The results of the population study show a potential fluvial-resident life-history strategy that inhabits the upper portion of the watershed and a fluvial-migratory life history strategy that does not penetrate beyond ALE4, with its summer migrations from larger Elk and Michel Creeks into Alexander Creek. Of those suspected fluvial-resident fish, those tagged in West Alexander Creek were almost exclusively found to remain in West Alexander Creek for all life-history activities.

Benthic Invertebrate Community

Benthic invertebrates were collected at Alexander Creek in 2014, 2017, and 2019. There were more than twice as many invertebrates collected in samples from 2017 at ALE7, ALE8, and ALE10 compared with samples in 2014, although community composition remained similar (Table 12.4-14). Results of the RIVPACS assessment and site comparisons and probabilities to reference groups are provided in the Fish and Fish Habitat Baseline Assessment in Appendix 12-B. ALE7 and ALE8 transitioned from being similar to reference conditions to mildly divergent from 2014 to 2017; all other sites stayed the same categorization of disturbance between years. WA3 had the highest number of taxa predicted to occur in the sample based on the RIVPACs assessment, but some of these taxa were found to be absent.

Table 12.4-14: Benthic Invertebrate Metrics and CABIN Assessment for the Alexander Creek Watershed

2014								
Reach	TA	TR	% D	*D*	H	%EPT	%E	%C
ALE7	4,200	20	53.92	0.79	1.90	78.76	67.97	17.32
ALE8	6,000	19	49.02	0.83	2.06	81.33	62.95	16.71
ALE9	7,480	18	58.38	0.74	1.95	92.43	69.46	6.49
ALE10	3,989	18	36.21	0.87	2.29	94.43	45.96	3.34
UWA2	1,750	17	35.56	0.87	2.25	86.98	50.16	11.74
UWA3	1,292	15	58.82	0.8	1.93	65.02	23.53	31.89
WAL1	7,100	19	58.87	0.8	2.04	88.45	62.82	3.66
2017								
Reach	TA	TR	% D	*D*	H	%EPT	%E	%C
ALE7	2,7860	21	52.95	0.81	2.02	80.59	59.59	15.86
ALE8	2,1640	21	62.58	0.77	1.79	86.62	76.99	12.63
ALE9	5,550	20	49.39	0.85	2.23	86.59	60.98	11.28
ALE10	9,580	17	52.78	0.79	1.97	81.41	48.72	10.26
UWA2	1,894	18	51.56	0.84	2.12	70.31	37.5	26.56
WAL1	11,020	21	36.26	0.88	2.37	76.19	33.52	14.10
2019								
Reach	TA	TR	% D	*D*	H	%EPT	%E	%C
ALE1	5,617	23	39.10	0.87	2.35	79.40	54.63	8.66
ALE2	4,414	23	34.63	0.89	2.45	72.82	46.28	5.50

Note:
TA – Total Abundance of all Benthic Invertebrate Organisms, TR – Taxa Richness, % D - The Proportion of Individuals in Dominant and Second Dominant Taxon, *D* - Simpson's Diversity Index, H – Shannon Diversity Index, % EPT - % Ephemeroptera, Plecoptera and Trichoptera, % E - % Ephemeroptera, % C - % Chironomidae.

Periphyton Community

Periphyton surveys were completed in Alexander Creek in 2014 and 2017. ALE9 had the highest amount of chl-a and AFDM in 2014, but levels dropped in the 2017 sample (Table 12.4-15). All other sites had relatively low chl-a and AFDM across both years. Chrysophytes and diatoms were the dominant groups of periphyton in 2014 and 2017; however, in 2019 chlorophytes and cyanobacteria were more prevalent.

Table 12.4-15: Periphyton Community in the Alexander Creek Watershed

2014				
Site ID	Dominant Group (%)	Dominant Taxon	Chl-a (mg/m^2)	AFDM (g/m^2)
ALE7	Chrysophytes (99.2)	*Hydrurus* sp.	0.58	0.44
ALE8	Chrysophytes (95.03)	*Hydrurus* sp.	0.01	0.52
ALE9	Chrysophytes (99.5)	*Hydrurus* sp.	2.94	2.16
ALE10	Diatoms (83.6)	*Gomphonema minutum*	0.02	0.02
WAL1	Diatoms (64.1)	*Gomphonema minutum*	0.01	0.02
WAL2	Diatoms (55.3)	*Homoeothrix varians*	0.02	0.10
2017				
Site ID	Dominant Group (%)	Dominant Taxon	Chl-a (mg/m^2)	AFDM (g/m^2)
ALE7	Diatoms (35.5)	*Hydrurus* sp.	0.06	0.04
ALE8	Chrysophytes (76.9)	*Hydrurus* sp.	0.16	0.32
ALE9	Chrysophytes (43.2)	*Heteroleibeinia profunda*	0.06	0.28
ALE10	Diatoms (59.4)	*Achnanthes minutissima*	0.05	0.09
WAL1	Diatoms (91.1)	*Diatoma vulgare*	0.03	0.07
2019				
Site ID	Dominant Group (%)	Dominant Taxon	Chl-a (mg/m^2)	AFDM (g/m^2)
ALE1	Chlorophyte (65.0)	*Diatoma vulgare*	0.25	0.22
ALE2	Cyanobacteria (97.9)	*Heteroleibeinia profunda*	0.29	0.51
UWA2	Cyanobacteria (61.0)	*Heteroleibeinia profunda*	0.04	0.16

Chl-a - Chlorophyll-a, AFDM - ash-free dry biomass.

Aquatic Health

Fish Tissue

Selenium concentrations in WCT tissue ranged from 2.82 to 4.18 mg/kg dw in Alexander Creek reaches ALE7 and ALE 9, and from 2.53 to 4.75 mg/kg dw in WAL1. There were three samples that exceeded the B.C. guideline for selenium in fish tissue of 4 mg/kg dw at ALE7 and ALE9, and two samples that exceeded the guideline in WAL1. There does not appear to be a spatial relationship between these exceedances and the areas they were collected from. Concentrations were below the U.S. EPA selenium guideline of 8.5 mg/kg. Metals results for individual fish samples are provided in Appendix 12-D.

