The Technical Advisory Committee (TAC) for the Elk Valley Water Quality Plan (the "Plan") held their 7th meeting on July 8-10, 2014. This document is a record of the technical advice received after this meeting, and is Appendix B to the Meeting Notes.

The TAC process is structured around a review of work packages submitted to the TAC in advance of their meetings by Teck. These work packages relate to the analytical process that Teck is undertaking to inform decisions around the selection of water quality targets, management scenarios, and any additional monitoring and studies that will be included in the Plan. The advice in this table relates primarily to work packages that were reviewed and discussed at TAC Meeting #7.

Summary Table

Category	#	Description of "Technical Advice" from Mtg	Rationale
Human Health and Groundwater Chapter 5 Human Health	7B-1	Suggest replacing the term "conservative health-protective benchmarks" with the more commonly used "risk-based" benchmarks.	This is the commonly used term in Canada and BC to identify a benchmark established based on risk rather than generic default values. In this report, the unknowns include for example, fish consumption patterns, contaminant levels in backyard produce, contaminant levels in country foods, and locations of individual water supply intakes. Therefore, the benchmarks are established based on logical assumptions and therefore, are risk-based. The term "conservative health-protective benchmarks" is not clearly understood.
Human Health and Groundwater Chapter 5 Human Health Page 5-17	7B-2	Recommend assessing hardness using the calcium carbonate guideline (previously provided to ENVIRON). If impacts to the taste, odour and suitability of surface and groundwater from mining impacts is not provided in this section, please indicate where it is provided in the report.	As described in the Terms of Reference (TOR), protection of groundwater is an objective (Section 3.3 d). Aesthetic water quality guidelines are developed to protect the usefulness of water resources for multiple uses including domestic supply. The influences of mining activities on the quality of water used for domestic supply is an important aspect to understand as this may affect not only suitability of a source but also treatment costs as well as costs if alternate sources are required. There was discussion at TAC 6 that although hardness (measured as calcium carbonate) and sulphate would be assessed in groundwater and surface water, however this assessment may not be contained in the human health section. If not, please be clear where this assessment will be located in the report.
Water Quality Targets and Implementation Plan Chapter 8 Section 8.2.5	7B-3	**Plan Implementation:** Recommend that the effects of feeding inhibition of *D. magna* be considered in the cadmium assessment.	The Canadian Council of Ministers of the Environment (CCME) used the EC10 feeding inhibition endpoint as the most sensitive endpoint to create their guideline.

Summary Table			
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Memo: Evaluation of Phosphorus Loads on Upper Lake Koocanusa Trophic Status	7B-4	Recommend that the findings and conclusions are reviewed and analyses are re-run.	The memo states that "This memorandum presents an analysis of the potential for phosphorus discharge from the biological treatment facilities to affect the trophic status of Lake Koocanusa". However, the findings and conclusions are not substantiated by the analyses that were conducted and the data provided. The following are deficiencies found in this regards:
			• The title of the memo implies that phosphorus loading will be analyzed; however, there is very little loading data at all.
			  ○ There are no daily, monthly or yearly loading calculations.
			  ○ There is no calculation of current phosphorus loading from the Elk River to the lake, and no comparison to future increases in loading from the treatment process effluent.
			  ○ Table 2 provides estimated concentration data, but no loading data.
			• Equation 1 does not represent a mass balance; it is simply the cumulative addition of phosphorus concentration. This equation does not represent a method to determine Lake Koocanusa phosphorus concentration.
			The conclusion that "active water treatment using biological treatment technology and the associated phosphorus discharge will not change the trophic status of Lake Koocanusa" is unsubstantiated by the data provided. The methods used in this memo are not appropriate to make such a conclusion. Furthermore, phosphorus is only one component of determined trophic status. Lakes are complex systems and there are other physical, chemical and biological factors that influence trophic status that were not examined (i.e., Chl-a, secchi depth, nitrogen, N:P ratios, etc.).

Memo: Evaluation of Phosphorus Loads on Upper Lake Koocanusa Trophic Status	7B-5	Recommend using flow data and water quality from the same station at the mouth of the Elk River.	Flow data from Fernie will be quite different than flow data >60km downstream near Lake Koocanusa. Loading calculations will be vastly underrepresented as flows downstream will be greater than those upstream.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Memo: Evaluation of Phosphorus Loads on Upper Lake Koocanusa Trophic Status	7B-6	Recommend using in-situ phosphorus data from Lake Koocanusa rather than "calculated" data.	The assumption that phosphorus concentrations can be accurately calculated using river water concentrations is flawed. The lake is a complex system with a variety of physical, chemical and biological factors that influence water quality and trophic status. Water quality data exists for the lake, and that data should be used here.
Memo: Evaluation of Phosphorus Loads on Upper Lake Koocanusa Trophic Status	7B-7	Recommend providing clarification and rationale for why river flow is expressed as CMS/km^2 of drainage area.	River flow data should be compared directly to phosphorus concentration data. There is no need for area based normalization.
Memo: Evaluation of Phosphorus Loads on Upper Lake Koocanusa Trophic Status	7B-8	Recommend using spring phosphorus values (before stratification occurs) in analyses along with seasonal averages.	Spring phosphorus is a key component of analyzing trophic status for lakes with water residence times of >6 months. Refer to: Nordin, R.N. 1985. Water Quality Criteria for Nutrients and Algae – Technical Appendix. Water Management Branch, Ministry of Environment. Victoria BC. 104 pp.
Memo: Evaluation of Phosphorus Loads on Upper Lake Koocanusa Trophic Status	7B-9	Recommend using flow periods other than low flow conditions for loading analyses. Consider using actual flow conditions compared to actual concentrations, along with average and "worst-case" high flow conditions.	The use of low-flow conditions may be appropriate to determine localized impacts of effluent on a receiving environment, but is not appropriate when analyzing nutrient loads. Using low flow conditions severely underestimates the load of nutrients on downstream environments.
Memo: Evaluation of Phosphorus Loads on Upper Lake Koocanusa Trophic Status	7B-10	Recommend re-running the model using a Total cumulative approach for Discharge (by year and season) and total loadings vs. average conditions approach.	Average conditions do not represent the total loadings to the environment.
Memo: Evaluation of Phosphorus Loads on Upper Lake Koocanusa Trophic Status	7B-11	Recommend providing Effluent Q and P loading data and estimates	There is no data on the projected effluent loading (Q). This makes it impossible to review the model.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Memo: Evaluation of Phosphorus Loads on Upper Lake Koocanusa Trophic Status	7B-12	Recommend being specific on hydrologic summary terms and labels	Many graphs and tables omit specific unit labels (e.g., cms). It is difficult to review the model without knowledge of the units of specific variables and how those variables were calculated (i.e., Annual Avg, Critical Summer Season, growing season). It appears that the three WSC data were added together, but this is the reviewer's assumption, as it is not stated in the text. The report needs to provide more specifics for review.
Memo: Evaluation of Phosphorus Loads on Upper Lake Koocanusa Trophic Status	7B-13	Recommend being more specific on sample locations.	Cannot evaluate sample site vs. effect on loading (i.e., BC08NG008 is not shown on the map).
Memo: Evaluation of Phosphorus Loads on Upper Lake Koocanusa Trophic Status	7B-14	Recommend assessing of current concentration in the upper lake be done directly on the lake vs. the input streams which are far removed from the confluence to the lake	The sample locations appear to be far removed from the lake. What is the concentration in the lake on an annual and seasonal basis? What is the volume? How much P will be added yearly compared to what is resident in the lake?
Memo: Evaluation of Phosphorus Loads on Upper Lake Koocanusa Trophic Status	7B-15	Recommend the Mass balance equation (1), be clarified and data examples provided (i.e., effluent conc and Q's). Discuss why a simple comparison of Effluent Conc/ Discharge to River Q and Conc is not used.	The variables in the equation are not specified and the reviewer cannot determine why a simple comparison of Effluent Conc/ Discharge to River Q and Conc is not used. Why does the eqn roll the effluent Loadings and Q' into the mass balance vs using it separately for a comparison.
Memo: Evaluation of Phosphorus Loads on Upper Lake Koocanusa Trophic Status	7B-16	Provide rationale for the statistics used.	It is odd to break a distribution in half and have slopes running in two different directions on one graph. The significance of the regressions is not made available for the reviewer to adjudicate. Nor is the standard deviation or variance.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Memo: Evaluation of Phosphorus Loads on Upper Lake Koocanusa Trophic Status	7B-17	Recommend not lumping the WSC station discharges together in the model, but to model each separately in relation to effluent Q and Loadings.	Discharge is key to diluting effluent concentrations. By lumping discharge together a greater dilution ratio is created. It is impossible therefore for the review to adjudicate if certain parts of the tributaries to upper lake will exceed permissible P loadings.
Memo: Evaluation of Phosphorus Loads on Upper Lake Koocanusa Trophic Status	7B-18	Provide rationale as to why the 1 in 10 year flow is selected.	Report lacks a rationale as to why the derived 1 in 10 year statistic is used. Report states as it compares to 1979.
Memo: Evaluation of Phosphorus Loads on Upper Lake Koocanusa Trophic Status	7B-19	Recommend providing the ratios of flow / loadings of treated effluent to natural flow.	Treatment of 7500-30000 m#/day equates to roughly .090-.350 m3/s. The stated flow is 143 m3/s. It is more meaningful to draw comparison of overall loading and dilution to the environment.
Memo: Evaluation of Phosphorus Loads on Upper Lake Koocanusa Trophic Status	7B-20	Recommend that worked examples for table 2 and 3 (with data) be provided.	It is difficult to review the results provided without a more specific knowledge of how they were calculated.
Memo: Evaluation of Phosphorus Loads on Upper Lake Koocanusa Trophic Status	7B-21	Recommend the model be revised and made available for review again.	Much information on the model parameters and specifics were not available to reviewers in order to properly evaluate the model.
Annex E. Benchmark Derivation report for Selenium	7B-22	Recommend adding confidence intervals for benchmark concentrations for Selenium (Pg.6, Table 3-1)	Measures of uncertainty should always be included with estimates. Reporting confidence intervals will help when determining the uncertainty associated with the effects estimates.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Annex K.1 Synthesis Report	7B-23	Reorganize the Synthesis Report to present the relevant information on existing conditions in the watershed on a receptor-by-receptor basis. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The Terms of Reference of the EVWQP indicate that the plan will use the best available science to evaluate the impacts and cumulative effects of point and non-point sources of waste on water quality, aquatic biota, and human consumers. Currently, the Synthesis Report includes sections on a variety of topics (i.e., water quality, sediment quality, calcite, tissues chemistry), but does not provide a basis for evaluating effects or cumulative effects arising from single or multiple stressors. To do so, the report would be structured in a manner that is more consistent with the conceptual site model(s), whereby multiple lines-of-evidence would be used to evaluate the effects and potential effects for each receptor group. For example, the evaluation of effects on benthic invertebrates under current conditions should rely on data on surface water chemistry, surface water toxicity, sediment chemistry, sediment toxicity, benthic invertebrate community structure, stream-bed substrate composition, and calcite index.
Annex K.1 Synthesis Report	7B-24	Evaluate environmental quality conditions for all water bodies within the study area, including mine works, when considering bioaccumulative substances (such as selenium). *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	For toxic substances, it is reasonable to exclude mine works from the evaluation of current conditions. However, bioaccumulative contaminants have the potential to cause adverse effects on ecological receptors within the mine works when those areas represent an attractive nuisance for wildlife (e.g., Clode Pond). Therefore, the effects of bioaccumulative chemicals of potential concern (COPCs) need to be evaluated within such areas as part of the overall assessment of existing environmental conditions in the Elk Valley.
Annex K.1 Synthesis Report - Surface Water Quality	7B-25	Develop a table that identifies all of the potentially mining-influenced tributaries to the Elk and Fording Rivers (i.e., by management unit) and identifies the water quality sampling stations on each tributary. This table should also include sampling stations on the Elk River and the Fording River. The analyte groups that were measured at each station should also be identified (i.e., conventional variables, major ions, nutrients, metals, PAHs, others). *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The maps 3.1-2 to 3.1-7 provide useful information on the locations of surface water sampling stations within the study area. However, the reader also needs to understand the spatial extent of sampling stations relative to coal-mining activities. Accordingly, there is a need to provide a more complete understanding of the extent to which mining-influenced tributaries have been sampled. Such a table will provide a basis for identifying all the water bodies that have been influenced by mining activities in the Elk Valley.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Annex K.1 Synthesis Report - Surface Water Quality	7B-26	Include a table of the water quality guidelines (WQGs) that were used to screen surface-water chemistry data from the Elk Valley in the main body of the report. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The first step of the evaluation of existing surface water chemistry data involves screening against WQGs. The reader needs to know what WQGs were used in the screening process.
Annex K.1 Synthesis Report - Surface Water Quality	7B-27	Prior to initiating screening of the existing water quality data, the underlying surface-water chemistry data need to be evaluated to determine if minimum data requirements are met. To complete this step, minimum data requirements need to be established. Such minimum data requirements need to consider spatial coverage within the MU (i.e., all mining-influenced tributary and mainstem reaches need to have been sampled), temporal coverage (i.e., were the results of at least two 5-in-30 day sampling events available for each mining-influenced tributary and mainstem reach), and minimum number of samples per sampling location and analyte (e.g., at least 10 samples should be available for a location before using the results to screen out an analyte). *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	One of the key tenets of screening-level assessments is to avoid screening out analytes prematurely. To avoid doing so, it is important to ensure that enough data are available to provide a fulsome evaluation of water quality conditions. Establishment of minimum data requirements provides a transparent basis for ensuring that screening does not result in inappropriate elimination of analytes.
Annex K.1 Synthesis Report - Surface Water Quality	7B-28	Provide clear rationale for identifying primary and secondary chemicals of interest (CoIs) for each MU. In addition, describe the underlying rationale for the methods that were selected for identifying primary and secondary CoIs. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	In the second step of the surface-water evaluation process, median concentrations of CoIs were calculated and used to classify the CoIs into two categories, primary and secondary. The rationale for doing so is not provided in the draft document. Moreover, this step in the process is unnecessary and may result in screening out CoIs that should be included in the assessment of existing conditions in the Elk River watershed.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Annex K.1 Synthesis Report - Surface Water Quality	7B-29	In addition to reporting the frequency of exceedance of WQGs, calculate and report maximum hazard quotients based on a comparison of measured COPC concentrations to each of the selected WQGs for each sampling station in each MU. The results of this analysis need to be tabulated and presented in the text of the main report for all analytes. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Most of the underlying surface water chemistry data used in the evaluation of existing water quality conditions were obtained from grab samples collected on a monthly or less frequent basis. Therefore, all of these results (with the exception of samples collected as part of a 5-in-30 day sampling event) should be considered to represent mean monthly concentrations of the CoIs in surface water and should be compared to long-term WQGs. Hence, exceedance of a long-term WQG in one or more surface water samples represents a condition that could adversely affect aquatic organisms. This analysis will provide relevant information on current water quality conditions.
Annex K.1 Synthesis Report - Surface Water Quality	7B-30	Present the results of the analysis of reference water quality conditions in the main text of the report. This analysis needs to include a description of the criteria that were used to identify candidate reference stations and to evaluate the adequacy of candidate reference stations. In addition, the reference concentrations that were calculated for all analytes should be tabulated and presented in the main report. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	In the third step of the evaluation of surface-water chemistry data, the surface-water chemistry data from the study area are compared to reference concentrations of Constituents of Interest (CoIs). However, examination of the information presented at TAC-6 indicates that reference concentrations are not reported for most analytes in surface water. In addition, it appears that inappropriate procedures have been used to calculate reference concentrations. For example, reference concentrations of 18 NTU and 40 mg/L were reported for turbidity and total suspended solids (TSS), respectively. This is inappropriate because both analytes exhibit substantial temporal (i.e., high flow vs. low flow) and spatial (i.e., tributary vs. mainstem) variability (See Table 3.1-1). Therefore, it is inappropriate to calculate a single reference concentration for these variables. In addition, the reference concentrations presented in Table 3.1-3 appear to have been unduly affected by apparent outliers or data from inappropriate reference stations (e.g., selenium, copper, uranium, phenanthrene, pyrene). Selection of inappropriate reference concentrations has the potential to influence the results of the screen.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Annex K.1 Synthesis Report - Surface Water Quality	7B-31	Establish reference concentrations using data on the measured concentrations of Constituents of Interest (CoIs) in surface water only. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The available data on the concentrations of CoIs at reference stations includes both measured concentrations and non-detect results. Because high non-detect results have the potential to bias high the estimates of reference concentrations, it is essential to either eliminate non-detect data from the analysis prior to calculating reference concentrations or screen non-detect data for reference stations against Water Quality Guidelines (WQGs) prior to calculating reference concentrations (i.e., non-detect data with detection limits greater than WQGs should not be used to establish reference concentrations).
Annex K.1 Synthesis Report - Surface Water Quality	7B-32	Eliminate the evaluation of the frequency of exceedance of reference concentration (i.e., 10% of concentrations need to be greater than the reference concentration for a Constituent of Interest (CoI) to be carried forward) from the CoI refinement process. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The frequency of exceedance criterion has the potential to result in elimination of numerous CoIs that should be evaluated in the detailed evaluation. For example, ammonia in all Management Units (MUs), cadmium in MU-3, zinc in MU-3 and 4, cobalt, and uranium in MU-1. However, this approach completely ignores the magnitude of exceedance of the reference concentration.
Annex K.1 Synthesis Report - Surface Water Quality	7B-33	Conduct a sensitivity analysis by calculating flow-weighted average concentrations to represent reference conditions for the Elk River downstream of the confluence of the Fording River (represented by the average of GH_ER2 and FR_UFR1) and the Elk River downstream of the confluence of Michel Creek (represented by the average of GH_ER2, FR_UFR1, and CM_MC1). If applicable, incorporate the flow-weighted average concentrations into the background comparison analysis. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Background surface water concentrations estimated by taking the arithmetic mean of the background concentrations from multiple upstream locations may be over- or under-estimated depending on the differences in the flow conditions of each of the streams being incorporated in the average. Therefore the flow-weighted average concentrations may provide a better estimate of background conditions for stations that are influenced by multiple streams.

