

Responses to Public Comments: Groundwater

Memo

To	Dan Farmer (TCL)	Client	TCL.
From	Gregory Fagerlund (SRK), MSc, PGeo.	Project	CAPR002055
Reviewed By	Dan Mackie (SRK), MSc, PGeo.	Date	November 17, 2022
Subject	Responses to public comments related to groundwater		

1 Comment #560-6 – Skeena Wild Conservation Trust

The Project's water and load balance model underestimates groundwater attenuation rates, thereby creating substantial uncertainty regarding the timing and duration of water quality impacts. This underestimates the significance of water quality effects of the Project, the Project's contribution to cumulative effects, and creates uncertainty as to whether the Proponent will be able to appropriately monitor and mitigate these impacts.

Response to 560-6

We believe the word "attenuation" may be mis-used in this comment as well as in comment 560-57, and is actually intended to mean mass transport time (or "breakthrough") in groundwater. For clarification, a definition for the term "Natural Attenuation" is provided by the BC Ministry of Environment in the **Technical Guidance on Contaminated Sites** document, "**Using Monitored Natural Attenuation and Enhanced Attenuation**" as:

"Natural attenuation refers to a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil, sediment or groundwater."

Regarding "attenuation" in this technical sense, the Project's water balance and load model is conservative and does not include any attenuation mechanism that reduces mass, toxicity, mobility, volume, or concentration of contaminants in groundwater (or surface water).

The Project's water balance and load model (WBLM) assumed:

- All the particles from the mine travel via groundwater to the Tenas Creek, Four Creek, Goathorn Creek, and Telkwa River for a period of 25 years, which corresponds to the initial (i.e., the first 10%) arrival time of the particles discharging into Tenas Creek, as modelled by the base case numerical groundwater model; and

- The concentrations of the groundwater discharges after 25 years are those predicted for the long term Post-Closure period (i.e., which is in the 100's of years), when 100% of the potential mine contact groundwater is discharging to surface (for additional details, see Section 6.6.3 in the Groundwater Technical Report; SRK, 2022).

All screenings of water quality predictions to assess significance of results used the long-term future concentrations, not the concentrations predicted at Year 25. The durations of effects were assessed as extending into the long term and water quality effects were considered not significant when compared against BC Water Quality Guidelines, assuming the longer-term concentrations.

2 Comment #560-23 – Skeena Wild Conservation Trust

1. Groundwater seepage from the Project's waste management ponds is a primary driver of predicted mine-related changes to surface water quality in the receiving environment. The use of pond liners is proposed as a mitigation measure.
2. The water and load balance model assumes a much faster rate of groundwater seepage than will actually be the case, so there is a high degree of uncertainty regarding how long pond liners will need to be functional to appropriately mitigate seepage. Liners may well be required for much longer than the liner lifespan provided in the Application of 50 years. An alternatives assessment should be performed to assess pond liner options, including increased liner thickness and/or alternate liner materials. This assessment should not be based on groundwater seepage rates assumed in the water and load balance model, as these are not reflective of true conditions.
3. The Proponent's contingency plan in the event of liner failure would require removing PAG waste and draining the ponds in order to repair, thicken, or replace liners. This is not realistic, and creates unacceptable risks from exposing PAG materials and possibly discharging large volumes of wastewater to the receiving environment in order to drain the ponds. A more appropriate contingency plan needs to be developed for potential liner failure.

Response to 560-23

Thank you for taking the time to share your feedback with us as part of the recent Tenas Project BC environmental assessment public comment request. We wanted to respond to some of your specific comments; they are as follows:

1. Acknowledged.
2. We think the comments about "much faster rate of groundwater seepage than will actually be the case" and "these are not reflective of true conditions" refers to the 25-year travel time assumption. See response to Comment #560-6 for details on this assumption.

The liner lifespan of 50 years was a nominal time provided for the bituminous liner that will be installed in the Tenas Control Pond; the manufacturer will provide a written guarantee of between 150 to 250 years for this type of liner depending on installation method and how it is protected from the outside environment. The bentonite soil liner proposed for the management ponds has no defined lifespan as it is natural substance and has been used for thousands of years.

As part of the EA process Telkwa Coal will provide alternatives assessment on liner thickness and materials and placement to understand the potential effects to water quality and quantity over the lifespan of the Project.

3. In the event of liner failure, an alternate contingency plan of is to capture the pond infiltration with a series of groundwater interceptor wells, combined if necessary with bentonite slurry walls to optimize capture efficiency, and to pump it back into the management ponds.

3 Comment #560-35 – Skeena Wild Conservation Trust

In addition to the issues identified in the General Comments section regarding the Project CEA, there are issues specific to the Water Quality CEA:

The CEA for water quality does not consider the fact that delays to groundwater seepage migration have been underestimated. Effects to water quality are likely to arise and persist later than the Proponent has predicted, and this creates considerable uncertainty regarding potential for the Project's contribution to cumulative effects.

Response to 560-35

Refer to the response to comment 560-6 for clarification on how groundwater travel times and concentrations were used for water quality predictions. Longer term, Post-Closure, groundwater concentrations were used in the water quality predictions.

4 Comment #560-57 – Skeena Wild Conservation Trust

Groundwater dominates stream baseflows during winter months in the Project area, and groundwater seepage may impact surface water quality, especially during winter months and in late summer. Groundwater modeling for the Project is based on a limited dataset, and the modeling assumes groundwater seepage will reach receiving streams after 25 years. However, based on groundwater flow modeling presented in the application, the average time predicted for 50% of particles to reach the nearby creeks from the mine site varies from 65 years for Tenas Creek, 95 years for Four Creek, 320 years for Goathorn Creek, to over 400 years for the Telkwa River. Overall, the potential impacts to groundwater presented by the proponent underestimate the duration of the potential seepage effects and provide limited feasible mitigation options to constrain impacts to groundwater if they are worse than expected. Additionally, because groundwater impacts will likely not occur until post-closure, and after TCL plans to end its post-closure responsibilities, few options will be available to mitigate impacts when the greatest impacts are likely to occur.

Recommendations:

- The water quantity and quality modeling assume that groundwater seepage will reach receiving streams after 25 years. The proponent notes that this assumption is a conservative estimate.

- however, there are some issues with this assumption that are not clearly addressed. For example, the proponent claims that any expected changes to surface water quality will be mitigated. However, the true expected attenuation rate of loads could mean that changes are not observed until well past closure when there are few mitigation options possible. Surface water quality models were developed for the Project to the year 2100, and suggest that most contaminant loads will have decreased by the end of the modeled period. As a result, the proponent does not characterize the duration of residual effects to water quality as being long term. However, the proponent does not clarify that because inaccurate attenuation rates are modeled, modeling may not account for some long-term impacts beyond Year 2100. The proponent and EAO should both consider that the duration of the Project's surface water quality impacts is likely being underestimated.
- Liners have been designed to cover the entire internal footprints of all ponds, except West Management Pond where approximately 57% of the pond will be lined. A full options analysis should be considered for liners, including consideration of their associated seepage rates. Increasing the efficiency of liners in the Management Ponds and Tenas Control Pond should be investigated (as recommended by SRK 2022) to reduce the amount of load entering the receiving environment via groundwater pathways.
- Changes to stream baseflows that are dominated by groundwater quality post-closure were deemed by the project to be "Not Significant" based on proposed Site Performance Objectives (SPOs) that exceed water quality guidelines. The significance rating for groundwater quality post-closure should be based on BC Approved Water Quality Guidelines, or BC AWQG (ENV 2017), and the BC Working Water Quality Guidelines, or BC WWQG (ENV 2015).
- The proponent states that if groundwater predictions are not as expected, adaptive management principles and strategies will be implemented. Groundwater quality is not expected to worsen until post-closure, so it is possible that groundwater quality could worsen after the proponent has stopped managing the site. Feasible mitigation strategies for managing groundwater seepage impacts have not been included in the application and need to be included at this stage.

Response to 560-57

1. Acknowledged
2. The response to comment 560-6 clarifies how groundwater travel times and concentrations were used for water quality predictions. The WBLM assumed the groundwater impacted by the Project reaches the creeks after a period of 25 years (i.e., first arrival of particles as modelled by the base case numerical groundwater model); then these baseflows are assigned permanently with the long-term future concentrations. Therefore, the water quality predictions represent the maximum long-term expected changes to the groundwater and baseflows.
3. As part of the EA process Telkwa Coal will provide alternatives assessment on liner thickness and materials and placement to understand the potential effects to water quality and quantity over the lifespan of the Project.
4. Screening of the estimated groundwater baseflow quality against BC WWQG are provided in the attachment for each of the stations located in Tenas Creek, Four Creek, Goathorn Creek, and the

Telkwa River. Table 4-1 provides the definitions of the residual effect magnitude applicable to changes of groundwater baseflow quality feeding creeks and river, and Table 4-2 the associated ratings.

The screening show exceedances in fluoride, cadmium, and chromium concentrations above the BC guidelines; exceedances which are already reported by baseline monitoring in the overburden and bedrock groundwater systems. At post-closure, the predicted concentrations are typically lower or the same as observed during baseline conditions except for cadmium; however, all exceedances are predicted to be lower than the 95th percentile baseline background groundwater quality. As a result, the Magnitude rating for the residual effect to groundwater quality is Low. The effect of the changes in groundwater baseflows quality because of the Project are rated as Not Significant.

Table 4-1: Effect Characteristics Considered when Determining the Significance of Residual Effects from Changes of the Groundwater Baseflow Quality Feeding Creeks and Rivers

Residual Effect Characteristic	Definition	Indicator	Rating
Magnitude	Increase of parameter concentrations compared to baseline conditions and water quality guidelines.	Change in parameter concentrations	<u>Low</u> : Affected area, where water quality concentrations are expected to exceed guideline as well as the 95th percentile from baseline monitoring, is less than 5% of RSA <u>Moderate</u> : Affected area is 5% or more but less than 10% of RSA <u>High</u> : Affected area is 10% or more of RSA
	Increase of parameter concentrations compared to baseline conditions	Change in other measurable parameters	<u>Low</u> : Affected area, where water quality concentrations are expected to exceed the 95th percentile from baseline monitoring, is less than 5% of RSA <u>Moderate</u> : Affected area is 5% or more but less than 10% of RSA <u>High</u> : Affected area is 10% or more of RSA

Table 4-2: Summary of Effect Characteristics Ratings for the Residual Effects from Changes of the Groundwater Baseflow Quality Feeding Creeks and Rivers

Residual Effects Characteristic	Rating	Rationale for Rating
Magnitude	Low	Three (3) constituents (i.e., fluoride, cadmium, and chromium) exceed the BC Water Quality Guidelines for Freshwater Aquatic Life. The average baseline concentrations of these constituents in groundwater already exceed guidelines at baseline conditions. At Post-closure, all exceedances are predicted lower than the 95th percentile baseline background groundwater quality.

Residual Effects Characteristic	Rating	Rationale for Rating
Geographic Extent	Local	Effect is limited to the LSA.
Duration	Long-term	The effect is predicted to continue beyond the Post-closure Phase.
Frequency	Continuous	The effect occurs constantly.
Reversibility	Irreversible	The effect cannot be reversed.
Context	Moderate	Assessment of residual effect magnitude is conservative in that it does not account for attenuation of constituents in the groundwater system before discharge to surface water.

Notes: LSA=Local Study Area

5. The proposed mitigation measures (i.e., management, control, and water storage pond designs, blasting measures, management of ML/ARD, spill management, chemical and materials storage and handling, and additional specific measure to reduce nitrogen release) are focusing on source control to avoid significant impacts to groundwater in the first place. The proposed monitoring program is intended to detect the unanticipated effects close and immediately downgradient of the mine components, before potential seepage migration is kilometers away. The proximity of the groundwater monitoring stations with the mine components will provide an early detection system allowing the implementation of adaptive management principles and strategies within shorter time frames if the original predictions of effects and mitigation effectiveness are not as expected.

Regards,
SRK Consulting (Canada) Inc.

This signature has been scanned.
The author has given permission for
its use in this particular document.
The original signature is held on file.

Gregory Fagerlund, MSc, PGeo.
Senior Consultant, Hydrogeology

This signature has been scanned.
The author has given permission for
its use in this particular document.
The original signature is held on file.

Dan Mackie, MSc, PGeo.
Principal consultant, Hydrogeology

Attachments:

Attachment 1 Screening of the Estimated Groundwater Baseflow Quality Against BC WWQG

SRK Consulting (Canada) Inc. has prepared this document for TCL., our client. Any use or decisions by which a third party makes of this document are the responsibility of such third parties. In no circumstance does SRK accept any consequential liability arising from commercial decisions or actions resulting from the use of this report by a third party.

The opinions expressed in this document have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. While SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

References

BC Ministry of Environment in the Technical Guidance on Contaminated Sites document, “Using Monitored Natural Attenuation and Enhanced Attenuation”. Source: <https://www2.gov.bc.ca/assets/gov/environment/air-land-water/site-remediation/docs/technical-guidance/tg22.pdf>

Attachment 1

Screening of the Estimated Groundwater Baseflow Quality Against BC WWQG

Estimation of the base case croundwater baseflow quality at WQS02, Tenas Creek

1- Groundwater contributions at WQS02, Tenas Creek

(Base Case, Post-closure, Affected area: 3.6% of the RSA)

ID	% Baseflow Bckgrnd	% Baseflow Mine	Detailed distribution of mine affected baseflow					
			NMP	EMP	WMP-In	TCP	PL 909	SWR 901
			%	%	%	%	%	%
Post-closure	95.0%	5.0%			100.0%			
Pulse TCL 25y ⁽¹⁾	95.0%	5.0%			100.0%			

Note: Modelled WQS09 GW'shed corresponds only to the southern contribution from the valley.

¹ Scenario evaluating maximum potential influence from TCL after post-closure (25 year pulse from TCL).

It assumes TCL discharges contributions of mine contact water on long term (i.e., steady state) even if it has been decomissioned at EOM..