Benthic Invertebrate Tissue

Within the Alexander Creek watershed, selenium concentrations in benthic invertebrate tissue ranged from 1.02 mg/kg dw at ALE2 to 5.34 mg/kg dw at ALE10, and 3.11 mg/kg dw in the sample collected from

WAL1. Overall, selenium concentrations were higher in 2017 than in 2019; however, there were a limited number of samples collected and each site was only sampled once. ALE10 exceeded the B.C. guideline value of 4 mg/kg dw but was below the U.S. EPA guideline of 8.5 mg/kg dw. The remainder of the sites were below both the B.C. and U.S. EPA guideline values for total selenium in invertebrates during the 2017 and 2019 sampling events. Minnow Environmental (2014) suggested 6.7 mg/kg dw as a reference benchmark value for the Elk Valley; all samples were also below this benchmark. Metals results for individual samples are provided in Appendix 12-D.

Periphyton Tissue

Within the Alexander Creek watershed, selenium concentrations in periphyton tissue ranged from 1.48 mg/kg dw at ALE8 to 8.57 mg/kg dw at ALE1, and 3.08 mg/kg dw in the sampled collected from WAL1. Overall, selenium concentrations were higher in 2019 than in 2017; however, there were a limited number of samples collected and each site was only sampled once. Minnow Environmental (2014) reported a range of 0.87 to 4.60 mg/g dw for reference streams in the Elk Valley and both ALE1 and ALE2 exceeded this range in 2019. Metals results for individual samples are provided in Appendix 12-D.

Sediment Quality

The sediment types sampled in the Alexander Creek watershed included cobble, coarse sand, sand, fines mixed with sand, and silt, with limited organic debris and limited visual or olfactory observations of sheens or odours. No sediment was collected at ALE1 as the substrate consisted of cobbles and gravels. Selenium concentrations ranged from 0.62 mg/kg at ALE7 to 1.88 mg/kg at ALE10, and 0.48 mg/kg at WAL1. All selenium concentrations were below the lower WSWQ value of 2.0 mg/kg.

ALE10 had the lowest concentration of nickel (11.8 mg/kg) and arsenic (2.03 mg/kg), below the lower WSQG of 16 mg/kg and 5.9 mg/kg, respectively. All other sites had values between the lower and upper WSQG for nickel (75 mg/kg) and arsenic (17 mg/kg), with the greatest concentration of both at ALE9. ALE7 and WAL1 had the lowest cadmium concentrations (0.50 mg/kg); all other sites were above the lower WSQG of 0.6 mg/kg but below the upper WSQG of 3.5 mg/kg. All sites were below the lower WSQG for copper, chromium, iron, lead, manganese, mercury, silver, and zinc.

The Alexander Creek sites had acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, and benzo(a)pyrene sediment concentrations that were between the lower and upper WSQG guideline values, with the exception of ALE2, which was below the lower WSQG guideline value for each of the above-listed PAHs. All sites were below the lower WSQG for benzo(g,h,i)perylene, benzo(k)fluoranthene, and indeno(1,2,3-c,d). Chrysene and pyrene concentrations were approximately at the lower WSQG guideline value for all sites. All sites were between the lower and upper WSQG for dibenz(a,h)anthracene and fluorene, except for ALE2, which was below the lower WSQG guideline value. All sites were below the lower WSQG for fluoranthene. Metal and PAH results for individual samples are provided in Appendix 12-D.

12.4.2.2.2 Grave Creek

Grave Creek is a fourth order stream and a tributary of the Elk River located adjacent to the Project footprint. It is comprised of four fish bearing reaches and drains into the northern portion of the Fish and Fish Habitat LSA (Figure 12.4-5). Grave Creek Reaches 1 and 2 are downstream of the Project footprint and have been described previously during baseline studies conducted for Teck's Elkview Operations

(Lotic Environmental, 2015). Grave Creek Reach 3 (GRA3) and Reach 4 (GRA4) are located upstream of Teck's previous assessment area and were therefore included in the Project baseline studies. Two tributaries of Grave Creek, Unnamed Tributary of Grave Creek 1 (UTG1) and Unnamed Tributary of Grave Creek 2 (UTG2) are located within the proposed Project footprint. A migration barrier (3 m high waterfall) on Grave Creek Reach 1 has previously been identified as a barrier to all species of fish, excluding WCT (Lotic Environmental, 2015). Therefore, it is accepted that only an isolated population of WCT reside in the Grave Creek reaches GRA3 and GRA4.

Grave Creek Reach 1 extends upstream from the confluence of the Elk River to upstream of the outflow of Grave Lake. The upstream limit to Reach 1 is marked by a change in confinement, as the stream enters a canyon section at Reach 2 (Lotic Environmental, 2015). Grave Creek Reach 2 extends to Harmer Creek and is located downstream of the confluences with UTG1 and UTG2. Grave Creek Reach 3 is located upstream of the confluence with Harmer Creek and any surface water influence from Teck's Elkview Operations. Grave Creek Reach 4 is upstream of the confluences with UTG1 and UTG2 and is designated as a reference site for the Project.

Unnamed Tributary of Grave Creek 1 (UTG1) is a first order, unnamed tributary with one reach entering on the south side of Grave Creek at the break between GRA3 and GRA4. Unnamed Tributary Grave Creek 2 (UTG2) is a second order, unnamed tributary on the east side of Grave Creek. There are two reaches on Unnamed Tributary of Grave Creek 2 (UTG2-1 and UTG2-2).

Fish Habitat

Fish Habitat Assessment Procedures

Key habitat characteristics in Grave Creek Reaches 3 and 4 and their unnamed tributaries are summarized in Table 12.4-16. GRA3 was characterized by cascade-pool morphology and GRA4 was characterized by step-pool morphology. Substrates in both reaches were dominated by cobble and gravel. Cover in GRA3 was considered poor, with sparse boulders, large wood debris, and undercut banks present, while cover in GRA4 was considered good, with abundant boulders, large and small woody debris, and overhanging vegetation. Riparian vegetation consisted of mixed forest along GRA3 and mature coniferous forest along GRA4. Both GRA3 and GRA4 are fish bearing. Habitat conditions in GRA3 remained consistent with previous surveys completed in 2009 to 2011 (Lotic Environmental, 2015).

Table 12.4-16: Habitat Summary and Fish Bearing Status for Grave Creek Reaches 3 and 4 and their Tributaries

Reach	Fish Bearing	Reach Length (m)	Bankfull Width (m)	Wetted Width (m)	Water Depth (m)	Average Gradient (%)
GRA3	Yes	6,370	5.76	3.42	0.12	5.50%
GRA4	Yes	2,320	4.37	2.56	0.13	24.10%
UTG1	Yes	3,140	3.76	2.05	0.12	9.36%
UTG2-1	Yes	680	4.74	1.89	-	7.10%
UTG2-2	No	-	-	-	-	-
UTG3	No	-	-	-	-	-

UTG1 was characterized by step-pool morphology with cobble and gravel substrates and poor cover provided by large and small woody debris and undercut banks. Riparian vegetation along UTG1 consisted of mature coniferous forest. UTG2-1 was characterized by cascade-pool morphology with gravel and cobble substrates and limited cover provided by small and large woody debris. UTG2-2 is characterized by step-pool morphology with gravel and cobble substrates and moderate cover provided by small and large woody debris and overhanging vegetation. Riparian vegetation along both UTG2-1 and UTG2-2 consisted of mixed forest. UTG2-1 is considered fish bearing based on average gradient and morphology, whereas UTG2-2 is considered non-fish bearing as it begins with a 30% gradient for 100 m, preventing fish from moving upstream from UTG2-1 (FPCBC, 1998).