Summary Table			
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Annex K.1 Synthesis Report - Surface Water Quality	7B-34	Re-evaluate the list of CoIs that require detailed evaluation after revising the procedures for refining the CoI list, as described in Section 3.1.2 of the Synthesis Report. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The procedures that are described for CoI refinement (Section 3.1.2 of the Synthesis Report) are not appropriate. Application of these procedures will result in screening out a number of CoIs for various MUs and/or altogether. As the analysis of current water quality conditions needs to be robust and defensible, it is essential that the CoI refinement steps be repeated using more appropriate procedures.
Annex K.1 Synthesis Report - Surface Water Quality	7B-35	Any CoI that exceeds a WQG in two or more surface water samples from an MU needs to be evaluated in the detailed evaluation of water quality conditions. In addition, any analyte for which WQGs are not available or for which insufficient data are available to characterize concentrations in all mining-influenced tributaries and all mainstem stations need to be evaluated in the detailed evaluation. The total number of samples for which data exist for each analyte in each MU needs to be reported. In addition, tables that provide summary statistics for each analyte in each MU and for each analyte in the reference samples need to be included in the Synthesis Report (i.e., n, number samples with detected concentrations, minimum, maximum, mean, geomean, and 5th, 10th, 25th, 50th, 75th, 90th, and 95th percentiles). *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The procedures that are described in Section 3.2.1 for refining the list of CoIs appears to have the potential for inappropriate elimination of certain substances that could be adversely affecting water quality conditions in the study area. In addition, the results of the screening steps are not fully presented in the Synthesis Report (i.e., results are presented only for those analytes that exceeded WQGs or reference concentrations). Summary statistics are required to provide additional perspective on the screening-level analysis of the underlying water quality data.

