	< 0.02	4.47	4.56		5.96	52	6		0.0000242	0.0000278
11-Jul-12	60.8	0.03	170	69.7	< 0.02	4.83	5.53	7.26	9.34	76	9.4	2.73	0.0000228	0.0000187
7-Aug-12	90	0.02	213	107	0.024	2.38	3.09	8.37	15	114	1.2	0.73	0.000018	0.000015
4-Sep-12	89	0.013	180	105	0.023		2.56	8.22			< 1	0.64	0.000014	0.000009
10-Oct-12	89.8	0.01	272	101	0.048			8.09	17.9	128	< 1	0.79	0.000017	0.000012
8-Nov-12	110	0.017	139	129	0.159	1.47	1.35	7.77	22.3	162	< 1		0.000023	0.000023
4-Dec-12	124	0.14	293	152	0.229	1.49		7.63	26.5	162	< 1	1.39	0.000018	0.000022
3-Jan-13	130	0.022	92	162	1.91	0.98	1.24	8.04	29.9	166	< 1	1.39	0.000014	0.000016
5-Feb-13	134	0.013	386	157	0.236	1.4	1.64	7.51	29.1	172	< 1	1.34	0.000016	0.000022
6-Mar-13	134	0.029	367	157	0.242	1.61	1.63	7.41	28.2	188	< 1	1.21	0.000012	0.00001
8-Apr-13	143	0.012		165	0.271	1.24	1.58		30.9	196	< 1		0.000011	0.000014
9-Apr-13			358					7.56				0.35		
8-May-13	117	0.028	131	137	0.198	2.26	3.65	7.17	24.8	156	< 1	1.76	0.000018	0.000038
17-Jun-13	41.8	0.011	124	48	< 0.02	5.11	4.82	7.96	7.76	50	6.2	1.96	0.000043	0.000052
10-Jul-13	77.7	< 0.005	177	86.7	0.026	2.69	3.02	7.92	14.2	114	< 1	0.73	0.000017	0.000021
7-Aug-13	94.1	0.02	236	112	< 2	2.75	2.78	8.01	18.1	132	< 1	0.97	0.000018	0.000018
10-Sep-13	83.2	0.013	224	96.1	< 2	3.31	3.43	8.31	16.1	132	< 1	0.81	0.000016	0.000015
2-Oct-13			204					7.66						
5-Nov-13	113	0.016	261	147	< 2	1.82	2.11	7.3	28.3	184	< 1	2.77	0.000084	0.000075

Table C.17: Water quality data and summary statistics for mine exposed station X10, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
11-Jan-10		0.000049	0.104	0.000145	11.5	0.0264	0.00079	1.12	< 0.000005	3.03	0.192	0.00253	0.0447	0.0436
22-Feb-10	48.3	0.000024		0.000162	11.3	0.0116	0.00068	1.19	< 0.000005	3.06	0.202	0.00271	0.0268	0.0252
10-Mar-10	47	0.00003	0.08	0.000076	11.1	0.0146	0.00073	1.13	< 0.000005	3.09	0.201	0.00287	0.0293	0.0294
13-Apr-10	47.6	0.000041	0.091	0.000572	10.5	0.016	0.00066		< 0.000005	2.99	0.204	0.00292	0.0457	0.0434
3-May-10	19.3	0.000187	0.489	0.00176	4.43	0.0518	0.00175	1.22	< 0.000005	1.39	0.086	0.000851	0.0229	0.0184
4-Jun-10	15.3		0.206	0.000761		0.0205	0.0005	0.56	< 0.000005	1.47	0.0659	0.000578	0.0117	0.0173
8-Jul-10	20.4	0.000068	0.264	0.000721	4.31	0.0228		0.51	< 0.000005	1.63	0.0898	0.000743	0.0135	0.0143
3-Aug-10	27.9	0.000055	0.319	0.000586	6.24	0.0267	0.00049	0.71	< 0.000005			0.00125	0.0198	0.0241
2-Sep-10	29	0.000073	0.335	0.0002	6.64	0.0271	0.00051	0.71	< 0.000005	2.17	0.13	0.00123	0.0216	0.0342
21-Oct-10	35.3	0.000141	0.395	0.000801	8.37	0.0481	0.00061	0.87	< 0.000005	2.32	0.166	0.00184	0.0271	0.023
9-Nov-10	40	0.000093	0.203	0.000772	8.66	0.0451	0.00075	0.98	< 0.000005	2.45	0.179		0.0414	0.037
1-Dec-10	40.7		0.18	0.000139	8.57	0.0426	0.00065	1	< 0.000005	2.62	0.176	0.00185	0.0421	0.0431
18-Jan-11	44.2	0.000045	0.113	0.000123	10.2	0.0173		1.09		3	0.199	0.00269	0.0334	0.0345
1-Feb-11	48.4	0.000033	0.117	0.000151	10.4	0.0134	0.00058	1.15			0.203			0.0309
14-Mar-11	46	0.000017	0.07	0.000116	12.8			1.35	< 0.000005	3.71	0.225	0.00308	0.0351	0.0331
13-Apr-11	47.1	0.000023	0.079	0.000319	12.2		0.00068	1.44	< 0.000005	3.74	0.225	0.00303	0.0251	0.0269
5-May-11	40.7	0.000043	0.235	0.000233	9.02	0.0151	0.00081		< 0.000005	2.96	0.181		0.033	0.0363
20-Jun-11	14.9		0.187	0.000739	3.77	0.0211	0.00058	0.47	< 0.000005	1.3	0.0676		0.0076	
14-Jul-11	26.2	0.000075	0.218	0.000285	6.18	0.0255	0.00054	0.58	< 0.000005	1.65	0.113	0.00107	0.0117	0.0126
24-Aug-11	25.9	0.000116	0.237	0.000896	6	0.0327	0.00057	0.61	< 0.000005	1.66	0.113	0.000989	0.0131	0.0113
21-Sep-11	31.7	0.000073	0.286	0.000696	7.22	0.031	0.00056	0.77	< 0.000005		0.136	0.00142	0.0217	0.0143
20-Oct-11	37.3		0.482	0.00201	8.74	0.0602	0.00065	0.88	< 0.000005	2.39	0.162		0.0299	0.0491
15-Nov-11	34.2	0.000096	0.147	0.000281	8.2	0.0485	0.00064	1.01	< 0.000005	2.38		0.00188	0.0374	0.0383
6-Dec-11	40.5	0.000068	0.207	0.000253	8.9	0.0378	0.00051	1	< 0.000005	2.65	0.17	0.00219	0.028	0.03
18-Jan-12	42.2	0.000063		0.000125	9.1	0.0313	0.00054	1.1	< 0.000005	2.81	0.193	0.00234	0.0307	0.0315
7-Feb-12		0.000042	0.164	0.000515	10.2	0.0241	0.00052	1.15	< 0.000005	3.02		0.00263		0.04
5-Mar-12	49.5	0.00004	0.146		11	0.0196	0.00067	1.27	< 0.000005		0.207	0.00265	0.0274	0.0306
18-Apr-12														
15-May-12	30.4	0.000137	0.611	0.000591		0.052	0.00101	1.38	< 0.000005		0.134	0.00136	0.0262	0.0284
12-Jun-12	11.2	0.000135	0.256	0.00213	2.48	0.0176	0.000845	0.533	0.0000119	0.921	0.0501	0.000412	0.00944	0.00779
11-Jul-12	19.1	0.000179	0.273	0.000861	4.75	0.0218	0.00088		0.0000066	1.39	0.0809	0.000689	0.00838	0.00813
7-Aug-12	31.7	0.000102	0.368	0.000402	6.81	0.0348	0.000554	0.749	< 0.000005	1.93	0.13	0.00126	0.0177	0.0167
4-Sep-12	27.4	0.000112	0.33	0.000326		0.0359	0.000524	0.82	< 0.000005	2.25	0.129	0.00118	0.0194	0.0184
10-Oct-12	29	0.000139	0.356	0.000314	6.88	0.0556	0.000458	0.741	< 0.000005	2.05	0.126	0.00128	0.0257	
8-Nov-12	38.1	0.000215	0.34	0.000352	8.22	0.0828		0.983	< 0.000005	2.38	0.167	0.00185	0.0472	0.0472
4-Dec-12	44.3	0.000126	0.242	0.00019	10.2		0.000774	1.13	< 0.000005	3.02	0.201	0.00255	0.0405	0.0438
3-Jan-13	43.7	0.000124	0.232	0.000132	9.89	0.0457	0.00083	1.15	< 0.000005	2.87	0.193	0.00258	0.0451	0.0462
5-Feb-13	42.7	0.000086	0.231	0.000116	10.3	0.0394	0.00071	1.25	< 0.000005	3.02	0.206	0.00266	0.0388	0.0391
6-Mar-13	45.8	0.000058	0.203	0.000101	10.5	0.029	0.000547	1.2	< 0.000005	3.2	0.204	0.00263	0.0343	0.032
8-Apr-13	46.6	0.00005	0.145	0.000097	10.7	0.0221	0.000557	1.28	< 0.000005	3.13	0.217	0.00294	0.0262	0.0319
9-Apr-13														
8-May-13	40.5	0.000074	0.34	0.000536	8.8	0.0252	0.000683	1.51	< 0.000005	2.74	0.181	0.00231	0.0276	0.102
17-Jun-13	13.9	0.000149	0.273	0.00202	2.99	0.0218	0.000857	0.583	0.000007	1.1	0.0621	0.000617	0.0221	0.03
10-Jul-13	24.7	0.000103	0.323	0.000373	6.1	0.0301	0.00173	0.623	< 0.000005	1.77	0.113	0.00115	0.0198	0.0263
7-Aug-13	32.5	0.000113	0.403	0.000235	7.46	0.0352	0.000678	0.726	< 0.000005	2.05	0.132	0.00132	0.0281	0.0272
10-Sep-13	25.7	0.000163	0.328	0.000203	6.88	0.0362	0.000805	0.698	< 0.000005	1.93	0.125	0.00121	0.0336	0.032
2-Oct-13														
5-Nov-13	43	0.000833	0.551	0.00112	9.54	0.131	0.00187	0.978	< 0.000005	2.47	0.173	0.00197	0.206	0.199

Table C.17: Water quality data and summary statistics for mine exposed station X10, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
7-Nov-13	108	0.017		138	< 2	2.39	1.73		27.7	174	< 1		0.000076	0.00007
12-Nov-13												1.43		
14-Nov-13												1.4		
19-Nov-13	118	0.08		129	< 2	1.68	1.74		32.3	152	< 1		0.000086	0.000085
21-Nov-13	127	0.016		177	< 2	1.38	1.89		30.3	138	< 1		0.000081	0.000081
26-Nov-13												2.59		
28-Nov-13												3.15		
4-Dec-13	121	0.021	270	140	< 2	2.21	2.58	7.06	28.9	176	< 1	1.85	0.000115	0.000115
27-Dec-13												2.11		
8-Jan-14	125	0.018	304	154	< 2	1.87	2.44	7.46	36	196	< 1	1.98	0.00021	0.000197
14-Jan-14												12.06		
5-Feb-14	132	0.026	322	159	< 2	2.63	3	7.5	35.7	196	< 1	1.78	0.000249	0.000223
10-Mar-14	147	0.01	393	193	< 2	2.4	2.59	7.49	45.1	188	< 1	0.5	0.000339	0.000319
8-Apr-14	142	0.013	360	180	0.288	1.74	1	7.15	40.1	226	< 1	0.47	0.000332	0.000335
7-May-14	33.1	0.021	73	44.2	< 2	13.8	14	7.2	< 0.5	84	14.3	6.27	0.000141	0.000145
3-Jun-14	55.2	0.013	129	69.6	0.021	4.25	4.11	8.22	12.9	74	1.6	0.9	0.000052	0.000045
7-Jul-14	76.7	0.011	186	87.4	< 0.02	4.09	4.09	8.32	14.7	110	1.2	0.61	0.000059	0.000069
5-Aug-14	92.3	0.008	240	111	0.025	2.27	2.86	7.62	18.5	120	< 1	0.98	0.000093	0.000085
3-Sep-14	89	0.03	230	106	< 2	4.18	5.28	8.01	15.8	112	2	1.3	0.000064	0.000066
15-Oct-14			281					8.09						
n	57	54	56	58	37	55	52	55	56	57	54	51	58	52
minimum	33.1	<0.005	73	38.1	<0.02	0.98	0.8	7.06	5.96	50	<1	0.35	<0.000005	0.000009
maximum	150	0.14	393	193	1.91	13.8	14	8.37	45.1	226	14.3	12.06	0.000339	0.000335
median	113	0.021	228	135	<0.16	2.21	2.435	7.73	25.3	150	<1	1.00	0.000018	0.000022
mean [a]	106	0.026	229	125	0.18	2.8	2.8	7.74	22.8	146	2	1.50	0.0000474	0.0000520
standard deviation (SD) [a]	33	0.025	82	40	0.31	2.3	2.1	0.35	8.6	46	3	1.79	0.0000720	0.000071
max detection limit	0	0.05	-	-	2	-	-	-	0.5	-	4	-	0.000005	0
# < detection limit	0	10	-	-	20	-	-	-	1	-	39	-	1	0
% < detection limit	0%	19%	-	-	54%	-	-	-	2%	-	72%	-	2%	0%
upper background (BG) benchmark	134.6	0.056	278	141	0.19	14.2	11.9	8.4	17.8	170	13	2.87	0.000105	0.000044
% samples > upper BG benchmark	19%	7%	30%	38%	38%	0%	2%	2%	68%	33%	2%	6%	10%	29%
lower background (BG) benchmark	10.5	-	-	-	-	0.8	0.8	7.2	-	-	-	-	-	-
% samples < lower BG benchmark	0%	-	-	-	-	0%	0%	7%	-	-	-	-	-	-
background median	43.6	0.014	126	51.2	0.03	2.3	2.3	7.78	8.3	68	<1	0.62	0.000010	0.000010
station median > BG median	1	1	1	1	1	0	1	0	1	1	0	1	1	1
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	218	-	-	-	0.000203	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	0	-	-	0	-	-	0	0	-	-	-	4	-
% > current water quality criterion	-	0%	-	-	0%	-	-	0%	0%	-	-	-	7%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.17: Water quality data and summary statistics for mine exposed station X10, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
7-Nov-13	39	0.000706	0.483	0.000597	9.81	0.119	0.00181	1.03	< 0.000005	2.65	0.168	0.00177	0.186	0.177
12-Nov-13														
14-Nov-13														
19-Nov-13	34.8	0.000526	0.162	0.000303	10.1	0.0874	0.00164	1.1	< 0.000005	2.63	0.169	0.00176	0.185	0.173
21-Nov-13	52	0.000256	0.0956	0.0001	11.5	0.0426	0.00108	1.15	< 0.000005	2.46	0.177	0.00162	0.0919	0.09
26-Nov-13														
28-Nov-13														
4-Dec-13	40.1	0.000774	0.292	0.000187	9.8	0.103	0.00218	1.04	< 0.000005	2.65	0.188	0.00215	0.253	0.253
27-Dec-13														
8-Jan-14	43.6	0.00101	0.307	0.000138	10.9	0.105	0.003	1.08	< 0.000005	2.93	0.195	0.0024	0.421	0.406
14-Jan-14														
5-Feb-14	45.7	0.00107	0.255	0.000151	10.9	0.106	0.00337	1.13	< 0.000005	2.96	0.213	0.00246	0.499	0.48
10-Mar-14	53.3	0.000966	0.106	0.000174	14.5	0.104	0.00496	1.4	< 0.000005	3.79	0.247	0.00307	0.73	0.715
8-Apr-14	49.9	0.00106	0.096	0.000141	13.4	0.0984	0.00489	1.28	< 0.000005	3.31	0.214	0.00271	0.7	0.712
7-May-14	12.8	0.000808	1.02	0.00467	3.01	0.0882	0.00214	1.72	0.000008	1.07	0.0579	0.000432	0.122	0.121
3-Jun-14	19.8	0.000257	0.214	0.000657	4.87	0.0262	0.000976	0.659	< 0.000005	1.45	0.0849	0.000836	0.0768	0.0618
7-Jul-14	25.2	0.000288	0.276	0.000465	5.91	0.0362	0.00092	0.603	< 0.000005	1.72	0.115	0.000939	0.0898	0.0997
5-Aug-14	32	0.000397	0.456	0.000654	7.52	0.0587	0.00134	0.744	< 0.000005	2.04	0.141	0.00127	0.148	0.137
3-Sep-14	30	0.000315	0.303	0.000314	7.42	0.0409	0.000991	0.615	< 0.000005	1.77	0.126	0.00104	0.0966	0.0953
15-Oct-14														
n	56	54	56	57	55	55	54	55	56	53	55	53	56	56
minimum	11.2	0.000017	0.07	0.000076	2.48	0.0116	0.000458	0.47	<0.000005	0.921	0.0501	0.000412	0.0076	0.00779
maximum	53.3	0.00107	1.02	0.00467	14.5	0.131	0.00496	1.72	0.000012	3.79	0.247	0.00308	0.73	0.715
median	37.7	0.0001125	0.25	0.000314	8.8	0.0352	0.00072	1.01	<0.000005	2.46	0.169	0.00184	0.032	0.034
mean [a]	35.1	0.000238	0.27	0.000563	8.50	0.0448	0.00110	0.98	0.000003	2.40	0.156	0.00181	0.088	0.090
standard deviation (SD) [a]	11.3	0.000300	0.16	0.00074	2.75	0.0304	0.00098	0.29	0.000002	0.72	0.050	0.000805	0.153	0.150
max detection limit	-	-	-	0	-	-	0	-	0.000005	-	-	0	0	-
# < detection limit	-	-	-	0	-	-	0	-	52	-	-	0	0	-
% < detection limit	-	-	-	0%	-	-	0%	-	93%	-	-	0%	0%	-
upper background (BG) benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
% samples > upper BG benchmark	36%	28%	13%	4%	47%	40%	24%	11%	0%	9%	45%	28%	91%	82%
lower background (BG) benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% samples < lower BG benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
background median	15.6	0.0000350	0.1115	0.000144	2.67	0.00855	0.00030	0.57	<0.000005	1.9	0.0728	0.000761	0.0017	0.0022
station median > BG median	1	1	1	1	1	1	1	1	0	1	1	1	1	1
current water quality criterion [b]	-	0.0025	1	0.008	-	1.197	0.120	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	0	1	0	-	0	0	0	0	-	-	0	29	-
% > current water quality criterion	-	0%	2%	0%	-	0%	0%	0%	0%	-	-	0%	52%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.18: Water quality data and summary statistics for mine exposed station W8, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
17-Jun-10	55	< 0.1		53.7		3	3.4	7.72	8.6	68	4		0.000035	
n	1	1	0	1	0	1	1	1	1	1	1	0	1	0
minimum	55	<0.10	0	53.7	-	3	3.4	7.72	8.6	68	4	-	0.000035	0
maximum	55	0.1	0	53.7	-	3	3.4	7.72	8.6	68	4	-	0.000035	0
median	55	0.100	-	54	-	3.0	3.4	7.72	8.6	68	4	-	0.000035	-
mean [a]	55	0.050	-	54	-	3.0	3.4	7.72	8.6	68	4	-	0.000035	-
standard deviation (SD) [a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
max detection limit	-	0.1	-	-	-	-	-	-	-	-	0	-	-	-
# < detection limit	-	1	-	-	-	-	-	-	-	-	0	-	-	-
% < detection limit	-	100%	-	-	-	-	-	-	-	-	0%	-	-	-
upper background (BG) benchmark	134.6	0.056	278	141	0.19	14.2	11.9	8.4	17.8	170	13	2.87	0.000105	0.000044
% samples > upper BG benchmark	0%	100%	-	0%	-	0%	0%	0%	0%	0%	0%	-	0%	-
lower background (BG) benchmark	10.5	-	-	-	-	0.8	0.8	7.2	-	-	-	-	-	-
% samples < lower BG benchmark	0%	-	-	-	-	0%	0%	0%	-	-	-	-	-	-
background median	43.6	0.014	126	51.2	0.03	2.3	2.3	7.78	8.3	68	<1	0.62	0.000010	0.000010
station median > BG median	1	1	0	1	-	1	1	0	1	0	1	-	1	-
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	218	-	-	-	0.000095	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	0	-	-	-	-	-	0	0	-	-	-	0	-
% > current water quality criterion	-	0%	-	-	-	-	-	0%	0%	-	-	-	0%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.18: Water quality data and summary statistics for mine exposed station W8, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
17-Jun-10	16.9	0.00004	0.058	0.000789		0.0127	0.0004	0.7	< 0.000005	1.73	0.0643	0.000193	0.015	0.0131
n	1	1	1	1	0	1	1	1	1	1	1	1	1	1
minimum	16.9	0.00004	0.058	0.00079	0	0.0127	0.0004	0.7	<0.000005	1.73	0.0643	0.000193	0.015	0.0131
maximum	16.9	0.00004	0.058	0.00079	0	0.0127	0.0004	0.7	<0.000005	1.73	0.0643	0.000193	0.015	0.0131
median	16.9	0.00004	0.06	0.00079	-	0.0127	0.0004	0.70	<0.000005	1.73	0.0643	0.000193	0.015	0.0131
mean [a]	16.9	0.00004	0.06	0.00079	-	0.0127	0.0004	0.70	<0.000003	1.73	0.0643	0.000193	0.015	0.0131
standard deviation (SD) [a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
max detection limit	-	-	-	-	-	-	-	-	0.000005	-	-	0	-	-
# < detection limit	-	-	-	-	-	-	-	-	1	-	-	0	-	-
% < detection limit	-	-	-	-	-	-	-	-	100%	-	-	0%	-	-
upper background (BG) benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
% samples > upper BG benchmark	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	0%	0%	100%	0%
lower background (BG) benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% samples < lower BG benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
background median	15.6	0.0000350	0.1115	0.000144	2.67	0.00855	0.00030	0.57	<0.000005	1.9	0.0728	0.000761	0.0017	0.0022
station median > BG median	1	1	0	1	0	1	1	1	0	0	0	0	1	1
current water quality criterion [b]	-	0.0025	1	0.005	-	0.841	0.060	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	0	0	0	-	0	0	0	0	-	-	0	0	-
% > current water quality criterion	-	0%	0%	0%	-	0%	0%	0%	0%	-	-	0%	0%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.19: Water quality data and summary statistics for mine exposed station X14, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	pH units	mg/L	mg/L	mg/L	NTU	mg/L	mg/L
11-Jan-10	190	0.1	624	379		1.4		6.76		540	2	2.7	0.000054	0.000058
22-Feb-10	190	0.1	720	425		1.3	1.5	6.91	220	580	< 1	3.2	0.00006	0.000062
10-Mar-10		0.1	757	458		1.3	1.2	7.71	240	590	< 1	4.3	0.000073	0.000064
22-Mar-10		0.14	749	498		1.9	1.5	7.49	260		< 1	4.2	0.000075	0.000074
23-Mar-10														
24-Mar-10														
25-Mar-10														
26-Mar-10														
27-Mar-10														
28-Mar-10														
29-Mar-10														
30-Mar-10	200	0.28	1030	591		2.2	2.4	7.37	290	840		3.8	0.000096	0.000081
31-Mar-10														
1-Apr-10														
5-Apr-10														
6-Apr-10	210	0.29	1100	657		1.3	1	7.4	490	880	< 1		0.000095	0.000102
7-Apr-10														
8-Apr-10														
9-Apr-10														
10-Apr-10														
11-Apr-10														
12-Apr-10														
13-Apr-10	200	0.27	1027	588		1.2	1.5	7.85	470	870	< 1	2.5	0.0001	0.000089
14-Apr-10														
15-Apr-10														
20-Apr-10	140	0.26	1914	458		2.5	3.1	7.44	360	620		10	0.000091	0.000073
23-Apr-10														
25-Apr-10														
26-Apr-10														
27-Apr-10	86	0.13	357	175		5.4	5.3	7.3		230	5		0.000057	0.000045
29-Apr-10														
2-May-10														
3-May-10														
4-May-10	90	0.085	506	296		7.9	8.9	7.53	230		2	2.5	0.000058	0.000051
5-May-10														
6-May-10														
7-May-10														
8-May-10														
9-May-10														
10-May-10														
11-May-10	91	0.085	471	240		6.1	5.3	7.65	180	360	4	2.5	0.000045	0.000037
12-May-10														
13-May-10														
14-May-10														
15-May-10														
16-May-10														
17-May-10														
18-May-10	73		360	181		7.4	5	8.02	120	280	4		0.000052	0.000072
19-May-10	64	0.038		127	0.04			7.38	80	190			0.000063	
20-May-10														
21-May-10														
22-May-10														
23-May-10														

Table C.19: Water quality data and summary statistics for mine exposed station X14, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
11-Jan-10	111	0.00181	0.357	0.00071	24.6	2.66	0.00485		< 0.000005	8.96	0.342	0.00353	0.0431	0.0408
22-Feb-10	124	0.00268	0.404	0.000129	27.8		0.00617	2.24	< 0.000005	9.99	0.386	0.00377	0.022	0.0213
10-Mar-10	136	0.00304	0.466	0.000094	28.6	3.98	0.00661	2.4	< 0.000005		0.4	0.00395	0.0241	0.0237
22-Mar-10		0.00337	0.601	0.000118	28.1	4.15	0.00699	2.31	< 0.000005	10.6	0.39	0.00374	0.0321	0.0345
23-Mar-10													0.055	0.048
24-Mar-10													0.147	0.142
25-Mar-10													0.087	
26-Mar-10													0.099	0.088
27-Mar-10													0.082	0.08
28-Mar-10													0.093	0.085
29-Mar-10													0.091	0.079
30-Mar-10	171	0.00716	0.441	0.000119	38.8	5.92	0.0124	3.14	< 0.000005	14.2	0.509	0.00451	0.101	0.106
31-Mar-10													0.08	0.072
1-Apr-10													0.081	0.073
5-Apr-10													0.06	0.023
6-Apr-10	193	0.00896	0.442	0.000129	41.2	7.24	0.0152			15.1	0.585	0.00446	0.11	0.085
7-Apr-10													0.09	0.082
8-Apr-10													0.09	0.083
9-Apr-10													0.095	0.081
10-Apr-10													0.089	0.09
11-Apr-10													0.064	0.057
12-Apr-10													0.063	0.052
13-Apr-10	180	0.00634	0.432	0.00016	33.8	5.35	0.0104	3.1	0.00006		0.542	0.0042	0.0925	0.0821
14-Apr-10													0.059	0.056
15-Apr-10													0.064	
20-Apr-10	140	0.00582	0.731	0.0041	26.2	4.2	0.0101	2.71	< 0.000005	9.96		0.00296	0.0738	0.062
23-Apr-10													0.056	
25-Apr-10													0.058	0.025
26-Apr-10													0.035	0.026
27-Apr-10	52.9	0.000939	0.567	0.00158	10.4	0.88	0.00239		< 0.000005	4.02	0.185		0.0427	0.0308
29-Apr-10													0.036	
2-May-10													0.051	0.028
3-May-10													0.047	0.053
4-May-10	91.9	0.00354	0.388	0.00114	16.1	2.44	0.00666	2.25	< 0.000005	5.93	0.274	0.00146	0.066	0.0575
5-May-10													0.064	0.057
6-May-10													0.085	0.062
7-May-10													0.058	0.047
8-May-10													0.06	0.052
9-May-10													0.065	0.041
10-May-10													0.059	0.049
11-May-10	70.8	0.00244	0.469	0.00133	14.5	1.71	0.00464	1.7	< 0.000005	4.79	0.241	0.00142	0.0454	0.0423
12-May-10													0.059	0.044
13-May-10													0.051	0.04
14-May-10													0.052	0.042
15-May-10													0.054	0.034
16-May-10													0.043	0.033
17-May-10													0.04	0.029
18-May-10	52.5		0.406	0.00191	11.5	1.32	0.00416		< 0.000005	3.73	0.188		0.0385	0.027
19-May-10	37.4	0.0015	0.991	0.00481	8.24	0.891	0.00329	1.16	< 0.000005	2.65	0.127	0.000867	0.0398	0.019
20-May-10													0.038	0.013
21-May-10													0.026	0.016
22-May-10													0.022	0.019
23-May-10													0.026	0.016

Table C.19: Water quality data and summary statistics for mine exposed station X14, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	pH units	mg/L	mg/L	mg/L	NTU	mg/L	mg/L
25-May-10		< 0.005	243	105		5.3	5.6	8.01	63	180	6	2.6		0.000024
26-May-10														
27-May-10														
1-Jun-10	55	< 0.005	345	141			2.7	8.14	99	230	2		0.000038	
8-Jun-10	70	0.018	380	177		3.1	2.7	7.93	130	250	< 1		0.000045	0.000089
15-Jun-10		0.06	420	211		3.1	2.7	7.87	160	330	< 1	0.7	0.000038	0.00004
22-Jun-10	81	0.02	438	210			2.3	7.75	150	310	< 1	1.1	0.000045	0.000033
24-Jun-10														
29-Jun-10	84	0.1	501	258		2.3		7.35	180	370	< 1	0.9	0.000036	0.000032
6-Jul-10	67	0.058	395	184		3.5	3.7	8.01	130	250	< 1		0.000031	0.000026
13-Jul-10	80	0.058	456	250		2.3	2.4	8.19	170	340	< 1		0.000034	0.000038
20-Jul-10	96	0.15	563	279		2	2.7	7.76	180	410			0.000043	0.000046
27-Jul-10	97	0.16	606	322		3	1.9	8.11	250	430	2	1.3		0.000083
3-Aug-10	110	0.012	338	152	< 0.02	1.8	4.3	7.99	57	210	2	0.8	0.000027	0.000069
10-Aug-10	100	0.19	658	329		2.2	2.3	7.92	220	440	< 4	1.4	0.000064	0.000049
17-Aug-10	110	0.35	614	333		2.4	2	7.92	270	460			0.000047	0.00006
24-Aug-10	94	0.07	423	249		2.5	2.5	8.67	160		< 1		0.00004	
31-Aug-10	100	0.11	650	314		3.7	3.7	7.96	220	420			0.000055	0.000029
7-Sep-10	99	0.29	532		0.06	2.7	2.6	8.27	170	340	< 1		0.000033	0.000039
21-Oct-10	130	0.11	426	228	0.11	2.3	1.7	7.8	110	290		1.8	0.000035	0.000046
3-Nov-10	130	0.022	235.4	203	0.12			7.83	95	260	< 4		0.000042	0.000029
9-Nov-10	140	0.078	500	234	0.14	1.1	1.9	7.89	120	330	< 4	1.62	0.000044	0.000042
17-Nov-10														
18-Nov-10	170	0.2	1010	641		1.7	1.3	7.75	420	800	6	3.18	0.000115	0.00009
19-Nov-10														
20-Nov-10														
21-Nov-10														
22-Nov-10														
23-Nov-10														
24-Nov-10														
25-Nov-10	170	0.16	1008	546	0.15	1.9	2	8.21	390	780	< 4	2.5	0.00007	0.00007
26-Nov-10														
27-Nov-10														
28-Nov-10														
29-Nov-10														
30-Nov-10														
1-Dec-10														
2-Dec-10	170		1000	544	0.16	1.8	1.8	7.7	380	690	< 1	2.21		0.00005
18-Jan-11	170		719	385	0.22	1.6	1.3	7.35	190	500	2	< 0.25	0.000066	0.00006
1-Feb-11	170	0.048	150	394	0.16	1.5	1.3	7.97	190	460	< 1	2.81	0.000058	0.000066
14-Mar-11	200	0.14	590	589	0.2	1.4	1.3	7.16	350		< 1	0.42	0.00011	0.000118
24-Mar-11	240		1435	902	0.21	1.4	1.5	7.69		1300	5	2.49	0.00013	
29-Mar-11	220	0.33	1410	784	0.22	2	1.6	7.69	550			5.08	0.00013	0.00011
5-Apr-11	220	0.31	1471	749	0.19	1.8	1.4	7.58	580	1100		2.19	0.00013	0.00014
12-Apr-11	220	0.32	1430	810	0.18	1.7	1.3	7.36	580	1100	2	2.03	0.00012	0.0001
19-Apr-11	220	0.29	1323	853	0.16	1.3	1.3	7.49	580	1100	< 1	3.16		0.00006
26-Apr-11	210	0.26	1303	694	0.15	1.8	1.8	7.4	530	1000	2	2.43		
3-May-11	240	0.42	1935	1110	0.11	2	2.3	6.99	940	1600	4		0.00015	0.0001
4-May-11	160	0.25	1134	552	0.16	1.8	1.6	7.49	430	820	2	1.88	0.000109	0.000097
10-May-11		0.28	1043	499	0.16		4.4	7.95	380	710	3	1.84	0.000119	0.000108
17-May-11	77	0.072	456	215	0.13	14.6		7.73	150	290	11	3.29		0.000079
18-May-11	41	0.061		84.3	0.05	19.6	19	7.36	46	130	55	3.99	0.00019	0.000057
24-May-11	25		117	43.5	< 0.02	12.5	13.1	8.07	19	62	22		0.000085	0.00004

Table C.19: Water quality data and summary statistics for mine exposed station X14, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
25-May-10	30.7	0.0009	0.375		6.97	0.583	0.00243	0.96	< 0.000005	2.44	0.107	0.000722	0.0226	0.0216
26-May-10													0.024	0.018
27-May-10													0.028	0.015
1-Jun-10	41.1	0.00157	0.233	0.00106	9.29			1.03	< 0.000005	3.81	0.133	0.000765	0.0426	0.0308
8-Jun-10	50.7	0.00215	0.215	0.000512	12.3	1.39	0.00372	1.12	< 0.000005	4	0.166	0.000996	0.0399	0.0359
15-Jun-10	59.7		0.245	0.000532	14.6	1.74	0.00441	1.39	< 0.000005	4.56	0.207		0.0484	0.046
22-Jun-10	59.3	0.00261	0.29	0.000469	15.1	1.59	0.00448	1.41		4.83	0.204	0.00104	0.0455	0.0436
24-Jun-10														0.065
29-Jun-10	71.2	0.00322	0.274	0.000369	17.1	1.86	0.00506		< 0.000005		0.236		0.0493	0.0459
6-Jul-10		0.00206	0.277	0.000544	12.1	1.29	0.00323	1.13		4	0.171	0.000821	0.048	0.0301
13-Jul-10	72		0.308	0.000644	16.9	1.76		1.59	< 0.000005	5.54	0.248		0.0429	0.0422
20-Jul-10		0.00399	0.327	0.000499	19.2	2.35	0.00583	1.85	< 0.000005	6.29		0.00125	0.0583	0.0565
27-Jul-10	94.1		0.382		21	2.33	0.00629	2.04	< 0.000005	6.59	0.316	0.00135	0.0726	0.0721
3-Aug-10	44.7	0.000409	0.369	0.000583	9.88	0.624	0.00139	1.02	< 0.000005	3.42	0.172	0.00155	0.019	0.0451
10-Aug-10	96.7	0.00345	0.428	0.00123	21.3	2.12	0.00552	2.15	< 0.000005	6.97	0.329	0.00152	0.0614	0.0576
17-Aug-10	89.7	0.00269	0.392		20.2	1.8	0.00444	2.06	< 0.000005	6.55	0.315	0.00138	0.052	0.0517
24-Aug-10	73.1	0.00211	0.4	0.00054	16.2	1.38	0.00344	1.63	< 0.000005	5.53		0.00125	0.0424	0.0399
31-Aug-10	86	0.00276	0.441	0.000573	19.7	1.84	0.00423	2.06	< 0.000005	6.08	0.314	0.00119	0.0496	0.042
7-Sep-10	65.2	0.00218	0.369	0.000376	15.4	1.47	0.00358	1.52	< 0.000005	5.1	0.259	0.00146	0.0411	0.0378
21-Oct-10	67.3	0.00091	0.418	0.000282	14.5	1.39	0.00245	1.3	< 0.000005	4.67	0.24	0.00239	0.0239	0.0239
3-Nov-10	59.1	0.0009	0.306	0.000179	13.4	1.2	0.00248	1.24	< 0.000005	4.43	0.224	0.00224	0.0347	0.0306
9-Nov-10	68.8	0.00105	0.305	0.000301	14.6	1.49		1.35	< 0.000005	4.69	0.254		0.036	0.0382
17-Nov-10													0.118	0.107
18-Nov-10	174	0.0134	1.02	0.000978	39.8	8.78	0.0195	3.18	< 0.000005	12.7	0.516	0.00315	0.135	0.123
19-Nov-10													0.109	0.107
20-Nov-10													0.109	0.105
21-Nov-10													0.104	
22-Nov-10													0.104	0.089
23-Nov-10													0.101	0.096
24-Nov-10													0.1	0.092
25-Nov-10	143		0.373	0.00026	33.1	8.45		2.6	< 0.00003	10.3	0.464		0.13	0.119
26-Nov-10													0.093	0.091
27-Nov-10													0.089	0.078
28-Nov-10													0.088	0.086
29-Nov-10													0.091	0.086
30-Nov-10													0.09	0.083
1-Dec-10													0.085	0.084
2-Dec-10	154	0.0138	0.384		33		0.0181	2.5	< 0.00003		0.468	0.00285	0.108	0.114
18-Jan-11	98.7	0.00206	0.386	0.000197	23.1	2.99	0.00536	1.96	0.000037	7.63	0.34	0.00352	0.0296	0.035
1-Feb-11	118	0.00217	0.412	0.000229	24.4	3.1	0.00517	2.12	< 0.000005	8.16	0.36	0.00349	0.0256	0.0266
14-Mar-11	168	0.00456	0.612	0.000107	39.1	6.05	0.0107	3.08	< 0.000005	13.4	0.497	0.00447	0.0259	0.026
24-Mar-11	242		0.809	0.00078	55.3	14.4		3.7	< 0.00003	17.9	0.708	0.00485	0.125	0.132
29-Mar-11		0.0127	0.514	0.00035	52.1	9.89	0.0209	4.2	< 0.00003	17.1	0.669	0.00524		0.106
5-Apr-11	220	0.0159	0.415	0.00033	48.5	10.3	0.023		< 0.00003	16	0.64	0.00491	0.109	0.115
12-Apr-11	217	0.0183	0.41	0.00021	47.8	11.1	0.0251	3.6	< 0.00003		0.611	0.00459		0.11
19-Apr-11	246			0.00012		12.2	0.0268	3.9	< 0.00003	17.3	0.666	0.00461	0.107	0.108
26-Apr-11	213	0.0179	0.474			11.3	0.0237	3.7	< 0.00003	14.8	0.587	0.00415	0.0975	0.105
3-May-11	322	0.0504	0.983	0.00103	70.6	25.5	0.0562		< 0.00003	21.6	0.867		0.189	0.177
4-May-11		0.00946	0.454	0.00126	34.7	6.12	0.0129	3.38	< 0.000005	11.5		0.0031	0.0628	0.065
10-May-11	155	0.0069		0.00077	34.3	4.41	0.00992	4.16	< 0.000005	10.9	0.496	0.00231	0.0997	0.0907
17-May-11	57.4	0.00283		0.00304	13.4	1.58	0.00468	2.28	0.000006		0.191	0.0011	0.0625	0.0516
18-May-11	24.4	0.00272	3.84	0.0144	5.7	1.05	0.0055	1.9	0.000036	1.7	0.0935	0.000706	0.081	0.0276
24-May-11		0.000705	0.605	0.00619	2.72	0.315	0.00181	1.1	0.000011	0.95	0.0468	0.000481	0.0226	

Table C.19: Water quality data and summary statistics for mine exposed station X14, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	pH units	mg/L	mg/L	mg/L	NTU	mg/L	mg/L
31-May-11	32	0.076	133	57.9	< 0.02	5.1		8.8	31	100	9	3.29	0.000042	0.000036
7-Jun-11		0.063	280	116	0.04	3.3	3.1	7.63	72	170	2	1.15	0.00012	0.000024
14-Jun-11	65	0.037	256	139	0.03	3.9	4.5	7.91	78	200	< 1	0.61	0.000021	
21-Jun-11	58	0.055	220	93.7	< 0.02	4.1	4.2	7.5	55	72	8		0.000036	0.000036
28-Jun-11	65		260	120	0.03	3.9	3.8	8.18		160	2	0.93	0.000024	0.00003
5-Jul-11	77	0.078	273	143	0.03	3.9	4.6	7.97	68	200	2	1.39	0.000032	0.000036
12-Jul-11	82	0.09	292	161	0.03	4.6	4.6			250	< 1	0.77	0.000025	
19-Jul-11	82	0.077	335	161	0.03	4.1	3.8	7.85	91	230		0.87	0.000021	0.000029
26-Jul-11	88	0.073	375	183	0.04	2.9	3.6	8.06	110		< 1	0.82	0.00004	0.000038
2-Aug-11	87			194	0.04	3.3	3.2	9	110	240	< 1	1.13	0.000042	0.000047
9-Aug-11	95	0.099	351	201	0.04	2.7	2.4	7.82		300	< 1	0.97	0.00004	0.000031
16-Aug-11		0.094	341	179	0.04		3.6	8.27	95	300	< 1		0.000019	0.000026
23-Aug-11	82	0.095	346	163	0.03	4.4		7.97	98	230		0.68	0.000022	0.000021
25-Aug-11	85	0.073		173		2.9	3.8	7.71	98	260	2	0.63	0.000013	0.000015
30-Aug-11	91	0.067	390	202			3	8.03		290	< 4	0.71	0.000022	0.000016
6-Sep-11	99	0.076	422	236	0.06	3.3	3.6	7.85		350	< 1	0.91		0.000034
13-Sep-11	97	0.067	438	217	0.05	2.7	3.9	7.91	130		< 1	0.75	0.000029	0.000027
20-Sep-11	100	0.11	570	248	0.06	2.4	2.5	7.96	150	360	2			0.000029
27-Sep-11			525	244	0.06	2.3	2.9	7.58	170	390	< 1	1.16	0.00003	0.000035
25-Oct-11	120	0.032	445	195	0.1	2	1.8	7.55	70.8	230	< 1		0.000031	0.000033
23-Nov-11	168	0.23	998	525	0.184	< 5	< 5		349	750	5	1.74	0.000106	0.00009
29-Nov-11	177	0.28		601	0.142	1.37	1.75	7.37		882	2.1	1.81	0.0001	0.00008
8-Dec-11	179	0.4	1118	625	0.146	1.43	1.76	7.39	494	928	< 4	3.39		0.000065
18-Jan-12	145	0.12	240	292	0.193		3.4	7.59	160	372	1.3	2.44	0.000062	0.000049
2-Feb-12	165	0.1	681	342	0.213	1.83	2.01		191	440	1.3	1.71	0.000063	0.000069
5-Mar-12	183		771	440	0.226	1.87	1.08	7.9	241	566	2.2	5.55	0.000106	0.000092
19-Apr-12			1190					7.85				2.77		
24-Apr-12			1238					7.51				3.6		
1-May-12	184	0.28	1250	625	0.119	7.35		7.46	461		5.3		0.000098	0.000085
8-May-12	132	0.22		415		4.52	3.85	7.73	280	562	3.6		0.000078	0.000068
9-May-12	126	0.146		382	0.117				262	523		5.07	0.000072	0.000068
15-May-12	107	0.11	595	290	0.094	6.02		7.67	225	406	2.2		0.00006	0.0000847
22-May-12	73.4	0.054	488	150	0.063		9.45		91	228	22		0.0000765	0.0000345
28-May-12	47.9	0.039		72.3	0.0309		9.1		29.2	120	7.6		0.0000424	0.0000314
29-May-12	45.4	0.037	163	79.1	0.033	7.36		7.82		108	6.3		0.0000378	0.000025
30-May-12	48	0.0122		77.5		9.99				113	6.7		0.000031	< 0.000044
5-Jun-12	38.6	0.015	187	63.1	0.032	5.1	5.96	7.75	29.4	103	17.6	7.12	0.0000568	0.0000252
12-Jun-12	36.4		117	59.6		5.27	6.07	7.85	24.6	74	17.6		0.0000334	0.0000207
19-Jun-12	49.5	0.038	205	88.4	0.026	3.74	3.87	8.12		130	2.9		0.0000243	0.0000258
26-Jun-12	63.1	0.053	313	120	0.03	3.16	3.01	8.47	66.9	182	4.3		0.0000412	0.0000241
3-Jul-12	59.1	0.016	217	96.1	0.028	6.01	5.98		40.1	118	7		0.0000322	0.0000175
10-Jul-12	80.4	0.049	344	161	0.041			7.99	77.4	190	3.2		0.0000401	0.0000246
17-Jul-12	72.8	0.051	317	133	0.031	3.56	3.98	7.64	80.6	170	2.6	0.09	0.0000224	0.0000249
24-Jul-12	83.9	0.05	280	188	0.042	3.41	3.79	7.65	103	258	2.2	1.14	0.000036	0.0000338
26-Jul-12	93.1	0.0491		200	0.0392				110	271		1.49	0.000031	0.000026
31-Jul-12	90	0.067	510	242	0.054	3.2	2.97	7.97	135	302	1.1		0.000059	0.000054
7-Aug-12	99.8	0.086	500	258	0.058	2.61	2.92	7.66	161			1.47	0.000045	0.000186
9-Aug-12	109	0.0633		241	0.0516				140	297	< 3	1.54	0.000042	
14-Aug-12	89.4	0.064		207		4.05	3.77	8.41	121	292	1.5	1	0.000032	
21-Aug-12	98.4	0.082	535	249	0.051	2.64	3.43	8.14	149	338	1.7	1.58		0.00005
28-Aug-12	103	0.092	485	241	0.051	4.3	4.09	8.45	142	346	1.4	7.65	0.000034	0.000054
4-Sep-12	97.1	0.071		261	0.06	1.48	3.06	8.3	166	356	< 1	1.66	0.000037	0.000035
13-Sep-12	95.7	0.0615	463	223	0.0463	3.3	3.02		135		1.4	1.22	0.000036	0.000034

Table C.19: Water quality data and summary statistics for mine exposed station X14, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
31-May-11		0.00052	0.261	0.00307	3.99	0.289	0.00141	0.72	0.000007	1.34	0.064	0.000491	0.0138	0.0108
7-Jun-11	33.4	0.00138	0.174	0.00685	7.72	0.842	0.00222	1.72	< 0.000005	2.32	0.121	0.000822	0.074	0.0194
14-Jun-11	36.7	0.0012	0.173	0.000437	9.06	0.754		0.86	< 0.000005	2.5	0.13	0.000943	0.0186	0.0202
21-Jun-11	25.7	0.0011	0.222	0.00123	6.65	0.62	0.00178	0.61	< 0.000005	2	0.0962	0.000714	0.0137	
28-Jun-11	32.4	0.000902	0.208	0.000996	9.42	0.601	0.00166	0.84	< 0.000005		0.121		0.0194	0.0182
5-Jul-11	38.7		0.226	0.00144		0.701	0.00193	0.81	< 0.000005	2.65	0.142	0.00103	0.0206	0.0242
12-Jul-11		0.000986		0.000394	10.4	0.687	0.00169	0.9	< 0.000005	2.82	0.158	0.000975	0.019	0.0214
19-Jul-11	44.3	0.00114	0.253	0.000736	11.4	0.779	0.0019	1.01	< 0.000005	3.13	0.173	0.00101	0.0223	0.0254
26-Jul-11	49.7	0.00136	0.291	0.000541	14.3	0.864	0.00223	1.19	< 0.000005	3.7	0.191	0.00112	0.0356	0.0276
2-Aug-11	55.2	0.00143	0.305	0.0011	13.5	0.954	0.00222	1.18	< 0.000005		0.2	0.0012	0.0351	0.0347
9-Aug-11	56.1	0.00163	0.315	0.000488	14.8	1.06	0.00233	1.36	0.000006	3.95	0.238	0.0014	0.0276	0.0254
16-Aug-11	50.8	0.000867		0.000289	12.6	0.667	0.00165	1.13	< 0.000005	3.56	0.186	0.00106	0.0161	0.0138
23-Aug-11	46.3	0.00136	0.233		11.5	0.846	0.002	1.01	< 0.000005	3.07	0.18	0.0011	0.0166	0.0176
25-Aug-11	49.3	0.00145	0.242	0.000732	12.2		0.00216		< 0.000005	3.28	0.187	0.00109	0.0166	0.0174
30-Aug-11	54.6	0.00138	0.29	0.000493	13.4	0.968	0.00212	1.17	< 0.000005	3.61	0.206	0.00124	0.0182	0.0183
6-Sep-11	66	0.00212	0.323			1.38	0.00286	1.41	< 0.000005	4.3	0.243	0.00145	0.0236	0.0245
13-Sep-11	61.2	0.00189	0.293	0.000892	15.5	1.18	0.00263	1.37	< 0.000005	3.98	0.224	0.00144	0.0211	0.0199
20-Sep-11	65.6		0.349	0.000731		1.51		1.51	< 0.000005	4.34	0.243	0.00161	0.0247	0.024
27-Sep-11	69.6			0.000216	16.2	2.63	0.00522	1.37	0.000013	4.45	0.239	0.00163	0.0296	0.0314
25-Oct-11	56.9		0.451	0.000687	12.8	0.861		1.17	< 0.000005	3.95	0.204	0.00209	0.0263	0.0246
23-Nov-11	184	0.0148		0.000864	38.8	7.94	0.0158	2.99	< 0.000005	11.8	0.486	0.00322	0.0861	0.0906
29-Nov-11	168	0.0197	0.501	0.00038	39.6	10.6	0.0203	3.1	< 0.00003	11.7	0.524	0.00333	0.102	0.0926
8-Dec-11	181	0.0227	0.709	0.000276	42.1	12		3.11	< 0.000005	12.7	0.579	0.00351	0.146	0.0885
18-Jan-12		0.00163	0.457	0.00053	18.8	2.25	0.00408	1.77	< 0.000005	6.17	0.291	0.00305		0.0325
2-Feb-12	102	0.00188	0.472	0.000138	21.2	2.84	0.00487	1.94	< 0.000005	6.83	0.323	0.00283	0.0281	0.0289
5-Mar-12	126		0.71	0.00144	29.6			2.46	< 0.000005	9.47	0.389	0.00349	0.0322	0.0288
19-Apr-12														
24-Apr-12														
1-May-12	170	0.0214	1.67	0.000418	42.8	11.8	0.021		< 0.000025	13.2		0.00365	0.0768	0.0792
8-May-12	125	0.00951	1.42	0.00133	24.7	5.31	0.00957	2.59		7.83	0.409	0.00265	0.0534	0.0509
9-May-12	113	0.00846	1.34	0.00184	21.9		0.0086	2.3	< 0.00002	6.6		0.00219	0.0615	0.055
15-May-12	87.9	0.00448	0.916		17.1	2.89	0.0113	2.1	< 0.000005	5.35	0.306	0.0017	0.0441	0.0613
22-May-12	45.9	0.00238	1.71	0.00352	8.6	1.31		1.55		2.73	0.161	0.00108		0.017
28-May-12	21.6	0.000363	0.426	0.00138	4.45	0.22	0.00137	1.11	0.0000085		0.0888	0.000569	0.0101	0.013
29-May-12	24.2	0.000318	0.379	0.00162	4.47	0.219		1.12		1.36	0.0892	0.000605	0.0106	0.00834
30-May-12	23.4	0.00039	0.582	0.00201	5.13	0.209	0.00155	0.947	0.000015	1.33	0.0895	0.00062	0.0121	< 0.0318
5-Jun-12	18	0.00065	0.745	0.00455	3.81	0.307	0.00197	0.889	0.0000132	1.47	0.0719	0.00056	0.0154	0.0129
12-Jun-12	17	0.000523	0.29	0.00254	3.61	0.277	0.00136	0.658	0.0000068	1.36		0.000484	0.0132	0.00849
19-Jun-12	26.4	0.00072	0.201	0.00114		0.464	0.00129	0.796	< 0.000005	1.83		0.000593	0.0127	0.0165
26-Jun-12	33.3	0.00117	0.295	0.00273	7.46	0.715	0.00184	0.868	0.0000074	2.44	0.136	0.000871	0.0199	
3-Jul-12	28.5	0.000718	0.32	0.00212	6.04	0.459	0.0015	0.67	0.0000085	1.81	0.11	0.000586	0.0125	0.00963
10-Jul-12	47.7	0.00119	0.294	0.00101	10.2	0.784		0.999	< 0.000005	2.79	0.159		0.0208	0.0197
17-Jul-12	38.3	0.00119	0.217	0.000553	9.04	0.759	0.00172	0.816	< 0.000005	2.58	0.147	0.000983	0.0161	
24-Jul-12	54	0.0019	0.295	0.00043		1.27	0.00223	1.16	< 0.000005	3.61		0.00114	0.0237	0.0235
26-Jul-12	56.9	0.0017	0.336		14.2	1.09	0.0021	< 2	< 0.00002	3.5		0.00119	0.0265	0.0243
31-Jul-12	69.9	0.00237	0.411	0.00116	16.2		0.00272	1.44	< 0.000005	4.33	0.243	0.00141	0.0364	0.0408
7-Aug-12	72	0.00312	0.448	0.00088	18	1.85	0.00317	1.65	< 0.000005	4.7	0.267	0.00145	0.0343	0.178
9-Aug-12	69.6	0.00225	0.426	< 0.0005	17.3	1.32	0.0024	< 2		4.3				0.0303
14-Aug-12	56.6	0.00203	0.38	0.000386	14.3	1.22	0.00228	1.28	< 0.000005	3.88	0.207	0.00112	0.0323	0.0311
21-Aug-12	71.3	0.00357	0.524	0.000333	17.1		0.00358	1.6	< 0.000005	4.69	0.263	0.00145	0.0387	0.035
28-Aug-12	70.9	0.00588	0.826	0.000259	16.6	3.01	0.00336	1.48	0.000006	4.52	0.245	0.00146	0.0355	0.0294
4-Sep-12	67.8	0.00312	0.483	0.000334	17.6	1.76	0.0032	1.52	< 0.000005	4.86	0.258	0.00131	0.044	0.0426
13-Sep-12	71	0.00289	0.379	0.000395	16.8	1.71	0.003	1.26	< 0.000005	4.4	0.224	0.00138	0.0428	0.0396

Table C.19: Water quality data and summary statistics for mine exposed station X14, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	mg/L	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L	pH units	mg/L	mg/L	mg/L	NTU	mg/L	mg/L
18-Sep-12	97.1	0.078		241	0.055			8.64		360	1.7	1.45	0.000037	0.000039
20-Sep-12	105	0.058		271	0.0514	3			160	336	1.4	-4.5	0.000037	0.000029
25-Sep-12	94.5	0.034	284	149	0.041	2.64	2.65	8.06	59.9	184	< 1	0.78	0.000022	0.000018
10-Oct-12	98.7	0.026	296	141	0.052	2.57	3.06	7.66	57.4		< 1	0.85	0.000047	0.000042
24-Oct-12	129	0.04			0.0928		2.57		87	288	< 1	1.52		
8-Nov-12	126	0.046	483	205	0.137	1.64	1.35	7.37	90.8	266	< 1	1.77	0.000051	0.000051
4-Dec-12		0.13	568	295	0.114	1.18	1.38	7.66	150	368	< 1	2.24	0.000063	0.000059
10-Jan-13	175	0.21	944	565	0.205	1.07	1.33	7.49	380	772	1.7	2.96	0.000095	0.000081
15-Jan-13	150	0.17	875	476	0.154	1.65	1.94	7.66	342	664	2.5	3.19	0.000081	0.00008
24-Jan-13	176	0.19	1221	556	0.189	1.78	2.39	7.38	395	796	1.1	2.66	0.000083	0.000086
29-Jan-13	179	0.42	1429	641	0.191	2.39	2.42	7.02	471	878	3		0.000095	0.000098
5-Feb-13	177	0.22	1009	553	0.194	1.84	1.86	7.01	402	780	3.1	13.83	0.000085	0.000084
12-Feb-13	179	0.24	1254	603	0.188	1.6	1.85	7.32	429	878	5	8.73	0.000091	0.000101
5-Mar-13	179	0.0831	679	365	0.214	2.76		7.04	199	470	1.1		0.000079	0.000072
6-Mar-13	169	0.099	758	354	0.219	1.31	1.49	7.02	218	492	3.3	2.91	0.000072	0.000072
8-Apr-13	185	0.12		428	0.223	1.5	1.59		251	584	< 1		0.000098	0.000117
9-Apr-13			890					7.29				2.8		
9-May-13			867					7.29				6.15		
14-May-13	52.7	0.054	190	104	0.061	12.7	14.2	7.48	56.2	160	12.6	5.39	0.000129	0.000107
21-May-13	67.1	0.038	289	134	0.06	13	13.6	6.69	73.5	214	12.1	9.98	0.00009	0.00007
23-May-13	85	0.0368	282	159	0.0524			7.77	74.2	212	8.5	9.32	0.000086	0.000069
30-May-13	23.4	0.083	69	33.3	< 0.02	5.87	6.66	7.67	9.28	58	38.6	11.5	0.000091	0.000041
4-Jun-13	34.7	0.037	143	51.6	< 0.02	5.63	8.01	7.69	16.3	66	14.5	5.45	0.000039	0.000043
11-Jun-13	44.1	0.017	147	69.4	< 0.05	4	4.6	7.88	26	108	6.1	2.72	0.000026	0.000035
18-Jun-13	57.1	0.0108	158	70.7	0.026			7.72	24.3	90	5.6	1.64	0.000021	0.000016
10-Jul-13	89.5	0.022	294	138	0.031	2.72	2.91	7.89	57.5	180	1.7	0.84	0.000078	0.000051
23-Jul-13	82.9	0.042	325	155	0.023	4.13	4.31	7.55	85.5	204	2.4	1.35	0.000043	0.000029
24-Jul-13	93.6	0.0387	389	184	0.019			7.98	97.9		< 3	1.72	0.000032	0.000031
7-Aug-13	113	0.068	544	227	< 2	2.57	2.87	7.88	138	314	< 1	3.83	0.00004	0.000042
13-Aug-13	112	0.01		169	0.02	2.9	2.79		64	201	< 1		0.000026	0.000027
22-Aug-13			329					7.88						
27-Aug-13	82.6	0.03	333	126	< 2	4.59	4.94	7.84	61.9	196	8.8	2.7	0.000034	0.000025
5-Sep-13	97.7	0.054	351	175	< 2	3.18	3.36	8.1	82.7	228	1.3	1.56	0.000032	0.000032
10-Sep-13	98.2	0.031	336	167	< 2	3.22	3.58	7.83	88.8	244	1.2	1.01	0.00003	0.000032
17-Sep-13	100	0.059	417	204	< 2	2.95	3.22	7.95	121	230	1.4	5.33	0.000037	0.000032
24-Sep-13	101	0.041	397	185	< 2	3.47	3.65	7.98	103	214	1.7	1.15	0.000033	0.000039
1-Oct-13			538					7.88						
8-Oct-13			452					7.56						
22-Oct-13	126	0.071	535	260	< 2	2.26	2.37	7.6	144	350	8	3.95	0.000083	0.00007
29-Oct-13	114	0.064	463	258	< 2	2.02	1.75	7.77	143	318	1.9		0.000095	0.000093
5-Nov-13	145	0.14	829	447	< 2	1.72	2.16	7.47	289	586	3.5	8.44	0.000107	0.00009
7-Nov-13	144	0.13		433	< 2	1.6	2.2		255	610	2.6		0.000098	0.000082
12-Nov-13	142	0.15	827	444	< 2	1.92	2.26	7.61	290	556	4.7	8.09	0.000106	0.000104
14-Nov-13												2.85		
19-Nov-13	127	0.057		225	< 2	1.85	1.91		106	204	< 1		0.000111	0.000109
21-Nov-13	133	0.054		238	< 2	1.99	2.2		120	178	< 1		0.000121	0.000113
26-Nov-13												1.91		
28-Nov-13												3.76		
4-Dec-13	143	0.057	504	250	< 2	1.66	2.42	7.09	132	354	< 1	2.43	0.000143	0.000135
27-Dec-13												2.62		
8-Jan-14	152	0.063	646	320	< 2	2.36	2.45	7.24	175	382	1.5	3.43	0.000218	0.000214
14-Jan-14	64.4	0.0162		99.9	0.0297				36	114	6	11.5	0.000055	0.000045
23-Jan-14	183	0.2	998	587	< 2	2.43	2.51	7.1	485	840	9.1	4.08	0.000224	0.000214

Table C.19: Water quality data and summary statistics for mine exposed station X14, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
18-Sep-12	69.4	0.00344	0.405	0.000762	16.5	1.98	0.00318	1.43	< 0.000005	4.47	0.266	0.00133	0.0432	0.0404
20-Sep-12	76.1	0.00328	0.403	0.000192	16.1	1.89	0.00315	1.28	< 0.00001	4.14	0.247	0.00139	0.0396	0.036
25-Sep-12	41.7	0.000828	0.326	0.00134		0.677	0.00142	0.903	< 0.000005	2.9	0.168	0.00124	0.0218	0.0199
10-Oct-12	41.1	0.000492	0.379	0.000216	9.44	0.64	0.00144	0.956	< 0.000005	2.91	0.158	0.0015	0.0229	0.0216
24-Oct-12														
8-Nov-12	60.5	0.00103	0.457	0.000416	13	1.31	0.00292	1.34	< 0.000005	3.89		0.00223	0.0589	0.0432
4-Dec-12	87.1	0.00191	0.55	0.000807	18.9	2.42	0.00513	1.66	< 0.000005	5.88	0.288		0.0357	0.0345
10-Jan-13	169	0.00922	0.673	0.000173	34.8	6.52	0.0104	2.85	< 0.000005	10.2	0.517	0.00378	0.0662	0.0644
15-Jan-13	140	0.00801	0.62	0.000498	30.3	5.69	0.00896	2.86	< 0.000005	8.85	0.446	0.00294	0.0514	0.0474
24-Jan-13	151	0.0109	0.765	0.000206	33.5	7.18	0.0105	2.76	< 0.000005	9.85	0.516	0.00327	0.059	0.0623
29-Jan-13	188	0.0147	1.17	0.00022	41.8	8.82	0.0134	3.28	< 0.000025	11.8	0.56	0.00336	0.0773	0.0772
5-Feb-13	159	0.0131	1.45	0.000104	34.8	8.33	0.0114	2.82	< 0.000005	10	0.512	0.00359	0.0588	0.0611
12-Feb-13	172	0.0167	2.08	0.000289	40.2	9.95	0.0138	2.99	< 0.000025	11.4	0.574	0.00374	0.0753	0.0787
5-Mar-13	110	0.00209	0.578	0.000248	24.4	3.34	0.00533	1.86	< 0.00001	6.99	0.33	0.00333	0.0323	0.0291
6-Mar-13	95.4	0.00204	0.527	0.000072	23	3.28	0.00532	1.94	< 0.000005	7.09	0.344	0.00341	0.0298	0.0322
8-Apr-13	128	0.00286	0.686	0.000191	26.5	4.2	0.00695	2.24	< 0.000005	8.04	0.408	0.00381	0.0242	0.0371
9-Apr-13														
9-May-13														
14-May-13	30.1	0.0013	0.905	0.00581	7.04	0.822	0.00309	2.48	0.000017	1.98	0.107	0.000799	0.0664	0.0623
21-May-13	39.3	0.00165	0.834	0.00202	8.63	1.09	0.00323	2.06	0.00001	2.34	0.136	0.0011	0.0451	0.0363
23-May-13	44.9	0.0021	1.01	0.00188	10.5	1.37	0.00364	2.05	0.000057	2.67	0.164	0.00135	0.0403	0.0356
30-May-13	9.69	0.000871	1.05	0.0108	2.2	0.201	0.00274	1.53	0.000007	0.734	0.0419	0.00046	0.0254	0.0136
4-Jun-13	15	0.000605	0.491	0.00339	3.45	0.273	0.00169	1.05	0.000006	1.11	0.0566	0.000502	0.0117	0.0375
11-Jun-13	20.2	0.00069	0.351	0.0011	4.57	0.436	0.00143	0.77	< 0.000005	1.45	0.077	0.000697	0.00873	0.0553
18-Jun-13	21.5	0.00035	0.345	0.000951	5.15	0.301	0.00126	0.83	< 0.00001	1.56	0.0869	0.000878	0.0092	0.0079
10-Jul-13	39	0.00129	1.18	0.0095	9.52	0.904	0.00324	0.928	0.000014	2.81	0.156	0.00144	0.0436	0.0741
23-Jul-13	44	0.00251	0.33	0.000553	10.9	1.64	0.00298	0.883	0.000031	3.09	0.151	0.00108	0.0248	0.0189
24-Jul-13	52.8	0.00334	0.401	0.000393	12	2.17	0.00334	1.03	< 0.00001	3.36	0.19	0.0012	0.0212	0.0197
7-Aug-13	66.3	0.00408	0.504	0.000306	14.8	2.58	0.00399	1.27	< 0.000005	4.25	0.232	0.00189	0.0273	0.0302
13-Aug-13	47.2	0.00069	0.5	0.00035	11.2	0.91	0.00195		< 0.00001	3.04	0.18	0.00161	0.02	0.02
22-Aug-13														
27-Aug-13	35.3	0.00174	0.43	0.0011	8.74	1.12	0.00236	0.777	< 0.000005	2.47	0.147	0.00108	0.0262	0.0221
5-Sep-13	48	0.00208	0.395	0.000323	11.1	1.43	0.00244	0.993	< 0.000005	3	0.176	0.00122	0.0329	0.0374
10-Sep-13	42.5	0.00236	0.364	0.000227	10.9	1.44	0.00259	0.983	< 0.000005	3.13	0.176	0.00147	0.0352	0.0342
17-Sep-13	57.5	0.00455	0.364	0.000331	13.6	2.7	0.00405	1.16	< 0.000005	3.78	0.203	0.00146	0.041	0.0404
24-Sep-13	52	0.00355	0.332	0.000331	12.2	2.17	0.00348	1.09	< 0.000005	3.43	0.185	0.00145	0.0459	0.0509
1-Oct-13														
8-Oct-13														
22-Oct-13	73.4	0.00422	0.932	0.00143	18.6	2.88	0.00517	1.43	< 0.000005	5.18	0.236	0.00204	0.141	0.128
29-Oct-13	75	0.00552	0.559	0.0023	17.3	3.07	0.00515	1.41	< 0.000005	4.67	0.242	0.00198	0.176	0.161
5-Nov-13	132	0.0139	1.22	0.000916	28.8	7.53	0.0107	2.05	< 0.000005	7.61	0.4	0.00272	0.178	0.16
7-Nov-13	124	0.0139	1.21	0.000724	29.9	7.29	0.0111	2.14	< 0.000005	7.93	0.403	0.00264	0.16	0.144
12-Nov-13	130	0.014	1.78	0.000354	28.9	7.66	0.0105	2.12	< 0.000005	7.5	0.396	0.00243	0.171	0.175
14-Nov-13														
19-Nov-13	67.4	0.00129	0.445	0.000304	13.8	1.33	0.00351	1.31	< 0.000005	3.82	0.233	0.00213	0.187	0.193
21-Nov-13	69.2	0.00153	0.396	0.000225	15.9	1.56	0.00385	1.48	< 0.000005	4.36	0.272	0.00237	0.202	0.204
26-Nov-13														
28-Nov-13														
4-Dec-13	72.3	0.00197	0.535	0.000577	16.9	1.95	0.00476	1.5	< 0.000005	4.7	0.264	0.0026	0.226	0.226
27-Dec-13														
8-Jan-14	92.3	0.00285	0.681	0.00017	21.8	2.91	0.00688	1.62	< 0.000005	5.92	0.311	0.00285	0.341	0.337
14-Jan-14	29.2	0.00095	0.469	0.00175	6.62	0.588	0.00199	0.89	< 0.00001	1.78	0.0998	0.000904	0.0517	0.0458
23-Jan-14	169	0.0184	2.01	0.000817	40.2	11	0.0156	2.88	< 0.000005	10.8	0.528	0.00368	0.279	0.265