An additional unnamed tributary to Grave Creek (UTG3) was surveyed in July 2020 in order to classify the channel and determine fish bearing status. This tributary was surveyed because it partially overlaps with the Project footprint along the upper haul road. UTG3 is a narrow groundwater fed channel that goes subsurface 50 m after it crosses Grave Creek Road, then resurfaces and widens further downstream. There are two confirmed fish barriers downstream from that point. Between the fish barrier and the confluence with Grave Creek, the tributary is considered to default to fish bearing for approximately 500 m, with substrates dominated by fine gravel and sand. Between the lower fish barrier and the confluence with Grave Creek, the stream has an average width of 40 cm. Moderate cover is provided by overhanging riparian vegetation and woody debris. The riparian habitat consisted of mixed forest.

Barriers to Fish Passage

Several barriers to fish passage were noted within Grave Creek and its tributaries, including four bedrock waterfalls ranging from 1 to 3 m high located downstream of the Grave Lake outlet that serve as potential barriers to fish passage to all species excluding WCT (Lotic Environmental, 2015), in addition to the 30% gradient in UTG2-2 that prevents fish from moving upstream from UTG2-1.

Instream Flow Study

Instream flow studies are used to assess fish habitat changes that may result from reductions in the quantity of stream flow. Flow reductions resulting from the Project were identified as a possibility in Grave Creek, where water storage and withdrawal are proposed.

Calcite Assessment

No calcite was detected within the Grave Creek survey sites (i.e., calcite index scores of 0.00).

<u>Fish Community</u>

Fish Inventory and Distribution

Surveyed reaches considered fish bearing included GRA3 and GRA4, and UTG1. WCT was the only species captured (Table 12.4-17). UTG1 was confirmed to be fish bearing to the headwaters and required no further assessment of fish distribution. UTG2 was differentiated into two reaches, UTG2-1 and UTG2-2. No fish were captured or observed during the fish inventory sampling in either reach. However, WCT were observed in UTG2-1 during spawning surveys, confirming the fish bearing status (Table 12.4-17).

Table 12.4-17: Fish Inventory Sampling Summary for Fish Bearing Reaches in the Grave Creek Watershed

Reach	Sample Date	Electrofishing Effort (s)	Species	Total Number Captured	Min Fork Length (mm)	Max Fork Length (mm)
GRA3	July 11, 2017	1,316	WCT	3	155	201
	July 14, 2017	658	WCT	5	152	186
GRA4	July 10, 2017	1,265	WCT	12	135	171
UTG1	July 29, 2014	311	WCT	4	47	201
UTG2-1	July 29, 2014	325	NFC*	0	-	-

Note: NFC denotes No Fish Caught; Min = minimum, Max = maximum; WCT = Westslope Cutthroat Trout

Rearing

Summer rearing fish use was assessed via fish community surveys in GRA3, GRA4, and UTG1 in 2017. Fish community sampling of UTG2 was not required as it is unlikely to be impacted by the Project and was included for inventory to provide a more complete assessment of fish habitat availability within the Grave Creek watershed. Fish community results, including species captured, total number of species capture, minimum/maximum fork length (mm), and pooled fish density (fish/100 m^2) are provided in Table 12.4-18.

The WCT population upstream of Grave Creek Reach 2 is isolated as a result of the migration barrier in Grave Creek Reach 1; therefore, WCT in the surveyed reaches must carry out all life stages within the habitat available. Fork lengths measured during the summer rearing surveys indicated that all captured individuals were in the juvenile age class (Table 12.4-18).

Table 12.4-18: Fish Community Assessment Data for Fish Bearing Reaches in the Grave Creek Watershed

Reach	Date	Species	Total Number Captured	Min Fork Length (mm)	Max Fork Length (mm)	Density (fish/ 100 m^2)
GRA3	September 20, 2017	WCT	5	150	209	1
GRA4	October 11, 2017	WCT	16	76	165	7
UTG1	October 11, 2017	WCT	4	61	119	2

Spawning

Spawning surveys were completed in the spring of 2014 and 2017 within Grave Creek and its tributaries. Fall spawning surveys were not required in these reaches as no fall spawning fish species are present upstream of the Grave Creek Reach 1 barrier. Overall, Grave Creek and its tributaries provide moderate to good spawning potential (Table 12.4-19). In GRA3, areas of suitable spawning habitat were noted during spring surveys. However, no direct evidence of spawning (i.e., redds or paired fish) was observed. In GRA4, two adult WCT were observed pairing up near the Branch C Road. The fish were displaying spawning behaviour; however, no redd was observed. Overall, spawning potential was considered to be good in this reach (Table 12.4-19).

Table 12.4-19: Spawning Potential in Grave Creek

Reach	Spawning Potential
GRA3	Moderate-good
GRA4	Good
UTG1	Good
UTG2-1	Moderate

Ten habitat units were documented in UTG1 as moderate potential to be used by WCT. These sites contained good spawning gravel size, fair overhead cover, good flow, and fair water depth. A pair of WCT was observed during the 2014 survey, but they did not display any typical spawning behaviour. A second survey in 2014 found one WCT redd. As such, spawning potential in UTG1 was considered good.

In UTG2-1, eight habitat units had good potential to be used as WCT spawning sites. Spawning sites had fair depth, a good range of flows, and good spawning gravel size, but limited cover. Two WCT were observed holding in suitable spawning habitat in 2014. However, no redds were observed at this time or at any other time during spawning surveys.

Overwintering

Overwintering potential at Grave Creek was not directly assessed due to site access limitations and significant avalanche risk. However, depths, temperatures, and DO levels measured during fall surveys suggest overwintering potential is likely for all fish bearing reaches in Grave Creek. This is further supported by the fact that the WCT population in these reaches is isolated and therefore the available habitat must support all life stages.