Summary Table			
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Annex K.1 Synthesis Report - Surface Water Quality	7B-36	Evaluate the potential effects of cadmium using hardness-based WQGs, including the draft BC WQG that was recently released by BCMOE. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The Toxicology Work Group (TWG) (a working group of the Technical Advisory Committee) provided a number of recommendations regarding the evaluation of cadmium in the EVWQP. More specifically, the TWG recognized the inherent uncertainty in the application of a biotic ligand model (BLM) for cadmium because: 1. No numerical WQGs have been established in Canada using the BLM; 2. No numerical WQC have been established in the United States using the BLM; and, 3. No site-specific toxicity testing has been conducted to evaluate the applicability of the BLM for cadmium in the Elk Valley. Accordingly, it was agreed that evaluations of the potential effects of cadmium on aquatic organisms would be evaluated using hardness-normalized WQGs and the BLM for cadmium. Hence, the Synthesis Report needs to be revised to include an evaluation of the effects of cadmium using the hardness-normalized WQGs.
Annex K.1 Synthesis Report - Surface Water Quality	7B-37	The detailed evaluations of water quality conditions should be revised to report both the frequency of exceedance of the site-specific toxicity thresholds and the magnitude of exceedance of the site-specific toxicity thresholds. The results for tributary stations and for mainstem stations should be reported separately. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The evaluations of existing water quality conditions presented in Section 3.1.3 of the Synthesis Report are focused on determination of the number of stations within each MU that have exceedances (i.e., maximum and median concentrations) of the site-specific toxicity thresholds. While these results may provide relevant information for evaluating water quality conditions, they provide no information on the frequency or magnitude of exceedance of the selected toxicity thresholds. Because effects on aquatic organisms are likely to be influenced by both the frequency and magnitude of exceedance of the selected toxicity thresholds, the frequency and magnitude of exceedance of the toxicity thresholds need to be reported for each analyte at each station, then summed for all tributaries within an MU.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Annex K.1 Synthesis Report - Surface Water Quality	7B-38	Evaluate the potential effects of zinc on aquatic organisms using hardness-based WQGs. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	To date, there has been no discussion among the members of the TWG or the Technical Advisory Committee (TAC) regarding the application of a Biotic Ligand Model (BLM) to evaluate the effects of zinc on aquatic organisms. There is inherent uncertainty in the application of a BLM for zinc because: 1. No numerical WQGs have been established in Canada using a BLM for zinc; 2. No numerical WQC have been established in the United States using the BLM for zinc; and, 3. No site-specific toxicity testing has been conducted to evaluate the applicability of the BLM for zinc in the Elk Valley. Accordingly, evaluations of the potential effects of zinc on aquatic organisms should be evaluated using hardness-normalized WQGs for zinc. Hence, the Synthesis Report needs to be revised to include an evaluation of the effects of zinc using the hardness-normalized WQGs.
Annex K.1 Synthesis Report - Surface Water Quality	7B-39	Revise the Section of the Synthesis Report on toxicity tests (i.e., Section 3.1.4) to provide additional information on the toxicity tests that were conducted, on the number of samples that were tested, and on the limitations of the toxicity testing program. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The toxicity testing programs that were conducted in 2013 provide relevant information for evaluating current water quality conditions within the study area. However, the description of the toxicity testing that was done is insufficient to enable the reader to fully understand the work that was done or its implications. For example, while the species tested are identified in the text, the duration of exposure and endpoints measured are not. Therefore, this section of the report needs to be revised to provide more information on the studies that were conducted and the associated results.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Annex K.1 Synthesis Report - Surface Water Quality	7B-40	Revise Section 3.1.5.1 of the Synthesis Report to provide additional information on the sampling locations that are discussed, the magnitude of the exceedances of WQGs, and the forms of phosphorus that were evaluated. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Section 3.1.5.1 of the Synthesis Report describes the results of the evaluation of phosphorus in MU-6. Concentrations of phosphorus in the lake downstream of the Elk River are compared to the levels that were measured at an upstream location. However, the upstream station is not identified and it could be the lake station that is potentially influenced by phosphorus loadings from the Elk River. Therefore, comparisons should explicitly describe concentrations that were measured at Wardner. Currently, the discussion focuses on median concentrations at each station. However, it is also important to discuss ranges and distributions of phosphorus data when comparing stations. Furthermore, the current discussion does not describe the phosphorus species that was measured. Therefore, the discussion should describe the species that was measured (TP, TDP, OP) and discuss the limitations of the data for evaluating biologically-available phosphorus in the lake.
Annex K.1 Synthesis Report - Surface Water Quality	7B-41	The discussion of selenium concentrations in Lake Koocanusa (Section 3.1.5.2) needs to be revised to reflect the limitations of the data relative to comparison to the B.C. WQG for water and to reference concentrations. Because only monthly water quality data are available, each measurement should be compared to the WQG to evaluate attainment with WQGs. In addition, selenium concentrations in the lake should not be compared to the 95th percentile of reference locations. Rather, concentrations in the lake should be compared to data from the site at Wardner (minimum, maximum, mean, distributions). *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The long-term WQG for selenium in water is 2 µ/L. Attainment of the WQG is evaluated using the results of five surface water samples collected within a 30-d period. The WQG is not intended to be compared to a median concentration at any station or for multiple stations. Such comparisons provide a biased evaluation of water quality conditions in the lake.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Annex K.1 Synthesis Report - Surface Water Quality	7B-42	The conclusion that no constituents were classified as COPCs in Lake Koocanusa must be revised based on a more objective evaluation of water quality conditions in the lake. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The evaluation of water quality conditions in Lake Koocanusa was based on inappropriate statistical analysis of the data prior to comparison to WQGs. Because water samples collected on a monthly basis must be considered to represent average conditions for the month, the data for each monthly surface-water sampling result must be compared to the corresponding long-term WQG. In addition, the evaluation of water quality conditions in the lake relied on inappropriate comparisons of in-lake concentrations to pooled reference stations from the Elk River watershed and Lake Koocanusa. Because the Kootenay River and the Elk River represent the primary sources of surface water to the lake, data from the Elk River at the mouth and each sampling station in the lake must be compared to the data that were collected at Wardner. This will provide a more accurate evaluation of the influence of contaminant loadings from the Elk River on water quality conditions in Lake Koocanusa.
Annex K.1 Synthesis Report – Sediment Quality	7B-43	Develop and present a table that summarizes the sediment chemistry data for reference stations. This analysis needs to include a description of the criteria that were used to identify candidate reference stations and to evaluate the adequacy of candidate reference stations. In addition, the reference concentrations that were calculated for all analytes should be tabulated and presented in the main report. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The comparison of data from mining-influenced areas to reference area concentration data is a key step in the COPC identification process for sediments (i.e., as described in Section 3.2.2 of the Synthesis Report). However, the data that were used to calculate reference area concentrations were not presented in the main body of the Synthesis Report. For this reason, a summary of the reference area concentration data needs to be presented (i.e., minimum, mean, standard deviation, maximum, 5th, 10th, 25th, 50th, 75th, 90th, and 95th percentiles). Because inclusion of inappropriate reference stations can influence the reference area concentrations that are calculated, the selection criteria for reference stations needs to be fully described.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Annex K.1 Synthesis Report – Sediment Quality	7B-44	The reference area data should be screened (i.e., to remove samples with non-detected concentrations above the benchmarks) before they are used to estimate reference area concentrations for the various COPCs. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Based on the information presented in Table 3.2.4, most of the measurements of PAH concentrations in sediments from reference areas were less than the detection limit (<DL). Treatment of these <DL results can substantially influence the reference area concentrations that are estimated from the underlying data. Because a <DL should not be used to determine if a SQG has been exceeded unless the DL is lower than the SQG, <DL measurements with DLs that are greater than the interim sediment quality guideline (ISQG) should be eliminated from the data set prior to data analysis. After DL screening, the remaining data in the data set should be evaluated using an appropriate outlier analysis. Outliers should be removed from the data set prior to data analysis. Following screening, the remaining data should be evaluated to determine if sufficient data are available to calculate a reference area concentration (i.e., minimum of 10 samples).
Annex K.1 Synthesis Report – Sediment Quality	7B-45	Re-evaluate the COPCs following implementation of a more robust approach to the estimation of reference area concentrations. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Based on a review of the information presented in Section 3.2.2, a number of COPCs have been screened out of the assessment as a result of selecting inappropriate reference area concentrations (e.g., 1.78 mg/kg DW for phenanthrene). Therefore, the COPC refinement step needs to be repeated after more appropriate reference area concentrations have been estimated.
Annex K.1 Synthesis Report – Sediment Quality	7B-46	In Section 3.2.2.4, explicitly acknowledge the limitations of the toxicity test results in terms of evaluating the effects of sediment-associated COPCs on benthic invertebrates. In addition, the description of the toxicity testing results presented in Section 3.2.2.4 does not agree with Table 3.2.7 (i.e., text refers to testing at multiple stations per location, while the table does not). This discrepancy needs to be corrected. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Two toxicity tests were utilized to evaluate the toxicity of Elk Valley sediments to benthic invertebrates. In total, six sediment samples were tested, including two reference area samples, one mine workings sample, and three mining influenced samples. This represents an extremely limited data set for characterizing sediment toxicity in the study area. In addition, the two toxicity tests that were selected were of short duration and measured a limited number of endpoints. Therefore, the results of the toxicity testing conducted to date do not provide a basis for characterizing sediment toxicity in the study area.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Annex K.1 Synthesis Report – Sediment Quality	7B-47	Conduct long-term toxicity tests with midge (life-cycle) and amphipods (42-d) to evaluate sediment toxicity in future sediment quality assessments. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Benthic invertebrates are continuously exposed to sediment-associated contaminants throughout their life cycles. Such exposure to sediment-associated COPCs can adversely affect the survival, growth, biomass, and reproduction of benthic invertebrates. Accordingly, long-term toxicity tests that evaluate survival, growth, biomass, and reproduction need to be conducted to provide a basis for assessing effects on these receptors.
Annex K.1 Synthesis Report – Sediment Quality	7B-48	Revise the summary of the Elk River watershed evaluation of sediment quality conditions to provide a more balanced assessment of current conditions. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The text of Section 3.2.2.5 indicates that sediment quality conditions are generally acceptable throughout most of the study area. This conclusion is not supported by the existing data and information for several reasons. First, the available sediment chemistry data indicate that COPC concentrations consistently exceed ISQGs and frequently exceed probable effect levels (PELs; i.e., Cadmium, Nickel, fluorene, naphthalene, and phenanthrene). Hence, the concentrations of COPCs are frequently sufficient to adversely affect the survival, growth, biomass, and/or reproduction of benthic invertebrates. The magnitude of exceedance of the SQGs also needs to be considered in this evaluation (i.e., in addition to the frequency of exceedance). Second, limited short-term sediment toxicity data showed that the survival of benthic invertebrates was impaired in at least one exposure area. In addition, the toxicity tests did not evaluate effects in long-term exposures or effects on reproduction, rendering them of limited value for assessing sediment quality conditions. Third, the benthic invertebrate community structure data were not considered in the sediment quality assessment. Even with the insensitive methods that were used in the benthic invertebrate community structure analysis, impairment of the benthic invertebrate community was demonstrated at numerous locations throughout the Elk Valley. As benthic invertebrate communities are likely responding to multiple stressors, including sediment quality conditions, such data should have been used in the sediment quality assessment.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Annex K.1 Synthesis Report – Sediment Quality	7B-49	Describe the effects of stream-bed substrate composition on benthic invertebrates and fish in the Elk Valley. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The section of the report on sediment quality focuses on sediment chemistry and sediment toxicity. However, stream-bed substrate composition represents a key factor influencing egg-to-fry survival rates for salmonid fishes. In addition, stream-bed substrate composition can affect benthic invertebrate community structure and the abundance of benthic invertebrates. Therefore, there is a need to characterize existing conditions in the Elk Valley and describe the effects of sedimentation on these receptors.
Annex K.1 Synthesis Report – Sediment Quality	7B-50	Revise Section 3.2.3 of the Synthesis Report to explicitly describe the limitations of the existing data for evaluating sediment quality conditions in Lake Koocanusa. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Sediment chemistry was the only line of evidence used to evaluate sediment quality conditions in Lake Koocanusa. Based on the information presented in Table 3.2.8, the conclusion that sediments in the lake pose negligible potential for harm to aquatic biota is based on comparison of total metal concentrations in sediments to SQGs. The number of samples evaluated is not identified. In addition, the magnitude of the exceedances of SQGs is not described. Furthermore, no data are presented on the concentrations of PAHs in lake sediments. Importantly, no sediment toxicity, benthic invertebrate community structure, or sediment bioaccumulation data were presented for the lake. Therefore, the conclusion that was reached regarding sediment quality conditions in the lake is, at best, only very poorly supported by relevant and appropriate data. At worst, this conclusion is misleading and potentially wrong. At minimum, this section of the document must be revised to explicitly recognize the limitations in the available data and information.
Annex K.1 Synthesis Report – Calcite	7B-51	Use concretion status (CI C) as a primary metric for the evaluating effects of calcite on benthic invertebrates and fish. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The calcite index currently includes two metrics that are combined in the calculation. One of the metrics provides information on the presence/absence of calcite. The second metric provides information on embeddedness of the streambed substrate. The second metric (i.e., concretion status) is likely to be more biologically relevant than the first metric. Therefore, the concretion status alone (and other metrics) should be used to evaluate the potential effects of calcite on fish and invertebrates.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Annex K.1 Synthesis Report – Calcite	7B-52	Evaluations of the effects of calcite formation on stream-resident biota should include robust monitoring of habitat quality variables (including physical and chemical variables; e.g., intra-gravel DO, velocity, etc.) and biological effects (e.g., benthic invertebrate community structure and abundance; salmonid egg-to-fry survival rates; etc.). *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	To date, calcite monitoring has focused on determining the distribution and spatial extent of calcite formation. As such, no data have been generated on the effects of calcite on ecological receptors. This is a major limitation relative to evaluating the effects of calcite on benthic invertebrates, fish, and other aquatic organisms. This data gap also makes it difficult to evaluate the interactive effects of multiple stressors or the cumulative effects of anthropogenic activities.
Annex K.1 Synthesis Report – Periphyton	7B-53	Compile the available periphyton community structure data on a broad taxonomic basis, including green algae (Chlorophyta), blue-green algae (Cyanophyta), flagellate chrysophytes (Xanthophyceae and Chrysophyceae), diatoms (Bacillariophyceae), and other algae. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The existing periphyton community structure data appear to be limited value due to difficulties that the labs experience while sorting samples and identifying species. While these difficulties appear to limit the value of the benthic invertebrate community structure data, a more simplistic analysis may yield more useful results. For this reason, the existing data should be re-analysed to determine the relative abundance of major periphyton taxa.
Annex K.1 Synthesis Report – Benthic Invertebrates	7B-54	Detailed advice related to the collection and interpretation of benthic invertebrate samples was provided by KNC following TAC-5. It is not clear that this advice was considered during preparation of the Aquatic Synthesis Report. Therefore, the benthic invertebrate section of the report should be revised to incorporate the advice that was provided previously. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	There are numerous limitations to the underlying benthic invertebrate community structure data that were reported in the Aquatic Synthesis Report. In addition, the data analyses that were conducted are not at all transparent and do not appear to provide a sensitive basis for evaluating effects on benthic invertebrate communities within the study area.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Annex K.1 Synthesis Report – Benthic Invertebrates	7B-55	Present the tabulated results of the benthic invertebrate community structure assessment in the main body of the report. Present the results separately for the two years of sampling. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The description of the results of the benthic invertebrate community structure assessment does not appear to be supported by a tabulated summary of the available data. The text references Table 3.4-5; however, that table does not appear in the list of tables or in the tables themselves. Therefore, the description of community structure and health (Section 3.5.2) is not supported by data or the results of data analyses.
Annex K.1 Synthesis Report – Benthic Invertebrates	7B-56	In the tabulated results of the benthic community structure data, identify unaffected reference stations and reference stations that may have been affected by logging, road construction, or other anthropogenic activities. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	A reference envelope-type approach has been used to evaluate the benthic invertebrate community structure data that have been collected within the study area. The underlying assumption of this type of analysis is that benthic communities at reference locations represent conditions in areas that have not been adversely affected by mining or other human activities. However, benthic communities are known to respond to a number of stressors, including fine sediment that is mobilized by various activities within a watershed. Inclusion of "reference stations" that have been affected by non-mining-related activities expands the size of the reference envelope and decreases the power to detect mining-related effects. Therefore, it is essential that only appropriate reference sites are used to define reference conditions within the Elk Valley.