Table C.19: Water quality data and summary statistics for mine exposed station X14, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
28-Jan-14	185	0.32	1216	660	< 2	1.73	2.21	7.64	552	952	7.3	20.1	0.000192	0.00018
27-Feb-14	182	0.11	840	429	< 2	1.61	1.66	6.99	264	578	< 1	1.46	0.000283	0.000272
10-Mar-14	197	0.14	1082	552	< 2	2.14	2.9	7.33	345	692	2.8	7.05	0.000316	0.000293
2-Apr-14	192	0.13	938	488	< 2	2.35	1.32	7.07	308	684	3.7	4.2	0.00031	0.000291
6-May-14	47.7	0.014	148	59	< 2	12	12.3	6.8	9.81	104	289	5.7	0.000217	0.000114
13-May-14	44	0.031	155	72.9	< 2	9.85	10.1	7.73	30.4	132	9	4.29	0.000092	0.000069
20-May-14	46.2	0.015	178	68.3	< 2	8.15	7.95	8	27.4	116	11.3	4.59	0.000067	0.00004
27-May-14	70.5	0.02	252	111	0.042	5.41	6.51	6.95	45.5	142	4.8	2.44	0.000062	0.000061
3-Jun-14	69.8	0.028	273	122	0.029	3.5	3.97	7.61	57.6	168	1.5	1.43	0.000058	0.000053
12-Jun-14	66.5	0.024	253	117	< 2	2.79	4.28	7.85	63.3	166	1.3	1.27	0.000056	0.000069
17-Jun-14	59.6	0.053	243	115	< 0.02	2.9	4.39	7.98	61.1	170	2.9	1.83	0.000049	0.000044
3-Jul-14	83.9	0.096	350	167	< 2	3.12	3.61	8.08	104	216	1.5	0.97	0.000078	0.000093
8-Jul-14	92.6	0.053	399	189	0.025	2.56	3.72	7.84	115	262	1.2	3.09	0.000064	0.000057
15-Jul-14	101	0.046	410	195	0.025	3.07	2.87	7.67	105	268	1.3	1.25	0.000075	0.000076
22-Jul-14	108	0.056	442	230	0.031	2.58	2.09	8.31	133	296	2.1	1.47	0.000092	0.000085
29-Jul-14	109	0.066	485	249	0.029	3.67	3.11	7.71	146	338	< 1	1.83	0.000111	0.000105
5-Aug-14	105	0.062	540	232	0.025	3.07	3.07	7.72	143	314	1.1	1.32	0.000097	0.000093
25-Sep-14	99	0.037	420	202	< 2	3.54	3.44	7.93	103	264	1.2	0.9	0.000073	0.000069
14-Oct-14			586					8.43						
n	154	153	149	161	104	143	141	152	150	151	149	129	152	153
minimum	23.4	<0.005	69	33.3	<0.02	1.07	1	6.69	9.28	58	<1	0.09	0.000013	0.000015
maximum	240	0.42	1935	1110	0.226	19.6	19	9	940	1600	289	20.1	0.000316	0.000293
median	99	0.071	463	230	0.05	2.7	2.9	7.73	139	300	2	2.21	0.0000580	0.000054
mean [a]	114	0.11	583	292	0.09	3.5	3.6	7.72	188	393	6	3.05	0.0000717	0.000066
standard deviation (SD) [a]	51	0.09	377	201	0.07	2.8	2.7	0.40	155	279	24	2.95	0.0000524	0.000048
max detection limit	-	0.005	-	-	2	5	5	-	-	-	4	0.25	-	0.000044
# < detection limit	-	2	-	-	34	1	1	-	-	-	49	1	-	1
% < detection limit	-	1%	-	-	33%	1%	1%	-	-	-	33%	1%	-	1%
upper background (BG) benchmark	134.6	0.056	278	141	0.19	14.2	11.9	8.4	17.8	170	13	2.87	0.000105	0.000044
% samples > upper BG benchmark	31%	65%	82%	78%	13%	1%	4%	5%	98%	82%	5%	34%	18%	59%
lower background (BG) benchmark	10.5	-	-	-	-	0.8	0.8	7.2	-	-	-	-	-	-
% samples < lower BG benchmark	0%	-	-	-	-	0%	0%	7%	-	-	-	-	-	-
background median	43.6	0.014	126	51.2	0.03	2.3	2.3	7.78	8.3	68	<1	0.62	0.000010	0.000010
station median > BG median	1	1	1	1	1	1	1	0	1	1	1	1	1	1
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	218	-	-	-	0.000316	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	23	-	-	0	-	-	0	46	-	-	-	0	-
% > current water quality criterion	-	15%	-	-	0%	-	-	0%	31%	-	-	-	0%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.19: Water quality data and summary statistics for mine exposed station X14, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
28-Jan-14	186	0.0268	4.03	0.00027	47.5	14.2	0.0201	3.2	< 0.000025	12.5	0.581	0.00363	0.311	0.309
27-Feb-14	126	0.00371	0.791	0.000218	27.9	4.84	0.00943	2.09	0.000016	7.55	0.41	0.00354	0.333	0.341
10-Mar-14	161	0.00487	0.976	0.000189	36.1	6.45	0.0123	2.77	< 0.000005	10.4	0.494	0.00427	0.415	0.408
2-Apr-14	142	0.00484	0.937	0.000618	32.2	5.75	0.012	2.41	< 0.000005	8.45	0.424	0.00365	0.44	0.464
6-May-14	17.2	0.00155	1.78	0.00683	3.89	0.329	0.00312	1.79	< 0.000005	1.23	0.0783	0.000625	0.169	0.139
13-May-14	20.8	0.00109	0.608	0.00467	5.06	0.569	0.00251	1.21	< 0.000005	1.31	0.0826	0.000624	0.0718	0.0644
20-May-14	19.6	0.000771	0.493	0.00551	4.68	0.407	0.00193	0.892	0.000008	1.39	0.0802	0.000679	0.0425	0.0354
27-May-14	31.7	0.00119	0.313	0.00103	7.67	0.764	0.00225	0.931	< 0.000005	2.01	0.127	0.00106	0.0655	0.0594
3-Jun-14	35.2	0.00145	0.283	0.000574	8.22	1.03	0.00221	0.871	< 0.000005	2.29	0.128	0.00101	0.0616	0.0588
12-Jun-14	33.9	0.00141	0.266	0.000575	7.95	0.979	0.00214	0.785	< 0.000005	2.18	0.122	0.000955	0.0655	0.0651
17-Jun-14	33.5	0.00144	0.303	0.000906	7.56	0.928	0.00198	0.796	< 0.000005	2.28	0.117	0.000843	0.0532	0.051
3-Jul-14	49.3	0.00199	0.346	0.00121	10.7	1.26	0.00242	1.01	< 0.000005	3.17	0.171	0.00115	0.0782	0.0799
8-Jul-14	56.3	0.00211	0.4	0.000385	11.8	1.35	0.0027	1.03	< 0.000005	3.27	0.197	0.00123	0.0826	0.0751
15-Jul-14	57	0.00223	0.471	0.000391	12.7	1.5	0.00293	1.09	0.000007	3.45	0.201	0.00132	0.0874	0.0867
22-Jul-14	68.3	0.00291	0.513	0.000325	14.5	1.9	0.00345	1.29	< 0.000005	3.91	0.235	0.0016	0.123	0.112
29-Jul-14	73	0.00332	0.586	0.000506	16.3	2.1	0.00403	1.35	0.000044	4.4	0.253	0.00159	0.151	0.135
5-Aug-14	69.3	0.00259	0.537	0.000543	14.2	1.69	0.00328	1.26	< 0.000005	3.98	0.235	0.00154	0.127	0.113
25-Sep-14	59.4	0.00251	0.491	0.000511	13	1.54	0.00289	1.09	< 0.000005	3.54	0.182	0.00134	0.103	0.0986
14-Oct-14														
n	153	150	155	153	154	154	149	152	155	153	150	150	212	209
minimum	9.69	0.000318	0.173	0.000072	2.2	0.201	0.00126	0.61	<0.000005	0.734	0.0419	0.00046	0.00873	0.0079
maximum	322	0.0504	4.03	0.0144	70.6	25.5	0.0562	4.2	0.00006	21.6	0.867	0.00524	0.44	0.464
median	67.3	0.00216	0.43	0.000553	15.0	1.59	0.0035	1.435	<0.000005	4.33	0.236	0.00145	0.051	0.045
mean [a]	83.7	0.00458	0.60	0.00125	18.8	3.13	0.0062	1.70	0.000006	5.68	0.275	0.00197	0.069	0.066
standard deviation (SD) [a]	57.1	0.00643	0.53	0.00199	12.5	3.72	0.0069	0.83	0.000009	4.04	0.163	0.00123	0.064	0.065
max detection limit	-	-	-	0.0005	-	-	0	2	0.00003	-	-	-	-	0.0318
# < detection limit	-	-	-	1	-	-	0	2	129	-	-	-	-	1
% < detection limit	-	-	-	1%	-	-	0%	1%	83%	-	-	-	-	0%
upper background (BG) benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
% samples > upper BG benchmark	77%	100%	45%	13%	81%	100%	100%	58%	14%	71%	69%	31%	96%	86%
lower background (BG) benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% samples < lower BG benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
background median	15.6	0.0000350	0.1115	0.000144	2.67	0.00855	0.00030	0.57	<0.000005	1.9	0.0728	0.000761	0.0017	0.0022
station median > BG median	1	1	1	1	1	1	1	1	0	1	1	1	1	1
current water quality criterion [b]	-	0.0025	1	0.013	-	1.617	0.180	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	67	18	1	-	76	0	0	0	-	-	0	155	-
% > current water quality criterion	-	45%	12%	1%	-	49%	0%	0%	0%	-	-	0%	73%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.20: Water quality data and summary statistics for mine exposed station R4, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
19-May-11	37	0.033			0.06	21.3	23.1	7.44	32	110	33	5.97	0.000156	0.000044
29-May-12	51.1			76.5			8.89		28.2	122	9.1	3.97		0.0000255
29-Aug-12				176									0.000032	0.000023
23-Oct-12	133	0.018			0.152				63.4	244		0.51		
4-Jun-13	35.9	< 0.005		46	0.0285	6.68	6.78		14.3	72.2	19		0.000068	0.00002
12-Aug-13	109	< 0.005		147	0.03	2.58	2.51		49.2	185	< 1		0.000016	0.000016
19-Nov-14	90.5	< 0.005		133	0.0575	3.59	3.99		56.3	167	3.4	2.6	0.000053	0.00005
n	6	5	0	5	5	4	5	1	6	6	5	4	5	6
minimum	35.9	<0.005	-	46	0.0285	2.58	2.51	7.44	14.3	72.2	<1	0.51	0.000016	0.000016
maximum	133	0.033	-	176	0.152	21.3	23.1	7.44	63.4	244	33	5.97	0.000156	0.00005
median	71	<0.005	-	133	0.06	5.135	6.78	7.44	41	144.5	9.1	3.29	0.0000530	0.000024
mean [a]	76	0.012	-	116	0.07	8.5	9.1	7.44	41	150	13	3.26	0.0000650	0.000030
standard deviation (SD) [a]	41	0.014	-	53	0.05	8.7	8.2	-	19	61	13	2.30	0.0000546	0.000014
max detection limit	-	0.005	-	-	-	-	-	-	-	-	1	-	-	0
# < detection limit	-	3	-	-	-	-	-	-	-	-	1	-	-	0
% < detection limit	-	60%	-	-	-	-	-	-	-	-	20%	-	-	0%
upper background (BG) benchmark	134.6	0.056	278	141	0.19	14.2	11.9	8.4	17.8	170	13	2.87	0.000105	0.000044
% samples > upper BG benchmark	0%	0%	-	40%	0%	25%	20%	0%	83%	33%	40%	50%	20%	17%
lower background (BG) benchmark	10.5	-	-	-	-	0.8	0.8	7.2	-	-	-	-	-	-
% samples < lower BG benchmark	0%	-	-	-	-	0%	0%	0%	-	-	-	-	-	-
background median	43.6	0.014	126	51.2	0.03	2.3	2.3	7.78	8.3	68	<1	0.62	0.000010	0.000010
station median > BG median	1	0	0	1	1	1	1	0	1	1	1	1	1	1
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	218	-	-	-	0.000201	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	0	-	-	0	-	-	0	0	-	-	-	0	-
% > current water quality criterion	-	0%	-	-	0%	-	-	0%	0%	-	-	-	0%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.20: Water quality data and summary statistics for mine exposed station R4, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
19-May-11		0.00364		0.0109	4.6	2.01	0.0067	1.8	0.000031	1.8	0.0749	0.000581	0.066	0.0227
29-May-12	23.2	0.000606			4.51	0.361	0.00186	1.01	0.0000122	1.32	0.0884	0.000609	0.0118	0.0133
29-Aug-12	51.6	0.00158	0.283		11.5	0.961	0.00234	1.23	< 0.000005	3.13	0.18	0.00117	0.0157	0.0139
23-Oct-12														
4-Jun-13	13.4	0.00086	1.08	0.00624	3	0.294	0.0029	0.963	0.000028	0.932	0.0544	0.00049	0.0185	0.007
12-Aug-13	43	0.00016	0.2	0.00016	9.88	0.25	0.00105		< 0.00001	2.66	0.17	0.00138	0.0099	0.0074
19-Nov-14	41.7	0.00096	0.301	0.000436	8.63	0.637	0.00197	0.928	< 0.00001	2.43	0.159	0.00124	0.0639	0.0531
n	5	6	4	4	6	6	6	5	6	6	6	6	6	6
minimum	13.4	0.00016	0.2	0.00016	3	0.25	0.00105	0.928	<0.000005	0.932	0.0544	0.00049	0.0099	0.007
maximum	51.6	0.00364	1.08	0.0109	11.5	2.01	0.0067	1.8	0.000031	3.13	0.18	0.00138	0.066	0.0531
median	41.7	0.000910	0.29	0.003338	6.6	0.499	0.0022	1.01	<0.000011	2.115	0.124	0.0008895	0.017	0.014
mean [a]	34.6	0.001301	0.47	0.00443	7.0	0.752	0.0028	1.19	0.000014	2.05	0.121	0.00091	0.031	0.020
standard deviation (SD) [a]	15.7	0.001236	0.41	0.00514	3.4	0.671	0.0020	0.36	0.000013	0.84	0.055	0.000393	0.027	0.017
max detection limit	-	0	0	0	-	-	0	-	0.00001	-	-	0	0	0
# < detection limit	-	0	0	0	-	-	0	-	3	-	-	0	0	0
% < detection limit	-	0%	0%	0%	-	-	0%	-	50%	-	-	0%	0%	0%
upper background (BG) benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
% samples > upper BG benchmark	60%	83%	25%	50%	33%	100%	100%	20%	33%	0%	17%	0%	67%	33%
lower background (BG) benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% samples < lower BG benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
background median	15.6	0.0000350	0.1115	0.000144	2.67	0.00855	0.00030	0.57	<0.000005	1.9	0.0728	0.000761	0.0017	0.0022
station median > BG median	1	1	1	1	1	1	1	1	1	1	1	1	1	1
current water quality criterion [b]	-	0.0025	1	0.008	-	1.190	0.119	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	1	1	1	-	1	0	0	0	-	-	0	2	-
% > current water quality criterion	-	17%	25%	25%	-	17%	0%	0%	0%	-	-	0%	33%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.21: Water quality data and summary statistics for mine exposed station A1, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
21-Jan-10		0.009	199.1	181	0.24				44	230	1		0.000008	< 0.000005
26-Feb-10	150	< 0.005	208.2	177	0.24			8.21	56	220	< 1		0.000011	0.000006
30-Mar-10	150	< 0.005	231	206	0.25			8.36	81	240	1		0.00002	0.000033
19-May-10	75	0.009	146	118	0.06			7.81	45	160	93		0.000173	
3-Aug-10	130	< 0.005	236	148	< 0.02			8.29	40	170	1		0.000033	
4-Nov-10	120	0.015		157	0.15			8.11	41	180	8		0.000023	0.000008
19-May-11	39	0.039		22.8	0.05	24.4	23.2		15	86	180	18.4	0.00007	0.000053
29-May-12	54	0.049			0.0457		10.4		17.9	110	27.4	13.9	0.0000803	0.0000246
29-Aug-12													0.000068	0.000022
23-Oct-12	140				0.125		3.92		43.5	228	1.7	1.17		
4-Jun-13	38.8	0.0082		45.6	0.0327	7.38	7.61		10.2	73.7	119		0.000172	0.000023
12-Aug-13	114	0.005		143	0.01	2.71	3.23		33.2	172	41.7		0.000098	< 0.00001
19-Nov-14	99	< 0.005		118	0.0654	4.72	5.17		33	144	20.4	19.03	0.000059	0.000026
n	11	11	5	10	12	4	6	5	12	12	12	4	12	10
minimum	38.8	<0.005	146	22.8	0.01	2.71	3.23	7.81	10.2	73.7	<1	1.17	0.000008	<0.000005
maximum	150	0.049	236	206	0.25	24.4	23.2	8.36	81	240	180	19.03	0.000173	0.000053
median	114	0.008	208	146	0.06	6.05	6.4	8.21	41	171	14	16.2	0.0000635	0.0000225
mean [a]	101	0.013	204	132	0.11	9.8	8.9	8.16	38	168	41	13.1	0.0000679	0.000020
standard deviation (SD) [a]	43	0.016	36	58	0.09	9.9	7.5	0.21	19	57	59	8.3	0.0000567	0.000016
max detection limit	-	0.005	-	-	0.02	-	-	-	-	-	1	-	-	0.00001
# < detection limit	-	4	-	-	1	-	-	-	-	-	1	-	-	2
% < detection limit	-	36%	-	-	8%	-	-	-	-	-	8%	-	-	20%
upper background (BG) benchmark	134.6	0.056	278	141	0.19	14.2	11.9	8.4	17.8	170	13	2.87	0.000105	0.000044
% samples > upper BG benchmark	27%	0%	0%	60%	25%	25%	17%	20%	83%	50%	50%	75%	17%	10%
lower background (BG) benchmark	10.5	-	-	-	-	0.8	0.8	7.2	-	-	-	-	-	-
% samples < lower BG benchmark	0%	-	-	-	-	0%	0%	0%	-	-	-	-	-	-
background median	43.6	0.014	126	51.2	0.03	2.3	2.3	7.78	8.3	68	<1	0.62	0.000010	0.000010
station median > BG median	1	0	1	1	1	1	1	1	1	1	1	1	1	1
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	218	-	-	-	0.000216	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	0	-	-	0	-	-	0	0	-	-	-	0	-
% > current water quality criterion	-	0%	-	-	0%	-	-	0%	0%	-	-	-	0%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.21: Water quality data and summary statistics for mine exposed station A1, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
21-Jan-10	53.6	0.000029	0.041	0.000086	11.4	0.0102	0.00049	1.49	< 0.000005	3.34	0.172	0.00238	0.0021	0.0025
26-Feb-10	52.7	0.000026	0.035	0.000034	11	0.00625	0.00039	1.41	< 0.000005			0.00249	0.0015	0.0017
30-Mar-10	60.6	0.00005	0.057	0.000198	13.2	0.0145	0.00053	1.61	< 0.000005	4.22	0.195	0.00279	0.0036	0.0018
19-May-10	34.1	0.00164	2.08	0.00402	7.9	0.524	0.00653	1.47	< 0.000005	2.1	0.11	0.00133	0.0324	
3-Aug-10	43.2	0.000078	0.069	0.000167	9.72	0.0365	0.00087	1.35	< 0.000005	2.71		0.00161	0.0027	
4-Nov-10	45.5	0.000144	0.152	0.000472	10.6	0.0468	0.00091				0.157		0.0048	0.0013
19-May-11	5.8	0.00098		0.00062	2	0.081	0.0023	1	0.000018	0.8	0.0325	0.00175	0.007	0.009
29-May-12	20.4	0.000583	0.68		4.24	0.217	0.00273	1.17	0.000018	1.14	0.0729	0.000684	0.0086	0.00352
29-Aug-12	42.5	0.000651	0.631	0.00072	9.73	0.31	0.00243	1.3	0.000005	2.4	0.136	0.00139	0.00886	0.00324
23-Oct-12														
4-Jun-13	14.9	0.00186	3.42	0.00585	3.89	0.237	0.00738	1.48	0.00005	1.01	0.0566	0.000725	0.0242	0.0047
12-Aug-13	39.3	0.00072	1.79	0.00128	9.92	0.06	0.00331		0.000034	2.08	0.14	0.00172	0.01	< 0.001
19-Nov-14	35.5	0.00047	0.851	0.000739	8.14	0.154	0.00245	1.22	0.000012	2.12	0.125	0.00143	0.0229	0.0128
n	12	12	11	11	12	12	12	10	11	10	10	11	12	10
minimum	5.8	0.000026	0.035	0.000034	2	0.00625	0.00039	1	<0.000005	0.8	0.0325	0.000684	0.0015	0.001
maximum	60.6	0.00186	3.42	0.00585	13.2	0.524	0.00738	1.61	0.00005	4.22	0.195	0.00279	0.0324	0.0128
median	40.9	0.000527	0.63	0.000620	9.725	0.0705	0.0024	1.38	0.000005	2.11	0.131	0.00161	0.0078	0.0029
mean [a]	37.3	0.000603	0.89	0.001290	8.5	0.1414	0.0025	1.35	0.000014	2.19	0.120	0.00166	0.0107	0.0041
standard deviation (SD) [a]	16.4	0.000624	1.10	0.00188	3.4	0.157	0.0023	0.18	0.000016	1.07	0.052	0.000675	0.0101	0.0039
max detection limit	-	-	-	-	-	-	-	-	0.000005	-	-	-	-	-
# < detection limit	-	-	-	-	-	-	-	-	5	-	-	-	-	-
% < detection limit	-	-	-	-	-	-	-	-	45%	-	-	-	-	-
upper background (BG) benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
% samples > upper BG benchmark	50%	58%	55%	18%	58%	67%	58%	60%	18%	20%	10%	9%	25%	0%
lower background (BG) benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% samples < lower BG benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
background median	15.6	0.0000350	0.1115	0.000144	2.67	0.00855	0.00030	0.57	<0.000005	1.9	0.0728	0.000761	0.0017	0.0022
station median > BG median	1	1	1	1	1	1	1	1	0	1	1	1	1	1
current water quality criterion [b]	-	0.0025	1	0.008	-	1.245	0.127	373	0.00025	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	0	3	0	-	0	0	0	0	-	-	0	1	-
% > current water quality criterion	-	0%	27%	0%	-	0%	0%	0%	0%	-	-	0%	8%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, retained in summary statistics

Suspect value, excluded from summary statistics

Value was reported as below detection limit (DL) but the DL was the maximum reported station value; therefore, the value was excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.22: Water quality data and summary statistics for Pelly River station P1, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
19-May-11	72	0.023		112	< 0.02	16.7	18.2	7.97	30	140	160	17.1		0.000176
29-May-12	64	0.018		98.5	0.0246		9.42		32.8		116		0.000885	0.000148
29-Aug-12				178									0.000148	0.000102
23-Oct-12	145	0.019			0.0295		3.04		77.1	288	6.9	1.42		
6-Jun-13	68.7	< 0.005		84.8	0.0106	7.49	7.83		28.5	121	130		0.000451	0.000078
12-Aug-13	115	< 0.005		178	0.0065	2.94	2.91		66.8	223	3.4		0.000086	0.00007
19-Nov-14	117	< 0.005		176	0.0053	3.32	3.4		70	207	3.4	9.85	0.000157	0.000128
n	6	6	0	6	6	4	6	1	6	5	6	3	5	6
minimum	64	<0.005	-	84.8	0.0053	2.94	2.91	7.97	28.5	121	3.4	1.42	0.000086	0.00007
maximum	145	0.023	-	178	0.0295	16.7	18.2	7.97	77.1	288	160	17.1	0.000885	0.000176
median	93.5	<0.012	-	144	0.02	5.405	5.615	7.97	49.8	207	61.45	9.85	0.000157	0.000115
mean [a]	97	0.011	-	138	0.01	7.6	7.5	7.97	50.9	196	70	9.46	0.000345	0.000117
standard deviation (SD) [a]	33	0.010	-	44	0.01	6.4	5.9	-	22.7	67	73	7.8	0.000333	0.000041
max detection limit	-	0.005	-	-	0.02	-	-	-	-	-	0	-	-	-
# < detection limit	-	3	-	-	1	-	-	-	-	-	0	-	-	-
% < detection limit	-	50%	-	-	17%	-	-	-	-	-	0%	-	-	-
upper background (BG) benchmark	134.6	0.056	278	141	0.19	14.2	11.9	8.4	17.8	170	13	2.87	0.000105	0.000044
% samples > upper BG benchmark	17%	0%	-	50%	0%	25%	17%	0%	100%	60%	50%	67%	80%	100%
lower background (BG) benchmark	10.5	-	-	-	-	0.8	0.8	7.2	-	-	-	-	-	-
% samples < lower BG benchmark	0%	-	-	-	-	0%	0%	0%	-	-	-	-	-	-
background median	43.6	0.014	126	51.2	0.03	2.3	2.3	7.78	8.3	68	<1	0.62	0.000010	0.000010
station median > BG median	1	0	0	1	0	1	1	1	1	1	1	1	1	1
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	218	-	-	-	0.000215	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	0	-	-	0	-	-	0	0	-	-	-	2	-
% > current water quality criterion	-	0%	-	-	0%	-	-	0%	0%	-	-	-	40%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.22: Water quality data and summary statistics for Pelly River station P1, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
19-May-11	28.6	0.00238	4.74	0.00366	9.8	0.294	0.0215		0.000086	1.3	0.124	0.00122	0.076	0.0099
29-May-12	25.9	0.00154	1.82	0.00185	8.18	0.166	0.0114	0.835	0.0000638	0.978	0.117	0.000973	0.0679	0.00871
29-Aug-12		0.0001	0.153	0.000124	15	0.0137	0.00362	0.742	< 0.000005	1.78	0.191	0.00165	0.00786	0.00507
23-Oct-12														
6-Jun-13	24.1	0.00171	3.76	0.00255	7.85	0.125	0.0115	1.36	0.000086	0.918	0.105	0.000836	0.0469	0.006
12-Aug-13	44.5	< 0.0001	0.11	0.000066	16.2	0.00924	0.00221		< 0.00001	1.71	0.19	0.00173	0.0054	0.0034
19-Nov-14	46.2	< 0.0001	0.172	0.000086	15.9	0.0131	0.00424	0.719	< 0.00001	1.81	0.212	0.00184	0.0118	0.0073
n	5	6	6	6	6	6	6	4	6	6	6	6	6	6
minimum	24.1	<0.0001	0.11	0.000066	7.85	0.00924	0.00221	0.719	<0.000005	0.918	0.105	0.000836	0.0054	0.0034
maximum	46.2	0.00238	4.74	0.00366	16.2	0.294	0.0215	1.36	0.000086	1.81	0.212	0.00184	0.076	0.0099
median	28.6	0.000820	1.00	0.000987	12.4	0.06935	0.0078	0.7885	<0.000037	1.51	0.157	0.001435	0.029	0.00665
mean [a]	33.9	0.000972	1.79	0.001389	12.2	0.1035	0.0091	0.91	0.000041	1.42	0.157	0.00137	0.036	0.0067
standard deviation (SD) [a]	10.6	0.001031	2.03	0.00153	4.0	0.1147	0.0073	0.30	0.000042	0.41	0.0462	0.000423	0.032	0.0024
max detection limit	-	-	-	-	-	-	-	-	0.000010	-	-	-	-	-
# < detection limit	-	-	-	-	-	-	-	-	3	-	-	-	-	-
% < detection limit	-	-	-	-	-	-	-	-	50%	-	-	-	-	-
upper background (BG) benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
% samples > upper BG benchmark	40%	50%	50%	33%	67%	50%	100%	25%	50%	0%	50%	0%	50%	0%
lower background (BG) benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% samples < lower BG benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
background median	15.6	0.0000350	0.1115	0.000144	2.67	0.00855	0.00030	0.57	<0.000005	1.9	0.0728	0.000761	0.0017	0.0022
station median > BG median	1	1	1	1	1	1	1	1	1	0	1	1	1	1
current water quality criterion [b]	-	0.0025	1	0.008	-	1.239	0.126	373	0.0001	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	0	3	0	-	0	0	0	0	-	-	0	3	-
% > current water quality criterion	-	0%	50%	0%	-	0%	0%	0%	0%	-	-	0%	50%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.23: Water quality data and summary statistics for Pelly River station P4, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
19-May-11	52	0.029		90.8	0.23	19.8	24	7.9	27	110	190	20.4	0.000635	0.000114
29-May-12	64.7	0.022			0.0234		9.14		30.1	132			0.00103	0.000114
29-Aug-12													0.000088	0.000058
23-Oct-12	147	0.02			0.0377		3.27		67.9	292	1.9	1.11		
4-Jun-13	65.3	0.0055		81.9	< 0.005	8.23	9.43		25.1	123	164		0.000515	0.000078
12-Aug-13	114	< 0.005		190	0.0053	2.85	2.89		67.7	226	5.1		0.000084	0.000059
21-Oct-14												-999		
19-Nov-14	119	< 0.005		175	0.0063	3.24	3.29		69.4	206	2.8	10.14	0.000126	0.000099
n	6	6	0	4	6	4	6	1	6	6	5	3	6	6
minimum	52	<0.005	-	81.9	<0.005	2.85	2.89	7.9	25.1	110	1.9	1.11	0.000084	0.000058
maximum	147	0.029	-	190	0.23	19.8	24	7.9	69.4	292	190	20.4	0.00103	0.000114
median	89.65	0.013	-	132.9	0.01	5.735	6.215	7.90	48.9	169	5.1	10.14	0.0003205	0.0000885
mean [a]	94	0.014	-	134	0.05	8.5	8.7	7.90	48	182	73	10.55	0.000413	0.000087
standard deviation (SD) [a]	38	0.011	-	-	0.09	-	8.1	-	22	72	96	9.65	0.000384	0.000026
max detection limit	-	0.005	-	-	0.01	-	-	-	-	-	0	-	-	-
# < detection limit	-	2	-	-	1	-	-	-	-	-	0	-	-	-
% < detection limit	-	33%	-	-	17%	-	-	-	-	-	0%	-	-	-
upper background (BG) benchmark	134.6	0.056	278	141	0.19	14.2	11.9	8.4	17.8	170	13	2.87	0.000105	0.000044
% samples > upper BG benchmark	17%	0%	-	50%	17%	25%	17%	0%	100%	50%	40%	67%	67%	100%
lower background (BG) benchmark	10.5	-	-	-	-	0.8	0.8	7.2	-	-	-	-	-	-
% samples < lower BG benchmark	0%	-	-	-	-	0%	0%	0%	-	-	-	-	-	-
background median	43.6	0.014	126	51.2	0.03	2.3	2.3	7.78	8.3	68	<1	0.62	0.000010	0.000010
station median > BG median	1	0	0	1	0	1	1	1	1	1	1	1	1	1
current water quality criterion [b]	-	0.21	-	-	3.0	-	-	6.5 - 9.0	218	-	-	-	0.000201	-
source [b]	-	CCME	-	-	CCME	-	-	CCME	BCMOE	-	-	-	CCME	-
# > current water quality criterion	-	0	-	-	0	-	-	0	0	-	-	-	3	-
% > current water quality criterion	-	0%	-	-	0%	-	-	0%	0%	-	-	-	50%	-
# < current water quality criterion	-	-	-	-	-	-	-	0	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	0%	-	-	-	-	-	-

Suspect value, excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.23: Water quality data and summary statistics for Pelly River station P4, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
19-May-11	23.7	0.00427	6.22	0.00858	7.7	1.34	0.0164	1.9	0.000096	1.3	0.0971	0.00113	0.077	0.0084
29-May-12	28.9	0.00215	2.97		8.37	0.246	0.0134	0.925	0.0000937	1	0.121	0.00106	0.0798	0.00722
29-Aug-12	45.2	0.000263		0.000259	13.9	0.113	0.00288	0.922	0.000005	2.13	0.182	0.0015	0.00631	0.00235
23-Oct-12														
4-Jun-13	24.3	0.00234	5.28	0.00363	7.92	0.164	0.014	1.61	0.000117	0.926	0.102	0.000863	0.0564	0.0053
12-Aug-13	44.6	< 0.0001	0.16	0.000276	16.5	0.01	0.00233		< 0.00001	1.7	0.2	0.00176	0.0053	0.0015
21-Oct-14														
19-Nov-14	47.4	< 0.0001	0.173	0.000104	16.1	0.0164	0.00391	0.737	< 0.00001	1.88	0.209	0.00189	0.0097	0.0069
n	6	6	5	5	6	6	6	5	6	6	6	6	6	6
minimum	23.7	<0.0001	0.16	0.000104	7.7	0.01	0.00233	0.737	0.000005	0.926	0.0971	0.000863	0.0053	0.0015
maximum	47.4	0.00427	6.22	0.00858	16.5	1.34	0.0164	1.9	0.000117	2.13	0.209	0.00189	0.0798	0.0084
median	36.8	0.0012065	2.97	0.000276	11.1	0.1385	0.0087	0.925	0.000052	1.5	0.1515	0.001315	0.033	0.0061
mean [a]	35.7	0.001521	2.96	0.00257	11.7	0.315	0.0088	1.2	0.00005	1.49	0.152	0.00137	0.039	0.0053
standard deviation (SD) [a]	11.2	0.00170	2.81	0.00367	4.2	0.510	0.0064	0.5	0.0001	0.49	0.0508	0.000412	0.036	0.0028
max detection limit	-	-	-	-	-	-	-	-	0.000010	-	-	-	-	-
# < detection limit	-	-	-	-	-	-	-	-	2	-	-	-	-	-
% < detection limit	-	-	-	-	-	-	-	-	33%	-	-	-	-	-
upper background (BG) benchmark	41.4	0.000193	0.45	0.00204	9.0	0.0404	0.0010	1.31	0.000018	3.14	0.175	0.00254	0.013	0.020
% samples > upper BG benchmark	50%	67%	60%	40%	50%	67%	100%	40%	50%	0%	50%	0%	50%	0%
lower background (BG) benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% samples < lower BG benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-
background median	15.6	0.0000350	0.1115	0.000144	2.67	0.00855	0.00030	0.57	<0.000005	1.9	0.0728	0.000761	0.0017	0.0022
station median > BG median	1	1	1	1	1	1	1	1	1	0	1	1	1	1
current water quality criterion [b]	-	0.0025	1	0.008	-	1.190	0.119	373	0.0001	-	-	0.015	0.03	-
source [b]	-	CCME	BCMOE	CCME	-	BCMOE	CCME	BCMOE	CCME	-	-	CCME	CCME	-
# > current water quality criterion	-	1	3	1	-	1	0	0	1	-	-	0	3	-
% > current water quality criterion	-	17%	60%	20%	-	17%	0%	0%	17%	-	-	0%	50%	-
# < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Suspect value, excluded from summary statistics

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation

[b] Refer to Tables 2.1 and 2.2 for information regarding the source, selection, and derivation of water quality criteria.

Table C.24: Water quality data and summary statistics for drinking water station GCULV, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
3-Nov-10	30	0.011	40.9	31.8	0.04			7.66	7	54	< 4		< 0.000005	< 0.000005
18-May-11	14	0.097		21.9	0.03	24	25	6.99	< 0.5	34	13	2.08	0.000077	0.00004
29-May-12	16	0.012			0.0213		7.2		1.99	30	6	2.32	0.000021	0.0000133
28-Aug-12				23.5									0.000011	< 0.000005
24-Oct-12	28.2				0.0326		2.47		7.69	64	< 1	0.18		
5-Jun-13	10.1	< 0.005		10.3	0.0067	4.97	7.48		2.31	29.3	38		0.00005	< 0.00001
13-Aug-13	27	< 0.005		26.9	0.0088	2.6	2.66		5.33	45.1	< 1		< 0.00001	< 0.00001
19-Nov-14	19.2	< 0.005		23	0.0092	3.34	3.43		6.56	31.9	1.6	2.61	< 0.00001	< 0.00001
n	7	6	1	6	7	4	6	2	7	7	7	4	7	7
minimum	10.1	<0.005	40.9	10.3	0.0067	2.6	2.47	6.99	<0.50	29.3	<1.00	0.18	<0.000005	<0.000005
maximum	30	0.097	40.9	31.8	0.04	24	25	7.66	7.69	64	38	2.61	0.000077	0.00004
median	19.2	<0.008	40.9	23	0.02	4	5.3	7.3	5.3	34	4	2.2	0.000011	<0.000010
mean [a]	20.6	0.021	40.9	23	0.02	9	8.0	7.3	4.4	41	9	1.80	0.000025	0.00001
standard deviation (SD) [a]	7.8	0.037	-	7	0.01	10.2	8.6	0.5	2.9	14	14	1.10	0.000028	0.00001
max detection limit	-	0.01	-	-	-	-	-	-	0.5	-	4	-	0.0000	0.00001
# < detection limit	-	3	-	-	-	-	-	-	1	-	3	-	3	5
% < detection limit	-	50%	-	-	-	-	-	-	14%	-	43%	-	43%	71%
current drinking water quality criterion [b]	30 - 500	-	-	-	10	5	4	6.5 - 8.5	500	500	-	0.1 - 1.0	0.005	-
source [b]	OMOE	-	-	-	Health Canada	OMOE	BCMOE	Health Canada	Health Canada	Health Canada	-	Health Canada	Health Canada	-
# > current drinking water quality criterion	0	-	-	-	0	1	3	0	0	0	-	3	0	-
% > current drinking water quality criterion	0%	-	-	-	0%	25%	50%	0%	0%	0%	-	75%	0%	-
# < current drinking water quality criterion	6	-	-	-	-	-	-	0	-	-	-	0	-	-
% < current drinking water quality criterion	86%	-	-	-	-	-	-	0%	-	-	-	0%	-	-

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation
[b] Refer to Table 6H-3 for information regarding the source of drinking water quality guidelines

Table C.24: Water quality data and summary statistics for drinking water station GCULV, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
3-Nov-10	9.93	0.000021	0.07	0.00003	1.71	0.00759	0.00014	0.32	< 0.000005	1.87	0.0629	0.000546	0.001	0.0007
18-May-11	6.63	0.000269	0.645	0.00136	1.31	0.12	0.00081	2.35	0.000012	0.73	0.037	0.000828	0.0104	0.0076
29-May-12	6.13	0.0000939	0.39		0.976	0.0437	0.000394	0.837	0.0000051	1.11	0.0397	0.000647	0.00184	0.00831
28-Aug-12	7.31	0.00008		0.000117	1.27	0.0334	0.000303	0.257	< 0.000005	1.45	0.0442	0.000503	0.00115	0.00109
24-Oct-12														
5-Jun-13	3.73	0.00065	1.6	0.00195	0.793	0.0717	0.00154	0.893	0.00002	0.772	0.0263	0.00131	0.009	0.0071
13-Aug-13	8.85	< 0.0001	0.13	< 0.00005	1.42	0.00657	< 0.0005		< 0.00001	1.54	0.05	0.000472	< 0.003	0.001
19-Nov-14	7.48	< 0.0001	0.108	0.000059	1.14	0.00823	< 0.0005	0.282	< 0.00001	1.52	0.0494	0.000449	< 0.003	0.0011
n	7	7	6	6	7	7	7	6	7	7	7	7	7	7
minimum	3.73	0.000021	0.07	0.00003	0.793	0.01	0.00014	0.257	<0.000005	0.73	0.0263	0.00045	0.001	0.0007
maximum	9.93	0.00065	1.6	0.00195	1.71	0.12	0.00154	2.35	0.00002	1.87	0.0629	0.00131	0.0104	0.00831
median	7.31	0.000100	0.26	0.000088	1.27	0.0334	0.0005	0.6	<0.000010	1.45	0.044	0.00055	0.003	0.0011
mean [a]	7.2	0.00017	0.49	0.00059	1.23	0.042	0.0005	0.8	0.000007	1.28	0.044	0.00068	0.004	0.004
standard deviation (SD) [a]	2.0	0.00023	0.59	0.00085	0.30	0.042	0.0005	0.8	0.000006	0.43	0.012	0.00031	0.004	0.004
max detection limit	-	-	-	0.000	-	-	-	-	0.00001	-	-	-	0.003	-
# < detection limit	-	-	-	1	-	-	-	-	4	-	-	-	2	-
% < detection limit	-	-	-	17%	-	-	-	-	57%	-	-	-	29%	-
current drinking water quality criterion [b]	-	-	0.3	0.01	100	0.05	-	-	-	200	-	0.02	5	-
source [b]	-	-	Health Canada	Health Canada	BCMOE	Health Canada	-	-	-	Health Canada	-	Health Canada	Health Canada	-
# > current drinking water quality criterion	-	-	3	0	0	2	-	-	-	0	-	0	0	-
% > current drinking water quality criterion	-	-	50%	0%	0%	29%	-	-	-	0%	-	0%	0%	-
# < current drinking water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current drinking water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation
[b] Refer to Table 6H-3 for information regarding the source of drinking water quality guidelines

Table C.25: Water quality data and summary statistics for drinking water station K8, Faro Mine, Yukon.

Date	Non-metals												Metals	
	Alkalinity, Total	Ammonia-N	Conductivity, Field	Hardness, Total ($CaCO_3$)	Nitrate-N	Organic carbon, Dissolved	Organic carbon, Total	pH, Field	Sulfate	Total dissolved solids	Total suspended solids	Turbidity, Lab	Cadmium, Total	Cadmium, Dissolved
Units	**mg/L**	**mg/L**	**µS/cm**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**pH units**	**mg/L**	**mg/L**	**mg/L**	**NTU**	**mg/L**	**mg/L**
3-Nov-10	53	0.041	59.7	56.6	0.05			7.91	11	74	< 4		0.000006	< 0.000005
18-May-11	30	0.02		42.8	0.12	17.7	15.7	7.4	14	88	8	2.23	0.00007	0.000071
28-May-12	33.4	0.025					8.29		8.64	62	< 1	0.63	0.0000262	0.0000242
28-Aug-12				34.4									0.000006	< 0.000005
24-Oct-12	46.9	0.013			0.0649				11.5	86	< 1			
4-Jun-13	11.5	< 0.005		12.9	0.007	5.48	4.56		2.29	28.3	4.3		0.000015	< 0.00001
13-Aug-13	55.5	< 0.005		64.1	0.03	2.18	2.04		12.1	86.3	< 2		0.00001	< 0.00001
19-Nov-14	33	< 0.005		36.6	0.0122	2.35	2.37		8.41	46.5	< 1	1.14	< 0.00001	< 0.00001
n	7	7	1	6	6	4	5	2	7	7	7	3	7	7
minimum	11.5	0.005	59.7	12.9	0.007	2.18	2.04	7.4	2.29	28.3	1	0.63	0.000006	<0.000005
maximum	55.5	0.041	59.7	64.1	0.12	17.7	15.7	7.91	14	88	8	2.23	0.00007	0.000071
median	33.4	0.013	59.7	40	0.04	3.9	4.6	7.7	11.0	74	<2	1.14	0.00001	<0.000010
mean [a]	37.6	0.015	59.7	41	0.05	6.9	6.6	7.7	9.7	67	2	1.33	0.000020	0.00002
standard deviation (SD) [a]	15.4	0.015	-	18	0.04	7.3	5.7	0.4	3.8	23	3	0.82	0.000023	0.00003
max detection limit	-	0.01	-	-	-	-	-	-	-	-	4	-	0.0000	0.0000
# < detection limit	-	3	-	-	-	-	-	-	-	-	5	-	1	5
% < detection limit	-	43%	-	-	-	-	-	-	-	-	71%	-	14%	71%
current drinking water quality criterion [b]	30 - 500	-	-	-	10	5	4	6.5 - 8.5	500	500	-	0.1 - 1.0	0.005	-
source [b]	OMOE	-	-	-	Health Canada	OMOE	BCMOE	Health Canada	Health Canada	Health Canada	-	Health Canada	Health Canada	-
# > current drinking water quality criterion	0	-	-	-	0	1	3	0	0	0	-	2	0	-
% > current drinking water quality criterion	0%	-	-	-	0%	25%	60%	0%	0%	0%	-	67%	0%	-
# < current drinking water quality criterion	1	-	-	-	-	-	-	0	-	-	-	0	-	-
% < current drinking water quality criterion	14%	-	-	-	-	-	-	0%	-	-	-	0%	-	-

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation
[b] Refer to Table 2.3 for information regarding the source of drinking water quality guidelines

Table C.25: Water quality data and summary statistics for drinking water station K8, Faro Mine, Yukon.

Date	Metals													
	Calcium, Total	Cobalt, Total	Iron, Total	Lead, Total	Magnesium, Total	Manganese, Total	Nickel, Total	Potassium, Total	Silver, Total	Sodium, Total	Strontium, Total	Uranium, Total	Zinc, Total	Zinc, Dissolved
Units	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**	**mg/L**
3-Nov-10	18.4	0.000014	0.006	0.000052	2.58	0.00023		0.45	< 0.000005	2.01	0.122	0.00214	0.0006	0.0014
18-May-11	12.9	0.00047	0.553	0.00543	2.6	0.0166	0.0022	2.1	0.00002	1.2	0.0783	0.00103	0.017	0.0092
28-May-12	10.7	0.0000358		0.000486	1.62	0.00199	0.000549	1.27	0.0000079	1.13	0.0765	0.000954	0.00282	0.00819
28-Aug-12	11.3	0.000019	0.035	0.000119	1.51	0.000863	0.000243	0.376	< 0.000005	1.77	0.0646	0.000695	0.00085	0.00084
24-Oct-12														
4-Jun-13	4.26	< 0.0001	0.239	0.000572	0.594	0.00624	< 0.0005	0.748	< 0.00001	0.539	0.0271	0.000555	0.004	0.0037
13-Aug-13	21.1	< 0.0001	0.01	0.000069	2.89	0.000491	< 0.0005		< 0.00001	1.98	0.13	0.00187	< 0.003	< 0.001
19-Nov-14	12.5	< 0.0001	0.021	0.000107	1.56	0.000623	< 0.0005	0.367	< 0.00001	1.79	0.0797	0.000933	< 0.003	0.0024
n	7	7	6	7	7	7	6	6	7	7	7	7	7	7
minimum	4.26	0.000014	0.006	0.000052	0.594	0.00023	0.000243	0.367	<0.000005	0.539	0.0271	0.000555	0.0006	0.00084
maximum	21.1	0.00047	0.553	0.00543	2.89	0.0166	0.0022	2.1	0.00002	2.01	0.13	0.00214	0.017	0.0092
median	12.5	0.000100	0.028	0.000119	1.62	0.0009	<0.0005	0.6	<0.00001	1.77	0.078	0.000954	0.003	0.0024
mean [a]	13.0	0.00010	0.14	0.00098	1.91	0.0039	0.0006	0.9	0.000007	1.49	0.083	0.00117	0.004	0.004
standard deviation (SD) [a]	5.5	0.00016	0.22	0.0020	0.81	0.0060	0.0008	0.7	0.000006	0.55	0.035	0.00060	0.006	0.004
max detection limit	-	0.0001	-	-	-	-	0.001	-	0.00001	-	-	-	0.003	0.001
# < detection limit	-	3	-	-	-	-	3	-	5	-	-	-	2	1
% < detection limit	-	-	-	-	-	-	50%	-	71%	-	-	-	29%	14%
current drinking water quality criterion [b]	-	-	0.3	0.01	100	0.05	-	-	-	200	-	0.02	5	-
source [b]	-	-	Health Canada	Health Canada	BCMOE	Health Canada	-	-	-	Health Canada	-	Health Canada	Health Canada	-
# > current drinking water quality criterion	-	-	1	0	0	0	-	-	-	0	-	0	0	-
% > current drinking water quality criterion	-	-	17%	0%	0%	0%	-	-	-	0%	-	0%	0%	-
# < current drinking water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-
% < current drinking water quality criterion	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] values reported as less than the detection limit (DL) were used at 1/2 the DL for calculation
[b] Refer to Table 2.3 for information regarding the source of drinking water quality guidelines

Table C.26: Water chemistry and summary statistics for reference stations sampled in the vicinity of the Faro Mine, August 2014. Shaded values exceed the selected water quality guideline (See Table 2.1).

Analytes		Units	Selected Water Quality Criterion[a]	Source	R7	FC	R6	USFR	V1	VR	BLC	NEXC	GRC	STC	HOC	BEC	BUC	REF-220	REF-376	REF-327
					25-AUG-14	20-AUG-14	22-AUG-14	21-AUG-14	20-AUG-14	20-AUG-14	21-AUG-14	20-AUG-14	24-AUG-14	24-AUG-14	24-AUG-14	24-AUG-14	21-AUG-14	24-AUG-14	24-AUG-14	23-AUG-14
in-situ measurements	Temperature	°C			6.50	6.38	4.90	8.50	6.00	4.50	6.80	6.66	8.30	7.90	9.37	15.16	9.42	3.60	7.58	6.60
	Dissolved Oxygen (mg/L)	mg/L	9		13.71	10.83	16.10	10.38	11.27	11.35	11.38	10.92	10.10	15.88	10.57	10.44	11.13	12.27	11.01	15.17
	Dissolved Oxygen (%)	% saturation			128.4	87.5	126.1	88.8	90.9	88.0	93.4	89.3	84.8	135.6	92.5	104.8	97.7	92.5	92.1	121.8
	Specific Conductance	µS/cm			167.3	36.0	332.0	56.0	92.0	95.0	203.0	101.0	760.0	602.0	589.0	845.0	476.0	867.0	369.0	478.0
	pH	pH units	6.5 - 9.0		7.97	7.49	8.51	7.38	8.34	8.17	8.1	7.74	8.62	8.52	8.26	8.44	8.16	8.37	8.39	8.49
Physical Tests	Hardness (as CaCO3)	mg/L			86.5	14.3	156	24.5	31.5	32.5	87.2	50.8	543	417	361	545	289	550	221	234
	Total Suspended Solids	mg/L		CCME	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	4.0	<3.0	<3.0	<3.0	3.3	4.0	<3.0	<3.0	<3	3
	Total Dissolved Solids	mg/L			127	48	183	48	65	62	125	79	690	498	429	714	332	697	239	288
	Turbidity	NTU		CCME	0.96	0.56	0.76	0.89	0.40	0.36	1.23	0.18	0.73	0.46	0.78	1.52	0.67	0.58	1.71	0.68
Anions and Nutrients	Alkalinity, Total (as CaCO3)	mg/L	10	BCMOE	86.2	16.0	132	21.7	25.4	31.3	79.2	55.6	286	245	279	199	218	290	210	130
	Ammonia, Total (as N)	mg/L	0.21	CCME	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.0062	0.0519	<0.0050	<0.005	0.005
	Chloride (Cl)	mg/L	120	CCME	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.5	<0.5	<0.5	<2.5	<0.5	<2.5	<0.5	0.5
	Fluoride (F)	mg/L	0.12	CCME	0.095	0.076	0.067	0.058	0.060	0.065	0.111	0.077	0.33	0.113	0.179	0.28	0.130	0.22	0.487	0.056
	Nitrate (as N)	mg/L	3	CCME	<0.0050	<0.0050	0.0509	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.027	0.0714	0.0079	<0.0250	0.0992	0.118	<0.005	0.0866
	Nitrite (as N)	mg/L	0.06	CCME	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	<0.0010	<0.0010	<0.0050	<0.0010	<0.0050	<0.001	0.001
	Phosphorus (P)-Total	mg/L			<0.0020	0.0032	0.0057	0.0045	0.0029	0.0021	0.0065	0.0026	<0.0020	<0.0020	<0.0020	0.0048	0.0026	0.026	0.0021	0.0030
	Sulfate (SO4)	mg/L	128 - 429	BCMOE	6.96	1.44	21.4	5.47	8.61	5.34	13.8	3.11	240	154	80.8	322	60.3	243	8.59	92.3
Carbon	Dissolved Organic Carbon	mg/L		BCMOE	2.56	3.89	2.67	2.78	2.41	3.11	4.04	2.45	3.67	1.38	3.70	3.77	5.41	1.45	3.91	1.26
	Total Organic Carbon	mg/L		BCMOE	2.48	3.63	2.71	2.89	2.45	3.13	4.13	2.48	3.66	1.25	3.82	4.01	5.70	1.47	3.91	1.11
Total Metals	Aluminum (Al)-Total	mg/L	0.1	CCME	0.0381	0.0526	0.0202	0.0265	0.0156	0.0283	0.0336	0.0178	0.0132	0.0111	0.0089	0.0195	0.0123	0.0103	0.0542	0.0200
	Antimony (Sb)-Total	mg/L	0.02	BCMOE	<0.00010	<0.00010	0.00012	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00035	0.00016	0.00018	0.00023	<0.00010	0.00019	0.00010	0.00013
	Arsenic (As)-Total	mg/L	0.005	CCME	0.00083	0.00016	0.00051	0.00035	0.00030	0.00027	0.00077	0.00016	0.00057	0.00024	0.00062	0.00076	0.00034	0.00026	0.00066	0.00018
	Barium (Ba)-Total	mg/L	1	BCMOE	0.0508	0.0178	0.0725	0.0270	0.0268	0.0315	0.0646	0.0272	0.0758	0.0957	0.0880	0.0556	0.100	0.0920	0.108	0.0870
	Beryllium (Be)-Total	mg/L	0.0053	BCMOE	<0.00010	<0.00010	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001
	Bismuth (Bi)-Total	mg/L			<0.00050	<0.00050	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005
	Boron (B)-Total	mg/L	1.5	CCME	<0.01000	<0.01000	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
	Cadmium (Cd)-Total	mg/L	0.00014	CCME	0.000011	0.000011	0.000015	<0.00001	<0.00001	0.000013	0.000011	0.000016	0.000015	0.000112	0.000015	0.000018	0.000017	0.000383	0.000014	0.000028
	Calcium (Ca)-Total	mg/L			26.2	4.29	43.9	7.84	10.2	10.1	24.9	16.2	116	96.8	79.9	104	87.3	134	65.3	60.0
	Chromium (Cr)-Total	mg/L	0.001	CCME	0.00019	0.00019	0.00014	0.00012	0.00012	0.00012	0.00013	0.00016	<0.00010	0.00015	<0.00010	<0.00010	<0.00010	0.00025	0.00055	0.00016
	Cobalt (Co)-Total	mg/L	0.0025	CCME	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00072	<0.0001	0.0001
	Copper (Cu)-Total	mg/L	0.002	CCME	0.00050	0.00067	0.00056	<0.00050	<0.00050	0.00057	0.00063	0.00053	0.00097	<0.00050	<0.00050	0.00058	0.00062	0.00068	0.00076	0.0005
	Iron (Fe)-Total	mg/L	0.3	CCME	0.267	0.056	0.192	0.136	0.035	0.019	0.141	0.012	0.014	0.031	0.099	0.167	0.053	0.155	0.108	0.033
	Lead (Pb)-Total	mg/L	0.006	CCME	0.000069	0.000703	<0.00005	0.000069	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.000072	<0.00005	<0.00005	0.000103	0.00005
	Lithium (Li)-Total	mg/L			0.00325	0.00216	0.00153	0.00097	0.00100	<0.00050	0.00148	0.00221	0.00963	0.00445	0.00428	0.00576	0.00360	0.00533	0.00554	0.00095
	Magnesium (Mg)-Total	mg/L			5.12	0.87	11.3	1.21	1.48	1.79	6.11	2.51	61.6	42.6	39.1	69.4	17.3	52.5	14.1	20.3
	Manganese (Mn)-Total	mg/L	0.983	BCMOE	0.0253	0.00200	0.0196	0.00935	0.00104	0.000840	0.0117	0.000336	0.00117	0.00575	0.0102	0.00670	0.0137	0.0195	0.00403	0.00121
	Mercury (Hg)-Total	mg/L	0.000026	CCME	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001
	Molybdenum (Mo)-Total	mg/L	0.073	CCME	0.000529	0.000181	0.00114	0.000256	0.000229	0.000124	0.000712	0.000289	0.00182	0.00150	0.00259	0.00157	0.000792	0.000947	0.00124	0.000733
	Nickel (Ni)-Total	mg/L	0.085	CCME	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00052	<0.00050	0.00155	0.00161	0.00090	0.00433	0.00054	0.00893	0.00062	<0.00050
	Phosphorus (P)-Total	mg/L			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
	Potassium (K)-Total	mg/L	373	BCMOE	0.57	0.17	1.05	0.26	0.34	0.36	0.86	0.56	1.23	0.60	1.31	0.94	2.22	0.83	0.82	0.62
	Selenium (Se)-Total	mg/L	0.001	CCME	0.00022	<0.00010	0.00069	<0.00010	<0.00010	<0.00010	0.00022	<0.00010	0.00324	0.00509	0.00162	0.00298	0.00065	0.00649	0.00024	0.00072
	Silicon (Si)-Total	mg/L			4.82	6.54	4.44	3.23	4.30	4.60	4.49	6.07	3.67	2.92	4.92	1.90	4.30	2.90	4.48	2.53
	Silver (Ag)-Total	mg/L	0.00025	CCME	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Sodium (Na)-Total	mg/L			2.01	1.86	1.88	1.59	1.69	1.63	3.02	2.05	3.95	2.75	4.93	2.59	5.35	1.74	3.92	1.15
	Strontium (Sr)-Total	mg/L			0.109	0.0281	0.126	0.0486	0.0558	0.0559	0.106	0.0701	0.575	0.400	0.377	0.537	0.276	0.628	0.338	0.193
	Sulfur (S)-Total	mg/L			2.59	0.64	7.59	1.98	3.07	1.93	5.09	1.27	77.3	51.3	27.7	110	21.5	82.6	3.23	30.9
	Thallium (Tl)-Total	mg/L	0.0008	CCME	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
	Tin (Sn)-Total	mg/L			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	Titanium (Ti)-Total	mg/L	2	BCMOE	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	Uranium (U)-Total	mg/L	0.015	CCME	0.000925	0.000134	0.00173	0.000383	0.000375	0.000364	0.000647	0.000354	0.0137	0.00592	0.00490	0.0112	0.00323	0.0120	0.00202	0.00250
	Vanadium (V)-Total	mg/L	0.006	BCMOE	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
	Zinc (Zn)-Total	mg/L	0.03	CCME	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0070	<0.003	0.0034	<0.003	0.0320	<0.003	<0.003

[a] Selected benchmarks from Table 2.1. Hardness based guidelines calculated based on median reference hardness.

Table C.26: Water chemistry and summary statistics for reference stations sampled in the vicinity of the Faro Mine, August 2014. Shaded values exceed the selected water quality guideline (See Table 2.1).

	Analytes	Units	Selected Water Quality Criterion[a]	REF-325	REF-213	REF-126	REF-328	REF-340	REF-212	n	Minimum	Maximum	Median	Mean	SD	# < Detection Limit	% < Detection Limit	95th Percentile	5th Percentile
				23-AUG-14	23-AUG-14	22-AUG-14	23-AUG-14	23-AUG-14	23-AUG-14										
in-situ measurements	Temperature	°C		4.60	4.30	7.16	5.06	5.61	9.50	22	3.60	15.16	6.63	7.02	2.51			9.50	4.31
	Dissolved Oxygen (mg/L)	mg/L	9	15.03	10.31	10.86	11.69	11.34	10.59	22	10.1	16.1	11.2	11.9	1.9			15.8	10.3
	Dissolved Oxygen (%)	% saturation		117.4	79.0	89.9	91.6	-	92.7	22	79.0	135.6	93	99	16			128	85
	Specific Conductance	µS/cm		150.0	191.0	90.0	128.0	182.0	271.0	22	36.0	867	197	322	264			841	58
	pH	pH units	6.5 - 9.0	8.1	8.13	7.56	7.64	8.13	8.15	22	7.38	8.62	8.16	8.12	0.36			8.52	7.49
Physical Tests	Hardness (as CaCO3)	mg/L		59.8	85.9	43.2	62.4	105	151	22	14.3	550	96	189	182	0	0.00	545	25
	Total Suspended Solids	mg/L		3	<3	4.0	<3	<3	<3	22	<3	4	3.0	3.2	0.4	13	59.09	4.0	3.0
	Total Dissolved Solids	mg/L		92	121	78	110	124	183	22	48	714	126	242	222	0	0.00	697	49
	Turbidity	NTU		0.68	0.18	0.82	0.18	0.25	0.58	22	0.18	1.71	0.68	0.69	0.40	0	0.00	1.51	0.18
Anions and Nutrients	Alkalinity, Total (as CaCO3)	mg/L	10	60.3	68.3	34.4	45.9	93.5	104	22	16	290	90	123	94	0	0.00	286	22
	Ammonia, Total (as N)	mg/L	0.21	0.005	<0.005	0.0055	<0.005	<0.005	<0.005	22	<0.005	0.0519	0.005	0.007	0.010	14	63.64	0.006	0.005
	Chloride (Cl)	mg/L	120	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	22	<0.5	<2.5	0.50	0.77	0.70	16	72.73	2.50	0.50
	Fluoride (F)	mg/L	0.12	0.082	0.080	0.061	0.084	0.066	0.049	22	0.049	0.487	0.081	0.128	0.110	0	0.00	0.328	0.056
	Nitrate (as N)	mg/L	3	0.0170	0.0665	0.0589	0.103	<0.005	0.0656	22	<0.0050	0.118	0.021	0.038	0.039	8	36.36	0.103	0.005
	Nitrite (as N)	mg/L	0.06	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	22	<0.0010	<0.0050	0.001	<0.0015	0.001	16	72.73	0.005	0.001
	Phosphorus (P)-Total	mg/L		0.0036	0.0039	0.0035	0.0023	0.0027	0.0025	22	<0.0020	0.026	0.0028	0.0042	0.0050	3	13.64	0.0065	0.0020
	Sulfate (SO4)	mg/L	128 - 429	5.61	20.2	11.3	19.6	6.54	44.6	22	1.44	322	16.7	62.5	92.8	0	0.00	242.9	3.2
Carbon	Dissolved Organic Carbon	mg/L		3.27	4.07	2.86	1.95	3.09	1.18	22	1.18	5.41	2.98	2.95	1.08	0	0.00	4.07	1.27
	Total Organic Carbon	mg/L		3.41	3.58	3.08	1.95	3.35	1.22	22	1.11	5.7	3.11	2.97	1.13	0	0.00	4.12	1.22
Total Metals	Aluminum (Al)-Total	mg/L	0.1	0.0483	0.0412	0.0493	0.0183	0.0133	0.0179	22	0.0089	0.0542	0.0198	0.0259	0.0149	0	0.00	0.0524	0.0103
	Antimony (Sb)-Total	mg/L	0.02	0.0001	<0.0001	0.00014	<0.0001	0.00011	<0.0001	22	<0.0001	0.00035	0.00010	0.00013	0.00006	11	50.00	0.00023	0.00010
	Arsenic (As)-Total	mg/L	0.005	0.00011	0.00018	0.00031	0.00021	0.00025	0.00013	22	0.00011	0.00083	0.00029	0.00037	0.00023	0	0.00	0.00077	0.00013
	Barium (Ba)-Total	mg/L	1	0.0304	0.0178	0.0294	0.0117	0.0226	0.0661	22	0.0117	0.108	0.0532	0.0545	0.0315	0	0.00	0.0998	0.0178
	Beryllium (Be)-Total	mg/L	0.0053	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	22	<0.0001	<0.0001	<0.0001	<0.0001	0.0000	16	72.73	<0.0001	<0.0001
	Bismuth (Bi)-Total	mg/L		0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	22	<0.0005	<0.0005	<0.0005	<0.0005	0.0000	16	72.73	<0.0005	<0.0005
	Boron (B)-Total	mg/L	1.5	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	22	<0.01	<0.01	<0.01	<0.01	0.00	16	72.73	<0.01	<0.01
	Cadmium (Cd)-Total	mg/L	0.00014	0.00001	<0.00001	0.000017	0.000020	<0.00001	0.000017	22	<0.00001	0.000383	0.000015	0.000036	0.000080	4	18.18	0.000108	0.000010
	Calcium (Ca)-Total	mg/L		18.1	29.0	14.2	21.3	29.9	40.0	22	4.29	134	29.5	47.2	39.3	0	0.00	115.4	8.0
	Chromium (Cr)-Total	mg/L	0.001	0.00015	0.00015	0.00017	0.00019	0.00017	0.00011	22	<0.00010	0.00055	0.00015	0.00016	0.00009	2	9.09	0.00025	0.00010
	Cobalt (Co)-Total	mg/L	0.0025	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	22	<0.0001	0.00072	0.00010	0.00013	0.00013	19	86.36	0.00010	0.00010
	Copper (Cu)-Total	mg/L	0.002	0.0005	0.00079	0.00104	0.00052	<0.0005	<0.0005	22	<0.0005	0.00104	0.00055	0.00061	0.00016	6	27.27	0.00096	0.00050
	Iron (Fe)-Total	mg/L	0.3	0.085	0.053	0.048	0.023	0.040	0.030	22	0.012	0.267	0.053	0.082	0.068	0	0.00	0.191	0.014
	Lead (Pb)-Total	mg/L	0.006	0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	22	<0.00005	0.000703	0.000050	0.000085	0.000139	13	59.09	0.000101	0.000050
	Lithium (Li)-Total	mg/L		0.00102	0.00318	0.00116	0.00096	0.00050	0.00100	22	0.0005	0.00963	0.0018	0.0027	0.0023	1	4.55	0.0057	0.0005
	Magnesium (Mg)-Total	mg/L		3.57	3.24	1.85	2.27	7.32	12.3	22	0.87	69.4	6.7	17.2	21.4	0	0.00	61.1	1.2
	Manganese (Mn)-Total	mg/L	0.983	0.00356	0.00139	0.00152	0.000776	0.00327	0.00141	22	0.000336	0.0253	0.0034	0.0066	0.0073	0	0.00	0.0196	0.0008
	Mercury (Hg)-Total	mg/L	0.000026	0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	22	<0.00001	<0.00001	<0.00001	<0.00001	0.00000	16	72.73	<0.00001	<0.00001
	Molybdenum (Mo)-Total	mg/L	0.073	0.000662	0.00985	0.000241	0.00128	0.000581	0.000701	22	0.000124	0.00985	0.00072	0.00127	0.00201	0	0.00	0.00255	0.00018
	Nickel (Ni)-Total	mg/L	0.085	<0.00050	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	22	<0.0005	0.00893	0.0005	0.0012	0.0019	14	63.64	0.0042	0.0005
	Phosphorus (P)-Total	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	22	<0.05	<0.05	<0.05	<0.05	0.00	18	81.82	<0.05	<0.05
	Potassium (K)-Total	mg/L	373	0.58	0.83	0.80	0.81	0.38	0.83	22	0.17	2.22	0.81	0.77	0.44	0	0.00	1.31	0.26
	Selenium (Se)-Total	mg/L	0.001	<0.00010	0.00012	0.00015	<0.0001	0.00011	0.00038	22	<0.0001	0.00649	0.00022	0.00107	0.00178	7	31.82	0.005	0.00010
	Silicon (Si)-Total	mg/L		5.62	4.76	4.09	4.34	4.86	3.02	22	1.9	6.54	4.39	4.22	1.14	0	0.00	6.05	2.55
	Silver (Ag)-Total	mg/L	0.00025	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	22	<0.00001	<0.00001	<0.00001	<0.00001	0.00000	18	81.82	<0.00001	<0.00001
	Sodium (Na)-Total	mg/L		2.30	1.80	1.34	1.84	1.40	1.69	22	1.15	5.35	1.87	2.39	1.16	0	0.00	4.88	1.34
	Strontium (Sr)-Total	mg/L		0.0916	0.131	0.0484	0.102	0.119	0.148	22	0.0281	0.628	0.123	0.207	0.186	0	0.00	0.573	0.048
	Sulfur (S)-Total	mg/L		2.09	6.86	4.02	6.69	2.47	15.1	22	0.64	110	5.9	21.2	31.1	0	0.00	82.3	1.3
	Thallium (Tl)-Total	mg/L	0.0008	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	22	<0.00001	<0.00001	<0.00001	<0.00001	0.00000	18	81.82	<0.00001	<0.00001
	Tin (Sn)-Total	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	22	<0.0001	<0.0001	<0.0001	<0.0001	0.0000	18	81.82	<0.0001	<0.0001
	Titanium (Ti)-Total	mg/L	2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	22	<0.01	<0.01	<0.01	<0.01	0.00	18	81.82	<0.01	<0.01
	Uranium (U)-Total	mg/L	0.015	0.00137	0.00874	0.000501	0.000682	0.00149	0.00192	22	0.000134	0.0137	0.0016	0.0034	0.0042	0	0.00	0.0120	0.0004
	Vanadium (V)-Total	mg/L	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	22	<0.001	<0.001	<0.001	<0.001	0.000	18	81.82	<0.001	<0.001
	Zinc (Zn)-Total	mg/L	0.03	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	22	<0.003	0.032	0.0030	0.0045	0.0062	19	86.36	0.0068	<0.003

[a] Selected benchmarks from Table 2.1. Hardness based guidelines calculated based on median reference hardness.