2- Observed and precicted groundwater quality at WQS02, Tenas Creek

Parameter	Detection Limit ¹ (mg/L)	BC WQG FAL				Groundwater background (GWB) (Source: GWQuality_Summary_Stats_rev08_smh.xlsx)				Base Case Source Terms (ST) (Source: Results_MPSeepage_WaterQuality_EAModel_rev06_07072021.xlsm)						Baseflow quality at WQS02: Scenario A *		Baseflow quality at WQS02: Scenario B **	
		Screening parameter	Approved guidelines (mg/L)	Working guidelines (mg/L)	Screening value (mg/L)	Overburden		Bedrock		Control Pond Avg. Winter	NMP Avg. Winter	EMP Avg. Winter	WMP Avg. Winter	Pit lake 909masl Avg. Winter	Saturated WR 901masl Avg. Winter	GWB: OVB P50	GWB: BDR P50	GWB: OVB P50	GWB: BDR P50
						P50	P95	P50	P95							ST: Avg. Winter	ST: Avg. Winter	ST: Avg. Winter	ST: Avg. Winter
Anions and Nitrogen																			
Ammonia, Total (as N)	0.0050	Ammonia, Total (as N)	0.681-28.7 ^(pH, T)	n.g.	1	0.025	0.610	0.320	0.690	0.440	0.049	0.048	0.200	0.001	0.073	0.034	0.314	0.034	0.314
Chloride (Cl)	0.50	Chloride (Cl)	600.00	n.g.	600	0.5	3.3	2.5	10.0	15.0	6.9	2.6	19.0	3.4	18.0	1.4	3.3	1.4	3.3
Fluoride (F)	0.020	Fluoride (F)	0.4-2.0 ^(H)	n.g.	0.4	0.13	0.35	1.50	5.10	0.09	0.07	0.00	0.08	0.01	0.17	0.13	1.43	0.13	1.43
Nitrate (as N)	0.0050	Nitrate (as N)	32.80	n.g.	33	0.01	0.17	0.03	0.16	3.30	0.17	0.38	1.30	0.01	0.02	0.07	0.09	0.07	0.09
Nitrite (as N)	0.0010	Nitrite (as N)	0.06 ^(c)	n.g.	0.06	0.001	0.005	0.005	0.020	0.076	0.005	0.009	0.030	0.000	0.002	0.002	0.006	0.002	0.006
Sulfate (SO4)	0.50	Sulfate (SO4)	100.00	n.g.	100	11.0	42.0	6.0	75.0	330.0	140.0	61.0	430.0	74.0	380.0	31.9	27.1	31.9	27.1
Dissolved Metals																			
Aluminum (Al)-Dissolved	0.0050	Aluminum (Al)-Dissolved	0.10 ^{(pH)(2)}	n.g.	0.10	0.005	0.034	0.009	0.100	0.065	0.013	0.049	0.150	0.004	0.007	0.012	0.016	0.012	0.016
Arsenic (As)-Dissolved	0.00050	Arsenic (As)-Total	0.01	n.g.	0.01	0.00081	0.01100	0.0006	0.0020	0.0062	0.0027	0.0010	0.0076	0.0014	0.0073	0.0011	0.0009	0.0011	0.0009
Barium (Ba)-Dissolved	0.020	Barium (Ba)-Total	n.g.	5.00	5	0.093	0.250	0.330	3.600	0.057	0.029	0.013	0.049	0.010	0.060	0.091	0.316	0.091	0.316
Beryllium (Be)-Dissolved	0.0010	Beryllium (Be)-Total	n.g.	0.01	0.01	0.0001	0.0002	0.0001	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001
Boron (B)-Dissolved	0.10	Boron (B)-Total	1.20	n.g.	1.2	0.10	0.10	0.16	0.34	0.26	0.12	0.04	0.33	0.06	0.32	0.11	0.17	0.11	0.17
Cadmium (Cd)-Dissolved	0.00001	Cadmium (Cd)-Dissolved	0.0000176-0.000457 ^{(H)(5)}	n.g.	0.0000176	0.00002	0.00027	0.00001	0.00160	0.00025	0.00007	0.00010	0.00041	0.00006	0.00014	0.00004	0.00003	0.00004	0.00003
Chromium (Cr)-Dissolved	0.0010	Chromium (Cr)-Total	n.g.	0.001 or 0.0089 ³	0.001	0.001	0.001	0.001	0.002	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.001
Cobalt (Co)-Dissolved	0.00030	Cobalt (Co)-Total	0.11	n.g.	0.11	0.000	0.004	0.000	0.003	0.011	0.005	0.002	0.014	0.002	0.013	0.001	0.001	0.001	0.001
Copper (Cu)-Dissolved	0.0010	Copper (Cu)-Total	0.002 - 0.026 ^(H)	n.g.	0.002	0.0010	0.0050	0.0010	0.0039	0.0025	0.0010	0.0005	0.0026	0.0006	0.0024	0.0011	0.0011	0.0011	0.0011
Iron (Fe)-Dissolved	0.030	Iron (Fe)-Dissolved	0.35	n.g.	0.35	0.0300	0.0990	0.0650	0.5900	0.0360	0.0120	0.0190	0.0640	0.0032	0.0190	0.0317	0.0650	0.0317	0.0650
Lead (Pb)-Dissolved	0.00050	Lead (Pb)-Total	0.003 - 0.33 ^(H)	n.g.	0.003	0.0005	0.0009	0.0005	0.0010	0.0004	0.0002	0.0001	0.0006	0.0001	0.0004	0.0005	0.0005	0.0005	0.0005
Lithium (Li)-Dissolved	0.0050	Lithium (Li)-Total	n.g.	0.87	0.87	0.003	0.007	0.050	0.100	0.130	0.056	0.022	0.160	0.028	0.150	0.011	0.055	0.011	0.055
Manganese (Mn)-Dissolved	0.00030	Manganese (Mn)-Total	0.80-3.80 ^(H)	n.g.	0.80	0.05200	0.57000	0.01700	0.25000	0.01500	0.00650	0.00520	0.02500	0.00210	0.01400	0.05065	0.01740	0.05065	0.01740
Molybdenum (Mo)-Dissolved	0.0010	Molybdenum (Mo)-Total	2.00	n.g.	2	0.0010	0.0150	0.0010	0.0150	0.0210	0.0087	0.0034	0.0240	0.0050	0.0230	0.0021	0.0021	0.0021	0.0021
Nickel (Ni)-Dissolved	0.0010	Nickel (Ni)-Total	n.g.	0.025 - 0.180 ^(H)	0.025	0.001	0.017	0.001	0.005	0.017	0.008	0.003	0.022	0.004	0.020	0.002	0.002	0.002	0.002
Potassium (K)-Dissolved	2.0	Potassium (K)-Total	n.g.	373-432	373	2.00000	2.00000	2.00000	3.50000	11.00000	4.90000	1.70000	13.00000	2.50000	13.00000	2.54853	2.54853	2.54853	2.54853
Selenium (Se)-Dissolved	0.00010	Selenium (Se)-Total	0.00	n.g.	0.002	0.000200	0.000960	0.000140	0.001000	0.014000	0.006100	0.002300	0.018000	0.003200	0.016000	0.001088	0.001031	0.001088	0.001031
Silver (Ag)-Dissolved	0.000020	Silver (Ag)-Total	0.0001-0.003 ^(H)	n.g.	0.0001	0.0000	0.0003	0.0000	0.0001	0.0002	0.0000	0.0001	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Uranium (U)-Dissolved	0.00020	Uranium (U)-Total	n.g.	0.30	0.30	0.00110	0.00320	0.00040	0.00710	0.00086	0.00039	0.00020	0.00110	0.00018	0.00093	0.00110	0.00043	0.00110	0.00043
Zinc (Zn)-Dissolved	0.0050	Zinc (Zn)-Total	0.033-0.265 ^(H)	n.g.	0.033	0.005000	0.012000	0.005000	0.011000	0.011000	0.004900	0.001800	0.013000	0.002400	0.013000	0.005399	0.005399	0.005399	0.005399

Notes:

BCWQG BC Water Quality Guidelines

Maximum concentrations for Freshwater Aquatic Life

(-) Not applicable

¹ Lowest reported detection limit listed

² Dissolved Aluminum is pH dependent. 100 ug/L for a pH greater than or equal to 6.5 and e ^{(1.209 - 2.426 (pH) + 0.286K)} where K = (pH)2 for a pH less than 6.5

³ Chromium (VI) maximum is 1.0 ug/l and Chromium (III) maximum is 8.9 ug/L

⁴ Thallium - 1.7 ug/L human health, consumption of water + organism and 6.3 ug/L human health, consumption of organism only

⁵ Dissolved Cadmium is hardness dependent. Lower bound for long term average guideline exposure is 0.0000176 mg/L and the upper bound is 0.000457 mg/L.

(Cl) Chloride dependent guideline

(H) Hardness dependent guideline

(pH) pH dependent guideline

(T) Temperature dependent guideline

n.g. No guideline

GWB Groundwater background

ST Source terms

* Scenario A: Base Case, Post-closure (25 years pulse from control pond already discharged).

** Scenario B: Base Case, 1st 25 years of Post-closure period (incl. steady state discharges from control pond).

Format exceedances:

0.001 red fill, red font correspond to concentrations exceeding BC fresh water quality guideline.

0.01 red fill, red bold and larger font corresponds to concentrations exceeding BC fresh water quality guideline and the 95th percentile of the background concentrationse monitored during baseline conditions.

Estimation of the base case croundwater baseflow quality at WQS022, Tenas Creek

1- Groundwater contributions at WQS22, Tenas Creek

(Base Case, Post-closure, Affected area: 4.8% of the RSA)

ID	% Baseflow Bckgrnd	% Baseflow Mine	Detailed distribution of mine affected baseflow					
			NMP	EMP	WMP-In	TCP	PL 909	SWR 901
			%	%	%	%	%	%
Post-closure	89.8%	10.2%	14.8%		84.4%	na		0.8%
Pulse TCL 25y ⁽¹⁾	89.6%	10.4%	14.5%		82.3%	2.4%		0.8%

Note: Modelled WQS09 GW'shed corresponds only to the southern contribution from the valley.

¹ Scenario evaluating maximum potential influence from TCL after post-closure (25 year pulse from TCL).

It assumes TCL discharges contributions of mine contact water on long term (i.e., steady state) even if it has been decomissioned at EOM..

2- Observed and precicted groundwater quality at WQS22, Tenas Creek

Parameter	Detection Limit ¹ (mg/L)	BC WQG FAL				Groundwater background (GWB) (Source: GWQuality_Summary_Stats_rev08_smh.xlsx)				Base Case Source Terms (ST) (Source: Results_MPSeepage_WaterQuality_EAModel_rev06_07072021.xlsm)						Baseflow quality at WQS22: Scenario A *		Baseflow quality at WQS22: Scenario B **	
		Screening parameter	Approved guidelines (mg/L)	Working guidelines (mg/L)	Screening value (mg/L)	Overburden		Bedrock		Control Pond Avg. Winter	NMP Avg. Winter	EMP Avg. Winter	WMP Avg. Winter	Pit lake 909masl Avg. Winter	Saturated WR 901masl Avg. Winter	GWB: OVB P50	GWB: BDR P50	GWB: OVB P50	GWB: BDR P50
						P50	P95	P50	P95							ST: Avg. Winter	ST: Avg. Winter	ST: Avg. Winter	ST: Avg. Winter
Anions and Nitrogen																			
Ammonia, Total (as N)	0.0050	Ammonia, Total (as N)	0.681-28.7 ^(pH, T)	n.g.	1	0.025	0.610	0.320	0.690	0.440	0.049	0.048	0.200	0.001	0.073	0.040	0.305	0.041	0.306
Chloride (Cl)	0.50	Chloride (Cl)	600.00	n.g.	600	0.5	3.3	2.5	10.0	15.0	6.9	2.6	19.0	3.4	18.0	2.2	4.0	2.2	4.0
Fluoride (F)	0.020	Fluoride (F)	0.4-2.0 ^(H)	n.g.	0.4	0.13	0.35	1.50	5.10	0.09	0.07	0.00	0.08	0.01	0.17	0.12	1.36	0.12	1.35
Nitrate (as N)	0.0050	Nitrate (as N)	32.80	n.g.	33	0.01	0.17	0.03	0.16	3.30	0.17	0.38	1.30	0.01	0.02	0.12	0.14	0.13	0.14
Nitrite (as N)	0.0010	Nitrite (as N)	0.06 ^(c1)	n.g.	0.06	0.001	0.005	0.005	0.020	0.076	0.005	0.009	0.030	0.000	0.002	0.004	0.007	0.004	0.007
Sulfate (SO4)	0.50	Sulfate (SO4)	100.00	n.g.	100	11.0	42.0	6.0	75.0	330.0	140.0	61.0	430.0	74.0	380.0	49.1	44.7	49.9	45.4
Dissolved Metals																			
Aluminum (Al)-Dissolved	0.0050	Aluminum (Al)-Dissolved	0.10 ^{(pH)(2)}	n.g.	0.10	0.005	0.034	0.009	0.100	0.065	0.013	0.049	0.150	0.004	0.007	0.018	0.021	0.018	0.021
Arsenic (As)-Dissolved	0.00050	Arsenic (As)-Total	0.01	n.g.	0.01	0.00081	0.01100	0.0006	0.0020	0.0062	0.0027	0.0010	0.0076	0.0014	0.0073	0.0014	0.0012	0.0014	0.0012
Barium (Ba)-Dissolved	0.020	Barium (Ba)-Total	n.g.	5.00	5	0.093	0.250	0.330	3.600	0.057	0.029	0.013	0.049	0.010	0.060	0.088	0.301	0.088	0.301
Beryllium (Be)-Dissolved	0.0010	Beryllium (Be)-Total	n.g.	0.01	0.01	0.0001	0.0002	0.0001	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001
Boron (B)-Dissolved	0.10	Boron (B)-Total	1.20	n.g.	1.2	0.10	0.10	0.16	0.34	0.26	0.12	0.04	0.33	0.06	0.32	0.12	0.17	0.12	0.17
Cadmium (Cd)-Dissolved	0.00001	Cadmium (Cd)-Dissolved	0.0000176-0.000457 ^{(H)(5)}	n.g.	0.0000176	0.00002	0.00027	0.00001	0.00160	0.00025	0.00007	0.00010	0.00041	0.00006	0.00014	0.00006	0.00005	0.00006	0.00005
Chromium (Cr)-Dissolved	0.0010	Chromium (Cr)-Total	n.g.	0.001 or 0.0089 ³	0.001	0.001	0.001	0.001	0.002	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.001
Cobalt (Co)-Dissolved	0.00030	Cobalt (Co)-Total	0.11	n.g.	0.11	0.000	0.004	0.000	0.003	0.011	0.005	0.002	0.014	0.002	0.013	0.002	0.002	0.002	0.002
Copper (Cu)-Dissolved	0.0010	Copper (Cu)-Total	0.002 - 0.026 ^(H)	n.g.	0.002	0.0010	0.0050	0.0010	0.0039	0.0025	0.0010	0.0005	0.0026	0.0006	0.0024	0.0011	0.0011	0.0011	0.0011
Iron (Fe)-Dissolved	0.030	Iron (Fe)-Dissolved	0.35	n.g.	0.35	0.0300	0.0990	0.0650	0.5900	0.0360	0.0120	0.0190	0.0640	0.0032	0.0190	0.0326	0.0641	0.0326	0.0640
Lead (Pb)-Dissolved	0.00050	Lead (Pb)-Total	0.003 - 0.33 ^(H)	n.g.	0.003	0.0005	0.0009	0.0005	0.0010	0.0004	0.0002	0.0001	0.0006	0.0001	0.0004	0.0005	0.0005	0.0005	0.0005
Lithium (Li)-Dissolved	0.0050	Lithium (Li)-Total	n.g.	0.87	0.87	0.003	0.007	0.050	0.100	0.130	0.056	0.022	0.160	0.028	0.150	0.017	0.060	0.017	0.060
Manganese (Mn)-Dissolved	0.00030	Manganese (Mn)-Total	0.80-3.80 ^(H)	n.g.	0.80	0.05200	0.57000	0.01700	0.25000	0.01500	0.00650	0.00520	0.02500	0.00210	0.01400	0.04897	0.01752	0.04888	0.01752
Molybdenum (Mo)-Dissolved	0.0010	Molybdenum (Mo)-Total	2.00	n.g.	2	0.0010	0.0150	0.0010	0.0150	0.0210	0.0087	0.0034	0.0240	0.0050	0.0230	0.0031	0.0031	0.0032	0.0032
Nickel (Ni)-Dissolved	0.0010	Nickel (Ni)-Total	n.g.	0.025 - 0.180 ^(H)	0.025	0.001	0.017	0.001	0.005	0.017	0.008	0.003	0.022	0.004	0.020	0.003	0.003	0.003	0.003
Potassium (K)-Dissolved	2.0	Potassium (K)-Total	n.g.	373-432	373	2.00000	2.00000	2.00000	3.50000	11.00000	4.90000	1.70000	13.00000	2.50000	13.00000	2.99527	2.99527	3.01548	3.01548
Selenium (Se)-Dissolved	0.00010	Selenium (Se)-Total	0.00	n.g.	0.002	0.000200	0.000960	0.000140	0.001000	0.014000	0.006100	0.002300	0.018000	0.003200	0.016000	0.001827	0.001773	0.001858	0.001804
Silver (Ag)-Dissolved	0.000020	Silver (Ag)-Total	0.0001-0.003 ^(H)	n.g.	0.0001	0.0000	0.0003	0.0000	0.0001	0.0002	0.0000	0.0001	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Uranium (U)-Dissolved	0.00020	Uranium (U)-Total	n.g.	0.30	0.30	0.00110	0.00320	0.00040	0.00710	0.00086	0.00039	0.00020	0.00110	0.00018	0.00093	0.00109	0.00046	0.00109	0.00046
Zinc (Zn)-Dissolved	0.0050	Zinc (Zn)-Total	0.033-0.265 ^(H)	n.g.	0.033	0.005000	0.012000	0.005000	0.011000	0.011000	0.004900	0.001800	0.013000	0.002400	0.013000	0.005691	0.005691	0.005704	0.005704

Notes:

BCWQG BC Water Quality Guidelines

Maximum concentrations for Freshwater Aquatic Life

(-) Not applicable

¹ Lowest reported detection limit listed

² Dissolved Aluminum is pH dependent. 100 ug/L for a pH greater than or equal to 6.5 and e ^{(1.209 - 2.426 (pH) + 0.286K)} where K = (pH)2 for a pH less than 6.5

³ Chromium (VI) maximum is 1.0 ug/l and Chromium (III) maximum is 8.9 ug/L

⁴ Thallium - 1.7 ug/L human health, consumption of water + organism and 6.3 ug/L human health, consumption of organism only

⁵ Dissolved Cadmium is hardness dependent. Lower bound for long term average guideline exposure is 0.0000176 mg/L and the upper bound is 0.000457 mg/L.