Annex K.1 Synthesis Report – Fish Tissue	7B-57	Present the dietary toxicity reference values (TRVs) for fish and aquatic-dependent birds in the main text of the Aquatic Synthesis Report. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The text of the report provided hazard quotients (HQs) that were calculated for fish or aquatic-dependent birds, using the selected dietary TRVs for fish and birds. However, these TRVs do not appear to be presented in the text of the report. Therefore, the TRVs that were selected for use in the screening-level assessment must be identified, along with the underlying rationale for their selection.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Annex K.1 Synthesis Report – Fish Tissue	7B-58	For the evaluation of Se fish tissue concentrations, change the "comparison to reference areas" to "comparison with non-mine influenced water bodies" with a disclaimer (i.e., footnote) stating that these sites have not been evaluated to determine if they are appropriate reference areas in terms of hydrological and biogeochemical similarity. *For additional context and Appendix 1 refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The concentrations of selenium in fish tissues from reference areas have been calculated and used in the tissue screening evaluation. While information on reference tissue concentrations can be relevant in assessments of fish tissue quality, there is substantial uncertainty in the estimates of reference concentrations of selenium in the Elk Valley (i.e., because fish are mobile and fish collected in reference areas may have been exposed to selenium in mine-affected areas. Therefore, comparison to reference selenium concentrations could inappropriately result in screening out species or areas that may be a concern from the standpoint of selenium bioaccumulation (Appendix 1).
Annex K.1 Synthesis Report – Fish Tissue	7B-59	Provide the additional rationale for selecting large-scale suckers (LSU) as sentinel species for evaluating mining-related effects on fish. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Although some rationale is provided for selecting LSU as a sentinel species, no information was provided on their potential to bioaccumulate selenium or to be responsive to other stressors associated with mining activities. Before selecting sentinel species, it is helpful to develop effects hypotheses. Such hypotheses are essential for identifying measurement endpoints (i.e., indicators and metrics) that can be used to evaluate mining-related effects. Currently, this type of linkage to the conceptual site model is missing from this section of the Aquatic Synthesis Report.
Annex K.1 Synthesis Report – Amphibians	7B-60	Present the dietary TRVs for amphibians in the text of the Aquatic Synthesis Report. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The text of the report provided HQs that were calculated for amphibians, using the selected dietary TRVs for fish. However, these TRVs do not appear to be presented in the text of the report. Therefore, the TRVs that were selected for use in the screening-level assessment must be identified, along with the underlying rationale for their selection.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Annex K.1 Synthesis Report – Amphibians	7B-61	For the evaluation of Se egg-mass concentrations, change "comparison to reference areas" to "comparison with non-mine influenced water bodies" with a disclaimer (i.e., footnote) stating that these sites have not been evaluated to determine if they are appropriate reference areas in terms of hydrological and biogeochemical similarity. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The concentrations of selenium in eggs from reference areas have been calculated and used in the tissue screening evaluation. While information on reference tissue concentrations can be relevant in assessments of tissue quality, there is substantial uncertainty in the estimates of reference concentrations of selenium in the Elk Valley.
Annex K.1 Synthesis Report – Evaluation of Environmental Quality	7B-62	Describe the data that were considered in the evaluation of environmental quality in the context of the CSM (i.e., describe the data that were used to evaluate effects on each receptor group). *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The text of the report generally describes the data that were used to evaluate environmental quality in the Elk Valley. However, this description is not linked to the CSM for the site or effects hypotheses. Therefore, the data that are directly relevant to each receptor group need to be identified and used to evaluate effects on that receptor group (e.g., surface-water chemistry data and periphyton community data are relevant for evaluating effects on periphyton). The evaluation of environmental quality is not useful for evaluating current conditions in the abstract.
Annex K.1 Synthesis Report – Evaluation of Environmental Quality	7B-63	Provide a more complete description of the water quality index (WQI) that was developed for use in the Elk Valley. Provide the rationale for altering the water quality classification system that was developed by the CCME (2001). *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	It appears that the site-specific WQI includes the site-specific water quality benchmarks that were developed during the EVWQP process. However, different water quality benchmarks were developed for each receptor group. Therefore, it would seem to be appropriate to develop a separate WQI for each of the receptor groups that are considered in the evaluation. It is not clear, from the description of the WQI provided, that multiple WQIs were developed and used in the assessment. Therefore more information is needed to fully describe the WQI and the rationale for its use in the assessment.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Annex K.1 Synthesis Report – Evaluation of Environmental Quality	7B-64	Eliminate the description of the approach for interpreting overall environmental quality by area within management units. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The approach to evaluating overall environmental quality by area within management units is not appropriate. To be useful, this evaluation needs to be conducted first on a receptor-by-receptor basis, where individual and then multiple stressors are evaluated. Subsequently, the results that were generated for each receptor group for the tributaries, for the off-channel habitats, and for the mainstem reaches within each MU can be discussed collectively. Finally, the results for all receptor groups can be discussed collectively. The current approach is not consistent with the CSM and does not provide a basis for evaluating effects hypotheses.
Annex K.1 Synthesis Report – Future Studies & Monitoring	7B-65	Revise the section of the report that indicates that there are no data gaps. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Although a substantial amount of information has been collected to support the evaluation of current conditions in the Elk Valley, it is incorrect to indicate that there are no major data gaps. Some of the key data gaps include (but are not limited to): 1. Distribution of freshwater mussels within the Elk River watershed, Lake Koocanusa, and appropriately selected reference areas; 2. Effects of contaminants associated with mining-activities on the survival, growth, and reproduction of freshwater mussels; 3. Effects of calcite formation and presence on the distribution and abundance of freshwater mussels; 4. Levels of selenium in the tissues of burbot in Lake Koocanusa; 5. Bioaccumulation of selenium in aquatic plants, aquatic invertebrates, and fish in Lake Koocanusa; 6. Effects of egg/ovary selenium on the reproduction of peamouth chub, burbot, and bulltrout; 7. Effects of nitrate on the survival, growth, and reproduction of mayflies; 8. Effects of multiple stressors and nutrient addition on periphyton abundance and community structure (i.e., at the highest taxonomic levels); 9. The effects of multiple stressors on the benthic invertebrate abundance and community structure; 10. The sensitivity of the CABIN-Reference Envelope Approach to benthic invertebrate community structure assessment; and, 11. Critical levels of aquatic plant nutrients in Lake Koocanusa. Therefore, the report needs to be revised to identify key data gaps that need to be addressed by future monitoring and supporting studies.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Draft Chapter 4 - EVWQP	7B-66	Revise Sections 4.3 and 4.4 of the EVWQP (i.e., Existing Data and Evaluation of Environmental Quality) based on the advice that was provided on the Aquatic Synthesis Report. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Detailed advice was provided to facilitate revision of the Aquatic Synthesis Report. This advice demonstrated that the data and approaches used to evaluate the existing status of surface water quality, sediment quality, periphyton communities, benthic invertebrate communities, fish communities, amphibian communities, and avian communities had limitations that needed to be addressed. As Sections 4.3 and 4.4 of the EVWQP are based, in large measure, on the Aquatic Synthesis Report, there is a need to revise this chapter of the Plan accordingly.
Draft Chapter 4 – EVWQP – Current Baseline Conditions	7B-67	Explicitly identify data gaps and uncertainties in Chapter 4 of the EVWQP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Data gaps and uncertainties associated with the evaluation of existing environmental conditions in the Elk Valley need to be explicitly identified to maintain transparency in the EVWQP process.
Draft Chapter 5 – EVWQP – Human Health & Groundwater	7B-68	Provide a clear and consistent rationale for the selection of guidelines and TRVs used in the human health evaluation. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	It is essential that the rationale for the selection of guidelines and TRVs is cleared documented in the evaluation. In addition, the procedures that were used to derive guidelines or TRVs need to be described to provide transparency in the evaluation process.
Draft Chapter 5 – EVWQP – Human Health & Groundwater	7B-69	Present the complete results of the screen that was conducted for surface water, sediments, and fish tissues. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The current evaluation presents the screening results for only those substances that exceeded the selected guidelines. The evaluation would be strengthened by including tabulated summaries for all media types that include all measured Constituent of Potential Concern (COPCs), maximum concentrations, the selected guideline, and associated hazard quotient (HQ). Substances for which no guidelines are available should be included in the tabulated summaries to ensure that uncertain COPCs are consistently identified. In addition, substances that could have been released into the environment (i.e., as identified using the Conceptual Site Model (CSM) for human health), but were not measured, need to be included in the summary and identified as uncertain COPCs. This approach will provide greater transparency in the assessment.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Draft Chapter 5 – EVWQP – Human Health & Groundwater	7B-70	Re-evaluate the risks to human health associated with exposure to bromide in surface water. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The results of the evaluation indicated that the maximum concentration of dissolved bromide in surface water exceeded the guideline for total bromide. This result should have resulted in identification of bromide as a constituent of concern that required more detailed evaluation (i.e., if dissolved bromide exceeded a guideline, then total bromide would also exceed the guideline). Therefore, the effects of bromide on human health need to be re-evaluated. If no human-health based guideline is available for bromide, this CoI needs to be identified as an uncertain COPC and brought forward into the risk assessment.
Draft Chapter 5 – EVWQP – Human Health & Groundwater	7B-71	Evaluate the significance of indirect pathways for those COPCs that tend to accumulate or biomagnify in the environment. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The assumption that secondary or indirect exposure pathways are all minor and do not need to be evaluated may flawed. For substances that tend to accumulate or biomagnify in the environment, uptake by wildlife and consumption of game meat could provide an important source of exposure. Similarly, uptake by riparian plants and subsequent consumption of these plants could result in significant exposure to substances that accumulate in plants. Therefore, these secondary pathways need to be evaluated. If insufficient data are available to conduct a comprehensive spatial evaluation for certain COPCs, then this must be identified as a data gap that needs to be addressed. Information on traditional land use practices by KNC members and associated traditional ecological knowledge should be used to inform the evaluation of secondary exposure pathways.
Draft Chapter 5 – EVWQP – Human Health & Groundwater	7B-72	The effects of Total dissolved solids (TDS) should be evaluated relative to human health and potability of drinking water supplies. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	TDS has the potential to adversely affect drinking water supplies. Therefore, TDS needs to be addressed in the assessment of protection of human health and groundwater.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Draft Chapter 6 – EVWQP – Management Options	7B-73	Validate the water quality model to confirm that it provides an accurate basis for predicting COPC concentrations in Lake Koocanusa, using data on COPC levels in the tributaries and other source areas. *For additional context, Appendix 3 and Appendix 4 refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The evaluation of management options was, in part, based on water quality modeling that provided a basis for "if this-then that" evaluations of various scenarios. Therefore, the water quality model plays a fundamental role in the evaluation and selection of mitigation options in the EVWQP. Therefore, the accuracy of the model as it relates to model predictions in Lake Koocanusa is a key uncertainty in the EVWQP process. To reduce this uncertainty, the concentrations of COPCs in surface water in Lake Koocanusa that are predicted using the model should be compared to actual measurements of surface water quality in Lake Koocanusa as more data become available. This needs to be conducted annually as new data are generated. This type of water quality model validation is also needed for the riverine components of the watershed and associated tributaries. Appendix 3 and 4 provide additional comments on the management options proposed by Teck.
Draft Chapter 7 – EVWQP - Calcite	7B-74	A conceptual site model has been presented that links calcite formation to effects on ecological receptors. Use the CSM to develop environmental effects hypotheses, interactive effects hypotheses, and cumulative effects hypotheses that explicitly consider the potential effects of calcite and other stressors on aquatic receptors. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Calcite represents an important physical stressor for ecological receptors utilizing habitats in tributaries and, to a lesser extent, mainstem areas. Development of a CSM provides a systematic basis for formulating environmental effects hypotheses, interactive effects hypotheses, and cumulative effects hypotheses that explicitly consider the potential effects of calcite and other stressors on aquatic receptors. Such hypotheses are needed to guide monitoring and assessment activities relative to calcite in the future.
Draft Chapter 8 – EVWQP - Targets	7B-75	Adopt the draft B.C. WQG for dissolved cadmium as the long-term water quality target for cadmium. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The Toxicology Working Group evaluated a number of options for selecting benchmarks for cadmium for the protection of aquatic life. Toxicity-based targets that are equivalent to the B.C. WQGs offer a higher level of protection relative to WQGs established by the CCME. Ultimately, it was recommended by KNC and BCMOE that the draft BC WQGs for dissolved cadmium be selected for use in evaluating current conditions in the Elk Valley and for establishing a long-term target for cadmium.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Draft Chapter 8 – EVWQP - Targets	7B-76	The B.C. WQGs and site-specific benchmarks for cadmium, nitrate, selenium, and sulphate should not be regarded as "pollute up to numbers." Rather, all reasonable and practical mitigation measures should be taken to minimize loadings of these substances to receiving waters. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Ecological receptors utilizing aquatic and riparian habitats in the Elk Valley have the potential to be exposed to a variety of physical and chemical stressors. The effects of some, but not all, of these stressors have been evaluated in the EVWQP. These evaluations have resulted in the adoption of WQGs for certain COPCs (i.e., sulphate) and development of site-specific benchmarks for other COPCs (i.e., cadmium, nitrate, and selenium). These benchmarks have been established at EC 10 levels for specific receptors and do not include application of uncertainty factors. The effects of various other stressors, such as calcite, TSS, intragravel dissolved oxygen, deposited sediment, water temperature, etc., have not been quantitatively evaluated. In addition, the interactive effects of multiple stressors and the cumulative effects of multiple anthropogenic activities have not been quantitatively evaluated. Therefore, there is still a substantial amount of residual uncertainty about the level of protection that the WQGs and site-specific benchmarks provide, when interactive and cumulative effects are considered. Accordingly, all reasonable and practical mitigation measures should be taken to minimize loadings of these substances to receiving waters (i.e., to ensure that concentrations of these COPCs are maintained at the lowest practical levels).
Draft Chapter 8 – EVWQP - Targets	7B-77	Adopting BC MoE tissue guidelines as long-term benchmarks and targets for the EVWQP is the most appropriate approach to protect aquatic organisms against the effects of selenium. Adoption of BC MoE WQGs for selenium in for other media (water, sediment, dietary) could also be helpful in an adaptive management framework to protect unimpacted areas and serve as long-term assessment goals in impacted areas of the Elk Valley where mitigative measures are undertaken (also see Appendix 6 and 7). *For additional context, Appendix 6, and Appendix 7 refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The B.C. WQGs are more conservative than the proposed water quality targets, account for multiple sources of uncertainty, and are aligned with recommended Se toxicity thresholds, criteria and benchmarks published by other regulatory jurisdictions. Although dietary tissue benchmarks for juvenile fish and birds is not recommended (because diet is not a direct measure of toxicity), if dietary benchmarks are adopted they should be consistent with BC's WQG. The implementation of dietary benchmarks should be part of an adaptive management framework to provide an early alert in management units where new mining activities may pose a risk to sensitive organisms.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Draft Chapter 8 – EVWQP - Targets	7B-78	A comprehensive quantitative assessment of cumulative impacts from coal mining to aquatic life should be conducted for the Elk Valley that incorporates additional studies on a wider range of resident fish, bird and amphibian species. *For additional context, Appendix 6 and Appendix 7, refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The assessment of interactive effects in the EVWQP is qualitative and too subjective. There is also a lack of quantitative information on the cumulative effects on a wide range of species exposed to effluents and habitat disturbance from coal mining. Additional comments on the water quality targets and the initial implementation plan are provided in Appendix 6 and 7.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Draft Chapter 10 – EVWQP - Monitoring	7B-79	Develop a monitoring framework for the Elk Valley that will provide the data and information needed to thoroughly evaluate the effects of mining activities on the aquatic ecosystem. The steps involved in this process should include: **1.** Develop a single conceptual site model (CSM) that describes sources and releases of contaminants, identifies physical and chemical stressors of potential concern, describes environmental transport and fate processes, describes the expected ecological effects of physical and chemical stressors (based on literature-based information and other studies), identifies potentially-complete exposure pathways, identifies receptors potentially at risk. **2.** Use the CSM to develop hypotheses regarding the effects of individual stressors, the interactive effects of multiple stressors, and the cumulative effects of stressors associated with multiple human activities. **3.** Identify assessment endpoints (e.g., survival, growth, and reproduction of fish) that need to be evaluated using the results of monitoring programs. **4.** Identify measurement endpoints (e.g., egg-to-fry survival of cutthroat trout) that will provide a basis for evaluating the status of each assessment endpoint. **5.** Design monitoring programs to guide the collection of data for each measurement endpoint, including spatial and temporal considerations. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The monitoring chapter of the EVWQP currently includes descriptions of the monitoring requirements identified in the Terms of Reference for monitoring objectives for the EVWQP, and for monitoring objectives for the RAEMP. However, the monitoring that is described does not appear to have been informed by a consolidated CSM or focused on providing the information needed to test an ecological effects hypothesis. This represents a major limitation of the design of the monitoring programs that are described in this chapter of the EVWQP. This limitation can be effectively addressed by following and documenting a systematic data quality objectives process, as described above (see USEPA 2000; 2006; MacDonald et al. 2009a; 2009b; 2009c; 2009d; 2009e; 2009f; MacDonald et al. 2009g; Zajdik et al. 2009; Clark et al. 2010).