Table C.27: PCA results of water quality at 22 reference, 11 exposed, and 2 minimally influenced areas. Percent variance explained, Monte Carlo randomization p-values of axis significance, and station scores, August 2014.

Area Type	Axis	PCA-1	PCA-2	PCA-3	PCA-4
	% Variance explained	28.4	25.7	11.2	9.1
	Monte Carlo P	0.0001	0.0001	0.0001	0.0001
Reference	BEC	5.958	6.735	0.938	-1.013
	BLC	-1.239	-0.822	1.532	-1.542
	BUC	2.226	2.612	2.438	-3.246
	FC	-3.398	-2.178	1.539	-0.912
	GRC	6.636	7.040	1.474	-2.091
	HOC	2.865	3.384	1.699	-2.116
	NEXC	-2.983	-1.275	0.965	-0.530
	R6	-0.719	0.324	-0.158	-0.365
	R7	-1.812	-0.771	0.389	0.022
	REF-126	-2.469	-1.397	0.726	-0.701
	REF-212	-1.739	0.816	-0.279	0.430
	REF-213	-1.414	0.171	1.673	-1.984
	REF-220	7.508	6.941	-1.425	3.964
	REF-325	-3.147	-0.681	-7.813	-3.307
	REF-327	-0.976	2.284	-9.762	-1.571
	REF-328	-2.813	-0.648	0.237	0.160
	REF-340	-2.538	-0.585	1.197	-1.292
	REF-376	1.670	1.674	1.978	-2.054
	STC	3.060	5.176	-1.363	1.461
	USFR	-3.611	-1.439	1.002	-0.339
	V1	-3.303	-1.028	0.572	-0.372
	VR	-3.244	-1.279	0.868	-0.783
Exposed	A1	14.342	-14.339	-0.915	-2.720
	R2	0.971	-0.690	0.404	3.167
	R3	-0.173	0.281	-0.626	2.132
	R4	-0.407	0.415	-0.463	1.201
	R5	-0.624	0.166	0.406	0.025
	R9	-1.615	-0.659	0.711	-0.316
	RDE-1	-0.762	-1.212	0.163	2.510
	RDE-2	-1.027	-0.795	0.112	2.062
	RDE-3	-0.865	-0.590	0.502	1.281
	X2	2.027	-4.401	-0.878	6.883
	X3	-0.847	-1.184	0.287	2.810
	Grum	-3.701	-1.747	1.043	-0.176
	R1	-1.837	-0.297	0.824	-0.680

Table C.28: Spearman correlation of area principal components analysis axes scores with water quality variables.

Water Quality Variables	PCA Axis-1 (28.4%)			PCA Axis-2 (25.7%)		
	Axis score	Pearson r-value	p-value	Axis score	Pearson r-value	p-value
Docon	-0.1456	0.186	0.284	0.2325	0.045	0.797
DOp	0.0942	0.359	0.034	0.2627	0.197	0.256
SpeCon	2.2672	0.895	0.000	2.4236	0.820	0.000
pH	1.3911	0.528	0.001	1.5714	0.792	0.000
Hard	2.2965	0.885	0.000	2.4434	0.817	0.000
TSS	2.1791	0.164	0.347	-2.4109	-0.255	0.139
TDS	2.2709	0.897	0.000	2.4499	0.798	0.000
Turbid	2.1913	0.396	0.019	-2.3868	-0.210	0.225
Alka	2.2416	0.889	0.000	2.2103	0.794	0.000
NH3	0.3793	0.181	0.299	0.4605	0.203	0.242
Cl	-0.4449	-0.146	0.402	0.1910	0.110	0.530
F	1.5799	0.760	0.000	1.6159	0.476	0.004
NO3	0.7915	0.378	0.025	0.8167	0.326	0.056
NO2	-0.4449	-0.146	0.402	0.1910	0.110	0.530
TP	2.3086	0.119	0.497	-1.9535	-0.366	0.030
SO4	2.0543	0.823	0.000	2.3509	0.736	0.000
DOC	0.3823	0.045	0.796	-0.1337	-0.012	0.945
TOC	0.7786	0.132	0.449	-0.5554	-0.041	0.815
Al	2.1477	-0.272	0.114	-2.5154	-0.627	0.000
Sb	2.6734	0.539	0.001	0.5002	0.465	0.005
As	2.1829	0.495	0.003	-1.9272	-0.100	0.569
Ba	2.4583	0.832	0.000	0.5305	0.556	0.001
Be	-0.4449	-0.146	0.402	0.1910	0.110	0.530
Bi	-0.4449	-0.146	0.402	0.1910	0.110	0.530
B	-0.4449	-0.146	0.402	0.1910	0.110	0.530
Cd	1.5598	0.648	0.000	-0.0241	0.092	0.599
Ca	2.3343	0.888	0.000	2.3573	0.828	0.000
Cr	2.1564	0.079	0.651	-2.4845	-0.259	0.133
Co	1.2451	0.419	0.012	-1.2922	-0.166	0.341
Cu	2.3076	0.492	0.003	-2.2801	-0.053	0.761
Fe	1.9130	0.347	0.041	-2.4464	-0.249	0.150
Pb	0.8842	0.152	0.382	-1.5812	-0.418	0.012
Li	2.4001	0.804	0.000	1.4089	0.387	0.022
Mg	2.1550	0.865	0.000	2.4350	0.810	0.000
Mn	0.2736	0.460	0.005	-0.3670	-0.079	0.653
Hg	0.1811	-0.011	0.950	-0.6631	-0.083	0.638
Mo	0.4346	0.658	0.000	0.5044	0.711	0.000
Ni	2.4678	0.843	0.000	0.5609	0.232	0.180
P	2.1563	0.289	0.093	-2.3794	-0.289	0.093
K	2.0778	0.738	0.000	0.1277	0.540	0.001
Se	1.9709	0.890	0.000	2.1538	0.719	0.000
Si	0.3424	-0.073	0.677	-2.6229	-0.452	0.006
Ag	2.1033	0.331	0.052	-2.4915	-0.402	0.017
Na	1.3467	0.672	0.000	1.0650	0.363	0.032
Sr	2.2489	0.838	0.000	2.4687	0.840	0.000
S	2.0513	0.829	0.000	2.3473	0.739	0.000
Tl	2.1563	0.289	0.093	-2.3794	-0.289	0.093
Ti	2.1866	0.331	0.052	-2.4674	-0.402	0.017
U	1.9545	0.759	0.000	2.2858	0.832	0.000
V	2.1563	0.289	0.093	-2.3794	-0.289	0.093
Zn	0.2008	0.461	0.005	-0.7889	-0.121	0.489

- indcates absolute r-values greater than 0.50.
- indicates p-value less than 0.05.

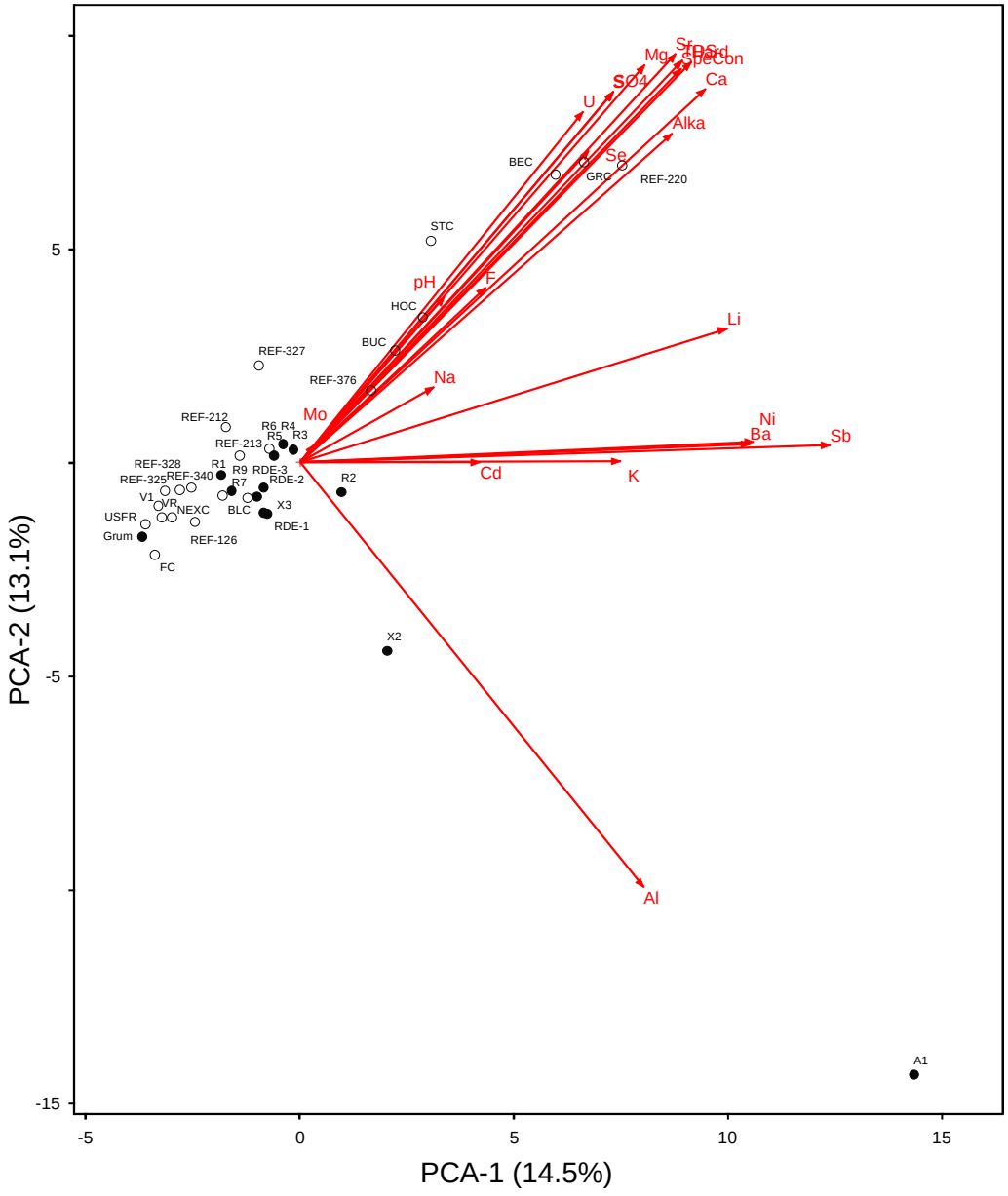


Figure C.1: Biplot of water quality PCA using all study areas. Reference areas (n = 22) are depicted by open circles and exposed areas (n = 13) are depicted by closed circles. Only water quality variables having significant ($p < 0.05$) absolute spearman r-values > 0.5 with PCA-1 or PCA-2 are displayed. Water quality vector length is proportional to the influence of the variable on station location in ordination space.

APPENDIX D

PERIPHYTON DATA

Table D.1: Locations and dates of periphyton community and productivity sample collections, August 2014.

Site Code	Reference or Exposed	Description	UTM (NAD 83)			Sample Date
R7	Ref	North Fork Rose Creek	8U	586447	6914347	25-Aug-14
FC	Ref	Faro Creek	8U	585353	6916735	20-Aug-14
R6	Ref	Rose Creek	8U	568180	6921708	21-Aug-14
USFR	Ref	Upper South Fork Rose Creek	8U	590252	6907390	21-Aug-14
BLC	Ref	Blind Creek	8U	563669	6895952	21-Aug-14
V1	Ref	Vangorda Creek	8U	594435	6903741	20-Aug-14
VR	Ref	West Fork Vangorda	8U	590679	6906914	20-Aug-14
STC	Ref	Star Creek	9U	349222	6851621	24-Aug-14
HOC	Ref	Horton Creek	8U	656453	6855508	24-Aug-14
BUC	Ref	Buttle Creek	8U	589947	6894046	21-Aug-14
NEXC	Ref	Next Creek	8U	579169	6915382	20-Aug-14
REF-327	Ref	unknown	8U	588635	6881006	23-Aug-14
REF-325	Ref	unknown	8U	549389	6886489	23-Aug-14
REF-213	Ref	unknown	8U	558172	6883774	23-Aug-14
REF-126	Ref	unknown	8U	559596	6943301	22-Aug-14
REF-328	Ref	unknown	8U	559663	6880950	23-Aug-14
REF-340	Ref	unknown	8U	549042	6871745	23-Aug-14
REF-212	Ref	unknown	8U	581220	6887386	23-Aug-14
GRC	Ref	Grew Creek	8U	611834	6882072	24-Aug-14
REF-376	Ref	unknown	9U	357492	6835508	24-Aug-14
REF-220	Ref	unknown	8U	643996	6854240	24-Aug-14
BEC	Ref	Beautiful Creek	8U	638207	6863348	24-Aug-14
R1	MI*	South Fork Rose Creek	8U	584022	6912399	20-Aug-14
Grum	MI*	South Fork Rose Creek	8U	589811	6907397	21-Aug-14
R9	Exp	North Fork Rose Creek	8U	585242	6913662	24-Aug-14
X2	Exp	North Fork Rose Creek	8U	584061	6912782	20-Aug-14
X3	Exp	Rose Creek	8U	583295	6912519	21-Aug-14
RDE-1	Exp	Rose Creek Diversion	8U	583025	6912620	22-Aug-14
RDE-2	Exp	Rose Creek Diversion	8U	581366	6913330	22-Aug-14
RDE-3	Exp	Rose Creek Diversion	8U	579572	6914517	23-Aug-14
R2	Exp	Rose Creek	8U	579045	6914953	20-Aug-14
R3	Exp	Rose Creek	8U	573828	6917490	22-Aug-14
R4	Exp	Rose Creek	8U	567737	6921637	22-Aug-14
R5	Exp	Anvil Creek	8U	566481	6922635	22-Aug-14
A1	Exp	Anvil Creek	8U	545213	6924197	22-Aug-14

* minimally influenced

Table D.2: Periphyton species densities (# cells/cm²) at reference areas sampled in August 2014.

Group	Species	Reference																				
		R7-1	FC	R6	USFR	V1	VR	BLC	NEXC	GRC	STC	HOC	BEC	BUC	REF-126	REF-212	REF-213	REF-220	REF-325	REF-327	REF-328	REF-340	REF-376
Cyanophyte	*Chamaesiphon incrustans* Smith				1,291		566		689												150		
	Gloeocapsa punctata										13,426	1,177									150		
	Gloeothece sp.					3,098											4,561						
	Heteroleibeinia profunda Komarek		345		2,083	11,963	2,484		3,216		4,647		24,978		1,563	400					1,766	443	
	Homoeothrix varians Komarek & Kalina			3,661	155	172			345	517	22,618	2,900	4,522			374		29,090			666		
	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek		57								620	29											
	Phormidium autumnale Agardh			215		9,037															17	98	
	Pseudoanabaena sp.																		1,377				
	Rivularia dura Roth				172								7,752										
Chlorophyte	*Closteriopsis* sp.	861						215											86				
	Cosmarium sp.																						
	Mougeotia sp.	646											646							1,033			
	Scenedesmus acuminatus Chodat							861															
	Stigeoclonium sp.		804		344						826	86	4,953	646							67	74	
	Ulothrix sp.																689						
	Ulothrix zonata Kutzing	1,938						1,292				86					430					246	
Chrysophyte	*Hydrurus* sp. Agardh					5,422														9,639			
Diatom	*Achnanthes minutissima* Kutzing	23,256	2,957	29,500	293	430	2,631	14,212	172	7,235	8,262		230	36,391	100	1,278	4,949	27,024	12,737		300	344	95,320
	Anomoenies vitrea Ross	215		646			25	1,077		345	103	29		1,077		39	301		86	172			574
	Cocconies disculus Schum.			215														172	258				
	Cyclotella pseudostelligera															13							
	Cymbella gracilis (Rabhorst) Cleve																						
	Cymbella lapponica			1,723				215						431	14	13	43		86			25	
	Cymbella microcephala Grunow							3,015		1,034				431				3,270					
	Cymbella minuta Kutzing	6,460		2,799			25							646			129			172			
	Cymbella prostrata (Berkeley) Cleve	215		215		172											43		86				
	Cymbella turgida (Gregory) Cleve							215											258			49	574
	Denticula sp														14								
	Diatoma mesodon Grun.					86											732						1,148
	Diatoma tenue Agardh									1,550	1,239			431		284	1,162	861		14,114		25	6,316
	Diatoma vulgare Bory	431	86	18,088	86	344	49	35,099	29	12,748	9,295	57	861	8,613		361	1,635	5,508	172	24,959	17	49	10,910
	Didymosphenia geminata Schmidt	2,369		1,507	17			861						1,292			43		861			98	17,801
	Diploneis elliptica			215																			
	Encyonema silesiacum (Bleisch) D.G. Mann	3,015		5,383			221	861					431	1,292	72	13	387	344	172	344		123	2,871
	Eucocconeis sp.													215		13	86				17		574
	Eunotia pectinalis (Kutzing) Rabenhorst						25			172						26			86	3,443		74	
	Fragilaria capucina Grunow	1,292	57	5,599	86	1,033	221	215		1,206	310		646	4,091	330	90	2,066	4,647	2,668	29,262	17	74	18,949
	Fragilaria construens (Ehrenberg) Grunow	2,153															430						
	Fragilaria pinata Ehrenberg																						
	Frustulia rhomboides (Ehrenberg) de Toni			215				215					215	431		13						74	
	Gomphonema acuminatum Ehrenberg																						
	Gomphonema angustum Agardh																172		86				
	Gomphonema constrictum v capitata (Ehrenberg) Cleve				17																	25	
	Gomphonema lagerheimii Hustedt							215						1,723					258		17		
	Gomphonema minutum	431	86	1,292	17	344	49	215		1,895	516		215		531	129	2,195	4,303	172		1,016		
	Gomphonema truncatum Ehrenberg																						
	Gyrosigma sp																						
	Hannaea arcus Patrick	12,274		215		602				1,034	103				258		387	21,344		6,024	17	197	
	Meridion circulare Agardh						25															197	
	Navicula exigua (Greg.) Muller						25							861			43						
	Navicula minima Grunow																						
	Navicula pupula Kutzing																						
	Navicula radiosa Kutzing			215	17			215					431	215			43		86				
	Nitzschia filiformis (W. Smith) Hustedt								29									2,754					
	Nitzschia linearis W. Smith			215																			
	Synedra acus Kutzing																						
	Synedra acus v. radians (Kutzing) Hustedt		57				74	1,077		17,743				215	86	52	473		86	2,066	17		
	Synedra ulna (Nitzsch) Ehrenberg			861	172		98	2,369	29	689	103	29		2,153	100	26	172		86	1,377		2,680	18,375
	Tabellaria fenestrata (Lyngbye) Kutzing				17		295																
	Tabellaria flocculsa (Roth) Kutzing																		172				
Rhodophyte	*Audouinella / Chantransia* stage. Red alga	7,967					713				1,652	287	16,581						2,066			246	
Density (# cells/cm²)		**63,523**	**4,450**	**72,782**	**4,768**	**32,704**	**7,524**	**62,446**	**4,508**	**46,167**	**63,722**	**4,680**	**62,461**	**61,154**	**3,070**	**3,124**	**21,172**	**99,318**	**21,946**	**92,605**	**4,231**	**5,139**	**173,414**
Richness (LPL)		**15**	**8**	**19**	**14**	**12**	**16**	**18**	**7**	**12**	**14**	**9**	**13**	**18**	**10**	**16**	**23**	**11**	**21**	**12**	**14**	**19**	**11**

Table D.3: Periphyton species densities (# cells/cm²) at minimally influenced and mine-exposed areas sampled in August 2014.

Group	Species	Minimally Influenced		Exposed										
		South Fork Rose Creek		North Fork Rose Creek			Rose Creek Diversion			Rose Creek downstream from RCTA			Anvil Creek	
		R1	Grum	R9	X2	X3	RDE-1	RDE-2	RDE-3	R2	R3	R4	R5	A1
Cyanophyte	*Chamaesiphon incrustans* Smith													
	Gloeocapsa punctata						4,594						6,891	
	Gloeothece sp.													
	Heteroleibeinia profunda Komarek		2,957			28,137		6,316						
	Homoeothrix varians Komarek & Kalina		115			20,672				4,307		1,034	6,891	1,895
	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek												1,292	
	Phormidium autumnale Agardh	1,380	57				574	861						
	Pseudoanabaena sp.			6,891										
	Rivularia dura Roth													
Chlorophyte	*Closteriopsis* sp.				431	574						172		
	Cosmarium sp.						574							
	Mougeotia sp.					1,723				2,153				
	Scenedesmus acuminatus Chodat													
	Stigeoclonium sp.	4,831	172				1,723	1,723		13,135	14,427	9,130	3,876	
	Ulothrix sp.													
	Ulothrix zonata Kutzing		172	13,781					6,891	861				1,378
Chrysophyte	*Hydrurus* sp. Agardh													
Diatom	*Achnanthes minutissima* Kutzing	101,454	431	105,082	31,869	117,140	43,066	53,115	80,965	26,701	40,698	19,811	29,500	17,399
	Anomoenies vitrea Ross	1,380	29	4,307	646	2,297				431	646		1,077	345
	Cocconies disculus Schum.				431									172
	Cyclotella pseudostelligera													
	Cymbella gracilis (Rabhorst) Cleve	1,380												
	Cymbella lapponica	1,380	29	861		2,297	287		431	431	215	172	431	
	Cymbella microcephala Grunow	5,521			1,077		3,732			215				517
	Cymbella minuta Kutzing	2,761	57	38,760	1,723	2,871			2,584		215			1,378
	Cymbella prostrata (Berkeley) Cleve								1,292					
	Cymbella turgida (Gregory) Cleve						287	1,148	2,153					
	Denticula sp													
	Diatoma mesodon Grun.										215	172		
	Diatoma tenue Agardh			15,504				287		3,015	1,292	517	1,292	2,239
	Diatoma vulgare Bory	6,211	29			1,148		287	431	2,584	1,507	3,962	10,121	10,853
	Didymosphenia geminata Schmidt	11,043	57	20,672	431								215	
	Diploneis elliptica													
	Encyonema silesiacum (Bleisch) D.G. Mann	11,043	373	20,672	431	22,394	1,723	1,148	17,227	3,445	3,015	517	7,967	3,445
	Eucocconeis sp.	690						1,148	1,292		215	1,034		
	Eunotia pectinalis (Kutzing) Rabenhorst			861	215		287							
	Fragilaria capucina Grunow	4,141	115	6,891	6,891	12,633	861	1,148	8,183	646	646	172	2,799	6,891
	Fragilaria construens (Ehrenberg) Grunow													
	Fragilaria pinata Ehrenberg													517
	Frustulia rhomboides (Ehrenberg) de Toni		29	861		574		287	431				431	172
	Gomphonema acuminatum Ehrenberg				215									
	Gomphonema angustum Agardh	690												
	Gomphonema constrictum v capitata (Ehrenberg) Cleve													
	Gomphonema lagerheimii Hustedt							287	1,292		431		646	345
	Gomphonema minutum	1,380		3,445	215	5,168	2,297	287	2,153	3,876	215	345	431	3,962
	Gomphonema truncatum Ehrenberg											345		
	Gyrosigma sp							287						
	Hannaea arcus Patrick		57	31,008	215		574	287	431	215	215		646	
	Meridion circulare Agardh										3,015			
	Navicula exigua (Greg.) Muller							574	4,307	215		1,550		
	Navicula minima Grunow										646			172
	Navicula pupula Kutzing			861										
	Navicula radiosa Kutzing	2,071	29	1,723			574							345
	Nitzschia filiformis (W. Smith) Hustedt		57					287						
	Nitzschia linearis W. Smith											172		
	Synedra acus Kutzing													
	Synedra acus v. radians (Kutzing) Hustedt					1,148			2,584	861		172	431	1,034
	Synedra ulna (Nitzsch) Ehrenberg	1,380	57		431	13,207	287	861	861	2,584	646	172	1,292	345
	Tabellaria fenestrata (Lyngbye) Kutzing					4,594		1,148			215			
	Tabellaria flocculsa (Roth) Kutzing								861			172		
Rhodophyte	*Audouinella / Chantransia* stage. Red alga					31,582	25,266	4,020		7,321	4,522	2,412		
Density (# cells/cm²)		**158,738**	**4,823**	**272,179**	**45,220**	**268,160**	**86,707**	**75,510**	**134,367**	**72,997**	**72,997**	**42,033**	**76,227**	**53,402**
Richness (LPL)		**17**	**18**	**16**	**14**	**17**	**16**	**20**	**18**	**18**	**19**	**19**	**18**	**19**

Table D.4: Relative abundance (%) of periphyton species at reference areas sampled in August 2014.

Group	Species	Reference																				
		R7	FC	R6	USFR	V1	VR	BLC	NEXC	GRC	STC	HOC	BEC	BUC	REF-126	REF-212	REF-213	REF-220	REF-325	REF-327	REF-328	REF-340	REF-376
Cyanophyte	*Chamaesiphon incrustans* Smith	0	0	0	27.1	0	7.5	0	15.3	0	0	0	0	0	0	0	0	0	0	0	3.5	0	
	Gloeocapsa punctata	0	0	0	0	0	0	0	0	0	21.1	25.2	0	0	0	0	0	0	0	0	3.5	0	0
	Gloeothece sp.	0	0	0	0	9.5	0	0	0	0	0	0	0	0	0	0	21.5	0	0	0	0	0	0
	Heteroleibeinia profunda Komarek	0	7.7	0.0	43.7	36.6	33.0	0	71.3	0	7.3	0	40.0	0	50.9	12.8	0	0	0	0	41.7	8.6	0
	Homoeothrix varians Komarek & Kalina	0	0.0	5.0	3.2	0.5	0	0	7.6	1.1	35.5	62.0	7.2	0	0	12.0	0	29.3	0	0	15.7	0	0
	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	0	1.3	0	0	0	0	0	0	0	1.0	0.6	0	0	0	0	0	0	0	0	0	0	0
	Phormidium autumnale Agardh	0	0	0.3	0	27.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	1.9	0
	Pseudoanabaena sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.3	0	0	0	0
	Rivularia dura Roth	0	0	0	3.6	0	0	0	0	0	0	0	12.4	0	0	0	0	0	0	0	0	0	0
Chlorophyte	*Closteriopsis* sp.	1.4	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0
	Cosmarium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mougeotia sp.	1.0	0	0	0	0	0	0	0	0	0	0	1.0	0	0	0	0	0	0	1.1	0	0	0
	Scenedesmus acuminatus Chodat	0	0	0	0	0	0	1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stigeoclonium sp.	0	18.1	0	7.2	0	0	0	0	0	1.3	1.8	7.9	1.1	0	0	0	0	0	0	1.6	1.4	0
	Ulothrix sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.3	0	0	0	0	0	0
	Ulothrix zonata Kutzing	3.1	0	0	0	0	0	2.1	0	0	0	1.8	0	0	0	0	2.0	0	0	0	0	4.8	0
Chrysophyte	*Hydrurus* sp. Agardh	0	0	0	0	16.6	0	0	0	0	0	0	0	0	0	0	0	0	0	10.4	0	0	0
Diatom	*Achnanthes minutissima* Kutzing	36.6	66.5	40.5	6.1	1.3	35.0	22.8	3.8	15.7	13.0	0	0.4	59.5	3.3	40.9	23.4	27.2	58.0	0	7.1	6.7	55.0
	Anomoenies vitrea Ross	0.3	0	0.9	0	0	0.3	1.7	0	0.7	0.2	0.6	0	1.8	0	1.2	1.4	0	0.4	0.2	0	0	0.3
	Cocconies disculus Schum.	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	1.2	0	0	0	0
	Cyclotella pseudostelligera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0
	Cymbella gracilis (Rabhorst) Cleve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cymbella lapponica	0	0	2.4	0	0	0	0.3	0	0	0	0	0	0.7	0.5	0.4	0.2	0	0.4	0	0	0.5	0
	Cymbella microcephala Grunow	0	0	0	0	0	0	4.8	0	2.2	0	0	0	0.7	0	0	0	3.3	0	0	0	0	0
	Cymbella minuta Kutzing	10.2	0	3.8	0	0	0.3	0	0	0	0	0	0	1.1	0	0	0.6	0	0	0.2	0	0	0
	Cymbella prostrata (Berkeley) Cleve	0.3	0	0.3	0	0.5	0	0	0	0	0	0	0	0	0	0	0.2	0	0.4	0	0	0	0
	Cymbella turgida (Gregory) Cleve	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	1.2	0	0	1.0	0.3
	Denticula sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0
	Diatoma mesodon Grun.	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	3.5	0	0	0	0	0	0.7
	Diatoma tenue Agardh	0	0	0	0	0	0	0	0	3.4	1.9	0	0	0.7	0	9.1	5.5	0.9	0	15.2	0	0.5	3.6
	Diatoma vulgare Bory	0.7	1.9	24.9	1.8	1.1	0.7	56.2	0.6	27.6	14.6	1.2	1.4	14.1	0	11.6	7.7	5.5	0.8	27.0	0.4	1.0	6.3
	Didymosphenia geminata Schmidt	3.7	0	2.1	0.4	0	0	1.4	0	0	0	0	0	2.1	0	0	0.2	0	3.9	0	0	1.9	10.3
	Diploneis elliptica	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Encyonema silesiacum (Bleisch) D.G. Mann	4.7	0	7.4	0	0	2.9	1.4	0	0	0	0	0.7	2.1	2.3	0.4	1.8	0.3	0.8	0.4	0	2.4	1.7
	Eucocconeis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0.4	0.4	0	0	0	0.4	0	0.3
	Eunotia pectinalis (Kutzing) Rabenhorst	0	0	0	0	0	0.3	0	0	0.4	0	0	0	0	0	0.8	0	0	0.4	3.7	0	1.4	0
	Fragilaria capucina Grunow	2.0	1.3	7.7	1.8	3.2	2.9	0.3	0	2.6	0.5	0	1.0	6.7	10.7	2.9	9.8	4.7	12.2	31.6	0.4	1.4	10.9
	Fragilaria construens (Ehrenberg) Grunow	3.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.0	0	0	0	0	0	0
	Fragilaria pinata Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Frustulia rhomboides (Ehrenberg) de Toni	0	0	0.3	0	0	0	0.3	0	0	0	0	0.3	0.7	0	0.4	0	0	0	0	0	1.4	0
	Gomphonema acuminatum Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gomphonema angustum Agardh	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0	0.4	0	0	0	0
	Gomphonema constrictum v capitata (Ehrenberg) Cleve	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0
	Gomphonema lagerheimii Hustedt	0	0	0	0	0	0	0.3	0	0	0	0	0	2.8	0	0	0	0	1.2	0	0.4	0	0
	Gomphonema minutum	0.7	1.9	1.8	0.4	1.1	0.7	0.3	0	4.1	0.8	0	0.3	0	17.3	4.1	10.4	4.3	0.8	0	24.0	0	0
	Gomphonema truncatum Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gyrosigma sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hannaea arcus Patrick	19.3	0	0.3	0	1.8	0	0	0	2.2	0.2	0	0	0	8.4	0	1.8	21.5	0	6.5	0.4	3.8	0
	Meridion circulare Agardh	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.8	0
	Navicula exigua (Greg.) Muller	0	0	0	0	0	0.3	0	0	0	0	0	0	1.4	0	0	0.2	0	0	0	0	0	0
	Navicula minima Grunow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Navicula pupula Kutzing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Navicula radiosa Kutzing	0	0	0.3	0.4	0	0	0.3	0	0	0	0	0.7	0.4	0	0	0.2	0	0.4	0	0	0	0
	Nitzschia filiformis (W. Smith) Hustedt	0	0	0	0	0	0	0	0.6	0	0	0	0	0	0	0	0	2.8	0	0	0	0	0
	Nitzschia linearis W. Smith	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Synedra acus Kutzing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Synedra acus v. radians (Kutzing) Hustedt	0	1.3	0	0	0	1.0	1.7	0	38.4	0	0	0	0.4	2.8	1.7	2.2	0	0.4	2.2	0.4	0	0
	Synedra ulna (Nitzsch) Ehrenberg	0	0	1.2	3.6	0	1.3	3.8	0.6	1.5	0.2	0.6	0	3.5	3.3	0.8	0.8	0	0.4	1.5	0	52.2	10.6
	Tabellaria fenestrata (Lyngbye) Kutzing	0	0	0	0.4	0	3.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Tabellaria flocculsa (Roth) Kutzing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0	0	0	0
Rhodophyte	*Audouinella / Chantransia* stage. Red alga	12.5	0	0	0	0	9.5	0	0	0	2.6	6.1	26.5	0	0	0	0	0	9.4	0	0	4.8	0
Relative Abundance		**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Table D.5: Relative abundance (%) of periphyton species at minimally influenced and mine-exposed areas sampled in August 2014.

Group	Species	Minimally Influenced		Exposed										
		South Fork Rose Creek		North Fork Rose Creek			Rose Creek Diversion			Rose Creek downstream from RCTA			Anvil Creek	
		R1	Grum	R9	X2	X3	RDE-1	RDE-2	RDE-3	R2	R3	R4	R5	A1
Cyanophyte	*Chamaesiphon incrustans* Smith	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gloeocapsa punctata	0	0	0	0	0	5.3	0	0	0	0	0	9.0	0
	Gloeothece sp.	0	0	0	0	0	0	0	0	0	0	0	0	0
	Heteroleibeinia profunda Komarek	0	61.3	0	0	10.5	0	8.4	0	0	0	0	0	0
	Homoeothrix varians Komarek & Kalina	0	2.4	0	0	7.7	0	0	0	5.9	0	2.5	9.0	3.5
	Leptolyngbya lemnetica (Anaga.) Anagnostidis and Komarek	0	0	0	0	0	0	0	0	0	0	0	1.7	0
	Phormidium autumnale Agardh	0.9	1.2	0	0	0	0.7	1.1	0	0	0	0	0	0
	Pseudoanabaena sp.	0	0	2.5	0	0	0	0	0	0	0	0	0	0
	Rivularia dura Roth	0	0	0	0	0	0	0	0	0	0	0	0	0
Chlorophyte	*Closteriopsis* sp.	0	0	0	1.0	0.2	0	0	0	0	0	0.4	0	0
	Cosmarium sp.	0	0	0	0	0	0.7	0	0	0	0	0	0	0
	Mougeotia sp.	0	0	0	0	0.6	0	0	0	2.9	0	0	0	0
	Scenedesmus acuminatus Chodat	0	0	0	0	0	0	0	0	0	0	0	0	0
	Stigeoclonium sp.	3.0	3.6	0	0	0	2.0	2.3	0	18.0	19.8	21.7	5.1	0
	Ulothrix sp.	0	0	0	0	0	0	0	0	0	0	0	0	0
	Ulothrix zonata Kutzing	0	3.6	5.1	0	0	0	0	5.1	1.2	0	0	0	2.6
Chrysophyte	*Hydrurus* sp. Agardh	0	0	0	0	0	0	0	0	0	0	0	0	0
Diatom	*Achnanthes minutissima* Kutzing	63.9	8.9	38.6	70.5	43.7	49.7	70.3	60.3	36.6	55.8	47.1	38.7	32.6
	Anomoenies vitrea Ross	0.9	0.6	1.6	1.4	0.9	0	0	0	0.6	0.9	0	1.4	0.6
	Cocconies disculus Schum.	0	0	0	1.0	0	0	0	0	0	0	0	0	0.3
	Cyclotella pseudostelligera	0	0	0	0	0	0	0	0	0	0	0	0	0
	Cymbella gracilis (Rabhorst) Cleve	0.9	0	0	0	0	0	0	0	0	0	0	0	0
	Cymbella lapponica	0.9	0.6	0.3	0	0.9	0.3	0	0.3	0.6	0.3	0.4	0.6	0
	Cymbella microcephala Grunow	3.5	0	0	2.4	0	4.3	0	0	0.3	0	0	0	1.0
	Cymbella minuta Kutzing	1.7	1.2	14.2	3.8	1.1	0	0	1.9	0	0.3	0	0	2.6
	Cymbella prostrata (Berkeley) Cleve	0	0	0	0	0	0	0	1.0	0	0	0	0	0
	Cymbella turgida (Gregory) Cleve	0	0	0	0	0	0.3	1.5	1.6	0	0	0	0	0
	Denticula sp	0	0	0	0	0	0	0	0	0	0	0	0	0
	Diatoma mesodon Grun.	0	0	0	0	0	0	0	0	0	0.3	0.4	0	0
	Diatoma tenue Agardh	0	0	5.7	0	0	0	0.4	0	4.1	1.8	1.2	1.7	4.2
	Diatoma vulgare Bory	3.9	0.6	0	0	0.4	0	0.4	0.3	3.5	2.1	9.4	13.3	20.3
	Didymosphenia geminata Schmidt	7.0	1.2	7.6	1.0	0	0	0	0	0	0	0	0.3	0
	Diploneis elliptica	0	0	0	0	0	0	0	0	0	0	0	0	0
	Encyonema silesiacum (Bleisch) D.G. Mann	7.0	7.7	7.6	1.0	8.4	2.0	1.5	12.8	4.7	4.1	1.2	10.5	6.5
	Eucocconeis sp.	0.4	0	0	0	0	0	1.5	1.0	0	0.3	2.5	0	0
	Eunotia pectinalis (Kutzing) Rabenhorst	0	0	0.3	0.5	0	0.3	0	0	0	0	0	0	0
	Fragilaria capucina Grunow	2.6	2.4	2.5	15.2	4.7	1.0	1.5	6.1	0.9	0.9	0.4	3.7	12.9
	Fragilaria construens (Ehrenberg) Grunow	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fragilaria pinata Ehrenberg	0	0	0	0	0	0	0	0	0	0	0	0	1.0
	Frustulia rhomboides (Ehrenberg) de Toni	0	0.6	0.3	0	0.2	0	0.4	0.3	0	0	0	0.6	0.3
	Gomphonema acuminatum Ehrenberg	0	0	0	0.5	0	0	0	0	0	0	0	0	0
	Gomphonema angustum Agardh	0.4	0	0	0	0	0	0	0	0	0	0	0	0
	Gomphonema constrictum v capitata (Ehrenberg) Cleve	0	0	0	0	0	0	0	0	0	0	0	0	0
	Gomphonema lagerheimii Hustedt	0	0	0	0	0	0	0.4	1.0	0	0.6	0	0.8	0.6
	Gomphonema minutum	0.9	0	1.3	0.5	1.9	2.6	0.4	1.6	5.3	0.3	0.8	0.6	7.4
	Gomphonema truncatum Ehrenberg	0	0	0	0	0	0	0	0	0	0	0.8	0	0
	Gyrosigma sp	0	0	0	0	0	0	0.4	0	0	0	0	0	0
	Hannaea arcus Patrick	0	1.2	11.4	0.5	0	0.7	0.4	0.3	0.3	0.3	0	0.8	0
	Meridion circulare Agardh	0	0	0	0	0	0	0	0	0	4.1	0	0	0
	Navicula exigua (Greg.) Muller	0	0	0	0	0	0	0.8	3.2	0.3	0	3.7	0	0
	Navicula minima Grunow	0	0	0	0	0	0	0	0	0	0.9	0	0	0.3
	Navicula pupula Kutzing	0	0	0.3	0	0	0	0	0	0	0	0	0	0
	Navicula radiosa Kutzing	1.3	0.6	0.6	0	0	0.7	0	0	0	0	0	0	0.6
	Nitzschia filiformis (W. Smith) Hustedt	0	1.2	0	0	0	0	0.4	0	0	0	0	0	0
	Nitzschia linearis W. Smith	0	0	0	0	0	0	0	0	0	0	0.4	0	0
	Synedra acus Kutzing	0	0	0	0	0	0	0	0	0	0	0	0	0
	Synedra acus v. radians (Kutzing) Hustedt	0	0	0	0	0.4	0	0	1.9	1.2	0	0.4	0.6	1.9
	Synedra ulna (Nitzsch) Ehrenberg	0.9	1.2	0	1.0	4.9	0.3	1.1	0.6	3.5	0.9	0.4	1.7	0.6
	Tabellaria fenestrata (Lyngbye) Kutzing	0	0	0	0	1.7	0	1.5	0	0	0.3	0	0	0
	Tabellaria flocculsa (Roth) Kutzing	0	0	0	0	0	0	0	0.6	0	0	0.4	0	0
Rhodophyte	*Audouinella / Chantransia* stage. Red alga	0	0	0	0	11.8	29.1	5.3	0	10.0	6.2	5.7	0	0
Relative Abundance		**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Table D.6: Supporting environmental variables employed in correlation analyses with periphtyon community endpoints.

Category	Variable Abbreviation	Full Variable Name
Geologic	Met	Metamorphic (%)
	Plu	Plutonic geology (%)
	Sed	Sedimentary geology (%)
	SedVol	Sedimentary and Volcanic (%)
	Ult	Ultramafic (%)
	UltMet	Ultramafic and Metamorphic (%)
	Uncon	Unconsolidated (%)
	Vol	Volcanic (%)
Land Cover	F8013	Area burned between 1980 and 2013 (%)
	Shadow	Basin area landcover obscured by shadow (%)
	Water	Open water within basin areas (%)
	SnoIce	Snow and Ice cover within basin area (%)
	RocRub	Rock and Rubble cover within basin area (%)
	ExpLan	Exposed land within basin area (%)
	ShrTal	Tall shurb cover within basin area (%)
	ShrLow	Low shrub cover within basin area (%)
	WetTre	Treed wetland cover within basin area (%)
	WetShr	Shrub wetland cover within basin area (%)
	WetHer	Herbaceous wetand cover within basin area (%)
	Herb	Herbaceous cover within basin area (%)
	ConDen	Dense coniferous cover within basin area (%)
	ConOpe	Open coniferous cover within basin area (%)
	ConSpa	Sparce coniferous cover within basin area (%)
	BroDen	Dense broadleaf cover within basin area (%)
	BroOpe	Open broadleaf cover within basin area (%)
	MixOpe	Open mixedwood cover within basin area (%)
	MixSpa	Sparce mixedwood cover within basin area (%)
	Logged	Area logged between 1987 and 2013 (%)
Basin and Stream Character	Smin	Minimum basin area slope (Degree)
	Smax	Maximum basin area slope (Degree)
	Smean	Mean basin area slope (Degree)
	Amin	Minimum aspect of basin area (Degree)
	Amax	Maximum aspect of basin area (Degree)
	Amean	Mean aspect of basin area (Degree)
	East	Longitude (UTM)
	North	Latitude (UTM)
	Elev	Altitude of sampling area (meters above sea level)
	SouEle	Altitude of main channel stream source (meters above sea level)
	EleCha	Mean altitude of main channel (meters above sea level)
	ChaLen	Length of main stream channel (m)
	GrMaCh	Mean gradient of main stream channel (m)
	GrStSp	Change in elevation between 100 meters upstream and downstream of sampling locatior
	BaArea	Size of basin (km^2)
	StrOrd	Strahler stream order
	SuStLe	Sum of all stream segments in basin (m)
	DraDen	Density of stream length in basin (m/km^2)
In-situ Habitat	AvWatVel	Average water velocity of sampling area (m/s)
	DepAve	Average water depth of sampling area (m)
	Cobble	Visual estimation of areal coverage of stream substrate what was cobble (%)
	Gravel	Visual estimation of areal coverage of stream substrate what was gravel (%)
	Sand	Visual estimation of areal coverage of stream substrate what was sand (%)
	MedCob	Mean intermediate axis length of 100 pebble count
	MedEmbed	Mean embedded depth of every 10th rock (n = 10) (Five class depths)
	Gradient	Stream gradient (clinometer) (Degree)
	BanWid	Bankfull width (m)
	WetWid	Wetted width (m)
	Macro	Visual estimate of percent macrophyte coverage (Five classes)
	Peri	Visual estimate of percent periphyton coverage (Five classes)
	Densi	Forest canopy conver at sample location using a densiometer (%)
Water Quality	Temp	Water temperature (˚C)
	DOc	Dissloved oxygen (mg/L)
	DOp	Dissolved oxygen (%)
	SpeCon	Specific conductance (µs/cm)
	pH	pH Units
	Hard	Hardness (as CaCO3) (mg/L)
	TSS	Total Suspended Solids (mg/L)
	TDS	Total Dissolved Solids (mg/L)
	Turbid	Turbidity (NTU)
	Alka	Alkalinity, Total (as CaCO3) (mg/L)
	NH3	Ammonia, Total (as N) (mg/L)
	Cl	Chloride (mg/L)
	F	Fluoride (mg/L)
	NO3	Nitrate (as N) (mg/L)
	NO2	Nitrite (as N) (mg/L)
	TP	Total Phosphorus (mg/L)
	SO4	Sulfate (SO4) (mg/L)
	DOC	Dissolved Organic Carbon (mg/L)
	TOC	Total Organic Carbon (mg/L)
	Alka	Aluminum (mg/L)
	Sb	Antimony (mg/L)
	As	Arsenic (mg/L)
	Ba	Barium (mg/L)
	Be	Beryllium (mg/L)
	Bi	Bismuth (mg/L)
	B	Boron (mg/L)
	Cd	Cadmium (mg/L)
	Ca	Calcium (mg/L)
	Cr	Chromium (mg/L)
	Co	Cobalt (mg/L)
	Cu	Copper (mg/L)
	Fe	Iron (mg/L)
	Pb	Lead (mg/L)
	Li	Lithium (mg/L)
	Mg	Magnesium (mg/L)
	Mn	Manganese (mg/L)
	Hg	Mercury (mg/L)
	Mo	Molybdenum (mg/L)
	Ni	Nickel (mg/L)
	P	Phosphorus (mg/L)
	K	Potassium (mg/L)
	Se	Selenium (mg/L)
	Si	Silicon (Si) (mg/L)
	Ag	Silver (mg/L)
	Na	Sodium (mg/L)
	Sr	Strontium (mg/L)
	S	Sulfur (mg/L)
	Tl	Thallium (mg/L)
	Sn	Tin (mg/L)
	Ti	Titanium (mg/L)
	U	Uranium (mg/L)
	V	Vanadium (mg/L)
	Zn	Zinc (mg/L)

Table D.7: NMS results of periphtyon community structure at 22 reference areas. Percent variance explained, Monte Carlo randomization p-values of axis significance, and station scores of 22 reference areas, August 2014.

Axis	NMS-1	NMS-2	NMS-3
% Variance explained	52.3	15.6	11.0
Monte Carlo P	0.004	0.004	0.004
BEC	0.23571	-1.1483	-0.07152
BLC	-0.8473	0.44532	0.09272
BUC	-0.87841	0.16608	-0.21541
FC	0.43979	0.63365	-0.36934
GRC	-0.62106	0.2019	0.38876
HOC	0.75533	-0.39331	-1.03426
NEXC	1.24243	-0.27926	0.2168
R6	-0.768	-0.0338	-0.12131
R7	-0.76105	-0.13437	-0.52544
REF-126	0.94578	0.13793	0.52583
REF-212	0.67007	0.37047	-0.32902
REF-213	-0.24774	0.4054	0.20142
REF-220	-0.8106	-0.39952	-0.24947
REF-325	-0.42091	0.34125	-0.36579
REF-327	-1.11276	-0.20668	0.7691
REF-328	1.06609	-0.06703	-0.12569
REF-340	0.63899	0.82034	0.30155
REF-376	-1.3396	0.03661	-0.00321
STC	-0.2874	-0.45783	-0.06952
USFR	1.11243	0.08895	0.18597
V1	0.37911	-0.67473	0.75762
VR	0.60913	0.14695	0.0402

Table D.8: Spearman correlation of periphyton community NMS axis scores with periphyton taxon densities for 22 reference areas, August 2014.

Category	Variable	NMS-1		NMS-2		NMS-3	
		r	p	r	p	r	p
Periphyton Taxa	*Chamaesiphon incrustans*	0.599	0.003	-0.091	0.686	0.150	0.505
	Gloeocapsa punctata	0.262	0.239	-0.376	0.085	-0.296	0.181
	Gloeothece sp.	0.023	0.920	-0.031	0.893	0.343	0.118
	Heteroleibeinia profunda	0.645	0.001	-0.351	0.110	0.285	0.198
	Homoeothrix varians	0.177	0.431	-0.632	0.002	-0.200	0.373
	Leptolyngbya lemnetica	0.141	0.532	-0.118	0.600	-0.387	0.075
	Phormidium autumnale	0.140	0.534	-0.083	0.713	0.210	0.349
	Rivularia dura	0.239	0.285	-0.261	0.240	0.044	0.845
	Closteriopsis sp.	-0.306	0.167	0.201	0.369	-0.306	0.167
	Mougeotia sp.	-0.295	0.182	-0.381	0.081	0.020	0.930
	Stigeoclonium sp.	0.241	0.280	-0.123	0.585	-0.289	0.192
	Ulothrix zonata	-0.078	0.731	0.285	0.198	-0.113	0.616
	Hydrurus sp.	-0.212	0.344	-0.343	0.118	0.499	0.018
	Achnanthes minutissima	-0.674	0.001	0.238	0.287	-0.382	0.079
	Anomoenies vitrea	-0.735	0.000	0.257	0.248	-0.090	0.690
	Cocconies disculus	-0.294	0.184	-0.048	0.831	-0.326	0.138
	Cymbella lapponica	-0.229	0.306	0.570	0.006	-0.026	0.910
	Cymbella microcephala	-0.478	0.024	0.142	0.529	-0.007	0.976
	Cymbella minuta	-0.435	0.043	0.028	0.901	-0.065	0.772
	Cymbella prostrata	-0.212	0.343	-0.068	0.762	-0.123	0.585
	Cymbella turgida	-0.329	0.135	0.413	0.056	0.013	0.953
	Diatoma mesodon	-0.220	0.324	-0.035	0.877	0.285	0.199
	Diatoma tenue	-0.538	0.010	0.059	0.795	0.258	0.247
	Diatoma vulgare	-0.873	0.000	-0.034	0.879	0.053	0.814
	Didymosphenia geminata	-0.505	0.017	0.345	0.116	-0.178	0.428
	Encyonema silesiacum	-0.707	0.000	0.089	0.693	-0.145	0.521
	Eucocconeis sp.	-0.168	0.454	0.233	0.297	-0.141	0.532
	Eunotia pectinalis	-0.103	0.649	0.363	0.097	0.242	0.277
	Fragilaria capucina	-0.835	0.000	-0.123	0.585	0.109	0.629
	Fragilaria construens	-0.129	0.567	0.087	0.700	-0.140	0.533
	Frustulia rhomboides	-0.244	0.275	0.234	0.296	-0.103	0.648
	Gomphonema angustum	-0.072	0.749	0.326	0.139	-0.061	0.787
	Gomphonema constrictum v capitata	0.343	0.118	0.285	0.198	0.252	0.257
	Gomphonema lagerheimii	-0.223	0.318	0.289	0.191	-0.251	0.260
	Gomphonema minutum	-0.098	0.666	-0.100	0.657	-0.008	0.972
	Hannaea arcus	-0.284	0.200	-0.238	0.285	0.323	0.143
	Meridion circulare	0.200	0.371	0.333	0.130	0.205	0.361
	Navicula exigua	-0.137	0.543	0.283	0.202	0.020	0.930
	Navicula radiosa	-0.280	0.207	0.144	0.522	-0.111	0.621
	Navicula filiformis	0.080	0.722	-0.326	0.139	-0.012	0.956
	Synedra acus v. radians	-0.264	0.236	0.562	0.006	0.249	0.263
	Synedra ulna	-0.415	0.055	0.430	0.046	0.430	0.046
	Tabellaria fenestrata	0.317	0.151	0.077	0.734	0.122	0.588
	Audouinella / Chantransia stage	0.043	0.849	-0.231	0.300	-0.365	0.095

indicates absolute r-value greater than 0.50.

indicates a p-value below 0.05.

Table D.9: Spearman correlation of periphyton community NMS axis scores with periphtyon taxon densities and environmental variables, for 22 reference areas, August 2014.

Category	Variable	NMS-1		NMS-2		NMS-3	
		r	p	r	p	r	p
Geologic	Met	-0.224	0.317	-0.321	0.146	-0.165	0.462
	Plu	0.281	0.218	0.239	0.297	0.096	0.678
	Sed	-0.217	0.331	-0.151	0.503	0.081	0.721
	SedVol	-0.328	0.136	-0.126	0.577	-0.160	0.477
	UltMet	0.155	0.492	0.361	0.099	0.224	0.317
	Uncon	0.134	0.554	-0.371	0.089	-0.285	0.198
	Vol	-0.226	0.311	-0.237	0.288	0.038	0.867
Land Cover	F8013	-0.202	0.367	-0.130	0.564	-0.173	0.442
	Shadow	0.028	0.902	-0.396	0.068	0.000	1.000
	Water	0.063	0.782	0.100	0.659	-0.256	0.250
	SnoIce	0.172	0.445	-0.116	0.607	0.393	0.070
	RocRub	0.269	0.225	-0.340	0.121	0.216	0.334
	ExpLan	0.159	0.481	-0.280	0.208	0.260	0.242
	ShrTal	0.381	0.080	0.080	0.725	0.033	0.883
	ShrLow	0.058	0.797	0.396	0.068	-0.006	0.978
	WetTre	-0.178	0.429	-0.247	0.268	-0.268	0.227
	WetShr	-0.084	0.710	-0.019	0.934	-0.142	0.529
	WetHer	-0.117	0.605	-0.029	0.897	-0.109	0.631
	Herb	0.678	0.001	-0.168	0.456	0.142	0.529
	ConDen	-0.328	0.136	-0.073	0.747	-0.232	0.299
	ConOpe	-0.476	0.025	-0.110	0.626	-0.125	0.580
	ConSpa	-0.460	0.031	0.077	0.732	-0.202	0.368
	BroDen	0.415	0.055	-0.022	0.923	-0.118	0.601
	BroOpe	0.321	0.145	0.124	0.582	0.111	0.624
	MixOpe	0.278	0.210	0.261	0.240	0.146	0.516
	MixSpa	-0.429	0.046	0.130	0.565	-0.157	0.487
	Logged	-0.160	0.478	-0.005	0.984	0.291	0.189
Basin and Stream Character	Smin	0.120	0.594	0.086	0.704	0.052	0.820
	Smax	0.033	0.883	-0.457	0.033	-0.197	0.379
	Smean	-0.042	0.852	-0.274	0.217	0.366	0.093
	Amin	0.120	0.594	0.086	0.704	0.052	0.820
	Amax	-0.240	0.282	-0.221	0.323	-0.179	0.425
	Amean	-0.010	0.966	-0.015	0.946	0.256	0.251
	East	-0.037	0.871	-0.310	0.160	-0.084	0.710
	North	0.283	0.202	0.270	0.223	0.095	0.673
	Elev	0.455	0.034	-0.038	0.867	0.240	0.282
	SouEle	0.161	0.474	-0.247	0.268	0.346	0.114
	EleCha	-0.389	0.074	-0.104	0.644	0.077	0.732
	ChaLen	-0.539	0.010	-0.077	0.732	-0.292	0.187
	GrMaCh	0.397	0.067	-0.086	0.702	0.383	0.078
	GrStSp	0.387	0.075	0.047	0.835	0.058	0.797
	BaArea	-0.421	0.051	0.033	0.883	-0.325	0.140
	StrOrd	-0.316	0.153	0.004	0.987	-0.262	0.239
	SuStLe	-0.340	0.121	0.179	0.425	-0.212	0.344
	DraDen	0.034	0.879	0.276	0.214	0.147	0.513
In-situ Habitat	AvWatVel	0.036	0.875	-0.024	0.915	0.150	0.506
	DepAve	-0.202	0.368	0.309	0.162	0.006	0.978
	Cobble	0.326	0.139	-0.010	0.966	0.171	0.448
	Gravel	-0.133	0.556	-0.402	0.064	-0.182	0.418
	Sand	-0.103	0.648	0.218	0.329	-0.360	0.100
	MedCob	-0.028	0.903	-0.117	0.604	0.232	0.299
	MedEmbed	0.089	0.692	-0.459	0.031	-0.020	0.929
	Gradient	-0.190	0.396	-0.180	0.424	0.359	0.101
	BanWid	-0.033	0.883	0.065	0.774	0.198	0.377
	WetWid	-0.072	0.751	0.214	0.339	0.023	0.919
	Macro	-0.185	0.410	0.162	0.470	-0.128	0.572
	Peri	-0.412	0.057	-0.398	0.067	0.075	0.740
	Densi	0.123	0.596	-0.283	0.213	-0.426	0.054
Water Quality	Temp	0.086	0.702	-0.144	0.523	-0.047	0.836
	DOc	-0.415	0.055	-0.220	0.326	-0.134	0.553
	DOp	-0.488	0.021	-0.459	0.032	-0.398	0.067
	SpeCon	-0.560	0.007	-0.336	0.126	-0.146	0.516
	pH	-0.560	0.007	-0.405	0.061	0.138	0.539
	Hard	-0.520	0.013	-0.331	0.132	-0.161	0.474
	TSS	0.463	0.355	-0.031	0.954	0.093	0.862
	TDS	-0.533	0.011	-0.371	0.090	-0.193	0.390
	Turbid	-0.393	0.071	-0.116	0.607	-0.156	0.488
	Alka	-0.537	0.010	-0.278	0.210	-0.206	0.357
	NH3	0.205	0.741	-0.154	0.805	-0.205	0.741
	F	-0.424	0.049	-0.217	0.331	-0.342	0.120
	NO3	-0.291	0.385	-0.336	0.312	0.227	0.502
	TP	-0.220	0.380	-0.076	0.763	-0.042	0.867
	SO4	-0.387	0.075	-0.405	0.062	-0.031	0.891
	DOC	-0.231	0.301	0.452	0.035	-0.099	0.662
	TOC	-0.207	0.356	0.370	0.090	-0.124	0.582
	Alka	-0.093	0.680	0.413	0.056	0.023	0.919
	Sb	0.223	0.509	-0.533	0.091	-0.014	0.968
	As	-0.313	0.156	-0.237	0.288	-0.024	0.915
	Ba	-0.642	0.001	-0.307	0.165	-0.194	0.386
	Cd	0.070	0.784	-0.622	0.006	0.254	0.308
	Ca	-0.529	0.011	-0.315	0.154	-0.142	0.529
	Cr	-0.240	0.337	-0.111	0.660	-0.227	0.366
	Cu	-0.027	0.922	0.354	0.179	0.322	0.225
	Fe	-0.396	0.068	-0.106	0.640	-0.438	0.041
	Pb	0.182	0.696	0.218	0.638	-0.309	0.500
	Li	-0.353	0.117	-0.318	0.161	-0.270	0.237
	Mg	-0.510	0.015	-0.318	0.149	-0.137	0.543
	Mn	-0.459	0.032	-0.085	0.706	-0.523	0.012
	Mo	-0.311	0.159	-0.208	0.352	-0.146	0.516
	Ni	0.524	0.183	-0.786	0.021	-0.310	0.456
	K	-0.399	0.066	-0.063	0.781	-0.207	0.354
	Se	-0.170	0.545	-0.733	0.002	-0.268	0.334
	Si	0.219	0.328	0.429	0.046	-0.272	0.221
	Na	-0.352	0.108	-0.095	0.673	-0.430	0.046
	Sr	-0.509	0.016	-0.313	0.156	-0.163	0.468
	S	-0.400	0.065	-0.395	0.069	-0.041	0.855
	U	-0.471	0.027	-0.207	0.355	-0.102	0.651

indicates absolute r-value greater than 0.50.

indicates a p-value below 0.05.

Table D.10: NMS results of periphtyon community structure at 22 reference, 11 exposed, and 2 minimally influenced areas. Percent variance explained, Monte Carlo randomization p-values of axis significance, and station scores of 22 reference areas, August 2014.

Area Type	Axis	NMS-1	NMS-2
	% Variance explained	60.8	16.5
	Monte Carlo P	0.004	0.004
Reference	BEC	-0.265	-1.140
	BLC	0.602	0.538
	BUC	0.664	0.084
	FC	-0.834	0.348
	GRC	0.328	0.638
	HOC	-1.102	1.154
	NEXC	-1.690	-0.387
	R6	0.567	0.136
	R7	0.591	-0.196
	REF-126	-1.393	-0.168
	REF-212	-1.110	0.365
	REF-213	-0.084	0.438
	REF-220	0.734	0.209
	REF-325	0.147	0.214
	REF-327	1.001	1.019
	REF-328	-1.399	0.009
	REF-340	-1.125	0.688
	REF-376	1.074	-0.020
	STC	-0.069	-0.051
	USFR	-1.519	-0.249
	V1	-0.786	-0.993
	VR	-0.925	-0.088
Exposed	A1	0.465	0.250
	R2	0.427	-0.122
	R3	0.599	-0.275
	R4	0.287	-0.064
	R5	0.506	0.066
	R9	1.311	-0.249
	RDE-1	0.595	-0.401
	RDE-2	0.368	-0.368
	RDE-3	0.977	-0.258
	X-2	0.648	0.028
	X3	0.761	-0.675
	Grum	-1.299	-0.270
	R1	0.948	-0.207

Table D.11: Spearman correlation of periphyton community NMS axis scores with periphyton taxon densities and environmental variables, for 22 reference, 2 minimally influenced, and 11 exposed areas, August 2014.

Category	Variable	NMS-1		NMS-2	
		r	p	r	p
Periphyton Taxa	*Chamaesiphon incrustans*	-0.508	0.002	-0.197	0.257
	Gloeocapsa punctata	-0.145	0.406	0.065	0.712
	Gloeothece sp.	-0.145	0.404	-0.039	0.824
	Heteroleibeinia profunda	-0.584	0.000	-0.485	0.003
	Homoeothrix varians	-0.199	0.251	-0.025	0.889
	Leptolyngbya lemnetica	-0.158	0.366	0.263	0.128
	Phormidium autumnale	-0.117	0.502	-0.273	0.113
	Pseudoanabaena sp.	0.178	0.308	0.007	0.968
	Rivularia dura	-0.265	0.125	-0.308	0.072
	Closteriopsis sp.	0.234	0.176	-0.003	0.988
	Mougeotia sp.	0.225	0.195	-0.188	0.280
	Stigeoclonium sp.	-0.115	0.511	-0.272	0.114
	Ulothrix zonata	0.139	0.427	0.144	0.410
	Hydrurus sp.	0.105	0.548	0.011	0.949
	Achnanthes minutissima	0.776	0.000	-0.237	0.170
	Anomoenies vitrea	0.616	0.000	0.183	0.293
	Cocconies disculus	0.181	0.298	0.262	0.129
	Cymbella lapponica	0.411	0.014	-0.140	0.424
	Cymbella microcephala	0.399	0.017	0.152	0.384
	Cymbella minuta	0.553	0.001	-0.132	0.449
	Cymbella prostrata	0.087	0.618	-0.054	0.760
	Cymbella turgida	0.236	0.172	-0.038	0.830
	Diatoma mesodon	0.092	0.598	-0.099	0.571
	Diatoma tenue	0.385	0.022	0.300	0.080
	Diatoma vulgare	0.471	0.004	0.358	0.035
	Didymosphenia geminata	0.362	0.032	0.141	0.418
	Encyonema silesiacum	0.749	0.000	-0.273	0.113
	Eucocconeis sp.	0.230	0.183	-0.110	0.528
	Eunotia pectinalis	0.153	0.379	0.264	0.125
	Fragilaria capucina	0.850	0.000	-0.028	0.872
	Fragilaria construens	0.003	0.984	0.079	0.650
	Frustulia rhomboides	0.291	0.090	-0.115	0.510
	Gomphonema angustum	0.060	0.733	0.133	0.445
	Gomphonema constrictum v capitata	-0.340	0.046	0.093	0.594
	Gomphonema lagerheimii	0.216	0.213	0.035	0.841
	Gomphonema minutum	0.354	0.037	-0.182	0.296
	Hannaea arcus	0.313	0.067	-0.045	0.798
	Meridion circulare	-0.132	0.449	0.015	0.932
	Navicula exigua	0.097	0.580	-0.086	0.624
	Navicula minima	0.111	0.524	-0.031	0.858
	Navicula radiosa	0.204	0.241	-0.094	0.590
	Navicula filiformis	-0.144	0.409	-0.234	0.177
	Navicula linearis	0.026	0.880	0.063	0.718
	Synedra acus v. radians	0.171	0.327	0.368	0.030
	Synedra ulna	0.468	0.005	0.145	0.406
	Tabellaria fenestrata	-0.026	0.883	-0.393	0.019
	Tabellaria flocculsa	0.101	0.565	-0.030	0.864
	Audouinella / Chantransia stage	0.006	0.974	-0.369	0.029

indicates absolute r-value greater than 0.50.

indicates a p-value below 0.05.