(Cl) Chloride dependent guideline

(H) Hardness dependent guideline

(pH) pH dependent guideline

(T) Temperature dependent guideline

n.g. No guideline

GWB Groundwater background

ST Source terms

* Scenario A: Base Case, Post-closure (25 years pulse from control pond already discharged).

** Scenario B: Base Case, 1st 25 years of Post-closure period (incl. steady state discharges from control pond).

Format exceedances:

0.001 red fill, red font correspond to concentrations exceeding BC fresh water quality guideline.

0.01 red fill, red bold and larger font corresponds to concentrations exceeding BC fresh water quality guideline and the 95th percentile of the background concentrationse monitored during baseline conditions.

Estimation of the base case croundwater baseflow quality at WQS04, Tenas Creek

1- Groundwater contributions at WQS04, Tenas Creek

(Base Case, Post-closure, Affected area: 5.1% of the RSA)

ID	% Baseflow Bckgrnd	% Baseflow Mine	Detailed distribution of mine affected baseflow					
			NMP	EMP	WMP-In	TCP	PL 909	SWR 901
			%	%	%	%	%	%
Post-closure	91.7%	8.3%	17.4%	5.9%	75.8%			0.9%
Pulse TCL 25y ⁽¹⁾	91.1%	8.9%	16.2%	5.4%	70.3%	7.2%		0.9%

Note: Modelled WQS09 GW'shed corresponds only to the southern contribution from the valley.

¹ Scenario evaluating maximum potential influence from TCL after post-closure (25 year pulse from TCL).

It assumes TCL discharges contributions of mine contact water on long term (i.e., steady state) even if it has been decomissioned at EOM..

2- Observed and precicted groundwater quality at WQS04, Tenas Creek

Parameter	Detection Limit ¹ (mg/L)	BC WQG FAL				Groundwater background (GWB) (Source: GWQuality_Summary_Stats_rev08_smh.xlsx)				Base Case Source Terms (ST) (Source: Results_MPSeepage_WaterQuality_EAModel_rev06_07072021.xlsm)						Baseflow quality at WQS04: Scenario A *		Baseflow quality at WQS04: Scenario B **		
		Screening parameter	Approved guidelines (mg/L)	Working guidelines (mg/L)	Screening value (mg/L)	Overburden		Bedrock		Control Pond Avg. Winter	NMP		EMP Avg. Winter	WMP Avg. Winter	Pit lake 909masl Avg. Winter	Saturated WR 901masl Avg. Winter	GWB: OVB P50	GWB: BDR P50	GWB: OVB P50	GWB: BDR P50
						P50	P95	P50	P95		Avg. Winter	Avg. Winter					ST: Avg. Winter	ST: Avg. Winter	ST: Avg. Winter	ST: Avg. Winter
Anions and Nitrogen																				
Ammonia, Total (as N)	0.0050	Ammonia, Total (as N)	0.681-28.7 ^(pH,T)	n.g.	1	0.025	0.610	0.320	0.690	0.440	0.049	0.048	0.200	0.001	0.073	0.036	0.307	0.039	0.308	
Chloride (Cl)	0.50	Chloride (Cl)	600.00	n.g.	600	0.5	3.3	2.5	10.0	15.0	6.9	2.6	19.0	3.4	18.0	1.8	3.6	1.9	3.7	
Fluoride (F)	0.020	Fluoride (F)	0.4-2.0 ^(H)	n.g.	0.4	0.13	0.35	1.50	5.10	0.09	0.07	0.00	0.08	0.01	0.17	0.13	1.38	0.13	1.37	
Nitrate (as N)	0.0050	Nitrate (as N)	32.80	n.g.	33	0.01	0.17	0.03	0.16	3.30	0.17	0.38	1.30	0.01	0.02	0.09	0.11	0.11	0.13	
Nitrite (as N)	0.0010	Nitrite (as N)	0.06 ^(C)	n.g.	0.06	0.001	0.005	0.005	0.020	0.076	0.005	0.009	0.030	0.000	0.002	0.003	0.007	0.003	0.007	
Sulfate (SO4)	0.50	Sulfate (SO4)	100.00	n.g.	100	11.0	42.0	6.0	75.0	330.0	140.0	61.0	430.0	74.0	380.0	39.7	35.1	41.5	37.0	
Dissolved Metals																				
Aluminum (Al)-Dissolved	0.0050	Aluminum (Al)-Dissolved	0.10 ^{(pH)(2)}	n.g.	0.10	0.005	0.034	0.009	0.100	0.065	0.013	0.049	0.150	0.004	0.007	0.014	0.018	0.015	0.018	
Arsenic (As)-Dissolved	0.00050	Arsenic (As)-Total	0.01	n.g.	0.01	0.00081	0.01100	0.0006	0.0020	0.0062	0.0027	0.0010	0.0076	0.0014	0.0073	0.0013	0.0011	0.0013	0.0011	
Barium (Ba)-Dissolved	0.020	Barium (Ba)-Total	n.g.	5.00	5	0.093	0.250	0.330	3.600	0.057	0.029	0.013	0.049	0.010	0.060	0.089	0.306	0.089	0.305	
Beryllium (Be)-Dissolved	0.0010	Beryllium (Be)-Total	n.g.	0.01	0.01	0.0001	0.0002	0.0001	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	
Boron (B)-Dissolved	0.10	Boron (B)-Total	1.20	n.g.	1.2	0.10	0.10	0.16	0.34	0.26	0.12	0.04	0.33	0.06	0.32	0.11	0.17	0.12	0.17	
Cadmium (Cd)-Dissolved	0.00001	Cadmium (Cd)-Dissolved	0.0000176-0.000457 ^{(H)(5)}	n.g.	0.0000176	0.00002	0.00027	0.00001	0.00160	0.00025	0.00007	0.00010	0.00041	0.00006	0.00014	0.00005	0.00004	0.00005	0.00004	
Chromium (Cr)-Dissolved	0.0010	Chromium (Cr)-Total	n.g.	0.001 or 0.0089 ³	0.001	0.001	0.001	0.001	0.002	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.001	
Cobalt (Co)-Dissolved	0.00030	Cobalt (Co)-Total	0.11	n.g.	0.11	0.000	0.004	0.000	0.003	0.011	0.005	0.002	0.014	0.002	0.013	0.001	0.001	0.001	0.001	
Copper (Cu)-Dissolved	0.0010	Copper (Cu)-Total	0.002 - 0.026 ^(H)	n.g.	0.002	0.0010	0.0050	0.0010	0.0039	0.0025	0.0010	0.0005	0.0026	0.0006	0.0024	0.0011	0.0011	0.0011	0.0011	
Iron (Fe)-Dissolved	0.030	Iron (Fe)-Dissolved	0.35	n.g.	0.35	0.0300	0.0990	0.0650	0.5900	0.0360	0.0120	0.0190	0.0640	0.0032	0.0190	0.0318	0.0639	0.0318	0.0637	
Lead (Pb)-Dissolved	0.00050	Lead (Pb)-Total	0.003 - 0.33 ^(H)	n.g.	0.003	0.0005	0.0009	0.0005	0.0010	0.0004	0.0002	0.0001	0.0006	0.0001	0.0004	0.0005	0.0005	0.0005	0.0005	
Lithium (Li)-Dissolved	0.0050	Lithium (Li)-Total	n.g.	0.87	0.87	0.003	0.007	0.050	0.100	0.130	0.056	0.022	0.160	0.028	0.150	0.014	0.057	0.014	0.057	
Manganese (Mn)-Dissolved	0.00030	Manganese (Mn)-Total	0.80-3.80 ^(H)	n.g.	0.80	0.05200	0.57000	0.01700	0.25000	0.01500	0.00650	0.00520	0.02500	0.00210	0.01400	0.04939	0.01729	0.04918	0.01728	
Molybdenum (Mo)-Dissolved	0.0010	Molybdenum (Mo)-Total	2.00	n.g.	2	0.0010	0.0150	0.0010	0.0150	0.0210	0.0087	0.0034	0.0240	0.0050	0.0230	0.0026	0.0026	0.0027	0.0027	
Nickel (Ni)-Dissolved	0.0010	Nickel (Ni)-Total	n.g.	0.025 - 0.180 ^(H)	0.025	0.001	0.017	0.001	0.005	0.017	0.008	0.003	0.022	0.004	0.020	0.002	0.002	0.003	0.003	
Potassium (K)-Dissolved	2.0	Potassium (K)-Total	n.g.	373-432	373	2.00000	2.00000	2.00000	3.50000	11.00000	4.90000	1.70000	13.00000	2.50000	13.00000	2.73875	2.73875	2.79123	2.79123	
Selenium (Se)-Dissolved	0.00010	Selenium (Se)-Total	0.00	n.g.	0.002	0.000200	0.000960	0.000140	0.001000	0.014000	0.006100	0.002300	0.018000	0.003200	0.016000	0.001424	0.001369	0.001504	0.001449	
Silver (Ag)-Dissolved	0.000020	Silver (Ag)-Total	0.0001-0.003 ^(H)	n.g.	0.0001	0.0000	0.0003	0.0000	0.0001	0.0002	0.0000	0.0001	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Uranium (U)-Dissolved	0.00020	Uranium (U)-Total	n.g.	0.30	0.30	0.00110	0.00320	0.00040	0.00710	0.00086	0.00039	0.00020	0.00110	0.00018	0.00093	0.00109	0.00044	0.00108	0.00045	
Zinc (Zn)-Dissolved	0.0050	Zinc (Zn)-Total	0.033-0.265 ^(H)	n.g.	0.033	0.005000	0.012000	0.005000	0.011000	0.011000	0.004900	0.001800	0.013000	0.002400	0.013000	0.005491	0.005491	0.005526	0.005526	

Notes:

BCWQG BC Water Quality Guidelines

Maximum concentrations for Freshwater Aquatic Life

(-) Not applicable

¹ Lowest reported detection limit listed

² Dissolved Aluminum is pH dependent. 100 ug/L for a pH greater than or equal to 6.5 and e ^{(1.209 - 2.426 (pH) + 0.286K)} where K = (pH)2 for a pH less than 6.5

³ Chromium (VI) maximum is 1.0 ug/l and Chromium (III) maximum is 8.9 ug/L

⁴ Thallium - 1.7 ug/L human health, consumption of water + organism and 6.3 ug/L human health, consumption of organism only

⁵ Dissolved Cadmium is hardness dependent. Lower bound for long term average guideline exposure is 0.0000176 mg/L and the upper bound is 0.000457 mg/L.

(Cl) Chloride dependent guideline

(H) Hardness dependent guideline

(pH) pH dependent guideline

(T) Temperature dependent guideline

n.g. No guideline

GWB Groundwater background

ST Source terms

* Scenario A: Base Case, Post-closure (25 years pulse from control pond already discharged).

** Scenario B: Base Case, 1st 25 years of Post-closure period (incl. steady state discharges from control pond).

Format exceedances:

0.001

red fill, red font correspond to concentrations exceeding BC fresh water quality guideline.

0.01

red fill, red bold and larger font corresponds to concentrations exceeding BC fresh water quality guideline and the 95th percentile of the background concentrationse monitored during baseline conditions.

Estimation of the base case croundwater baseflow quality at WQS03, Four Creek

1- Groundwater contributions at WQS03, Four Creek

(Base Case, Post-closure, Affected area: 0.3% of the RSA)

ID	% Baseflow Bckgrnd	% Baseflow Mine	Detailed distribution of mine affected baseflow					
			NMP	EMP	WMP-In	TCP	PL 909	SWR 901
			%	%	%	%	%	%
Post-closure	100.0%	0.0%						
Pulse TCL 25y ⁽¹⁾	100.0%	0.0%						

Note: Modelled WQS09 GW'shed corresponds only to the southern contribution from the valley.

¹ Scenario evaluating maximum potential influence from TCL after post-closure (25 year pulse from TCL).

It assumes TCL discharges contributions of mine contact water on long term (i.e., steady state) even if it has been decomissioned at EOM..