Benthic Invertebrate Community

Benthic invertebrates were collected at the Grave Creek and tributary survey sites in 2014 and 2017 (Table 12.4-20). The total abundance was more than five times greater at GRA3 in 2014 compared to GRA3 in 2017, but were more abundant at GRA4 in 2017 compared with 2014 (Table 12.4-20). The percent of Ephemeroptera, Plecoptera, and Trichoptera (% EPT) decreased by nearly 20% at GRA4 between 2014 and 2017, but remained similar at GRA3. Results of the RIVPACS assessment and site comparisons and probabilities to reference groups are provided in the Fish and Fish Habitat Baseline Assessment in Appendix 12-B. All sites were similar to reference conditions, except for UTG2-1, which was mildly divergent.

Table 12.4-20: Benthic Invertebrate Metrics and CABIN Assessment for the Grave Creek Watershed

2014								
Site	TA	TR	% D	*D*	H	%EPT	%E	%C
GRA3	16,553	21	73.01	0.72	1.64	98.99	43.44	0.32
GRA4	1,655	18	44.41	0.86	2.25	97.58	57.1	1.51

2017								
Site	TA	TR	% D	*D*	H	%EPT	%E	%C
GRA3	2,793	16	51.93	0.82	1.98	98.07	38.89	1.21
GRA4	52,29	21	37.22	0.89	2.52	78.41	32.95	7.95
UTG1	7,100	18	54.11	0.78	2.06	94.05	60.06	3.97
UTG2-1	1,348	19	35.79	0.89	2.45	78.42	24.86	14.75

TA – Total Abundance of all Benthic Invertebrate Organisms, TR – Taxa Richness, % D - The Proportion of Individuals in Dominant and Second Dominant Taxon, *D* - Simpson's Diversity Index, H – Shannon Diversity Index, % EPT - % Ephemeroptera, Plecoptera and Trichoptera, % E - % Ephemeroptera, % C - % Chironomidae.

Periphyton Community

Periphyton surveys were completed in Grave Creek in 2014 and 2017. All sites were observed to have low amounts of chl-a and AFDM (Table 12.4-21). GRA4 transitioned from being dominated by chlorophytes to chrysophytes between 2014 and 2017. UTG2-1 remained dominated by diatoms in both years.

Table 12.4-21: Periphyton Community for the Grave Creek Watershed

2014				
Site ID	Dominant Group (%)	Dominant Taxon	Chl-a (mg/m^2)	AFDM (g/m^2)
GRA4	Chlorophytes (38.4)	*Rivularia* sp.	0.03	0.08
UTG2-1	Diatoms (64.7)	*Gomphonema minutum*	0.00	0.02
2017				
Site ID	Dominant Group (%)	Dominant Taxon	Chl-a (mg/m^2)	AFDM (g/m^2)
GRA3	Cyanobacteria (75.3)	*Gloeocapsa punctata*	0.09	0.05
GRA4	Chrysophytes (60.6)	*Chamaesiphon incrustans*	0.01	0.02
UTG1	Cyanobacteria (72.5)	*Heteroleibeinia profunda*	0.06	0.06
UTG2-1	Diatoms (54.8)	*Heteroleibeinia profunda*	0.03	0.08

Note:
Chl-a denotes Chlorophyll-a.
AFDM denotes ash-free dry biomass.

Aquatic Health

Fish Tissue

Selenium concentrations in WCT tissue ranged from 2.5 mg/kg dw to 3.24 mg/kg dw in Grave Creek reaches GRA3 and GRA4, and from 2.66 to 6.20 mg/kg dw in UTG1. There was one sample that exceeded the B.C. guideline for selenium in fish tissue of 4 mg/kg dw at UTG1. Concentrations were below the U.S. EPA selenium guideline of 8.5 mg/kg dw. Metals results for individual fish samples are provided in the Aquatic Health Baseline Sampling Report in Appendix 12-D.

Benthic Invertebrate Tissue

Within the Grave Creek watershed, selenium concentrations in benthic invertebrate tissue collected in 2017 were 5.19 mg/kg dw in GRA3 and in GRA4 and ranged between 5.51 to 6.12 mg/kg dw in UTG1. All samples exceeded the B.C. guideline value of 4 mg/kg dw but were below the U.S. EPA guideline of 8.5 mg/kg dw. Minnow Environmental (2014) suggested 6.7 mg/kg dw as a reference benchmark value for the Elk Valley; all samples were also below this benchmark. Metals results for individual samples are provided in Appendix 12-D.

Periphyton Tissue

Within the Grave Creek watershed, selenium concentrations in periphyton tissue collected in 2017 ranged from 3.13 mg/kg dw in GRA3 to 0.64 mg/kg dw in GRA4, and from 3.13 to 3.46 mg/kg dw in UTG1. Minnow Environmental (2014) reported a range of 0.87 to 4.60 mg/kg dw for reference streams in the Elk Valley; all samples from the Grave Creek watershed were within this range. Metals results for individual samples are provided in Appendix 12-D.

Sediment Quality

The sediment types sampled in the Grave Creek watershed included fines mixed with sand, with limited organic debris and limited visual or olfactory observations of sheens or odours. Selenium concentrations ranged from 0.75 mg/kg in GRA3 to 0.90 mg/kg in GRA4, and 0.81 mg/kg at UTG1. All selenium concentrations were below the lower WSWQ value of 2.0 mg/kg.

Within the Grave Creek watershed, all sites were between the lower and upper WSQG for nickel, arsenic, and cadmium and were below the lower WSQG for chromium, copper, iron, lead, manganese, mercury, and silver. Concentrations of zinc were above the lower WSQG of 123 mg/kg in samples collected in GRA4, ranging from 138 to 151 mg/kg.

The Grave Creek sites had acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, dibenz(a,h)anthracene, fluorene, and phenanthrene sediment concentrations that were between the lower and upper WSQG values. All sites were below the lower WSQG for benzo(g,h,i)perylene, benzo(k)fluoranthene, fluoranthene, and indeno(1,2,3-c,d). Chrysene and pyrene concentrations were approximately at the lower WSQG guideline value for all sites, with GRA3 having the highest concentration. All sites were between the lower and upper WSQG for 2-methylnapthalene except GRA3, which exceeded the upper WSQG. Metals and PAH results for individual samples are provided in Appendix 12-D.

12.4.2.2.3 Unnamed Tributaries to the Elk River

Three additional tributaries to the Elk River near the proposed rail loadout were investigated in July 2020 for their status as classified streams, and if classified as a stream, for the potential of being fish bearing based on evidence from flow accumulation work. Unnamed tributary 1 and 2 (UTE1 and UTE2) are dry seasonal channels lined with riparian vegetation, with substrates dominated by fine materials. Neither tributary was connected to fish bearing waters, and the ephemeral conditions precluded presence of an isolated fish population. Unnamed tributary 3 (UTE2) has a defined channel with flows observed and substrates consisting of fine gravels and fines. The stream was considered unlikely to supporting fish due to its size and the presence of a hanging culvert with a 1 m drop.