Table D.12: Spearman correlation of periphyton community NMS axis scores with periphyton taxon densities and environmental variables, for 22 reference, 2 minimally influenced, and 11 exposed areas, August 2014.

Category	Variable	NMS-1		NMS-2	
		r	p	r	p
Geologic	Met	0.040	0.817	0.110	0.531
	Plu	-0.103	0.555	-0.466	0.005
	Sed	0.171	0.326	0.210	0.226
	SedVol	0.125	0.474	0.188	0.280
	Ult	0.304	0.076	-0.323	0.058
	UltMet	-0.204	0.240	0.255	0.140
	Uncon	-0.173	0.321	0.213	0.219
	Vol	0.291	0.090	-0.035	0.844
Land Cover	F8013	0.082	0.640	0.335	0.049
	Shadow	0.060	0.732	-0.134	0.444
	Water	-0.063	0.719	-0.122	0.487
	SnoIce	-0.214	0.218	-0.137	0.431
	RocRub	-0.246	0.154	-0.116	0.508
	ExpLan	-0.131	0.452	-0.281	0.102
	ShrTal	-0.430	0.010	0.017	0.925
	ShrLow	0.210	0.227	-0.089	0.613
	WetTre	-0.015	0.931	0.130	0.457
	WetShr	-0.107	0.539	0.262	0.129
	WetHer	-0.101	0.563	0.317	0.064
	Herb	-0.440	0.008	-0.319	0.062
	ConDen	0.054	0.757	0.411	0.014
	ConOpe	0.241	0.162	0.306	0.074
	ConSpa	0.462	0.005	0.111	0.524
	BroDen	-0.475	0.004	-0.113	0.519
	BroOpe	-0.052	0.768	-0.254	0.141
	MixOpe	0.027	0.876	-0.278	0.106
	MixSpa	0.106	0.545	0.457	0.006
	Logged	0.017	0.921	-0.026	0.880
Basin and Stream Character	Smin	0.109	0.533	-0.134	0.443
	Smax	-0.050	0.775	0.170	0.330
	Smean	-0.277	0.107	0.141	0.420
	Amin	-0.006	0.972	0.010	0.953
	Amax	0.071	0.684	0.159	0.363
	Amean	0.117	0.502	-0.375	0.026
	East	0.050	0.777	-0.075	0.671
	North	0.044	0.802	-0.311	0.069
	Elev	-0.150	0.390	-0.511	0.002
	SouEle	-0.095	0.587	-0.409	0.015
	EleCha	0.277	0.108	0.110	0.531
	ChaLen	0.454	0.006	0.163	0.349
	GrMaCh	-0.401	0.017	-0.209	0.228
	GrStSp	-0.402	0.017	0.038	0.827
	BaArea	0.410	0.014	0.134	0.442
	StrOrd	0.239	0.167	0.307	0.073
	SuStLe	0.329	0.054	0.211	0.223
	DraDen	-0.211	0.224	0.411	0.014
In-situ Habitat	AvWatVel	0.010	0.957	-0.022	0.902
	DepAve	0.377	0.026	-0.019	0.914
	Cobble	-0.126	0.471	-0.110	0.529
	Gravel	-0.148	0.396	0.260	0.131
	Sand	0.032	0.857	0.089	0.611
	MedCob	-0.067	0.703	-0.194	0.263
	MedEmbed	-0.105	0.547	-0.143	0.414
	Gradient	0.108	0.538	-0.097	0.580
	BanWid	0.188	0.278	0.165	0.343
	WetWid	0.235	0.175	0.229	0.185
	Macro	0.087	0.620	0.036	0.836
	Peri	0.463	0.005	-0.403	0.016
	Densi	-0.079	0.702	-0.068	0.742
Water Quality	Temp	0.045	0.796	-0.198	0.253
	DOc	0.418	0.013	-0.085	0.626
	DOp	0.551	0.001	-0.259	0.133
	SpeCon	0.433	0.009	0.281	0.102
	pH	0.370	0.029	0.247	0.152
	Hard	0.427	0.011	0.241	0.163
	TSS	0.000	1.000	-0.367	0.331
	TDS	0.426	0.011	0.255	0.139
	Turbid	0.448	0.007	-0.329	0.054
	Alka	0.428	0.010	0.316	0.064
	NH3	0.072	0.878	-0.414	0.355
	F	0.473	0.004	-0.039	0.823
	NO3	-0.023	0.913	0.269	0.204
	TP	0.157	0.407	-0.068	0.721
	SO4	0.283	0.100	0.236	0.173
	DOC	0.009	0.957	0.254	0.141
	TOC	0.022	0.898	0.235	0.174
	Alka	0.012	0.947	0.017	0.925
	Sb	-0.182	0.552	0.072	0.816
	As	0.484	0.003	-0.197	0.257
	Ba	0.509	0.002	0.329	0.053
	Cd	0.295	0.128	-0.323	0.093
	Ca	0.427	0.010	0.243	0.160
	Cr	0.119	0.523	0.417	0.020
	Co	0.011	0.972	-0.220	0.470
	Cu	-0.006	0.975	0.317	0.107
	Fe	0.528	0.001	-0.332	0.051
	Pb	0.041	0.862	-0.020	0.935
	Li	0.386	0.024	-0.036	0.840
	Mg	0.393	0.020	0.296	0.085
	Mn	0.531	0.001	-0.238	0.169
	Mo	0.130	0.458	0.548	0.001
	Ni	-0.271	0.276	-0.195	0.438
	K	0.307	0.072	0.301	0.079
	Se	-0.034	0.867	0.289	0.144
	Si	0.031	0.859	0.067	0.704
	Na	0.352	0.038	0.038	0.827
	Sr	0.448	0.007	0.195	0.261
	S	0.293	0.087	0.228	0.188
	U	0.302	0.078	0.444	0.008
	Zn	0.560	0.037	-0.178	0.543

indicates absolute r-value greater than 0.50.
indicates a p-value below 0.05.

Table D.13: Equivalence and interval threshold values (describing the mean± 1.645 SD at alpha = 0.05) and 5th and 95th percentiles (tolerance limits based on one tailed test at alpha = 0.05) for reference periphyton (density) data collected in 2014 (all reference areas combined n = 22). Gray shade indicates the most relevant results based on the characteristics of the data distribution for each endpoint. Red font indicates most relevant results for identifying communities that are outside of the reference condition.

Biotic Endpoint		Summary Statistics		Untransformed Data	Logit Transformation (Normal, Proportional Data)	Log_e Transformation (Left Skew Data)	Square Root (x) (Count Data)
Metrics	Density (cells/cm^2)	N (areas)		22			22
		Reference Mean		41,586.7			30,667.7
		SD (areas)		43,497.8			NA
		To Detect Values Less than Reference	Interval threshold value	< 0			< 0.0
			Equivalence threshold value	< 0			2,254.5
		To Detect Values Greater than Reference	Equivalence threshold value	93,498.1			91,665.1
			Interval threshold value	143,769.2			181,790.8
		5th percentile and lower tolerance limit		3,179.5 (< 0)			3,175.5 (709.4)
		95th percentile and upper tolerance limit		98,982.0 (123,641.3)			98,976.4 (142,037.4)
	Richness (Lowest Practical Level)	N (areas)		22		22	
		Reference Mean		14.1		13.5	
		SD (areas)		4.1		NA	
		To Detect Values Less than Reference	Interval threshold value	4.4		6.6	
			Equivalence threshold value	9.2		9.4	
		To Detect Values Greater than Reference	Equivalence threshold value	19.1		19.5	
			Interval threshold value	23.9		27.9	
		5th percentile and lower tolerance limit		8.1 (6.3)		8.0 (7.6)	
		95th percentile and upper tolerance limit		20.9 (22.0)		20.9 (24.2)	
	Diversity (Simpson's)	N (areas)		22	22		
		Reference Mean		0.70	0.71		
		SD (areas)		0.10	NA		
		To Detect Values Less than Reference	Interval threshold value	0.47	0.45		
			Equivalence threshold value	0.58	0.58		
		To Detect Values Greater than Reference	Equivalence threshold value	0.82	0.81		
			Interval threshold value	0.94	0.88		
		5th percentile and lower tolerance limit		0.52 (0.52)	0.52 (0.5)		
		95th percentile and upper tolerance limit		0.80 (0.89)	0.80 (0.9)		
	Evenness (Simpson's)	N (areas)		22	22		
		Reference Mean		0.27	0.26		
		SD (areas)		0.08	NA		
		To Detect Values Less than Reference	Interval threshold value	0.09	0.12		
			Equivalence threshold value	0.18	0.18		
		To Detect Values Greater than Reference	Equivalence threshold value	0.36	0.37		
			Interval threshold value	0.45	0.49		
		5th percentile and lower tolerance limit		0.15 (0.13)	0.15 (0.1)		
		95th percentile and upper tolerance limit		0.40 (0.42)	0.39 (0.4)		
Dominant Taxa	Chamaesiphon incrustans (cells/cm^2)	N (areas)		22			22
		Reference Mean		122.52			19.9
		SD (areas)		320.23			NA
		To Detect Values Less than Reference	Interval threshold value	< 0			< 0
			Equivalence threshold value	< 0			< 0
		To Detect Values Greater than Reference	Equivalence threshold value	504.69			283.5
			Interval threshold value	874.78			830.5
		5th percentile and lower tolerance limit		0.0 (< 0)			0 (< 0)
		95th percentile and upper tolerance limit		682.9 (726.6)			682.6 (577.0)
	Heterolelbeinia profunda (cells/cm^2)	N (areas)		22			22
		Reference Mean		2,449.4			817.3
		SD (areas)		5,705.2			NA
		To Detect Values Less than Reference	Interval threshold value	< 0			< 0
			Equivalence threshold value	< 0			431.0
		To Detect Values Greater than Reference	Equivalence threshold value	9,258.1			6,074.2
			Interval threshold value	15,851.6			15,807.1
		5th percentile and lower tolerance limit		0.0 (< 0)			0.0 (< 0)
		95th percentile and upper tolerance limit		11,597.1 (13,211.7)			11,516.5 (11,361.9)
	Homoeothrix varians (cells/cm^2)	N (areas)		22			22
		Reference Mean		2,955.4			780.4
		SD (areas)		7,587.2			NA
		To Detect Values Less than Reference	Interval threshold value	< 0			< 0
			Equivalence threshold value	< 0			< 0
		To Detect Values Greater than Reference	Equivalence threshold value	12,010.2			7,208.5
			Interval threshold value	20,778.8			19,619.8
		5th percentile and lower tolerance limit		0.0 (< 0)			0.0 (< 0)
		95th percentile and upper tolerance limit		21,712.8 (17,268.0)			21,384.4 (13,919.8)
	Achnanthes minutissima (cells/cm^2)	N (areas)		22			22
		Reference Mean		12,164.7			6,112.2
		SD (areas)		21,628.1			NA
		To Detect Values Less than Reference	Interval threshold value	< 0			< 0
			Equivalence threshold value	< 0			< 0
		To Detect Values Greater than Reference	Equivalence threshold value	37,976.3			30,002.1
			Interval threshold value	62,972.2			70,351.7
		5th percentile and lower tolerance limit		5.0 (< 0)			0.3 (< 0)
		95th percentile and upper tolerance limit		36,046.5 (52,964.1)			36,029.3 (52,163.0)
	Diatoma vulgare (cells/cm^2)	N (areas)		22			22
		Reference Mean		5,881.7			2,739.3
		SD (areas)		9,505.2			NA
		To Detect Values Less than Reference	Interval threshold value	< 0			< 0
			Equivalence threshold value	< 0			< 0.0
		To Detect Values Greater than Reference	Equivalence threshold value	17,225.5			14,595.8
			Interval threshold value	28,210.8			35,015.4
		5th percentile and lower tolerance limit		17.3 (< 0)			17.2 (< 0)
		95th percentile and upper tolerance limit		24,615.0 (23,812.4)			24,588.8 (25,784.0)
	Synedra ulna (cells/cm^2)	N (areas)		22			22
		Reference Mean		1,332.7			430.6
		SD (areas)		3,898.8			NA
		To Detect Values Less than Reference	Interval threshold value	< 0			< 0
			Equivalence threshold value	< 0			< 0
		To Detect Values Greater than Reference	Equivalence threshold value	5,985.6			3,299.3
			Interval threshold value	10,491.5			8,643.3
		5th percentile and lower tolerance limit		0.0 (< 0)			0.0 (< 0)
		95th percentile and upper tolerance limit		2,664.7 (8,687.4)			2,664.2 (6,200.6)
Group	Cyanobacteria (cells/cm^2)	N (areas)		22			22
		Reference Mean		7,426.7			3,603.6
		SD (areas)		12,767.2			NA
		To Detect Values Less than Reference	Interval threshold value	< 0			< 0
			Equivalence threshold value	< 0			< 0
		To Detect Values Greater than Reference	Equivalence threshold value	22,663.5			18,375.9
			Interval threshold value	37,418.8			43,555.3
		5th percentile and lower tolerance limit		0.0 (< 0)			0.0 (< 0)
		95th percentile and upper tolerance limit		36,844.2 (31,511.0)			36,820.3 (32,189.4)
	Chlorophyte (cells/cm^2)	N (areas)		22			22
		Reference Mean		764.96			326.1
		SD (areas)		1,384.9			NA
		To Detect Values Less than Reference	Interval threshold value	< 0			< 0
			Equivalence threshold value	< 0			< 0
		To Detect Values Greater than Reference	Equivalence threshold value	2,417.8			1,905.1
			Interval threshold value	4,018.3			4,682.4
		5th percentile and lower tolerance limit		0.0 (< 0)			0.0 (< 0)
		95th percentile and upper tolerance limit		3,391.5 (3,377.5)			3,386.7 (3,423.0)
	Chrysophyte (cells/cm^2)	N (areas)		22			22
		Reference Mean		684.60			61.0
		SD (areas)		2,309.4			NA
		To Detect Values Less than Reference	Interval threshold value	< 0			< 0
			Equivalence threshold value	< 0			< 0
		To Detect Values Greater than Reference	Equivalence threshold value	3,440.7			1,467.9
			Interval threshold value	6,109.7			4,604.1
		5th percentile and lower tolerance limit		0.0 (< 0)			0.0 (< 0)
		95th percentile and upper tolerance limit		5,150.9 (5,041.1)			4,893.4 (3,138.9)
	Diatom (cells/cm^2)	N (areas)		22		22	
		Reference Mean		31,368.9		8,294.0	
		SD (areas)		42,501.1		NA	
		To Detect Values Less than Reference	Interval threshold value	< 0		68.6	
			Equivalence threshold value	< 0		725.9	
		To Detect Values Greater than Reference	Equivalence threshold value	82,090.9		94,759.4	
			Interval threshold value	131,210.0		1,002,427.8	
		5th percentile and lower tolerance limit		281.6 (< 0)		272.0 (176.5)	
		95th percentile and upper tolerance limit		8,1347.5 (111,543.3)		81,303.7 (389,836.8)	
	Rhodophyte (cells/cm^2)	N (areas)		22			22
		Reference Mean		1,341.4			272.9
		SD (areas)		3,820.1			NA
		To Detect Values Less than Reference	Interval threshold value	< 0			< 0
			Equivalence threshold value	< 0			< 0
		To Detect Values Greater than Reference	Equivalence threshold value	5,900.4			3,186.6
			Interval threshold value	10,315.3			9,047.2
		5th percentile and lower tolerance limit		0.0 (< 0)			0.0 (< 0)
		95th percentile and upper tolerance limit		7,672.2 (8,547.7)			7,581.0 (6,341.7)

Note: Approaches presented are defining the middle 90% of each data set with 95% confidence.

Table D.14: Equivalence and interval threshold values (describing the mean ± 1.645 SD at alpha = 0.05) and 5th and 95th percentiles (tolerance limits based on one tailed test at alpha = 0.05) for reference periphyton (proportional) data collected in 2014 (all reference areas combined n = 22 Red font indicates the most relevant communities that are outside of the reference condition.

Biotic Endpoint		Summary Statistics		Untransformed Data
Dominant Taxa Group	Chamaesiphon incrustans (Proportion)	N (areas)		22
		Reference Mean		2.4
		SD (areas)		6.6
		To Detect Values Less than Reference	Interval threshold value	< 0
			Equivalence threshold value	< 0
		To Detect Values Greater than Reference	Equivalence threshold value	10.3
			Interval threshold value	17.9
		5th percentile and lower tolerance limit		0 (< 0)
		95th percentile and upper tolerance limit		14.9 (14.8)
	Heteroleibeinia profunda (Proportion)	N (areas)		22.0
		Reference Mean		16.1
		SD (areas)		21.8
		To Detect Values Less than Reference	Interval threshold value	< 0
			Equivalence threshold value	< 0
		To Detect Values Greater than Reference	Equivalence threshold value	42.1
			Interval threshold value	67.4
		5th percentile and lower tolerance limit		0 (< 0)
		95th percentile and upper tolerance limit		50.6 (57.3)
	Homoeothrix varians (Proportion)	N (areas)		22.0
		Reference Mean		8.2
		SD (areas)		15.5
		To Detect Values Less than Reference	Interval threshold value	< 0
			Equivalence threshold value	< 0
		To Detect Values Greater than Reference	Equivalence threshold value	26.6
			Interval threshold value	44.5
		5th percentile and lower tolerance limit		0 (< 0)
		95th percentile and upper tolerance limit		35.2 (37.4)
	Achnanthes minutissima (Proportion)	N (areas)		22.0
		Reference Mean		23.6
		SD (areas)		22.0
		To Detect Values Less than Reference	Interval threshold value	< 0
			Equivalence threshold value	< 0
		To Detect Values Greater than Reference	Equivalence threshold value	50.0
			Interval threshold value	75.5
		5th percentile and lower tolerance limit		0 (< 0)
		95th percentile and upper tolerance limit		59.4 (65.3)
	Diatoma vulgare (Proportion)	N (areas)		22.0
		Reference Mean		9.4
		SD (areas)		13.8
		To Detect Values Less than Reference	Interval threshold value	< 0
			Equivalence threshold value	< 0
		To Detect Values Greater than Reference	Equivalence threshold value	25.9
			Interval threshold value	41.9
		5th percentile and lower tolerance limit		0 (< 0)
		95th percentile and upper tolerance limit		27.6 (35.5)
	Synedra ulna (Proportion)	N (areas)		22.0
		Reference Mean		3.9
		SD (areas)		11.0
		To Detect Values Less than Reference	Interval threshold value	< 0
			Equivalence threshold value	< 0
		To Detect Values Greater than Reference	Equivalence threshold value	17.1
			Interval threshold value	29.8
		5th percentile and lower tolerance limit		0 (< 0)
		95th percentile and upper tolerance limit		10.3 (24.7)
Group	Cyanobacteria (Proportion)	N (areas)		22.0
		Reference Mean		32.9
		SD (areas)		33.0
		To Detect Values Less than Reference	Interval threshold value	< 0
			Equivalence threshold value	< 0
		To Detect Values Greater than Reference	Equivalence threshold value	72.2
			Interval threshold value	> 100
		5th percentile and lower tolerance limit		0 (< 0)
		95th percentile and upper tolerance limit		87.2 (95.0)
	Chlorophyte (Proportion)	N (areas)		22.0
		Reference Mean		2.9
		SD (areas)		4.3
		To Detect Values Less than Reference	Interval threshold value	< 0
			Equivalence threshold value	< 0
		To Detect Values Greater than Reference	Equivalence threshold value	8.1
			Interval threshold value	13.2
		5th percentile and lower tolerance limit		0 (< 0)
		95th percentile and upper tolerance limit		8.8 (11.2)
	Chrysophyte (Proportion)	N (areas)		22.0
		Reference Mean		1.2
		SD (areas)		4.1
		To Detect Values Less than Reference	Interval threshold value	< 0
			Equivalence threshold value	< 0
		To Detect Values Greater than Reference	Equivalence threshold value	6.1
			Interval threshold value	10.8
		5th percentile and lower tolerance limit		0 (< 0)
		95th percentile and upper tolerance limit		9.9 (8.9)
	Diatom (Proportion)	N (areas)		22.0
		Reference Mean		59.8
		SD (areas)		35.0
		To Detect Values Less than Reference	Interval threshold value	< 0
			Equivalence threshold value	18.0
		To Detect Values Greater than Reference	Equivalence threshold value	> 100
			Interval threshold value	> 100
		5th percentile and lower tolerance limit		4.9 (< 0)
		95th percentile and upper tolerance limit		98.9 (> 100)
	Rhodophyte (Proportion)	N (areas)		22.0
		Reference Mean		3.3
		SD (areas)		6.5
		To Detect Values Less than Reference	Interval threshold value	< 0
			Equivalence threshold value	< 0
		To Detect Values Greater than Reference	Equivalence threshold value	11.0
			Interval threshold value	18.4
		5th percentile and lower tolerance limit		0 (< 0)
		95th percentile and upper tolerance limit		12.4 (15.4)

Note: Approaches presented are defining the middle 90% of each data set with 95% confidence.

* No transformations improved distribution

Table D.15: Periphyton community metrics for 22 reference areas, August 2014.

Data Type	Transformation	Endpoint	Reference																				
			R7	FC	R6	USFR	V1	VR	BLC	NEXC	GRC	STC	HOC	BEC	BUC	REF-126	REF-212	REF-213	REF-220	REF-325	REF-327	REF-328	REF-340	REF-376
Absolute Abundance (# of cells/m^2)	Non-transformed	Total Density	63522.81	4450.17	72782.07	4767.92	32704.27	7524.45	62446.17	4507.61	46167.10	63721.62	4679.87	62460.51	61154.15	3069.60	3124.14	21171.69	99317.61	21946.24	92604.65	4231.04	5139.26	173413.74
		LPL Richness	15.00	8.00	19.00	14.00	12.00	16.00	18.00	7.00	12.00	14.00	9.00	13.00	18.00	10.00	16.00	22.00	11.00	21.00	12.00	14.00	19.00	11.00
		Diversity (Simpson's)	0.80	0.52	0.76	0.72	0.75	0.75	0.63	0.46	0.75	0.78	0.55	0.74	0.62	0.69	0.78	0.86	0.78	0.63	0.79	0.74	0.71	0.66
		Evenness (Simpson's)	0.33	0.26	0.22	0.26	0.34	0.25	0.15	0.26	0.33	0.33	0.25	0.30	0.15	0.32	0.28	0.32	0.42	0.13	0.39	0.27	0.18	0.27
		C.incrustans	0.00	0.00	0.00	1290.96	0.00	565.56	0.00	689.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	149.92	0.00	0.00
		H. profunda	0.00	344.53	0.00	2082.74	11962.87	2483.56	0.00	3215.62	0.00	4647.44	0.00	24978.47	0.00	1563.49	400.20	0.00	0.00	0.00	0.00	1765.70	442.61	0.00
		H.varians	0.00	0.00	3660.64	154.91	172.13	0.00	0.00	344.53	516.80	22617.56	2899.80	4521.96	0.00	0.00	374.38	0.00	29089.56	0.00	0.00	666.30	0.00	0.00
		A. minutissima	23255.81	2957.22	29500.43	292.62	430.32	2631.09	14211.89	172.27	7235.14	8262.12	0.00	229.69	36391.04	100.41	1278.05	4948.67	27024.03	12737.44	0.00	299.84	344.26	95320.13
		D. vulgare	430.66	86.13	18087.86	86.06	344.26	49.18	35099.05	28.71	12747.63	9294.89	57.42	861.33	8613.26	0.00	361.47	1635.21	5508.08	172.13	24958.50	16.66	49.18	10910.13
		S. ulna	0.00	0.00	861.33	172.13	0.00	98.36	2368.65	28.71	689.06	103.28	28.71	0.00	2153.32	100.41	25.82	172.13	0.00	86.06	1377.02	0.00	2680.27	18374.97
		Cyanophyte	0.00	401.95	3875.97	3700.74	24270.00	3049.12	0.00	4249.21	516.80	41310.61	4105.66	37252.37	0.00	1563.49	774.58	4561.38	29089.56	1377.02	0.00	2748.50	540.97	0.00
		Chlorophyte	3445.30	803.90	0.00	344.26	0.00	0.00	2368.65	0.00	0.00	826.21	172.26	5598.62	645.99	0.00	0.00	1118.83	0.00	86.06	1032.77	66.63	319.67	0.00
		Chrysophyte	0.00	0.00	0.00	0.00	5422.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9639.14	0.00	0.00	0.00
		Diatom	52110.24	3244.32	68906.10	722.92	3012.25	3762.23	60077.52	258.40	45650.30	19932.38	114.84	3028.99	60508.16	1506.11	2349.56	15491.48	70228.05	18417.63	81932.74	1415.91	4032.72	173413.74
		Rhodophyte	7967.27	0.00	0.00	0.00	0.00	713.10	0.00	0.00	0.00	1652.42	287.11	16580.53	0.00	0.00	0.00	0.00	0.00	2065.53	0.00	0.00	245.90	0.00
		NMS1	-0.76	0.44	-0.77	1.11	0.38	0.61	-0.85	1.24	-0.62	-0.29	0.76	0.24	-0.88	0.95	0.67	-0.25	-0.81	-0.42	-1.11	1.07	0.64	-1.34
		NMS2	-0.13	0.63	-0.03	0.09	-0.67	0.15	0.45	-0.28	0.20	-0.46	-0.39	-1.15	0.17	0.14	0.37	0.41	-0.40	0.34	-0.21	-0.07	0.82	0.04
	Square root	Total Density	252.04	66.71	269.78	69.05	180.84	86.74	249.89	67.14	214.87	252.43	68.41	249.92	247.29	55.40	55.89	145.50	315.15	148.14	304.31	65.05	71.69	416.43
	Log_e	LPL Richness	2.71	2.08	2.94	2.64	2.48	2.77	2.89	1.95	2.48	2.64	2.20	2.56	2.89	2.30	2.77	3.09	2.40	3.04	2.48	2.64	2.94	2.40
	Logit	Diversity (Simpson's)	1.36	0.07	1.14	0.96	1.11	1.10	0.52	-0.16	1.08	1.29	0.19	1.06	0.48	0.79	1.25	1.79	1.29	0.55	1.31	1.02	0.88	0.66
	Logit	Evenness (Simpson's)	-0.72	-1.05	-1.29	-1.06	-0.68	-1.10	-1.74	-1.02	-0.71	-0.70	-1.12	-0.86	-1.77	-0.75	-0.94	-0.76	-0.31	-1.90	-0.44	-0.99	-1.52	-1.01
	None[a]	C.incrustans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	None[a]	H. profunda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	None[a]	H.varians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Square root	A. minutissima	152.50	54.38	171.76	17.11	20.74	51.29	119.21	13.13	85.06	90.90	0.00	15.16	190.76	10.02	35.75	70.35	164.39	112.86	0.00	17.32	18.55	308.74
	Square root	D. vulgare	20.75	9.28	134.49	9.28	18.55	7.01	187.35	5.36	112.91	96.41	7.58	29.35	92.81	0.00	19.01	40.44	74.22	13.12	157.98	4.08	7.01	104.45
	None[a]	S. ulna	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	None[a]	Cyanophyte	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Square root	Chlorophyte	58.70	28.35	0.00	18.55	0.00	0.00	48.67	0.00	0.00	28.74	13.12	74.82	25.42	0.00	0.00	33.45	0.00	9.28	32.14	8.16	17.88	0.00
	None[a]	Chrysophyte	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Log_e	Diatom	10.86	8.08	11.14	6.58	8.01	8.23	11.00	5.55	10.73	9.90	4.74	8.02	11.01	7.32	7.76	9.65	11.16	9.82	11.31	7.26	8.30	12.06
	None[a]	Rhodophyte	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Relative Abundance (Proportion, %)	Non-transformed	C.incrustans	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.0	0.0	27.1	0.0	7.5
		H. profunda	0.0	40.0	0.0	0.0	7.7	0.0	0.0	71.3	0.0	50.9	12.8	0.0	0.0	0.0	0.0	41.7	8.6	0.0	7.3	43.7	36.6	33.0
		H.varians	0.0	7.2	0.0	0.0	0.0	1.1	62.0	7.6	5.0	0.0	12.0	0.0	29.3	0.0	0.0	15.7	0.0	0.0	35.5	3.2	0.5	0.0
		A. minutissima	36.6	0.4	22.8	59.5	66.5	15.7	0.0	3.8	40.5	3.3	40.9	23.4	27.2	58.0	0.0	7.1	6.7	55.0	13.0	6.1	1.3	35.0
		D. vulgare	0.7	1.4	56.2	14.1	1.9	27.6	1.2	0.6	24.9	0.0	11.6	7.7	5.5	0.8	27.0	0.4	1.0	6.3	14.6	1.8	1.1	0.7
		S. ulna	0.0	0.0	3.8	3.5	0.0	1.5	0.6	0.6	1.2	3.3	0.8	0.8	0.0	0.4	1.5	0.0	52.2	10.6	0.2	3.6	0.0	1.3
		Cyanophyte	0.0	59.6	0.0	0.0	9.0	1.1	87.7	94.3	5.3	50.9	24.8	21.5	29.3	6.3	0.0	65.0	10.5	0.0	64.8	77.6	74.2	40.5
		Chlorophyte	5.4	9.0	3.8	1.1	18.1	0.0	3.7	0.0	0.0	0.0	0.0	5.3	0.0	0.4	1.1	1.6	6.2	0.0	1.3	7.2	0.0	0.0
		Chrysophyte	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.4	0.0	0.0	0.0	0.0	0.0	16.6	0.0
		Diatom	82.0	4.8	96.2	98.9	72.9	98.9	2.5	5.7	94.7	49.1	75.2	73.2	70.7	83.9	88.5	33.5	78.5	100.0	31.3	15.2	9.2	50.0
		Rhodophyte	12.5	26.5	0.0	0.0	0.0	0.0	6.1	0.0	0.0	0.0	0.0	0.0	0.0	9.4	0.0	0.0	4.8	0.0	2.6	0.0	0.0	9.5

[a] No transformations (Logit, Log_e, $Log_e(1-x)$, Square root) resulted in improvement of data to a normal distribution.

Table D.16: Periphyton community metrics for 11 exposed and 2 minimally influenced areas, August 2014.

Data Type	Transformation	Endpoint	Minimally Influenced		Exposed										
			R1	Grum	R9	X2	X3	RDE-1	RDE-2	RDE-3	R2	R3	R4	R5	A1
Absolute Abundance (#/m^2)	Non-transformed	Total Density	158738.06	4823.41	272179.16	45219.61	268159.65	86706.87	75509.65	134366.93	72997.41	72997.37	42032.77	76227.37	53402.25
		LPL Richness	17	18	16	14	17	16	20	18	18	19	19	18	19
		Diversity (Simpson's)	0.58	0.61	0.80	0.48	0.77	0.66	0.49	0.61	0.81	0.64	0.72	0.80	0.82
		Evenness (Simpson's)	0.14	0.14	0.31	0.14	0.25	0.18	0.10	0.14	0.29	0.15	0.18	0.28	0.29
		C.incrustans	0	0	0	0	0	0	0	0	0	0	0	0	0
		H. profunda	0	2957	0	0	28137	0	6316	0	0	0	0	0	0
		H.varians	0	114.84	0	0	20672	0	0	0	4307	0	1034	6891	1895
		A. minutissima	101454	431	105082	31869	117140	43066	53115	80965	26701	40698	19811	29500	17399
		D. vulgare	6211	29	0	0	1148.44	0	287	431	2584	1507	3962	10121	10853
		S. ulna	1380	57	0	431	13207.01	287	861	861	2584	646	172	1292	345
		Cyanophyte	1380	3129	6891	0	48808	5168	7178	0	4307	0	1034	15073	1895
		Chlorophyte	4831	345	13781	431	2297	2297	1723	6891	16150	14427	9302	3876	1378
		Chrysophyte	0	0	0	0	0	0	0	0	0	0	0	0	0
		Diatom	152527	1349	251507	44789	185472	53976	62590	127476	45220	54048	29285	57278	50129
		Rhodophyte	0	0	0	0	31582	25266	4020	0	7321	4522	2412	0	0
		NMS1[b]	-	-	-	-	-	-	-	-	-	-	-	-	-
		NMS2[b]	-	-	-	-	-	-	-	-	-	-	-	-	-
	Square root	Total Density	398.42	69.45	521.71	212.65	517.84	294.46	274.79	366.56	270.18	270.18	205.02	276.09	231.09
	Log_e	LPL Richness	2.83	2.89	2.77	2.64	2.83	2.77	3.00	2.89	2.89	2.94	2.94	2.89	2.94
	Logit	Diversity (Simpson's)	0.31	0.43	1.38	-0.09	1.18	0.67	-0.03	0.45	1.45	0.58	0.92	1.39	1.52
	Logit	Evenness (Simpson's)	-1.82	-1.81	-0.80	-1.84	-1.09	-1.48	-2.21	-1.79	-0.89	-1.76	-1.48	-0.96	-0.87
	None[a]	C.incrustans	-	-	-	-	-	-	-	-	-	-	-	-	-
	None[a]	H. profunda	-	-	-	-	-	-	-	-	-	-	-	-	-
	None[a]	H.varians	-	-	-	-	-	-	-	-	-	-	-	-	-
	Square root	A. minutissima	318.52	20.75	324.16	178.52	342.26	207.52	230.47	284.54	163.40	201.74	140.75	171.76	131.90
	Square root	D. vulgare	78.81	5.36	0.00	0.00	33.89	0.00	16.94	20.75	50.83	38.82	62.95	100.60	104.18
	None[a]	S. ulna	-	-	-	-	-	-	-	-	-	-	-	-	-
	None[a]	Cyanophyte	-	-	-	-	-	-	-	-	-	-	-	-	-
	Square root	Chlorophyte	69.51	18.56	117.39	20.75	47.93	47.93	41.50	83.01	127.08	120.11	96.45	62.26	37.12
	None[a]	Chrysophyte	-	-	-	-	-	-	-	-	-	-	-	-	-
	Log_e	Diatom	11.94	7.21	12.44	10.71	12.13	10.90	11.04	11.76	10.72	10.90	10.28	10.96	10.82
	None[a]	Rhodophyte	-	-	-	-	-	-	-	-	-	-	-	-	-
Relative Abundance (Proportion, %)	Non-transformed	C.incrustans	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		H. profunda	0.0	61.3	0.0	0.0	10.5	0.0	8.4	0.0	0.0	0.0	0.0	0.0	0.0
		H.varians	0.0	2.4	0.0	0.0	7.7	0.0	0.0	0.0	5.9	0.0	2.5	9.0	3.5
		A. minutissima	63.9	8.9	38.6	70.5	43.7	49.7	70.3	60.3	36.6	55.8	47.1	38.7	32.6
		D. vulgare	3.9	0.6	0.0	0.0	0.4	0.0	0.4	0.3	3.5	2.1	9.4	13.3	20.3
		S. ulna	0.9	1.2	0.0	1.0	4.9	0.3	1.1	0.6	3.5	0.9	0.4	1.7	0.6
		Cyanophyte	0.9	64.9	2.5	0.0	18.2	6.0	9.5	0.0	5.9	0.0	2.5	19.8	3.5
		Chlorophyte	3.0	7.1	5.1	1.0	0.9	2.6	2.3	5.1	22.1	19.8	22.1	5.1	2.6
		Chrysophyte	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Diatom	96.1	28.0	92.4	99.0	69.2	62.3	82.9	94.9	61.9	74.0	69.7	75.1	93.9
		Rhodophyte	0.0	0.0	0.0	0.0	11.8	29.1	5.3	0.0	10.0	6.2	5.7	0.0	0.0

[a] No transformations (Logit, Log_e, $Log_e(1-x)$, Square root) resulted in improvement of data to a normal distribution.

[b] NMS values for exposed areas are omitted because they are independent of each other and therefore are not comparable between exposed areas.

Table D.17: Periphyton community metric non-central p-values for 22 reference areas, August 2014.

Data Type	Transformation	Endpoint	Reference																				
			R7	FC	R6	USFR	V1	VR	BLC	NEXC	GRC	STC	HOC	BEC	BUC	REF-126	REF-212	REF-213	REF-220	REF-325	REF-327	REF-328	REF-340	REF-376
Absolute Abundance (# of cells/m^2)	Non-Transformed	Total Density	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.87	1.00	0.96	1.00	1.00	0.00
		LPL Richness	1.00	0.72	0.96	1.00	1.00	1.00	1.00	0.44	1.00	1.00	0.93	1.00	1.00	0.99	1.00	0.26	1.00	0.51	1.00	1.00	0.96	1.00
		Diversity (Simpson's)	1.00	0.31	1.00	1.00	1.00	1.00	1.00	0.04	1.00	1.00	0.64	1.00	1.00	1.00	1.00	0.64	1.00	1.00	1.00	1.00	1.00	1.00
		Evenness (Simpson's)	1.00	1.00	1.00	1.00	1.00	1.00	0.55	1.00	1.00	1.00	1.00	1.00	0.49	1.00	1.00	1.00	0.20	0.28	0.62	1.00	0.93	1.00
		C.incrustans	1.00	1.00	1.00	0.00	1.00	0.82	1.00	0.39	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		H. profunda	1.00	1.00	1.00	1.00	0.50	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		H.varians	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.02	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00
		A. minutissima	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
		D. vulgare	1.00	1.00	0.90	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.18	1.00	1.00	1.00
		S. ulna	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
		Cyanophyte	1.00	1.00	1.00	1.00	0.88	1.00	1.00	1.00	1.00	0.01	1.00	0.05	1.00	1.00	1.00	1.00	0.47	1.00	1.00	1.00	1.00	1.00
		Chlorophyte	0.23	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		Chrysophyte	1.00	1.00	1.00	1.00	0.16	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
		Diatom	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.00
		Rhodophyte	0.42	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		NMS1	0.99	1.00	0.99	0.74	1.00	1.00	0.98	0.52	1.00	1.00	1.00	1.00	0.97	0.93	1.00	1.00	0.99	1.00	0.74	0.81	1.00	0.36
		NMS2	1.00	0.68	1.00	1.00	0.55	1.00	0.99	1.00	1.00	0.98	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.17	1.00
Absolute Abundance (# of cells/m^2)	Square root	Total Density	1.00	0.99	1.00	0.99	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.97	0.98	1.00	0.88	1.00	0.94	0.99	1.00	0.07
	Log_e	LPL Richness	1.00	0.46	0.98	1.00	1.00	1.00	1.00	0.11	1.00	1.00	0.87	1.00	1.00	0.99	1.00	0.61	1.00	0.78	1.00	1.00	0.98	1.00
	Logit	Diversity (Simpson's)	0.99	0.41	1.00	1.00	1.00	1.00	1.00	0.08	1.00	1.00	0.70	1.00	1.00	1.00	1.00	0.26	1.00	1.00	1.00	1.00	1.00	1.00
	Logit	Evenness (Simpson's)	1.00	1.00	1.00	1.00	1.00	1.00	0.42	1.00	1.00	1.00	1.00	1.00	0.35	1.00	1.00	1.00	0.45	0.12	0.81	1.00	0.94	1.00
	None[a]	C.incrustans	1.00	1.00	1.00	0.00	1.00	0.82	1.00	0.39	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	None[a]	H. profunda	1.00	1.00	1.00	1.00	0.50	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	None[a]	H.varians	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.02	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00
	Square root	A. minutissima	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00	0.79	1.00	1.00	1.00	0.98	1.00	0.99	1.00	1.00	0.00
	Square root	D. vulgare	1.00	1.00	0.78	1.00	1.00	1.00	0.05	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.31	1.00	1.00	1.00
	None[a]	S. ulna	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
	None[a]	Cyanophyte	1.00	1.00	1.00	1.00	0.88	1.00	1.00	1.00	1.00	0.01	1.00	0.05	1.00	1.00	1.00	1.00	0.47	1.00	1.00	1.00	1.00	1.00
	Square root	Chlorophyte	0.27	1.00	1.00	1.00	1.00	1.00	0.78	1.00	1.00	1.00	1.00	0.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	None[a]	Chrysophyte	1.00	1.00	1.00	1.00	0.16	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00
	Log_e	Diatom	1.00	1.00	0.99	0.95	1.00	1.00	1.00	0.46	1.00	1.00	0.13	1.00	1.00	1.00	1.00	1.00	0.99	1.00	0.97	1.00	1.00	0.71
	None[a]	Rhodophyte	0.42	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Relative Abundance (Proportion, %)	Transformation[a]	C.incrustans	1.00	1.00	1.00	0.00	1.00	1.00	1.00	0.22	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		H. profunda	1.00	1.00	1.00	0.91	1.00	1.00	1.00	0.02	1.00	1.00	1.00	0.98	1.00	0.59	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00
		H.varians	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.39	0.00	1.00	1.00	1.00	1.00	1.00	0.84	1.00	1.00	1.00	1.00	1.00
		A. minutissima	1.00	0.23	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.98	0.99	0.55	1.00	1.00	1.00	1.00	0.63	0.98	1.00	1.00	0.79
		D. vulgare	1.00	1.00	0.97	1.00	1.00	1.00	0.00	1.00	0.88	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	1.00	1.00	1.00
		S. ulna	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
		Cyanophyte	0.99	1.00	1.00	0.84	0.92	1.00	0.99	0.29	1.00	1.00	0.50	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.99	1.00	1.00	0.99
		Chlorophyte	1.00	0.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.82	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		Chrysophyte	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.07	1.00	1.00	1.00
		Diatom	1.00	1.00	0.99	0.91	0.76	1.00	0.99	0.65	0.97	1.00	0.54	0.62	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97
		Rhodophyte	0.77	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

[a] No transformations (Logit, Log_e, Log_e(1-x), Square root) resulted in improvement of data to a normal distribution.

Highlighted boxes indicate ncP values that fall between 0.05 and 0.95.

Highlighted boxes indicate ncP values that fall below 0.05.

Table D.18: Periphyton community metrics non-central p-values for 11 exposed and 2 minimally influenced areas, August 2014.

Data Type	Transformation	Endpoint	Minimally Influenced		Exposed											
			R1	Grum	R9	X2	X3	RDE-1	RDE-2	RDE-3	R2	R3	R4	R5	A1
Absolute Abundance (# of cells/m^2)	Non-Transformed	Total Density	0.01	1.00	0.00	1.00	0.00	0.99	1.00	0.12	1.00	1.00	1.00	1.00	1.00
		LPL Richness	1.00	1.00	1.00	1.00	1.00	1.00	0.79	1.00	1.00	0.96	0.96	1.00	0.96
		Diversity (Simpson's)	0.91	1.00	1.00	0.07	1.00	1.00	0.13	1.00	0.98	1.00	1.00	0.99	0.95
		Evenness (Simpson's)	0.40	0.43	1.00	0.37	1.00	0.97	0.06	0.46	1.00	0.52	0.97	1.00	1.00
		C.incrustans	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		H. profunda	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		H.varians	1.00	1.00	1.00	1.00	0.05	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		A. minutissima	0.00	1.00	0.00	1.00	0.00	0.78	0.27	0.00	1.00	0.88	1.00	1.00	1.00
		D. vulgare	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		S. ulna	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		Cyanophyte	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		Chlorophyte	0.00	1.00	0.00	1.00	0.98	0.98	1.00	0.00	0.00	0.00	0.00	0.08	1.00
		Chrysophyte	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		Diatom	0.01	1.00	0.00	1.00	0.00	1.00	1.00	0.07	1.00	1.00	1.00	1.00	1.00
		Rhodophyte	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00	0.62	1.00	1.00	1.00	1.00
		NMS1	0.74	0.94	0.29	0.99	0.99	1.00	1.00	0.80	1.00	0.99	1.00	1.00	1.00
		NMS2	1.00	1.00	1.00	1.00	0.28	0.76	0.97	0.99	1.00	1.00	1.00	1.00	1.00
	Square root	Total Density	0.14	0.99	0.00	1.00	0.00	0.98	1.00	0.37	1.00	1.00	1.00	1.00	1.00
	Log_e	LPL Richness	1.00	1.00	1.00	1.00	1.00	1.00	0.91	1.00	1.00	0.98	0.98	1.00	0.98
	Logit	Diversity (Simpson's)	0.92	0.99	0.99	0.13	1.00	1.00	0.21	1.00	0.96	1.00	1.00	0.99	0.87
	Logit	Evenness (Simpson's)	0.23	0.26	1.00	0.20	1.00	0.98	0.01	0.30	1.00	0.38	0.98	1.00	1.00
	None[a]	C.incrustans	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	None[a]	H. profunda	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	None[a]	H.varians	1.00	1.00	1.00	1.00	0.05	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Square root	A. minutissima	0.00	1.00	0.00	0.92	0.00	0.55	0.25	0.02	0.98	0.64	1.00	0.96	1.00
	Square root	D. vulgare	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	None[a]	S. ulna	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	None[a]	Cyanophyte	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Square root	Chlorophyte	0.04	1.00	0.00	1.00	0.81	0.81	0.98	0.00	0.00	0.00	0.00	0.15	1.00
	None[a]	Chrysophyte	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Log_e	Diatom	0.78	1.00	0.50	1.00	0.67	1.00	0.99	0.86	1.00	1.00	1.00	1.00	1.00
	None[a]	Rhodophyte	1.00	1.00	1.00	1.00	0.00	0.00	1.00	1.00	0.62	1.00	1.00	1.00	1.00
Relative Abundance (Proportion, %)	Transformation[a]	C.incrustans	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		H. profunda	1.00	0.15	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		H.varians	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		A. minutissima	0.33	1.00	1.00	0.12	1.00	0.96	0.12	0.51	1.00	0.75	0.99	1.00	1.00
		D. vulgare	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		S. ulna	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		Cyanophyte	1.00	1.00	1.00	0.99	1.00	1.00	1.00	0.99	1.00	0.99	1.00	1.00	1.00
		Chlorophyte	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00	0.00	1.00	1.00
		Chrysophyte	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		Diatom	0.99	1.00	1.00	0.97	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00	1.00
		Rhodophyte	1.00	1.00	1.00	1.00	0.88	0.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00

[a] No transformations (Logit, Log_e, $Log_e(1-x)$, Square root) resulted in improvement of data to a normal distribution.

Highlighted boxes indicate ncP values that fall between 0.05 and 0.95.

Highlighted boxes indicate ncP values that fall below 0.05.

Table D.19: Periphyton community metrics for 22 reference areas, August 2014. Orange highlight indicates values outside of the range represented by 90% of reference area values (non-central p-values ≤ 0.05). Yellow highlight indicates values that are uncertain with respect to being in the reference range (non-central p-values between 0.05 and 0.95).

Data Type	Transformation	Endpoint	Reference																				
			R7	FC	R6	USFR	V1	VR	BLC	NEXC	GRC	STC	HOC	BEC	BUC	REF-126	REF-212	REF-213	REF-220	REF-325	REF-327	REF-328	REF-340	REF-376
Absolute Abundance (# of cells/m^2)	Non-transformed	Total Density	63522.81	4450.17	72782.07	4767.92	32704.27	7524.45	62446.17	4507.61	46167.10	63721.62	4679.87	62460.51	61154.15	3069.60	3124.14	21171.69	99317.61	21946.24	92604.65	4231.04	5139.26	173413.74
		LPL Richness	15	8	19	14	12	16	18	7	12	14	9	13	18	10	16	22	11	21	12	14	19	11
		Diversity (Simpson's)	0.80	0.52	0.76	0.72	0.75	0.75	0.63	0.46	0.75	0.78	0.55	0.74	0.62	0.69	0.78	0.86	0.78	0.63	0.79	0.74	0.71	0.66
		Evenness (Simpson's)	0.33	0.26	0.22	0.26	0.34	0.25	0.15	0.26	0.33	0.33	0.25	0.30	0.15	0.32	0.28	0.32	0.42	0.13	0.39	0.27	0.18	0.27
		C.incrustans	0	0	0	1290.96	0	565.56	0	689.06	0	0	0	0	0	0	0	0	0	0	0	149.92	0.00	0
		H. profunda	0	344.53	0	2082.74	11962.87	2483.56	0	3215.62	0	4647.44	0	24978.47	0	1563.49	400.20	0	0	0	0	1765.70	442.61	0
		H.varians	0	0	3660.64	154.91	172.13	0	0	344.53	516.80	22617.56	2899.80	4521.96	0	0	374.38	0	29089.56	0	0	666.30	0.00	0
		A. minutissima	23255.81	2957.22	29500.43	292.62	430.32	2631.09	14211.89	172.27	7235.14	8262.12	0	229.69	36391.04	100.41	1278.05	4948.67	27024.03	12737.44	0	299.84	344.26	95320.13
		D. vulgare	430.66	86.13	18087.86	86.06	344.26	49.18	35099.05	28.71	12747.63	9294.89	57.42	861.33	8613.26	0	361.47	1635.21	5508.08	172.13	24958.50	16.66	49.18	10910.13
		S. ulna	0	0	861.33	172.13	0	98.36	2368.65	28.71	689.06	103.28	28.71	0	2153.32	100.41	25.82	172.13	0	86.06	1377.02	0	2680.27	18374.97
		Cyanophyte	0	401.95	3875.97	3700.74	24270.00	3049.12	0	4249.21	516.80	41310.61	4105.66	37252.37	0	1563.49	774.58	4561.38	29089.56	1377.02	0.00	2748.50	540.97	0
		Chlorophyte	3445.30	803.90	0	344.26	0	0	2368.65	0	0	826.21	172.26	5598.62	645.99	0	0	1118.83	0	86.06	1032.77	66.63	319.67	0
		Chrysophyte	0	0	0	0	5422.02	0	0	0	0	0	0	0	0	0	0	0	0	0	9639.14	0	0	0
		Diatom	52110.24	3244.32	68906.10	722.92	3012.25	3762.23	60077.52	258.40	45650.30	19932.38	114.84	3028.99	60508.16	1506.11	2349.56	15491.48	70228.05	18417.63	81932.74	1415.91	4032.72	173413.74
		Rhodophyte	7967.27	0	0	0	0	713.10	0	0	0	1652.42	287.11	16580.53	0	0	0	0	0	2065.53	0	0	245.90	0
	Square root	Total Density	252.04	66.71	269.78	69.05	180.84	86.74	249.89	67.14	214.87	252.43	68.41	249.92	247.29	55.40	55.89	145.50	315.15	148.14	304.31	65.05	71.69	416.43
	Log_e	LPL Richness	2.71	2.08	2.94	2.64	2.48	2.77	2.89	1.95	2.48	2.64	2.20	2.56	2.89	2.30	2.77	3.09	2.40	3.04	2.48	2.64	2.94	2.40
	Logit	Diversity (Simpson's)	1.36	0.07	1.14	0.96	1.11	1.10	0.52	-0.16	1.08	1.29	0.19	1.06	0.48	0.79	1.25	1.79	1.29	0.55	1.31	1.02	0.88	0.66
	Logit	Evenness (Simpson's)	-0.72	-1.05	-1.29	-1.06	-0.68	-1.10	-1.74	-1.02	-0.71	-0.70	-1.12	-0.86	-1.77	-0.75	-0.94	-0.76	-0.31	-1.90	-0.44	-0.99	-1.52	-1.01
	None[a]	C.incrustans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	None[a]	H. profunda	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	None[a]	H.varians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Square root	A. minutissima	152.50	54.38	171.76	17.11	20.74	51.29	119.21	13.13	85.06	90.90	0	15.16	190.76	10.02	35.75	70.35	164.39	112.86	0	17.32	18.55	308.74
	Square root	D. vulgare	20.75	9.28	134.49	9.28	18.55	7.01	187.35	5.36	112.91	96.41	7.58	29.35	92.81	0	19.01	40.44	74.22	13.12	157.98	4.08	7.01	104.45
	None[a]	S. ulna	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	None[a]	Cyanophyte	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Square root	Chlorophyte	58.70	28.35	0	18.55	0	0	48.67	0	0	28.74	13.12	74.82	25.42	0	0	33.45	0	9.28	32.14	8.16	17.88	0
	None[a]	Chrysophyte	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Log_e	Diatom	10.86	8.08	11.14	6.58	8.01	8.23	11.00	5.55	10.73	9.90	4.74	8.02	11.01	7.32	7.76	9.65	11.16	9.82	11.31	7.26	8.30	12.06
	None[a]	Rhodophyte	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Relative Abundance (Proportion, %)	Non-transformed	C.incrustans	0.0	0.0	0.0	27.1	0.0	7.5	0.0	15.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.0
		H. profunda	0.0	7.7	0.0	43.7	36.6	33.0	0.0	71.3	0.0	7.3	0.0	40.0	0.0	50.9	12.8	0.0	0.0	0.0	0.0	41.7	8.6	0.0
		H.varians	0.0	0.0	5.0	3.2	0.5	0.0	0.0	7.6	1.1	35.5	62.0	7.2	0.0	0.0	12.0	0.0	29.3	0.0	0.0	15.7	0.0	0.0
		A. minutissima	36.6	66.5	40.5	6.1	1.3	35.0	22.8	3.8	15.7	13.0	0.0	0.4	59.5	3.3	40.9	23.4	27.2	58.0	0.0	7.1	6.7	55.0
		D. vulgare	0.7	1.9	24.9	1.8	1.1	0.7	56.2	0.6	27.6	14.6	1.2	1.4	14.1	0.0	11.6	7.7	5.5	0.8	27.0	0.4	1.0	6.3
		S. ulna	0.0	0.0	1.2	3.6	0.0	1.3	3.8	0.6	1.5	0.2	0.6	0.0	3.5	3.3	0.8	0.8	0.0	0.4	1.5	0.0	52.2	10.6
		Cyanophyte	0.0	9.0	5.3	77.6	74.2	40.5	0.0	94.3	1.1	64.8	87.7	59.6	0.0	50.9	24.8	21.5	29.3	6.3	0.0	65.0	10.5	0.0
		Chlorophyte	5.4	18.1	0.0	7.2	0.0	0.0	3.8	0.0	0.0	1.3	3.7	9.0	1.1	0.0	0.0	5.3	0.0	0.4	1.1	1.6	6.2	0.0
		Chrysophyte	0.0	0.0	0.0	0.0	16.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.4	0.0	0.0	0.0
		Diatom	82.0	72.9	94.7	15.2	9.2	50.0	96.2	5.7	98.9	31.3	2.5	4.8	98.9	49.1	75.2	73.2	70.7	83.9	88.5	33.5	78.5	100.0
		Rhodophyte	12.5	0.0	0.0	0.0	0.0	9.5	0.0	0.0	0.0	2.6	6.1	26.5	0.0	0.0	0.0	0.0	0.0	9.4	0.0	0.0	4.8	0.0

[a] No transformations (Logit, Log_e, $Log_e(1-x)$, Square root) resulted in improvement of data to a normal distribution.

Table D.20: Periphyton community metrics for 11 exposed and 2 minimally influenced areas, August 2014. Orange highlight indicates values outside the range represented by 90% of reference area values (non-central p-values ≤ 0.05). Yellow highlight indicates values that are uncertain with respect to being in the reference range (non-central interval p-values between 0.05 and 0.95).

Data Type	Transformation	Endpoint	Minimally Influenced		Exposed										
			R1	Grum	R9	X2	X3	RDE-1	RDE-2	RDE-3	R2	R3	R4	R5	A1
Absolute Abundance (# of cells/m^2)	Non-transformed	Total Density	158738.06	4823.41	272179.16	45219.61	268159.65	86706.87	75509.65	134366.93	72997.41	72997.37	42032.77	76227.37	53402.25
		LPL Richness	17	18	16	14	17	16	20	18	18	19	19	18	19
		Diversity (Simpson's)	0.58	0.61	0.80	0.48	0.77	0.66	0.49	0.61	0.81	0.64	0.72	0.80	0.82
		Evenness (Simpson's)	0.14	0.14	0.31	0.14	0.25	0.18	0.10	0.14	0.29	0.15	0.18	0.28	0.29
		C.incrustans	0	0	0	0	0	0	0	0	0	0	0	0	0
		H. profunda	0	2957.22	0	0	28136.66	0	6316.39	0	0	0	0	0	0
		H.varians	0	114.84	0	0	20671.83	0	0	0	4306.63	0	1033.59	6890.61	1894.92
		A. minutissima	101454.32	430.66	105081.83	31869.08	117140.4	43066.32	53115.13	80964.69	26701.12	40697.67	19810.51	29500.43	17398.79
		D. vulgare	6211.49	28.71	0	0	1148.44	0	287.11	430.66	2583.98	1507.32	3962.1	10120.59	10852.71
		S. ulna	1380.33	57.42	0	430.66	13207.01	287.11	861.33	861.33	2583.98	645.99	172.27	1291.99	344.53
		Cyanophyte	1380.33	3129.48	6890.61	0	48808.49	5167.96	7177.72	0	4306.63	0	1033.59	15073.21	1894.92
		Chlorophyte	4831.16	344.54	13781.22	430.66	2296.87	2296.87	1722.65	6890.61	16149.88	14427.22	9302.33	3875.97	1378.12
		Chrysophyte	0	0	0	0	0	0	0	0	0	0	0	0	0
		Diatom	152526.57	1349.39	251507.33	44788.95	185472.32	53976.46	62589.76	127476.32	45219.63	54048.19	29285.14	57278.19	50129.21
		Rhodophyte	0	0	0	0	31581.97	25265.58	4019.52	0	7321.27	4521.96	2411.71	0	0
	Square root	Total Density	398.42	69.45	521.71	212.65	517.84	294.46	274.79	366.56	270.18	270.18	205.02	276.09	231.09
	Log_e	LPL Richness	2.83	2.89	2.77	2.64	2.83	2.77	3.00	2.89	2.89	2.94	2.94	2.89	2.94
	Logit	Diversity (Simpson's)	0.31	0.43	1.38	-0.09	1.18	0.67	-0.03	0.45	1.45	0.58	0.92	1.39	1.52
	Logit	Evenness (Simpson's)	-1.82	-1.81	-0.80	-1.84	-1.09	-1.48	-2.21	-1.79	-0.89	-1.76	-1.48	-0.96	-0.87
	None[a]	C.incrustans	-	-	-	-	-	-	-	-	-	-	-	-	-
	None[a]	H. profunda	-	-	-	-	-	-	-	-	-	-	-	-	-
	None[a]	H.varians	-	-	-	-	-	-	-	-	-	-	-	-	-
	Square root	A. minutissima	318.52	20.75	324.16	178.52	342.26	207.52	230.47	284.54	163.40	201.74	140.75	171.76	131.90
	Square root	D. vulgare	78.81	5.36	0.00	0.00	33.89	0.00	16.94	20.75	50.83	38.82	62.95	100.60	104.18
	None[a]	S. ulna	-	-	-	-	-	-	-	-	-	-	-	-	-
	None[a]	Cyanophyte	-	-	-	-	-	-	-	-	-	-	-	-	-
	Square root	Chlorophyte	69.51	18.56	117.39	20.75	47.93	47.93	41.50	83.01	127.08	120.11	96.45	62.26	37.12
	None[a]	Chrysophyte	-	-	-	-	-	-	-	-	-	-	-	-	-
	Log_e	Diatom	11.94	7.21	12.44	10.71	12.13	10.90	11.04	11.76	10.72	10.90	10.28	10.96	10.82
	None[a]	Rhodophyte	-	-	-	-	-	-	-	-	-	-	-	-	-
Relative Abundance (Proportion, %)	Non-transformed	C.incrustans	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		H. profunda	0.0	61.3	0.0	0.0	10.5	0.0	8.4	0.0	0.0	0.0	0.0	0.0	0.0
		H.varians	0.0	2.4	0.0	0.0	7.7	0.0	0.0	0.0	5.9	0.0	2.5	9.0	3.5
		A. minutissima	63.9	8.9	38.6	70.5	43.7	49.7	70.3	60.3	36.6	55.8	47.1	38.7	32.6
		D. vulgare	3.9	0.6	0.0	0.0	0.4	0.0	0.4	0.3	3.5	2.1	9.4	13.3	20.3
		S. ulna	0.9	1.2	0.0	1.0	4.9	0.3	1.1	0.6	3.5	0.9	0.4	1.7	0.6
		Cyanophyte	0.9	64.9	2.5	0.0	18.2	6.0	9.5	0.0	5.9	0.0	2.5	19.8	3.5
		Chlorophyte	3.0	7.1	5.1	1.0	0.9	2.6	2.3	5.1	22.1	19.8	22.1	5.1	2.6
		Chrysophyte	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		Diatom	96.1	28.0	92.4	99.0	69.2	62.3	82.9	94.9	61.9	74.0	69.7	75.1	93.9
		Rhodophyte	0.0	0.0	0.0	0.0	11.8	29.1	5.3	0.0	10.0	6.2	5.7	0.0	0.0

[a] No transformations (Logit, Log_e, $Log_e(1-x)$, Square root) resulted in improvement of data to a normal distribution.

[b] NMS values for exposed areas are omitted because they are independent of each other and therefore are not comparable between exposed areas.

Table D.21: Densities (# cells/cm^2) of periphyton groups, August 2014.

Area	Station ID	Cyanobacteria (cells/cm^2)	Chlorophyte (cells/cm^2)	Chrysophyte (cells/cm^2)	Diatom (cells/cm^2)	Rhodophyte (cells/cm^2)	Total (cells/cm^2)
Reference	R7	0	3,445	0	52,110	7,967	**63,523**
	FC	402	804	0	3,244	0	**4,450**
	R6	3,876	0	0	68,906	0	**72,782**
	USFR	3,701	344	0	723	0	**4,768**
	BLC	0	2,369	0	60,078	0	**62,446**
	V1	24,270	0	5,422	3,012	0	**32,704**
	VR	3,049	0	0	3,762	713	**7,524**
	GRC	517	0	0	45,650	0	**46,167**
	STC	41,311	826	0	19,932	1,652	**63,722**
	HOC	4,106	172	0	345	287	**4,910**
	BEC	37,252	5,599	0	3,029	16,581	**62,231**
	BUC	0	646	0	60,508	0	**61,154**
	NEXC	4,249	0	0	258	0	**4,508**
	REF-220	29,090	0	0	70,228	0	**99,318**
	REF-327	0	1,033	9,639	81,933	0	**92,605**
	REF-325	1,377	86	0	18,418	2,066	**21,946**
	REF-213	4,561	1,119	0	15,491	0	**21,172**
	REF-126	1,563	0	0	1,506	0	**3,070**
	REF-376	0	0	0	173,414	0	**173,414**
	REF-328	2,748	67	0	1,416	0	**4,231**
	REF-340	541	320	0	4,033	246	**5,139**
	REF-212	775	0	0	2,350	0	**3,124**
Minimally Exposed	R1	1,380	4,831	0	152,527	0	**158,738**
	Grum	3,129	345	0	1,349	0	**4,823**
Exposed	R9	6,891	13,781	0	251,507	0	**287,683**
	X2	0	431	0	44,789	0	**45,220**
	X3	48,808	2,297	0	185,472	31,582	**268,160**
	RDE-1	5,168	2,297	0	53,976	25,266	**86,707**
	RDE-2	7,178	1,723	0	62,590	4,020	**75,510**
	RDE-3	0	6,891	0	127,476	0	**134,367**
	R2	4,307	16,150	0	45,220	7,321	**72,997**
	R3	0	14,427	0	54,048	4,522	**72,997**
	R4	1,034	9,302	0	29,285	2,412	**42,033**
	R5	15,073	3,876	0	57,278	0	**76,227**
	A1	1,895	1,378	0	50,129	0	**53,402**

Table D.22: Pearson corrlations between periphyton endoints and water quality PCA axes, Faro Mine, August 2014.

Parameter	Family Richness		Total Density		*Achnanthes minutissima*		*Diatoma vulgare*		*Synedra ulna*		Cyanophyte		Chlorophyte		Diatom	
	(Log_e Transformed)		(Square Root Transformed)		(Square Root Transformed)		(Square Root Transformed)		(Non-transformed)		(Non-transformed)		(Square Root Transformed)		(Log_e Transformed)	
	r	p	r	p	r	p	r	p	r	p	r	p	r	p	r	p
PCA-1	-0.028	0.875	0.243	0.160	0.111	0.527	0.389	0.021	0.038	0.827	0.231	0.182	0.030	0.865	0.255	0.139
PCA-2	-0.245	0.156	0.102	0.559	-0.089	0.610	0.168	0.335	0.034	0.848	0.341	0.045	-0.067	0.702	-0.018	0.920
PCA-3	-0.096	0.583	-0.083	0.636	0.116	0.508	-0.205	0.236	0.138	0.429	-0.001	0.995	0.033	0.849	-0.194	0.264
PCA-4	0.049	0.780	0.248	0.151	0.319	0.062	-0.258	0.135	-0.018	0.918	0.288	0.094	0.277	0.107	0.232	0.179

Correlation is significant at p = 0.05 level (not adjusted for 32 comparisons; 2-tailed).

Correlation is significant at p = 0.002 (p = 0.05 adjusted for 32 comparisons; 2-tailed)

Table D.23: Periphyton ash-free dry mass and chlorophyll-a concentrations sampled in vicinity of the Faro Mine, August 2014.