2- Observed and precicted groundwater quality at WQS03, Four Creek

Parameter	Detection Limit ¹ (mg/L)	BC WQG FAL				Groundwater background (GWB) (Source: GWQuality_Summary_Stats_rev08_smh.xlsx)				Base Case Source Terms (ST) (Source: Results_MPSeepage_WaterQuality_EAModel_rev06_07072021.xlsm)						Baseflow quality at WQS03: Scenario A *		Baseflow quality at WQS03: Scenario B **				
		Screening parameter	Approved guidelines (mg/L)	Working guidelines (mg/L)	Screening value (mg/L)	Overburden		Bedrock		Control Pond Avg. Winter	NMP		EMP Avg. Winter	WMP Avg. Winter	Pit lake 909masl Avg. Winter	Saturated WR 901masl Avg. Winter	GWB: OVB P50	GWB: BDR P50	GWB: OVB P50	GWB: BDR P50		
						P50	P95	P50	P95		Avg. Winter	Avg. Winter					Avg. Winter	Avg. Winter	ST: Avg. Winter	ST: Avg. Winter	ST: Avg. Winter	ST: Avg. Winter
Anions and Nitrogen																						
Ammonia, Total (as N)	0.0050	Ammonia, Total (as N)	0.681-28.7 ^(pH,T)	n.g.	1	0.025	0.610	0.320	0.690	0.440	0.049	0.048	0.200	0.001	0.073	0.025	0.320	0.025	0.320			
Chloride (Cl)	0.50	Chloride (Cl)	600.00	n.g.	600	0.5	3.3	2.5	10.0	15.0	6.9	2.6	19.0	3.4	18.0	0.5	2.5	0.5	2.5			
Fluoride (F)	0.020	Fluoride (F)	0.4-2.0 ^(H)	n.g.	0.4	0.13	0.35	1.50	5.10	0.09	0.07	0.00	0.08	0.01	0.17	0.13	1.50	0.13	1.50			
Nitrate (as N)	0.0050	Nitrate (as N)	32.80	n.g.	33	0.01	0.17	0.03	0.16	3.30	0.17	0.38	1.30	0.01	0.02	0.01	0.03	0.01	0.03			
Nitrite (as N)	0.0010	Nitrite (as N)	0.06 ^(C)	n.g.	0.06	0.001	0.005	0.005	0.020	0.076	0.005	0.009	0.030	0.000	0.002	0.001	0.005	0.001	0.005			
Sulfate (SO4)	0.50	Sulfate (SO4)	100.00	n.g.	100	11.0	42.0	6.0	75.0	330.0	140.0	61.0	430.0	74.0	380.0	11.0	6.0	11.0	6.0			
Dissolved Metals																						
Aluminum (Al)-Dissolved	0.0050	Aluminum (Al)-Dissolved	0.10 ^{(pH)(2)}	n.g.	0.10	0.005	0.034	0.009	0.100	0.065	0.013	0.049	0.150	0.004	0.007	0.005	0.009	0.005	0.009			
Arsenic (As)-Dissolved	0.00050	Arsenic (As)-Total	0.01	n.g.	0.01	0.00081	0.01100	0.0006	0.0020	0.0062	0.0027	0.0010	0.0076	0.0014	0.0073	0.0008	0.0006	0.0008	0.0006			
Barium (Ba)-Dissolved	0.020	Barium (Ba)-Total	n.g.	5.00	5	0.093	0.250	0.330	3.600	0.057	0.029	0.013	0.049	0.010	0.060	0.093	0.330	0.093	0.330			
Beryllium (Be)-Dissolved	0.0010	Beryllium (Be)-Total	n.g.	0.01	0.01	0.0001	0.0002	0.0001	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001			
Boron (B)-Dissolved	0.10	Boron (B)-Total	1.20	n.g.	1.2	0.10	0.10	0.16	0.34	0.26	0.12	0.04	0.33	0.06	0.32	0.10	0.16	0.10	0.16			
Cadmium (Cd)-Dissolved	0.00001	Cadmium (Cd)-Dissolved	0.0000176-0.000457 ^{(H)(5)}	n.g.	0.0000176	0.00002	0.00027	0.00001	0.00160	0.00025	0.00007	0.00010	0.00041	0.00006	0.00014	0.00002	0.00001	0.00002	0.00001			
Chromium (Cr)-Dissolved	0.0010	Chromium (Cr)-Total	n.g.	0.001 or 0.0089 ³	0.001	0.001	0.001	0.001	0.002	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.001			
Cobalt (Co)-Dissolved	0.00030	Cobalt (Co)-Total	0.11	n.g.	0.11	0.000	0.004	0.000	0.003	0.011	0.005	0.002	0.014	0.002	0.013	0.000	0.000	0.000	0.000			
Copper (Cu)-Dissolved	0.0010	Copper (Cu)-Total	0.002 - 0.026 ^(H)	n.g.	0.002	0.0010	0.0050	0.0010	0.0039	0.0025	0.0010	0.0005	0.0026	0.0006	0.0024	0.0010	0.0010	0.0010	0.0010			
Iron (Fe)-Dissolved	0.030	Iron (Fe)-Dissolved	0.35	n.g.	0.35	0.0300	0.0990	0.0650	0.5900	0.0360	0.0120	0.0190	0.0640	0.0032	0.0190	0.0300	0.0650	0.0300	0.0650			
Lead (Pb)-Dissolved	0.00050	Lead (Pb)-Total	0.003 - 0.33 ^(H)	n.g.	0.003	0.0005	0.0009	0.0005	0.0010	0.0004	0.0002	0.0001	0.0006	0.0001	0.0004	0.0005	0.0005	0.0005	0.0005			
Lithium (Li)-Dissolved	0.0050	Lithium (Li)-Total	n.g.	0.87	0.87	0.003	0.007	0.050	0.100	0.130	0.056	0.022	0.160	0.028	0.150	0.003	0.050	0.003	0.050			
Manganese (Mn)-Dissolved	0.00030	Manganese (Mn)-Total	0.80-3.80 ^(H)	n.g.	0.80	0.05200	0.57000	0.01700	0.25000	0.01500	0.00650	0.00520	0.02500	0.00210	0.01400	0.05200	0.01700	0.05200	0.01700			
Molybdenum (Mo)-Dissolved	0.0010	Molybdenum (Mo)-Total	2.00	n.g.	2	0.0010	0.0150	0.0010	0.0150	0.0210	0.0087	0.0034	0.0240	0.0050	0.0230	0.0010	0.0010	0.0010	0.0010			
Nickel (Ni)-Dissolved	0.0010	Nickel (Ni)-Total	n.g.	0.025 - 0.180 ^(H)	0.025	0.001	0.017	0.001	0.005	0.017	0.008	0.003	0.022	0.004	0.020	0.001	0.001	0.001	0.001			
Potassium (K)-Dissolved	2.0	Potassium (K)-Total	n.g.	373-432	373	2.00000	2.00000	2.00000	3.50000	11.00000	4.90000	1.70000	13.00000	2.50000	13.00000	2.00000	2.00000	2.00000	2.00000			
Selenium (Se)-Dissolved	0.00010	Selenium (Se)-Total	0.00	n.g.	0.002	0.000200	0.000960	0.000140	0.001000	0.014000	0.006100	0.002300	0.018000	0.003200	0.016000	0.000200	0.000140	0.000200	0.000140			
Silver (Ag)-Dissolved	0.000020	Silver (Ag)-Total	0.0001-0.003 ^(H)	n.g.	0.0001	0.0000	0.0003	0.0000	0.0001	0.0002	0.0000	0.0001	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
Uranium (U)-Dissolved	0.00020	Uranium (U)-Total	n.g.	0.30	0.30	0.00110	0.00320	0.00040	0.00710	0.00086	0.00039	0.00020	0.00110	0.00018	0.00093	0.00110	0.00040	0.00110	0.00040			
Zinc (Zn)-Dissolved	0.0050	Zinc (Zn)-Total	0.033-0.265 ^(H)	n.g.	0.033	0.005000	0.012000	0.005000	0.011000	0.011000	0.004900	0.001800	0.013000	0.002400	0.013000	0.005000	0.005000	0.005000	0.005000			

Notes:

BCWQG BC Water Quality Guidelines

Maximum concentrations for Freshwater Aquatic Life

(-) Not applicable

¹ Lowest reported detection limit listed

² Dissolved Aluminum is pH dependent. 100 ug/L for a pH greater than or equal to 6.5 and e ^{(1.209 - 2.426 (pH) + 0.286K)} where K = (pH)2 for a pH less than 6.5

³ Chromium (VI) maximum is 1.0 ug/l and Chromium (III) maximum is 8.9 ug/L

⁴ Thallium - 1.7 ug/L human health, consumption of water + organism and 6.3 ug/L human health, consumption of organism only

⁵ Dissolved Cadmium is hardness dependent. Lower bound for long term average guideline exposure is 0.0000176 mg/L and the upper bound is 0.000457 mg/L.

(Cl) Chloride dependent guideline

(H) Hardness dependent guideline

(pH) pH dependent guideline

(T) Temperature dependent guideline

n.g. No guideline

GWB Groundwater background

ST Source terms

* Scenario A: Base Case, Post-closure (25 years pulse from control pond already discharged).

** Scenario B: Base Case, 1st 25 years of Post-closure period (incl. steady state discharges from control pond).

Format exceedances:

0.001 red fill, red font correspond to concentrations exceeding BC fresh water quality guideline.

0.01 red fill, red bold and larger font corresponds to concentrations exceeding BC fresh water quality guideline and the 95th percentile of the background concentrationse monitored during baseline conditions.

Estimation of the base case croundwater baseflow quality at WQS21, Four Creek

1- Groundwater contributions at WQS21, Four Creek

(Base Case, Post-closure, Affected area: 0.4% of the RSA)

ID	% Baseflow Bckgrnd	% Baseflow Mine	Detailed distribution of mine affected baseflow					
			NMP	EMP	WMP-In	TCP	PL 909	SWR 901
			%	%	%	%	%	%
Post-closure	100.0%	0.0%						
Pulse TCL 25y ⁽¹⁾	100.0%	0.0%						

Note: Modelled WQS09 GW'shed corresponds only to the southern contribution from the valley.

¹ Scenario evaluating maximum potential influence from TCL after post-closure (25 year pulse from TCL).

It assumes TCL discharges contributions of mine contact water on long term (i.e., steady state) even if it has been decomissioned at EOM..

2- Observed and precicted groundwater quality at WQS21, Four Creek

Parameter	Detection Limit ¹ (mg/L)	BC WQG FAL				Groundwater background (GWB) (Source: GWQuality_Summary_Stats_rev08_smh.xlsx)				Base Case Source Terms (ST) (Source: Results_MPSeepage_WaterQuality_EAModel_rev06_07072021.xlsm)						Baseflow quality at WQS21: Scenario A *		Baseflow quality at WQS21: Scenario B **	
		Screening parameter	Approved guidelines (mg/L)	Working guidelines (mg/L)	Screening value (mg/L)	Overburden		Bedrock		Control Pond Avg. Winter	NMP Avg. Winter	EMP Avg. Winter	WMP Avg. Winter	Pit lake 909masl Avg. Winter	Saturated WR 901masl Avg. Winter	GWB: OVB P50	GWB: BDR P50	GWB: OVB P50	GWB: BDR P50
						P50	P95	P50	P95							ST: Avg. Winter	ST: Avg. Winter	ST: Avg. Winter	ST: Avg. Winter
Anions and Nitrogen																			
Ammonia, Total (as N)	0.0050	Ammonia, Total (as N)	0.681-28.7 ^(pH, T)	n.g.	1	0.025	0.610	0.320	0.690	0.440	0.049	0.048	0.200	0.001	0.073	0.025	0.320	0.025	0.320
Chloride (Cl)	0.50	Chloride (Cl)	600.00	n.g.	600	0.5	3.3	2.5	10.0	15.0	6.9	2.6	19.0	3.4	18.0	0.5	2.5	0.5	2.5
Fluoride (F)	0.020	Fluoride (F)	0.4-2.0 ^(H)	n.g.	0.4	0.13	0.35	1.50	5.10	0.09	0.07	0.00	0.08	0.01	0.17	0.13	1.50	0.13	1.50
Nitrate (as N)	0.0050	Nitrate (as N)	32.80	n.g.	33	0.01	0.17	0.03	0.16	3.30	0.17	0.38	1.30	0.01	0.02	0.01	0.03	0.01	0.03
Nitrite (as N)	0.0010	Nitrite (as N)	0.06 ^(c)	n.g.	0.06	0.001	0.005	0.005	0.020	0.076	0.005	0.009	0.030	0.000	0.002	0.001	0.005	0.001	0.005
Sulfate (SO4)	0.50	Sulfate (SO4)	100.00	n.g.	100	11.0	42.0	6.0	75.0	330.0	140.0	61.0	430.0	74.0	380.0	11.0	6.0	11.0	6.0
Dissolved Metals																			
Aluminum (Al)-Dissolved	0.0050	Aluminum (Al)-Dissolved	0.10 ^{(pH)(2)}	n.g.	0.10	0.005	0.034	0.009	0.100	0.065	0.013	0.049	0.150	0.004	0.007	0.005	0.009	0.005	0.009
Arsenic (As)-Dissolved	0.00050	Arsenic (As)-Total	0.01	n.g.	0.01	0.00081	0.01100	0.0006	0.0020	0.0062	0.0027	0.0010	0.0076	0.0014	0.0073	0.0008	0.0006	0.0008	0.0006
Barium (Ba)-Dissolved	0.020	Barium (Ba)-Total	n.g.	5.00	5	0.093	0.250	0.330	3.600	0.057	0.029	0.013	0.049	0.010	0.060	0.093	0.330	0.093	0.330
Beryllium (Be)-Dissolved	0.0010	Beryllium (Be)-Total	n.g.	0.01	0.01	0.0001	0.0002	0.0001	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001
Boron (B)-Dissolved	0.10	Boron (B)-Total	1.20	n.g.	1.2	0.10	0.10	0.16	0.34	0.26	0.12	0.04	0.33	0.06	0.32	0.10	0.16	0.10	0.16
Cadmium (Cd)-Dissolved	0.00001	Cadmium (Cd)-Dissolved	0.0000176-0.000457 ^{(H)(5)}	n.g.	0.0000176	0.00002	0.00027	0.00001	0.00160	0.00025	0.00007	0.00010	0.00041	0.00006	0.00014	0.00002	0.00001	0.00002	0.00001
Chromium (Cr)-Dissolved	0.0010	Chromium (Cr)-Total	n.g.	0.001 or 0.0089 ³	0.001	0.001	0.001	0.001	0.002	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.001
Cobalt (Co)-Dissolved	0.00030	Cobalt (Co)-Total	0.11	n.g.	0.11	0.000	0.004	0.000	0.003	0.011	0.005	0.002	0.014	0.002	0.013	0.000	0.000	0.000	0.000
Copper (Cu)-Dissolved	0.0010	Copper (Cu)-Total	0.002 - 0.026 ^(H)	n.g.	0.002	0.0010	0.0050	0.0010	0.0039	0.0025	0.0010	0.0005	0.0026	0.0006	0.0024	0.0010	0.0010	0.0010	0.0010
Iron (Fe)-Dissolved	0.030	Iron (Fe)-Dissolved	0.35	n.g.	0.35	0.0300	0.0990	0.0650	0.5900	0.0360	0.0120	0.0190	0.0640	0.0032	0.0190	0.0300	0.0650	0.0300	0.0650
Lead (Pb)-Dissolved	0.00050	Lead (Pb)-Total	0.003 - 0.33 ^(H)	n.g.	0.003	0.0005	0.0009	0.0005	0.0010	0.0004	0.0002	0.0001	0.0006	0.0001	0.0004	0.0005	0.0005	0.0005	0.0005
Lithium (Li)-Dissolved	0.0050	Lithium (Li)-Total	n.g.	0.87	0.87	0.003	0.007	0.050	0.100	0.130	0.056	0.022	0.160	0.028	0.150	0.003	0.050	0.003	0.050
Manganese (Mn)-Dissolved	0.00030	Manganese (Mn)-Total	0.80-3.80 ^(H)	n.g.	0.80	0.05200	0.57000	0.01700	0.25000	0.01500	0.00650	0.00520	0.02500	0.00210	0.01400	0.05200	0.01700	0.05200	0.01700
Molybdenum (Mo)-Dissolved	0.0010	Molybdenum (Mo)-Total	2.00	n.g.	2	0.0010	0.0150	0.0010	0.0150	0.0210	0.0087	0.0034	0.0240	0.0050	0.0230	0.0010	0.0010	0.0010	0.0010
Nickel (Ni)-Dissolved	0.0010	Nickel (Ni)-Total	n.g.	0.025 - 0.180 ^(H)	0.025	0.001	0.017	0.001	0.005	0.017	0.008	0.003	0.022	0.004	0.020	0.001	0.001	0.001	0.001
Potassium (K)-Dissolved	2.0	Potassium (K)-Total	n.g.	373-432	373	2.00000	2.00000	2.00000	3.50000	11.00000	4.90000	1.70000	13.00000	2.50000	13.00000	2.00000	2.00000	2.00000	2.00000
Selenium (Se)-Dissolved	0.00010	Selenium (Se)-Total	0.00	n.g.	0.002	0.000200	0.000960	0.000140	0.001000	0.014000	0.006100	0.002300	0.018000	0.003200	0.016000	0.000200	0.000140	0.000200	0.000140
Silver (Ag)-Dissolved	0.000020	Silver (Ag)-Total	0.0001-0.003 ^(H)	n.g.	0.0001	0.0000	0.0003	0.0000	0.0001	0.0002	0.0000	0.0001	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Uranium (U)-Dissolved	0.00020	Uranium (U)-Total	n.g.	0.30	0.30	0.00110	0.00320	0.00040	0.00710	0.00086	0.00039	0.00020	0.00110	0.00018	0.00093	0.00110	0.00040	0.00110	0.00040
Zinc (Zn)-Dissolved	0.0050	Zinc (Zn)-Total	0.033-0.265 ^(H)	n.g.	0.033	0.005000	0.012000	0.005000	0.011000	0.011000	0.004900	0.001800	0.013000	0.002400	0.013000	0.005000	0.005000	0.005000	0.005000

Notes:

BCWQG BC Water Quality Guidelines

Maximum concentrations for Freshwater Aquatic Life

(-) Not applicable

¹ Lowest reported detection limit listed

² Dissolved Aluminum is pH dependent. 100 ug/L for a pH greater than or equal to 6.5 and e ^{(1.209 - 2.426 (pH) + 0.286K)} where K = (pH)2 for a pH less than 6.5

³ Chromium (VI) maximum is 1.0 ug/l and Chromium (III) maximum is 8.9 ug/L

⁴ Thallium - 1.7 ug/L human health, consumption of water + organism and 6.3 ug/L human health, consumption of organism only

⁵ Dissolved Cadmium is hardness dependent. Lower bound for long term average guideline exposure is 0.0000176 mg/L and the upper bound is 0.000457 mg/L.

