

## Frontier Oil Sands Mine Project Joint Review Panel

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October 13, 2017

Teck Resources Limited

**Attention: Sheila Risbud, Regulatory Manager, Energy**

**Subject: Additional Information Required from Teck Resources Limited**

Dear Ms. Risbud:

The Joint Review Panel (the Panel) has completed its review of the additional information submitted by Teck Resources Limited (Teck) regarding the Frontier Oil Sands Mine Project (the Project), as well as comments received in response to the public comment period which ended on July 24th, 2017. The attachment to this letter contains requests for additional information related to tailings management, air quality, Indigenous issues, economics, reclamation, wildlife and water. The Panel is currently reviewing the information submitted by Teck regarding human health and wildlife health, and a subsequent package of information request on those topics may follow.

The purpose of this phase of the review is to determine whether the information provided by Teck to date is sufficient to proceed to the public hearing stage of the review. In its review, and in consideration of the public comments received, the Panel sought to identify information gaps which would not allow it to satisfy its Terms of Reference or ultimately make conclusions regarding whether the Project is likely to cause significant adverse environmental effects.

Areas that in the Panel's opinion represented potential differences of professional judgement with respect to EIA methodology or interpretation of results, requests for potential conditions of approval or requests for the Panel to direct Teck or the governments of Alberta or Canada to take certain actions were not considered to be gaps and were not included in the information requests submitted to Teck. To the extent that these issues are of interest to hearing participants and relevant to the Panel's review, they may be raised and discussed during the hearing phase of the review.

To assist future planning efforts by the Panel and other participants, please provide an anticipated timeline for Teck's response. If you require clarification with regard to these information requests, do not hesitate to contact David Haddon or Tara Wheaton, the Panel co-managers, at [Frontier.Review@ceaa-acee.gc.ca](mailto:Frontier.Review@ceaa-acee.gc.ca).

Yours truly,

<Original signed by>

Alex Bolton

Chair, Joint Review Panel  
cc: Scott McKenzie, Teck Resources Limited

Attach

**Frontier Oil Sands Mine Project**

**Joint Review Panel Information Request Package #10**

**October 13, 2017**

**Tailings Management**

**10.1**

Rationale:

In Section 6, Volume 1 of the Project Update Teck states that it expects centrifuge operations to produce centrifuge cake with a nominal solids content of 55%. After deposition, Teck expects the solids content to increase to 65% in the ex-pit cake deposit (ETA 2) and 60% in the in-pit cake deposits (ITA 1 CFT and ITA2 CFT).

In Appendix 6, Volume 1 of the June 2015 Project Update, Teck indicates that centrifuge cake consolidation rates were modelled using finite strain analysis.

In its response to JRP IR 1.2 Teck identifies limited monitoring data related to the trajectory for consolidation and strength gain in large scale thick centrifuge cake deposits like those proposed for the project as a key uncertainty.

In its response to JRP IR 1.3 Teck states that both the ITA 1 and ITA 2 cake deposits and reclaimed sand caps are likely to settle several meters over the decades following reclamation soil placement.

Information Request:

Provide the results of the centrifuge cake consolidation modelling that was completed for the project. Include a discussion of the methodology and assumptions used.

Provide any other consolidation studies or modelling completed by Teck or others that supports the consolidation mechanism, expected degree of consolidation and consolidation rates used by Teck to develop its proposed plan for the deep in-pit centrifuge cake deposits.

**10.2**

Rationale:

In its response to JRP IR 1.3 Teck proposes a single performance indicator (centrifuge cake product solids concentration  $\geq 50\%$ ) to determine when cake deposits have achieved ready to reclaim (RTR) status.

Fluid tailings are considered RTR when they have been processed with an accepted technology, placed in their final landscape position, and meet performance criteria. Fluid tailings must meet RTR status in order to be removed from the fluid tailings inventory.

Teck states that general relationships between solids concentration and deposit undrained shear strength for treated oil sands fluid tailings deposits, including centrifuge cake, have been observed and published in industry literature, referencing a paper by McKenna *et al*, 2016. Teck states that solids concentration provides a single indicator that provides the required information about the strength of the cake deposit, the relationship to strength that is expected to be required for future capping and reclamation activities, and the status of the deposit with respect to residual settlement expectations.