12.4.2.2.4 Lentic Ecosystems

Select wetland ecosystems within the Fish and Fish Habitat LSA were surveyed as part of the wetland ecosystem baseline assessment (Dillon Consulting Limited [Dillon], 2020). Wetlands in the Fish and Fish Habitat LSA were generally observed in flat areas, valleys, and bowls, with many wetlands forming in basins, depression, and obstructions along drainage ways (e.g., presence of beaver dams; Dillon, 2020). Wetlands within the Fish and Fish Habitat LSA vary in size, with most being 1 ha or less. Six wetland classes are represented in the Fish and Fish Habitat LSA: bog; fen; marsh; swamp; shallow water; and transitional (mineral and marsh-fen; Dillon, 2020). Many of the wetlands in the Fish and Fish Habitat LSA are wetland complexes of two or more distinct wetland site associations or wetland types. Marshes occupied the greatest area of all wetland types in the Fish and Fish Habitat LSA, followed by swamps, transitional marsh-fens, shallow water wetlands, fens, mineral wetlands, and bogs (Dillon, 2020). Further details on wetland ecosystems are described in Chapter 13. Select wetlands were surveyed for potential fish habitat because the shallow water, vegetation cover, and high levels of nutrients and primary productivity typical of many wetlands make them important nursery areas for several juvenile fish species (Colvin et al., 2019).

Fish Habitat

Twenty-seven wetland (lentic) sites were surveyed for potential fish habitat in July 2019. Lentic sites in the Fish and Fish Habitat LSA were dominated by open water/channelized wetlands with slow moving or stagnant water, including active and inactive beaver impoundments. Most wetlands had emergent vegetation and were surrounded by mature forest. Sites L21, L22, and L23 were characterized as higher flow channels and floodplains associated with Alexander Creek. The physical characteristics and habitat suitability ratings for each surveyed site are summarized in Table 12.4-22.

Fish Presence/Absence

Fish presence/absence surveys completed from July 15 to 22, 2019 resulted in the capture of three juvenile Eastern Brook Trout in L24 and one juvenile Bull Trout in L26 (Table 12.4-23). Unknown juvenile fish and fry were also observed (but not captured) at wetlands WL1, WL5.1, and L25. Fish presence surveys indicated that 23 of the 27 wetlands surveyed had potential for fish presence, 12 of which were connected to watercourses (Table 12.4-22). Of these 23, 12 were considered fish bearing after the first year of inventory sampling and 13 had low probability for fish presence based on the lack of suitable habitat observed and/or disconnectedness with fish bearing watercourses.

Benthic Invertebrate Community

In September 2019, benthic invertebrate samples were collected from six wetlands in the Alexander Creek Valley considered to be of high importance to fish: WL4, WL5.1, WL6, WL11.1, WL17m and WL21. A triplicate sample was collected from WL21. WL21 had the greatest total taxa abundance, while site WL11.1 had the lowest (Table 12.4-24). Taxa that were absent in most of the samples included Chloroperlidae, Ephemerellidae, Rhyacophilidae, and Perlodidae (Table 12.4-24). The WL4 and WL21 replicate 2 and 3 were found to be at reference condition. The first replicate sample collected from W21 was mildly divergent and WL5.1 and WL6 were considered divergent from the CABIN reference condition. WL11.1 and WL17 were both found to be highly divergent from the CABIN reference condition. Results of the RIVPACS assessment and site comparisons and probabilities to reference groups are provided in the Fish and Fish Habitat Baseline Assessment in Appendix 12-B.

Table 12.4-22: Habitat Summary for Sampled Lentic Ecosystems

Site ID	Potential Fish Bearing	Total Area (m^2)	Water Depth (m)	Length (m)	Width (m)	Side Channel Presence	Mainstem Connectivity	Outflow Identified	Inflow Identified	Substrate	Notes
WL1	Yes	4,880	0.2-1	84	45	Yes	Yes	Yes	Yes	Dark	Fish observed
WL4	Yes	20,263	0.2-0.5	120	20	Yes	Yes	Yes	Yes	Macrophyte	NFC default to fish bearing
WL4.3	No	-	-	-	-	-	-	-	-	-	Confirmed with site visit: Low probability for fish presence
WL5.1	Yes	5,923	0.1	55	10	Yes	Yes	Yes	Yes	Sandy/dark	Fish observed
WL5.2	Yes	7,367	0.3	30	45	Yes	Yes	Yes	Yes	Algae/dark	NFC default to fish bearing
WL5.3	Yes	16,96	0.2-0.3	30	45	Yes	Yes	Yes	Yes	Fines/dark	NFC default to fish bearing
WL5.4	No	18,548	-	-	-	-	-	-	-	-	Confirmed with site visit: Low probability for fish presence
WL5.5	No	-	-	-	-	-	-	-	-	-	Confirmed with site visit: Low probability for fish presence
WL6	Yes	4,050	0.2-0.8	67	41	Yes	Yes	Yes	Yes	Dark/woody	NFC default to fish bearing
WL15	No	27,963	-	-	-	-	-	-	-	-	Confirmed with site visit: Low probability for fish presence
WL16	No	26,119	-	-	-	-	-	-	-	-	Confirmed with site visit: Low probability for fish presence
WL17	No	7,567	0.3	70	20	No	No	Yes	No	Fines	Confirmed with site visit: Low probability for fish presence
WL18	No	1,000	0.2	30	14	No	No	Yes	Yes	Fines	Confirmed with site visit: Low probability for fish presence
WL11.1	Yes	852	-	-	-	-	-	-	-	-	Default to fish bearing. Not sampled in July 2019
N1	No	-	-	-	-	-	-	-	-	-	Confirmed with site visit: Low probability for fish presence
N7	No	-	-	-	-	-	-	-	-	-	Confirmed with site visit: Low probability for fish presence