(Cl) Chloride dependent guideline

(H) Hardness dependent guideline

(pH) pH dependent guideline

(T) Temperature dependent guideline

n.g. No guideline

GWB Groundwater background

ST Source terms

* Scenario A: Base Case, Post-closure (25 years pulse from control pond already discharged).

** Scenario B: Base Case, 1st 25 years of Post-closure period (incl. steady state discharges from control pond).

Format exceedances:

0.001 red fill, red font correspond to concentrations exceeding BC fresh water quality guideline.

0.01 red fill, red bold and larger font corresponds to concentrations exceeding BC fresh water quality guideline and the 95th percentile of the background concentrationse monitored during baseline conditions.

Estimation of the base case croundwater baseflow quality at WQS20, Four Creek

1- Groundwater contributions at WQS20, Four Creek

(Base Case, Post-closure, Affected area: 0.4% of the RSA)

ID	% Baseflow Bckgrnd	% Baseflow Mine	Detailed distribution of mine affected baseflow					
			NMP	EMP	WMP-In	TCP	PL 909	SWR 901
			%	%	%	%	%	%
Post-closure	100.0%	0.0%						
Pulse TCL 25y ⁽¹⁾	100.0%	0.0%						

Note: Modelled WQS09 GW'shed corresponds only to the southern contribution from the valley.

¹ Scenario evaluating maximum potential influence from TCL after post-closure (25 year pulse from TCL).

It assumes TCL discharges contributions of mine contact water on long term (i.e., steady state) even if it has been decomissioned at EOM..

2- Observed and precicted groundwater quality at WQS20, Four Creek

Parameter	Detection Limit ¹ (mg/L)	BC WQG FAL				Groundwater background (GWB) (Source: GWQuality_Summary_Stats_rev08_smh.xlsx)				Base Case Source Terms (ST) (Source: Results_MPSeepage_WaterQuality_EAModel_rev06_07072021.xlsm)						Baseflow quality at WQS20: Scenario A *		Baseflow quality at WQS20: Scenario B **		
		Screening parameter	Approved guidelines (mg/L)	Working guidelines (mg/L)	Screening value (mg/L)	Overburden		Bedrock		Control Pond Avg. Winter	NMP		EMP Avg. Winter	WMP Avg. Winter	Pit lake 909masl Avg. Winter	Saturated WR 901masl Avg. Winter	GWB: OVB P50	GWB: BDR P50	GWB: OVB P50	GWB: BDR P50
						P50	P95	P50	P95		Avg. Winter	Avg. Winter					ST: Avg. Winter	ST: Avg. Winter	ST: Avg. Winter	ST: Avg. Winter
Anions and Nitrogen																				
Ammonia, Total (as N)	0.0050	Ammonia, Total (as N)	0.681-28.7 ^(pH,T)	n.g.	1	0.025	0.610	0.320	0.690	0.440	0.049	0.048	0.200	0.001	0.073	0.025	0.320	0.025	0.320	
Chloride (Cl)	0.50	Chloride (Cl)	600.00	n.g.	600	0.5	3.3	2.5	10.0	15.0	6.9	2.6	19.0	3.4	18.0	0.5	2.5	0.5	2.5	
Fluoride (F)	0.020	Fluoride (F)	0.4-2.0 ^(H)	n.g.	0.4	0.13	0.35	1.50	5.10	0.09	0.07	0.00	0.08	0.01	0.17	0.13	1.50	0.13	1.50	
Nitrate (as N)	0.0050	Nitrate (as N)	32.80	n.g.	33	0.01	0.17	0.03	0.16	3.30	0.17	0.38	1.30	0.01	0.02	0.01	0.03	0.01	0.03	
Nitrite (as N)	0.0010	Nitrite (as N)	0.06 ^(C)	n.g.	0.06	0.001	0.005	0.005	0.020	0.076	0.005	0.009	0.030	0.000	0.002	0.001	0.005	0.001	0.005	
Sulfate (SO4)	0.50	Sulfate (SO4)	100.00	n.g.	100	11.0	42.0	6.0	75.0	330.0	140.0	61.0	430.0	74.0	380.0	11.0	6.0	11.0	6.0	
Dissolved Metals																				
Aluminum (Al)-Dissolved	0.0050	Aluminum (Al)-Dissolved	0.10 ^{(pH)(2)}	n.g.	0.10	0.005	0.034	0.009	0.100	0.065	0.013	0.049	0.150	0.004	0.007	0.005	0.009	0.005	0.009	
Arsenic (As)-Dissolved	0.00050	Arsenic (As)-Total	0.01	n.g.	0.01	0.00081	0.01100	0.0006	0.0020	0.0062	0.0027	0.0010	0.0076	0.0014	0.0073	0.0008	0.0006	0.0008	0.0006	
Barium (Ba)-Dissolved	0.020	Barium (Ba)-Total	n.g.	5.00	5	0.093	0.250	0.330	3.600	0.057	0.029	0.013	0.049	0.010	0.060	0.093	0.330	0.093	0.330	
Beryllium (Be)-Dissolved	0.0010	Beryllium (Be)-Total	n.g.	0.01	0.01	0.0001	0.0002	0.0001	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	
Boron (B)-Dissolved	0.10	Boron (B)-Total	1.20	n.g.	1.2	0.10	0.10	0.16	0.34	0.26	0.12	0.04	0.33	0.06	0.32	0.10	0.16	0.10	0.16	
Cadmium (Cd)-Dissolved	0.00001	Cadmium (Cd)-Dissolved	0.0000176-0.000457 ^{(H)(5)}	n.g.	0.0000176	0.00002	0.00027	0.00001	0.00160	0.00025	0.00007	0.00010	0.00041	0.00006	0.00014	0.00002	0.00001	0.00002	0.00001	
Chromium (Cr)-Dissolved	0.0010	Chromium (Cr)-Total	n.g.	0.001 or 0.0089 ³	0.001	0.001	0.001	0.001	0.002	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.001	
Cobalt (Co)-Dissolved	0.00030	Cobalt (Co)-Total	0.11	n.g.	0.11	0.000	0.004	0.000	0.003	0.011	0.005	0.002	0.014	0.002	0.013	0.000	0.000	0.000	0.000	
Copper (Cu)-Dissolved	0.0010	Copper (Cu)-Total	0.002 - 0.026 ^(H)	n.g.	0.002	0.0010	0.0050	0.0010	0.0039	0.0025	0.0010	0.0005	0.0026	0.0006	0.0024	0.0010	0.0010	0.0010	0.0010	
Iron (Fe)-Dissolved	0.030	Iron (Fe)-Dissolved	0.35	n.g.	0.35	0.0300	0.0990	0.0650	0.5900	0.0360	0.0120	0.0190	0.0640	0.0032	0.0190	0.0300	0.0650	0.0300	0.0650	
Lead (Pb)-Dissolved	0.00050	Lead (Pb)-Total	0.003 - 0.33 ^(H)	n.g.	0.003	0.0005	0.0009	0.0005	0.0010	0.0004	0.0002	0.0001	0.0006	0.0001	0.0004	0.0005	0.0005	0.0005	0.0005	
Lithium (Li)-Dissolved	0.0050	Lithium (Li)-Total	n.g.	0.87	0.87	0.003	0.007	0.050	0.100	0.130	0.056	0.022	0.160	0.028	0.150	0.003	0.050	0.003	0.050	
Manganese (Mn)-Dissolved	0.00030	Manganese (Mn)-Total	0.80-3.80 ^(H)	n.g.	0.80	0.05200	0.57000	0.01700	0.25000	0.01500	0.00650	0.00520	0.02500	0.00210	0.01400	0.05200	0.01700	0.05200	0.01700	
Molybdenum (Mo)-Dissolved	0.0010	Molybdenum (Mo)-Total	2.00	n.g.	2	0.0010	0.0150	0.0010	0.0150	0.0210	0.0087	0.0034	0.0240	0.0050	0.0230	0.0010	0.0010	0.0010	0.0010	
Nickel (Ni)-Dissolved	0.0010	Nickel (Ni)-Total	n.g.	0.025 - 0.180 ^(H)	0.025	0.001	0.017	0.001	0.005	0.017	0.008	0.003	0.022	0.004	0.020	0.001	0.001	0.001	0.001	
Potassium (K)-Dissolved	2.0	Potassium (K)-Total	n.g.	373-432	373	2.00000	2.00000	2.00000	3.50000	11.00000	4.90000	1.70000	13.00000	2.50000	13.00000	2.00000	2.00000	2.00000	2.00000	
Selenium (Se)-Dissolved	0.00010	Selenium (Se)-Total	0.00	n.g.	0.002	0.000200	0.000960	0.000140	0.001000	0.014000	0.006100	0.002300	0.018000	0.003200	0.016000	0.000200	0.000140	0.000200	0.000140	
Silver (Ag)-Dissolved	0.000020	Silver (Ag)-Total	0.0001-0.003 ^(H)	n.g.	0.0001	0.0000	0.0003	0.0000	0.0001	0.0002	0.0000	0.0001	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Uranium (U)-Dissolved	0.00020	Uranium (U)-Total	n.g.	0.30	0.30	0.00110	0.00320	0.00040	0.00710	0.00086	0.00039	0.00020	0.00110	0.00018	0.00093	0.00110	0.00040	0.00110	0.00040	
Zinc (Zn)-Dissolved	0.0050	Zinc (Zn)-Total	0.033-0.265 ^(H)	n.g.	0.033	0.005000	0.012000	0.005000	0.011000	0.011000	0.004900	0.001800	0.013000	0.002400	0.013000	0.005000	0.005000	0.005000	0.005000	

Notes:

BCWQG BC Water Quality Guidelines

Maximum concentrations for Freshwater Aquatic Life

(-) Not applicable

¹ Lowest reported detection limit listed

² Dissolved Aluminum is pH dependent. 100 ug/L for a pH greater than or equal to 6.5 and e ^{(1.209 - 2.426 (pH) + 0.286K)} where K = (pH)2 for a pH less than 6.5

³ Chromium (VI) maximum is 1.0 ug/l and Chromium (III) maximum is 8.9 ug/L

⁴ Thallium - 1.7 ug/L human health, consumption of water + organism and 6.3 ug/L human health, consumption of organism only

⁵ Dissolved Cadmium is hardness dependent. Lower bound for long term average guideline exposure is 0.0000176 mg/L and the upper bound is 0.000457 mg/L.

(Cl) Chloride dependent guideline

(H) Hardness dependent guideline

(pH) pH dependent guideline

(T) Temperature dependent guideline

n.g. No guideline

GWB Groundwater background

ST Source terms

* Scenario A: Base Case, Post-closure (25 years pulse from control pond already discharged).

** Scenario B: Base Case, 1st 25 years of Post-closure period (incl. steady state discharges from control pond).

Format exceedances:

0.001 red fill, red font correspond to concentrations exceeding BC fresh water quality guideline.

0.01 red fill, red bold and larger font corresponds to concentrations exceeding BC fresh water quality guideline and the 95th percentile of the background concentrationse monitored during baseline conditions.

Estimation of the base case croundwater baseflow quality at WQS03DS, Four Creek

1- Groundwater contributions at WQS03DS, Four Creek

(Base Case, Post-closure, Affected area: 0.5% of the RSA)

ID	% Baseflow Bckgrnd	% Baseflow Mine	Detailed distribution of mine affected baseflow					
			NMP	EMP	WMP-In	TCP	PL 909	SWR 901
			%	%	%	%	%	%
Post-closure	74.1%	25.9%		100.0%				
Pulse TCL 25y ⁽¹⁾	74.1%	25.9%		100.0%				

Note: Modelled WQS09 GW'shed corresponds only to the southern contribution from the valley.

¹ Scenario evaluating maximum potential influence from TCL after post-closure (25 year pulse from TCL).

It assumes TCL discharges contributions of mine contact water on long term (i.e., steady state) even if it has been decomissioned at EOM..