The purpose of subobjective 2 RTR is to minimize the effect of the centrifuge cake deposit on the surrounding environment and to ensure that it will not compromise the ability to reclaim to a locally common, diverse, and self-sustaining ecosystem.

Information Request:

- a) Provide the referenced paper by McKenna et al and any other studies that Teck is relying on to establish the relationship between centrifuge cake solids concentration, deposit undrained shear strength, and settlement performance.
- b) Based on these relationships, provide estimates of the undrained shear strength and expected behaviour (solid, semi-solid, fluid) of the centrifuge filter cake at solids concentrations of 50 %, 55%, 60%, and 65%.
- c) Confirm at what solids concentration the deposit will no longer meet the definition of fluid tailings under the Tailings Management Framework and will be removed from the FFT inventory.
- d) Identify Teck's target solids concentration (or strength or other criteria) for the in-pit deep cake deposits immediately prior to capping and reclamation.

### **10.3**

Rationale:

In its response to JRP IR 1.2 Teck identifies a number of potential mitigation measures that could be implemented if cake behaviour does not respond as predicted, including:

- changes to total cake deposit thickness to manage post-reclamation settlement;
- changes to the annual rate of rise of cake deposits (i.e. by increasing the active surface area of the cake deposits at any time to reduce seepage path length for pore water contained in upper cake lifts);
- changes to planned methods of capping cake deposits (e.g. installing wick drains to dewater and strengthen the uppermost cake, or sand raining to establish the first lift of sand cap);
- changes to sand cap thickness; and
- optimization of flocculants or coagulants.

Teck notes in its response that the perimeters of ITA 1 and ITA2 will be more than 20 km and 30 km respectively and that the centrifuge cake deposits will be 30 - 60 meters thick.

Information Request:

Evaluate and discuss the degree to which changes to total cake deposit thickness, the rate of annual rise of cake deposit and changes to sand cap thickness can be accommodated within the proposed mine plan. Discuss the implications of implementing these mitigation measures on the proposed fine fluid tailings (FFT) volume profile.

Discuss the extent to which the identified options for mitigation may address risks to achieving final landscape eco sites or closure landforms identified in reclamation plans for these areas.

Provide information to demonstrate that the use of wick drains or geotextile grids would be technically and economically feasible for tailings deposits of the areal extent and thickness of those proposed for ITA 1 CFT and ITA 2 CFT.

## **10.4**

Rationale:

The milestone dates included as part of Teck's response to JRP IR 1.3 indicate that sand capping of ITA 2 will continue after the end of mining in year 41 (2066). Teck proposes to cap the centrifuge cake deep deposits in ITA 1 CFT and ITA 2 CFT with tailings sand having a nominal thickness of 10 m.

Information Request:

Provide information to confirm the availability of adequate sand for capping tailings deposits after the end of mine life.

## **Air Quality**

## **10.5**

Rationale:

JRP IR 3.12 required Teck to assess whether there are likely to be measurable, cumulative adverse effects on air quality, deposition, or acid input to the Peace-Athabasca Delta and Wood Buffalo National Park as a result of the project. In response, Teck indicated that "assessment conclusions are expected to be similar to those presented in Volume 8, Section 7.2 of the Integrated Application, this section was not explicitly updated for the Project Update", but did provide updated values for ambient concentrations, potential acid input predictions, and nitrogen deposition predictions.

Information Request:

Update the analyses (i.e. air quality predictions) and re-evaluate conclusions in Volume 8, Section 7.2 of the Integrated Application with findings from the Project Update.

## 10.6

### Rationale:

JRP IR 3.10 required Teck to evaluate and quantify the Project's potential contribution to secondary organic aerosols (SOA) in the atmosphere. In its response, Teck determined that "the Project could potentially increase the regional SOA precursor emissions by approximately 9%". Teck's response does not resolve the uncertainty in the representativeness of PM<sub>2.5</sub> in Teck's Project Update modelling assessment.

Teck's response also states that "adverse human health outcomes are not expected for short-term PM<sub>2.5</sub> concentrations of 5 µg/m<sup>3</sup> to 8 µg/m<sup>3</sup>" as the predicted concentrations are below the Alberta Ambient Air Quality Guideline for PM<sub>2.5</sub>. However, it is not clear how Teck has determined that the predicted PM<sub>2.5</sub> concentrations will occur over a short term.