Area		Ash Free Dry Mass				Chlorophyll-a			
		Lab Reported Dry Weight (g)	Density (g/m^2)	Average (g/m^2)	Standard Deviation	Lab Reported Chlorophyll-a (μg)	Density (mg/m^2)	Average (mg/m^2)	Standard Deviation
Reference (North Fork)	R7-1	0.0541	6.763	7.01	1.88	4.36	0.55	2.79	2.00
	R7-2	0.0421	5.263			35.1	4.39		
	R7-3	0.0720	9.000			27.4	3.43		
South Fork	R1-1	0.201	25.125	10.48	12.79	-[a]	-[a]	4.61	5.50
	R1-2	0.0385	4.813			68.0	8.50		
	R1-3	0.0120	1.500			5.78	0.72		
North Fork	R9-1	0.182	22.750	14.18	7.84	206	25.75	8.90	14.60
	R9-2	0.0993	12.413			1.47	0.18		
	R9-3	0.0590	7.375			6.11	0.76		
North Fork	X2-1	0.0626	7.825	5.79	2.87	26.0	3.25	4.26	1.42
	X2-2	0.0301	3.763			42.1	5.26		
Groundwater Recharge Ponds, Pumphouse Pond, North Fork Diversion	X3-1	0.0206	2.575	4.85	2.09	6.45	0.81	1.64	0.85
	X3-2	0.0424	5.300			20.0	2.50		
	X3-3	0.0534	6.675			12.8	1.60		
Rose Creek Diversion	RDE-1	0.0501	6.263	7.36	0.97	40.4	5.05	2.94	1.95
	RDE-2	0.0649	8.113			20.4	2.55		
	RDE-3	0.0617	7.713			9.67	1.21		
Downstream of RCTA	R2-1	0.0171	2.138	1.07	0.96	9.76	1.22	1.09	0.55
	R2-2	0.0022	0.275			12.5	1.56		
	R2-3	0.0064	0.800			3.92	0.49		

[a] no sample, laboratory accident.

Table D.24: Metal concentrations (mg/kg dw) in periphyton tissue, Faro Mine Aquatic Study, August 2014.

Analyte	Reference					Minimally Influenced										Exposed			
	North Fork Reference (R7)					South Fork (R1)					North Fork upstream from Haul Road (R9)					North Fork downstream from Haul Road (X2)			
	R7-1	R7-2	R7-3	Mean	Std. Dev.	R1-1	R1-2	R1-3	Mean	Std. Dev.	R9-1	R9-2	R9-3	Mean	Std. Dev.	X2-1	X2-2	Mean	Std. Dev.
Aluminum (Al)	13,000	11,900	12,500	12,467	551	14,600	10,200	11,100	11,967	2,325	14,100	16,400	16,500	15,667	1,358	21,700	16,800	19,250	3,465
Antimony (Sb)	0.022	0.029	0.031	0.027	0.004	0.011	0.015	0.008	0.011	0.004	0.030	0.034	0.030	0.032	0.002	0.004	0.021	0.012	0.012
Arsenic (As)	15.1	20.2	24.8	20.0	4.9	10.9	25.2	10.4	15.5	8.4	24.1	29.5	25.4	26.3	2.8	21.1	33.8	27.5	9.0
Barium (Ba)	287	434	547	423	130	304	1230	479	671	492	332	334	361	342	16	479	542	511	45
Beryllium (Be)	0.639	0.675	0.689	0.668	0.026	0.767	0.676	0.582	0.675	0.092	0.675	0.775	0.846	0.765	0.086	1.140	1.035	1.088	0.074
Bismuth (Bi)	0.198	0.179	0.365	0.247	0.102	0.239	0.176	0.172	0.196	0.038	0.279	0.360	0.377	0.339	0.052	15.100	0.697	7.899	10.184
Boron (B)	5.95	8.06	12.30	8.77	3.23	30.43	5.83	2.79	13.02	15.15	75.50	30.20	28.10	44.60	26.78	6.00	5.52	5.76	0.34
Cadmium (Cd)	0.528	0.840	1.410	0.926	0.447	0.386	1.670	0.645	0.900	0.679	0.536	0.588	0.652	0.592	0.058	2.400	4.550	3.475	1.520
Calcium (Ca)	7,210	8,660	16,600	10,823	5,055	11,010	9,420	6,500	8,977	2,287	21,100	13,100	12,300	15,500	4,866	7,690	8,190	7,940	354
Cesium (Cs)	2.10	1.79	2.09	1.99	0.18	2.41	1.72	1.79	1.97	0.38	2.35	2.71	3.11	2.72	0.38	3.56	2.64	3.10	0.65
Chromium (Cr)	25.5	25.4	22.9	24.6	1.5	33.2	23.8	31.6	29.5	5.0	26.5	31.8	38.8	32.4	6.2	51.0	40.1	45.6	7.7
Cobalt (Co)	8.7	9.5	12.6	10.3	2.1	10.9	28.6	12.5	17.3	9.8	8.1	10.5	10.8	9.8	1.5	40.5	82.8	61.6	29.9
Copper (Cu)	12.5	14.3	15.4	14.1	1.5	12.1	16.7	8.3	12.4	4.2	17.2	20.3	22.7	20.1	2.8	33.5	28.4	30.9	3.6
Gallium (Ga)	5.13	4.46	4.86	4.82	0.34	5.53	4.89	4.82	5.08	0.39	4.61	5.65	5.77	5.34	0.64	8.03	6.52	7.28	1.07
Iron (Fe)	24,400	24,500	27,300	25,400	1,646	28,250	26,900	19,900	25,017	4,482	27,600	32,600	31,600	30,600	2,646	40,100	43,700	41,900	2,546
Lead (Pb)	9.99	9.34	10.50	9.94	0.58	18.90	19.20	12.40	16.83	3.84	49.90	68.70	116.00	78.20	34.06	399.00	302.00	350.50	68.59
Lithium (Li)	26.2	21.4	23.5	23.7	2.4	25.9	18.6	21.1	21.9	3.7	23.1	29.7	30.1	27.6	3.9	38.6	30.1	34.4	6.0
Magnesium (Mg)	4,370	3,590	4,100	4,020	396	5,480	4,120	4,220	4,607	758	4,410	5,170	5,250	4,943	464	6,980	6,030	6,505	672
Manganese (Mn)	2,750	4,980	8,420	5,383	2,856	3,845	25,300	8,160	12,435	11,348	2,430	2,380	2,270	2,360	82	3,550	7,760	5,655	2,977
Mercury (Hg)	0.0267	0.0336	0.0344	0.0316	0.0042	0.0269	0.0256	0.0178	0.0234	0.0049	0.0604	0.0733	0.0887	0.0741	0.0142	0.2150	0.1530	0.1840	0.0438
Molybdenum (Mo)	0.762	1.120	1.290	1.057	0.270	0.419	1.540	0.508	0.822	0.623	0.869	1.500	1.030	1.133	0.328	0.540	1.515	1.028	0.689
Nickel (Ni)	19.7	18.8	25.3	21.3	3.5	24.1	57.6	28.5	36.7	18.2	19.4	24.5	27.0	23.6	3.9	44.7	48.8	46.8	2.9
Phosphorus (P)	1,470	1,850	1,940	1,753	249	788	959	796	848	97	1,220	1,380	1,440	1,347	114	1,050	1,175	1,113	88
Potassium (K)	2,980	4,740	3,980	3,900	883	1,905	2,090	1,270	1,755	430	3,780	3,990	4,410	4,060	321	3,760	3,855	3,808	67
Rhenium (Re)	0.00061	0.00059	0.00134	0.00085	0.00043	0.00040	0.00285	0.00036	0.00120	0.00143	0.00063	0.00166	0.00088	0.00106	0.00054	0.00112	0.00090	0.00101	0.00016
Rubidium (Rb)	21.5	23.4	22.9	22.6	1.0	19.1	15.0	13.1	15.7	3.1	23.4	26.8	31.1	27.1	3.9	31.5	25.2	28.4	4.5
Selenium (Se)	3.15	3.43	3.26	3.28	0.14	2.99	3.04	2.65	2.89	0.21	3.46	3.48	3.54	3.49	0.04	4.17	4.29	4.23	0.08
Silver (Ag)	0.117	0.504	0.102	0.241	0.228	0.086	0.087	0.064	0.079	0.013	0.169	0.315	0.294	0.259	0.079	0.467	0.373	0.420	0.067
Sodium (Na)	313	405	318	345	52	396	282	311	330	59	410	464	442	439	27	550	423	487	90
Strontium (Sr)	42.0	51.6	113.0	68.9	38.5	86.4	94.2	72.0	84.2	11.3	92.1	62.5	63.0	72.5	16.9	52.4	54.8	53.6	1.7
Thallium (Tl)	0.169	0.170	0.198	0.179	0.016	0.181	0.335	0.168	0.228	0.093	0.201	0.230	0.290	0.240	0.045	0.384	0.336	0.360	0.034
Thorium (Th)	4.74	3.47	3.69	3.97	0.68	5.89	4.46	5.63	5.33	0.76	3.32	4.39	4.40	4.04	0.62	7.56	5.13	6.35	1.72
Tin (Sn)	0.392	0.098	0.217	0.236	0.148	0.317	0.273	0.268	0.286	0.027	0.312	0.598	0.511	0.474	0.147	0.187	0.471	0.329	0.201
Titanium (Ti)	515	311	338	388	111	430	321	399	383	56	433	548	567	516	73	332	578	455	174
Uranium (U)	1.41	1.32	1.85	1.53	0.28	1.76	2.00	1.88	1.88	0.12	1.68	1.80	1.93	1.80	0.13	2.49	2.11	2.30	0.27
Vanadium (V)	37.8	35.0	37.3	36.7	1.5	30.2	23.3	24.7	26.1	3.6	41.4	46.4	49.2	45.7	4.0	58.9	51.1	55.0	5.5
Yttrium (Y)	8.54	7.51	8.41	8.15	0.56	10.64	10.40	8.93	9.99	0.93	11.10	10.40	10.80	10.77	0.35	15.50	18.85	17.18	2.37
Zinc (Zn)	73	79	108	87	19	79	197	95	124	64	89	114	225	143	72	1,940	3,695	2,818	1,241
Zirconium (Zr)	7.11	6.69	7.35	7.05	0.33	9.77	7.81	5.72	7.77	2.03	9.77	9.87	9.90	9.85	0.07	11.10	9.17	10.13	1.37

Table D.24: Metal concentrations (mg/kg dw) in periphyton tissue, Faro Mine Aquatic Study, August 2014.

Analyte	Exposed														
	Pumphouse Pond Outlet (X3)					Rose Creek Diversion (RDE)					Downstream from RCTA (R2)				
	X3-1	X3-2	X3-3	Mean	Std. Dev.	RDE-1	RDE-2	RDE-3	Mean	Std. Dev.	R2-1	R2-2	R2-3	Mean	Std. Dev.
Aluminum (Al)	10,200	10,400	17,400	12,667	4,100	8,970	9,410	14,100	10,827	2,843	8,610	9,640	7,630	8,627	1,005
Antimony (Sb)	0.072	0.075	0.029	0.059	0.026	0.036	0.058	0.033	0.042	0.014	0.055	0.038	0.086	0.060	0.024
Arsenic (As)	59.9	68.9	39.6	56.1	15.0	45.6	57.8	17.5	40.3	20.7	27.4	18.5	33.5	26.5	7.5
Barium (Ba)	3220	1750	655	1875	1287	1350	2030	396	1259	821	1430	1260	2170	1620	484
Beryllium (Be)	0.734	1.050	1.210	0.998	0.242	0.848	0.816	0.802	0.822	0.024	0.555	0.617	0.517	0.563	0.050
Bismuth (Bi)	0.244	0.327	0.597	0.389	0.185	0.283	0.252	0.288	0.274	0.020	0.195	0.176	0.153	0.175	0.021
Boron (B)	5.26	8.98	6.43	6.89	1.90	5.62	7.68	4.52	5.94	1.60	11.50	3.81	7.20	7.50	3.85
Cadmium (Cd)	27.100	21.100	6.640	18.280	10.517	11.300	10.100	3.520	8.307	4.189	3.800	2.470	4.320	3.530	0.954
Calcium (Ca)	15,600	11,900	9,120	12,207	3,251	12,400	13,600	9,630	11,877	2,036	14,600	10,400	16,200	13,733	2,996
Cesium (Cs)	1.44	1.70	2.84	1.99	0.74	1.74	1.48	2.08	1.77	0.30	1.23	1.28	1.07	1.19	0.11
Chromium (Cr)	23.2	25.6	43.1	30.6	10.9	23.2	66.2	90.1	59.8	33.9	48.4	33.5	43.2	41.7	7.6
Cobalt (Co)	530.0	420.0	101.0	350.3	222.8	127.0	191.0	70.1	129.4	60.5	159.0	131.0	185.0	158.3	27.0
Copper (Cu)	25.5	33.4	28.3	29.1	4.0	25.8	30.0	24.8	26.9	2.8	27.3	27.9	31.8	29.0	2.4
Gallium (Ga)	7.69	6.28	7.81	7.26	0.85	4.42	4.93	5.30	4.88	0.44	5.46	5.33	5.90	5.56	0.30
Iron (Fe)	31,800	66,400	50,700	49,633	17,325	95,700	52,600	37,400	61,900	30,242	66,100	47,100	65,300	59,500	10,746
Lead (Pb)	89.70	283.00	229.00	200.57	99.74	137.00	153.00	79.30	123.10	38.77	92.60	178.00	120.00	130.20	43.60
Lithium (Li)	12.6	16.7	29.9	19.7	9.0	13.9	12.9	23.1	16.6	5.6	13.3	16.7	11.5	13.8	2.6
Magnesium (Mg)	4,370	4,030	6,030	4,810	1,070	3,860	6,550	7,950	6,120	2,079	5,040	5,010	5,340	5,130	182
Manganese (Mn)	123,000	48,700	10,300	60,667	57,295	26,400	44,100	6,850	25,783	18,633	63,000	49,000	92,300	68,100	22,096
Mercury (Hg)	0.0767	0.1720	0.1410	0.1299	0.0486	0.0895	0.0780	0.0655	0.0777	0.0120	0.0580	0.0475	0.0575	0.0543	0.0059
Molybdenum (Mo)	10.300	8.190	1.600	6.697	4.538	2.590	3.660	1.020	2.423	1.328	4.370	3.300	5.960	4.543	1.338
Nickel (Ni)	180.0	106.0	52.4	112.8	64.1	84.3	240.0	72.0	132.1	93.6	110.0	74.3	134.0	106.1	30.0
Phosphorus (P)	1,080	1,580	1,290	1,317	251	854	726	1,110	897	196	643	899	670	737	141
Potassium (K)	3,230	3,800	3,620	3,550	291	2,950	2,320	3,260	2,843	479	2,190	1,740	1,760	1,897	254
Rhenium (Re)	0.00071	0.00105	0.00085	0.00087	0.00017	0.00100	0.00035	0.00057	0.00064	0.00033	0.00045	0.00052	0.00048	0.00048	0.00004
Rubidium (Rb)	15.1	21.6	26.8	21.2	5.9	15.9	11.5	18.3	15.2	3.4	11.0	10.0	9.1	10.0	1.0
Selenium (Se)	4.36	7.22	5.75	5.78	1.43	4.67	3.53	3.41	3.87	0.70	3.18	2.80	3.12	3.03	0.20
Silver (Ag)	0.160	0.320	0.459	0.313	0.150	0.182	0.175	0.178	0.178	0.004	0.170	0.154	0.182	0.169	0.014
Sodium (Na)	284	352	541	392	133	447	209	357	338	120	191	233	148	191	43
Strontium (Sr)	168.0	96.9	65.4	110.1	52.6	116.0	124.0	62.5	100.8	33.4	109.0	95.1	140.0	114.7	23.0
Thallium (Tl)	0.421	0.369	0.344	0.378	0.039	0.271	0.348	0.182	0.267	0.083	0.382	0.290	0.997	0.556	0.384
Thorium (Th)	3.57	3.65	6.29	4.50	1.55	3.36	3.06	4.90	3.77	0.99	2.81	4.72	2.94	3.49	1.07
Tin (Sn)	0.282	0.280	0.555	0.372	0.158	0.236	0.224	0.312	0.257	0.048	0.158	0.156	0.141	0.152	0.009
Titanium (Ti)	246	300	615	387	199	273	259	410	314	83	263	210	227	233	27
Uranium (U)	2.41	2.54	2.28	2.41	0.13	1.96	2.05	1.78	1.93	0.14	3.23	2.89	3.28	3.13	0.21
Vanadium (V)	33.0	41.5	55.4	43.3	11.3	32.5	31.7	38.2	34.1	3.5	33.4	30.1	29.6	31.0	2.1
Yttrium (Y)	19.70	31.60	25.30	25.53	5.95	17.70	12.90	11.30	13.97	3.33	9.66	9.17	9.94	9.59	0.39
Zinc (Zn)	19,800	12,000	4,770	12,190	7,517	9,290	11,100	4,130	8,173	3,617	3,600	2,680	3,990	3,423	673
Zirconium (Zr)	7.98	8.31	10.20	8.83	1.20	8.17	8.10	9.38	8.55	0.72	6.53	5.83	5.98	6.11	0.37

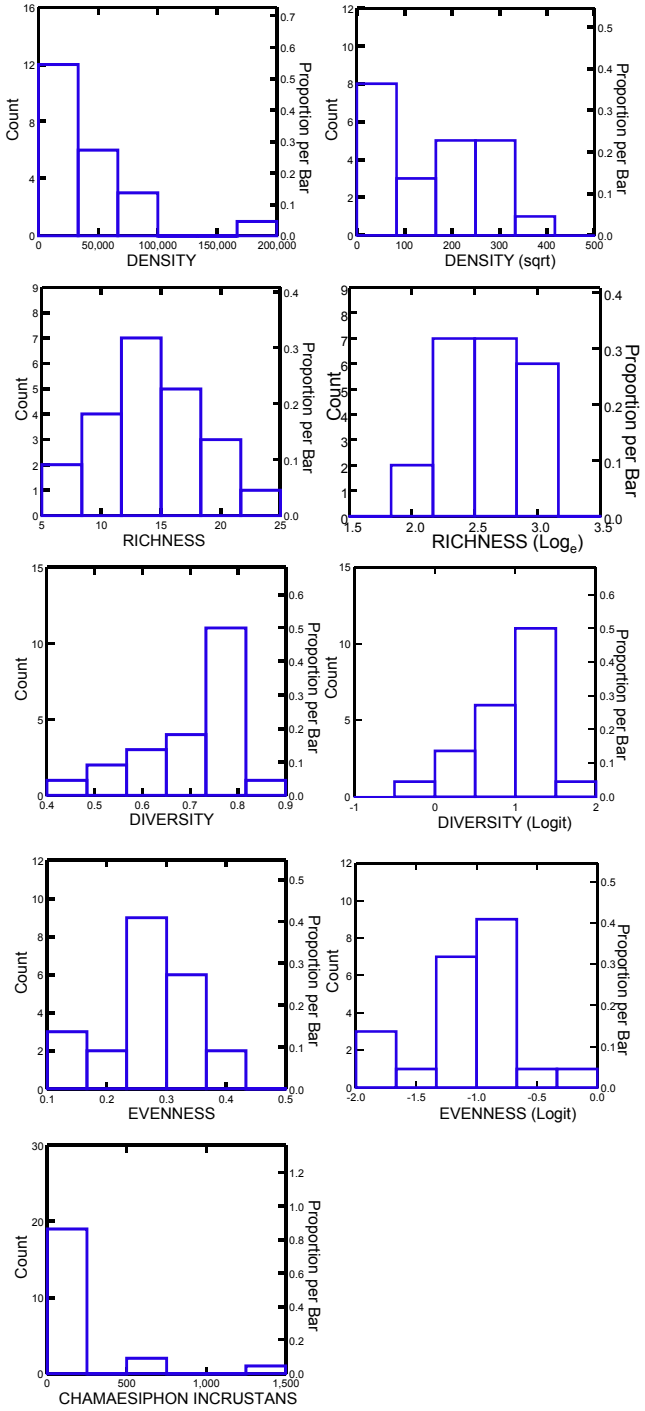


Figure D.1: Histograms of the absolute abundance (density) raw and transformed data for reference area (n = 22) periphyton community endpoints, Faro Mine, August 2014.

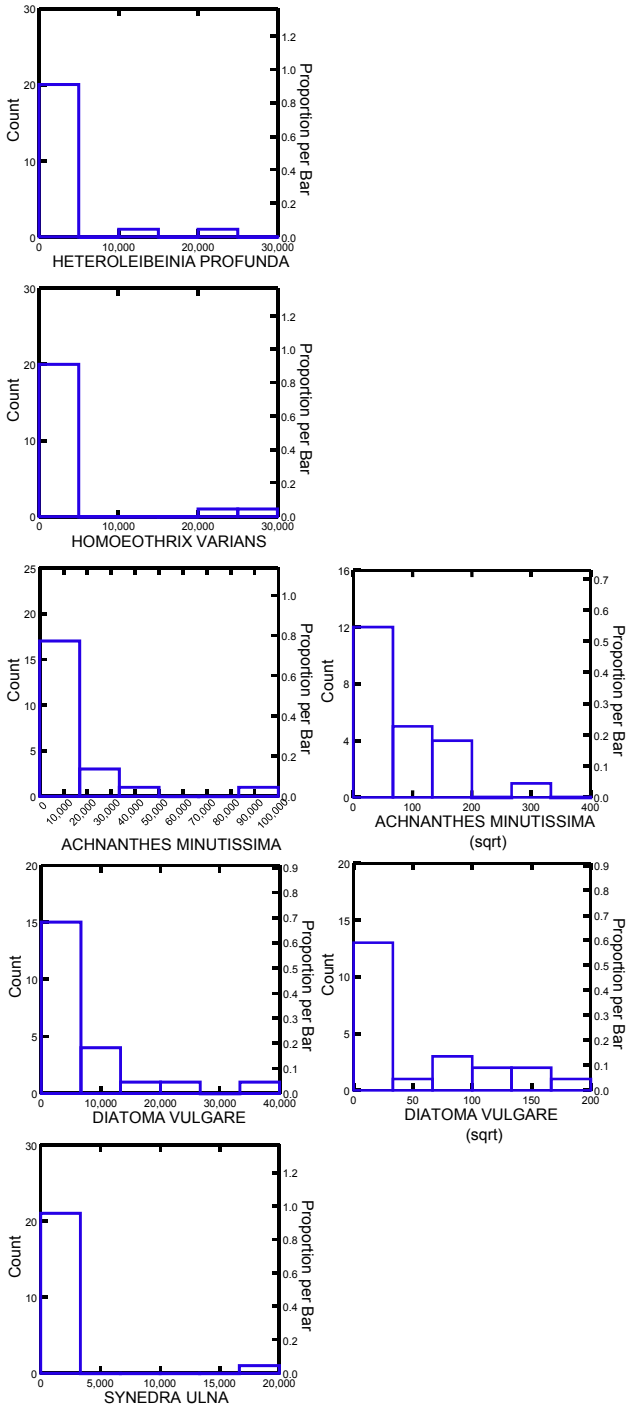


Figure D.1: Histograms of the absolute abundance (density) raw and transformed data for reference area (n = 22) periphyton community endpoints, Faro Mine, August 2014.

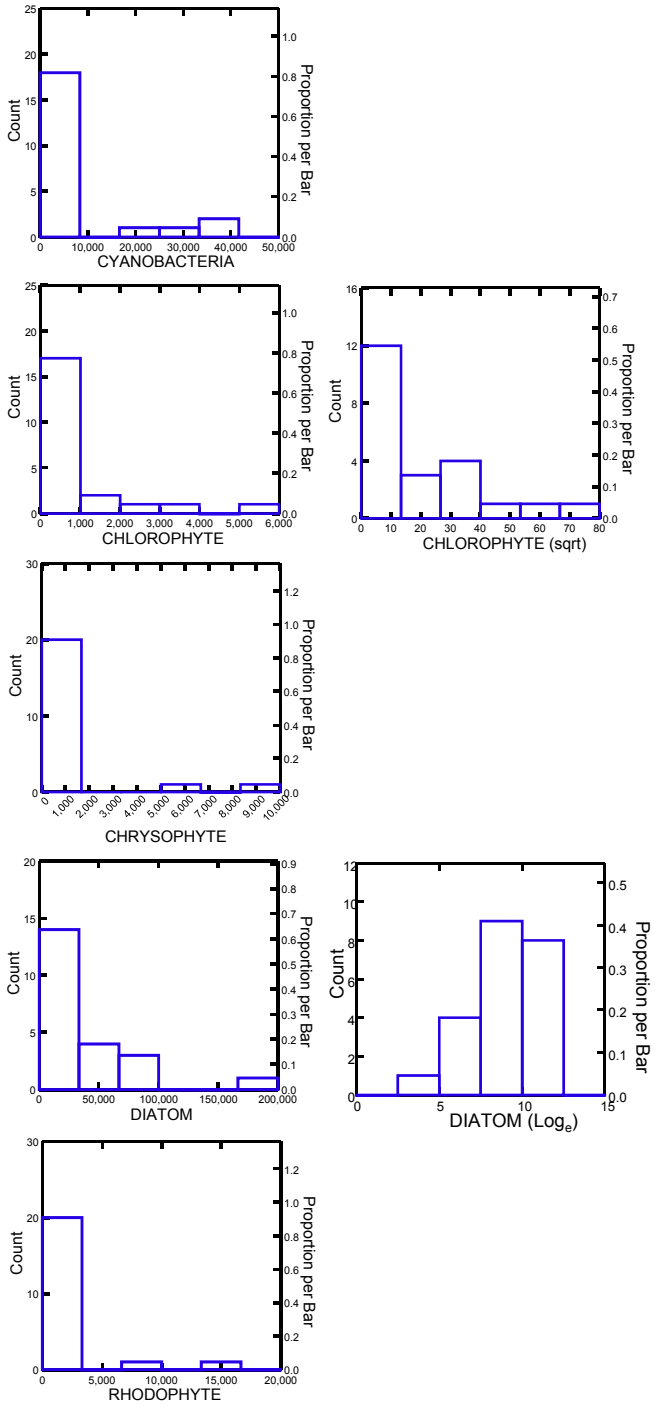


Figure D.1: Histograms of the absolute abundance (density) raw and transformed data for reference area (n = 22) periphyton community endpoints, Faro Mine, August 2014.

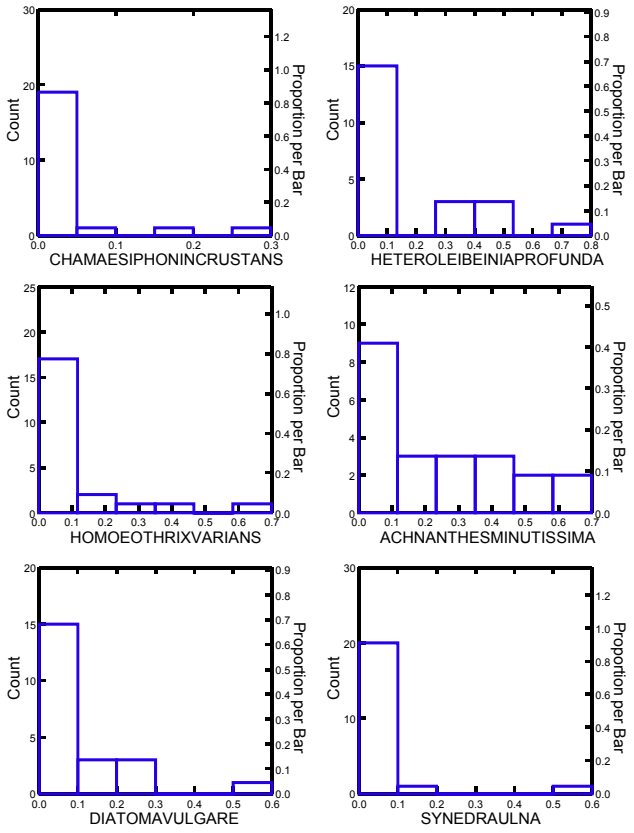


Figure D.2: Histograms of the relative abundance (proportional) data for reference area (n = 22) periphyton community endpoints, Faro Mine, August 2014.

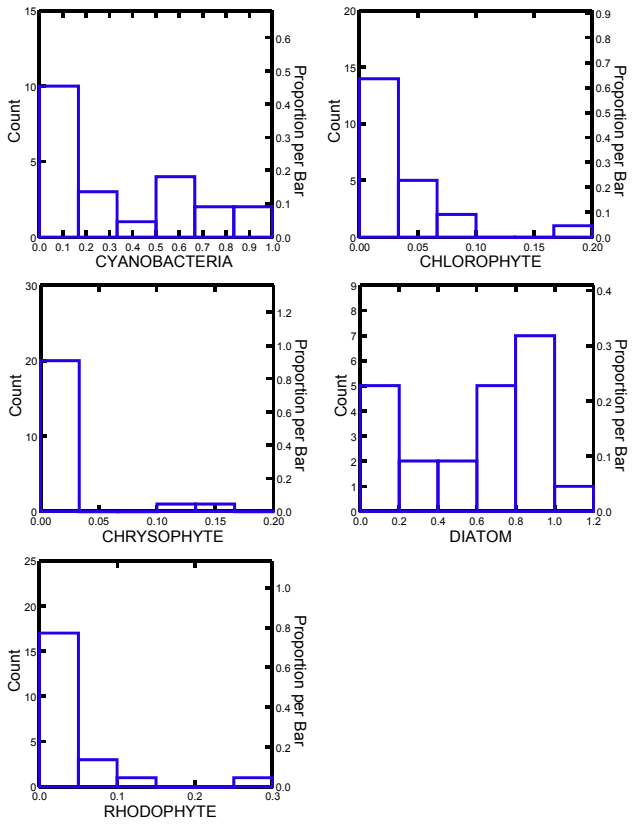


Figure D.2: Histograms of the relative abundance (proportional) data for reference area (n = 22) periphyton community endpoints, Faro Mine, August 2014.

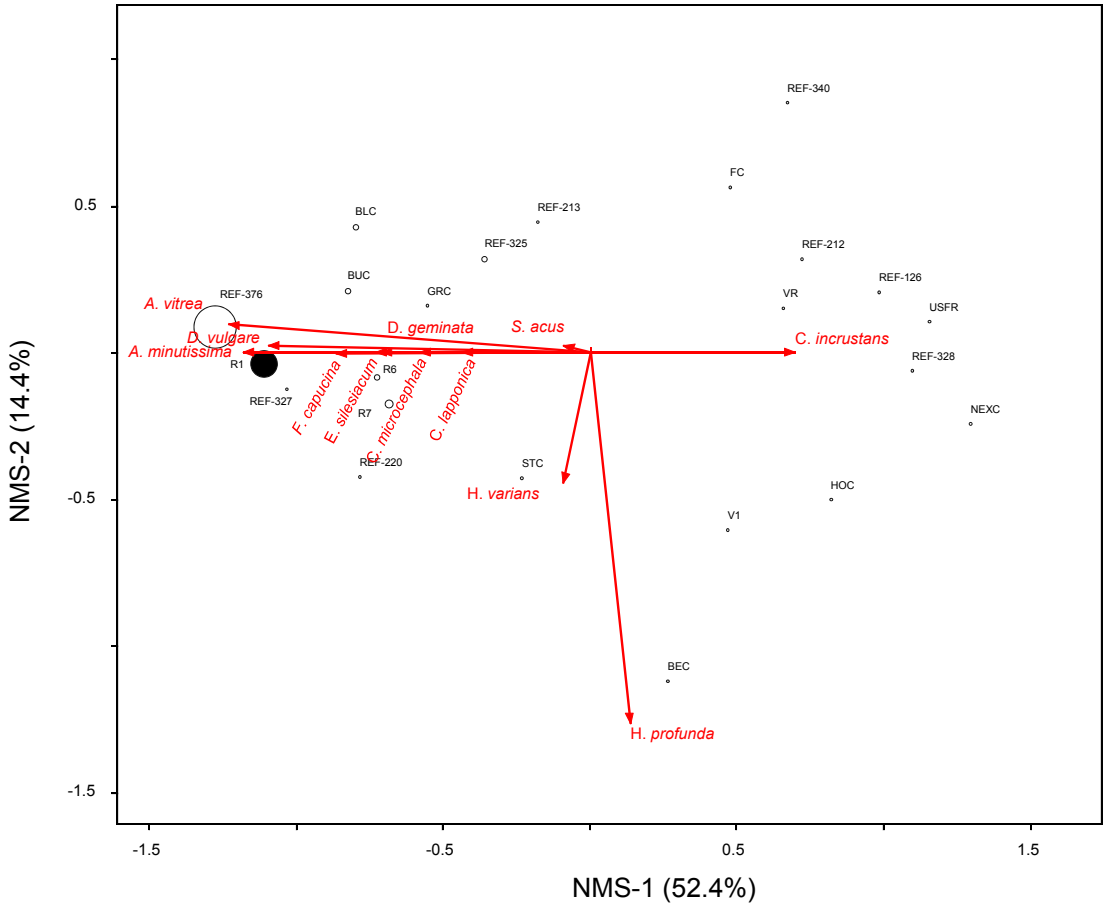


Figure D.3: Nonmetric multidimensional scaling (NMS) biplot of periphyton community structure at 22 reference areas and exposed area R1. Symbol size is proportional to the density of *Didymosphenia geminata* at an area. Displayed vectors have significant ($p < 0.05$) absolute Spearman correlation coefficient (r) greater than 0.50 with either NMS-1 or NMS-2; vector length is proportional to correlation strength. Lowest practical level of taxonomy was employed excluding taxa that were not found in more than one area. A stable 3-dimensional solution was found with stress of 8.73 .

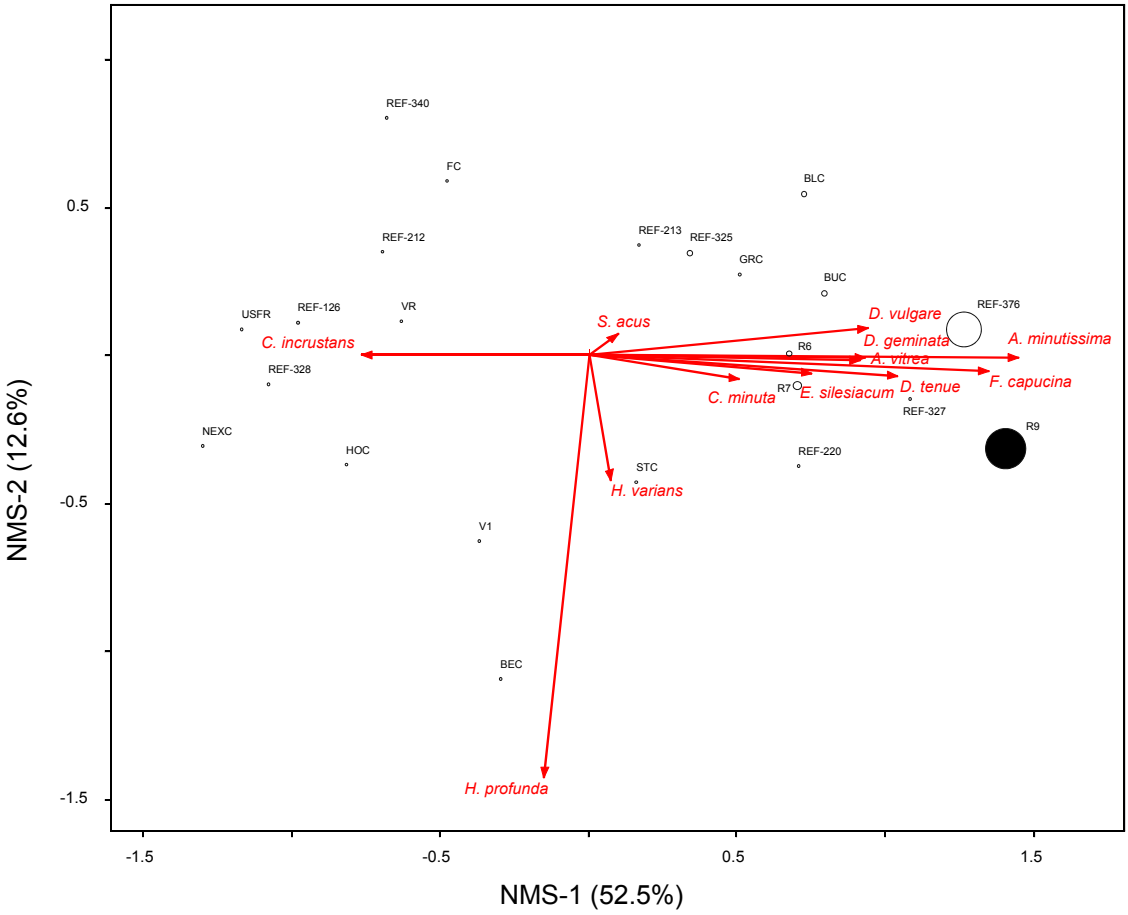


Figure D.4: Nonmetric multidimensional scaling (NMS) biplot of periphyton community structure at 22 reference areas and exposed area R9. Symbol size is proportional to the density of *Didymosphenia geminata* at an area. Displayed vectors have significant ($p < 0.05$) absolute Spearman correlation coefficient (r) greater than 0.50 with either NMS-1 or NMS-2; vector length is proportional to correlation strength. Lowest practical level of taxonomy was employed excluding taxa that were not found in more than one area. A stable 3-dimensional solution was found with stress of 8.64 .

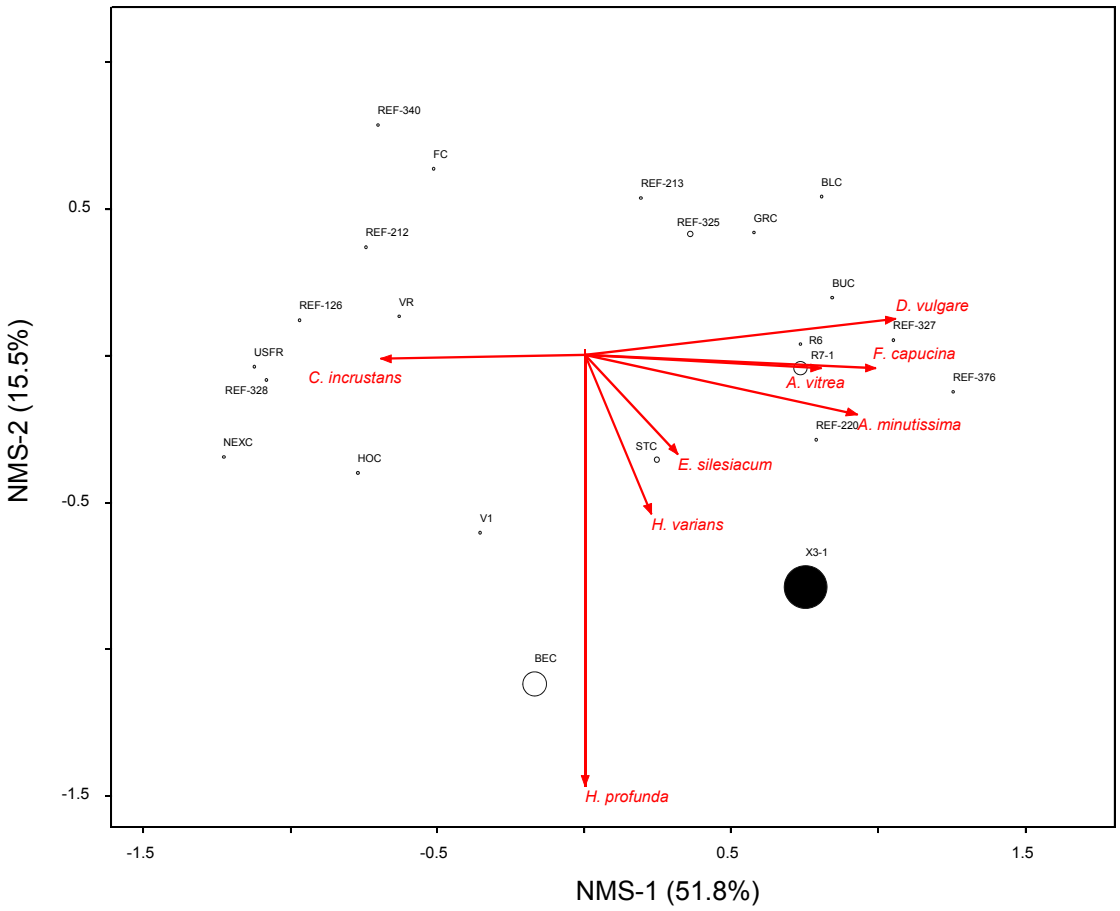


Figure D.5: Nonmetric multidimensional scaling (NMS) biplot of periphyton community structure at 22 reference areas and exposed area X3. Symbol size is proportional to the density of *Audouinella sp.* at an area. Displayed vectors have significant ($p < 0.05$) absolute Spearman correlation coefficient (r) greater than 0.50 with either NMS-1 or NMS-2; vector length is proportional to correlation strength. Lowest practical level of taxonomy was employed excluding taxa that were not found in more than one area. A stable 3-dimensional solution was found with stress of 8.75 .

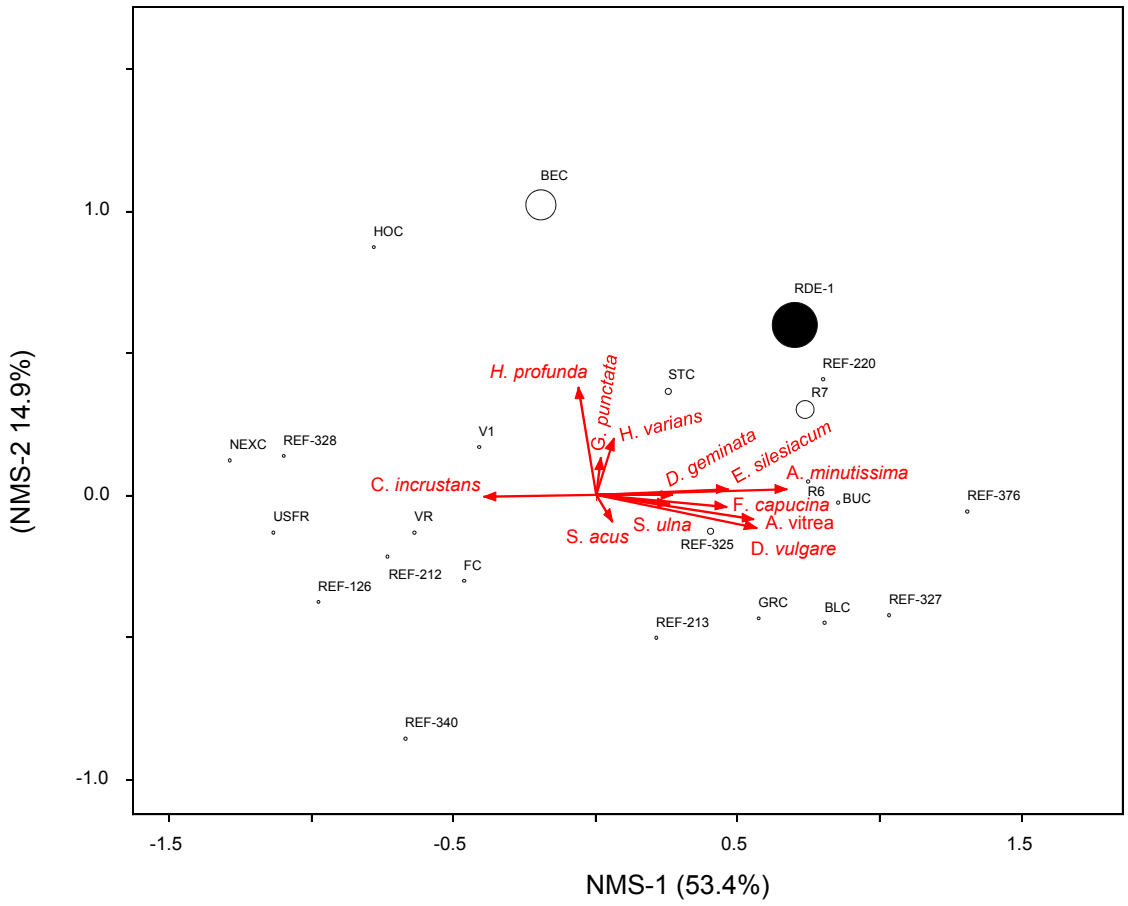


Figure D.6: Nonmetric multidimensional scaling (NMS) biplot of periphyton community structure at 22 reference areas and exposed area RDE-1. Symbol size is proportional to the density of *Audouinella* (Chantransia stage) at an area. Displayed vectors have significant ($p < 0.05$) absolute Spearman correlation coefficient (r) greater than 0.50 with either NMS-1 or NMS-2; vector length is proportional to correlation strength. Lowest practical level of taxonomy was employed excluding taxa that were not found in more than one area. A stable 3-dimensional solution was found with stress of 9.02.

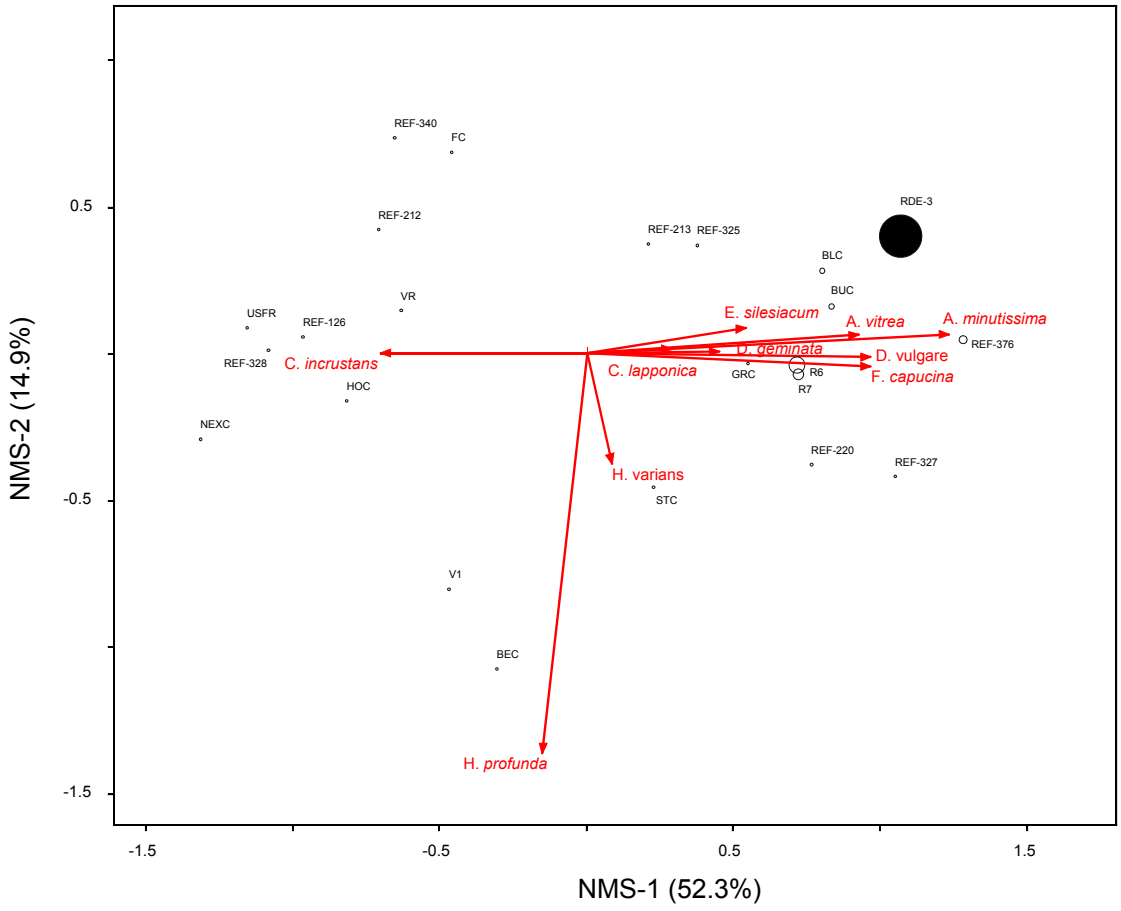


Figure D.7: Nonmetric multidimensional scaling (NMS) biplot of periphyton community structure at 22 reference areas and exposed area RDE-3. Symbol size is proportional to the density of *Encyonema silesiacum* at an area. Displayed vectors have significant ($p < 0.05$) absolute Spearman correlation coefficient (r) greater than 0.50 with either NMS-1 or NMS-2; vector length is proportional to correlation strength. Lowest practical level of taxonomy was employed excluding taxa that were not found in more than one area. A stable 3-dimensional solution was found with stress of 8.69.

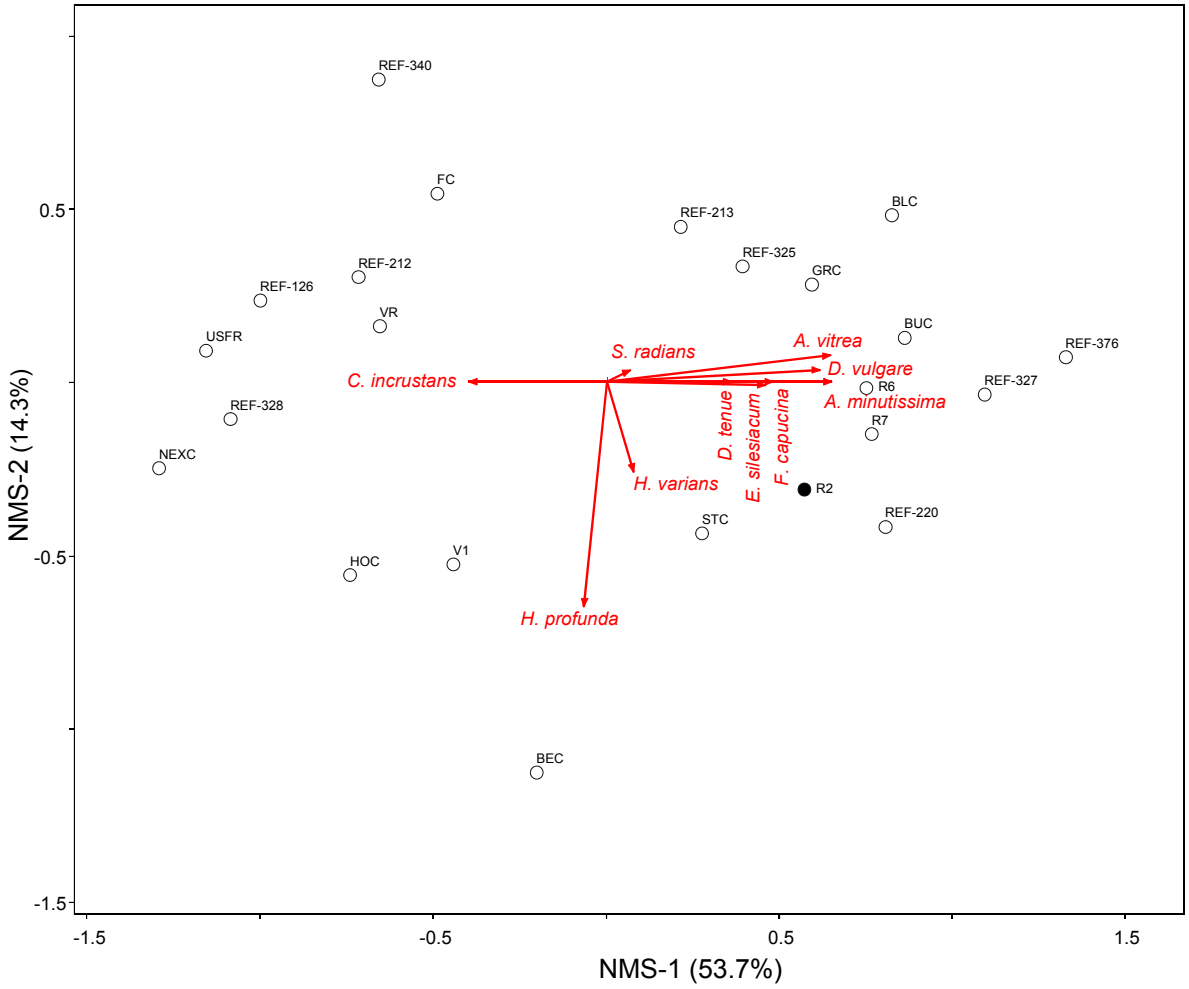


Figure D.8: Nonmetric multidimensional scaling (NMS) biplot of periphyton community structure at 22 reference areas and exposed area R2. Displayed vectors have significant ($p < 0.05$) absolute Spearman correlation coefficient (r) greater than 0.50 with either NMS-1 or NMS-2; vector length is proportional to correlation strength. Lowest practical level of taxonomy was employed excluding taxa that were not found in more than one area. A stable 3-dimensional solution was found with stress of 8.90.

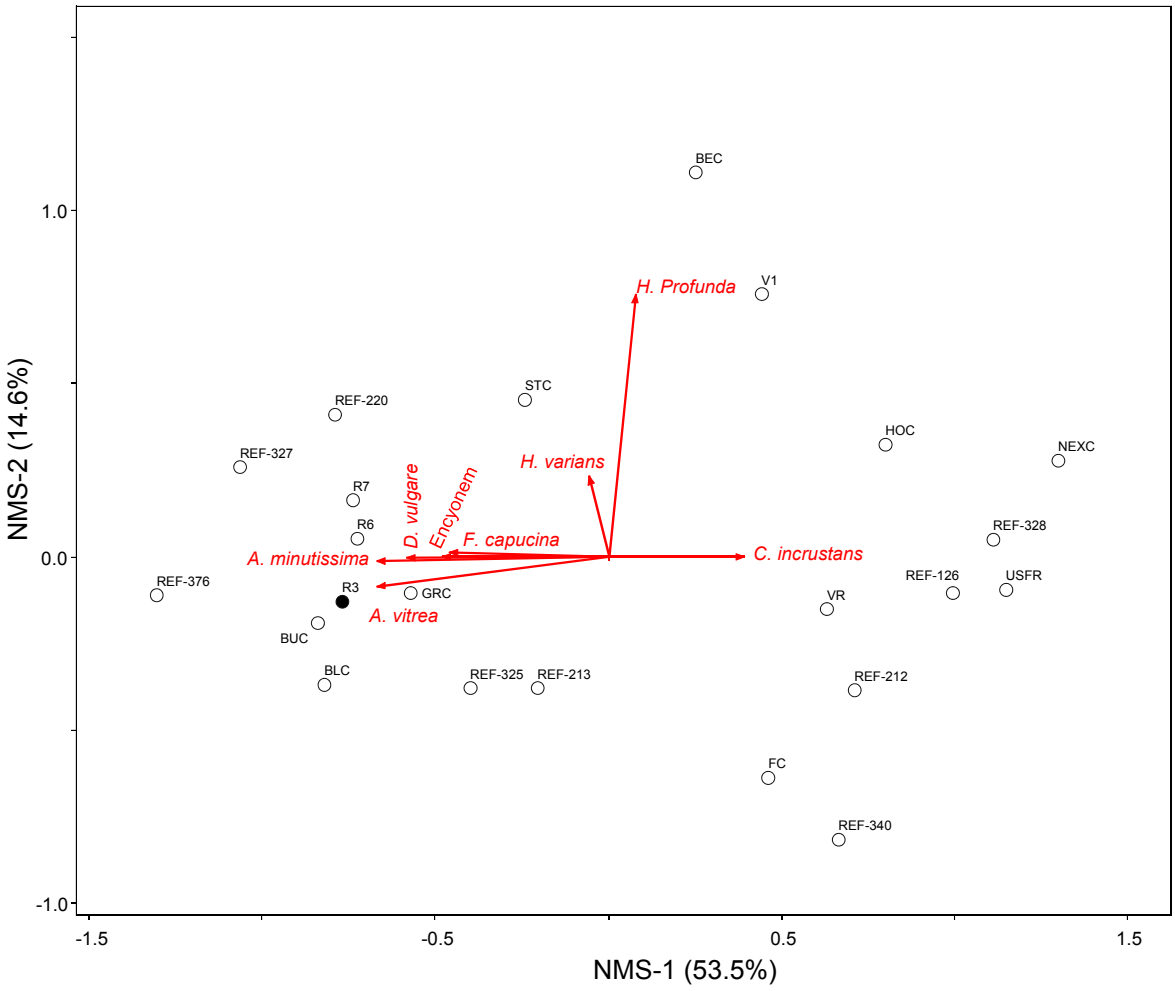


Figure D.9: Nonmetric multidimensional scaling (NMS) biplot of periphyton community structure at 22 reference areas and exposed area R3. Displayed vectors have significant ($p < 0.05$) absolute Spearman correlation coefficient (r) greater than 0.50 with either NMS-1 or NMS-2; vector length is proportional to correlation strength. Lowest practical level of taxonomy was employed excluding taxa that were not found in more than one area. A stable 3-dimensional solution was found with stress of 8.78.

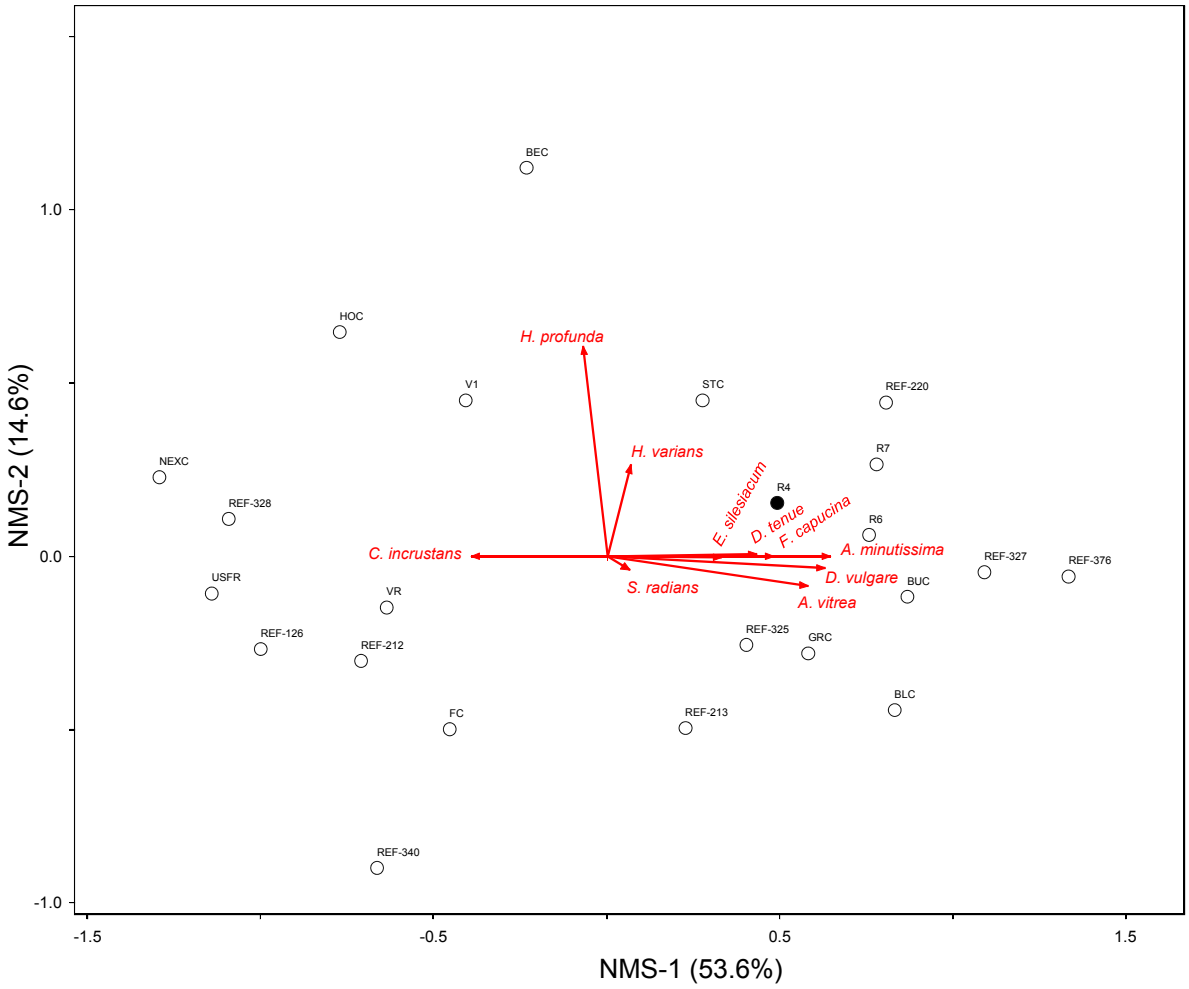


Figure D.10: Nonmetric multidimensional scaling (NMS) biplot of periphyton community structure at 22 reference areas and exposed area R4. Displayed vectors have significant ($p < 0.05$) absolute Spearman correlation coefficient (r) greater than 0.50 with either NMS-1 or NMS-2; vector length is proportional to correlation strength. Lowest practical level of taxonomy was employed excluding taxa that were not found in more than one area. A stable 3-dimensional solution was found with stress of 8.78.

APPENDIX E

BENTHIC INVERTEBRATE DATA

Table E.1: Benthic invertebrate biomass sampled in the vicinity of the Faro Mine, August 2014.

Area	Station	Total Biomass (preserved wet weight g/m^2)	Biomass (g/m^2)										Taxa included as "Other"
			Hydropsychidae	Brachycentridae	Chironomidae	Nemouridae	Limnephilidae	Rhyacophilidae	Heptageniidae	Ephemerellidae	Ceratopogonidae	Other Taxa	
Reference (North Fork)	R7	4.3	1.8		1.5							1.0	Nemouridae, Trichoptera, Ephemerellidae, Heptageniidae, Rhyacophilidae, Empididae, Arachnida, Perlodidae, Chloroperlidae, Capniidae, Baetidae, Glossosomatidae, Tipulidae, Ceratopogonidae, Simuliidae
South Fork	R1	3.9			0.7	0.5		0.4		1.1	0.4	0.7	Empididae, Psychodidae, Arachnida, Oligochaeta, Simuliidae, Heptageniidae, Perlodidae, Ameletidae, Baetidae, Taeniopterygidae
North Fork	R9	5.6	2.7		0.6	0.6			0.7			1.0	Ephemerellidae, Capniidae, Chloroperlidae, Perlodidae, Baetidae, Ceratopogonidae, Rhyacophilidae, Empididae, Arachnida, Taeniopterygidae, Brachycentridae, Ameletidae, Psychodidae, Oligochaeta
North Fork	X2	2.3	0.7		0.3	0.4	0.4	0.3				0.2	Heptageniidae, Epheremerllidae, Empididae, Trichoptera Pupa, Simuliidae, Perlodidae, Arachnida, Capniidae, Chloroperlidae, Brachycentridae, Baetidae, Glossosomatidae, Taeinopterygidae
Pumphouse Pond Outlet	X3	6.4	1.9	1.9	1.4							1.2	Nemouridae, Limnephilidae, Chloroperlidae, Arachnida, Perlodidae, Heptageniidae, Rhyacophilidae, Baetidae, Ephemerellidae, Psychodidae, Taeniopterygidae, Simuliidae, Capniidae, Ceratopogonidae
Rose Creek Diversion	RDE-1	3.1			2.5							0.6	Nemouridae, Ephemerellidae, Ceratopogonidae, Arachnida, Perlodidae, Empididae, Brachycentridae, Rhyacophilidae, Hydropsychidae, Capniidae, Leutridae, Baetidae, Psychodidae
	RDE-2	1.7			1.1	0.2						0.4	Arachnida, Perlodidae, Chloroperlidae, Tipulidae, Brachycentridae, Empididae, Ephemerellidae, Oligochaeta, Baetidae, Heptageniidae, Psychodidae, Capniidae, Ceratopogonidae
	RDE-3	2.7			1.5	0.5						0.6	Rhyacophilidae, Empididae, Chloroperlidae, Heptageniidae, Arachnida, Epheremerllidae, Baetidae, Perlodidae, Hydropsychidae, Plecoptera, Ceratopogonidae
Downstream of RCTA	R2	2.2			0.8	0.8						0.6	Rhyacophilidae, Hydropsychidae, Perlodidae, Capniidae, Arachnida, Empididae, Heptageniidae, Ephemerellidae, Ceratopogonidae, Baetidiae, Tipulidae

Table E.2: Benthic invertebrate taxa counts, Faro Mine Aquatic Baseline, August 2014.