2- Observed and precicted groundwater quality at WQS03DS, Four Creek

Parameter	Detection Limit ¹ (mg/L)	BC WQG FAL				Groundwater background (GWB) (Source: GWQuality_Summary_Stats_rev08_smh.xlsx)				Base Case Source Terms (ST) (Source: Results_MPSeepage_WaterQuality_EAModel_rev06_07072021.xlsm)						Baseflow quality at WQS03DS: Scenario A *		Baseflow quality at WQS03DS: Scenario B **				
		Screening parameter	Approved guidelines (mg/L)	Working guidelines (mg/L)	Screening value (mg/L)	Overburden		Bedrock		Control Pond Avg. Winter	NMP		EMP Avg. Winter	WMP Avg. Winter	Pit lake 909masl Avg. Winter	Saturated WR 901masl Avg. Winter	GWB: OVB P50	GWB: BDR P50	GWB: OVB P50	GWB: BDR P50		
						P50	P95	P50	P95		Avg. Winter	Avg. Winter					Avg. Winter	Avg. Winter	ST: Avg. Winter	ST: Avg. Winter	ST: Avg. Winter	ST: Avg. Winter
Anions and Nitrogen																						
Ammonia, Total (as N)	0.0050	Ammonia, Total (as N)	0.681-28.7 ^(pH,T)	n.g.	1	0.025	0.610	0.320	0.690	0.440	0.049	0.048	0.200	0.001	0.073	0.031	0.249	0.031	0.249			
Chloride (Cl)	0.50	Chloride (Cl)	600.00	n.g.	600	0.5	3.3	2.5	10.0	15.0	6.9	2.6	19.0	3.4	18.0	1.1	2.5	1.1	2.5			
Fluoride (F)	0.020	Fluoride (F)	0.4-2.0 ^(H)	n.g.	0.4	0.13	0.35	1.50	5.10	0.09	0.07	0.00	0.08	0.01	0.17	0.10	1.11	0.10	1.11			
Nitrate (as N)	0.0050	Nitrate (as N)	32.80	n.g.	33	0.01	0.17	0.03	0.16	3.30	0.17	0.38	1.30	0.01	0.02	0.10	0.12	0.10	0.12			
Nitrite (as N)	0.0010	Nitrite (as N)	0.06 ^(C)	n.g.	0.06	0.001	0.005	0.005	0.020	0.076	0.005	0.009	0.030	0.000	0.002	0.003	0.006	0.003	0.006			
Sulfate (SO4)	0.50	Sulfate (SO4)	100.00	n.g.	100	11.0	42.0	6.0	75.0	330.0	140.0	61.0	430.0	74.0	380.0	24.0	20.3	24.0	20.3			
Dissolved Metals																						
Aluminum (Al)-Dissolved	0.0050	Aluminum (Al)-Dissolved	0.10 ^{(pH)(2)}	n.g.	0.10	0.005	0.034	0.009	0.100	0.065	0.013	0.049	0.150	0.004	0.007	0.016	0.019	0.016	0.019			
Arsenic (As)-Dissolved	0.00050	Arsenic (As)-Total	0.01	n.g.	0.01	0.00081	0.01100	0.0006	0.0020	0.0062	0.0027	0.0010	0.0076	0.0014	0.0073	0.0009	0.0007	0.0009	0.0007			
Barium (Ba)-Dissolved	0.020	Barium (Ba)-Total	n.g.	5.00	5	0.093	0.250	0.330	3.600	0.057	0.029	0.013	0.049	0.010	0.060	0.072	0.248	0.072	0.248			
Beryllium (Be)-Dissolved	0.0010	Beryllium (Be)-Total	n.g.	0.01	0.01	0.0001	0.0002	0.0001	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001			
Boron (B)-Dissolved	0.10	Boron (B)-Total	1.20	n.g.	1.2	0.10	0.10	0.16	0.34	0.26	0.12	0.04	0.33	0.06	0.32	0.09	0.13	0.09	0.13			
Cadmium (Cd)-Dissolved	0.00001	Cadmium (Cd)-Dissolved	0.0000176-0.000457 ^{(H)(5)}	n.g.	0.0000176	0.00002	0.00027	0.00001	0.00160	0.00025	0.00007	0.00010	0.00041	0.00006	0.00014	0.00004	0.00003	0.00004	0.00003			
Chromium (Cr)-Dissolved	0.0010	Chromium (Cr)-Total	n.g.	0.001 or 0.0089 ³	0.001	0.001	0.001	0.001	0.002	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.001			
Cobalt (Co)-Dissolved	0.00030	Cobalt (Co)-Total	0.11	n.g.	0.11	0.000	0.004	0.000	0.003	0.011	0.005	0.002	0.014	0.002	0.013	0.001	0.001	0.001	0.001			
Copper (Cu)-Dissolved	0.0010	Copper (Cu)-Total	0.002 - 0.026 ^(H)	n.g.	0.002	0.0010	0.0050	0.0010	0.0039	0.0025	0.0010	0.0005	0.0026	0.0006	0.0024	0.0009	0.0009	0.0009	0.0009			
Iron (Fe)-Dissolved	0.030	Iron (Fe)-Dissolved	0.35	n.g.	0.35	0.0300	0.0990	0.0650	0.5900	0.0360	0.0120	0.0190	0.0640	0.0032	0.0190	0.0271	0.0531	0.0271	0.0531			
Lead (Pb)-Dissolved	0.00050	Lead (Pb)-Total	0.003 - 0.33 ^(H)	n.g.	0.003	0.0005	0.0009	0.0005	0.0010	0.0004	0.0002	0.0001	0.0006	0.0001	0.0004	0.0004	0.0004	0.0004	0.0004			
Lithium (Li)-Dissolved	0.0050	Lithium (Li)-Total	n.g.	0.87	0.87	0.003	0.007	0.050	0.100	0.130	0.056	0.022	0.160	0.028	0.150	0.008	0.043	0.008	0.043			
Manganese (Mn)-Dissolved	0.00030	Manganese (Mn)-Total	0.80-3.80 ^(H)	n.g.	0.80	0.05200	0.57000	0.01700	0.25000	0.01500	0.00650	0.00520	0.02500	0.00210	0.01400	0.03987	0.01394	0.03987	0.01394			
Molybdenum (Mo)-Dissolved	0.0010	Molybdenum (Mo)-Total	2.00	n.g.	2	0.0010	0.0150	0.0010	0.0150	0.0210	0.0087	0.0034	0.0240	0.0050	0.0230	0.0016	0.0016	0.0016	0.0016			
Nickel (Ni)-Dissolved	0.0010	Nickel (Ni)-Total	n.g.	0.025 - 0.180 ^(H)	0.025	0.001	0.017	0.001	0.005	0.017	0.008	0.003	0.022	0.004	0.020	0.001	0.001	0.001	0.001			
Potassium (K)-Dissolved	2.0	Potassium (K)-Total	n.g.	373-432	373	2.00000	2.00000	2.00000	3.50000	11.00000	4.90000	1.70000	13.00000	2.50000	13.00000	1.92223	1.92223	1.92223	1.92223			
Selenium (Se)-Dissolved	0.00010	Selenium (Se)-Total	0.00	n.g.	0.002	0.000200	0.000960	0.000140	0.001000	0.014000	0.006100	0.002300	0.018000	0.003200	0.016000	0.000744	0.000700	0.000744	0.000700			
Silver (Ag)-Dissolved	0.000020	Silver (Ag)-Total	0.0001-0.003 ^(H)	n.g.	0.0001	0.0000	0.0003	0.0000	0.0001	0.0002	0.0000	0.0001	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
Uranium (U)-Dissolved	0.00020	Uranium (U)-Total	n.g.	0.30	0.30	0.00110	0.00320	0.00040	0.00710	0.00086	0.00039	0.00020	0.00110	0.00018	0.00093	0.00087	0.00035	0.00087	0.00035			
Zinc (Zn)-Dissolved	0.0050	Zinc (Zn)-Total	0.033-0.265 ^(H)	n.g.	0.033	0.005000	0.012000	0.005000	0.011000	0.011000	0.004900	0.001800	0.013000	0.002400	0.013000	0.004170	0.004170	0.004170	0.004170			

Notes:

BCWQG BC Water Quality Guidelines

Maximum concentrations for Freshwater Aquatic Life

(-) Not applicable

¹ Lowest reported detection limit listed

² Dissolved Aluminum is pH dependent. 100 ug/L for a pH greater than or equal to 6.5 and e ^{(1.209 - 2.426 (pH) + 0.286K)} where K = (pH)2 for a pH less than 6.5

³ Chromium (VI) maximum is 1.0 ug/l and Chromium (III) maximum is 8.9 ug/L

⁴ Thallium - 1.7 ug/L human health, consumption of water + organism and 6.3 ug/L human health, consumption of organism only

⁵ Dissolved Cadmium is hardness dependent. Lower bound for long term average guideline exposure is 0.0000176 mg/L and the upper bound is 0.000457 mg/L.

(Cl) Chloride dependent guideline

(H) Hardness dependent guideline

(pH) pH dependent guideline

(T) Temperature dependent guideline

n.g. No guideline

GWB Groundwater background

ST Source terms

* Scenario A: Base Case, Post-closure (25 years pulse from control pond already discharged).

** Scenario B: Base Case, 1st 25 years of Post-closure period (incl. steady state discharges from control pond).

Format exceedances:

0.001 red fill, red font correspond to concentrations exceeding BC fresh water quality guideline.

0.01 red fill, red bold and larger font corresponds to concentrations exceeding BC fresh water quality guideline and the 95th percentile of the background concentrationse monitored during baseline conditions.

Estimation of the base case croundwater baseflow quality at WQS06US, Goathorn Creek

1- Groundwater contributions at WQS06US, Goathorn Creek

(Base Case, Post-closure, Affected area: 8.9% of the RSA)

ID	% Baseflow Bckgrnd	% Baseflow Mine	Detailed distribution of mine affected baseflow					
			NMP	EMP	WMP-In	TCP	PL 909	SWR 901
			%	%	%	%	%	%
Post-closure	100.0%	0.0%						
Pulse TCL 25y ⁽¹⁾	100.0%	0.0%						

Note: Modelled WQS09 GW'shed corresponds only to the southern contribution from the valley.

¹ Scenario evaluating maximum potential influence from TCL after post-closure (25 year pulse from TCL).

It assumes TCL discharges contributions of mine contact water on long term (i.e., steady state) even if it has been decomissioned at EOM..

2- Observed and precicted groundwater quality at WQS06US, Goathorn Creek

Parameter	Detection Limit ¹ (mg/L)	BC WQG FAL				Groundwater background (GWB) (Source: GWQuality_Summary_Stats_rev08_smh.xlsx)				Base Case Source Terms (ST) (Source: Results_MPSeepage_WaterQuality_EAModel_rev06_07072021.xlsm)						Baseflow quality at WQS06US: Scenario A *		Baseflow quality at WQS06US: Scenario B **				
		Screening parameter	Approved guidelines (mg/L)	Working guidelines (mg/L)	Screening value (mg/L)	Overburden		Bedrock		Control Pond Avg. Winter	NMP		EMP Avg. Winter	WMP Avg. Winter	Pit lake 909masl Avg. Winter	Saturated WR 901masl Avg. Winter	GWB: OVB P50	GWB: BDR P50	GWB: OVB P50	GWB: BDR P50		
						P50	P95	P50	P95		Avg. Winter	Avg. Winter					Avg. Winter	Avg. Winter	ST: Avg. Winter	ST: Avg. Winter	ST: Avg. Winter	ST: Avg. Winter
Anions and Nitrogen																						
Ammonia, Total (as N)	0.0050	Ammonia, Total (as N)	0.681-28.7 ^(pH,T)	n.g.	1	0.025	0.610	0.320	0.690	0.440	0.049	0.048	0.200	0.001	0.073	0.025	0.320	0.025	0.320			
Chloride (Cl)	0.50	Chloride (Cl)	600.00	n.g.	600	0.5	3.3	2.5	10.0	15.0	6.9	2.6	19.0	3.4	18.0	0.5	2.5	0.5	2.5			
Fluoride (F)	0.020	Fluoride (F)	0.4-2.0 ^(H)	n.g.	0.4	0.13	0.35	1.50	5.10	0.09	0.07	0.00	0.08	0.01	0.17	0.13	1.50	0.13	1.50			
Nitrate (as N)	0.0050	Nitrate (as N)	32.80	n.g.	33	0.01	0.17	0.03	0.16	3.30	0.17	0.38	1.30	0.01	0.02	0.01	0.03	0.01	0.03			
Nitrite (as N)	0.0010	Nitrite (as N)	0.06 ^(C)	n.g.	0.06	0.001	0.005	0.005	0.020	0.076	0.005	0.009	0.030	0.000	0.002	0.001	0.005	0.001	0.005			
Sulfate (SO4)	0.50	Sulfate (SO4)	100.00	n.g.	100	11.0	42.0	6.0	75.0	330.0	140.0	61.0	430.0	74.0	380.0	11.0	6.0	11.0	6.0			
Dissolved Metals																						
Aluminum (Al)-Dissolved	0.0050	Aluminum (Al)-Dissolved	0.10 ^{(pH)(2)}	n.g.	0.10	0.005	0.034	0.009	0.100	0.065	0.013	0.049	0.150	0.004	0.007	0.005	0.009	0.005	0.009			
Arsenic (As)-Dissolved	0.00050	Arsenic (As)-Total	0.01	n.g.	0.01	0.00081	0.01100	0.0006	0.0020	0.0062	0.0027	0.0010	0.0076	0.0014	0.0073	0.0008	0.0006	0.0008	0.0006			
Barium (Ba)-Dissolved	0.020	Barium (Ba)-Total	n.g.	5.00	5	0.093	0.250	0.330	3.600	0.057	0.029	0.013	0.049	0.010	0.060	0.093	0.330	0.093	0.330			
Beryllium (Be)-Dissolved	0.0010	Beryllium (Be)-Total	n.g.	0.01	0.01	0.0001	0.0002	0.0001	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001			
Boron (B)-Dissolved	0.10	Boron (B)-Total	1.20	n.g.	1.2	0.10	0.10	0.16	0.34	0.26	0.12	0.04	0.33	0.06	0.32	0.10	0.16	0.10	0.16			
Cadmium (Cd)-Dissolved	0.00001	Cadmium (Cd)-Dissolved	0.0000176-0.000457 ^{(H)(5)}	n.g.	0.0000176	0.00002	0.00027	0.00001	0.00160	0.00025	0.00007	0.00010	0.00041	0.00006	0.00014	0.00002	0.00001	0.00002	0.00001			
Chromium (Cr)-Dissolved	0.0010	Chromium (Cr)-Total	n.g.	0.001 or 0.0089 ³	0.001	0.001	0.001	0.001	0.002	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.001			
Cobalt (Co)-Dissolved	0.00030	Cobalt (Co)-Total	0.11	n.g.	0.11	0.000	0.004	0.000	0.003	0.011	0.005	0.002	0.014	0.002	0.013	0.000	0.000	0.000	0.000			
Copper (Cu)-Dissolved	0.0010	Copper (Cu)-Total	0.002 - 0.026 ^(H)	n.g.	0.002	0.0010	0.0050	0.0010	0.0039	0.0025	0.0010	0.0005	0.0026	0.0006	0.0024	0.0010	0.0010	0.0010	0.0010			
Iron (Fe)-Dissolved	0.030	Iron (Fe)-Dissolved	0.35	n.g.	0.35	0.0300	0.0990	0.0650	0.5900	0.0360	0.0120	0.0190	0.0640	0.0032	0.0190	0.0300	0.0650	0.0300	0.0650			
Lead (Pb)-Dissolved	0.00050	Lead (Pb)-Total	0.003 - 0.33 ^(H)	n.g.	0.003	0.0005	0.0009	0.0005	0.0010	0.0004	0.0002	0.0001	0.0006	0.0001	0.0004	0.0005	0.0005	0.0005	0.0005			
Lithium (Li)-Dissolved	0.0050	Lithium (Li)-Total	n.g.	0.87	0.87	0.003	0.007	0.050	0.100	0.130	0.056	0.022	0.160	0.028	0.150	0.003	0.050	0.003	0.050			
Manganese (Mn)-Dissolved	0.00030	Manganese (Mn)-Total	0.80-3.80 ^(H)	n.g.	0.80	0.05200	0.57000	0.01700	0.25000	0.01500	0.00650	0.00520	0.02500	0.00210	0.01400	0.05200	0.01700	0.05200	0.01700			
Molybdenum (Mo)-Dissolved	0.0010	Molybdenum (Mo)-Total	2.00	n.g.	2	0.0010	0.0150	0.0010	0.0150	0.0210	0.0087	0.0034	0.0240	0.0050	0.0230	0.0010	0.0010	0.0010	0.0010			
Nickel (Ni)-Dissolved	0.0010	Nickel (Ni)-Total	n.g.	0.025 - 0.180 ^(H)	0.025	0.001	0.017	0.001	0.005	0.017	0.008	0.003	0.022	0.004	0.020	0.001	0.001	0.001	0.001			
Potassium (K)-Dissolved	2.0	Potassium (K)-Total	n.g.	373-432	373	2.00000	2.00000	2.00000	3.50000	11.00000	4.90000	1.70000	13.00000	2.50000	13.00000	2.00000	2.00000	2.00000	2.00000			
Selenium (Se)-Dissolved	0.00010	Selenium (Se)-Total	0.00	n.g.	0.002	0.000200	0.000960	0.000140	0.001000	0.014000	0.006100	0.002300	0.018000	0.003200	0.016000	0.000200	0.000140	0.000200	0.000140			
Silver (Ag)-Dissolved	0.000020	Silver (Ag)-Total	0.0001-0.003 ^(H)	n.g.	0.0001	0.0000	0.0003	0.0000	0.0001	0.0002	0.0000	0.0001	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
Uranium (U)-Dissolved	0.00020	Uranium (U)-Total	n.g.	0.30	0.30	0.00110	0.00320	0.00040	0.00710	0.00086	0.00039	0.00020	0.00110	0.00018	0.00093	0.00110	0.00040	0.00110	0.00040			
Zinc (Zn)-Dissolved	0.0050	Zinc (Zn)-Total	0.033-0.265 ^(H)	n.g.	0.033	0.005000	0.012000	0.005000	0.011000	0.011000	0.004900	0.001800	0.013000	0.002400	0.013000	0.005000	0.005000	0.005000	0.005000			

Notes:

BCWQG BC Water Quality Guidelines

Maximum concentrations for Freshwater Aquatic Life

(-) Not applicable

¹ Lowest reported detection limit listed

² Dissolved Aluminum is pH dependent. 100 ug/L for a pH greater than or equal to 6.5 and e ^{(1.209 - 2.426 (pH) + 0.286K)} where K = (pH)2 for a pH less than 6.5

³ Chromium (VI) maximum is 1.0 ug/l and Chromium (III) maximum is 8.9 ug/L

⁴ Thallium - 1.7 ug/L human health, consumption of water + organism and 6.3 ug/L human health, consumption of organism only

⁵ Dissolved Cadmium is hardness dependent. Lower bound for long term average guideline exposure is 0.0000176 mg/L and the upper bound is 0.000457 mg/L.

(Cl) Chloride dependent guideline

(H) Hardness dependent guideline

(pH) pH dependent guideline

(T) Temperature dependent guideline

n.g. No guideline

GWB Groundwater background

ST Source terms

* Scenario A: Base Case, Post-closure (25 years pulse from control pond already discharged).