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Draft Chapter 10 – EVWQP - Monitoring	7B-80	Revise the EVWQP to identify a monitoring framework that includes three types of monitoring programs (rather than media types and special studies), including: **1.** Surveillance network monitoring programs (i.e., which are also referred to as Mine Site Monitoring Programs) that are conducted to provide data and information on the status and trends of environmental conditions within mine works, including effluent quality monitoring, seepage monitoring, on-site groundwater monitoring, etc. (as required under EMA permitting); **2.** Local AEMPs (LAEMPs) that are conducted in the immediate vicinity of individual projects to provide data and information of the effects of mining activities on the aquatic environment and aquatic-dependent wildlife. Typically, such AEMPs would be expected to include surface water monitoring, sediment quality monitoring, biological monitoring, etc. (as required under EMA permitting). **3.** RAEMP that is conducted throughout the Elk River watershed and Lake Koocanusa to provide data and information on the effects of mining activities on the aquatic environment and aquatic-dependent wildlife. The RAEMP will need to include a number of program elements including surface water monitoring, sediment quality monitoring, biological monitoring, and special studies. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	

Draft Chapter 10 – EVWQP - Monitoring	7B-81	Clearly identify all of the goals of the RAEMP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Whitfield (1988) described the goals and data collection designs for water quality monitoring. More specifically, Whitfield (1988) identified five reasons for conducting water quality monitoring, including: **1.** Assessment of the status and trends in environmental conditions; **2.** Evaluation of compliance (i.e., attainment) with water quality objectives or standards; **3.** Estimation of mass transport; **4.** Assessment of environmental effects and impacts; and, **5.** General surveillance. As monitoring programs need to be specifically designed to achieve each of these monitoring goals, it is essential to clearly define monitoring goals prior to designing the RAEMP. Based on discussions convened among the members of the Monitoring Working Group, it is apparent that the RAEMP has the following goals: **1.** Assessment of the status and trends in environmental conditions (Data and information generated from status and trends monitoring will inform the adaptive management program); **2.** Evaluation of attainment of short-term, medium-term, and long-term water quality targets (and associated triggers) for cadmium, nitrate, selenium, and sulphate (Data and information generated from targets attainment monitoring will inform the adaptive management program); **3.** Evaluation of the narrative targets that have been established for calcite (Data and information generated from targets attainment monitoring will inform the adaptive management program); and, **4.** Assessment of environmental effects of activities associated with coal mining in the Elk Valley (Data and information generated from environmental effects monitoring will inform the adaptive management program); **5.** Assessment of the cumulative environmental effects associated with coal mining and other anthropogenic activities in the Elk Valley, including climate change (Data and information generated from cumulative effects monitoring will inform the adaptive management program); and, **6.** Validation of key tools that were developed to support the EVWQP, including water quality models, bioaccumulation models, and site-specific benchmarks for water and other environmental media (Data and information

Summary Table			
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			generated during validation of key tools will inform refinement of the EVWQP and the adaptive management program). These goals need to be incorporated into the monitoring chapter of the EVWQP.