	Reference																					Minimally Influenced		Exposed										
																						South Fork Rose Creek		North Fork Rose Creek			Rose Creek Diversion			Rose Creek downstream from RCTA			Anvil Creek	
Sample:	R7	FC	R6	USFR	BLC	V1	VR	STC	HOC	BUC	NEXC	REF-327	REF-325	REF-213	REF-126	REF-328	REF-340	REF-212	GRC	BEC	REF-220	REF-376	R1	GRUM	R9	X2	X3	RDE-1	RDE-2	RDE-3	R2	R3	R4	R5	A1
Phylum: Arthropoda																																		
Subphylum: Hexapoda																																		
| Class: Insecta																																		
| Order: Ephemeroptera																																		
| Family: Ameletidae																																		
Ameletus		29	60	69	7	5	21	1			48			311	4	8	30		9				11	59	10					8			6	
| Family: Baetidae		12		11				6				1	8	11					6	40		65		41					8					
Acentrella insignificans																	30					5												
Acentrella sp.	13							7	3							4	120	1	2			40	56		30		58	8		8	33	45	47	13	23
Acentrella turbida					33					12																								
Baetis	25				47	10	321		100	94					7	8			2	620	44		222		30	53	100	62		142	42	120	124	19	35
Baetis bicaudatus					60					18			15		7			2			6													
Baetis flavistriga										29										80														
Baetis tricaudatus																				80							8							
| Family: Caenidae																											8							
Caenis sp.												1																						
| Family: Ephemerellidae	60	53	1220	78	87	10			35	182	48	2		89			90		1			65	811	153	270	28	42	262	150	17	75	15	135	19	28
Drunella coloradensis	3																									8			8	25				
Drunella doddsii	28	6	40	40	7			21	48	129	33		54	278		4	100	4				25		124	70	60	8			42	192	360	282	52	8
Drunella grandis group					7					24													11			3	17								5
Drunella sp.	15	12							8	29		3		44			30									5		46	8						3
Drunella spinifera			40						3														78											6	
Ephemerella					13					18			15				30					5					42		8						10
Ephemerella dorothea								1																										
Ephemerella needhami										6																								
Serratella	3																																	
| Family: Heptageniidae	13	235	200	111	127	480	116	14	65	82	324	73	338	522	168	554	680	87	123		25	85	156	118	150	100	92	15	17	50		115	153	181	108
Cinygmula sp.		6		11					8	18	71			89										6		13								
Epeorus deceptivus												16	185	11	200	50	30					5												
Epeorus grandis group				11																														
Epeorus longimanus												32	192		100	23		2																
Epeorus sp.	10	135		9	7	175	63	9	3	6	257	38	662	67	18	50	140	4	3		6	20	11	259	30	108					8	45	6	13	8
Heptagenia					7																										158				
Rhithrogena					107	170		6			10	22	8		204	35	10	109						6	10								68	10
| Order: Plecoptera									8		5	7		78		4					25		100	59				62				20			38
| Family: Capniidae		41	60		107	15	63	25	35	6	43	9		22	4	8	20	1	312		138	70		12	320	58			8	8	133	185	241	226	178
Capnura sp.										6			8		4						163														
| Family: Chloroperlidae	5	41		2		5	16	3			19	7			18	4	20	14	22		19	5					3	8			8	10	6	13	30
Haploperla sp.	25	6	20			50		40	8		29								21					6	40	10		8		25	58	60	71	32	
Suwallia						5						40	15	22	125	65	140	74			244	45					8	8							150
Sweltsa sp.	8	47	60	2	40	30	58			35	76		15		4	27	40	2				45	11	24						17		35	6	16	
| Family: Leuctridae		6		4							5			11		4	120				13					3						20		6	
Despaxia augusta				4						6			15	33								10												
| Family: Nemouridae	23	47	520	16	187			7		265			15	78	18	46	300		34	860	19	175	44		150		250		58		150	60	65		8
Malenka sp.																				20														
Visoka cataractae													23				10																	
Zapada	3	6		87		240	484	1	53		14								33				211	124	10	10		54	25	33	175	45	6	10	3
Zapada cinctipes	15	24	160	76	40			3	28	100	24	2	8	22			210		3		13		33	53	110	18	100	15	75	50	33	25	6		
Zapada columbiana				47				5			95	10			14	65	50				38	30		147								5		3	
Zapada oregonensis group	50	35	460	7	20			13	18	59	152	18	500	733	161	77	440		98		650	65	67	35	190	20	83	108	267	317	283	85	135	42	
| Family: Perlodidae	3	6	80	24	173			2	50	35		8	8	111	25	12	30	1	20		31	10	211	41		5	275	92	333	100	242	90	88	3	28
Kogotus sp.				2																														
Megarcys sp.						10	16	1	5									2	30		19				30		17				33	25	47	3	8
Skwala					7				3			4							13							3				8			6		
| Family: Taeniopterygidae	15		20					3	133			3		11				1			44	5	33		20		25	15	8		8				
Taenionema		53			67						14	4			7				11		188			6		5								
| Order: Trichoptera					7							1	31			12				40		5												
| Family: Brachycentridae					7									11						140							8							
Amiocentrus aspilus					7															120									33		5			
Brachycentrus americanus																				140														
Brachycentrus sp.																											15			8				
Micrasema																											8							
| Family: Glossosomatidae										24				22						40		5												
Glossosoma	18	6		24		10			20											80			11	53		10				17				
| Family: Hydropsychidae	8	6		36	13			1	20	112		6	46						3			10	11	112	50	20	8	8	25	25	17	5	24		
Arctopsyche grandis					7					18																								
Arctopsyche sp.									5			6	23	22		8	30										8							
Parapsyche sp.	8	6		4		15					10													18	10	13			8			15			
| Family: Hydroptilidae												1																						
Ochrotrichia sp.																																		

Table E.2: Benthic invertebrate taxa counts, Faro Mine Aquatic Baseline, August 2014.

	Reference																					Minimally Influenced		Exposed										
																						South Fork Rose Creek		North Fork Rose Creek			Rose Creek Diversion			Rose Creek downstream from RCTA			Anvil Creek	
Sample:	R7	FC	R6	USFR	BLC	V1	VR	STC	HOC	BUC	NEXC	REF-327	REF-325	REF-213	REF-126	REF-328	REF-340	REF-212	GRC	BEC	REF-220	REF-376	R1	GRUM	R9	X2	X3	RDE-1	RDE-2	RDE-3	R2	R3	R4	R5	A1
| Family: Limnephilidae		29		7							67				4		10					5		18										
Homophylax sp.														11																				
| Family: Rhyacophilidae																							11												
Rhyacophila	10	29		4		10		3	48	18	67	8	185	44	11		190	1	3			5			10	13			8	33		10	12		15
Rhyacophila arnaudi																15	30	2				5													
Rhyacophila atrata complex	3								3																							45	94	10	
Rhyacophila brunnea/vemna group					20			2	5	24												5		24			8			8		5			
Rhyacophila coloradensis group																4	50					5													
Rhyacophila hyalinata group	8	118				20		1				2	54				60	1	7					18		13				25	8	5			
Rhyacophila viquaea group																						5													
Rhyacophila vofixa group						5							46											35	10	3				17					
| Family: Uenoidae																																			
Neothremma sp.													23			4	20																		
| Order: Coleoptera																																			
| Family: Curculionidae									3																										
| Family: Staphylinidae		6																																	
| Order: Diptera		12												44				3														129			
| Family: Blephariceridae					13																														
Blepharicera sp.					13			2										1																	3
| Family: Ceratopogonidae	5		80																				100				17	62	17		67		24	10	
Bezzia/ Palpomyia					13					18							40		20	80				47								40			10
Probezzia				2					10															47		35		77	33	8					
| Family: Chironomidae																														17					
| Subfamily: Chironominae																																			
| Tribe: Tanytarsini																																			
Micropsectra	5		180	4	80						5									100			33	76	40	5						5		6	
Rheotanytarsus				7						171										2500			33			3	92		25						
Stempellina sp.				2																															
| Subfamily: Diamesinae																																			
Arctodiamesa appendiculata																																			
| Tribe: Diamesini																																			
Diamesa						25	11			24		2	15	78					107		181	100													
Pagastia	35	200	180	9		15			5		67			200	11	4	820		3		56	285	56	94	150	43	650	446	275	367	708	210	100	6	23
Pseudodiamesa sp.							5																												
| Subfamily: Orthocladiinae																																			
Cricotopus						305	74																												
Eukiefferiella	33	100	140	9	33	65	21	56		129	38	3	77	133	7	19	110			620	25		156		170	53	150	108	58	58	33	35	18	13	5
Heleniella sp.																		1																	
Heterotrissocladius sp.																																			8
Hydrobaenus					13																														
Metriocnemus sp.																													8						
Orthocladius sp.	263	424	3700		507	105		11	15	18		2		233	14	65	120	2	6	160		495	867		1200	23	325	685	392	858	75	45	47	116	80
Rheocricotopus	10		60	2		30					124																								
Synorthocladius		6									10	1		22											20										
Tvetenia	13							6		35				22		19		2		80				100	70		25	31							
| Tribe: Corynoneurini																																			
Thienemanniella				2																															
| Subfamily: Tanypodinae																																			
| Tribe: Pentaneuriini																																			
Thienemannimyia group				11											4			1		180		5						31	67	217	8			3	
| Family: Deuterophlebiidae																																			
Deuterophlebia sp.								3			5																								
| Family: Empididae							5												1								17								
Chelifera/ Metachela										24		1	23	44	7		50			140		5												5
Neoplasta sp.	43	6	60	7	33			5	13		5						10		9			5		18	70	15		69	50	117	67	45	18		
Oreogeton sp.		59				15	5	1	23	12	10		46			15			19		63	5												5
| Family: Psychodidae																																			
Pericoma/Telmatoscopus sp.			180		153				10		5										13		356	6	50		33	38				45	35	45	
| Family: Simuliidae							216		5		5												44		20	8			50			50	18		
Helodon sp.							74					2														10	17					10			
Prosimulium							100						38			12					56					3							3		
Simulium				2	33				3	18								2	4	1020				18							8	5			5
| Family: Tipulidae					13										4																				
Dicranota	5	12	120				5		3				23	11										6	10	3		38	8		8			13	20
Gonomyodes sp.																					13														
Ormosia sp.																																			
Rhabdomastix sp.																																			
Tipula																			1	20															
Subphylum: Chelicerata																																			

Table E.2: Benthic invertebrate taxa counts, Faro Mine Aquatic Baseline, August 2014.

	Reference																					Minimally Influenced		Exposed										
																						South Fork Rose Creek		North Fork Rose Creek			Rose Creek Diversion			Rose Creek downstream from RCTA			Anvil Creek	
Sample:	R7	FC	R6	USFR	BLC	V1	VR	STC	HOC	BUC	NEXC	REF-327	REF-325	REF-213	REF-126	REF-328	REF-340	REF-212	GRC	BEC	REF-220	REF-376	R1	GRUM	R9	X2	X3	RDE-1	RDE-2	RDE-3	R2	R3	R4	R5	A1
| Class: Arachnida																																		
| Order: Trombidiformes						10		1															22					15					3	
Acalyptonotus neoviolaceus		18																																
| Family: Aturidae																																		
Aturus			40		7					12							10					5					8	38	17	25					
| Family: Hydryphantidae																																		
Wandesia sp.			20																															
| Family: Hygrobatidae																																		
Atractides	3	12									24	2	46											6	10				8					
Hygrobates				2										22														8	17	8					
| Family: Lebertiidae																																		
Lebertia	8	18	140	20	67				3	76	5	3					70					10	56	29	10		125	46	300	133	42	35	29	23	8
| Family: Sperchontidae																																		
Sperchon	43	29	220	13	27	40		2	20	71	19			44		12	50		2	660		15	133	24	80	5	25	115	283	108	42	40	53	16	
Sperchonopsis sp.																				200							8								
| Family: Torrenticolidae																																		
Testudacarus sp.																												8	8						
Torrenticola					33																													
Phylum: Mollusca																																		
| Class: Bivalvia																																		
| Order: Veneroida																																		
| Family: Pisidiidae																																		
Pisidium																				20								8							
| Class: Gastropoda																			1															
| Order: Basommatophora																																		
| Family: Planorbidae																				100														
Phylum: Annelida																																		
Subphylum: Clitellata																																		
| Class: Oligochaeta								1															44											
| Order: Lumbriculida																																		
| Family: Lumbriculidae														44																				
| Order: Tubificida																																		
| Family: Enchytraeidae																																		
Enchytraeus			20						8				8	78		4		2		80							8	8	25			20		6	
| Family: Lumbricidae																				20														
Totals:	**838**	**1896**	**8080**	**778**	**2249**	**1875**	**1674**	**263**	**836**	**1963**	**1733**	**340**	**2768**	**3628**	**1150**	**1241**	**4340**	**322**	**929**	**8240**	**2092**	**1655**	**4099**	**2022**	**3450**	**791**	**2673**	**2617**	**2688**	**2874**	**2739**	**2040**	**2025**	**1004**	**868**
Taxa present but not included:																																		
Terrestrials				4																														
Phylum: Arthropoda																																		
| Class: Entognatha																																		
| Order: Collembola	3																	1																
Subphylum: Crustacea																																		
| Class: Ostracoda						50			5	47	10				7	19				120									8		125	30			
| Class: Copepoda									3																			8							
Phylum: Nemata			100	9			26	2												60						3		8	33				6	3
Phylum: Platyhelminthes																																		
| Class: Turbellaria									3					22																				3
Totals:	**3**	**0**	**100**	**13**	**0**	**50**	**26**	**2**	**11**	**47**	**10**	**0**	**0**	**22**	**7**	**19**	**0**	**1**	**0**	**180**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**16**	**41**	**0**	**125**	**30**	**0**	**6**	**6**

Table E.3: Metal concentrations (mg/kg dw) for benthic invertebrate tissue, Faro Mine Aquatic Baseline, August 2014.

Analyte	Reference					Minimally Influenced										Exposed			
	North Fork (R7)					South Fork (R1)					North Fork upstream from Haul Road (R9)					North Fork downstream from Haul Road (X2)			
	R7-1	R7-2	R7-3	Mean	Std. Dev.	R1-1	R1-2	R1-3	Mean	Std. Dev.	R9-1	R9-2	R9-3	Mean	Std. Dev.	X2-1	X2-2	Mean	Std. Dev.
Aluminum (Al)	679	2,230	2,340	1,750	929	961	1,300	3,220	1,827	1,218	2,120	2,330	1,780	2,077	278	2,900	1,190	2,045	1,209
Antimony (Sb)	0.0254	0.0090	0.0242	0.0195	0.0091	0.0145	0.0102	0.0105	0.0117	0.0024	0.0185	0.0411	0.0216	0.0271	0.0123	0.0015	0.0323	0.0169	0.0218
Arsenic (As)	2.81	4.68	4.45	3.98	1.02	2.23	3.22	3.03	2.83	0.53	6.44	4.80	4.29	5.18	1.12	7.35	7.12	7.24	0.16
Barium (Ba)	47.5	77.4	56.0	60.3	15.4	42.4	59.2	55.4	52.3	8.8	49.8	60.6	51.2	53.9	5.9	58.7	45.1	51.9	9.6
Beryllium (Be)	0.045	0.106	0.179	0.110	0.067	0.074	0.080	0.122	0.092	0.026	0.377	0.161	0.076	0.205	0.155	0.206	0.217	0.212	0.008
Bismuth (Bi)	0.0128	0.0226	0.0430	0.0261	0.0154	0.0210	0.0214	0.0266	0.0230	0.0031	0.3230	0.0380	0.0291	0.1300	0.1672	0.0434	0.3210	0.1822	0.1963
Boron (B)	0.72	1.24	1.06	1.01	0.26	1.25	1.60	1.21	1.35	0.21	1.71	1.23	1.17	1.37	0.30	1.45	0.45	0.95	0.71
Cadmium (Cd)	0.31	1.92	0.28	0.84	0.94	0.75	0.58	1.26	0.86	0.36	0.57	0.75	0.40	0.57	0.18	1.32	1.52	1.42	0.14
Calcium (Ca)	763	1,370	1,100	1,078	304	6,080	1,440	2,370	3,297	2,455	1,760	2,080	1,220	1,687	435	5,640	1,320	3,480	3,055
Cesium (Cs)	0.103	0.270	0.254	0.209	0.092	0.184	0.205	0.425	0.271	0.133	0.324	0.395	0.291	0.337	0.053	0.518	0.215	0.367	0.214
Chromium (Cr)	1.43	3.45	3.04	2.64	1.07	2.12	2.69	6.77	3.86	2.54	4.97	8.06	4.60	5.88	1.90	9.30	2.45	5.88	4.84
Cobalt (Co)	1.02	2.73	1.96	1.90	0.86	1.64	2.21	3.98	2.61	1.22	1.70	2.42	1.33	1.82	0.55	6.67	5.83	6.25	0.59
Copper (Cu)	14.7	22.8	13.1	16.9	5.2	46.5	20.1	24.0	30.2	14.3	15.6	16.5	15.1	15.7	0.7	15.7	18.1	16.9	1.7
Gallium (Ga)	0.291	0.948	0.912	0.717	0.369	0.268	0.496	1.270	0.678	0.525	0.799	0.861	0.630	0.763	0.120	1.450	0.652	1.051	0.564
Iron (Fe)	1,900	3,490	4,640	3,343	1,376	2,440	2,550	6,410	3,800	2,261	3,380	4,210	3,020	3,537	610	4,990	9,660	7,325	3,302
Lead (Pb)	0.72	1.24	1.78	1.25	0.53	1.57	1.52	3.02	2.04	0.85	6.93	7.63	8.16	7.57	0.62	68.10	47.30	57.70	14.71
Lithium (Li)	1.06	3.47	4.44	2.99	1.74	1.77	2.52	6.60	3.63	2.60	3.45	4.56	2.86	3.62	0.86	9.34	1.76	5.55	5.36
Magnesium (Mg)	1,060	1,520	1,370	1,317	235	2,760	1,460	2,490	2,237	686	1,480	1,990	1,570	1,680	272	2,800	1,460	2,130	948
Manganese (Mn)	831	1,180	767	926	222	582	756	948	762	183	441	384	366	397	39	515	283	399	164
Mercury (Hg)	0.0538	0.0557	0.0467	0.0521	0.0047	0.0375	0.0380	0.0351	0.0369	0.0016	0.0471	0.0526	0.0526	0.0508	0.0032	0.100	0.111	0.106	0.008
Molybdenum (Mo)	0.476	0.468	0.441	0.462	0.018	0.375	0.358	0.341	0.358	0.017	0.425	0.438	0.525	0.463	0.054	0.463	0.529	0.496	0.047
Nickel (Ni)	1.71	2.92	3.49	2.71	0.91	2.77	3.97	6.13	4.29	1.70	4.14	8.74	3.04	5.31	3.02	5.51	6.93	6.22	1.00
Phosphorus (P)	9,450	9,450	7,710	8,870	1,005	8,470	8,820	7,470	8,253	701	8,690	9,570	9,660	9,307	536	5,230	9,640	7,435	3,118
Potassium (K)	8,880	9,240	7,820	8,647	738	8,030	9,620	6,600	8,083	1,511	7,920	8,460	9,390	8,590	744	6,870	10,200	8,535	2,355
Rhenium (Re)	<0.00032	<0.00021	<0.00017	0.00023	0.00008	0.00056	<0.00023	<0.00034	0.00038	0.00017	<0.00027	<0.00017	<0.00021	0.00022	0.00005	0.00122	0.00017	0.00070	0.00074
Rubidium (Rb)	7.14	13.60	7.92	9.55	3.53	6.11	5.65	8.70	6.82	1.64	10.40	10.10	9.58	10.03	0.41	10.20	9.35	9.78	0.60
Selenium (Se)	2.96	3.90	2.51	3.12	0.71	2.05	2.24	2.47	2.25	0.21	3.07	3.37	3.30	3.25	0.16	3.23	4.02	3.63	0.56
Silver (Ag)	0.0453	0.0509	0.1660	0.0874	0.0681	0.0881	0.0696	0.0733	0.0770	0.0098	0.0865	0.0867	0.0642	0.0791	0.0129	0.0969	0.1160	0.1065	0.0135
Sodium (Na)	4,180	3,530	3,610	3,773	354	4,370	3,910	2,310	3,530	1,081	3,390	3,920	4,260	3,857	438	3,640	4,550	4,095	643
Strontium (Sr)	4.1	13.6	9.0	8.9	4.7	27.0	10.2	11.9	16.4	9.2	8.3	8.0	5.8	7.4	1.4	27.8	7.3	17.6	14.5
Thallium (Tl)	0.0136	0.0318	0.0275	0.0243	0.0095	0.0233	0.0208	0.0393	0.0278	0.0100	0.0523	0.0444	0.0372	0.0446	0.0076	0.0948	0.0786	0.0867	0.0115
Thorium (Th)	0.267	0.801	0.684	0.584	0.281	0.411	0.468	1.190	0.690	0.434	0.605	0.515	0.427	0.516	0.089	1.040	0.632	0.836	0.288
Tin (Sn)	0.0364	0.0266	0.0437	0.0356	0.0086	0.3570	0.0525	0.0603	0.1566	0.1736	0.1240	0.0927	0.0523	0.0897	0.0359	0.0083	0.0403	0.0243	0.0226
Titanium (Ti)	16.9	15.8	23.3	18.7	4.1	27.5	25.2	61.8	38.2	20.5	40.9	59.4	36.7	45.7	12.1	5.1	24.3	14.7	13.6
Uranium (U)	0.237	0.383	0.386	0.335	0.085	0.516	0.432	0.365	0.438	0.076	0.359	0.382	0.275	0.339	0.056	0.313	0.418	0.366	0.074
Vanadium (V)	2.04	5.89	5.73	4.55	2.18	2.23	2.68	6.89	3.93	2.57	5.54	7.81	6.20	6.52	1.17	7.18	4.25	5.72	2.07
Yttrium (Y)	0.485	1.370	1.020	0.958	0.446	0.771	0.842	1.810	1.141	0.580	1.340	1.360	0.970	1.223	0.220	3.060	4.660	3.860	1.131
Zinc (Zn)	145	196	125	155	37	177	157	199	178	21	147	182	180	170	20	1060	1060	1,060	0
Zirconium (Zr)	0.62	0.97	0.97	0.85	0.20	0.81	1.02	1.53	1.12	0.37	0.88	1.23	0.93	1.01	0.19	0.48	1.20	0.84	0.51

Table E.3: Metal concentrations (mg/kg dw) for benthic invertebrate tissue, Faro Mine Aquatic Baseline, August 2014.

Analyte	Exposed														
	Pumphouse Pond Outlet (X3)					Rose Creek Diversion (RDE)					Downstream from RCTA (R2)				
	X3-1	X3-2	X3-3	Mean	Std. Dev.	RDE-1	RDE-2	RDE-3	Mean	Std. Dev.	R2-1	R2-2	R2-3	Mean	Std. Dev.
Aluminum (Al)	3,020	772	1,770	1,854	1,126	1,110	6,270	1,220	2,867	2,948	3,020	4,770	2,050	3,280	1,379
Antimony (Sb)	0.0270	0.0809	0.0205	0.0428	0.0332	0.0311	0.0523	0.0228	0.0354	0.0152	0.0252	0.0190	0.0468	0.0303	0.0146
Arsenic (As)	4.87	4.75	4.25	4.62	0.33	8.63	5.26	1.59	5.16	3.52	4.63	3.65	8.27	5.52	2.43
Barium (Ba)	106.0	116.0	44.4	88.8	38.8	111.0	73.1	27.3	70.5	41.9	86.0	85.7	58.7	76.8	15.7
Beryllium (Be)	0.205	0.096	0.136	0.146	0.055	0.182	0.253	0.071	0.169	0.092	0.173	0.202	0.124	0.166	0.039
Bismuth (Bi)	0.0616	0.0231	0.0386	0.0411	0.0194	0.0239	0.7690	0.0230	0.2720	0.4304	0.0219	0.0502	0.0298	0.0340	0.0146
Boron (B)	1.93	0.64	0.70	1.09	0.73	0.71	0.63	0.48	0.61	0.12	0.69	0.69	0.44	0.61	0.14
Cadmium (Cd)	1.86	1.18	1.36	1.47	0.35	2.60	1.04	1.02	1.55	0.91	0.54	0.58	0.85	0.66	0.17
Calcium (Ca)	2,280	909	901	1,363	794	2,340	1,660	913	1,638	714	1,510	1,460	1,480	1,483	25
Cesium (Cs)	0.488	0.124	0.273	0.295	0.183	0.150	0.710	0.157	0.339	0.321	0.441	0.430	0.313	0.395	0.071
Chromium (Cr)	5.80	10.20	2.77	6.26	3.74	3.21	14.20	3.91	7.11	6.15	5.38	9.67	4.77	6.61	2.67
Cobalt (Co)	20.70	4.41	4.09	9.73	9.50	7.40	11.40	7.40	8.73	2.31	6.86	7.92	7.07	7.28	0.56
Copper (Cu)	16.5	16.4	14.0	15.6	1.4	12.9	15.7	11.6	13.4	2.1	10.5	14.8	14.3	13.2	2.4
Gallium (Ga)	1.150	0.387	0.697	0.745	0.384	0.646	2.080	0.423	1.050	0.899	1.210	1.820	0.835	1.288	0.497
Iron (Fe)	5,850	5,260	5,800	5,637	327	35,300	13,100	3,050	17,150	16,502	7,740	11,400	9,570	9,570	1,830
Lead (Pb)	16.70	25.30	19.50	20.50	4.39	9.76	24.20	4.08	12.68	10.37	9.10	16.70	9.46	11.75	4.29
Lithium (Li)	4.54	1.06	2.78	2.79	1.74	1.51	11.90	1.96	5.12	5.87	6.48	8.59	5.02	6.70	1.79
Magnesium (Mg)	2,220	3,140	1,420	2,260	861	1,300	4,370	1,490	2,387	1,720	1,570	2,750	1,810	2,043	624
Manganese (Mn)	1,010	281	272	521	424	511	844	461	605	208	1,980	1,590	1,300	1,623	341
Mercury (Hg)	0.052	0.108	0.113	0.091	0.034	0.0518	0.0435	0.0349	0.0434	0.0085	0.0297	0.0347	0.0399	0.0348	0.0051
Molybdenum (Mo)	0.589	0.447	0.362	0.466	0.115	0.398	0.710	0.314	0.474	0.209	0.412	0.514	0.342	0.423	0.086
Nickel (Ni)	10.80	15.20	3.98	9.99	5.65	7.36	14.20	4.51	8.69	4.98	7.71	10.90	8.83	9.15	1.62
Phosphorus (P)	9,870	10,500	9,250	9,873	625	7,350	7,400	7,840	7,530	270	4,000	5,350	7,520	5,623	1,776
Potassium (K)	13,100	10,300	9,150	10,850	2,032	8,020	7,060	7,080	7,387	549	4,190	4,990	6,430	5,203	1,135
Rhenium (Re)	0.00023	<0.00015	<0.00016	0.00018	0.00004	<0.00016	0.00019	<0.00016	0.00017	0.00002	<0.00036	<0.00027	<0.00021	0.00028	0.00008
Rubidium (Rb)	9.89	6.22	7.01	7.71	1.93	4.76	8.97	6.40	6.71	2.12	5.91	6.92	4.97	5.93	0.98
Selenium (Se)	2.80	3.49	3.27	3.19	0.35	2.62	2.55	2.75	2.64	0.10	1.75	2.07	2.56	2.13	0.41
Silver (Ag)	0.1050	0.1210	0.0932	0.1064	0.0140	0.0673	0.0948	0.0610	0.0744	0.0180	0.0588	0.0797	0.0946	0.0777	0.0180
Sodium (Na)	4,400	4,480	3,920	4,267	303	3,060	2,840	2,860	2,920	122	1,530	1,810	2,770	2,037	650
Strontium (Sr)	11.4	5.6	5.6	7.5	3.3	19.2	11.4	4.6	11.7	7.3	12.4	8.7	8.3	9.8	2.3
Thallium (Tl)	0.0577	0.0348	0.0373	0.0433	0.0126	0.0252	0.0761	0.0272	0.0428	0.0288	0.0432	0.0603	0.0325	0.0453	0.0140
Thorium (Th)	0.833	0.187	0.349	0.456	0.336	0.251	0.745	0.311	0.436	0.270	1.130	2.080	0.964	1.391	0.602
Tin (Sn)	0.0956	0.0414	0.0480	0.0617	0.0296	0.0247	0.0689	0.0363	0.0433	0.0229	0.0625	0.0599	0.0472	0.0565	0.0082
Titanium (Ti)	44.7	17.1	20.9	27.6	15.0	22.1	66.1	22.0	36.7	25.4	56.9	56.5	21.6	45.0	20.3
Uranium (U)	0.720	0.216	0.259	0.398	0.279	0.583	0.311	0.148	0.347	0.220	0.349	0.406	0.271	0.342	0.068
Vanadium (V)	7.54	2.75	3.89	4.73	2.50	5.39	15.00	2.82	7.74	6.42	9.27	8.62	5.40	7.76	2.07
Yttrium (Y)	3.660	2.480	2.790	2.977	0.612	3.900	2.040	1.130	2.357	1.412	1.980	2.290	2.040	2.103	0.164
Zinc (Zn)	1200	699	618	839	315	2420	794	1080	1,431	868	390	562	692	548	151
Zirconium (Zr)	1.69	0.54	0.76	1.00	0.61	1.45	1.62	0.82	1.30	0.42	2.12	2.65	1.25	2.01	0.71

Table E.4: NMS results of benthic community structure at 22 reference areas. Percent variance explained, Monte Carlo randomization p-values of axis significance, and station scores of 22 reference areas, August 2014.

Axis	NMS-1	NMS-2	NMS-3
% Variance explained	55.8	26.0	10.6
Monte Carlo P	0.016	0.016	0.008
BEC	1.365	-0.536	-0.404
BLC	0.663	0.051	-0.244
BUC	0.697	0.165	0.482
FC	0.192	-0.702	-0.120
GRC	-0.106	0.497	-0.737
HOC	0.704	0.883	0.461
NEXC	-0.506	-0.165	0.029
R6	0.979	-0.597	0.340
R7	0.865	-0.502	0.072
REF-126	-1.130	-0.015	-0.030
REF-212	-1.648	-0.286	-0.145
REF-213	0.087	0.056	0.532
REF-220	0.214	0.926	-0.777
REF-325	-0.931	-0.077	0.438
REF-327	-1.158	-0.201	-0.120
REF-328	-0.910	-0.173	-0.010
REF-340	0.092	-0.033	0.156
REF-376	0.611	-0.377	-0.169
STC	0.287	-0.133	-0.476
USFR	-0.084	0.476	0.824
V1	-0.347	-0.479	-0.061
VR	0.063	1.222	-0.043

Table E.5: Spearman correlation of benthic community NMS axis scores with benthic family densities for 22 reference areas, August 2014.

Category	Variable	NMS-1		NMS-2		NMS-3	
		r	p	r	p	r	p
Benthic Taxa	Ameletidae	-0.168	0.455	0.151	0.501	0.258	0.247
	Baetidae	0.524	0.012	0.395	0.069	-0.149	0.508
	Ephemerellidae	0.448	0.036	-0.075	0.739	0.627	0.002
	Heptageniidae	-0.904	0.000	-0.097	0.669	0.108	0.633
	Capniidae	0.049	0.828	0.327	0.137	-0.581	0.005
	Chloroperlidae	-0.531	0.011	-0.158	0.484	-0.532	0.011
	Leuctridae	-0.080	0.723	0.192	0.393	0.365	0.095
	Nemouridae	-0.086	0.702	0.706	0.000	0.342	0.120
	Perlodidae	-0.002	0.994	0.629	0.002	0.002	0.994
	Taeniopterygidae	0.133	0.555	0.089	0.693	-0.382	0.079
	Brachycentridae	0.343	0.118	-0.035	0.877	-0.126	0.577
	Glossosomatidae	0.473	0.026	-0.074	0.743	0.424	0.049
	Hydropsychidae	0.016	0.944	0.092	0.683	0.525	0.012
	Limnephilidae	-0.193	0.389	-0.061	0.788	0.294	0.184
	Rhyacophilidae	-0.196	0.382	-0.225	0.315	0.275	0.215
	Uenoidae	-0.283	0.202	-0.005	0.983	0.270	0.225
	Blephariceridae	-0.001	0.997	-0.016	0.943	-0.410	0.058
	Ceratopogonidae	0.602	0.003	0.106	0.639	0.167	0.459
	Chironomidae	0.710	0.000	-0.538	0.010	-0.156	0.487
	Deuterophlebiidae	-0.040	0.861	-0.049	0.830	-0.162	0.472
	Empididae	0.528	0.012	0.118	0.601	-0.045	0.844
	Psychodidae	0.374	0.086	0.164	0.466	-0.028	0.900
	Simuliidae	-0.013	0.953	0.429	0.047	-0.204	0.362
	Tipulidae	0.352	0.108	-0.012	0.956	0.050	0.826
	Trombidiformes	0.007	0.977	-0.383	0.078	-0.249	0.264
	Aturidae	0.474	0.026	-0.070	0.757	0.139	0.537
	Hygrobatidae	-0.277	0.213	-0.191	0.396	0.380	0.081
	Lebertiidae	0.434	0.044	-0.104	0.644	0.382	0.079
	Sperchontidae	0.716	0.000	-0.330	0.133	0.390	0.073
	Oligochaeta	0.118	0.601	-0.119	0.597	0.131	0.561

indicates absolute r-value greater than 0.50.
indicates a p-value below 0.05.

Table E.6: Spearman correlation of benthic community NMS axis scores with environmental variables for 22 reference areas, August 2014.

Category	Variable	NMS-1		NMS-2		NMS-3	
		r	p	r	p	r	p
Geologic	Met	0.519	0.013	-0.058	0.799	-0.345	0.116
	Plu	-0.197	0.393	-0.149	0.521	0.493	0.023
	Sed	-0.124	0.584	0.067	0.766	-0.471	0.027
	SedVol	0.400	0.065	-0.065	0.773	0.120	0.594
	UltMet	0.017	0.939	0.052	0.820	0.155	0.492
	Uncon	0.278	0.210	0.209	0.350	-0.007	0.976
	Vol	0.440	0.041	-0.051	0.821	-0.287	0.196
Land Cover	F8013	0.397	0.067	0.149	0.507	-0.206	0.359
	Shadow	-0.022	0.924	0.185	0.411	-0.302	0.172
	Water	0.375	0.086	0.159	0.481	0.262	0.238
	SnoIce	-0.563	0.006	-0.108	0.631	-0.102	0.652
	RocRub	-0.346	0.115	0.092	0.684	-0.029	0.899
	ExpLan	-0.407	0.060	0.069	0.759	0.056	0.805
	ShrTal	-0.335	0.128	-0.141	0.533	0.132	0.559
	ShrLow	-0.277	0.212	-0.380	0.081	0.123	0.587
	WetTre	0.581	0.005	0.138	0.541	-0.062	0.783
	WetShr	0.523	0.013	0.194	0.388	0.060	0.792
	WetHer	0.531	0.011	0.203	0.365	0.115	0.609
	Herb	-0.369	0.091	0.041	0.855	0.381	0.080
	ConDen	0.404	0.062	0.299	0.177	-0.075	0.740
	ConOpe	0.540	0.009	0.258	0.246	-0.340	0.121
	ConSpa	0.435	0.043	0.232	0.299	-0.277	0.212
	BroDen	-0.222	0.321	0.023	0.919	0.055	0.809
	BroOpe	-0.300	0.175	-0.458	0.032	0.307	0.164
	MixOpe	-0.086	0.702	-0.160	0.477	0.368	0.092
	MixSpa	-0.059	0.794	0.218	0.329	-0.464	0.029
	Logged	0.036	0.873	-0.063	0.779	-0.205	0.361
Basin and Stream Character	Smin	-0.052	0.820	0.361	0.099	-0.017	0.939
	Smax	0.023	0.919	-0.032	0.887	-0.224	0.316
	Smean	-0.336	0.126	0.101	0.654	-0.240	0.282
	Amin	-0.052	0.820	0.361	0.099	-0.017	0.939
	Amax	0.260	0.242	0.043	0.848	-0.191	0.393
	Amean	-0.155	0.490	-0.141	0.533	-0.011	0.962
	East	0.231	0.301	0.309	0.162	-0.207	0.355
	North	-0.162	0.471	-0.198	0.377	0.372	0.088
	Elev	-0.308	0.164	-0.254	0.255	0.211	0.347
	SouEle	-0.326	0.139	-0.234	0.294	-0.200	0.372
	EleCha	0.002	0.994	-0.128	0.570	-0.407	0.060
	ChaLen	0.422	0.051	-0.089	0.695	-0.080	0.725
	GrMaCh	-0.470	0.027	0.127	0.573	-0.098	0.665
	GrStSp	-0.582	0.005	0.021	0.926	0.019	0.934
	BaArea	0.417	0.053	-0.001	0.998	-0.036	0.875
	StrOrd	0.304	0.169	0.271	0.222	-0.088	0.696
	SuStLe	0.335	0.128	0.047	0.836	0.034	0.879
	DraDen	-0.059	0.793	0.373	0.087	0.179	0.425
In-situ Habitat	AvWatVel	-0.269	0.225	0.092	0.684	-0.092	0.684
	DepAve	-0.054	0.813	-0.223	0.318	0.244	0.273
	Cobble	-0.022	0.924	-0.170	0.451	0.033	0.886
	Gravel	0.050	0.824	0.172	0.445	-0.141	0.530
	Sand	0.485	0.022	-0.040	0.859	-0.022	0.923
	MedCob	-0.258	0.246	-0.093	0.680	0.211	0.347
	MedEmbed	0.146	0.517	0.196	0.382	0.093	0.681
	Gradient	-0.451	0.035	0.311	0.159	-0.091	0.686
	BanWid	-0.100	0.658	0.053	0.816	-0.305	0.167
	WetWid	-0.040	0.859	0.080	0.725	-0.042	0.852
	Macro	0.422	0.050	-0.317	0.151	-0.070	0.758
	Peri	0.529	0.011	-0.239	0.284	-0.536	0.010
	Densi	0.140	0.546	0.327	0.147	0.183	0.428
Water Quality	Temp	0.142	0.529	-0.060	0.789	-0.138	0.539
	DOc	0.078	0.728	-0.222	0.321	-0.102	0.651
	DOp	0.320	0.147	-0.350	0.110	-0.152	0.500
	SpeCon	0.409	0.059	0.149	0.510	-0.452	0.035
	pH	0.282	0.204	-0.005	0.982	-0.489	0.021
	Hard	0.422	0.051	0.137	0.543	-0.441	0.040
	TSS	0.463	0.355	0.123	0.816	-0.525	0.285
	TDS	0.437	0.042	0.071	0.755	-0.454	0.034
	Turbid	0.426	0.048	-0.125	0.579	-0.150	0.506
	Alka	0.429	0.047	0.196	0.382	-0.363	0.097
	NH3	0.718	0.172	0.359	0.553	0.205	0.741
	F	0.607	0.003	0.156	0.487	-0.318	0.149
	NO3	0.064	0.853	-0.100	0.770	-0.209	0.537
	TP	0.362	0.140	0.070	0.782	-0.068	0.788
	SO4	0.230	0.304	0.129	0.566	-0.432	0.045
	DOC	0.464	0.030	0.189	0.399	0.249	0.264
	TOC	0.508	0.016	0.186	0.408	0.157	0.485
	Alka	-0.103	0.647	-0.352	0.108	0.149	0.510
	Sb	0.196	0.564	0.396	0.228	-0.560	0.073
	As	0.692	0.000	0.055	0.807	-0.095	0.673
	Ba	0.371	0.089	0.167	0.457	-0.381	0.080
	Cd	-0.167	0.507	0.101	0.691	-0.356	0.147
	Ca	0.404	0.062	0.133	0.556	-0.409	0.059
	Cr	0.251	0.316	-0.198	0.432	-0.180	0.475
	Cu	0.062	0.820	0.351	0.182	-0.330	0.211
	Fe	0.690	0.000	-0.208	0.353	0.133	0.554
	Pb	0.618	0.139	-0.709	0.074	-0.418	0.350
	Li	0.589	0.005	0.146	0.529	-0.384	0.086
	Mg	0.375	0.085	0.110	0.626	-0.458	0.032
	Mn	0.748	0.000	-0.015	0.946	0.098	0.665
	Mo	0.348	0.112	0.121	0.590	-0.130	0.563
	Ni	-0.238	0.570	0.119	0.779	-0.738	0.037
	K	0.379	0.082	0.203	0.365	-0.116	0.608
	Se	0.159	0.571	0.177	0.528	-0.592	0.020
	Si	0.094	0.678	-0.040	0.859	0.496	0.019
	Na	0.570	0.006	0.031	0.891	-0.098	0.663
	Sr	0.390	0.073	0.171	0.446	-0.418	0.053
	S	0.240	0.282	0.130	0.563	-0.436	0.042
	U	0.301	0.174	0.225	0.313	-0.280	0.208

indicates absolute r-value greater than 0.50.
indicates a p-value below 0.05.

Table E.7: NMS results of benthic community structure at 22 reference, 11 exposed, and 2 minimally influenced areas. Percent variance explained, Monte Carlo randomization p-values of axis significance, and station scores of 22 reference areas, August 2014.

Area Type	Axis	NMS-1	NMS-2	NMS-3
	% Variance explained	62.9	18.7	10.0
	Monte Carlo P	0.004	0.004	0.004
Reference	BEC	1.267	0.541	0.446
	BLC	0.435	-0.136	0.232
	BUC	0.415	-0.290	-0.435
	FC	0.081	0.672	0.182
	GRC	-0.453	-0.622	0.552
	HOC	0.263	-1.051	-0.423
	NEXC	-0.714	0.281	-0.047
	R6	0.897	0.475	-0.207
	R7	0.704	0.348	-0.034
	REF-126	-1.378	0.367	-0.096
	REF-212	-1.868	0.570	0.208
	REF-213	-0.105	0.061	-0.596
	REF-220	-0.187	-1.095	0.704
	REF-325	-1.159	0.350	-0.525
	REF-327	-1.358	0.383	0.108
	REF-328	-1.116	0.422	-0.107
	REF-340	-0.110	0.164	-0.207
	REF-376	0.493	0.302	0.215
	STC	0.103	0.015	0.439
	USFR	-0.318	-0.350	-0.898
	V1	-0.425	0.628	-0.022
	VR	-0.544	-1.198	-0.466
Exposed	A1	-0.380	-0.337	1.000
	R2	0.467	-0.098	-0.152
	R3	0.273	-0.511	0.146
	R4	0.238	-0.759	0.090
	R5	-0.480	-0.062	0.655
	R9	0.661	0.216	0.236
	RDE-1	1.166	0.353	0.003
	RDE-2	0.985	0.218	-0.525
	RDE-3	0.849	0.505	0.061
	X2	-0.359	-0.228	-0.037
	X3	0.895	0.258	0.059
	Grum	-0.194	-0.154	-0.465
	R1	0.955	-0.241	-0.093

Table E.8: Spearman correlation of benthic community NMS axis scores with benthic family densities for 22 reference, 11 exposed, and 2 minimally influenced areas, August 2014.

Category	Variable	NMS-1		NMS-2		NMS-3	
		r	p	r	p	r	p
Benthic Taxa	Ameletidae	-0.280	0.103	0.003	0.985	-0.253	0.143
	Baetidae	0.335	0.049	-0.533	0.001	0.188	0.280
	Caenidae	-0.027	0.877	0.156	0.371	0.084	0.630
	Ephemerellidae	0.439	0.008	-0.357	0.035	-0.291	0.090
	Heptageniidae	-0.894	0.000	0.173	0.322	-0.100	0.567
	Capniidae	-0.313	0.067	-0.465	0.005	0.520	0.001
	Chloroperlidae	-0.645	0.000	0.071	0.683	0.491	0.003
	Leuctridae	-0.248	0.150	-0.145	0.407	-0.159	0.361
	Nemouridae	-0.097	0.581	-0.280	0.104	-0.521	0.001
	Perlodidae	0.283	0.100	-0.479	0.004	-0.048	0.782
	Taeniopterygidae	0.067	0.702	-0.031	0.861	0.248	0.150
	Brachycentridae	0.535	0.001	0.076	0.665	-0.026	0.881
	Glossosomatidae	0.199	0.253	-0.083	0.636	-0.350	0.039
	Hydropsychidae	0.048	0.783	-0.127	0.468	-0.422	0.012
	Limnephilidae	-0.234	0.176	0.121	0.487	-0.297	0.083
	Rhyacophilidae	-0.357	0.036	0.053	0.764	-0.088	0.614
	Uenoidae	-0.293	0.087	0.179	0.303	-0.298	0.082
	Blephariceridae	-0.131	0.452	-0.031	0.860	0.417	0.013
	Ceratopogonidae	0.440	0.008	-0.386	0.022	-0.063	0.720
	Chironomidae	0.824	0.000	0.357	0.035	0.154	0.379
	Deuterophlebiidae	-0.129	0.458	0.022	0.899	0.115	0.511
	Empididae	0.340	0.046	-0.087	0.619	0.083	0.636
	Psychodidae	0.342	0.044	-0.282	0.101	0.186	0.284
	Simuliidae	-0.025	0.886	-0.452	0.006	-0.009	0.960
	Tipulidae	0.044	0.802	-0.045	0.798	0.045	0.799
	Trombidiformes	0.122	0.485	0.232	0.181	0.215	0.215
	Aturidae	0.566	0.000	0.204	0.240	-0.119	0.497
	Hygrobatidae	0.005	0.977	0.325	0.057	-0.321	0.060
	Lebertiidae	0.546	0.001	-0.076	0.665	-0.139	0.426
	Sperchontidae	0.792	0.000	0.127	0.468	-0.161	0.355
	Torrenticolidae	0.368	0.029	0.046	0.791	-0.016	0.925
	Pisidiidae	0.402	0.017	0.266	0.123	0.166	0.339
	Oligochaeta	0.254	0.140	0.103	0.554	-0.079	0.650

indicates absolute r-value greater than 0.50.

indicates a p-value below 0.05.

Table E.9: Spearman correlation of benthic community NMS axis scores with benthic family densities and environmental variables for 22 reference, 11 exposed, and 2 minimally influenced areas, August 2014.

Category	Variable	NMS-1		NMS-2		NMS-3	
		r	p	r	p	r	p
Geologic	Met	0.276	0.108	-0.022	0.899	0.272	0.113
	Plu	-0.014	0.938	0.063	0.719	-0.443	0.008
	Sed	-0.064	0.715	-0.063	0.720	0.445	0.007
	SedVol	0.032	0.854	-0.095	0.586	0.166	0.340
	Ult	0.403	0.016	-0.143	0.413	0.074	0.673
	UltMet	-0.034	0.846	0.000	1.000	-0.136	0.437
	Uncon	0.049	0.778	-0.212	0.222	0.017	0.924
	Vol	0.351	0.039	-0.066	0.708	0.386	0.022
Land Cover	F8013	0.097	0.580	-0.227	0.190	0.282	0.101
	Shadow	0.155	0.373	-0.196	0.259	0.177	0.308
	Water	0.387	0.022	-0.273	0.112	-0.176	0.311
	SnoIce	-0.247	0.152	0.211	0.223	-0.097	0.579
	RocRub	-0.139	0.427	0.041	0.816	-0.114	0.515
	ExpLan	-0.216	0.213	0.060	0.734	-0.268	0.120
	ShrTal	-0.355	0.037	0.348	0.041	-0.095	0.589
	ShrLow	0.047	0.790	0.339	0.046	0.029	0.869
	WetTre	0.264	0.125	-0.133	0.445	0.094	0.592
	WetShr	0.211	0.223	-0.143	0.413	0.004	0.981
	WetHer	0.156	0.369	-0.184	0.289	0.059	0.735
	Herb	-0.187	0.283	0.124	0.477	-0.519	0.001
	ConDen	0.036	0.839	-0.230	0.184	0.229	0.185
	ConOpe	0.274	0.111	-0.387	0.022	0.297	0.083
	ConSpa	0.440	0.008	-0.373	0.027	0.242	0.162
	BroDen	-0.261	0.131	0.122	0.486	-0.072	0.682
	BroOpe	-0.066	0.707	0.346	0.042	-0.047	0.790
	MixOpe	0.025	0.888	-0.010	0.953	-0.011	0.952
	MixSpa	-0.222	0.201	-0.123	0.481	0.349	0.040
	Logged	-0.019	0.912	0.127	0.468	0.125	0.473
Basin and Stream Character	Smin	-0.064	0.716	-0.224	0.197	-0.140	0.423
	Smax	-0.107	0.540	-0.045	0.799	0.383	0.023
	Smean	-0.450	0.007	0.052	0.769	0.166	0.342
	Amin	-0.209	0.229	-0.296	0.084	-0.187	0.283
	Amax	0.046	0.791	-0.160	0.358	0.276	0.108
	Amean	-0.024	0.892	-0.078	0.654	-0.079	0.651
	East	0.112	0.521	-0.203	0.243	0.026	0.883
	North	0.071	0.687	0.050	0.775	0.005	0.978
	Elev	0.018	0.920	0.207	0.233	-0.353	0.038
	SouEle	-0.161	0.355	0.148	0.396	0.020	0.907
	EleCha	-0.020	0.907	-0.013	0.940	0.486	0.003
	ChaLen	0.346	0.042	-0.162	0.354	0.328	0.054
	GrMaCh	-0.405	0.016	0.165	0.343	-0.223	0.199
	GrStSp	-0.511	0.002	0.081	0.643	-0.202	0.245
	BaArea	0.356	0.036	-0.168	0.335	0.312	0.068
	StrOrd	0.197	0.256	-0.376	0.026	0.270	0.116
	SuStLe	0.289	0.092	-0.153	0.381	0.268	0.120
	DraDen	-0.240	0.165	-0.103	0.557	-0.136	0.436
In-situ Habitat	AvWatVel	-0.114	0.514	0.007	0.969	0.076	0.664
	DepAve	0.294	0.087	0.068	0.697	-0.014	0.936
	Cobble	-0.032	0.854	0.205	0.237	0.019	0.912
	Gravel	-0.322	0.060	-0.044	0.802	0.168	0.336
	Sand	0.384	0.023	0.027	0.876	0.108	0.536
	MedCob	0.051	0.772	0.166	0.340	-0.407	0.015
	MedEmbed	0.032	0.854	-0.161	0.357	-0.084	0.630
	Gradient	-0.280	0.104	-0.136	0.437	-0.048	0.783
	BanWid	0.028	0.872	-0.115	0.511	0.410	0.015
	WetWid	0.123	0.483	-0.160	0.360	0.320	0.061
	Macro	0.327	0.055	0.156	0.370	0.060	0.731
	Peri	0.534	0.001	0.092	0.601	0.304	0.076
	Densi	-0.110	0.594	-0.173	0.399	-0.030	0.883
Water Quality	Temp	0.242	0.161	-0.008	0.966	0.110	0.528
	DOc	0.166	0.340	-0.022	0.901	0.138	0.428
	DOp	0.458	0.006	0.055	0.752	0.166	0.339
	SpeCon	0.261	0.131	-0.247	0.153	0.475	0.004
	pH	0.143	0.412	-0.085	0.626	0.365	0.031
	Hard	0.275	0.109	-0.237	0.170	0.484	0.003
	TSS	0.201	0.604	-0.376	0.319	0.542	0.132
	TDS	0.263	0.126	-0.209	0.229	0.512	0.002
	Turbid	0.513	0.002	-0.080	0.648	0.238	0.169
	Alka	0.245	0.156	-0.249	0.150	0.469	0.005
	NH3	0.739	0.058	-0.396	0.379	0.000	1.000
	F	0.570	0.000	-0.312	0.068	0.368	0.030
	NO3	-0.358	0.086	0.116	0.590	0.276	0.192
	TP	0.376	0.040	-0.295	0.113	0.052	0.786
	SO4	0.136	0.436	-0.205	0.237	0.420	0.012
	DOC	0.223	0.198	-0.213	0.219	-0.146	0.402
	TOC	0.181	0.299	-0.271	0.115	-0.051	0.771
	Alka	-0.121	0.490	0.299	0.081	-0.130	0.458
	Sb	0.094	0.761	-0.372	0.211	0.554	0.050
	As	0.580	0.000	-0.217	0.211	0.300	0.080
	Ba	0.159	0.363	-0.298	0.082	0.535	0.001
	Cd	0.181	0.355	-0.204	0.297	0.221	0.259
	Ca	0.278	0.106	-0.245	0.157	0.465	0.005
	Cr	-0.244	0.186	-0.015	0.934	0.381	0.034
	Co	0.382	0.197	-0.413	0.161	-0.044	0.886
	Cu	-0.148	0.462	-0.417	0.030	0.361	0.064
	Fe	0.628	0.000	-0.139	0.425	0.121	0.490
	Pb	0.105	0.661	-0.068	0.774	0.212	0.369
	Li	0.402	0.018	-0.380	0.027	0.408	0.016
	Mg	0.223	0.199	-0.176	0.313	0.490	0.003
	Mn	0.564	0.000	-0.304	0.075	0.173	0.320
	Mo	0.020	0.907	-0.103	0.557	0.306	0.074
	Ni	-0.162	0.521	-0.156	0.537	0.340	0.168
	K	0.214	0.218	-0.304	0.075	0.309	0.071
	Se	-0.245	0.217	-0.240	0.228	0.503	0.007
	Si	0.071	0.685	-0.081	0.643	-0.109	0.532
	Na	0.420	0.012	-0.296	0.084	0.297	0.083
	Sr	0.306	0.074	-0.275	0.109	0.443	0.008
	S	0.150	0.388	-0.203	0.242	0.429	0.010
	U	0.139	0.425	-0.188	0.280	0.294	0.086
	Zn	0.319	0.267	0.103	0.725	-0.538	0.047

indicates absolute r-value greater than 0.50.
indicates a p-value below 0.05.

Table E.10: Equivalence and interval threshold values (describing the mean ± 1.645 SD at alpha = 0.05) and 5th and 95th percentiles (tolerance limits based on one taile test at alpha = 0.05) for reference benthic invertebrate community data collected in 2014 (all reference areas combined n = 22). Gray shade indicates the most relevant results based on the characteristics of the data distribution for each endpoint. Red font indicates most relevant results for identifying communities that are outside of the reference condition.

Biotic Endpoint	Summary Statistics		Untransformed Data	Logit Transformation (Normal, Proportional Data)	Log_e Transformation (Left Skew Data)	$Log_{e(1-x)}$ Transformation (Right Skew Data)	Square Root (x) (Count Data)
Abundance	N (areas)		22		22		
	Reference Mean		2,222.3		1,516.5		
	SD (areas)		2,173.0		NA		
	To Detect Values Less than Reference	Interval threshold value	< 0		176.9		
		Equivalence threshold value	< 0		509.2		
	To Detect Values Greater than Reference	Equivalence threshold value	4,815.6		4,516.8		
		Interval threshold value	7,327.0		12,997.2		
	5th percentile and lower tolerance limit		322.9 (< 0)		322.9 (270.2)		
	95th percentile and upper tolerance limit		7,893 (6,321.4)		7,832.8 (8,512.7)		
Richness (Family)	N (areas)		22		22		
	Reference Mean		17.9		17.5		
	SD (areas)		3.4		NA		
	To Detect Values Less than Reference	Interval threshold value	9.8		10.8		
		Equivalence threshold value	13.8		13.7		
	To Detect Values Greater than Reference	Equivalence threshold value	22.0		22.4		
		Interval threshold value	25.9		28.3		
	5th percentile and lower tolerance limit		12.1 (11.4)		12.1 (11.9)		
	95th percentile and upper tolerance limit		23.0 (24.3)		23.0 (25.8)		
Diversity (Simpson's)	N (areas)					22	
	Reference Mean		0.76			0.78	
	SD (areas)		0.10			NA	
	To Detect Values Less than Reference	Interval threshold value	0.53			0.42	
		Equivalence threshold value	0.65			0.64	
	To Detect Values Greater than Reference	Equivalence threshold value	0.88			0.87	
		Interval threshold value	0.99			0.92	
	5th percentile and lower tolerance limit		0.60 (0.58)			0.60 (0.53)	
	95th percentile and upper tolerance limit		0.87 (0.95)			0.87 (0.90)	
Evenness (Simpson's)	N (areas)		22	22			
	Reference Mean		0.29	0.28			
	SD (areas)		0.10	NA			
	To Detect Values Less than Reference	Interval threshold value	0.05	0.11			
		Equivalence threshold value	0.17	0.18			
	To Detect Values Greater than Reference	Equivalence threshold value	0.41	0.42			
		Interval threshold value	0.53	0.56			
	5th percentile and lower tolerance limit		0.17 (0.10)	0.17 (0.13)			
	95th percentile and upper tolerance limit		0.47 (0.49)	0.47 (0.50)			
Ephemeroptera (Proportion)	N (areas)		22	22			
	Reference Mean		34.4	31.5			
	SD (areas)		17.4	NA			
	To Detect Values Less than Reference	Interval threshold value	< 0	4.9			
		Equivalence threshold value	13.6	13.2			
	To Detect Values Greater than Reference	Equivalence threshold value	55.1	58.3			
		Interval threshold value	75.1	80.3			
	5th percentile and lower tolerance limit		10.2 (1.6)	10.2 (7.4)			
	95th percentile and upper tolerance limit		61.5 (67.1)	61.5 (72.7)			
Plecoptera (Proportion)	N (areas)		22	22			
	Reference Mean		31.3	30.1			
	SD (areas)		15.0	NA			
	To Detect Values Less than Reference	Interval threshold value	< 0	7.4			
		Equivalence threshold value	13.4	15.5			
	To Detect Values Greater than Reference	Equivalence threshold value	49.3	50.2			
		Interval threshold value	66.6	69.8			
	5th percentile and lower tolerance limit		16.5 (3.0)	16.5 (10.0)			
	95th percentile and upper tolerance limit		63.1 (59.7)	63.1 (62.4)			
Trichoptera (Proportion)	N (areas)		22				22
	Reference Mean		5.3				4.1
	SD (areas)		4.3				NA
	To Detect Values Less than Reference	Interval threshold value	< 0				< 0
		Equivalence threshold value	0.1				0.4
	To Detect Values Greater than Reference	Equivalence threshold value	10.5				11.4
		Interval threshold value	15.5				21.9
	5th percentile and lower tolerance limit		0 (< 0)				0 (0.0)
	95th percentile and upper tolerance limit		12.0 (13.5)				12.0 (17.3)
EPT[a] (Proportion)	N (areas)		22	22			
	Reference Mean		71.0	75.7			
	SD (areas)		19.8	NA			
	To Detect Values Less than Reference	Interval threshold value	24.5	17.2			
		Equivalence threshold value	47.4	44.0			
	To Detect Values Greater than Reference	Equivalence threshold value	94.6	92.5			
		Interval threshold value	> 1.00	97.9			
	5th percentile and lower tolerance limit		36.8 (33.7)	36.8 (26.1)			
	95th percentile and upper tolerance limit		95.6 (> 100)	95.6 (96.5)			
Chironomidae (Proportion)	N (areas)		22		22		
	Reference Mean		20.3		13.0		
	SD (areas)		16.4		NA		
	To Detect Values Less than Reference	Interval threshold value	< 0		< 0		
		Equivalence threshold value	0.7		3.5		
	To Detect Values Greater than Reference	Equivalence threshold value	39.9		47.5		
		Interval threshold value	58.9		>100		
	5th percentile and lower tolerance limit		2.4 (< 0)		2.4 (1.7)		
	95th percentile and upper tolerance limit		47.3 (51.3)		47.3 (> 100)		
Oligocheata[b] (Proportion)	N (areas)		22				
	Reference Mean		0.3				
	SD (areas)		0.8				
	To Detect Values Less than Reference	Interval threshold value	< 0				
		Equivalence threshold value	< 0				
	To Detect Values Greater than Reference	Equivalence threshold value	1.2				
		Interval threshold value	2.1				
	5th percentile and lower tolerance limit		0 (< 0)				
	95th percentile and upper tolerance limit		1.2 (1.8)				
Trombidiformes (Proportion)	N (areas)		22				22
	Reference Mean		3.0				2.1
	SD (areas)		2.8				NA
	To Detect Values Less than Reference	Interval threshold value	< 0				< 0
		Equivalence threshold value	< 0				0.1
	To Detect Values Greater than Reference	Equivalence threshold value	6.3				6.6
		Interval threshold value	9.6				13.5
	5th percentile and lower tolerance limit		0 (< 0)				0 (0.1)
	95th percentile and upper tolerance limit		8.0 (8.3)				8.0 (10.5)
Mollusca[b] (Proportion)	N (areas)		22				
	Reference Mean		0.1				
	SD (areas)		0.3				
	To Detect Values Less than Reference	Interval threshold value	< 0				
		Equivalence threshold value	< 0				
	To Detect Values Greater than Reference	Equivalence threshold value	0.4				
		Interval threshold value	0.8				
	5th percentile and lower tolerance limit		0 (< 0)				
	95th percentile and upper tolerance limit		0.1 (0.7)				

[a] Ephemeroptera + Plecoptera + Trichoptera.

Note: Approaches presented are defining the middle 90% of each data set with 95% confidence.

[b] No transformation improved distribution

Table E.11: Benthic invertebrate community metrics for 22 reference areas, August 2014.

Transformation	Endpoint	Reference																				
		R7	FC	R6	USFR	V1	VR	BLC	NEXC	GRC	STC	HOC	BEC	BUC	REF-126	REF-212	REF-213	REF-220	REF-325	REF-327	REF-328	REF-340	REF-376
Non-transformed	Abundance	838	1896	8080	778	1875	1674	2249	1733	929	263	836	8240	1963	1150	322	3628	2092	2768	340	1241	4340	1655
	Family Richness	17	22	18	19	15	11	24	20	18	18	22	15	18	13	12	23	14	18	19	19	19	19
	Diversity (Simpson's)	0.78	0.80	0.67	0.84	0.70	0.81	0.87	0.80	0.81	0.85	0.91	0.75	0.86	0.59	0.53	0.85	0.81	0.70	0.68	0.63	0.83	0.73
	Evenness (Simpson's)	0.26	0.23	0.17	0.32	0.24	0.47	0.34	0.26	0.31	0.42	0.52	0.29	0.40	0.19	0.18	0.31	0.41	0.19	0.19	0.16	0.32	0.21
	% EPT	44.4	52.4	36.4	88.2	67.5	69.2	53.8	81.4	81.4	66.5	85.5	27.4	69.0	95.9	95.7	73.1	80.5	90.0	95.3	87.9	70.5	49.8
	% Ephemeroptera	20.3	25.7	19.3	43.7	45.3	31.1	22.6	45.6	15.7	24.7	32.7	10.0	33.0	61.6	64.9	39.2	3.9	53.4	55.3	59.3	29.7	19.0
	% Plecoptera	17.5	16.5	17.1	34.8	18.9	38.1	28.5	27.5	64.3	39.2	40.8	10.7	26.1	33.0	29.5	30.9	76.7	21.9	32.9	25.1	31.8	27.8
	% Trichoptera	6.6	10.2	0.0	9.6	3.2	0.0	2.7	8.3	1.4	2.7	12.1	6.8	10.0	1.3	1.2	3.0	0.0	14.7	7.1	3.5	9.0	3.0
	% Chironomidae	42.8	38.5	52.7	5.9	29.1	6.6	28.1	14.1	12.5	27.8	2.4	44.2	19.2	3.1	1.9	19.0	12.5	3.3	2.4	8.6	24.2	47.4
	% Oligocheata	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.0	1.2	0.0	0.0	0.6	3.4	0.0	0.3	0.0	0.3	0.0	0.0
	% Trombidiformes	6.4	4.1	5.2	4.5	2.7	0.0	6.0	2.8	0.2	1.1	2.8	10.4	8.1	0.0	0.0	1.8	0.0	1.7	1.5	1.0	3.0	1.8
	% Mollusca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	NMS1	0.87	0.19	0.98	-0.08	-0.35	0.06	0.66	-0.51	-0.11	0.29	0.70	1.37	0.70	-1.13	-1.65	0.09	0.21	-0.93	-1.16	-0.91	0.09	0.61
	NMS2	-0.50	-0.70	-0.60	0.48	-0.48	1.22	0.05	-0.16	0.50	-0.13	0.88	-0.54	0.16	-0.02	-0.29	0.06	0.93	-0.08	-0.20	-0.17	-0.03	-0.38
Log_e	Abundance	6.73	7.55	9.00	6.66	7.54	7.42	7.72	7.46	6.83	5.57	6.73	9.02	7.58	7.05	5.77	8.20	7.65	7.93	5.83	7.12	8.38	7.41
Log_e	Family Richness	-2.83	-3.09	-2.89	-2.94	-2.71	-2.40	-3.18	-3.00	-2.89	-2.89	-3.09	-2.71	-2.89	-2.56	-2.48	-3.14	-2.64	-2.89	-2.94	-2.94	-2.94	-2.94
$Log_{e(1-x)}$	Diversity (Simpson's)	-1.49	-1.59	-1.12	-1.81	-1.21	-1.64	-2.07	-1.58	-1.67	-1.91	-2.39	-1.40	-1.96	-0.90	-0.75	-1.92	-1.68	-1.19	-1.15	-1.00	-1.80	-1.31
Logit	Evenness (Simpson's)	-1.03	-1.19	-1.59	-0.75	-1.15	-0.13	-0.65	-1.06	-0.79	-0.32	0.08	-0.89	-0.43	-1.45	-1.54	-0.81	-0.35	-1.43	-1.47	-1.65	-0.77	-1.35
Logit	% EPT	-0.23	0.10	-0.56	2.01	0.73	0.81	0.15	1.48	1.47	0.69	1.78	-0.97	0.80	3.16	3.09	1.00	1.42	2.20	3.01	1.98	0.87	-0.01
None[a]	% Ephemeroptera	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Logit	% Plecoptera	-1.55	-1.62	-1.58	-0.63	-1.45	-0.49	-0.92	-0.97	0.59	-0.44	-0.37	-2.12	-1.04	-0.71	-0.87	-0.80	1.19	-1.27	-0.71	-1.09	-0.76	-0.95
Square Root	% Trichoptera	0.26	0.32	0	0.31	0.18	0	0.16	0.29	0.12	0.16	0.35	0.26	0.32	0.11	0.11	0.17	0	0.38	0.27	0.19	0.30	0.17
Log_e	% Chironomidae	-0.85	-0.95	-0.64	-2.83	-1.24	-2.71	-1.27	-1.96	-2.08	-1.28	-3.73	-0.82	-1.65	-3.46	-3.98	-1.66	-2.08	-3.40	-3.75	-2.45	-1.42	-0.75
None[a]	% Oligocheata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Square Root	% Trombidiformes	0.25	0.20	0.23	0.21	0.16	0	0.24	0.17	0.05	0.11	0.17	0.32	0.28	0	0	0.13	0	0.13	0.12	0.10	0.17	0.13
None[a]	% Mollusca	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] No transformations (Logit, Log_e, $Log_e(1-x)$, Square root) resulted in improvement of data to a normal distribution.

Table E.12: Benthic invertebrate community metrics for 11 exposed and 2 minimally influenced areas, August 2014.

Transformation	Endpoint	Minimally Influenced		Exposed										
		R1	Grum	R9	X2	X3	RDE-1	RDE-2	RDE-3	R2	R3	R4	R5	A1
Non-transformed	Abundance	4099	2022	3450	791	2673	2617	2688	2790	2739	2040	2025	1004	868
	Family Richness	20	23	19	18	20	23	21	17	19	20	16	19	16
	Diversity (Simpson's)	0.83	0.88	0.73	0.86	0.74	0.73	0.84	0.70	0.83	0.90	0.90	0.84	0.86
	Evenness (Simpson's)	0.35	0.39	0.19	0.39	0.19	0.17	0.29	0.20	0.30	0.54	0.64	0.36	0.49
	% EPT	51.2	76.7	44.9	74.0	43.9	30.0	39.0	34.3	61.4	71.3	76.7	73.8	80.2
	% Ephemeroptera	33.1	37.9	17.4	47.8	14.0	15.0	7.4	10.5	18.5	34.3	36.9	37.5	27.4
	% Plecoptera	17.3	25.1	25.2	17.1	28.7	13.8	28.8	20.0	41.0	32.6	33.4	35.3	51.0
	% Trichoptera	0.8	13.7	2.3	9.1	1.2	1.2	2.8	3.9	1.8	4.4	6.4	1.0	1.7
	% Chironomidae	30.4	13.4	47.8	16.1	46.5	49.7	30.7	51.4	30.1	14.5	8.1	14.3	13.4
	% Oligocheata	1.1	0.0	0.0	0.0	0.3	0.3	0.9	0.0	0.0	1.0	0.0	0.6	0.0
	% Trombidiformes	5.1	2.9	2.9	0.6	6.2	8.8	23.5	9.8	3.1	3.7	4.0	4.2	0.9
	% Mollusca	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	NMS1[b]	-	-	-	-	-	-	-	-	-	-	-	-	-
	NMS2[b]	-	-	-	-	-	-	-	-	-	-	-	-	-
Log_e	Abundance	8.32	7.61	8.15	6.67	7.89	7.87	7.90	7.93	7.92	7.62	7.61	6.91	6.77
Log_e	Family Richness	-3.00	-3.14	-2.94	-2.89	-3.00	-3.14	-3.04	-2.83	-2.94	-3.00	-2.77	-2.94	-2.77
$Log_{e(1-x)}$	Diversity (Simpson's)	-1.79	-2.15	-1.31	-1.96	-1.33	-1.29	-1.81	-1.21	-1.75	-2.33	-2.32	-1.86	-2.00
Logit	Evenness (Simpson's)	-0.60	-0.44	-1.42	-0.44	-1.45	-1.56	-0.89	-1.40	-0.84	0.16	0.56	-0.59	-0.03
Logit	% EPT	0.05	1.19	-0.20	1.04	-0.25	-0.85	-0.45	-0.65	0.46	0.91	1.19	1.04	1.40
None[a]	% Ephemeroptera	-	-	-	-	-	-	-	-	-	-	-	-	-
Logit	% Plecoptera	-1.56	-1.09	-1.09	-1.58	-0.91	-1.83	-0.91	-1.39	-0.36	-0.73	-0.69	-0.61	0.04
Square Root	% Trichoptera	0.09	0.37	0.15	0.30	0.11	0.11	0.17	0.20	0.14	0.21	0.25	0.10	0.13
Log_e	% Chironomidae	-1.19	-2.01	-0.74	-1.83	-0.77	-0.70	-1.18	-0.67	-1.20	-1.93	-2.51	-1.94	-2.01
None[a]	% Oligocheata	-	-	-	-	-	-	-	-	-	-	-	-	-
Square Root	% Trombidiformes	0.23	0.17	0.17	0.08	0.25	0.30	0.49	0.31	0.18	0.19	0.20	0.20	0.10
None[a]	% Mollusca	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] No transformations (Logit, Log_e, $Log_e(1-x)$, Square root) resulted in improvement of data to a normal distribution.