** Scenario B: Base Case, 1st 25 years of Post-closure period (incl. steady state discharges from control pond).

Format exceedances:

0.001 red fill, red font correspond to concentrations exceeding BC fresh water quality guideline.

0.01 red fill, red bold and larger font corresponds to concentrations exceeding BC fresh water quality guideline and the 95th percentile of the background concentrationse monitored during baseline conditions.

Estimation of the base case croundwater baseflow quality at WQS06, Goathorn Creek

1- Groundwater contributions at WQS06, Goathorn Creek

(Base Case, Post-closure, Affected area: 9.8% of the RSA)

ID	% Baseflow Bckgrnd	% Baseflow Mine	Detailed distribution of mine affected baseflow					
			NMP	EMP	WMP-In	TCP	PL 909	SWR 901
			%	%	%	%	%	%
Post-closure	98.1%	1.9%		100.0%				
Pulse TCL 25y ⁽¹⁾	98.1%	1.9%		100.0%				

Note: Modelled WQS09 GW'shed corresponds only to the southern contribution from the valley.

¹ Scenario evaluating maximum potential influence from TCL after post-closure (25 year pulse from TCL).

It assumes TCL discharges contributions of mine contact water on long term (i.e., steady state) even if it has been decomissioned at EOM..

2- Observed and precicted groundwater quality at WQS06, Goathorn Creek

Parameter	Detection Limit ¹ (mg/L)	BC WQG FAL				Groundwater background (GWB) (Source: GWQuality_Summary_Stats_rev08_smh.xlsx)				Base Case Source Terms (ST) (Source: Results_MPSeepage_WaterQuality_EAModel_rev06_07072021.xlsm)						Baseflow quality at WQS06: Scenario A *		Baseflow quality at WQS06: Scenario B **				
		Screening parameter	Approved guidelines (mg/L)	Working guidelines (mg/L)	Screening value (mg/L)	Overburden		Bedrock		Control Pond Avg. Winter	NMP		EMP Avg. Winter	WMP Avg. Winter	Pit lake 909masl Avg. Winter	Saturated WR 901masl Avg. Winter	GWB: OVB P50	GWB: BDR P50	GWB: OVB P50	GWB: BDR P50		
						P50	P95	P50	P95		Avg. Winter	Avg. Winter					Avg. Winter	Avg. Winter	ST: Avg. Winter	ST: Avg. Winter	ST: Avg. Winter	ST: Avg. Winter
Anions and Nitrogen																						
Ammonia, Total (as N)	0.0050	Ammonia, Total (as N)	0.681-28.7 ^(pH,T)	n.g.	1	0.025	0.610	0.320	0.690	0.440	0.049	0.048	0.200	0.001	0.073	0.025	0.315	0.025	0.315			
Chloride (Cl)	0.50	Chloride (Cl)	600.00	n.g.	600	0.5	3.3	2.5	10.0	15.0	6.9	2.6	19.0	3.4	18.0	0.6	2.5	0.6	2.5			
Fluoride (F)	0.020	Fluoride (F)	0.4-2.0 ^(H)	n.g.	0.4	0.13	0.35	1.50	5.10	0.09	0.07	0.00	0.08	0.01	0.17	0.13	1.47	0.13	1.47			
Nitrate (as N)	0.0050	Nitrate (as N)	32.80	n.g.	33	0.01	0.17	0.03	0.16	3.30	0.17	0.38	1.30	0.01	0.02	0.01	0.03	0.01	0.03			
Nitrite (as N)	0.0010	Nitrite (as N)	0.06 ^(C)	n.g.	0.06	0.001	0.005	0.005	0.020	0.076	0.005	0.009	0.030	0.000	0.002	0.001	0.005	0.001	0.005			
Sulfate (SO4)	0.50	Sulfate (SO4)	100.00	n.g.	100	11.0	42.0	6.0	75.0	330.0	140.0	61.0	430.0	74.0	380.0	11.9	7.0	11.9	7.0			
Dissolved Metals																						
Aluminum (Al)-Dissolved	0.0050	Aluminum (Al)-Dissolved	0.10 ^{(pH)(2)}	n.g.	0.10	0.005	0.034	0.009	0.100	0.065	0.013	0.049	0.150	0.004	0.007	0.006	0.009	0.006	0.009			
Arsenic (As)-Dissolved	0.00050	Arsenic (As)-Total	0.01	n.g.	0.01	0.00081	0.01100	0.0006	0.0020	0.0062	0.0027	0.0010	0.0076	0.0014	0.0073	0.0008	0.0006	0.0008	0.0006			
Barium (Ba)-Dissolved	0.020	Barium (Ba)-Total	n.g.	5.00	5	0.093	0.250	0.330	3.600	0.057	0.029	0.013	0.049	0.010	0.060	0.092	0.324	0.092	0.324			
Beryllium (Be)-Dissolved	0.0010	Beryllium (Be)-Total	n.g.	0.01	0.01	0.0001	0.0002	0.0001	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001			
Boron (B)-Dissolved	0.10	Boron (B)-Total	1.20	n.g.	1.2	0.10	0.10	0.16	0.34	0.26	0.12	0.04	0.33	0.06	0.32	0.10	0.16	0.10	0.16			
Cadmium (Cd)-Dissolved	0.00001	Cadmium (Cd)-Dissolved	0.0000176-0.000457 ^{(H)(5)}	n.g.	0.0000176	0.00002	0.00027	0.00001	0.00160	0.00025	0.00007	0.00010	0.00041	0.00006	0.00014	0.00002	0.00001	0.00002	0.00001			
Chromium (Cr)-Dissolved	0.0010	Chromium (Cr)-Total	n.g.	0.001 or 0.0089 ³	0.001	0.001	0.001	0.001	0.002	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.001			
Cobalt (Co)-Dissolved	0.00030	Cobalt (Co)-Total	0.11	n.g.	0.11	0.000	0.004	0.000	0.003	0.011	0.005	0.002	0.014	0.002	0.013	0.000	0.000	0.000	0.000			
Copper (Cu)-Dissolved	0.0010	Copper (Cu)-Total	0.002 - 0.026 ^(H)	n.g.	0.002	0.0010	0.0050	0.0010	0.0039	0.0025	0.0010	0.0005	0.0026	0.0006	0.0024	0.0010	0.0010	0.0010	0.0010			
Iron (Fe)-Dissolved	0.030	Iron (Fe)-Dissolved	0.35	n.g.	0.35	0.0300	0.0990	0.0650	0.5900	0.0360	0.0120	0.0190	0.0640	0.0032	0.0190	0.0298	0.0641	0.0298	0.0641			
Lead (Pb)-Dissolved	0.00050	Lead (Pb)-Total	0.003 - 0.33 ^(H)	n.g.	0.003	0.0005	0.0009	0.0005	0.0010	0.0004	0.0002	0.0001	0.0006	0.0001	0.0004	0.0005	0.0005	0.0005	0.0005			
Lithium (Li)-Dissolved	0.0050	Lithium (Li)-Total	n.g.	0.87	0.87	0.003	0.007	0.050	0.100	0.130	0.056	0.022	0.160	0.028	0.150	0.003	0.049	0.003	0.049			
Manganese (Mn)-Dissolved	0.00030	Manganese (Mn)-Total	0.80-3.80 ^(H)	n.g.	0.80	0.05200	0.57000	0.01700	0.25000	0.01500	0.00650	0.00520	0.02500	0.00210	0.01400	0.05113	0.01678	0.05113	0.01678			
Molybdenum (Mo)-Dissolved	0.0010	Molybdenum (Mo)-Total	2.00	n.g.	2	0.0010	0.0150	0.0010	0.0150	0.0210	0.0087	0.0034	0.0240	0.0050	0.0230	0.0010	0.0010	0.0010	0.0010			
Nickel (Ni)-Dissolved	0.0010	Nickel (Ni)-Total	n.g.	0.025 - 0.180 ^(H)	0.025	0.001	0.017	0.001	0.005	0.017	0.008	0.003	0.022	0.004	0.020	0.001	0.001	0.001	0.001			
Potassium (K)-Dissolved	2.0	Potassium (K)-Total	n.g.	373-432	373	2.00000	2.00000	2.00000	3.50000	11.00000	4.90000	1.70000	13.00000	2.50000	13.00000	1.99442	1.99442	1.99442	1.99442			
Selenium (Se)-Dissolved	0.00010	Selenium (Se)-Total	0.00	n.g.	0.002	0.000200	0.000960	0.000140	0.001000	0.014000	0.006100	0.002300	0.018000	0.003200	0.016000	0.000239	0.000180	0.000239	0.000180			
Silver (Ag)-Dissolved	0.000020	Silver (Ag)-Total	0.0001-0.003 ^(H)	n.g.	0.0001	0.0000	0.0003	0.0000	0.0001	0.0002	0.0000	0.0001	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000			
Uranium (U)-Dissolved	0.00020	Uranium (U)-Total	n.g.	0.30	0.30	0.00110	0.00320	0.00040	0.00710	0.00086	0.00039	0.00020	0.00110	0.00018	0.00093	0.00108	0.00040	0.00108	0.00040			
Zinc (Zn)-Dissolved	0.0050	Zinc (Zn)-Total	0.033-0.265 ^(H)	n.g.	0.033	0.005000	0.012000	0.005000	0.011000	0.011000	0.004900	0.001800	0.013000	0.002400	0.013000	0.004940	0.004940	0.004940	0.004940			

Notes:

BCWQG BC Water Quality Guidelines

Maximum concentrations for Freshwater Aquatic Life

(-) Not applicable

¹ Lowest reported detection limit listed

² Dissolved Aluminum is pH dependent. 100 ug/L for a pH greater than or equal to 6.5 and e ^{(1.209 - 2.426 (pH) + 0.286K)} where K = (pH)2 for a pH less than 6.5

³ Chromium (VI) maximum is 1.0 ug/l and Chromium (III) maximum is 8.9 ug/L

⁴ Thallium - 1.7 ug/L human health, consumption of water + organism and 6.3 ug/L human health, consumption of organism only

⁵ Dissolved Cadmium is hardness dependent. Lower bound for long term average guideline exposure is 0.0000176 mg/L and the upper bound is 0.000457 mg/L.

(Cl) Chloride dependent guideline

(H) Hardness dependent guideline

(pH) pH dependent guideline

(T) Temperature dependent guideline

n.g. No guideline

GWB Groundwater background

ST Source terms

* Scenario A: Base Case, Post-closure (25 years pulse from control pond already discharged).

** Scenario B: Base Case, 1st 25 years of Post-closure period (incl. steady state discharges from control pond).

Format exceedances:

0.001 red fill, red font correspond to concentrations exceeding BC fresh water quality guideline.

0.01 red fill, red bold and larger font corresponds to concentrations exceeding BC fresh water quality guideline and the 95th percentile of the background concentrationse monitored during baseline conditions.

Estimation of the base case croundwater baseflow quality at WQS05, Goathorn Creek

1- Groundwater contributions at WQS05, Goathorn Creek

(Base Case, Post-closure, Affected area: 14.9% of the RSA)

ID	% Baseflow Bckgrnd	% Baseflow Mine	Detailed distribution of mine affected baseflow					
			NMP	EMP	WMP-In	TCP	PL 909	SWR 901
			%	%	%	%	%	%
Post-closure	95.2%	4.8%	11.6%	32.3%	55.6%			0.5%
Pulse TCL 25y ⁽¹⁾	94.9%	5.1%	11.1%	30.9%	53.2%	4.3%		0.5%

Note: Modelled WQS09 GW'shed corresponds only to the southern contribution from the valley.

¹ Scenario evaluating maximum potential influence from TCL after post-closure (25 year pulse from TCL).

It assumes TCL discharges contributions of mine contact water on long term (i.e., steady state) even if it has been decomissioned at EOM..