Draft Chapter 10 – EVWQP - Monitoring	7B-82	As part of the LAEMP and RAEMP, develop selection criteria, identify candidate reference areas (referred to control stations in the design of BACI-type monitoring programs), and evaluate the appropriateness of those reference areas (in terms of hydrological and biogeochemical similarity) that will be included in the environmental effects and cumulative effects monitoring elements of the RAEMP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	A BACI-based monitoring program design should be used in the RAEMP to evaluate the environmental effects associated with coal mining activities and the cumulative effects associated with all anthropogenic activities. This type of monitoring necessitates identification and evaluation of candidate reference stations that are potentially appropriate for used in the RAEMP. To ensure that the selection of reference stations is conducted in a transparent and appropriate manner, it is necessary to establish selection criteria on an a priori basis. Such selection criteria should include: **1.** The reference station should be located in the sample body of water as the effluent discharge (Environment Canada 2004; e.g., The reference stations for Michel Creek should be located within the Michel Creek drainage basin). If a suitable reference station is not available within the same water body, then the reference stations should be located in the nearest comparable drainage basin (Environment Canada 2004); **2.** The characteristics of riparian areas adjacent to reference stations should be similar to those at the mining-influenced stations prior to the implementation of mining activities; **3.** The stream order, streambed substrate types, hydrological characteristics of reference stations should be similar to those at the mining-influenced stations prior to the implementation of mining activities; **4.** Water quality characteristics at reference stations should be similar to those at the mining-influenced stations prior to the implementation of mining activities (i.e., based on baseline monitoring activities). When baseline data are not available, water quality characteristics at reference stations should be similar to those in the nearest comparable drainage basin; **5.** Sediment quality characteristics at reference stations should be similar to those at the mining-influenced stations prior to the implementation of mining activities (i.e., based on baseline monitoring activities). When baseline data are not available, sediment quality characteristics at reference stations should be similar to those in the nearest comparable drainage basin; **6.** Tissue chemistry at reference stations should be similar to those at the mining-influenced stations prior to the implementation of mining activities (i.e., based on baseline monitoring activities) and clearly not affected by exposure to discharges from mine sites (i.e., for mobile species). When baseline data are not available, tissue chemistry at reference stations should be similar to those in the nearest comparable drainage basin that has clearly not been affected by exposure to discharges from mine sites (i.e., for mobile species); and,

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			7. Surface water toxicity and sediment toxicity at reference stations should be within the range defined for acceptable negative control samples used in laboratory toxicity tests (as defined in Environment Canada, USEPA, and/or ASTM standard methods).
Draft Chapter 10 – EVWQP - Monitoring	7B-83	Include an additional monitoring station in Lake Koocanusa downstream of Sand Creek and outside the potential influence of discharges from the Elk River (i.e., located upstream of the existing monitoring station that is located upstream of the Elk Arm of Lake Koocanusa). *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The purpose of this monitoring station is to provide a reference station in the lake that is far enough upstream that it is unlikely to be influenced by discharges from the Elk River and far enough into the lake that fine sediment from the Kootenay River has largely settled out of the water column.
Draft Chapter 10 – EVWQP - Monitoring	7B-84	Expand the RAEMP to include ongoing groundwater monitoring, both in the immediate vicinity of mining activities and in downstream areas. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Groundwater resources have a number of uses in the Elk Valley, including drinking water supplies, irrigation, and livestock watering. In addition, groundwater recharge may represent an important component of the streamflow of the tributaries, the Fording River, and or the Elk River at certain times of the year. Therefore, it is important to characterize groundwater quality and quantity in the Elk Valley in the immediate vicinity of mining activities and in downstream areas. Teck initiated groundwater sampling activities in 2013. These results, in conjunction with the CSM, should be used to design an ongoing groundwater monitoring program for the Elk Valley.

Summary Table			
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Draft Chapter 10 – EVWQP - Monitoring	7B-85	Conduct a gradient-based sediment toxicity testing program within the Elk Valley and Lake Koocanusa as a supporting study under the RAEMP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	To date, only limited sediment toxicity data have been collected within the Elk Valley, including short-term toxicity tests with amphipods (14-d tests with Hyalella azteca) and midge (10-d tests with Chironomus dilutus). This is not sufficient to evaluate toxicity to benthic invertebrates in longer-term exposure or to evaluate reproductive effects. Implementation of this program should involve the collection of fine sediment (i.e., <2.00 mm) at near-field, mid-field, and far-field stations located throughout the study area (including Lake Koocanusa) to establish baseline conditions. By sampling along a potential concentration gradient, it may be possible to develop concentration-response relationships and site-specific sediment toxicity thresholds for selected COPCs.
Draft Chapter 10 – EVWQP - Monitoring	7B-86	Evaluate the distribution and abundance of freshwater mussels within the Elk River watershed, Lake Koocanusa, and appropriately selected reference areas as a supporting study under the RAEMP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Freshwater mussels represent key components of aquatic communities. To date, no information has been presented on the distribution or abundance of freshwater mussels in the Elk River, tributaries to the Elk River, or Lake Koocanusa. As freshwater mussels are known to be sensitive to a variety of physical, chemical, and biological stressors, including those that are associated with mining activities, it is essential to obtain information on the distribution and abundance of freshwater mussels in mining-influenced and appropriately selected reference areas.
Draft Chapter 10 – EVWQP - Monitoring	7B-87	Evaluate the effects of selected contaminants (i.e., cadmium, selenium, nitrate, and sulphate) associated with mining-activities on the survival, growth, and reproduction of freshwater mussels (in water-only exposures) as a supporting study under the RAEMP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	A series of toxicity tests have been conducted to evaluate the toxicity of nitrate and sulphate to aquatic plants, aquatic invertebrates, and fish. The results of these toxicity tests have provided the data and information needed to derive site-specific water quality benchmarks for these water quality variables. However, no toxicity testing has been conducted to evaluate the toxicity of these COPCs or other water quality variables on freshwater mussels. For this reason, it is appropriate to design and implement a toxicity testing program to determine if the water quality benchmarks that have been developed for the protection of other aquatic species would also be protective of freshwater mussels.

Summary Table			
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Draft Chapter 10 – EVWQP - Monitoring	7B-88	Evaluate the effects of calcite formation and presence on the distribution and abundance of freshwater mussels as a supporting study under the RAEMP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Calcite formation has the potential to alter the quality of streambed substrates and, hence, decrease their suitability for inhabitation by freshwater invertebrates and their use by fish for spawning and incubation. A study is currently being designed to evaluate the effects of calcite formation and presence on benthic macroinvertebrates. However, such a study is unlikely to be designed to assess effects on freshwater mussels. For this reason, the scope of the proposed study should be expanded to ensure that freshwater mussels are identified and enumerated at all of the mining-influenced and reference stations that are examined. Survey methods relevant to freshwater mussels will need to be employed to ensure that relevant data are generated on the effects of calcite formation and presence on the distribution and abundance of freshwater mussels (e.g., Smith et al. 2003; Angelo et al. 2007).
Draft Chapter 10 – EVWQP - Monitoring	7B-89	Evaluate the effects of egg/ovary selenium on the reproduction of peamouth chub, burbot, and bull trout as a supporting study under the RAEMP. In addition, the effects of egg/ovary selenium on the reproduction of mountain whitefish should be re-evaluated using a broader range of tissue concentrations than was obtained in the Nautilus Environmental (2012) study, including inclusion of control fish. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Data on the toxicity of tissue-associated selenium are available for a number of freshwater fish species. However, matching tissue chemistry and reproductive success data are not available for several key species that utilize habitats in Lake Koocanusa, including peamouth chub, burbot, and bull trout. This data gap makes it difficult to determine if the long-term target for selenium in water is likely to be protective of all fish species that utilize habitats in Lake Koocanusa. Generation of concentration-response data for these additional fish species will provide greater certainty that the targets, based on toxicity to brown trout, are protective of peamouth chub, burbot, and bull trout. Re-evaluation of the toxicity of selenium to mountain whitefish will provide improved confidence that the targets that are set for selenium will also protect mountain whitefish.
Draft Chapter 10 – EVWQP - Monitoring	7B-90	Evaluate the levels of selenium in the tissues of burbot and bull trout in Lake Koocanusa as a supporting study under the RAEMP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	To date, no data have been reported on the levels of selenium in the tissues of burbot collected in the Canadian portion of Lake Koocanusa. Because these species are utilized by KNC members and others as an important food source, it is important to document the levels of selenium in the tissues of these species. Whenever possible, non-lethal sampling methods (e.g., muscle plugs) should be used to obtain tissue samples. In addition, sampling opportunities may exist when KNC members are harvesting these species.

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Draft Chapter 10 – EVWQP - Monitoring	7B-91	Evaluate the accuracy of the selected bioaccumulation models (i.e., water to invertebrate tissues) by refining estimates of exposure point concentrations of selenium (i.e., concentrations in water based on weekly or more frequent measurements conducted during key seasons) and tissue concentrations of selenium (i.e., by collecting multiple replicate data at exposure stations) as a supporting study under the RAEMP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Currently, there is considerable uncertainty in the estimates of exposure for the matching surface-water chemistry and tissue chemistry data that have been used to develop the bioaccumulation models. That is, it is not clear that surface-water chemistry data collected on the same date that a tissue sample is collected (or an annual average calculated from monthly samples) represents the relevant exposure concentration for evaluating bioaccumulation. Therefore, a more focused study needs to be conducted to better define the relationship between exposure and tissue concentrations in benthic invertebrates. Consideration should be given to using multiplate samplers to collect periphyton and invertebrates for tissue analysis and to high-frequency samplers for collecting surface-water samples.
Draft Chapter 10 – EVWQP - Monitoring	7B-92	Evaluate the bioaccumulation of selenium in the tissues of aquatic plants, aquatic invertebrates, and fish in Lake Koocanusa as a supporting study under the RAEMP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Synoptically-collected water chemistry and tissue chemistry data have been collected from lentic and lotic habitats within the Elk River watershed to support bioaccumulation modelling of selenium. Comparable data have not been collected in Lake Koocanusa. Therefore, a study should be designed and implemented to collect exposure and tissue chemistry data to determine if the Elk Valley bioaccumulation model(s) provides a basis for accurately predicting bioaccumulation in Lake Koocanusa. All three major ecosystem (plants, invertebrates, and fish) need to be addressed in this study.
Draft Chapter 10 – EVWQP - Monitoring	7B-93	Evaluate the effects of multiple stressors and nutrient addition on periphyton abundance and community structure (i.e., at the highest taxonomic levels) throughout the Elk Valley as a supporting study under the RAEMP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	A variety of physical (e.g., fine sediment, flow, calcite formation), chemical (e.g., sulphate, N:P ratios, etc.), and biological stressors (e.g., grazing) can influence the abundance and community structure of periphyton in Elk Valley streams and rivers. To date, no information has been presented on the effects of multiple stressors on periphyton abundance and community structure in tributary streams or in the Elk and Fording rivers. Therefore, a study is needed to evaluate the effects of multiple stressors on primary productivity in lotic habitats within the Elk watershed.