Site ID	Potential Fish Bearing	Total Area (m^2)	Water Depth (m)	Length (m)	Width (m)	Side Channel Presence	Mainstem Connectivity	Outflow Identified	Inflow Identified	Substrate	Notes
N8	No	-	-	-	-	-	-	-	-	-	Confirmed with site visit: Low probability for fish presence
L20	No	-	-	-	-	-	-	-	-	-	Confirmed with site visit: Low probability for fish presence
L21	Yes	-	-	-	-	-	-	-	-	-	Low probability for fish presence, but defaulting to FB
L22	No	-	-	-	-	-	-	-	-	-	Confirmed with site visit: Low probability for fish presence
L23	No	-	-	-	-	-	-	-	-	-	Confirmed with site visit: Low probability for fish presence
L24	Yes	-	0.4	40	7	Yes	Yes	Yes	Yes	Fines	Fish captured
L25	Yes	-	-	-	-	-	-	-	-	-	Fish observed. Tributary
L26	Yes	-	0.5	300	32	Yes	Yes	Yes	Yes	Fines	Fish captured
L27	Yes	-	0.5	60	24	Yes	Yes	Yes	Yes	Muddy/dark	Potential for fish presence in high water levels
L28	No	-	-	-	-	-	-	-	-	-	Confirmed with site visit: Low probability for fish presence
WL21	Yes	23,955	1	79	>200	Yes	Yes	Yes	Yes	Fines/gravel	NFC excellent fish habitat

Legend: NFC – No Fish Caught, FB – Fish Bearing

Table 12.4-23: Fish Presence/Absence in Fish Bearing Wetlands

Site ID	Sample Date	Electro-fishing Effort (s)	Minnow Traps Set	Species	Total Number Captured/ Observed	Min Fork Length (mm)	Max Fork Length (mm)
WL1	July 15, 2019	307	2	Unknown	1 observed	~100	~100
WL4	July 17, 2019	187	4	NFC	-	-	-
WL5.1	July 18, 2019	124	1	Unknown	1 observed	~100	~100
WL5.2	July 18, 2019	30	3	NFC	-	-	-
WL5.3	July 18, 2019	-	3	NFC	-	-	-
WL6	July 22, 2019	116	5	NFC	-	-	-
WL11.1	Not sampled in July 2019	-	-	-	-	-	-
L24	July 16, 2019	81	0	EB	3	86	96
L25	July 16, 2019	-	0	Unknown	12 fry observed	~50	~50
				EB	1 observed	~100	~100
L26	July 16, 2019	-	3	BT	1	105	105
L27	July 17, 2019	-	4	NFC	-	-	-
WL21	July 16, 2019	969	4	NFC	-	-	-

Legend: NFC = No fish captured during sampling; EB = Eastern Brook Trout, BT = Bull Trout; Min = minimum; Max = maximum, unknown – fish observed but no positive identification possible, - - no data

Table 12.4-24: Benthic Invertebrate Metrics and CABIN Assessment for the Lentic Sample Sites

2019								
Site	TA	TR	% D	*D*	H	%EPT	%E	%C
WL4	2,067	9	86.51	0.57	1.14	8.88	6.58	26.97
WL5.1	618	17	51.95	0.8	2.15	41.23	15.58	40.01
WL6	1,514	8	93.99	0.28	0.62	12.31	2.7	84.38
WL11.1	65	5	93.75	0.278	0.60	1.56	0	1.56
WL17	3,033	10	69.36	0.70	1.36	4.46	4.46	32.03
WL21	5,533	14	67.7	0.71	1.61	50.62	39.75	47.2

TA – Total abundance of all benthic invertebrate organisms, TR – Taxa richness, % D - The proportion of individuals in dominant and second dominant taxon, *D* - Simpson's diversity index, H – Shannon diversity index, % EPT - % Ephemeroptera, Plecoptera and Trichoptera, % E - % Ephemeroptera, % C - % Chironomidae.

Aquatic Health

Benthic Invertebrate Tissue

Selenium concentrations in benthic invertebrate tissues sampled in 2019 ranged from 0.40 to 6.97 mg/kg dw in the wetlands sampled. All samples were above the B.C. guideline value of 4 mg/kg dw (with the exception of WL17) but did not exceed the U.S. EPA guideline of 8.5 mg/kg dw. Metals results for individual samples are provided in Appendix 12-D.

Sediment Quality

The sediment types sampled in wetlands in the Alexander Creek Valley consisted of fines with some organic matter, and in some instances, strong odours (typical for wetland ecosystems) and sheens were observed. Most wetlands exceeded the lower WSQG selenium guideline of 2.0 mg/kg with the exception of WL11.1, WL21, and one sample from WL6, which were below the lower WSWG. The highest selenium concentration (13 mg/kg) was recorded at WL5.1. Half of the wetlands exceeded the lower WSQG for nickel of 16 mg/kg. WL17 exceeded the upper WSQG for arsenic of 17 mg/kg, while WL11.1 exceeded the lower arsenic WSQG of 2.03 mg/kg. All other wetlands were below the lower arsenic WSQG. All sampled wetlands had concentrations of cadmium between the lower and upper WSQG guideline value, and all sites were below the lower WSQG for chromium, lead, and mercury. Most wetlands were below the lower WSQG for zinc, with the exception of WL17 and one sample from WL6, which exceeded the lower WSQG. Concentrations of PAHs were generally below the lower WSQG guideline values or between the lower and upper WSQG guideline values; however, three sites exceeded the upper WSQG for 2-methylnaphthalene and three samples from WL6 exceeded the upper WSQG for phenanthrene. Metal and PAH results for individual samples are provided in Appendix 12-D.

Surface Water Quality

Water quality at the six sampled wetland sites did not exceed any of the EVWQP benchmarks or provincial short-term guidelines for selenium, cadmium, nitrate or sulphate. All PAH concentrations were at the detection limit; which was greater than the short-term guideline for all PAH species.

12.5 Project Effects Assessment

12.5.1 Thresholds for Determining Significance of Residual Effects

For the purpose of this assessment, potential effects resulting from the Project that may result in changes in fish and fish habitat followed the assessment methods as outlined in Chapter 5 and also incorporated DFO's Fish and Fish Habitat Protection Program, as well as their regulatory process for compliance with the new *Fisheries Act* (DFO, 2019a; DFO, 2019b).

Accordingly, a significant adverse residual environmental effect on fish and fish habitat is one that could cause an unauthorized fish death by any means other than fishing, or one that results in an unauthorized HADD (as defined by subsection 35(1) of the *Fisheries Act*). Should the Project be unable to avoid the death of fish or the harmful alteration, disruption or destruction of fish habitat, these harmful impacts should be mitigated to the extent possible and authorized under the *Fisheries Act* in order to avoid causing a significant adverse residual environmental effect.