[b] NMS values for exposed areas are omitted because they are independent of each other and therefore are not comparable between exposed areas.

Table E.13: Benthic invertebrate community metric non-central p-values for reference areas, August 2014.

Transformation	Endpoint	Reference																				
		R7	FC	R6	USFR	V1	VR	BLC	NEXC	GRC	STC	HOC	BEC	BUC	REF-126	REF-212	REF-213	REF-220	REF-325	REF-327	REF-328	REF-340	REF-376
Non-Transformation	Abundance	1.00	1.00	0.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Family Richness	1.00	0.94	1.00	1.00	1.00	0.19	0.36	1.00	1.00	1.00	0.94	1.00	1.00	0.79	0.45	0.70	0.97	1.00	1.00	1.00	1.00	1.00
	Diversity (Simpson's)	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	1.00	0.73	1.00	1.00	0.42	0.04	1.00	1.00	1.00	1.00	0.87	1.00	1.00
	Evenness (Simpson's)	1.00	1.00	0.96	1.00	1.00	0.43	1.00	1.00	1.00	0.91	0.08	1.00	0.99	0.99	0.98	1.00	0.95	1.00	0.99	0.92	1.00	1.00
	% EPT	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.80	1.00	0.62	0.40	1.00	0.40	0.98	0.94	0.77	1.00	1.00
	% Ephemeroptera	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	0.09	1.00	1.00	0.83	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00
	% Plecoptera	1.00	0.97	0.94	0.99	1.00	0.94	1.00	1.00	1.00	1.00	0.62	1.00	0.98	1.00	1.00	1.00	0.94	0.10	1.00	1.00	1.00	1.00
	% Trichoptera	0.83	0.98	0.21	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.75	1.00	0.99	0.97	1.00	1.00	0.99	0.98	1.00	1.00	0.52
	% Chironomidae	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
	% Oligocheata	0.93	1.00	1.00	1.00	1.00	0.99	0.99	1.00	1.00	1.00	1.00	0.01	0.34	0.99	0.99	1.00	0.99	1.00	1.00	1.00	1.00	1.00
	% Trombidiformes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	% Mollusca	0.86	1.00	0.41	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.09	1.00	0.92	0.92	1.00	1.00	1.00	0.93	1.00	1.00	0.98
	NMS1	0.96	1.00	0.87	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.25	1.00	0.64	0.04	1.00	1.00	0.91	0.59	0.93	1.00	1.00
	NMS2	0.99	0.74	0.93	1.00	0.99	0.01	1.00	1.00	0.99	1.00	0.28	0.98	1.00	1.00	1.00	1.00	0.20	1.00	1.00	1.00	1.00	1.00
Log_e	Abundance	1.00	1.00	0.33	1.00	1.00	1.00	1.00	1.00	1.00	0.25	1.00	0.31	1.00	1.00	0.47	1.00	1.00	1.00	0.54	1.00	0.97	1.00
Log_e	Family Richness	1.00	0.98	1.00	1.00	1.00	0.07	0.66	1.00	1.00	1.00	0.98	1.00	1.00	0.75	0.31	0.87	0.98	1.00	1.00	1.00	1.00	1.00
$Log_{e(1-x)}$	Diversity (Simpson's)	1.00	1.00	0.99	1.00	1.00	1.00	0.88	1.00	1.00	1.00	0.14	1.00	0.99	0.69	0.28	1.00	1.00	1.00	1.00	0.92	1.00	1.00
Logit	Evenness (Simpson's)	1.00	1.00	0.90	1.00	1.00	0.55	1.00	1.00	1.00	0.92	0.16	1.00	0.99	0.99	0.95	1.00	0.96	1.00	0.99	0.78	1.00	1.00
Logit	% EPT	0.96	1.00	0.74	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	1.00	0.41	0.47	1.00	1.00	1.00	0.55	1.00	1.00	0.99
None[a]	% Ephemeroptera	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.80	1.00	0.62	0.40	1.00	0.40	0.98	0.94	0.77	1.00	1.00
Logit	% Plecoptera	0.99	0.98	0.99	1.00	1.00	1.00	1.00	1.00	0.19	1.00	1.00	0.37	1.00	1.00	1.00	1.00	0.01	1.00	1.00	1.00	1.00	1.00
Square Root	% Trichoptera	1.00	0.99	0.38	1.00	1.00	0.38	1.00	1.00	1.00	1.00	0.90	1.00	0.99	1.00	1.00	1.00	0.38	0.58	1.00	1.00	1.00	1.00
Log_e	% Chironomidae	0.98	0.99	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.64	0.97	1.00	0.89	0.38	1.00	1.00	0.92	0.62	1.00	1.00	0.95
None[a]	% Oligocheata	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Square Root	% Trombidiformes	0.97	1.00	1.00	1.00	1.00	0.66	0.99	1.00	0.99	1.00	1.00	0.28	0.73	0.66	0.66	1.00	0.66	1.00	1.00	1.00	1.00	1.00
None[a]	% Mollusca	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

[a] No transformations (Logit, Log_e, $Log_e(1-x)$, Square root) resulted in improvement of data to a normal distribution.

Highlighted boxes indicate ncP values that fall between 0.05 and 0.95.

Highlighted boxes indicate ncP values that fall below 0.05.

Table E.14: Benthic invertebrate community metric non-central p-values for 11 exposed and 2 minimally influenced areas, August 2014.

Transformation	Endpoint	Minimally Influenced		Exposed										
		R1	Grum	R9	X2	X3	RDE-1	RDE-2	RDE-3	R2	R3	R4	R5	A1
Non-Transformation	Abundance	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Family Richness	1.00	0.70	1.00	1.00	1.00	0.70	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Diversity (Simpson's)	1.00	0.94	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.80	0.81	1.00	0.99
	Evenness (Simpson's)	1.00	0.99	1.00	0.99	1.00	0.97	1.00	1.00	1.00	0.04	0.00	1.00	0.22
	% EPT	1.00	1.00	1.00	1.00	0.96	0.98	0.64	0.83	1.00	1.00	1.00	1.00	1.00
	% Ephemeroptera	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00	1.00	1.00	1.00	1.00	0.88
	% Plecoptera	0.99	0.22	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.99	1.00
	% Trichoptera	1.00	1.00	0.49	1.00	0.59	0.36	1.00	0.27	1.00	1.00	1.00	1.00	1.00
	% Chironomidae	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	% Oligocheata	1.00	1.00	1.00	1.00	0.97	0.15	0.00	0.04	1.00	1.00	1.00	1.00	1.00
	% Trombidiformes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	% Mollusca	0.99	1.00	0.88	1.00	0.83	0.15	0.56	0.30	1.00	1.00	1.00	1.00	1.00
	NMS1	0.75	1.00	0.99	1.00	0.93	0.57	0.58	0.96	1.00	1.00	1.00	1.00	1.00
	NMS2	1.00	1.00	1.00	1.00	1.00	0.98	1.00	0.97	1.00	1.00	0.97	1.00	1.00
Log_e	Abundance	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Log_e	Family Richness	1.00	0.87	1.00	1.00	1.00	0.87	1.00	1.00	1.00	1.00	1.00	1.00	1.00
$Log_{e(1-x)}$	Diversity (Simpson's)	1.00	0.68	1.00	0.99	1.00	1.00	1.00	1.00	1.00	0.23	0.25	1.00	0.97
Logit	Evenness (Simpson's)	1.00	0.99	1.00	0.99	0.99	0.93	1.00	1.00	1.00	0.09	0.00	1.00	0.34
Logit	% EPT	1.00	1.00	0.96	1.00	0.95	0.44	0.83	0.65	1.00	1.00	1.00	1.00	1.00
None[a]	% Ephemeroptera	1.00	1.00	1.00	1.00	0.96	0.98	0.64	0.83	1.00	1.00	1.00	1.00	1.00
Logit	% Plecoptera	0.99	1.00	1.00	0.99	1.00	0.83	1.00	1.00	1.00	1.00	1.00	1.00	0.93
Square Root	% Trichoptera	0.99	0.71	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Log_e	% Chironomidae	1.00	1.00	0.95	1.00	0.96	0.93	1.00	0.91	1.00	1.00	1.00	1.00	1.00
None[a]	% Oligocheata	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Square Root	% Trombidiformes	1.00	1.00	1.00	1.00	0.98	0.58	0.00	0.37	1.00	1.00	1.00	1.00	1.00
None[a]	% Mollusca	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

[a] No transformations (Logit, Log_e, $Log_e(1-x)$, Square root) resulted in improvement of data to a normal distribution.

Highlighted boxes indicate ncP values that fall between 0.05 and 0.95.

Highlighted boxes indicate ncP values that fall below 0.05.

Table E.15: Benthic invertebrate community metrics for 22 reference areas, August 2014. Orange highlight indicates values outside of the range represented by 90% of reference area values (non-central p-values ≤ 0.05). Yellow highlight indicates values that are uncertain with respect to being in the reference range (non-central p-values between 0.05 and 0.95).

Transformation	Endpoint	Reference																				
		R7	FC	R6	USFR	V1	VR	BLC	NEXC	GRC	STC	HOC	BEC	BUC	REF-126	REF-212	REF-213	REF-220	REF-325	REF-327	REF-328	REF-340	REF-376
Non-transformed	Abundance	838	1896	8080	778	1875	1674	2249	1733	929	263	836	8240	1963	1150	322	3628	2092	2768	340	1241	4340	1655
	Family Richness	17	22	18	19	15	11	24	20	18	18	22	15	18	13	12	23	14	18	19	19	19	19
	Diversity (Simpson's)	0.78	0.80	0.67	0.84	0.70	0.81	0.87	0.80	0.81	0.85	0.91	0.75	0.86	0.59	0.53	0.85	0.81	0.70	0.68	0.63	0.83	0.73
	Evenness (Simpson's)	0.26	0.23	0.17	0.32	0.24	0.47	0.34	0.26	0.31	0.42	0.52	0.29	0.40	0.19	0.18	0.31	0.41	0.19	0.19	0.16	0.32	0.21
	% EPT	44.4	52.4	36.4	88.2	67.5	69.2	53.8	81.4	81.4	66.5	85.5	27.4	69.0	95.9	95.7	73.1	80.5	90.0	95.3	87.9	70.5	49.8
	% Ephemeroptera	20.3	25.7	19.3	43.7	45.3	31.1	22.6	45.6	15.7	24.7	32.7	10.0	33.0	61.6	64.9	39.2	3.9	53.4	55.3	59.3	29.7	19.0
	% Plecoptera	17.5	16.5	17.1	34.8	18.9	38.1	28.5	27.5	64.3	39.2	40.8	10.7	26.1	33.0	29.5	30.9	76.7	21.9	32.9	25.1	31.8	27.8
	% Trichoptera	6.6	10.2	0.0	9.6	3.2	0.0	2.7	8.3	1.4	2.7	12.1	6.8	10.0	1.3	1.2	3.0	0.0	14.7	7.1	3.5	9.0	3.0
	% Chironomidae	42.8	38.5	52.7	5.9	29.1	6.6	28.1	14.1	12.5	27.8	2.4	44.2	19.2	3.1	1.9	19.0	12.5	3.3	2.4	8.6	24.2	47.4
	% Oligocheata	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.0	1.2	0.0	0.0	0.6	3.4	0.0	0.3	0.0	0.3	0.0	0.0
	% Trombidiformes	6.4	4.1	5.2	4.5	2.7	0.0	6.0	2.8	0.2	1.1	2.8	10.4	8.1	0.0	0.0	1.8	0.0	1.7	1.5	1.0	3.0	1.8
	% Mollusca	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	NMS1	0.87	0.19	0.98	-0.08	-0.35	0.06	0.66	-0.51	-0.11	0.29	0.70	1.37	0.70	-1.13	-1.65	0.09	0.21	-0.93	-1.16	-0.91	0.09	0.61
	NMS2	-0.50	-0.70	-0.60	0.48	-0.48	1.22	0.05	-0.16	0.50	-0.13	0.88	-0.54	0.16	-0.02	-0.29	0.06	0.93	-0.08	-0.20	-0.17	-0.03	-0.38
Log_e	Abundance	6.73	7.55	9.00	6.66	7.54	7.42	7.72	7.46	6.83	5.57	6.73	9.02	7.58	7.05	5.77	8.20	7.65	7.93	5.83	7.12	8.38	7.41
Log_e	Family Richness	-2.83	-3.09	-2.89	-2.94	-2.71	-2.40	-3.18	-3.00	-2.89	-2.89	-3.09	-2.71	-2.89	-2.56	-2.48	-3.14	-2.64	-2.89	-2.94	-2.94	-2.94	-2.94
$Log_{e(1-x)}$	Diversity (Simpson's)	-1.49	-1.59	-1.12	-1.81	-1.21	-1.64	-2.07	-1.58	-1.67	-1.91	-2.39	-1.40	-1.96	-0.90	-0.75	-1.92	-1.68	-1.19	-1.15	-1.00	-1.80	-1.31
Logit	Evenness (Simpson's)	-1.03	-1.19	-1.59	-0.75	-1.15	-0.13	-0.65	-1.06	-0.79	-0.32	0.08	-0.89	-0.43	-1.45	-1.54	-0.81	-0.35	-1.43	-1.47	-1.65	-0.77	-1.35
Logit	% EPT	-0.23	0.10	-0.56	2.01	0.73	0.81	0.15	1.48	1.47	0.69	1.78	-0.97	0.80	3.16	3.09	1.00	1.42	2.20	3.01	1.98	0.87	-0.01
None[a]	% Ephemeroptera	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Logit	% Plecoptera	-1.55	-1.62	-1.58	-0.63	-1.45	-0.49	-0.92	-0.97	0.59	-0.44	-0.37	-2.12	-1.04	-0.71	-0.87	-0.80	1.19	-1.27	-0.71	-1.09	-0.76	-0.95
Square Root	% Trichoptera	0.26	0.32	0	0.31	0.18	0	0.16	0.29	0.12	0.16	0.35	0.26	0.32	0.11	0.11	0.17	0	0.38	0.27	0.19	0.30	0.17
Log_e	% Chironomidae	-0.85	-0.95	-0.64	-2.83	-1.24	-2.71	-1.27	-1.96	-2.08	-1.28	-3.73	-0.82	-1.65	-3.46	-3.98	-1.66	-2.08	-3.40	-3.75	-2.45	-1.42	-0.75
None[a]	% Oligocheata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Square Root	% Trombidiformes	0.25	0.20	0.23	0.21	0.16	0	0.24	0.17	0.05	0.11	0.17	0.32	0.28	0	0	0.13	0	0.13	0.12	0.10	0.17	0.13
None[a]	% Mollusca	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] No transformations (Logit, Log_e, $Log_e(1-x)$, Square root) resulted in improvement of data to a normal distribution.

Table E.16: Benthic invertebrate community metrics for 11 exposed and 2 minimally influenced areas, August 2014. Orange highlight indicates values outside the range represented by 90% of reference area values (non-central p-values ≤ 0.05). Yellow highlight indicates values that are uncertain with respect to being in the reference range (non-central interval p-values between 0.05 and 0.95).

Transformation	Endpoint	Minimally Influenced		Exposed										
		R1	Grum	R9	X2	X3	RDE-1	RDE-2	RDE-3	R2	R3	R4	R5	A1
Non-transformed	Abundance	4099	2022	3450	791	2673	2617	2688	2790	2739	2040	2025	1004	868
	Family Richness	20	23	19	18	20	23	21	17	19	20	16	19	16
	Diversity (Simpson's)	0.83	0.88	0.73	0.86	0.74	0.73	0.84	0.70	0.83	0.90	0.90	0.84	0.86
	Evenness (Simpson's)	0.35	0.39	0.19	0.39	0.19	0.17	0.29	0.20	0.30	0.54	0.64	0.36	0.49
	% EPT	51.2	76.7	44.9	74.0	43.9	30.0	39.0	34.3	61.4	71.3	76.7	73.8	80.2
	% Ephemeroptera	33.1	37.9	17.4	47.8	14.0	15.0	7.4	10.5	18.5	34.3	36.9	37.5	27.4
	% Plecoptera	17.3	25.1	25.2	17.1	28.7	13.8	28.8	20.0	41.0	32.6	33.4	35.3	51.0
	% Trichoptera	0.8	13.7	2.3	9.1	1.2	1.2	2.8	3.9	1.8	4.4	6.4	1.0	1.7
	% Chironomidae	30.4	13.4	47.8	16.1	46.5	49.7	30.7	51.4	30.1	14.5	8.1	14.3	13.4
	% Oligocheata	1.1	0.0	0.0	0.0	0.3	0.3	0.9	0.0	0.0	1.0	0.0	0.6	0.0
	% Trombidiformes	5.1	2.9	2.9	0.6	6.2	8.8	23.5	9.8	3.1	3.7	4.0	4.2	0.9
	% Mollusca	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Log_e	Abundance	8.32	7.61	8.15	6.67	7.89	7.87	7.90	7.93	7.92	7.62	7.61	6.91	6.77
Log_e	Family Richness	-3.00	-3.14	-2.94	-2.89	-3.00	-3.14	-3.04	-2.83	-2.94	-3.00	-2.77	-2.94	-2.77
$Log_{e(1-x)}$	Diversity (Simpson's)	-1.79	-2.15	-1.31	-1.96	-1.33	-1.29	-1.81	-1.21	-1.75	-2.33	-2.32	-1.86	-2.00
Logit	Evenness (Simpson's)	-0.60	-0.44	-1.42	-0.44	-1.45	-1.56	-0.89	-1.40	-0.84	0.16	0.56	-0.59	-0.03
Logit	% EPT	0.05	1.19	-0.20	1.04	-0.25	-0.85	-0.45	-0.65	0.46	0.91	1.19	1.04	1.40
None[a]	% Ephemeroptera	-	-	-	-	-	-	-	-	-	-	-	-	-
Logit	% Plecoptera	-1.56	-1.09	-1.09	-1.58	-0.91	-1.83	-0.91	-1.39	-0.36	-0.73	-0.69	-0.61	0.04
Square Root	% Trichoptera	0.09	0.37	0.15	0.30	0.11	0.11	0.17	0.20	0.14	0.21	0.25	0.10	0.13
Log_e	% Chironomidae	-1.19	-2.01	-0.74	-1.83	-0.77	-0.70	-1.18	-0.67	-1.20	-1.93	-2.51	-1.94	-2.01
None[a]	% Oligocheata	-	-	-	-	-	-	-	-	-	-	-	-	-
Square Root	% Trombidiformes	0.23	0.17	0.17	0.08	0.25	0.30	0.49	0.31	0.18	0.19	0.20	0.20	0.10
None[a]	% Mollusca	-	-	-	-	-	-	-	-	-	-	-	-	-

[a] No transformations (Logit, Log_e, $Log_e(1-x)$, Square root) resulted in improvement of data to a normal distribution.

[b] NMS values for exposed areas are omitted because they are independent of each other and therefore are not comparable between exposed areas.

Table E.17: Pearson corrlations between benthic endpoints and water quality PCA axes, Faro Mine, August 2014.

Parameter	Abundance (Log_e Transformed)		Family Richness (Log_e Transformed)		% EPT (Logit Transformed)		% Ephemeroptera (Non-transformed)		% Plecoptera (Logit Transformed)		% Trichoptera (Square Root Transformed)		% Chironomidae (Non-transformed)		% Trombidiformes (Square Root Transformed)	
	r	p	r	p	r	p	r	p	r	p	r	p	r	p	r	p
PCA-1	-0.124	0.332	0.169	0.808	-0.043	0.018	-0.399	0.003	0.488	0.219	-0.213	0.478	-0.019	0.912	-0.151	0.387
PCA-2	0.027	0.725	0.062	0.877	-0.027	0.199	-0.222	0.315	0.175	0.753	-0.055	0.879	0.021	0.905	-0.015	0.931
PCA-3	0.288	0.585	-0.096	0.015	-0.406	0.061	-0.320	0.734	-0.059	0.407	-0.145	0.093	0.313	0.067	0.184	0.289
PCA-4	-0.044	0.805	0.043	0.234	-0.207	0.254	-0.198	0.969	0.007	0.175	-0.234	0.801	0.170	0.330	0.044	0.801

Correlation is significant at p = 0.05 level (not adjusted for 32 comparisons; 2-tailed).

Correlation is significant at p = 0.002 (p = 0.05 adjusted for 32 comparisons; 2-tailed)

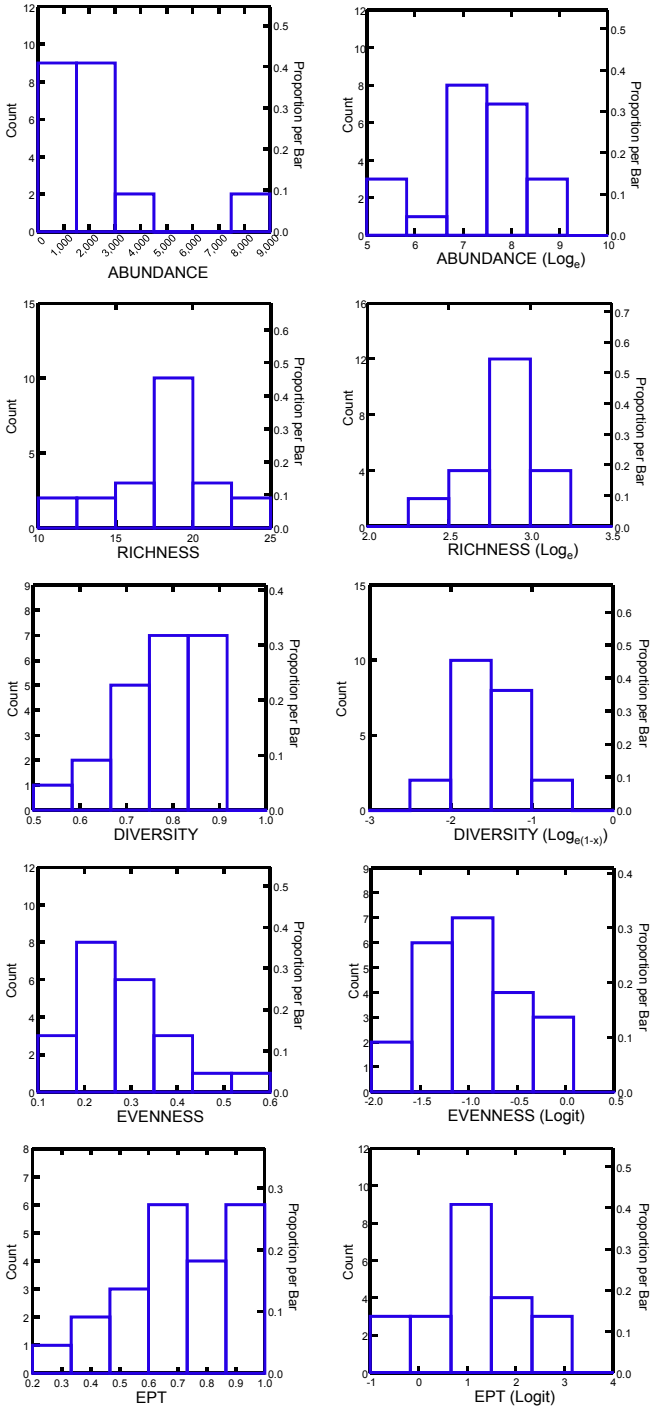


Figure E.1: Histograms of the relative abundance (proportional) data for reference area (n = 22) benthic invertebrate community endpoints, Faro Mine, August 2014.

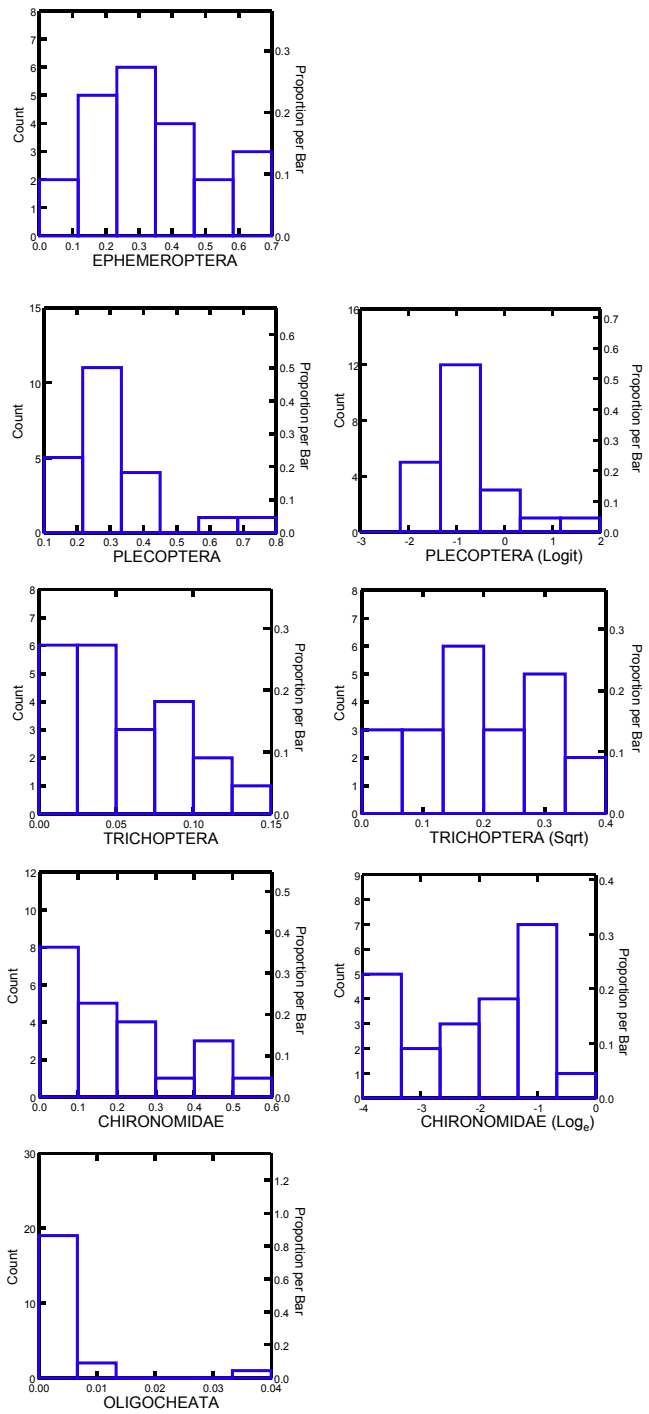


Figure E.1: Histograms of the relative abundance (proportional) data for reference area (n = 22) benthic invertebrate community endpoints, Faro Mine, August 2014.

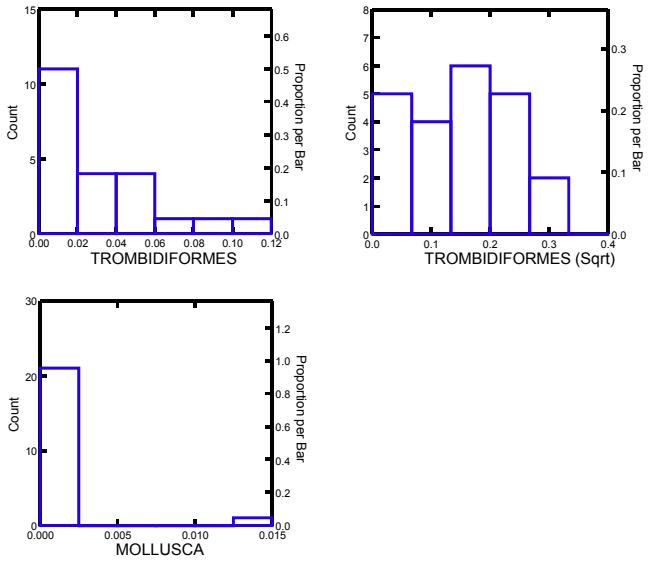


Figure E.1: Histograms of the relative abundance (proportional) data for reference area (n = 22) benthic invertebrate community endpoints, Faro Mine, August 2014.

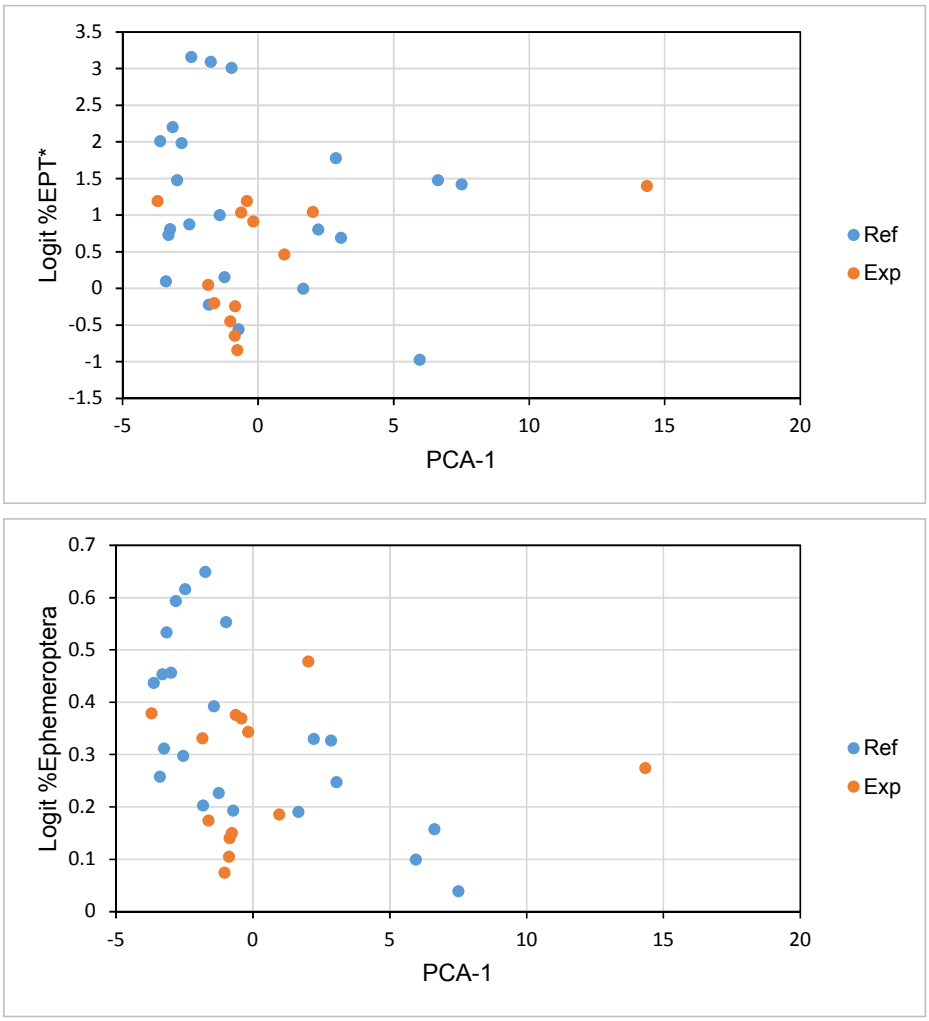


Figure E.2: Scatter plots of significant ($p < 0.05$) Pearson correlations between water quality axes and benthic invertebrate endpoints, Faro Mine, August 2014.

* Ephemeropter, Plecoptera, and Trichoptera

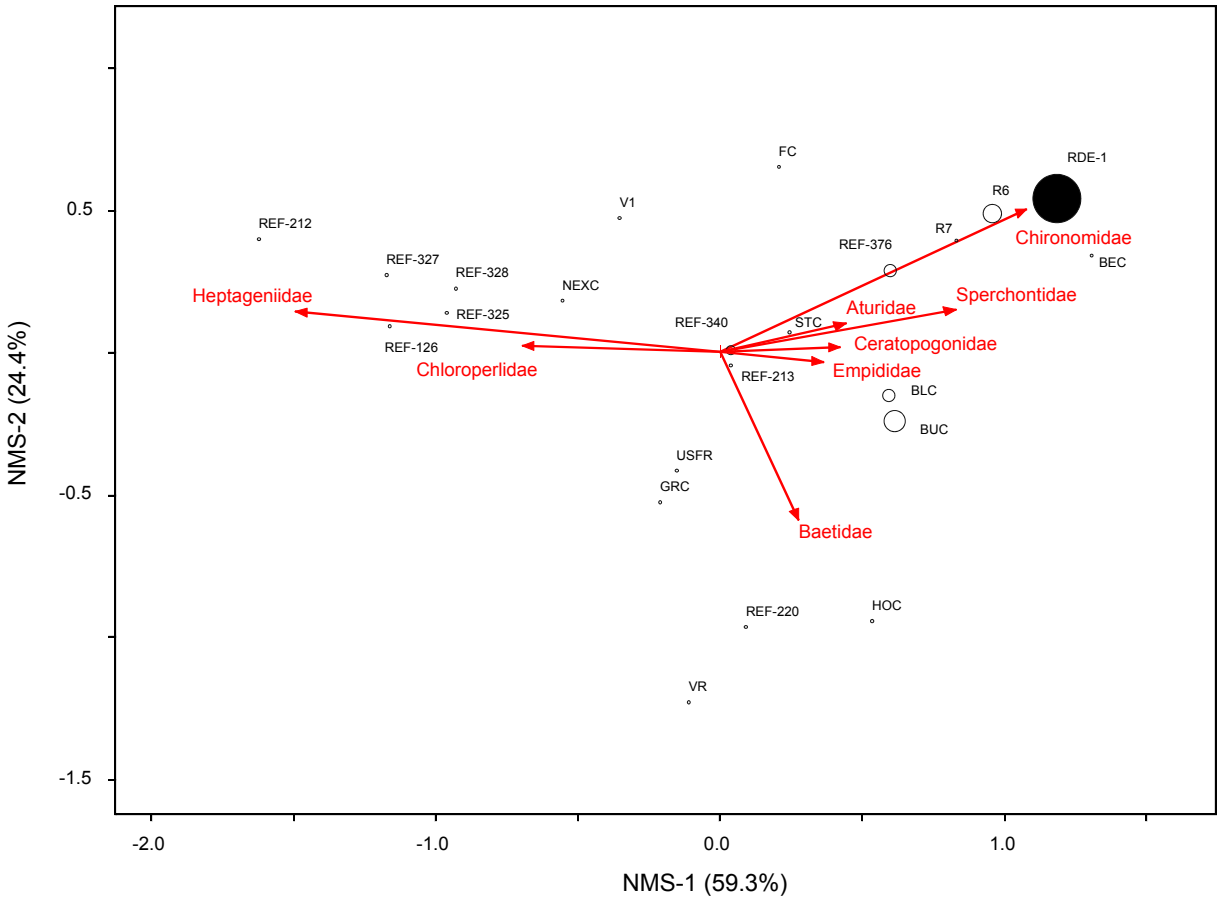


Figure E.3: Nonmetric multidimensional scaling (NMS) biplot of benthic invertebrate community structure at 22 reference areas and exposed area RDE-1. Symbol size is proportional to the relative abundance of *Aturidae sp.* at an area. Displayed vectors have significant ($p < 0.05$) absolute Spearman correlation coefficient (r) greater than 0.50 with either NMS-1 or NMS-2; vector length is proportional to correlation strength. Family level of taxonomy was employed excluding taxa that were not found in more than one area. A stable 3-dimensional solution was found with stress of 8.27 .

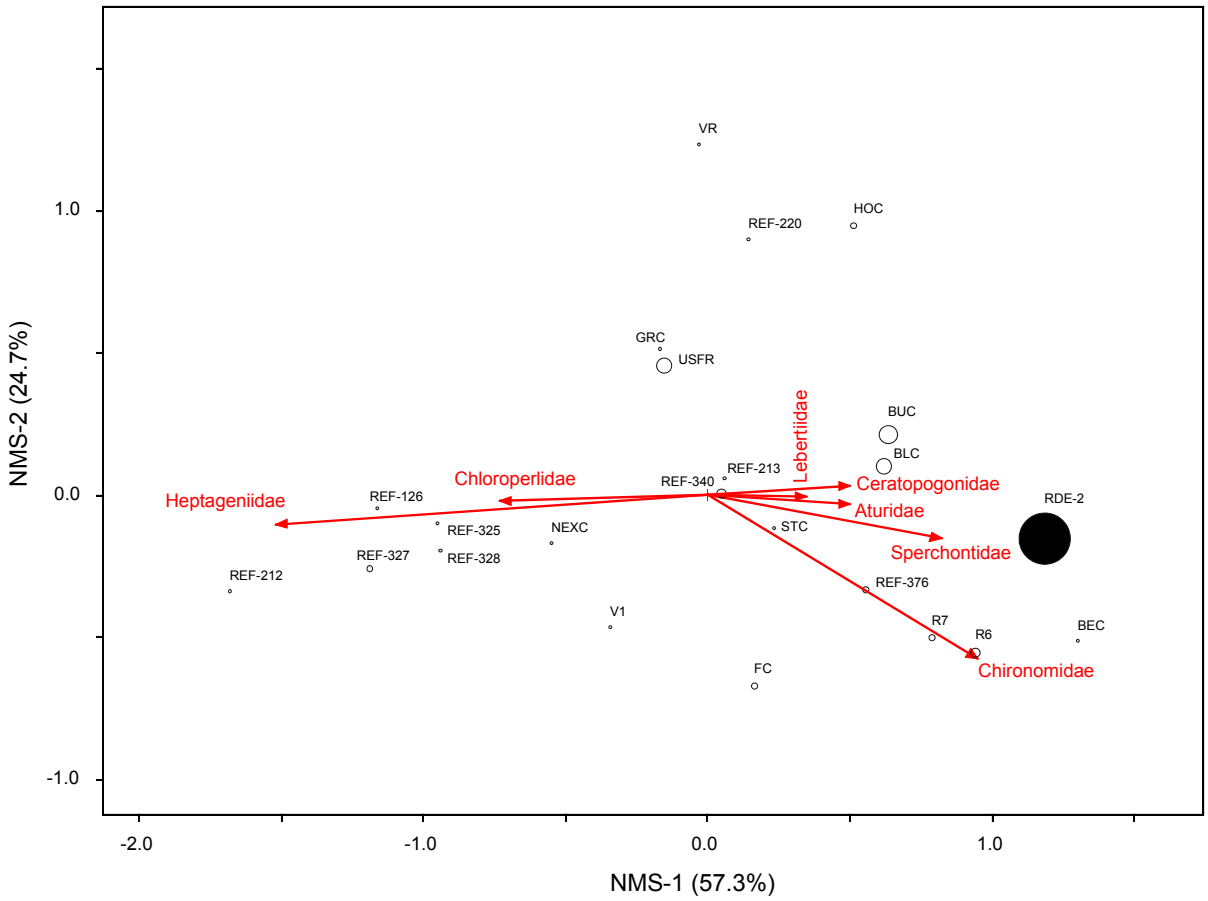


Figure E.4: Nonmetric multidimensional scaling (NMS) biplot of benthic invertebrate community structure at 22 reference areas and exposed area RDE-2. Symbol size is proportional to the relative abundance of *Lebertiidae sp.* at an area. Displayed vectors have significant ($p < 0.05$) absolute Spearman correlation coefficient (r) greater than 0.50 with either NMS-1 or NMS-2; vector length is proportional to correlation strength. Family level of taxonomy was employed excluding taxa that were not found in more than one area. A stable 3-dimensional solution was found with stress of 8.93 .

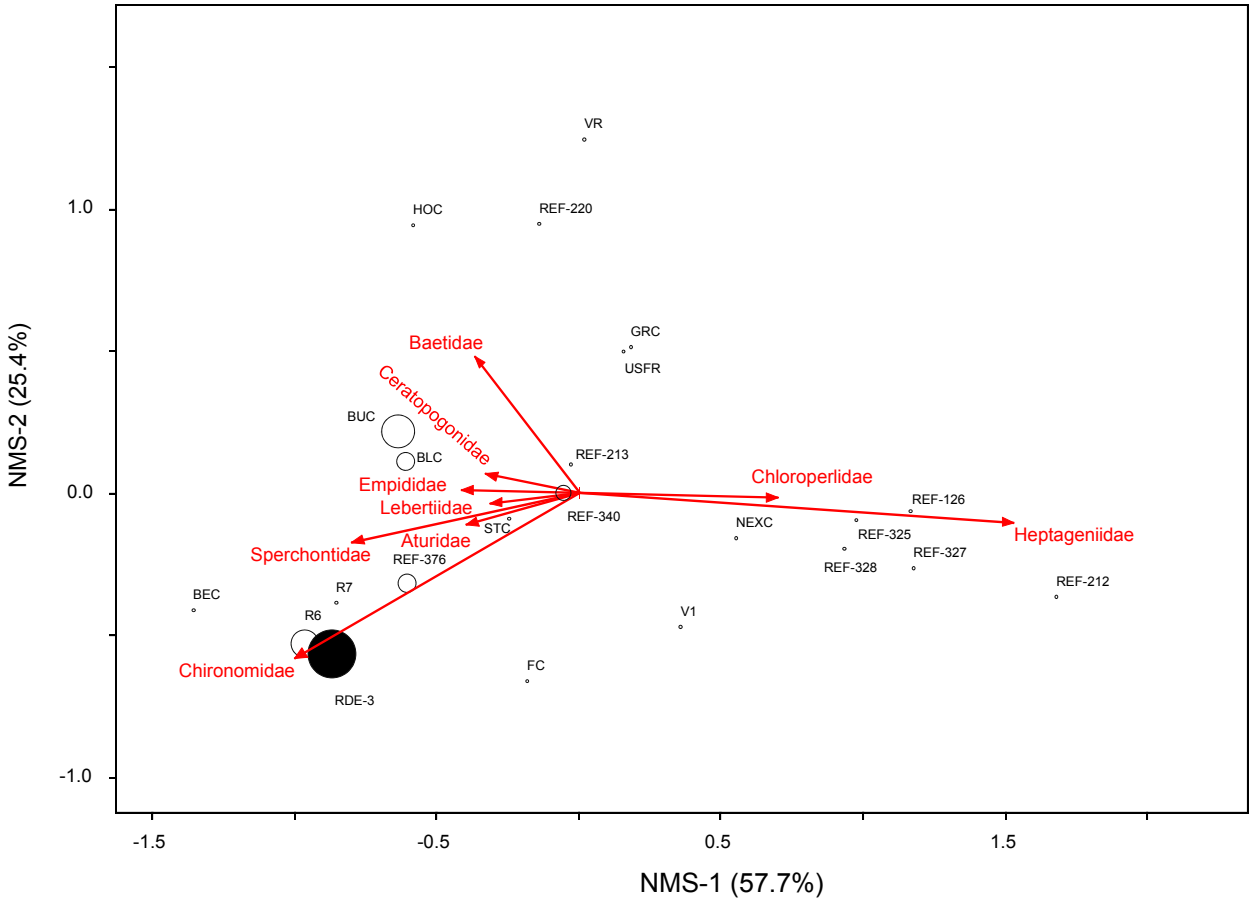


Figure E.5: Nonmetric multidimensional scaling (NMS) biplot of benthic invertebrate community structure at 22 reference areas and exposed area RDE-3. Symbol size is proportional to the relative abundance of *Aturidae sp.* at an area. Displayed vectors have significant ($p < 0.05$) absolute Spearman correlation coefficient (r) greater than 0.50 with either NMS-1 or NMS-2; vector length is proportional to correlation strength. Family level of taxonomy was employed excluding taxa that were not found in more than one area. A stable 3-dimensional solution was found with stress of 8.44.

APPENDIX F

FISH DATA

Table F.1: Electrofishing catch results by area, Faro Mine Aquatic Study, August 2014.

Area		Date	UTM (08V, NAD 83)		Effort (seconds)	Number Caught		CPUE (# fish/sec)	
			Start	Ending		Slimy Sculpin	Arctic Grayling	Slimy Sculpin	Arctic Grayling
North Fork upstream from Faro Creek	R7	26-Aug-14	586386 6914386	586655 6914361	1,001	5	0	0.005	0.000
South Fork	SF	22-Aug-14	584205 6912383	585489 6911343	2,316	28	5	0.012	0.002
North Fork upstream from Haul Road	NFA	24-Aug-14	585191 6913661	585774 6913801	792	16	0	0.020	0.000
North Fork downstream from Haul Road	NFB	21-Aug-14	584064 6912742	584722 6913026	1,105	13	0	0.012	0.000
Groundwater recharge ponds, Pumphouse Pond, North Fork Diversion	NFC	21-Aug-14	583713 6912483	583981 6912726	643	9	0	0.014	0.000
Rose Creek Diversion	RCD	23-Aug-14	583156 6912530	579475 6914915	2,244	36	1	0.016	0.000
Rose Creek downstream from RCTA	R2	23-Aug-14	579358 6915029	578860 6914987	1,023	14	1	0.014	0.001

CPUE - Catch-per-unit-effort as number of fish caught per second

Table F.2: Closed station electrofishing catch results, Faro Mine Aquatic Study, August 2014.

Area	Date	UTM (08V, NAD 83)		Effort (seconds)	Number Caught		CPUE (# fish/sec)	
		Start	Ending		Slimy Sculpin	Arctic Grayling	Slimy Sculpin	Arctic Grayling
NFRC Upstream from Haul Road (NFA) (Passes 1,2, and 3)	26-Aug-14	585235 6913660	585245 6913660	1,253	11	1	0.009	0.0008
				1,054	2	1	0.002	0.0009
				656	0	0	0.000	0.0000
NFRC Downstream from Haul Road (NFB) (Passes 1, 2, and 3)	25-Aug-14	584689 6913004	584676 6912986	1,639	18	9	0.011	0.0055
				1,311	12	2	0.009	0.0015
				869	8	2	0.009	0.0023

CPUE - Catch-per-unit-effort as number of fish caught per second

Table F.3: North Fork Rose Creek Upstream of Haul Road stream size measurements along transects at closed stations electrofished for estimates of fish densities, Faro Mine Aquatic Study, August 2014.

	NFRC Upstream from Haul Road [Station (NFA), stream length 16.0 m]				Mean
	Transect Characteristics				
Width (m)	8.0	7.7	8.0	7.9	7.9
Depths (cm)	43	58	44	48	40.1
	55	61	51	56	
	61	60	45	46	
	48	38	47	47	
	27	21	48	49	
	11	11	19	30	
	5			13	

Table F.4: North Fork Rose Creek Downstream of Haul Road stream size measurements along transects at closed stations electrofished for estimates of fish densities, Faro Mine Aquatic Study, August 2014.

	NFRC Downstream from Haul Road [Station (NFB), stream length 24.6 m]						Mean
	Transect Characteristics						
Width (m)	6.1	5.9	5.5	6.6	7.2	7.2	6.4
Depths (cm)	27	49	91	100	95	82	52.5
	37	32	92	95	97	92	
	38	29	71	73	94	91	
	32	25	40	52	74	88	
	20	20	20	45	66	75	
	15	12	16	19	29	50	
	9	4					

Table F.5: Gill net catch results, Faro Mine Aquatic Study, August 2014

Area	Coordinates	Set Date	Set Duration (h)	Catch	
				Arctic Grayling	Slimy Sculpin
Haul Road Pond	584826 6913239	24-Aug-15	6.33	3	4
North Fork Groundwater Recharge Pond	583887 6912626	20-Aug-14	0.33	3	0
Pumphouse Pond	583338 6912462	20-Aug-14	1.5	2	0
South Fork downstream from former reservoir	585119 6911829	22-Aug-14	3	0	0

Table F.6: Minnow trap catch results, Faro Mine Aquatic Study, August 2014

Area	Coordinates	Set Date	Set Duration (h)	Catch	
				Arctic Grayling	Slimy Sculpin
Pumphouse Pond	583289 6912505	20-Aug-14	6.5	0	1

Table F.7: Detailed slimy sculpin measurements for North Fork Rose Creek upstream of Faro Creek, Faro Mine Aquatic Study, August 2014.

Date	Area	Fish ID	Total Length (cm)	Fork Length (cm)	Total Body Weight (g)	Condition Factor	Age (yrs)	Tissue Sample	Comments	Fate
26-Aug-14	R7	SS-01	10.5	-	12.5	1.08	5	Y		sacrificed
26-Aug-14	R7	SS-02	8.1	-	5.2	0.98	4	Y	composite	sacrificed
26-Aug-14	R7	SS-03	7.2	-	3.2	0.86	4	Y	tissue	sacrificed
26-Aug-14	R7	SS-04	5.9	-	1.9	0.93	2	N		released
26-Aug-14	R7	SS-05	3.6	-	0.6	1.29		N		released
		Count	5	-	5	5	4			
		Minimum	3.6	-	0.6	0.86	2.0			
		Maximum	10.5	-	12.5	1.29	5.0			
		Mean	7.1	-	4.7	1.03	3.8			
		Standard Deviation	2.6	-	4.7	0.17	1.3			

Table F.8: Detailed fish measurements for South Fork Rose Creek, Faro Mine Aquatic Study, August 2014.

a) Arctic Grayling

Date	Area	Fish ID	Total Length (cm)	Fork Length (cm)	Total Body Weight (g)	Condition Factor	Age (yrs)	Tissue Sample	Comments	Fate
22-Aug-14	SF	AG-01	22.8	21.3	109.0	1.13	3	Y	from ponds	sacrificed
22-Aug-14	SF	AG-02	22.5	20.9	94.0	1.03	3	Y	from ponds	sacrificed
22-Aug-14	SF	AG-03	19.7	18.6	72.0	1.12	2	Y	from ponds, 1 otolith lost	sacrificed
22-Aug-14	SF	AG-04	20.9	19.0	69.0	1.01	2	N	from ponds	released
22-Aug-14	SF	AG-05	5.2	5.0	1.0	0.80		N	from ponds	released
25-Aug-14	Grum	AG-01	10.5	9.7	7.0	0.77		N	below access road	released
25-Aug-14	Grum	AG-02	9.9	9.2	4.1	0.53		N	below access road	released
		Count	7	7	7	7	4			
		Minimum	5.2	5.0	1.0	0.53	2.0			
		Maximum	22.8	21.3	109.0	1.13	3.0			
		Mean	15.9	14.8	50.9	0.91	2.5			
		Standard Deviation	7.2	6.6	45.9	0.22	0.6			

b) Slimy Sculpin

Date	Area	Fish ID	Total Length (cm)	Fork Length (cm)	Total Body Weight (g)	Condition Factor	Age (yrs)	Tissue Sample	Comments	Fate
22-Aug-14	SF	SS-01	10.1	-	10.0	0.97	5	Y	R1 area	sacrificed
22-Aug-14	SF	SS-02	9.2	-	7.8	1.00	5	Y	R1 area	sacrificed
22-Aug-14	SF	SS-03	8.9	-	8.4	1.19	3	Y	R1 area	sacrificed
22-Aug-14	SF	SS-04	7.3	-	4.0	1.03		N	R1 area	released
22-Aug-14	SF	SS-05	7.5	-	3.4	0.81		N	R1 area	released
22-Aug-14	SF	SS-06	7.6	-	3.9	0.89		N	R1 area	released
22-Aug-14	SF	SS-07	6.2	-	2.4	1.01		N	R1 area	released
22-Aug-14	SF	SS-08	4.1	-	0.6	0.87		N	R1 area	released
22-Aug-14	SF	SS-09	4.6	-	0.9	0.92		N	R1 area	released
22-Aug-14	SF	SS-10	4.2	-	0.7	0.94		N	R1 area	released
22-Aug-14	SF	SS-11	4.7	-	0.8	0.77		N	R1 area	released
22-Aug-14	SF	SS-12	9.2	-	7.8	1.00		N	ponds (main channel)	released
22-Aug-14	SF	SS-13	8.0	-	5.6	1.09		N	ponds (main channel)	released
22-Aug-14	SF	SS-14	8.6	-	5.6	0.88		N	near former dam	released

Table F.8: Detailed fish measurements for South Fork Rose Creek, Faro Mine Aquatic Study, August 2014.

Date	Area	Fish ID	Total Length (cm)	Fork Length (cm)	Total Body Weight (g)	Condition Factor	Age (yrs)	Tissue Sample	Comments	Fate
22-Aug-14	SF	SS-15	7.9	-	5.6	1.14		N	near former dam	released
22-Aug-14	SF	SS-16	8.4	-	4.7	0.79		N	near former dam	released
22-Aug-14	SF	SS-17	6.3	-	2.0	0.80		N	near former dam	released
22-Aug-14	SF	SS-18	5.7	-	1.6	0.86		N	near former dam	released
22-Aug-14	SF	SS-19	7.2	-	3.1	0.83		N	near former dam	released
22-Aug-14	SF	SS-20	7.5	-	3.7	0.88		N	near former dam	released
22-Aug-14	SF	SS-21	6.6	-	2.4	0.83		N	near former dam	released
22-Aug-14	SF	SS-22	4.3	-	0.5	0.63		N	near former dam	released
22-Aug-14	SF	SS-23	5.7	-	1.5	0.81		N	near former dam	released
22-Aug-14	SF	SS-24	5.6	-	1.5	0.85		N	near former dam	released
22-Aug-14	SF	SS-25	5.1	-	1.4	1.06		N	near former dam	released
22-Aug-14	SF	SS-26	4.5	-	0.7	0.77		N	near former dam	released
22-Aug-14	SF	SS-27	4.1	-	0.7	1.02		N	near former dam	released
22-Aug-14	SF	SS-28	4.6	-	0.8	0.82		N	near former dam	released
22-Aug-14	SF	SS-29	4.5	-	0.6	0.66		N	near former dam	released
22-Aug-14	SF	SS-30	1.6	-	0.1	2.44		N	near former dam	released
25-Aug-14	Grum	SS-01	9.8	-	8.6	0.91		N	below access road	released
25-Aug-14	Grum	SS-02	9.9	-	9.4	0.97		N	below access road	released
25-Aug-14	Grum	SS-03	8.6	-	5.6	0.88		N	below access road	released
25-Aug-14	Grum	SS-04	8.4	-	5.0	0.84		N	below access road	released
25-Aug-14	Grum	SS-05	8.6	-	5.6	0.88		N	below access road	released
25-Aug-14	Grum	SS-06	8.3	-	4.7	0.82		N	below access road	released
25-Aug-14	Grum	SS-07	8.3	-	4.5	0.79		N	below access road	released
		Count	37	-	37	37	3			
		Minimum	1.6	-	0.1	0.63	3			
		Maximum	10.1	-	10.0	2.44	5			
		Mean	6.8	-	3.7	0.94	4			
		Standard Deviation	2.1	-	2.9	0.28	1			

Table F.9: Detailed fish measurements for North Fork Rose Creek, Faro Creek to haul road (NFA), Faro Mine Aquatic Study, August 2014.

a) Arctic Grayling

Date	Area	Fish ID	Total Length (cm)	Fork Length (cm)	Total Body Weight (g)	Condition Factor	Age (yrs)	Tissue Sample	Comments	Fate
24-Aug-14	NFA	AG-01	32.9	30.9	305	1.03	5	Y	Haul Road Pond	sacrificed
24-Aug-14	NFA	AG-02	34.9	32.1	420	1.27	5	Y	Haul Road Pond	sacrificed
24-Aug-14	NFA	AG-03	32.9	31.0	296	0.99	5	Y	Haul Road Pond	sacrificed
26-Aug-14	NFA	AG-04	4.0	3.8	0.4	0.73			Closed Station Pass 1	released
		Count	4	4	4	4	3			
		Minimum	4.0	3.8	0.4	0.73	5.0			
		Maximum	34.9	32.1	420.0	1.27	5.0			
		Mean	26.2	24.5	255.4	1.01	5.0			
		Standard Deviation	14.8	13.8	179.1	0.22	0.0			

b) Slimy Sculpin

Date	Area	Fish ID	Total Length (cm)	Fork Length (cm)	Total Body Weight (g)	Condition Factor	Age (yrs)	Tissue Sample	Comments	Fate
24-Aug-14	NFA	SS-01	10.9	-	11.5	0.89	5	Y	Haul Road Pond	sacrificed
24-Aug-14	NFA	SS-02	10.7	-	11.8	0.96		Y	Haul Road Pond	sacrificed
24-Aug-14	NFA	SS-03	9.6	-	7.8	0.88	4	Y	Haul Road Pond	sacrificed
24-Aug-14	NFA	SS-04	11.0	-	14.3	1.07		N	upstream from R9	released
24-Aug-14	NFA	SS-05	10.1	-	8.9	0.86		N	upstream from R9	released
24-Aug-14	NFA	SS-06	10.0	-	8.3	0.83		N	upstream from R9	released
24-Aug-14	NFA	SS-07	9.1	-	6.4	0.85		N	upstream from R9	released
24-Aug-14	NFA	SS-08	8.6	-	5.7	0.90		N	upstream from R9	released
24-Aug-14	NFA	SS-09	8.5	-	5.1	0.83		N	upstream from R9	released
24-Aug-14	NFA	SS-10	8.0	-	4.2	0.82		N	upstream from R9	released
24-Aug-14	NFA	SS-11	8.2	-	5.3	0.96		N	upstream from R9	released
24-Aug-14	NFA	SS-12	7.3	-	3.4	0.87		N	upstream from R9	released
24-Aug-14	NFA	SS-13	7.1	-	2.1	0.59		N	upstream from R9	released
24-Aug-14	NFA	SS-14	7.4	-	3.2	0.79		N	upstream from R9	released
24-Aug-14	NFA	SS-15	6.3	-	2.3	0.92		N	upstream from R9	released
24-Aug-14	NFA	SS-16	6.4	-	2.4	0.92		N	upstream from R9	released

Table F.9: Detailed fish measurements for North Fork Rose Creek, Faro Creek to haul road (NFA), Faro Mine Aquatic Study, August 2014.

Date	Area	Fish ID	Total Length (cm)	Fork Length (cm)	Total Body Weight (g)	Condition Factor	Age (yrs)	Tissue Sample	Comments	Fate
24-Aug-14	NFA	SS-17	5.4	-	1.3	0.83		N	upstream from R9	released
24-Aug-14	NFA	SS-18	5.5	-	1.5	0.90		N	upstream from R9	released
24-Aug-14	NFA	SS-19	3.6	-	0.4	0.86		N	upstream from R9	released
26-Aug-14	NFA	SS-20	9.8	-	8.8	0.93		N	closed station pass 1	released
26-Aug-14	NFA	SS-21	9.1	-	6.6	0.88		N	closed station pass 1	released
26-Aug-14	NFA	SS-22	9.5	-	7.4	0.86		N	closed station pass 1	released
26-Aug-14	NFA	SS-23	9.3	-	9.0	1.12		N	closed station pass 1	released
26-Aug-14	NFA	SS-24	8.9	-	6.5	0.92		N	closed station pass 1	released
26-Aug-14	NFA	SS-25	7.4	-	3.4	0.84		N	closed station pass 1	released
26-Aug-14	NFA	SS-26	6.9	-	2.9	0.89		N	closed station pass 1	released
26-Aug-14	NFA	SS-27	3.6	-	0.7	1.50		N	closed station pass 1	released
26-Aug-14	NFA	SS-28	4.2	-	0.6	0.81		N	closed station pass 1	released
26-Aug-14	NFA	SS-29	4.4	-	0.7	0.82		N	closed station pass 1	released
26-Aug-14	NFA	SS-30	3.7	-	0.5	0.99		N	closed station pass 1	released
26-Aug-14	NFA	SS-31	3.7	-	0.5	0.99		N	closed station pass 1	released
26-Aug-14	NFA	SS-32	10.0	-	10.3	1.03		N	closed station pass 2	released
26-Aug-14	NFA	SS-33	3.8	-	0.5	0.91		N	closed station pass 2	released
		Count	33	-	33	33	2			
		Minimum	3.6	-	0.4	0.59	4.0			
		Maximum	11.0	-	14.3	1.50	5.0			
		Mean	7.5	-	5.0	0.91	4.5			
		Standard Deviation	2.4	-	3.9	0.14	0.7			

Table F.10: Detailed fish measurements for North Fork Rose Creek, haul road to access road (NFB), Faro Mine Aquatic Study, August 2014.

a) Arctic Grayling

Date	Area	Fish ID	Total Length (cm)	Fork Length (cm)	Total Body Weight (g)	Condition Factor	Age (yrs)	Tissue Sample	Comments	Fate
25-Aug-14	NFB	AG-01	39.1	36.9	640.0	1.27		N	Closed Station Pass 1	released
25-Aug-14	NFB	AG-02	34.5	32.1	420.0	1.27		N	Closed Station Pass 1	released
25-Aug-14	NFB	AG-03	29.6	27.8	250.0	1.16		N	Closed Station Pass 1	released
25-Aug-14	NFB	AG-04	27.2	25.0	205.0	1.31		N	Closed Station Pass 1	released
25-Aug-14	NFB	AG-05	24.3	21.2	120.0	1.26		N	Closed Station Pass 1	released
25-Aug-14	NFB	AG-06	25.0	22.9	145.0	1.21		N	Closed Station Pass 1	released
25-Aug-14	NFB	AG-07	26.3	24.0	155.0	1.12		N	Closed Station Pass 1	released
25-Aug-14	NFB	AG-08	19.8	18.0	60.0	1.03		N	Closed Station Pass 1	released
25-Aug-14	NFB	AG-09	12.0	11.3	12.5	0.87		N	Closed Station Pass 1	released
25-Aug-14	NFB	AG-10	26.6	24.7	191.0	1.27		N	Closed Station Pass 2	released
25-Aug-14	NFB	AG-11	16.1	14.6	29.8	0.96		N	Closed Station Pass 2	released
25-Aug-14	NFB	AG-12	31.6	28.5	289.0	1.25		N	Closed Station Pass 3	released
25-Aug-14	NFB	AG-13	30.3	27.9	222.0	1.02		N	Closed Station Pass 3	released
		Count	13	13	13	13				
		Minimum	12.0	11.3	12.5	0.87				
		Maximum	39.1	36.9	640.0	1.31				
		Mean	26.3	24.2	210.7	1.15				
		Standard Deviation	7.3	6.9	170.0	0.14				

b) Slimy Sculpin

Date	Area	Fish ID	Total Length (cm)	Fork Length (cm)	Total Body Weight (g)	Condition Factor	Age (yrs)	Tissue Sample	Comments	Fate
21-Aug-14	NFB	SS-01	9.6	-	10.8	1.22	5	Y	near haul road	sacrificed
21-Aug-14	NFB	SS-02	8.8	-	6.5	0.95	4	Y	near haul road	sacrificed
21-Aug-14	NFB	SS-03	8.9	-	6.9	0.98	4	Y	near haul road	sacrificed
21-Aug-14	NFB	SS-04	7.2	-	3.4	0.91		N	near haul road	released
21-Aug-14	NFB	SS-05	8.2	-	5.1	0.92		N	near haul road	released
21-Aug-14	NFB	SS-06	5.5	-	1.6	0.96		N	near haul road	released
21-Aug-14	NFB	SS-07	7.9	-	4.8	0.97		N	near haul road	released
21-Aug-14	NFB	SS-08	6.6	-	2.8	0.97		N	near haul road	released
21-Aug-14	NFB	SS-09	8.2	-	5.1	0.92		N	near haul road	released
21-Aug-14	NFB	SS-10	8.4	-	5.3	0.89		N	near haul road	released

Table F.10: Detailed fish measurements for North Fork Rose Creek, haul road to access road (NFB), Faro Mine Aquatic Study, August 2014.

Date	Area	Fish ID	Total Length (cm)	Fork Length (cm)	Total Body Weight (g)	Condition Factor	Age (yrs)	Tissue Sample	Comments	Fate
21-Aug-14	NFB	SS-11	8.0	-	4.5	0.88		N	near haul road	released
21-Aug-14	NFB	SS-12	4.2	-	0.6	0.81		N	near haul road	released
21-Aug-14	NFB	SS-13	4.0	-	0.6	0.94		N	near haul road	released
25-Aug-14	NFB	SS-14	11.0	-	13.8	1.03		N	closed station pass 1	released
25-Aug-14	NFB	SS-15	9.2	-	9.0	1.16		N	closed station pass 1	released
25-Aug-14	NFB	SS-16	11.5	-	17.5	1.15		N	closed station pass 1	released
25-Aug-14	NFB	SS-17	8.8	-	6.7	0.98		N	closed station pass 1	released
25-Aug-14	NFB	SS-18	9.0	-	6.9	0.95		N	closed station pass 1	released
25-Aug-14	NFB	SS-19	7.1	-	4.3	1.20		N	closed station pass 1	released
25-Aug-14	NFB	SS-20	6.5	-	2.4	0.87		N	closed station pass 1	released
25-Aug-14	NFB	SS-21	6.0	-	2.2	1.02		N	closed station pass 1	released
25-Aug-14	NFB	SS-22	5.8	-	1.9	0.97		N	closed station pass 1	released
25-Aug-14	NFB	SS-23	4.2	-	0.6	0.81		N	closed station pass 1	released
25-Aug-14	NFB	SS-24	3.6	-	0.5	1.07		N	closed station pass 1	released
25-Aug-14	NFB	SS-25	4.2	-	0.7	0.94		N	closed station pass 1	released
25-Aug-14	NFB	SS-26	4.2	-	0.7	0.94		N	closed station pass 1	released
25-Aug-14	NFB	SS-27	4.1	-	0.6	0.87		N	closed station pass 1	released
25-Aug-14	NFB	SS-28	3.8	-	0.6	1.09		N	closed station pass 1	released
25-Aug-14	NFB	SS-29	3.8	-	0.6	1.09		N	closed station pass 1	released
25-Aug-14	NFB	SS-30	3.5	-	0.4	0.93		N	closed station pass 1	released
25-Aug-14	NFB	SS-31	1.8	-	0.1	1.71		N	closed station pass 1	released
25-Aug-14	NFB	SS-32	9.7	-	10.5	1.15		N	closed station pass 2	released
25-Aug-14	NFB	SS-33	8.5	-	5.7	0.93		N	closed station pass 2	released
25-Aug-14	NFB	SS-34	10.4	-	10.8	0.96		N	closed station pass 2	released
25-Aug-14	NFB	SS-35	8.5	-	5.6	0.91		N	closed station pass 2	released
25-Aug-14	NFB	SS-36	8.5	-	2.4	0.39		N	closed station pass 2	released
25-Aug-14	NFB	SS-37	4.5	-	0.9	0.99		N	closed station pass 2	released
25-Aug-14	NFB	SS-38	4.1	-	0.6	0.87		N	closed station pass 2	released
25-Aug-14	NFB	SS-39	4.1	-	0.7	1.02		N	closed station pass 2	released
25-Aug-14	NFB	SS-40	4.5	-	0.8	0.88		N	closed station pass 2	released
25-Aug-14	NFB	SS-41	4.5	-	0.9	0.99		N	closed station pass 2	released
25-Aug-14	NFB	SS-42	4.0	-	0.5	0.78		N	closed station pass 2	released
25-Aug-14	NFB	SS-43	3.7	-	0.4	0.79		N	closed station pass 2	released
25-Aug-14	NFB	SS-44	9.9	-	11.0	1.13		N	closed station pass 3	released

Table F.10: Detailed fish measurements for North Fork Rose Creek, haul road to access road (NFB), Faro Mine Aquatic Study, August 2014.