Summary Table			
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Draft Chapter 10 – EVWQP - Monitoring	7B-94	Design and implement a supporting study to evaluate the relative sensitivity of the CABIN-based sampling methods, replicate Serber-based sampling methods, and multiplate sampling methods for evaluating the effects of water quality and other stressors on benthic invertebrate community structure, abundance, and biomass. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	A CABIN-based approach has been used to evaluate the effects of mining activities on benthic invertebrates within the Study Area. This method provides a standard approach to biological monitoring and assessment that can be used across Canada to evaluate aquatic ecosystem health. However, the approach was not designed to support hypothesis testing or to provide a quantitative impact assessment tool. Borisko et al. (2007) reported that such rapid bioassessment tools are coarse and are unlikely to detect subtle impacts to the benthic community. This is because such methods that lack replication have insufficient statistical power to detect subtle differences (Kerans et al. 1992). Rapid bioassessment methods are better suited to the detection of major impacts or gross impairment (Kilgour et al. 2005). As benthic invertebrate sampling in the Elk Valley should be designed to detect subtle, as well as gross, impacts, a study needs to be designed and implemented for the sensitivity of various sampling methods and levels of replication for detecting mining-related effects in Elk Valley streams. See Beatty et al. (2006) for further information on the design of such a study.

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Draft Chapter 10 – EVWQP - Monitoring	7B-95	Evaluate the effects of multiple stressors on the benthic invertebrate abundance and community structure in streams and rivers within the Elk Valley. Monitoring should be conducted annually at core stations and every three years at all of the other stations as a supporting study under the RAEMP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	A variety of physical (e.g., fine sediment, flow, calcite formation), chemical (e.g., sulphate, nitrate, cadmium, etc.), and biological stressors (e.g., predation) can influence the abundance and community structure of benthic invertebrates in Elk Valley streams and rivers. Monitoring of benthic invertebrate communities to date has utilized a general biomonitoring approach (i.e., a CABIN-based reference envelope monitoring program). While such monitoring provides information on the status of the benthic invertebrate community, this type of monitoring is not sufficiently sensitive to detect subtle effects on benthic invertebrates exposed to multiple stressors. Accordingly, a before-after/control-impact (BACI) design needs to be used to evaluate the effects of mining activities on the benthic community. For streams that are already affected by discharges from a mine, a control-impact (CI) design will need to be applied. For all new mines, a BACI-type design should be utilized. To support the design of ongoing BACI and CI monitoring and to calibrate the data that have been collected to date using the CABIN-based approach, a number of core monitoring stations should be sampled in 2014 using the CABIN sampling protocol, a CI-based replicate-sampling protocol (using Surber samplers; 10 replicates/station), and multi-plate sampler (e.g., Hester- Dendy samplers for mainstem locations; for example, see Letovsky et al. 2012). The resultant data should be used to identify the minimum number of replicate samples that need to be collected at each station to detect subtle effects on the benthic invertebrate community using the BACI- and/or CI- based sampling designs.
Draft Chapter 10 – EVWQP - Monitoring	7B-96	Determine critical levels of aquatic plant nutrients (ammonia, nitrite, nitrate, phosphorus) in Lake Koocanusa as a supporting study under the RAEMP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The water quality targets for nitrate are based on the toxicity of nitrate to aquatic invertebrates and fish. However, nitrate is an important aquatic plant nutrient that can contribute to changes in the trophic status of receiving waters. As there are already numerous sources of phosphorus in the Elk Valley and active water treatment plants could represent additional sources of phosphorus, it is important to determine the levels of nitrate (as well as ammonia and nitrite) that would protect against eutrophication in Lake Koocanusa. It is likely that in-situ limnocorral-based investigations would provide one of the most means of establishing nutrient-based WQOs for nitrate in Lake Koocanusa.

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Draft Chapter 10 – EVWQP - Monitoring	7B-97	Develop a site-specific WQO (benchmark) for phosphorus (i.e., total phosphorus (TP), total dissolved phosphorus (TDP), and/or orthophosphate phosphorus (OP) in Lake Koocanusa; i.e., using limnocorrals) as a supporting study under the RAEMP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Section 3.1.5.1 of the Synthesis Report describes the results of the evaluation of current phosphorus levels in Lake Koocanusa. These results indicate that about one-third of the samples from MU-6 had phosphorus concentrations above the selected WQG. This is a concern because operation of active water treatment plants (AWTPs) in the Elk Valley is likely to result in releases of additional phosphorus into receiving waters. Therefore, loadings of phosphorus to Lake Koocanusa are likely to increase in the coming years. Considering the loadings of nitrogen to the lake that are already occurring, increases in phosphorus loadings have the potential to increase the frequency and/or magnitude of algal blooms in the lake and/or alteration of the trophic status of the lake. Site-specific WQOs for phosphorus would provide critical information for managing releases of nutrients to the lake.
Draft Chapter 10 – EVWQP - Monitoring	7B-98	Evaluate the bioaccumulation of selenium in amphibian species from the Elk Valley as a supporting study under the RAEMP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	While there is a considerable amount of data available to evaluate linkages between concentrations of selenium in surface water and the concentrations of selenium in benthic invertebrate tissues, there is uncertainty in the relationship between dietary selenium levels and egg selenium concentrations in amphibians. Therefore, a laboratory study should be conducted to evaluate bioaccumulation in a surrogate species (i.e., by feeding leopard frogs invertebrates with different concentrations of selenium). This study should be linked to the effects study described below.
Draft Chapter 10 – EVWQP - Monitoring	7B-99	Evaluate the effects of selenium bioaccumulation on the reproductive success of amphibians in a laboratory study (i.e., using leopard frogs) as a supporting study under the RAEMP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	There is still considerable uncertainty regarding the effects of selenium on the reproductive success of amphibians in the Elk Valley. For this reason, toxicity testing with a surrogate species should be conducted to evaluate the effects of selenium bioaccumulation on reproductive success (i.e., from egg to metamorphosis).

Summary Table			
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Draft Chapter 11 – EVWQP – Adaptive Management	7B-100	Develop a stand-alone adaptive management plan that provides specific information on the adaptive management triggers and associated management actions, in addition to the chapter of the EVWQP that addresses adaptive management. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	An adaptive management plan represents an essential element of the overall adaptive management framework that will be applied in the Elk Valley. While the chapter of the EVWQP that addresses adaptive management and plan implementation provides important information on the proposed adaptive management framework, a stand-alone adaptive management plan will be more amenable to periodic update and refinement as new data and information becomes available. Therefore, it is more likely that a stand-alone AMP can be consistently used to guide future management decisions than the EVWQP itself. The stand-alone AMP should be revised, at minimum, every three years.
Draft Chapter 11 – EVWQP – Adaptive Management	7B-101	Define the objectives for the adaptive management component of the EVWQP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	A definition of adaptive management is provided in the EVWQP. However, clearly defined objectives for the adaptive management component of the EVWQP are not provided. Such objectives are required to inform the development of a responsive adaptive management framework.
Draft Chapter 11 – EVWQP – Adaptive Management	7B-102	Provide an overview of the CSM for the site and the associated environmental effects, interactive effects, and cumulative effects hypotheses in the adaptive management chapter of the EVWQP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Adaptive management provides a systematic process for learning during implementation of the EVWQP to confirm that the objectives are being met and to adjust management actions if required. To be effective, the adaptive management component of the plan must be linked to key indicators of environmental quality conditions and informed by the results of focussed environmental monitoring programs. The CSM and associated effects hypotheses identify the assessment endpoints that are likely to be affected by stressors associated with coal mining activities and/or other anthropogenic activities. In addition, the CSM and associated effects hypotheses inform the selection of measurement endpoints (i.e., environmental variables) that will be used to evaluate the status of the assessment endpoints.

Summary Table			
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Draft Chapter 11 – EVWQP – Adaptive Management	7B-103	Identify the assessment endpoints (i.e., indicators of environmental quality conditions) and measurement endpoints (i.e., metrics) that will be used to inform management decisions under the EVWQP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The EVWQP currently identifies the monitoring components (e.g., water quality monitoring at order stations, periphyton monitoring, ambient sub-lethal toxicity tests, groundwater monitoring, and human health assessment) that will be considered in the adaptive management plan. However, these components are not sufficiently specific to provide a basis for explicitly identifying the assessment endpoints (e.g., survival, growth, and reproduction of westslope cutthroat trout) and measurement endpoints (e.g., concentrations of selenium in cutthroat trout eggs/ovaries) that will be used to support management decisions in the Elk Valley. Therefore, assessment endpoint and measurement endpoints need to be explicitly identified in the adaptive management framework.
Draft Chapter 11 – EVWQP – Adaptive Management	7B-104	Identify the targets (if relevant) and triggers for action in the adaptive management framework. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	Triggers for use in adaptive management are identified in the EVWQP, including trends and concentrations compared to predictions, targets, and timeframes, chlorophyll-a trends and guidelines, critical effects sizes, trends and drinking water guidelines, and changes in health risk results. However, these triggers are not sufficiently specific to guide decision making under the EVWQP. Therefore, the triggers for action need to be identified in the EVWQP (e.g., If a the target of selenium in cutthroat trout is the EC10 for cutthroat trout, then a trigger needs to be set below the target value that provides sufficient time to implement management actions to ensure that the target is not exceeded).
Draft Chapter 11 – EVWQP – Adaptive Management	7B-105	Identify the management actions that will be taken if one or more of the triggers for action are exceeded during the implementation phase of the EVWQP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The EVWQP currently includes an adaptive management decision flow chart that generally describes how the triggers would be used within the adaptive management framework. However, this information is not sufficiently specific to determine what actions would be taken if a trigger is exceeded during Plan implementation. Therefore, the adaptive management plan must identify the specific actions that would be taken for each of the triggers that are included in the AMP. This lack of specificity represents a key uncertainty that needs to be addressed because, without further information, there is no way of knowing what actions would be taken when targets are exceeded.