- A significant adverse residual environmental effect on fish habitat is therefore defined as one that results in an unavoidable, unmitigated, or non-offset loss of habitat utilized by fish for any part of their life history;
- A significant adverse residual environmental effect on fish community will be one that results in the death of fish, or complete loss of habitat functionality, during any of the Project phases, as a result of any means other than fishing. These effects can be direct or indirect in nature;
- A significant adverse residual environmental effect on species at risk will be defined as above, but also one that contravenes Sections 32 to 35 of SARA (2002), which prohibits killing or causing harm to a species listed as extirpated, endangered, or threatened in Schedule 1 of the Act; and

- B.C. WQG for the protection of aquatic life is the threshold for significance for fish and fish habitat health. Exceedances of the CCME and B.C. WQG could lead to significant impacts on fish and fish habitat health.

12.5.2 Project Effects

Project activities and components have the potential to result in adverse effects to fish and fish habitat in both the immediate (i.e., Fish and Fish Habitat LSA) and downstream (i.e., Aquatic RSA) aquatic environments. This assessment focuses only on planned activities within the designed scope of the Project. Potential effects related to unplanned events (e.g., spills, equipment malfunctions, accidents) are presented in Chapter 21.

12.5.2.1 Project Interactions

Project activities during the Construction and Pre-Production, Operations, Reclamation and Closure, and Post-Closure phases have the potential to affect fish and fish habitat. Key Project activities that are expected to interact with fish and fish habitat, with a potential for adverse effects, are presented in Table 12.5-1. In some cases, an effect could have a higher interaction with one VC than another. This is based on distribution patterns presented in the Fish and Fish Habitat Baseline Assessment (Lotic Environmental, 2020a; Appendix 12-B) and Habitat Wizard Fish and Fish Habitat Database. Westslope Cutthroat Trout and Bull Trout are the two species occurring most prevalently in West Alexander and Alexander Creeks and are therefore most likely to interact with different Project activities. Mountain Whitefish was recorded in the lower sections of Alexander Creek, upstream of the confluence with Michel Creek, in very low abundance. Specific details on Project activities and components are discussed in Chapter 3. A spatial overview of the Project footprint infrastructure in relation to fish habitat is shown in Figure 12.5-1.

In general, the Project has the potential to affect fish and fish habitat through:

- Fish mortality, by means other than fishing;
- Change in fishing pressure;
- Instream habitat loss due to mine design or infrastructure layout;
- Habitat loss due to changes in water quantity (both through surface water and groundwater losses), which could lead to reduced habitat availability and suitability for certain life stages of fish;
- Changes in water quality, which could reduce habitat suitability for fish and benthic invertebrates, as bioaccumulation of toxicological substances influences reproductive and physiological health and survival rates;
- Potential impacts arising from vibration caused by mine pit blasts;
- Changes in streambed structure (i.e., changes in sediment load and concretion due to calcite precipitation);
- Riparian disturbance through logging and clearing of vegetation have the potential to affect fish and fish habitat through removal of riparian vegetation and increased erosion and sediment deposition; and
- Road construction and maintenance could potentially affect fish and fish habitat through construction-related activities, increased dust and sedimentation of receiving waterbodies, and an increase in the recreational pressure on popular angling species such as Bull Trout and

Table 12.5-1: Project-Fish and Fish Habitat VC Interaction Matrix and Ranking

Project Phase	Project Component	Description of Activities	Fish and Fish Habitat VC						
			Westslope Cutthroat Trout	Bull Trout	Kokanee	Burbot	Mountain Whitefish	Longnose Sucker	Benthic Invertebrates
Construction and Pre-Production	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items.	I	I	I	I	I	I	I
	Logging of Merchantable Timber	Merchantable timber will be logged from the infrastructure and pre-production development footprint.	II	II	I	I	I	I	II
	Clearing and Grubbing	After the merchantable timber has been removed, the remaining vegetation will be cleared and grubbed from the infrastructure and pre-production development footprint.	II	II	I	I	I	I	II
	Stockpiling Wood Waste	Wood waste will be stockpiled on site and used for reclamation as a source of coarse woody debris.	I	I	I	I	I	I	I
	Quarry for Construction Materials	Excavation of road bed materials from the North Pit footprint for use on Grave Creek Road.	II	I	I	I	I	I	II
	Water Management or Water Management Structures	Water management structures to support initial construction activities will be built prior to soil being salvaged from the run of mine (ROM) and plant site.	II	II	I	I	I	I	II
		Interim Sediment Pond will be built prior to the soil removal and stockpiling from the pit access road and initial phase of the North Pit.	III	III	I	I	I	I	III

Project Phase	Project Component	Description of Activities	Fish and Fish Habitat VC						Benthic Invertebrates
			Westslope Cutthroat Trout	Bull Trout	Kokanee	Burbot	Mountain Whitefish	Longnose Sucker	
		Grave Creek Reservoir will be constructed to act as a back-up source of process water.	II	I	I	I	I	I	II
	Soil Salvage	Soil will be salvaged from the footprint of the infrastructure.	II	I	I	I	I	I	II
	Road Upgrading and Construction	Branch C Road will be widened and upgraded to facilitate construction and mine traffic to plant site area.	II	II	I	I	I	I	II
		Grave Creek Road will be widened to facilitate the clean coal haul.	II	II	I	I	I	I	II
		A new road will be constructed off the Valley Road to access the rail loadout for construction and operation.	II	II	I	I	I	I	II
	Linear Infrastructure	Installation of the powerline.	I	I	I	I	I	I	I
		Installation of the natural gas line.	II	II	I	I	I	I	II
	Overland Conveyor	Clearing, grubbing, and construction of overland conveyor from the plant site to Grave Creek Road.	I	I	I	I	I	I	I
	Coal Handling Process Plant Construction	Excavating and pouring of foundation.	I	I	I	I	I	I	I
		Transportation of materials and personnel to site.	I	I	I	I	I	I	I
		Constructing of the Coal Handling Process Plant (CHPP).	I	I	I	I	I	I	I
		Commissioning of the CHPP.	I	I	I	I	I	I	I
	Workshop / Mine Dry Construction	Excavating and pouring of foundations.	I	I	I	I	I	I	I
		Transportation of materials to site.	I	I	I	I	I	I	I
		Construction of workshop / mine dry.	I	I	I	I	I	I	I