2- Observed and precicted groundwater quality at WQS05, Goathorn Creek

Parameter	Detection Limit ¹ (mg/L)	BC WQG FAL				Groundwater background (GWB) (Source: GWQuality_Summary_Stats_rev08_smh.xlsx)				Base Case Source Terms (ST) (Source: Results_MPSeepage_WaterQuality_EAModel_rev06_07072021.xlsm)						Baseflow quality at WQS05: Scenario A *		Baseflow quality at WQS05: Scenario B **		
		Screening parameter	Approved guidelines (mg/L)	Working guidelines (mg/L)	Screening value (mg/L)	Overburden		Bedrock		Control Pond Avg. Winter	NMP		EMP Avg. Winter	WMP Avg. Winter	Pit lake 909masl Avg. Winter	Saturated WR 901masl Avg. Winter	GWB: OVB P50 ST: Avg. Winter	GWB: BDR P50 ST: Avg. Winter	GWB: OVB P50 ST: Avg. Winter	GWB: BDR P50 ST: Avg. Winter
						P50	P95	P50	P95		Avg. Winter	Avg. Winter								
Anions and Nitrogen																				
Ammonia, Total (as N)	0.0050	Ammonia, Total (as N)	0.681-28.7 ^(pH,T)	n.g.	1	0.025	0.610	0.320	0.690	0.440	0.049	0.048	0.200	0.001	0.073	0.030	0.311	0.031	0.311	
Chloride (Cl)	0.50	Chloride (Cl)	600.00	n.g.	600	0.5	3.3	2.5	10.0	15.0	6.9	2.6	19.0	3.4	18.0	1.1	3.0	1.1	3.0	
Fluoride (F)	0.020	Fluoride (F)	0.4-2.0 ^(H)	n.g.	0.4	0.13	0.35	1.50	5.10	0.09	0.07	0.00	0.08	0.01	0.17	0.13	1.43	0.13	1.43	
Nitrate (as N)	0.0050	Nitrate (as N)	32.80	n.g.	33	0.01	0.17	0.03	0.16	3.30	0.17	0.38	1.30	0.01	0.02	0.05	0.07	0.05	0.07	
Nitrite (as N)	0.0010	Nitrite (as N)	0.06 ^(C)	n.g.	0.06	0.001	0.005	0.005	0.020	0.076	0.005	0.009	0.030	0.000	0.002	0.002	0.006	0.002	0.006	
Sulfate (SO4)	0.50	Sulfate (SO4)	100.00	n.g.	100	11.0	42.0	6.0	75.0	330.0	140.0	61.0	430.0	74.0	380.0	23.9	19.1	24.5	19.8	
Dissolved Metals																				
Aluminum (Al)-Dissolved	0.0050	Aluminum (Al)-Dissolved	0.10 ^{(pH)(2)}	n.g.	0.10	0.005	0.034	0.009	0.100	0.065	0.013	0.049	0.150	0.004	0.007	0.010	0.013	0.010	0.013	
Arsenic (As)-Dissolved	0.00050	Arsenic (As)-Total	0.01	n.g.	0.01	0.00081	0.01100	0.0006	0.0020	0.0062	0.0027	0.0010	0.0076	0.0014	0.0073	0.0010	0.0008	0.0010	0.0008	
Barium (Ba)-Dissolved	0.020	Barium (Ba)-Total	n.g.	5.00	5	0.093	0.250	0.330	3.600	0.057	0.029	0.013	0.049	0.010	0.060	0.090	0.316	0.090	0.315	
Beryllium (Be)-Dissolved	0.0010	Beryllium (Be)-Total	n.g.	0.01	0.01	0.0001	0.0002	0.0001	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	
Boron (B)-Dissolved	0.10	Boron (B)-Total	1.20	n.g.	1.2	0.10	0.10	0.16	0.34	0.26	0.12	0.04	0.33	0.06	0.32	0.11	0.16	0.11	0.16	
Cadmium (Cd)-Dissolved	0.00001	Cadmium (Cd)-Dissolved	0.0000176-0.000457 ^{(H)(5)}	n.g.	0.0000176	0.00002	0.00027	0.00001	0.00160	0.00025	0.00007	0.00010	0.00041	0.00006	0.00014	0.00003	0.00002	0.00003	0.00002	
Chromium (Cr)-Dissolved	0.0010	Chromium (Cr)-Total	n.g.	0.001 or 0.0089 ³	0.001	0.001	0.001	0.001	0.002	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.001	
Cobalt (Co)-Dissolved	0.00030	Cobalt (Co)-Total	0.11	n.g.	0.11	0.000	0.004	0.000	0.003	0.011	0.005	0.002	0.014	0.002	0.013	0.001	0.001	0.001	0.001	
Copper (Cu)-Dissolved	0.0010	Copper (Cu)-Total	0.002 - 0.026 ^(H)	n.g.	0.002	0.0010	0.0050	0.0010	0.0039	0.0025	0.0010	0.0005	0.0026	0.0006	0.0024	0.0010	0.0010	0.0010	0.0010	
Iron (Fe)-Dissolved	0.030	Iron (Fe)-Dissolved	0.35	n.g.	0.35	0.0300	0.0990	0.0650	0.5900	0.0360	0.0120	0.0190	0.0640	0.0032	0.0190	0.0306	0.0639	0.0307	0.0639	
Lead (Pb)-Dissolved	0.00050	Lead (Pb)-Total	0.003 - 0.33 ^(H)	n.g.	0.003	0.0005	0.0009	0.0005	0.0010	0.0004	0.0002	0.0001	0.0006	0.0001	0.0004	0.0005	0.0005	0.0005	0.0005	
Lithium (Li)-Dissolved	0.0050	Lithium (Li)-Total	n.g.	0.87	0.87	0.003	0.007	0.050	0.100	0.130	0.056	0.022	0.160	0.028	0.150	0.008	0.053	0.008	0.053	
Manganese (Mn)-Dissolved	0.00030	Manganese (Mn)-Total	0.80-3.80 ^(H)	n.g.	0.80	0.05200	0.57000	0.01700	0.25000	0.01500	0.00650	0.00520	0.02500	0.00210	0.01400	0.05027	0.01697	0.05020	0.01697	
Molybdenum (Mo)-Dissolved	0.0010	Molybdenum (Mo)-Total	2.00	n.g.	2	0.0010	0.0150	0.0010	0.0150	0.0210	0.0087	0.0034	0.0240	0.0050	0.0230	0.0017	0.0017	0.0017	0.0017	
Nickel (Ni)-Dissolved	0.0010	Nickel (Ni)-Total	n.g.	0.025 - 0.180 ^(H)	0.025	0.001	0.017	0.001	0.005	0.017	0.008	0.003	0.022	0.004	0.020	0.002	0.002	0.002	0.002	
Potassium (K)-Dissolved	2.0	Potassium (K)-Total	n.g.	373-432	373	2.00000	2.00000	2.00000	3.50000	11.00000	4.90000	1.70000	13.00000	2.50000	13.00000	2.31067	2.31067	2.32934	2.32934	
Selenium (Se)-Dissolved	0.00010	Selenium (Se)-Total	0.00	n.g.	0.002	0.000200	0.000960	0.000140	0.001000	0.014000	0.006100	0.002300	0.018000	0.003200	0.016000	0.000750	0.000692	0.000778	0.000721	
Silver (Ag)-Dissolved	0.000020	Silver (Ag)-Total	0.0001-0.003 ^(H)	n.g.	0.0001	0.0000	0.0003	0.0000	0.0001	0.0002	0.0000	0.0001	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Uranium (U)-Dissolved	0.00020	Uranium (U)-Total	n.g.	0.30	0.30	0.00110	0.00320	0.00040	0.00710	0.00086	0.00039	0.00020	0.00110	0.00018	0.00093	0.00108	0.00042	0.00108	0.00042	
Zinc (Zn)-Dissolved	0.0050	Zinc (Zn)-Total	0.033-0.265 ^(H)	n.g.	0.033	0.005000	0.012000	0.005000	0.011000	0.011000	0.004900	0.001800	0.013000	0.002400	0.013000	0.005167	0.005167	0.005179	0.005179	

Notes:

BCWQG BC Water Quality Guidelines

Maximum concentrations for Freshwater Aquatic Life

(-) Not applicable

¹ Lowest reported detection limit listed

² Dissolved Aluminum is pH dependent. 100 ug/L for a pH greater than or equal to 6.5 and e ^{(1.209 - 2.426 (pH) + 0.286K)} where K = (pH)2 for a pH less than 6.5

³ Chromium (VI) maximum is 1.0 ug/l and Chromium (III) maximum is 8.9 ug/L

⁴ Thallium - 1.7 ug/L human health, consumption of water + organism and 6.3 ug/L human health, consumption of organism only

⁵ Dissolved Cadmium is hardness dependent. Lower bound for long term average guideline exposure is 0.0000176 mg/L and the upper bound is 0.000457 mg/L.

(Cl) Chloride dependent guideline

(H) Hardness dependent guideline

(pH) pH dependent guideline

(T) Temperature dependent guideline

n.g. No guideline

GWB Groundwater background

ST Source terms

* Scenario A: Base Case, Post-closure (25 years pulse from control pond already discharged).

** Scenario B: Base Case, 1st 25 years of Post-closure period (incl. steady state discharges from control pond).

Format exceedances:

0.001

red fill, red font correspond to concentrations exceeding BC fresh water quality guideline.

0.01

red fill, red bold and larger font corresponds to concentrations exceeding BC fresh water quality guideline and the 95th percentile of the background concentrationse monitored during baseline conditions.

Estimation of the base case croundwater baseflow quality at WQS09, Telkwa River

1- Groundwater contributions at WQS09, Telkwa River

(Base Case, Post-closure, Affected area: 92% of the RSA)

ID	% Baseflow Bckgrnd	% Baseflow Mine	Detailed distribution of mine affected baseflow					
			NMP	EMP	WMP-In	TCP	PL 909	SWR 901
			%	%	%	%	%	%
Post-closure	95.6%	4.4%	13.6%	31.6%	54.3%			0.5%
Pulse TCL 25y ⁽¹⁾	95.2%	4.8%	12.4%	28.8%	49.5%	8.8%		0.4%

Note: Modelled WQS09 GW'shed corresponds only to the southern contribution from the valley.

¹ Scenario evaluating maximum potential influence from TCL after post-closure (25 year pulse from TCL).

It assumes TCL discharges contributions of mine contact water on long term (i.e., steady state) even if it has been decomissioned at EOM..

2- Observed and precicted groundwater quality at WQS09, Telkwa River

Parameter	Detection Limit ¹ (mg/L)	BC WQG FAL				Groundwater background (GWB) (Source: GWQuality_Summary_Stats_rev08_smh.xlsx)				Base Case Source Terms (ST) (Source: Results_MPSeepage_WaterQuality_EAModel_rev06_07072021.xlsm)						Baseflow quality at WQS09: Scenario A *		Baseflow quality at WQS09: Scenario B **		
		Screening parameter	Approved guidelines (mg/L)	Working guidelines (mg/L)	Screening value (mg/L)	Overburden		Bedrock		Control Pond Avg. Winter	NMP		EMP Avg. Winter	WMP Avg. Winter	Pit lake 909masl Avg. Winter	Saturated WR 901masl Avg. Winter	GWB: OVB P50	GWB: BDR P50	GWB: OVB P50	GWB: BDR P50
						P50	P95	P50	P95		ST: Avg. Winter	ST: Avg. Winter					ST: Avg. Winter	ST: Avg. Winter		
Anions and Nitrogen																				
Ammonia, Total (as N)	0.0050	Ammonia, Total (as N)	0.681-28.7 ^(pH,T)	n.g.	1	0.025	0.610	0.320	0.690	0.440	0.049	0.048	0.200	0.001	0.073	0.030	0.312	0.031	0.312	
Chloride (Cl)	0.50	Chloride (Cl)	600.00	n.g.	600	0.5	3.3	2.5	10.0	15.0	6.9	2.6	19.0	3.4	18.0	1.0	2.9	1.1	3.0	
Fluoride (F)	0.020	Fluoride (F)	0.4-2.0 ^(H)	n.g.	0.4	0.13	0.35	1.50	5.10	0.09	0.07	0.00	0.08	0.01	0.17	0.13	1.44	0.13	1.43	
Nitrate (as N)	0.0050	Nitrate (as N)	32.80	n.g.	33	0.01	0.17	0.03	0.16	3.30	0.17	0.38	1.30	0.01	0.02	0.04	0.06	0.06	0.08	
Nitrite (as N)	0.0010	Nitrite (as N)	0.06 ^(C)	n.g.	0.06	0.001	0.005	0.005	0.020	0.076	0.005	0.009	0.030	0.000	0.002	0.002	0.006	0.002	0.006	
Sulfate (SO4)	0.50	Sulfate (SO4)	100.00	n.g.	100	11.0	42.0	6.0	75.0	330.0	140.0	61.0	430.0	74.0	380.0	22.7	17.9	24.0	19.2	
Dissolved Metals																				
Aluminum (Al)-Dissolved	0.0050	Aluminum (Al)-Dissolved	0.10 ^{(pH)(2)}	n.g.	0.10	0.005	0.034	0.009	0.100	0.065	0.013	0.049	0.150	0.004	0.007	0.009	0.013	0.009	0.013	
Arsenic (As)-Dissolved	0.00050	Arsenic (As)-Total	0.01	n.g.	0.01	0.00081	0.01100	0.0006	0.0020	0.0062	0.0027	0.0010	0.0076	0.0014	0.0073	0.0010	0.0008	0.0010	0.0008	
Barium (Ba)-Dissolved	0.020	Barium (Ba)-Total	n.g.	5.00	5	0.093	0.250	0.330	3.600	0.057	0.029	0.013	0.049	0.010	0.060	0.090	0.317	0.090	0.316	
Beryllium (Be)-Dissolved	0.0010	Beryllium (Be)-Total	n.g.	0.01	0.01	0.0001	0.0002	0.0001	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	
Boron (B)-Dissolved	0.10	Boron (B)-Total	1.20	n.g.	1.2	0.10	0.10	0.16	0.34	0.26	0.12	0.04	0.33	0.06	0.32	0.10	0.16	0.11	0.16	
Cadmium (Cd)-Dissolved	0.00001	Cadmium (Cd)-Dissolved	0.0000176-0.000457 ^{(H)(5)}	n.g.	0.0000176	0.00002	0.00027	0.00001	0.00160	0.00025	0.00007	0.00010	0.00041	0.00006	0.00014	0.00003	0.00002	0.00003	0.00002	
Chromium (Cr)-Dissolved	0.0010	Chromium (Cr)-Total	n.g.	0.001 or 0.0089 ³	0.001	0.001	0.001	0.001	0.002	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.001	0.001	0.001	
Cobalt (Co)-Dissolved	0.00030	Cobalt (Co)-Total	0.11	n.g.	0.11	0.000	0.004	0.000	0.003	0.011	0.005	0.002	0.014	0.002	0.013	0.001	0.001	0.001	0.001	
Copper (Cu)-Dissolved	0.0010	Copper (Cu)-Total	0.002 - 0.026 ^(H)	n.g.	0.002	0.0010	0.0050	0.0010	0.0039	0.0025	0.0010	0.0005	0.0026	0.0006	0.0024	0.0010	0.0010	0.0010	0.0010	
Iron (Fe)-Dissolved	0.030	Iron (Fe)-Dissolved	0.35	n.g.	0.35	0.0300	0.0990	0.0650	0.5900	0.0360	0.0120	0.0190	0.0640	0.0032	0.0190	0.0306	0.0640	0.0306	0.0639	
Lead (Pb)-Dissolved	0.00050	Lead (Pb)-Total	0.003 - 0.33 ^(H)	n.g.	0.003	0.0005	0.0009	0.0005	0.0010	0.0004	0.0002	0.0001	0.0006	0.0001	0.0004	0.0005	0.0005	0.0005	0.0005	
Lithium (Li)-Dissolved	0.0050	Lithium (Li)-Total	n.g.	0.87	0.87	0.003	0.007	0.050	0.100	0.130	0.056	0.022	0.160	0.028	0.150	0.007	0.052	0.008	0.053	
Manganese (Mn)-Dissolved	0.00030	Manganese (Mn)-Total	0.80-3.80 ^(H)	n.g.	0.80	0.05200	0.57000	0.01700	0.25000	0.01500	0.00650	0.00520	0.02500	0.00210	0.01400	0.05041	0.01696	0.05026	0.01695	
Molybdenum (Mo)-Dissolved	0.0010	Molybdenum (Mo)-Total	2.00	n.g.	2	0.0010	0.0150	0.0010	0.0150	0.0210	0.0087	0.0034	0.0240	0.0050	0.0230	0.0016	0.0016	0.0017	0.0017	
Nickel (Ni)-Dissolved	0.0010	Nickel (Ni)-Total	n.g.	0.025 - 0.180 ^(H)	0.025	0.001	0.017	0.001	0.005	0.017	0.008	0.003	0.022	0.004	0.020	0.002	0.002	0.002	0.002	
Potassium (K)-Dissolved	2.0	Potassium (K)-Total	n.g.	373-432	373	2.00000	2.00000	2.00000	3.50000	11.00000	4.90000	1.70000	13.00000	2.50000	13.00000	2.28108	2.28108	2.31829	2.31829	
Selenium (Se)-Dissolved	0.00010	Selenium (Se)-Total	0.00	n.g.	0.002	0.000200	0.000960	0.000140	0.001000	0.014000	0.006100	0.002300	0.018000	0.003200	0.016000	0.000698	0.000641	0.000755	0.000698	
Silver (Ag)-Dissolved	0.000020	Silver (Ag)-Total	0.0001-0.003 ^(H)	n.g.	0.0001	0.0000	0.0003	0.0000	0.0001	0.0002	0.0000	0.0001	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Uranium (U)-Dissolved	0.00020	Uranium (U)-Total	n.g.	0.30	0.30	0.00110	0.00320	0.00040	0.00710	0.00086	0.00039	0.00020	0.00110	0.00018	0.00093	0.00108	0.00041	0.00108	0.00042	
Zinc (Zn)-Dissolved	0.0050	Zinc (Zn)-Total	0.033-0.265 ^(H)	n.g.	0.033	0.005000	0.012000	0.005000	0.011000	0.011000	0.004900	0.001800	0.013000	0.002400	0.013000	0.005149	0.005149	0.005174	0.005174	

Notes:

BCWQG BC Water Quality Guidelines

Maximum concentrations for Freshwater Aquatic Life

(-) Not applicable

¹ Lowest reported detection limit listed

² Dissolved Aluminum is pH dependent. 100 ug/L for a pH greater than or equal to 6.5 and e ^{(1.209 - 2.426 (pH) + 0.286K)} where K = (pH)2 for a pH less than 6.5

³ Chromium (VI) maximum is 1.0 ug/l and Chromium (III) maximum is 8.9 ug/L

⁴ Thallium - 1.7 ug/L human health, consumption of water + organism and 6.3 ug/L human health, consumption of organism only

⁵ Dissolved Cadmium is hardness dependent. Lower bound for long term average guideline exposure is 0.0000176 mg/L and the upper bound is 0.000457 mg/L.

(Cl) Chloride dependent guideline

(H) Hardness dependent guideline

(pH) pH dependent guideline

(T) Temperature dependent guideline

n.g. No guideline

GWB Groundwater background

ST Source terms

* Scenario A: Base Case, Post-closure (25 years pulse from control pond already discharged).

** Scenario B: Base Case, 1st 25 years of Post-closure period (incl. steady state discharges from control pond).

Format exceedances:

0.001 red fill, red font correspond to concentrations exceeding BC fresh water quality guideline.

0.01 red fill, red bold and larger font corresponds to concentrations exceeding BC fresh water quality guideline and the 95th percentile of the background concentrationse monitored during baseline conditions.