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Draft Chapter 11 – EVWQP – Adaptive Management	7B-106	Identify the metrics and associated triggers that would lead to implementation of passive mitigation measures, semi-passive mitigation measures, and cover installation under the EVWQP. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The EVWQP currently identifies research and development as part of the overall adaptive management framework for the Elk Valley. However, clear linkages between environmental monitoring and the implementation of alternative mitigation options are not provided in the Plan. Therefore, it is not possible to determine what metrics or triggers will be used to facilitate incorporation of new technologies or alternative existing technologies into the Plan.
Draft Chapter 11 – EVWQP – Adaptive Management & Annex K. 1 Synthesis Report	7B-107	Establish an independent environmental monitoring agency to provide guidance and oversight related to the collection, analysis, interpretation, and reporting of data collected within the Elk Valley. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	A great deal of data and information has been collected on environmental conditions in the Elk Valley in recent years. In the future, implementation of the Regional Aquatic Effects Monitoring Program (AEMP) and various mine-related AEMPs will result in collection of additional data and information. To ensure that such data collection is focused and relevant, that the resultant information is evaluated using appropriate methods and procedures, and that the dissemination of such data and information is timely and accurate, an independent environmental monitoring agency needs to be established in the Elk Valley.
Draft Chapter 2 – EVWQP – Regulatory Context	7B-108	Describe the regulatory context of the EVWQP, including its relationship to federal and provincial legislation, regulations, and policies, to other plans relevant to the Elk Valley, and to future permitting of Teck-lead and other development projects in the Elk Valley. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The Terms of Reference for the EVWQP indicate that the Plan will outline the current regulatory context applicable to selenium, cadmium, nitrate, and sulphate in water and calcite formation in the Designated Area. While this chapter provides a description of the provincial and federal environmental legislation that are relevant to managing the environment in B.C., this chapter should fully describe the regulatory context of the EVWQP. The text in Chapter 2 provides little information on the regulatory context for the EVWQP.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Draft Chapter 2 – EVWQP – Regulatory Context	7B-109	The EVWQP should be reviewed and revised at least every five years to provide a current and relevant plan for permitting new projects and amending permits for existing projects. *For additional context refer to D. MacDonald (TAC Member for KNC) letter (dated July 11. 2014).*	The Terms of Reference for the EVWQP indicate that the Plan will propose for periodic BCMOE review and approval of amendments to the Plan. Given the timing of the proposed mitigation actions, it is reasonable to expect that the EVWQP will need to be updated at least every five years. This is important because there are numerous data gaps and uncertainties that need to be addressed during implementation of the Plan. The results of monitoring, special studies, and mitigation research and development are likely to influence both the water quality targets that have been established under the Plan and the mitigation that is selected to address water quality concerns. The Plan needs to be updated to reflect the new information and to inform permitting of new and existing projects.
Annex K.1 Synthesis Report	7B-110	Consider spatial distribution and temporal fluctuations of constituents when using the 95th percentile of reference site data to identify constituents of potential concern (COPC) in the evaluation process.	The evaluation process applied to water quality and sediment to identify COPC rely on a comparison to the 95th percentile of reference site data collected across all stations in the designated area and for all three years. For some constituents, high background concentrations at one or a few stations increases the 95th percentile which may not be appropriate for other areas of the watershed that have low baseline concentrations. Also, due to hydrological fluctuations throughout the year, some constituents are naturally elevated during high or low water. Comparisons with reference data should be done for the same season so that seasonal changes can be detected.
Annex K.2	7B-111	Table 1: Recommend that the average tissue concentration for each species by location and sampling cycle be compared to the BC tissue guidelines for Selenium.	Table 1 and Section 1.2.1 report the frequency of individual samples exceeding the BCMOE guidelines for fish tissue. The BCMOE selenium guideline recommends for each species and sample cycle, to compare a mean of ≥ 8 fish tissue samples in a representative area to the guidelines. (BC MOE Companion Document to: Ambient Water Quality Guidelines for Selenium Update 2014). For example, in Table 1 the reference location for bull trout in 2009 reports 14% of reference samples exceeding the BC WQG, however, the average of the 7 samples is 2.2 mg/kg dry weight which does not exceed the BC WQG of 4.

Summary Table			
Category	**#**	**Description of "Technical Advice" from Mtg**	**Rationale**
Draft Chapter 5 – EVWQP – Human Health and Ground Water	7B-112	Recommend as part of the Adaptive Management Plan that monitoring, assessing, and communicating environmental levels compared to human health guidelines (drinking water, food consumption, etc.) be incorporated annually or as information becomes available. This is a critical step in the protection of human health.	The TOR (Section 3.3 c) identifies protection of human health as an objective of this plan. As discussed during the Human health Working Group meeting June 19, 2014: Public health is protected by maintaining contaminant levels below MOE source water guidelines. If these are exceeded, health officials may need to recommend further actions to protect public health to avoid or reduce excessive exposure of contaminants in the environment (i.e. do not drink advisory, health assessment). Therefore, there needs to be a clear understanding of contaminant levels in the various media, when and where guidelines are exceeded, along with the frequency, and duration. The chapter on human health does not yet make it clear how the plan will address on-going human health protection. As an example, the final section of this report (5.8) states that levels of Selenium in the Upper Fording exceed both the current and proposed drinking water guideline and that this section of river should not be used for drinking water. This type of advice should be issued and communicated to the public by health officials. Further, this section also mentions that the Se guideline is not a health-based guideline but is based on dietary intake. The latter is in fact a health-based guideline and part of the dietary intake is from water. Again, these types of conclusions need to be made from health officials. As part of the adaptive management framework, a clear monitoring strategy that will ensure public health is protected (and how this information will be communicated back to health agencies and the MOE, so that together, all agencies ensure public health is protected), should be included.

References Cited:

Angelo, R.T., M.S. Cringan, D.L. Chamberlain, A.J. Stahl, S.G. Haslouer, and C.A. Goodrich. 2007. Residual effects of lead and zinc mining on freshwater mussels in the Spring River Basin (Kansas, Missouri, and Oklahona, USA). Science of the Total Environment 384(1-3): 467-496.

Beatty, J.M., L.E. McDonald, F.W. Westcott and C.J. Perrin. 2006. Guidelines for sampling benthic invertebrates in British Columbia streams. Prepared for British Columbia Ministry of Environment.

Borisko, J.P., B.W. Kilgour, L.W. Stanfield, and F.C. Jones. 2007. An evaluation of rapid bioassessment protocols for stream benthic invertebrates in Southern Ontario, Canada. Water Quality Research Journal of Canada 42(3): 184-193.

CCME (Canadian Council of Ministers of the Environment). 2001. Canadian water quality guidelines for the protection of aquatic life: CCME Water Quality Index 1.0, Technical Report. *In:* Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

Clark, M.J.R., D.D. MacDonald, P.H. Whitfield, and M.P. Wong. 2010. Designing monitoring programs for water quality based on experience in Canada. Part II - Monitoring Tools - Problem Characterization and Data Quality Objectives. Trends in Analytical Chemistry 29(5):385-398.

Environ. 2014. Elk Valley Water Quality Plan: Human health evaluation of current baseline conditions. Project Number: 3034724A. Prepared for Teck Coal Limited, Sparwood, British Columbia. Prepared by Environmental International Corporation, Seattle, Washington.

Environment Canada. 2004. Pulp and Paper EEM guidance document. May 2004. National Environmental Effects Monitoring Office.

Health Canada. 2010. Federal contaminated site risk assessment in Canada. Part V: Guidance on human health detailed quantitative risk assessment for chemicals ($DQRA_{CHEM}$). ISBN: 978-1-100-17926-1. Prepared by Contaminated Sites Division. Safe Environments Directorate.

Kerans, B.L. J.R. Karr, and S.A. Ahlstedt. 1992. Aquatic invertebrate assemblages: spatial and temporal differences among sampling protocols. Journal of the North American Benthological Society 11: 377-390.

Kilour, B.W., K.R. Munkittrick, C.B. Portt, K. Hedley, J. Culp, S. Dixit, and G. Pastershank. 2005. Biological criteria for municipal wastewater effluent monitoring programs. Water Quality Research Journal of Canada 40: 374-387.

Letovsky, E., I.E. Myers, A. Canepa, and D.J. McCabe. 2012. Differences between kick sampling techniques and short-term Hester-Dendy sampling for stream macroinvertebrates. BIOS 83(2): 47-55.

MacDonald, D.D., B. Zajdlik, and INAC Water Resources. 2009a. Guidelines for designing and implementing aquatic effects monitoring programs for development projects in the Northwest Territories: Volume 1- Recommended procedures for identifying issues and concerns associated with development projects. Prepared for Indian and Northern Affairs Canada. Water Resources Division. Yellowknife, Northwest Territories. Prepared by MacDonald Environmental Sciences Ltd., Nanaimo, British Columbia and Zajdlik and Associates, Rockwood, Ontario.

MacDonald, D.D., B. Zajdlik, and INAC Water Resources. 2009b. Guidelines for designing and implementing aquatic effects monitoring programs for development projects in the Northwest Territories: Volume 2 - Recommended procedures for developing the problem formulation to support the design of aquatic effects monitoring identifying issues and concerns associated with development projects. Prepared for Indian and Northern Affairs Canada. Water Resources Division. Yellowknife, Northwest Territories. Prepared by MacDonald Environmental Sciences Ltd., Nanaimo, British Columbia and Zajdlik and Associates, Rockwood, Ontario. MacDonald, D.D., B. Zajdlik, and INAC Water Resources. 2009c. Guidelines for designing and implementing aquatic effects monitoring programs for development projects in the Northwest Territories: Volume 3 - Recommended procedures for developing data quality objectives and a conceptual study design. Prepared for Indian and Northern Affairs Canada. Water Resources Division. Yellowknife, Northwest Territories. Prepared by MacDonald Environmental Sciences Ltd., Nanaimo, British Columbia and Zajdlik and Associates, Rockwood, Ontario.

MacDonald, D.D., B. Zajdlik, and INAC Water Resources. 2009d. Guidelines for designing and implementing aquatic effects monitoring programs for development projects in the Northwest Territories: Volume 5 - Recommended procedures for documenting and verifying conceptual and detailed designs of aquatic effects monitoring programs. Prepared for Indian and Northern Affairs Canada. Water Resources Division. Yellowknife, Northwest Territories. Prepared by MacDonald Environmental Sciences Ltd., Nanaimo, British Columbia and Zajdlik and Associates, Rockwood, Ontario.

MacDonald, D.D., B. Zajdlik, and INAC Water Resources. 2009e. Guidelines for designing and implementing aquatic effects monitoring programs for development projects in the Northwest Territories: Volume 6 - Recommended procedures for evaluating, compiling, interpreting, and reporting data collected under aquatic effects monitoring programs. Prepared for Indian and Northern Affairs Canada. Water Resources Division. Yellowknife, Northwest Territories. Prepared by MacDonald Environmental Sciences Ltd., Nanaimo, British Columbia and Zajdlik and Associates, Rockwood, Ontario.

MacDonald, D.D. M.J.R. Clark, P.H. Whitfield, and M.P. Wong. 2009f. Designing monitoring programs for water quality based on experience in Canada I. Theory and framework. Trends in Analytical Chemistry 28(2):204-213.

Nautilus Environmental. 2012. Evaluation of the effects of selenium on early lifestage development of mountain whitefish from the Elk Valley, BC. Prepared for Teck Coal Ltd., Calgary, Alberta. Prepared by Nautilus Environmental, Burnaby, British Columbia.

Smith, D.R., R.F. Villella, and D.P. Lemarie. 2003. Application of adaptive cluster sampling to low-density populations of freshwater mussels. Environmental and Ecological Statistics 10: 7-15.

USEPA (United States Environmental Protection Agency). 2000. Data quality objectives process for hazardous waste site investigations. EPA QA/G-4HW. EPA/600/R-00/007. Office of Environmental Information. Washington, District of Columbia.

USEPA (United States Environmental Protection Agency). 2006. Guidance on systematic planning using the data quality objectives process. EPA QA/G-4. EPA/240/B-06/001. Office of Environmental Information. Washington, District of Columbia.

Whitfield, P.H. 1988. Goals and data collection designs for water quality monitoring. Water Resources Bulletin 24(4):775-780.

Zajdlik, B. D.D. MacDonald, and INAC Water Resources. 2009. Guidelines for designing and implementing aquatic effects monitoring programs for development projects in the Northwest Territories: Volume 4 - Recommended procedures for developing detailed designs of aquatic effects monitoring programs. Prepared for Indian and Northern Affairs Canada. Water Resources Division. Yellowknife, Northwest Territories. Prepared by Zajdlik and Associates, Rockwood, Ontario and MacDonald Environmental Sciences Ltd., Nanaimo, British Columbia.