Date	Area	Fish ID	Total Length (cm)	Fork Length (cm)	Total Body Weight (g)	Condition Factor	Age (yrs)	Tissue Sample	Comments	Fate
25-Aug-14	NFB	SS-45	9.4	-	8.4	1.01		N	closed station pass 3	released
25-Aug-14	NFB	SS-46	7.9	-	4.4	0.89		N	closed station pass 3	released
25-Aug-14	NFB	SS-47	7.9	-	4.9	0.99		N	closed station pass 3	released
25-Aug-14	NFB	SS-48	7.5	-	3.9	0.92		N	closed station pass 3	released
25-Aug-14	NFB	SS-49	3.9	-	0.6	1.01		N	closed station pass 3	released
25-Aug-14	NFB	SS-50	3.9	-	0.6	1.01		N	closed station pass 3	released
25-Aug-14	NFB	SS-51	3.9	-	0.6	1.01		N	closed station pass 3	released
		Count	51	-	51	51	3			
		Minimum	1.8	-	0.1	0.39	4.0			
		Maximum	11.5	-	17.5	1.71	5.0			
		Mean	6.5	-	4.0	0.98	4.3			
		Standard Deviation	2.5	-	4.0	0.17	0.6			

Table F.11: Detailed fish measurements for North Fork Rose Creek between access road and X3 (NFC), Faro Mine Aquatic Study, August 2014.

a) Arctic Grayling

Date	Area	Fish ID	Total Length (cm)	Fork Length (cm)	Total Body Weight (g)	Condition Factor	Age (yrs)	Tissue Sample	Comments	Fate
20-Aug-14	NFC	AG-01	30.1	28.0	239.0	1.09	5	N	NF Pond 1	released
20-Aug-14	NFC	AG-02	27.6	25.9	190.0	1.09	4	N	NF Pond 1	released
20-Aug-14	NFC	AG-03	21.9	20.4	90.0	1.06	2	Y	Pumphouse Pond	sacrificed
20-Aug-14	NFC	AG-04	25.7	23.9	131.0	0.96	4	Y	Pumphouse Pond	sacrificed
20-Aug-14	NFC	AG-05	30.5	28.3	244.0	1.08	5	Y	NF Pond 1	sacrificed
20-Aug-14	NFC	AG-06	23.2	21.5	114.0	1.15	3	Y	NF Pond 1	sacrificed
		Count	6	6	6	6	6			
		Min	21.9	20.4	90.0	0.96	2.0			
		Max	30.5	28.3	244.0	1.15	5.0			
		Mean	26.5	24.7	168.0	1.07	3.8			
		Stand Deviation	3.5	3.3	65.8	0.06	1.2			

b) Slimy Sculpin

Date	Area	Fish ID	Total Length (cm)	Fork Length (cm)	Total Body Weight (g)	Condition Factor	Age (yrs)	Tissue Sample	Comments	Fate
20-Aug-14	NFC	SS-01	10.9	-	15.3	1.18	7	Y	Pumphouse Pond	sacrificed
21-Aug-14	NFC	SS-02	9.2	-	7.4	0.95		Y	NF Ponds	sacrificed
21-Aug-14	NFC	SS-03	9.0	-	6.4	0.88		Y	NF Ponds	sacrificed
21-Aug-14	NFC	SS-04	7.9	-	4.7	0.95		N	NF Ponds	released
21-Aug-14	NFC	SS-05	6.2	-	2.3	0.97		N	NF Ponds	released
21-Aug-14	NFC	SS-06	8.0	-	4.6	0.90		N	NF Ponds	released
21-Aug-14	NFC	SS-07	7.2	-	3.4	0.91		N	NF Ponds	released
21-Aug-14	NFC	SS-08	5.8	-	1.6	0.82		N	NF Ponds	released
21-Aug-14	NFC	SS-09	7.4	-	3.5	0.86		N	NF Ponds	released
21-Aug-14	NFC	SS-10	5.6	-	1.4	0.80		N	NF Ponds	released
		Count	10	-	10	10	1			
		Min	5.6	-	1.4	0.80	7.0			
		Max	10.9	-	15.3	1.18	7.0			
		Mean	7.7	-	5.1	0.92	7.0			
		Stand Deviation	1.7	-	4.1	0.11				

Table F.12: Detailed fish measurements for Rose Creek Diversion, Faro Mine Aquatic Study, August 2014.

a) Arctic Grayling

Date	Area	Fish ID	Total Length (cm)	Fork Length (cm)	Total Body Weight (g)	Condition Factor	Age (yrs)	Tissue Sample	Comments	Fate
21-Aug-14	RCD	AG-01	38.7	35.4	490.0	1.10	7	Y	X10 - John Minder	sacrificed
21-Aug-14	RCD	AG-02	32.6	30.1	290.0	1.06	5	Y	X10 - John Minder	sacrificed
21-Aug-14	RCD	AG-03	41.0	37.0	570.0	1.13	11	Y	X10 - John Minder	sacrificed
23-Aug-14	RCD	AG-04	6.0	5.7	1.3	0.70		N	Diversion Channel	released
		Count	4	4	4	4	3			
		Minimum	6.0	5.7	1.3	0.70	5.0			
		Maximum	41.0	37.0	570.0	1.13	11.0			
		Mean	29.6	27.1	337.8	1.00	7.7			
		Standard Deviation	16.1	14.5	253.4	0.20	3.1			

b) Slmiy Sculpin

Date	Area	Fish ID	Total Length (cm)	Fork Length (cm)	Total Body Weight (g)	Condition Factor	Age (yrs)	Tissue Sample	Comments	Fate
23-Aug-14	RCD	SS-01	10.8	-	10.0	0.79	9	Y		sacrificed
23-Aug-14	RCD	SS-02	10.5	-	9.5	0.82	5	Y		sacrificed
23-Aug-14	RCD	SS-03	10.2	-	10.2	0.96	5	Y		sacrificed
23-Aug-14	RCD	SS-04	8.3	-	4.4	0.77		N		released
23-Aug-14	RCD	SS-05	6.2	-	2.0	0.84		N		released
23-Aug-14	RCD	SS-06	5.7	-	1.5	0.81		N		released
23-Aug-14	RCD	SS-07	6.0	-	1.8	0.83		N		released
23-Aug-14	RCD	SS-08	6.2	-	1.8	0.76		N		released
23-Aug-14	RCD	SS-09	6.0	-	1.8	0.83		N		released
23-Aug-14	RCD	SS-10	4.5	-	0.7	0.77		N		released
23-Aug-14	RCD	SS-11	4.2	-	0.6	0.81		N		released
23-Aug-14	RCD	SS-12	4.2	-	0.6	0.81		N		released
23-Aug-14	RCD	SS-13	4.2	-	0.6	0.81		N		released
23-Aug-14	RCD	SS-14	4.4	-	0.6	0.70		N		released
23-Aug-14	RCD	SS-15	6.7	-	2.4	0.80		N		released
23-Aug-14	RCD	SS-16	6.6	-	2.2	0.77		N		released
23-Aug-14	RCD	SS-17	9.4	-	7.3	0.88		N		released

Table F.12: Detailed fish measurements for Rose Creek Diversion, Faro Mine Aquatic Study, August 2014.

Date	Area	Fish ID	Total Length (cm)	Fork Length (cm)	Total Body Weight (g)	Condition Factor	Age (yrs)	Tissue Sample	Comments	Fate
23-Aug-14	RCD	SS-18	8.8	-	6.4	0.94		N		released
23-Aug-14	RCD	SS-19	8.5	-	6.3	1.03		N		released
23-Aug-14	RCD	SS-20	7.5	-	4.5	1.07		N		released
23-Aug-14	RCD	SS-21	7.7	-	3.5	0.77		N		released
23-Aug-14	RCD	SS-22	7.6	-	3.9	0.89		N		released
23-Aug-14	RCD	SS-23	7.1	-	2.9	0.81		N		released
23-Aug-14	RCD	SS-24	4.2	-	0.6	0.81		N		released
23-Aug-14	RCD	SS-25	4.1	-	0.6	0.87		N		released
23-Aug-14	RCD	SS-26	6.0	-	1.9	0.88		N		released
23-Aug-14	RCD	SS-27	5.0	-	1.0	0.80		N		released
23-Aug-14	RCD	SS-28	4.5	-	0.8	0.88		N		released
23-Aug-14	RCD	SS-29	4.3	-	0.7	0.88		N		released
23-Aug-14	RCD	SS-30	4.2	-	0.7	0.94		N		released
23-Aug-14	RCD	SS-31	7.5	-	3.2	0.76		N		released
23-Aug-14	RCD	SS-32	8.9	-	8.4	1.19		N		released
23-Aug-14	RCD	SS-33	6.7	-	2.7	0.90		N		released
23-Aug-14	RCD	SS-34	6.0	-	1.9	0.88		N		released
23-Aug-14	RCD	SS-35	6.2	-	1.9	0.80		N		released
23-Aug-14	RCD	SS-36	5.4	-	1.2	0.76		N		released
23-Aug-14	RCD	SS-37	6.5	-	2.1	0.76		N		released
23-Aug-14	RCD	SS-38	6.0	-	1.7	0.79		N		released
23-Aug-14	RCD	SS-39	5.5	-	1.3	0.78		N		released
23-Aug-14	RCD	SS-40	5.5	-	1.4	0.84		N		released
23-Aug-14	RCD	SS-41	4.7	-	0.9	0.87		N		released
23-Aug-14	RCD	SS-42	4.0	-	0.6	0.94		N		released
23-Aug-14	RCD	SS-43	3.6	-	0.4	0.86		N		released
23-Aug-14	RCD	SS-44	4.0	-	0.5	0.78		N		released
23-Aug-14	RCD	SS-45	3.4	-	0.3	0.76		N		released
		Count	45	-	45	45	3			
		Minimum	3.4	-	0.3	0.70	5.0			
		Maximum	10.8	-	10.2	1.19	9.0			
		Mean	6.2	-	2.7	0.84	6.3			
		Standard Deviation	1.9	-	2.7	0.09	2.3			

Table F.13: Detailed fish measurements for Rose Creek downstream of RCTA (area R2), Faro Mine Aquatic Study, August 2014.

a) Arctic Grayling

Date	Area	Fish ID	Total Length (cm)	Fork Length (cm)	Total Body Weight (g)	Condition Factor	Age (yrs)	Tissue Sample	Comments	Fate
21-Aug-14	R2	AG-01	34.0	31.4	340.0	1.10	5	Y	X14 - John Minder	sacrificed
22-Aug-14	R2	AG-02	37.2	34.1	435.0	1.10	6	Y	X14 - John Minder	sacrificed
23-Aug-14	R2	AG-03	5.1	4.9	1.0	0.85		N		released
		Count	3	3	3	3	2			
		Minimum	5.1	4.9	1.0	0.85	5.0			
		Maximum	37.2	34.1	435.0	1.10	6.0			
		Mean	25.4	23.5	258.7	1.02	5.5			
		Standard Deviation	17.7	16.1	228.1	0.14	0.7			

b) Slimy Sculpin

Date	Area	Fish ID	Total Length (cm)	Fork Length (cm)	Total Body Weight (g)	Condition Factor	Age (yrs)	Tissue Sample	Comments	Fate
23-Aug-14	R2	SS-01	9.1	-	6.4	0.85	4	Y		sacrificed
23-Aug-14	R2	SS-02	8.5	-	5.5	0.90	1	Y		sacrificed
23-Aug-14	R2	SS-03	9.1	-	6.7	0.89	4	Y		sacrificed
23-Aug-14	R2	SS-04	4.4	-	0.9	1.06		N		released
23-Aug-14	R2	SS-05	5.9	-	1.2	0.58		N		released
23-Aug-14	R2	SS-06	5.4	-	1.3	0.83		N		released
23-Aug-14	R2	SS-07	5.0	-	1.0	0.80		N		released
23-Aug-14	R2	SS-08	4.0	-	0.6	0.94		N		released
23-Aug-14	R2	SS-09	4.6	-	0.9	0.92		N		released
23-Aug-14	R2	SS-10	4.6	-	0.8	0.82		N		released
23-Aug-14	R2	SS-11	4.5	-	0.7	0.77		N		released
23-Aug-14	R2	SS-12	4.4	-	0.6	0.70		N		released
23-Aug-14	R2	SS-13	4.4	-	0.6	0.70		N		released
23-Aug-14	R2	SS-14	4.4	-	0.7	0.82		N		released
		Count	14	-	14	14	3			
		Minimum	4.0	-	0.6	0.58	1.0			
		Maximum	9.1	-	6.7	1.06	4.0			
		Mean	5.6	-	2.0	0.83	3.0			
		Standard Deviation	1.9	-	2.3	0.12	1.7			

Table F.14: Arctic grayling tissue metal concentrations, Faro Mine Aquatic Study, August 2014.

Sample ID	Units	South Fork (SF)					North Fork upstream from Haul Road (NFA)					North Fork - Haul Road to Access Road (NFB)				North Fork - Ponds and Diversion (NFC)					
		SF-AG-01	SF-AG-02	SF-AG-03	Mean	Standard Deviation	NFA-AG-01	NFA-AG-02	NFA-AG-03	Mean	Standard Deviation	FISH ID 229[a]	FISH ID 230[a]	Mean	Standard Deviation	NFC-AG-03	NFC-AG-04	NFC-AG-05	NFC-AG-06	Mean	Standard Deviation
% Moisture	%	77.7	77.8	74.7	76.7	1.8	75.2	73.2	76.8	75.1	1.8	73.4	71.1	72.3	1.6	79.7	79.1	77.5	80.8	79.3	1.4
Metals (dry weight)																					
Aluminum (Al)	mg/kg	<5.0	<5.0	<5.0	5.0	0.0	12.4	5.6	11.0	9.7	3.6	4.9	2.5	3.7	1.7	28.6	22.2	<5.0	7.5	15.8	11.4
Antimony (Sb)	mg/kg	<0.010	<0.010	<0.010	0.010	0.000	<0.010	<0.010	<0.010	0.010	0.000	<0.010	<0.010	0.010	0.000	<0.010	0.011	<0.010	<0.010	0.010	0.001
Arsenic (As)	mg/kg	0.062	0.064	0.083	0.070	0.012	0.063	0.096	0.085	0.081	0.017	0.271	0.257	0.264	0.010	0.152	0.133	0.078	0.074	0.109	0.039
Barium (Ba)	mg/kg	0.26	0.17	0.14	0.19	0.06	0.23	0.21	0.39	0.28	0.10	1.55	1.63	1.59	0.06	0.61	0.62	0.23	0.28	0.44	0.21
Beryllium (Be)	mg/kg	<0.010	<0.010	<0.010	0.010	0.000	<0.010	<0.010	<0.010	0.010	0.000	<0.010	<0.010	0.010	0.000	<0.010	<0.010	<0.010	<0.010	0.010	0.000
Bismuth (Bi)	mg/kg	<0.010	<0.010	<0.010	0.010	0.000	<0.010	<0.010	<0.010	0.010	0.000	<0.010	<0.010	0.010	0.000	<0.010	<0.010	<0.010	<0.010	0.010	0.000
Boron (B)	mg/kg	<1.0	<1.0	<1.0	1.0	0.0	<1.0	<1.0	<1.0	1.0	0.0	<1.0	<1.0	1.0	0.0	<1.0	<1.0	<1.0	<1.0	1.0	0.0
Cadmium (Cd)	mg/kg	<0.010	<0.010	<0.010	0.010	0.000	<0.010	<0.010	<0.010	0.010	0.000	0.017	0.013	0.015	0.003	0.050	0.042	<0.010	<0.010	0.028	0.021
Calcium (Ca)	mg/kg	1,280	931	480	897	401	602	365	863	610	249	16,600	20,300	18,450	2,616	1,080	816	535	990	855	240
Cesium (Cs)	mg/kg	0.232	0.159	0.260	0.217	0.052	0.168	0.213	0.143	0.175	0.035	1.190	1.380	1.285	0.134	0.082	0.151	0.219	0.136	0.147	0.057
Chromium (Cr)	mg/kg	<0.20	<0.20	<0.20	0.20	0.00	<0.20	<0.20	<0.20	0.20	0.00	0.84	0.22	0.53	0.44	0.12	8.22	<0.20	<0.20	2.18	4.02
Cobalt (Co)	mg/kg	0.05	0.11	0.06	0.07	0.03	0.02	0.04	0.03	0.03	0.01	0.25	0.14	0.20	0.08	0.16	0.14	0.08	0.08	0.11	0.04
Copper (Cu)	mg/kg	1.68	1.74	1.53	1.65	0.11	1.46	1.33	2.03	1.61	0.37	2.15	2.43	2.29	0.20	2.25	2.28	2.03	1.27	1.96	0.47
Iron (Fe)	mg/kg	15.9	19.6	25.8	20.4	5.0	29.1	20.3	38.2	29.2	9.0	27.1	28.9	28.0	1.3	52.1	131.0	36.1	24.6	61.0	48.0
Lead (Pb)	mg/kg	<0.050	0.050	0.149	0.083	0.057	0.187	0.245	0.250	0.227	0.035	0.090	0.092	0.091	0.001	0.252	0.589	0.122	0.146	0.277	0.215
Lithium (Li)	mg/kg	<0.50	<0.50	<0.50	0.50	0.00	<0.50	<0.50	<0.50	0.50	0.00	<0.50	<0.50	0.50	0.00	<0.50	<0.50	<0.50	<0.50	0.50	0.00
Magnesium (Mg)	mg/kg	1,480	1,210	1,210	1,300	156	1,350	1,160	1,580	1,363	210	1,220	1,080	1,150	99	1,290	1,340	1,050	1,320	1,250	135
Manganese (Mn)	mg/kg	1.42	1.58	0.72	1.24	0.46	1.23	1.18	2.74	1.72	0.89	7.27	10.20	8.74	2.07	2.14	2.94	1.20	1.44	1.93	0.78
Mercury (Hg)	mg/kg	0.166	0.130	0.215	0.170	0.043	0.205	0.174	0.203	0.194	0.017	0.358	0.268	0.313	0.064	0.111	0.190	0.215	0.182	0.175	0.045
Molybdenum (Mo)	mg/kg	<0.040	<0.040	<0.040	0.040	0.000	<0.040	<0.040	<0.040	0.040	0.000	0.111	<0.020	0.066	0.064	<0.020	0.214	<0.040	<0.040	0.079	0.091
Nickel (Ni)	mg/kg	<0.20	0.23	0.22	0.22	0.02	<0.20	<0.20	0.26	0.22	0.03	0.56	<0.20	0.38	0.25	0.24	0.59	<0.20	<0.20	0.31	0.19
Phosphorus (P)	mg/kg	11,300	10,900	9,540	10,580	923	10,200	9,410	11,200	10,270	897	17,100	18,300	17,700	849	11,500	11,200	8,710	10,400	10,453	1,251
Potassium (K)	mg/kg	22,500	22,400	18,500	21,133	2,281	17,900	16,500	19,100	17,833	1,301	16,700	14,000	15,350	1,909	20,100	19,800	17,400	19,000	19,075	1,209
Rubidium (Rb)	mg/kg	31.1	19.0	32.7	27.6	7.5	20.2	26.6	27.4	24.7	3.9	28.1	26.4	27.3	1.2	15.4	21.0	21.2	18.6	19.1	2.7
Selenium (Se)	mg/kg	3.7	3.6	3.9	3.7	0.1	4.5	4.1	7.0	5.2	1.5	9.6	13.7	11.7	2.9	5.2	3.9	3.8	4.8	4.4	0.7
Sodium (Na)	mg/kg	1,370	1,490	1,070	1,310	216	995	984	1,290	1,090	174	2,190	1,880	2,035	219	1,230	993	1,180	2,160	1,391	523
Strontium (Sr)	mg/kg	1.14	0.59	0.34	0.69	0.41	0.25	0.21	0.56	0.34	0.19	12.30	17.20	14.75	3.46	0.93	0.80	0.48	0.67	0.72	0.19
Tellurium (Te)	mg/kg	<0.020	<0.020	<0.020	0.020	0.000	<0.020	<0.020	<0.020	0.020	0.000	<0.020	<0.020	0.020	0.000	<0.020	<0.020	<0.020	<0.020	0.020	0.000
Thallium (Tl)	mg/kg	0.023	0.020	0.024	0.022	0.002	0.013	0.024	0.016	0.018	0.006	0.067	0.061	0.064	0.004	0.025	0.021	0.033	0.024	0.026	0.005
Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	0.10	0.00	<0.10	<0.10	<0.10	0.10	0.00	0.13	<0.10	0.12	0.02	<0.10	<0.10	<0.10	<0.10	0.10	0.00
Uranium (U)	mg/kg	<0.0020	<0.0020	<0.0020	0.0020	0.0000	0.0020	<0.0020	<0.0020	0.0020	0.0000	0.0034	0.0073	0.0054	0.0028	0.0023	0.0023	<0.0020	<0.0020	0.0022	0.0002
Vanadium (V)	mg/kg	<0.10	<0.10	<0.10	0.10	0.00	<0.10	<0.10	<0.10	0.10	0.00	<0.10	0.24	0.17	0.10	<0.10	<0.10	<0.10	<0.10	0.10	0.00
Zinc (Zn)	mg/kg	22.5	20.8	34.7	26.0	7.6	24.3	21.8	22.7	22.9	1.3	68.8	77.3	73.1	6.0	29.0	26.6	30.7	28.9	28.8	1.7
Zirconium (Zr)	mg/kg	<0.20	<0.20	<0.20	0.20	0.00	<0.20	<0.20	<0.20	0.20	0.00	<0.20	<0.20	0.20	0.00	<0.20	<0.20	<0.20	<0.20	0.20	0.00

[a] Fish collected by Environmental Dynamics Incorporated (EDI), June and July 2014.

Table F.14: Arctic grayling tissue metal concentrations, Faro Mine Aquatic Study, August 2014.

Sample ID	Units	Rose Creek Diversion (RCD)							Rose Creek downstream from RCTA (R2)							
		RCD-AG-01	RCD-AG-02	RCD-AG-03	FISH ID 180[a]	FISH ID 237[a]	Mean	Standard Deviation	R2-AG-01	R2-AG-02	FISH ID 60[a]	FISH ID 187[a]	FISH ID 200[a]	FISH ID 219[a]	Mean	Standard Deviation
% Moisture	%	77.7	80.2	78.7	73.4	75.0	77.0	2.8	77.0	76.7	76.5	73.9	72.7	72.7	74.9	2.0
Metals (dry weight)																
Aluminum (Al)	mg/kg	29.9	6.8	<5.0	2.5	11.6	11.2	11.0	6.4	12.8	76.4	2.7	6.3	5.8	18.4	28.6
Antimony (Sb)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.000	<0.010	<0.010	0.012	<0.010	<0.010	<0.010	0.010	0.001
Arsenic (As)	mg/kg	0.105	0.108	0.087	0.126	0.104	0.106	0.014	0.096	0.138	0.237	0.125	0.167	0.128	0.149	0.049
Barium (Ba)	mg/kg	0.67	0.28	0.43	2.89	4.04	1.66	1.70	0.68	0.73	8.74	2.06	3.39	4.13	3.29	3.01
Beryllium (Be)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.000	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.000
Bismuth (Bi)	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.000	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.000
Boron (B)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	0.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	0.0
Cadmium (Cd)	mg/kg	0.023	0.013	0.011	0.016	0.010	0.015	0.005	<0.010	0.040	0.253	0.018	0.019	0.034	0.062	0.094
Calcium (Ca)	mg/kg	640	672	2,020	29,900	34,400	13,526	17,084	3,340	637	21,600	24,600	32,300	54,200	22,780	19,752
Cesium (Cs)	mg/kg	0.154	0.098	0.140	0.158	0.115	0.133	0.026	0.440	0.159	0.100	0.131	0.494	0.137	0.243	0.175
Chromium (Cr)	mg/kg	0.30	<0.20	<0.20	0.13	1.61	0.49	0.63	0.26	0.17	2.54	0.55	0.70	0.08	0.72	0.92
Cobalt (Co)	mg/kg	0.28	0.14	0.11	0.28	0.14	0.19	0.08	0.14	0.17	0.77	0.19	0.20	0.30	0.29	0.24
Copper (Cu)	mg/kg	1.38	1.26	0.91	2.16	2.61	1.66	0.70	1.11	1.74	3.05	2.74	2.31	2.29	2.21	0.70
Iron (Fe)	mg/kg	48.1	27.2	27.5	26.1	50.0	35.8	12.1	32.9	35.6	254.0	31.1	33.8	37.1	70.8	89.8
Lead (Pb)	mg/kg	0.647	0.197	0.110	0.053	0.098	0.221	0.244	0.235	0.168	0.404	0.042	0.170	0.135	0.192	0.121
Lithium (Li)	mg/kg	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	0.00	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	0.00
Magnesium (Mg)	mg/kg	1,270	1,690	1,230	1,200	1,440	1,366	204	1,540	1,240	1,120	1,110	1,420	1,600	1,338	212
Manganese (Mn)	mg/kg	2.22	2.34	4.61	30.30	12.60	10.41	11.90	10.60	4.05	260.00	31.00	14.00	61.90	63.59	98.44
Mercury (Hg)	mg/kg	0.268	0.239	0.497	0.269	0.285	0.312	0.105	0.181	0.246	0.242	0.209	0.221	0.266	0.228	0.030
Molybdenum (Mo)	mg/kg	<0.020	<0.040	<0.040	<0.020	0.192	0.062	0.073	<0.040	<0.020	0.378	0.074	0.095	0.022	0.105	0.137
Nickel (Ni)	mg/kg	0.26	0.47	<0.20	<0.20	1.01	0.43	0.34	0.27	<0.20	1.88	0.38	0.46	<0.20	0.57	0.65
Phosphorus (P)	mg/kg	11,200	11,200	10,700	22,900	27,400	16,680	7,897	12,800	11,000	19,900	21,100	26,500	35,500	21,133	9,043
Potassium (K)	mg/kg	21,100	22,100	20,000	13,900	16,300	18,680	3,457	21,600	20,500	14,600	14,300	14,300	14,900	16,700	3,395
Rubidium (Rb)	mg/kg	18.4	19.8	17.3	11.0	14.4	16.2	3.5	26.0	17.8	18.5	12.4	18.2	11.2	17.4	5.3
Selenium (Se)	mg/kg	4.4	5.2	2.6	2.7	4.3	3.8	1.1	4.8	5.2	5.9	4.0	9.7	4.0	5.6	2.1
Sodium (Na)	mg/kg	1,100	1,470	1,450	2,380	2,720	1,824	689	1,390	1,250	4,080	2,530	2,580	2,960	2,465	1,049
Strontium (Sr)	mg/kg	0.47	0.35	1.71	23.50	29.90	11.19	14.35	2.69	0.46	17.70	17.20	27.80	39.90	17.62	14.95
Tellurium (Te)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	0.000	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	0.000
Thallium (Tl)	mg/kg	0.027	0.027	0.016	0.042	0.024	0.027	0.009	0.026	0.028	0.022	0.034	0.041	0.041	0.032	0.008
Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	0.11	0.10	0.00	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	0.00
Uranium (U)	mg/kg	0.0033	<0.0020	<0.0020	0.0093	0.0190	0.0071	0.0073	<0.0020	<0.0020	0.0324	0.0100	0.0117	0.0111	0.0115	0.0111
Vanadium (V)	mg/kg	<0.10	<0.10	<0.10	0.12	<0.10	0.10	0.01	<0.10	<0.10	0.26	<0.10	<0.10	0.35	0.17	0.11
Zinc (Zn)	mg/kg	17.8	25.0	18.6	86.2	81.5	45.8	34.9	26.2	20.2	98.1	65.3	77.7	105.0	65.4	35.7
Zirconium (Zr)	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	0.00	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	0.00

[a] Fish collected by Environmental Dynamics Incorporated (EDI), June and July 2014.

Table F.15: Arctic grayling whole body metal concentrations, Faro Mine Aquatic Study, August 2014.

Sample ID	Units	South Fork (SF)					North Fork upstream from Haul Road (NFA)					North Fork - Haul Road to Access Road (NFB)				North Fork - Ponds and Diversion (NFC)					
		SF-AG-01-W	SF-AG-02-W	SF-AG-03-W	Mean	Standard Deviation	NFA-AG-01-W	NFA-AG-02-W	NFA-AG-03-W	Mean	Standard Deviation	FISH ID 229-W[a]	FISH ID 230-W[a]	Mean	Standard Deviation	NFC-AG-03-W	NFC-AG-04-W	NFC-AG-05-W	NFC-AG-06-W	Mean	Standard Deviation
% Moisture	%	75.8	73.7	70.6	73.4	2.6	68.2	72.5	70.8	70.5	70.5	72.6	69.3	71.0	2.3	77.6	74.0	74.3	73.4	74.8	1.9
Metals (dry weight)																					
Aluminum (Al)	mg/kg	9.4	20.7	7.9	12.7	7.0	33.2	4.8	82.7	40.2	39.4	95.9	63.0	79.5	23.3	27.4	34.4	42.3	11.7	29.0	13.0
Antimony (Sb)	mg/kg	<0.010	<0.010	<0.010	0.010	0.000	<0.010	<0.010	<0.010	0.010	0.000	<0.010	<0.010	0.010	0.000	<0.010	<0.010	<0.010	<0.010	0.010	0.000
Arsenic (As)	mg/kg	0.122	0.452	0.216	0.263	0.170	0.132	0.165	0.371	0.223	0.130	0.375	0.344	0.360	0.022	0.236	0.179	0.182	0.125	0.181	0.045
Barium (Ba)	mg/kg	4.31	4.28	2.69	3.76	0.93	3.15	1.71	4.92	3.26	1.61	4.63	2.67	3.65	1.39	4.84	4.74	3.23	3.24	4.01	0.90
Beryllium (Be)	mg/kg	<0.010	<0.010	<0.010	0.010	0.000	<0.010	<0.010	<0.010	0.010	0.000	<0.010	<0.010	0.010	0.000	<0.010	<0.010	<0.010	<0.010	0.010	0.000
Bismuth (Bi)	mg/kg	<0.010	<0.010	<0.010	0.010	0.000	<0.010	<0.010	<0.010	0.010	0.000	0.015	<0.010	0.013	0.004	<0.010	<0.010	<0.010	<0.010	0.010	0.000
Boron (B)	mg/kg	<1.0	<1.0	<1.0	1.0	0.0	<1.0	<1.0	<1.0	1.0	0.0	<1.0	<1.0	1.0	0.0	<1.0	<1.0	<1.0	<1.0	1.0	0.0
Cadmium (Cd)	mg/kg	0.023	0.042	0.062	0.043	0.020	0.021	0.015	0.040	0.025	0.013	0.864	0.493	0.679	0.262	0.241	0.059	0.133	0.023	0.114	0.096
Calcium (Ca)	mg/kg	28,200	20,700	21,900	23,600	4,029	19,300	14,900	18,400	17,533	2,325	23,900	14,700	19,300	6,505	23,000	29,300	19,900	26,100	24,575	4,041
Cesium (Cs)	mg/kg	0.139	0.106	0.146	0.130	0.021	0.092	0.145	0.101	0.113	0.029	0.886	1.190	1.038	0.215	0.084	0.111	0.193	0.092	0.120	0.050
Chromium (Cr)	mg/kg	0.17	0.07	0.06	0.10	0.06	0.13	0.13	0.22	0.16	0.05	0.24	0.20	0.22	0.03	0.48	0.12	0.14	0.07	0.20	0.19
Cobalt (Co)	mg/kg	0.15	0.29	0.19	0.21	0.07	0.07	0.12	0.17	0.12	0.05	0.44	0.28	0.36	0.11	0.52	0.30	0.26	0.21	0.32	0.14
Copper (Cu)	mg/kg	2.22	2.11	2.02	2.12	0.10	1.66	1.72	2.33	1.90	0.37	3.08	3.36	3.22	0.20	4.23	1.95	2.24	2.37	2.70	1.04
Iron (Fe)	mg/kg	67.7	343.0	92.7	167.8	152.2	102.0	37.5	240.0	126.5	103.4	205.0	137.0	171.0	48.1	116.0	118.0	150.0	63.4	111.9	35.9
Lead (Pb)	mg/kg	0.057	0.128	0.104	0.096	0.036	0.218	0.117	1.380	0.572	0.702	1.010	0.674	0.842	0.238	0.660	0.359	0.606	0.124	0.437	0.247
Lithium (Li)	mg/kg	<0.50	<0.50	<0.50	0.50	0.00	<0.50	<0.50	<0.50	0.50	0.00	<0.50	<0.50	0.50	0.00	<0.50	<0.50	<0.50	<0.50	0.50	0.00
Magnesium (Mg)	mg/kg	1,240	1,050	1,070	1,120	104	1,020	1,090	1,010	1,040	44	1,160	932	1,046	161	1,300	1,230	1,230	1,270	1,258	34
Manganese (Mn)	mg/kg	18.00	34.50	14.50	22.33	10.68	14.50	8.18	31.30	17.99	11.95	25.60	18.10	21.85	5.30	27.00	32.80	15.40	23.10	24.58	7.30
Mercury (Hg)	mg/kg	0.120	0.098	0.133	0.117	0.018	0.144	0.171	0.128	0.148	0.022	0.292	0.269	0.281	0.016	0.100	0.118	0.211	0.134	0.141	0.049
Molybdenum (Mo)	mg/kg	0.029	0.029	0.031	0.030	0.001	<0.020	<0.020	0.038	0.026	0.010	0.074	0.071	0.073	0.002	0.091	0.028	0.032	0.024	0.044	0.032
Nickel (Ni)	mg/kg	<0.20	<0.20	<0.20	0.20	0.00	<0.20	<0.20	0.21	0.20	0.01	0.45	0.23	0.34	0.16	0.41	<0.20	<0.20	<0.20	0.25	0.11
Phosphorus (P)	mg/kg	23,900	19,200	19,700	20,933	2,581	17,300	16,600	17,900	17,267	651	20,900	15,300	18,100	3,960	22,200	25,400	20,300	22,400	22,575	2,108
Potassium (K)	mg/kg	14,600	14,300	12,700	13,867	1,021	10,500	13,600	12,100	12,067	1,550	12,300	11,300	11,800	707	15,200	13,400	15,100	12,300	14,000	1,402
Rubidium (Rb)	mg/kg	22.3	14.1	21.0	19.1	4.4	12.9	22.9	18.4	18.1	5.0	22.3	22.7	22.5	0.3	13.4	15.6	20.6	12.9	15.6	3.5
Selenium (Se)	mg/kg	4.4	5.3	6.8	5.5	1.2	7.3	7.1	10.4	8.3	1.9	13.7	15.8	14.8	1.5	7.4	4.8	7.2	5.3	6.2	1.3
Sodium (Na)	mg/kg	3,440	3,250	2,670	3,120	401	2,160	2,540	2,970	2,557	405	2,970	2,790	2,880	127	3,270	2,810	3,030	2,430	2,885	357
Strontium (Sr)	mg/kg	31.00	20.60	23.30	24.97	5.40	15.40	14.50	14.70	14.87	0.47	19.50	12.70	16.10	4.81	22.00	31.60	20.80	25.10	24.88	4.84
Tellurium (Te)	mg/kg	<0.020	<0.020	<0.020	0.020	0.000	<0.020	<0.020	<0.020	0.020	0.000	<0.020	<0.020	0.020	0.000	<0.020	<0.020	<0.020	<0.020	0.020	0.000
Thallium (Tl)	mg/kg	0.019	0.022	0.023	0.021	0.002	0.011	0.023	0.013	0.015	0.006	0.048	0.048	0.048	0.000	0.025	0.021	0.035	0.023	0.026	0.006
Tin (Sn)	mg/kg	0.36	<0.10	<0.10	0.19	0.15	<0.10	<0.10	<0.10	0.10	0.00	<0.10	<0.10	0.10	0.00	0.15	0.10	<0.10	<0.10	0.11	0.03
Uranium (U)	mg/kg	0.0232	0.0150	0.0082	0.0155	0.0075	0.0077	0.0070	0.0537	0.0228	0.0268	0.0261	0.0242	0.0252	0.0013	0.0102	0.0145	0.0123	0.0106	0.0119	0.0020
Vanadium (V)	mg/kg	0.15	0.29	<0.10	0.18	0.10	0.13	<0.10	0.40	0.21	0.17	0.47	0.44	0.46	0.02	0.10	0.12	0.18	<0.10	0.13	0.04
Zinc (Zn)	mg/kg	77.9	86.4	136.0	100.1	31.4	56.4	51.0	69.0	58.8	9.2	105.0	77.4	91.2	19.5	129.0	104.0	137.0	94.2	116.1	20.2
Zirconium (Zr)	mg/kg	<0.20	<0.20	<0.20	0.20	0.00	<0.20	<0.20	<0.20	0.20	0.00	<0.20	<0.20	0.20	0.00	<0.20	<0.20	<0.20	<0.20	0.20	0.00

[a] Fish collected by Environmental Dynamics Incorporated (EDI), June and July 2014.

Table F.15: Arctic grayling whole body metal concentrations, Faro Mine Aquatic Study, August 2014.

Sample ID	Units	Rose Creek Diversion (RCD)							Rose Creek downstream from RCTA (R2)						
		RCD-AG-01-W	RCD-AG-02-W	RCD-AG-03-W	FISH ID 180-W[a]	FISH ID 237-W[a]	Mean	Standard Deviation	R2-AG-01-W	R2-AG-02-W	FISH ID 187-W[a]	FISH ID 200-W[a]	FISH ID 219-W[a]	Mean	Standard Deviation
% Moisture	%	73.7	77.5	74.5	73.5	74.5	74.7	1.6	72.0	73.8	76.0	71.3	69.6	72.5	2.5
Metals (dry weight)															
Aluminum (Al)	mg/kg	1920.0	1190.0	799.0	113.0	9.6	806.3	791.0	103.0	175.0	40.3	244.0	5.6	113.6	97.4
Antimony (Sb)	mg/kg	0.024	0.043	0.049	<0.010	<0.010	0.027	0.018	<0.010	0.016	<0.010	0.013	<0.010	0.012	0.003
Arsenic (As)	mg/kg	0.821	1.120	0.344	0.196	0.110	0.518	0.434	0.266	0.408	0.196	0.571	0.162	0.321	0.169
Barium (Ba)	mg/kg	19.00	33.20	12.30	4.96	7.28	15.35	11.34	5.52	10.20	4.96	5.99	4.90	6.31	2.22
Beryllium (Be)	mg/kg	0.065	0.048	0.021	<0.010	<0.010	0.031	0.025	<0.010	<0.010	<0.010	0.014	<0.010	0.011	0.002
Bismuth (Bi)	mg/kg	0.014	<0.010	<0.010	<0.010	<0.010	0.011	0.002	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.000
Boron (B)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	0.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	0.0
Cadmium (Cd)	mg/kg	0.330	0.325	0.192	0.266	0.092	0.241	0.100	0.113	0.152	0.286	0.508	0.334	0.279	0.157
Calcium (Ca)	mg/kg	24,000	24,200	27,200	28,400	53,200	31,400	12,334	13,400	28,600	29,800	12,300	53,800	27,580	16,793
Cesium (Cs)	mg/kg	0.214	0.193	0.138	0.162	0.097	0.161	0.046	0.225	0.125	0.149	0.426	0.085	0.202	0.135
Chromium (Cr)	mg/kg	5.59	14.10	2.58	1.10	0.96	4.87	5.49	0.39	0.36	0.69	0.51	1.94	0.78	0.66
Cobalt (Co)	mg/kg	2.74	2.78	0.91	0.62	0.19	1.45	1.23	0.72	1.02	0.48	1.31	0.56	0.82	0.34
Copper (Cu)	mg/kg	3.82	4.36	3.02	2.68	2.50	3.28	0.79	2.83	2.70	3.39	3.37	2.08	2.87	0.54
Iron (Fe)	mg/kg	2950.0	2630.0	1210.0	186.0	66.6	1408.5	1341.9	388.0	456.0	133.0	725.0	83.1	357.0	260.5
Lead (Pb)	mg/kg	2.040	2.240	0.736	0.373	0.195	1.117	0.957	0.897	1.790	0.364	2.870	0.195	1.223	1.111
Lithium (Li)	mg/kg	3.66	2.14	0.95	<0.50	<0.50	1.55	1.36	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	0.00
Magnesium (Mg)	mg/kg	1,990	1,780	1,740	1,230	1,570	1,662	284	956	1,230	1,320	1,020	1,290	1,163	165
Manganese (Mn)	mg/kg	170.00	465.00	63.70	52.50	25.60	155.36	181.60	108.00	179.00	81.80	68.20	103.00	108.00	42.83
Mercury (Hg)	mg/kg	0.140	0.179	0.367	0.257	0.303	0.249	0.092	0.129	0.150	0.335	0.201	0.219	0.207	0.080
Molybdenum (Mo)	mg/kg	0.122	1.560	0.109	0.152	0.093	0.407	0.645	0.044	0.056	0.112	0.142	0.275	0.126	0.093
Nickel (Ni)	mg/kg	3.57	10.10	1.88	0.82	0.48	3.37	3.95	0.44	0.64	0.63	0.78	1.29	0.76	0.32
Phosphorus (P)	mg/kg	20,200	21,900	22,200	22,800	37,100	24,840	6,921	15,100	23,000	23,700	13,300	34,200	21,860	8,306
Potassium (K)	mg/kg	12,500	16,100	13,500	13,300	13,900	13,860	1,352	12,600	12,900	15,700	11,700	9,690	12,518	2,176
Rubidium (Rb)	mg/kg	13.1	16.2	13.5	11.2	12.9	13.4	1.8	17.2	12.6	13.5	16.3	7.8	13.5	3.7
Selenium (Se)	mg/kg	5.5	6.3	3.7	3.8	4.8	4.8	1.1	7.6	6.5	5.7	12.4	5.3	7.5	2.9
Sodium (Na)	mg/kg	3,230	3,910	3,230	3,410	4,090	3,574	401	3,000	3,420	3,740	3,170	3,960	3,458	395
Strontium (Sr)	mg/kg	22.20	22.90	23.30	22.90	46.60	27.58	10.64	11.30	23.10	22.30	12.00	38.00	21.34	10.84
Tellurium (Te)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	0.000	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	0.000
Thallium (Tl)	mg/kg	0.039	0.037	0.022	0.035	0.024	0.031	0.008	0.027	0.028	0.039	0.037	0.030	0.032	0.005
Tin (Sn)	mg/kg	<0.10	<0.10	0.14	<0.10	0.13	0.11	0.02	<0.10	<0.10	0.14	<0.10	0.14	0.12	0.02
Uranium (U)	mg/kg	0.1280	0.1640	0.0644	0.0475	0.0383	0.0884	0.0549	0.0341	0.0373	0.0269	0.1110	0.0167	0.0452	0.0376
Vanadium (V)	mg/kg	4.96	3.79	3.02	0.29	<0.10	2.43	2.16	0.47	1.28	0.15	1.26	0.13	0.66	0.57
Zinc (Zn)	mg/kg	171.0	139.0	104.0	114.0	111.0	127.8	27.5	96.4	118.0	117.0	118.0	134.0	116.7	13.4
Zirconium (Zr)	mg/kg	0.70	0.51	0.24	<0.20	<0.20	0.37	0.23	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	0.00

[a] Fish collected by Environmental Dynamics Incorporated (EDI), June and July 2014.

Table F.16: Slimy sculpin whole body metal concentrations, Faro Mine Aquatic Study, August 2014.

Sample ID	Units	North Fork upstream from Faro Creek (R7)							South Fork (SF)					North Fork upstream from Haul Road (NFA)				
		R7-SS-01	R7-SS-02	R7-SS-03	R7-SS-04	R7-SS-05	Mean	Standard Deviation	SF-SS-01	SF-SS-02	SF-SS-03	Mean	Standard Deviation	NFA-SS-01	NFA-SS-02	NFA-SS-03	Mean	Standard Deviation
% Moisture	%	74.5	76.3	71.6	69.9	82.5	75.0	4.9	76.4	75.9	75.3	75.9	0.6	79.8	76.2	76.3	77.4	2.1
Metals (dry weight)																		
Aluminum (Al)	mg/kg	294	82	77	205	282	188	105	54	158	27	80	69	224	102	91	139	74
Antimony (Sb)	mg/kg	0.019	0.011	0.012	0.016	0.035	0.019	0.010	<0.010	<0.010	<0.010	0.010	0.000	0.026	<0.010	0.018	0.018	0.008
Arsenic (As)	mg/kg	0.661	0.780	0.703	0.826	1.740	0.942	0.451	0.444	0.545	0.353	0.447	0.096	0.808	0.549	0.748	0.702	0.136
Barium (Ba)	mg/kg	15.80	10.60	9.36	10.60	31.10	15.49	9.07	9.92	16.30	6.85	11.02	4.82	16.10	6.74	12.40	11.75	4.71
Beryllium (Be)	mg/kg	0.012	<0.010	<0.010	0.016	0.019	0.013	0.004	<0.010	0.011	<0.010	0.010	0.001	0.010	<0.010	<0.010	0.010	0.000
Bismuth (Bi)	mg/kg	<0.010	<0.010	<0.010	<0.010	0.014	0.011	0.002	<0.010	<0.010	<0.010	0.010	0.000	0.017	<0.010	<0.010	0.012	0.004
Boron (B)	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	0.0	<1.0	<1.0	<1.0	1.0	0.0	<1.0	<1.0	<1.0	1.0	0.0
Cadmium (Cd)	mg/kg	0.09	0.07	0.07	0.09	0.22	0.11	0.06	0.12	0.17	0.07	0.12	0.05	0.27	0.12	0.10	0.16	0.09
Calcium (Ca)	mg/kg	39,800	35,600	24,000	22,200	70,900	38,500	19,595	43,000	56,400	28,300	42,567	14,055	57,800	20,700	48,800	42,433	19,352
Cesium (Cs)	mg/kg	0.103	0.096	0.046	0.140	0.101	0.097	0.034	0.108	0.124	0.077	0.103	0.024	0.142	0.093	0.097	0.111	0.027
Chromium (Cr)	mg/kg	0.45	<0.20	0.24	0.56	1.03	0.50	0.33	0.12	0.34	0.10	0.19	0.14	0.46	0.92	0.26	0.55	0.34
Cobalt (Co)	mg/kg	0.17	0.11	0.10	0.24	0.29	0.18	0.08	0.21	0.25	0.09	0.18	0.08	0.27	0.14	0.15	0.19	0.07
Copper (Cu)	mg/kg	3.24	3.09	2.65	1.99	4.76	3.15	1.02	3.28	3.56	2.43	3.09	0.59	5.40	2.62	2.65	3.56	1.60
Iron (Fe)	mg/kg	443	338	268	910	905	573	312	163	416	86	222	173	588	196	218	334	220
Lead (Pb)	mg/kg	1.72	0.49	0.72	0.78	2.61	1.26	0.89	0.20	0.40	0.11	0.24	0.15	3.63	1.19	2.01	2.28	1.24
Lithium (Li)	mg/kg	<0.50	<0.50	<0.50	0.60	0.68	0.56	0.08	<0.50	0.56	<0.50	0.52	0.03	<0.50	<0.50	<0.50	0.50	0.00
Magnesium (Mg)	mg/kg	1,430	1,920	931	1,230	2,200	1,542	515	1,320	1,550	1,190	1,353	182	1,870	982	1,710	1,521	473
Manganese (Mn)	mg/kg	86.8	67.0	51.8	78.7	215.0	99.9	65.7	61.5	109.0	30.5	67.0	39.5	56.4	16.1	41.4	38.0	20.4
Mercury (Hg)	mg/kg	0.13	0.13	0.12	0.12	0.14	0.13	0.01	0.16	0.11	0.09	0.12	0.04	0.42	0.34	0.20	0.32	0.11
Molybdenum (Mo)	mg/kg	0.117	0.081	0.084	0.088	0.299	0.134	0.093	0.075	0.111	0.060	0.082	0.026	0.142	0.079	0.118	0.113	0.032
Nickel (Ni)	mg/kg	0.52	0.30	0.28	0.54	0.98	0.52	0.28	0.36	0.50	<0.20	0.35	0.15	0.62	0.35	0.35	0.44	0.16
Phosphorus (P)	mg/kg	29,000	24,800	16,800	14,600	39,700	24,980	10,094	30,400	37,400	21,200	29,667	8,125	38,000	17,200	37,000	30,733	11,731
Potassium (K)	mg/kg	12,900	12,800	9,670	10,400	21,200	13,394	4,592	13,900	11,700	13,200	12,933	1,124	15,200	13,400	12,600	13,733	1,332
Rubidium (Rb)	mg/kg	17.0	10.9	11.2	11.8	8.8	11.9	3.0	11.1	10.7	8.3	10.0	1.5	14.4	9.0	11.7	11.7	2.7
Selenium (Se)	mg/kg	4.57	5.13	4.78	4.52	6.32	5.06	0.74	3.63	2.97	2.84	3.15	0.42	4.44	3.87	4.32	4.21	0.30
Sodium (Na)	mg/kg	3,580	3,870	2,950	2,240	6,060	3,740	1,440	4,370	3,750	3,540	3,887	432	5,480	3,970	5,010	4,820	773
Strontium (Sr)	mg/kg	45.4	40.9	33.0	25.5	95.7	48.1	27.7	62.0	79.2	46.1	62.4	16.6	56.4	22.7	52.8	44.0	18.5
Tellurium (Te)	mg/kg	<0.020	<0.020	<0.020	<0.020	<0.020	0.020	0.000	<0.020	<0.020	<0.020	0.020	0.000	<0.020	<0.020	<0.020	0.020	0.000
Thallium (Tl)	mg/kg	0.019	0.016	0.012	0.016	0.020	0.016	0.003	0.027	0.029	0.014	0.023	0.008	0.046	0.028	0.040	0.038	0.010
Tin (Sn)	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	0.10	0.00	<0.10	<0.10	<0.10	0.10	0.00	<0.10	<0.10	<0.10	0.10	0.00
Uranium (U)	mg/kg	0.051	0.040	0.039	0.059	0.096	0.057	0.023	0.031	0.073	0.017	0.040	0.029	0.087	0.032	0.054	0.058	0.028
Vanadium (V)	mg/kg	1.00	0.44	0.34	0.79	1.37	0.79	0.42	0.33	0.64	0.16	0.38	0.24	1.27	0.46	1.19	0.97	0.45
Zinc (Zn)	mg/kg	93	82	70	79	176	100	43	125	138	102	122	18	166	131	125	141	22
Zirconium (Zr)	mg/kg	<0.20	<0.20	<0.20	0.21	0.24	0.21	0.02	<0.20	<0.20	<0.20	0.20	0.00	<0.20	<0.20	<0.20	0.20	0.00

Table F.16: Slimy sculpin whole body metal concentrations, Faro Mine Aquatic Study, August 2014.

Sample ID	Units	North Fork - Haul Road to Access Road (NFB)					North Fork - Ponds and Diversion (NFC)					Rose Creek Diversion (RCD)					Rose Creek downstream from RCTA (R2)				
		NFB-SS-01	NFB-SS-02	NFB-SS-03	Mean	Standard Deviation	NFC-SS-01	NFC-SS-02	NFC-SS-03	Mean	Standard Deviation	RCD-SS-01	RCD-SS-02	RCD-SS-03	Mean	Standard Deviation	R2-SS-01	R2-SS-02	R2-SS-03	Mean	Standard Deviation
% Moisture	%	76.8	72.9	73.0	74.2	2.2	71.8	79.3	73.4	74.8	4.0	73.7	77.1	70.0	73.6	3.6	74.9	79.5	76.9	77.1	2.3
Metals (dry weight)																					
Aluminum (Al)	mg/kg	99	6	99	68	53	96	128	18	81	57	84	365	160	203	145	91	116	85	97	17
Antimony (Sb)	mg/kg	<0.010	<0.010	0.013	0.011	0.002	<0.010	0.013	<0.010	0.011	0.002	<0.010	0.025	<0.010	0.015	0.009	0.011	0.013	<0.010	0.011	0.002
Arsenic (As)	mg/kg	0.689	0.422	1.140	0.750	0.363	0.306	0.803	0.432	0.514	0.258	0.505	0.902	0.391	0.599	0.268	0.405	0.394	0.347	0.382	0.031
Barium (Ba)	mg/kg	8.27	3.25	10.90	7.47	3.89	15.80	14.90	6.66	12.45	5.04	10.80	24.30	10.50	15.20	7.88	7.81	17.50	7.75	11.02	5.61
Beryllium (Be)	mg/kg	<0.010	<0.010	0.012	0.011	0.001	<0.010	<0.010	<0.010	0.010	0.000	<0.010	0.019	<0.010	0.013	0.005	<0.010	<0.010	<0.010	0.010	0.000
Bismuth (Bi)	mg/kg	<0.010	<0.010	<0.010	0.010	0.000	<0.010	<0.010	<0.010	0.010	0.000	<0.010	0.012	<0.010	0.011	0.001	<0.010	<0.010	<0.010	0.010	0.000
Boron (B)	mg/kg	<1.0	<1.0	<1.0	1.0	0.0	<1.0	<1.0	<1.0	1.0	0.0	<1.0	<1.0	<1.0	1.0	0.0	<1.0	<1.0	<1.0	1.0	0.0
Cadmium (Cd)	mg/kg	0.16	0.08	0.23	0.16	0.08	0.13	0.18	0.12	0.14	0.04	0.13	0.29	0.21	0.21	0.08	0.12	0.17	0.14	0.14	0.03
Calcium (Ca)	mg/kg	32,700	14,100	31,100	25,967	10,308	14,300	58,100	30,400	34,267	22,155	29,700	47,900	24,300	33,967	12,365	42,000	62,300	53,900	52,733	10,200
Cesium (Cs)	mg/kg	0.266	0.389	0.228	0.294	0.084	0.162	0.118	0.113	0.131	0.027	0.105	0.263	0.211	0.193	0.081	0.088	0.201	0.147	0.145	0.056
Chromium (Cr)	mg/kg	0.48	<0.20	0.29	0.32	0.14	0.29	0.37	0.29	0.32	0.05	0.21	0.80	0.35	0.45	0.31	0.29	0.37	0.34	0.33	0.04
Cobalt (Co)	mg/kg	0.41	0.12	0.55	0.36	0.22	0.35	0.71	0.12	0.39	0.30	0.28	0.66	0.26	0.40	0.22	0.41	0.51	0.44	0.45	0.05
Copper (Cu)	mg/kg	2.76	1.79	2.55	2.37	0.51	2.29	3.37	1.73	2.46	0.83	2.07	5.95	2.95	3.66	2.03	2.56	3.37	3.22	3.05	0.43
Iron (Fe)	mg/kg	336	47	639	341	296	181	329	118	209	108	356	663	243	421	217	332	362	374	356	22
Lead (Pb)	mg/kg	1.54	0.34	2.02	1.30	0.86	0.58	2.30	0.94	1.27	0.91	1.00	5.64	1.58	2.74	2.53	0.65	0.89	0.53	0.69	0.18
Lithium (Li)	mg/kg	<0.50	<0.50	<0.50	0.50	0.00	<0.50	<0.50	<0.50	0.50	0.00	<0.50	0.68	<0.50	0.56	0.10	<0.50	<0.50	<0.50	0.50	0.00
Magnesium (Mg)	mg/kg	1,370	921	1,210	1,167	228	1,160	2,000	1,330	1,497	444	1,290	1,530	1,070	1,297	230	1,420	1,960	1,680	1,687	270
Manganese (Mn)	mg/kg	31.8	18.8	103.0	51.2	45.3	39.4	76.6	25.8	47.3	26.3	27.4	50.5	25.4	34.4	14.0	178.0	192.0	170.0	180.0	11.1
Mercury (Hg)	mg/kg	0.22	0.11	0.13	0.15	0.06	0.15	0.21	0.17	0.17	0.03	0.36	0.17	0.11	0.21	0.13	0.09	0.15	0.11	0.12	0.03
Molybdenum (Mo)	mg/kg	0.076	<0.040	0.088	0.068	0.025	0.118	0.175	0.103	0.132	0.038	0.117	0.154	0.081	0.117	0.037	0.103	0.159	0.092	0.118	0.036
Nickel (Ni)	mg/kg	0.51	<0.20	0.57	0.43	0.20	0.49	0.56	0.36	0.47	0.10	0.48	0.99	0.46	0.64	0.30	0.52	0.70	0.46	0.56	0.12
Phosphorus (P)	mg/kg	25,700	13,600	20,900	20,067	6,093	15,800	38,800	20,600	25,067	12,133	22,400	26,800	19,000	22,733	3,911	30,500	44,000	35,700	36,733	6,809
Potassium (K)	mg/kg	11,900	11,300	10,100	11,100	917	11,900	15,900	10,800	12,867	2,684	10,800	12,100	10,800	11,233	751	12,800	14,800	14,400	14,000	1,058
Rubidium (Rb)	mg/kg	15.2	16.0	16.4	15.9	0.6	6.6	7.6	6.3	6.8	0.7	5.1	8.8	8.0	7.3	1.9	6.8	8.0	10.5	8.5	1.9
Selenium (Se)	mg/kg	5.00	7.07	7.62	6.56	1.38	3.88	4.15	3.15	3.73	0.52	2.74	3.74	3.49	3.32	0.52	4.92	4.33	6.08	5.11	0.89
Sodium (Na)	mg/kg	3,220	2,250	2,690	2,720	486	2,220	4,450	3,240	3,303	1,116	3,270	4,310	2,980	3,520	699	3,740	5,710	4,220	4,557	1,027
Strontium (Sr)	mg/kg	32.8	15.5	34.4	27.6	10.5	17.6	71.0	34.7	41.1	27.3	32.5	56.1	32.2	40.3	13.7	35.0	62.9	44.2	47.4	14.2
Tellurium (Te)	mg/kg	<0.020	<0.020	<0.020	0.020	0.000	<0.020	<0.020	<0.020	0.020	0.000	<0.020	<0.020	<0.020	0.020	0.000	<0.020	<0.020	<0.020	0.020	0.000
Thallium (Tl)	mg/kg	0.030	0.028	0.031	0.029	0.002	0.015	0.026	0.017	0.020	0.006	0.019	0.036	0.025	0.027	0.008	0.019	0.035	0.025	0.026	0.008
Tin (Sn)	mg/kg	0.14	<0.10	<0.10	0.11	0.02	<0.10	<0.10	<0.10	0.10	0.00	<0.10	<0.10	<0.10	0.10	0.00	<0.10	<0.10	<0.10	0.10	0.00
Uranium (U)	mg/kg	0.030	0.005	0.043	0.026	0.019	0.047	0.037	0.012	0.032	0.018	0.044	0.120	0.041	0.068	0.045	0.025	0.053	0.025	0.034	0.016
Vanadium (V)	mg/kg	0.44	<0.10	0.57	0.37	0.24	0.33	0.91	0.24	0.49	0.36	0.56	1.44	0.56	0.85	0.51	0.47	0.77	0.73	0.66	0.16
Zinc (Zn)	mg/kg	204	116	233	184	61	156	315	175	215	87	252	331	222	268	56	185	242	187	205	32
Zirconium (Zr)	mg/kg	<0.20	<0.20	<0.20	0.20	0.00	<0.20	<0.20	0.22	0.21	0.01	<0.20	0.21	<0.20	0.20	0.01	<0.20	<0.20	<0.20	0.20	0.00

Table F.17: Statistical analysis results of slimy sculpin condition for areas in the vicinity of the Faro Mine.

a) Statistical results based on log-transformed data

Comparison	Endpoint		Sample Size		Regression Relationship Between Parameter and Covariate				Model	Statistical Difference Between Areas (*p* -value)		Power
					Reference		Exposed					
	Parameter	Covariate	Ref	Exp	r	p-value	r	p-value				
SF vs NFA[e]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	36	32	0.98	0.000	0.99	0.000	ANCOVA	No	0.764	-
SF vs NFB[f]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	36	49	0.98	0.000	0.99	0.000	ANCOVA	Yes	0.000	0.986
SF vs NFC	Log_{10} Body Weight (g)	Log_{10} Length (cm)	36	10	0.98	0.000	0.99	0.000	ANCOVA	No	0.852	-
SF vs RCD	Log_{10} Body Weight (g)	Log_{10} Length (cm)	36	45	0.98	0.000	0.99	0.000	ANCOVA	No	0.131	-
SF vs R2	Log_{10} Body Weight (g)	Log_{10} Length (cm)	36	14	0.98	0.000	0.97	0.000	ANCOVA	No	0.272	-
NFA vs NFB[g]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	32	49	0.99	0.000	0.99	0.000	ANCOVA	Yes	0.000	0.993
NFA vs NFC[h]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	31	9	0.99	0.000	0.99	0.000	ANCOVA	No	0.811	-
NFA vs RCD[e]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	32	45	0.99	0.000	0.99	0.000	ANCOVA	No	0.112	-
NFA vs R2[e]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	32	14	0.99	0.000	0.97	0.000	ANCOVA	No	0.123	-
NFB vs NFC[i]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	49	9	0.99	0.000	0.99	0.000	ANCOVA	Yes	0.007	0.874
NFB vs RCD[f]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	49	45	0.99	0.000	0.99	0.000	ANCOVA	Yes	0.000	1.000
NFB vs R2[f]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	49	14	0.99	0.000	0.97	0.000	ANCOVA	Yes	0.000	0.998
NFC vs RCD[j]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	9	43	0.99	0.000	0.99	0.000	ANCOVA	Yes	0.037	0.679
NFC vs R2	Log_{10} Body Weight (g)	Log_{10} Length (cm)	10	14	0.99	0.000	0.97	0.000	ANCOVA	No	0.305	-
RCD vs R2	Log_{10} Body Weight (g)	Log_{10} Length (cm)	45	14	0.99	0.000	0.97	0.000	ANCOVA	No	0.611	-

b) Results expressed as anti-logged values

Comparison	Endpoint		Sample Size		Mean, Adjusted Mean or Predicted Value[a]			Magnitude of Difference (%)[b,c]	Minimum Detectable Effect Size (%)[d]	
	Parameter	Covariate	Ref	Exp		Ref	Exp		Increase	Decrease
SF vs NFA[e]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	36	32	Mean	2.97	2.94	-	9.3	-8.5
SF vs NFB[f]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	36	49	Mean	2.26	2.50	10.4	-	-
SF vs NFC	Log_{10} Body Weight (g)	Log_{10} Length (cm)	36	10	Mean	2.87	2.85	-	11	-10
SF vs RCD	Log_{10} Body Weight (g)	Log_{10} Length (cm)	36	45	Mean	2.11	2.03	-	7.8	-7.3
SF vs R2	Log_{10} Body Weight (g)	Log_{10} Length (cm)	36	14	Mean	2.17	2.03	-	12.3	-11.0
NFA vs NFB[g]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	32	49	Mean	2.48	2.73	10.3	-	-
NFA vs NFC[h]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	31	9	Mean	3.41	3.38	-	8	-7
NFA vs RCD[e]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	32	45	Mean	2.32	2.23	-	7	-7
NFA vs R2[e]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	32	14	Mean	2.54	2.37	-	12	-10
NFB vs NFC[i]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	49	9	Mean	2.43	2.17	-10.7	-	-
NFB vs RCD[f]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	49	45	Mean	2.10	1.83	-12.9	-	-
NFB vs R2[f]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	49	14	Mean	2.04	1.74	-15	-	-
NFC vs RCD[j]	Log_{10} Body Weight (g)	Log_{10} Length (cm)	9	43	Mean	1.88	1.82	-3	-	-
NFC vs R2	Log_{10} Body Weight (g)	Log_{10} Length (cm)	10	14	Mean	2.01	1.95	-	18.4	-15.5
RCD vs R2	Log_{10} Body Weight (g)	Log_{10} Length (cm)	45	14	Mean	1.60	1.57	-	9.2	-8.4

[a] The mean and adjusted mean is reported for ANOVAs and ANCOVAs, respectively, and the predicted values of the regression line equations for minimum and maximum values of the covariate (where the data sets overlap) for ANCOVAs where a significant interaction (i.e., difference in slopes) occurs and cannot be resolved by removing outliers, and the r^2 for the ANCOVA models with and without the interaction term are less than 0.8 or differ by more than 0.02.

[b] ANCOVA - magnitude of difference between antilogged adjusted means for upstream and downstream areas calculated as: [(downstream adjusted mean - upstream adjusted mean) /upstream adjusted mean] x 100.

[c] ANCOVA with Interaction - magnitude of difference between predicted minimum and maximum values for upstream and downstream areas calculated as: [(downstream predicted value - upstream predicted value) / upstream predicted value] x 100.

[d] Minimum detectable effect size (see methods section of report for formula).

[e] Studientized outlier NFA-SS-27 removed.

[f] studientized outlier NFB-SS-36 removed.

[h] Cook's outliers NFA-SS-13, NFA-SS-27 and NFS-SS-01 removed.

[i] Cook's outliers NFB-SS-36 and NFC-SS-27 removed.

[j] Cook's outliers NFC-SS-01, RCD-SS-20 and RCD-SS-32 removed.

APPENDIX G

LABORATORY REPORTS
(ON CD ATTACHED
TO BACK COVER)