Project Phase	Project Component	Description of Activities	Fish and Fish Habitat VC						Benthic Invertebrates
			Westslope Cutthroat Trout	Bull Trout	Kokanee	Burbot	Mountain Whitefish	Longnose Sucker	
		Equipment wash bay and heavy equipment parking.	I	I	I	I	I	I	I
		Administration, first aid, and mine dry building.	I	I	I	I	I	I	I
		Diesel tank farm.	I	I	I	I	I	I	I
		Warehouse.	I	I	I	I	I	I	I
		Potable water system.	I	I	I	I	I	I	I
		Septic system.	I	I	I	I	I	I	I
		Water supply pipelines from Grave Creek and West Alexander Creek.	I	I	I	I	I	I	I
		Commissioning of the facilities.	I	I	I	I	I	I	I
	Explosives Factory Construction	Construction of the explosives factory.	I	I	I	I	I	I	I
	Rail Loadout Construction	Excavation and preparation of the rail bed.	II	I	I	I	I	I	II
		Excavation and preparation of foundation stockpiling and coal handling systems.	I	I	I	I	I	I	I
		Transportation of materials and personnel to site.	I	I	I	I	I	I	I
		Construction of rail loadout.	II	I	I	I	I	I	II
		Connection to the Canadian Pacific Railway Fording Sub-line.	I	I	I	I	I	I	I
		Commissioning of the rail loadout.	I	I	I	I	I	I	I

Project Phase	Project Component	Description of Activities	Fish and Fish Habitat VC						Benthic Invertebrates
			Westslope Cutthroat Trout	Bull Trout	Kokanee	Burbot	Mountain Whitefish	Longnose Sucker	
	Labour	Hiring of personnel for the mine, CHPP operations, administration, and coal haul.	I	I	I	I	I	I	I
		Training of personnel.	I	I	I	I	I	I	I
	Construction Waste Materials	Collection and transfer to a recycling facility or other approved facility.	I	I	I	I	I	I	I
Operations	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items.	I	I	I	I	I	I	I
	Explosives Factory	Ammonium nitrate / emulsion storage facilities which have the ability to load explosive agents into delivery trucks.	I	I	I	I	I	I	I
		Wash facility to decontaminate the bulk explosive delivery trucks.	I	I	I	I	I	I	I
		Storage of explosives (detonators and boosters).	I	I	I	I	I	I	I
	Fuel Storage	Receiving bulk fuel deliveries.	I	I	I	I	I	I	I
		On-site storage of fuel.	I	I	I	I	I	I	I
		Dispensing fuel.	I	I	I	I	I	I	I
		Transferring fuel to on-site delivery trucks.	I	I	I	I	I	I	I
	Mine Roads Development	Building roads from material sourced on-site.	II	II	I	I	I	I	II
	Mining	Progressive clearing.	II	II	I	I	I	I	II

Project Phase	Project Component	Description of Activities	Fish and Fish Habitat VC						Benthic Invertebrates
			Westslope Cutthroat Trout	Bull Trout	Kokanee	Burbot	Mountain Whitefish	Longnose Sucker	
		Removal of unconsolidated material.	I	I	I	I	I	I	I
		Loading, hauling, and stockpiling of soil.	III	III	I	I	I	I	III
		Drilling and loading of blastholes.	I	I	I	I	I	I	I
		Detonating the explosives.	II	I	I	I	I	I	II
		Loading, hauling, and dumping of mine rock.	III	III	I	I	I	I	III
		Loading, hauling, and stockpiling of coal.	I	I	I	I	I	I	I
	Site Water Requirements	Using contact water as the primary process make-up water from Interim Sediment Pond (Year 1 to 5).	I	I	I	I	I	I	I
		Using contact water as the primary process make-up water from the North Pit (Year 5 to 15).	II	II	I	I	I	I	II
		Backup reservoir in Grave Creek as a secondary source of process make-up water.	II	I	I	I	I	I	II
	Coal Processing	ROM coal sizing.	I	I	I	I	I	I	I
		Washing coal.	I	I	I	I	I	I	I
		Mechanical and thermal drying of coal.	I	I	I	I	I	I	I
		Coal reject disposal (part of loading, hauling, and dumping of mine rock activities).	III	I	I	I	I	I	III
		Conveying clean coal.	I	I	I	I	I	I	I
	Sewage Treatment	Sewage will be treated by a septic system constructed at the plant site which will support the administration, mine dry, and CHPP facilities.	I	I	I	I	I	I	I

Project Phase	Project Component	Description of Activities	Fish and Fish Habitat VC						Benthic Invertebrates
			Westslope Cutthroat Trout	Bull Trout	Kokanee	Burbot	Mountain Whitefish	Longnose Sucker	
	Main Sediment Pond	Construction of Main Sediment Pond in Year 4.	III	III	I	I	I	I	III
		Management of the Main Sediment Pond discharge.	III	III	III	III	III	III	III
	Reclamation	Reclaiming available areas as soon as possible to achieve reclamation objectives.	II	I	I	I	I	I	II
Reclamation and Closure	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items.	I	I	I	I	I	I	I
	Dismantling Infrastructure and Buildings	Dismantling of the CHPP, maintenance facilities, administration, and other facilities.	I	I	I	I	I	I	I
		Dismantling, salvaging, collecting, and transferring materials to a recycling facility or other approved facility.	I	I	I	I	I	I	I
	Removal of Linear Infrastructure	Removal of the powerline.	I	I	I	I	I	I	I
		Removal of the natural gas line.	I	I	I	I	I	I	I
	Reclamation	Reclaiming available areas as soon as possible to achieve reclamation objectives.	II	I	I	I	I	I	II
	Monitoring	Reclamation monitoring.	I	I	I	I	I	I	I
		Geotechnical monitoring.	I	I	I	I	I	I	I
		Aquatic effects monitoring.	I	I	I	I	I	I	I

Project Phase	Project Component	Description of Activities	Fish and Fish Habitat VC						Benthic Invertebrates
			Westslope Cutthroat Trout	Bull Trout	Kokanee	Burbot	Mountain Whitefish	Longnose Sucker	
	Water Management	Management of the Main Sediment Pond discharge.	III	III	III	III	III	III	III
Post-Closure	Water Management	Decommissioning the Main Sediment Pond once water quality objectives have been met.	II	II	I	I	II	I	I
	Road Use	Branch C Road will remain as a permanent access road for future commercial and recreational use.	II	II	I	I	II	I	II
	Rail Line	The rail line will remain as a permanent feature.	I	I	I	I	I	I	I
	Monitoring	Reclamation monitoring.	I	I	I	I	I	I	I
		Geotechnical monitoring.	I	I	I	I	I	I	I
		Aquatic effects monitoring.	I	I	I	I	I	I	I

Notes (after EAO, 2013):
I = No or negligible effect (positive or adverse) is anticipated; not carried forward in the assessment
II = Potential adverse effects requiring additional mitigation or substantive positive effects are expected; carried forward in the assessment
III = Key interaction resulting in potential significant adverse effect or significant concern; carried forward in the assessment