### Information Request:

- a) Provide any relevant calculations, parameters and assumptions associated with Teck's estimate of the Project's increase to the region's SOA (i.e. the 9% contribution).
- b) Explain how the 5 µg/m<sup>3</sup> to 8 µg/m<sup>3</sup> range was calculated for Teck's estimated 1 hour average concentration range of PM<sub>2.5</sub> attributable to SOA.
- c) Provide an estimate of how model-predicted concentrations of PM<sub>2.5</sub> are expected to change once SOA from the Project are taken into account. This analysis should include a selection of appropriate receptors (including Fort McKay, Fort McMurray, and Fort Chipewyan) and comparison of the revised concentrations to the Canadian Ambient Air Quality Standards for PM<sub>2.5</sub>.
- d) Provide justification for the assessment that PM<sub>2.5</sub> concentrations arising from SOA are considered "short-term."

## 10.7

### Rationale:

JRP IR 3.7 required Teck to describe the modelling assumptions used in metals and PAH deposition modelling, and justify how the assumptions could be considered conservative. In Volume 3, Appendix 4A, Table 4A-67 of the Project Update total PAH emissions were stated to be zero for all tailings ponds. As tailings ponds can be a potential source of PAH emissions, the conservativeness of the PAH deposition predictions is in question.

Environment and Climate Change Canada (ECCC) states that, according to Galarneau et al. (2014), estimated fluxes of PAH from air and water measurements for the oil sands region have shown that emissions from tailings ponds alone were four times greater than what was reported to the National Pollutant Release Inventory for all PAH sources combined. Omission of this source might result in substantial underestimation of PAH emissions from the Project.

Also according to ECCC, it is not clear whether Teck has adequately demonstrated that the conservative estimates applied in the human health risk assessment and the wildlife health risk assessment

effectively offset the underestimation of deposition rates in the model when compared to rates measured by Zhang et al. (2014), which were up to a factor of three times higher (Table 3.7b-9).

ECCC also states that wildfire activity in the region constitutes a major source of PAH, which could increase ambient concentrations above the predictions in the Project Update.

Information Request:

- a) Provide an estimate of PAH emissions from the Project's tailings ponds based on available scientific information (e.g. exchange fluxes from Galarneau et al. (2014)). Assess the increase in total PAH emissions from the Project taking into account PAH emissions from tailings ponds.
- b) Provide a sensitivity analysis for PAH concentrations in surface water, which incorporates the rates of PAH deposition determined in Zhang et al (2014) as well as the inclusion of tailings ponds as emission sources as determined in a).
- c) Discuss whether the conclusions reached in the WHRA are accurate after incorporation of the revised PAH emission and deposition as determined in a) and b), respectively.
- d) Provide details regarding how monitoring and modelling updates account for contributions from fire activity in 2016. Provide an analysis of whether this source of increased pre-development PAH changes the modeled predictions for environmental concentrations.

## **10.8**

Rationale:

Oil sands operations in Alberta are required to report VOC emission to the National Pollutant Release Inventory (NPRI). In their submission to the Panel, ECCC states "to date there have been few direct measurements of emissions rates of multiple VOC from complex industrial facilities due to the fugitive nature of sources, technical difficulties and costs in measuring a large number of compounds and a lack of suitable methods to enable emission rate determination. Recent research demonstrated a new methodology that provides validation of VOC emission reports using a top-down approach, which allows emission rates for a large number of VOC and chemical speciation profiles from each operating oil sands surface mining facility to be determined. Total VOC emissions from existing oil sands facilities were determined to be up to 4.5 times higher than what is reported to NPRI (Li et al. 2017)."

In Volume 3, Appendix 4A of the Project Update, Teck provides an overview of the VOC emissions estimation methodology it intends to use for reporting.

Based on the findings described by ECCC actual VOC emissions from the Project may be higher than the estimates that would be reported to the NPRI.

Information Request:

Provide a plan for validating the VOC emissions estimation methodology to ensure that VOC emissions estimates are accurate and that VOC emissions reported to NPRI are not lower than the actual emissions from the Project.

## Indigenous Issues

### 10.9

#### Rationale:

JRP IR 4.5 required Teck to provide a detailed description of how access to, through and around the Project site for each indigenous group will change at each phase of the mine advancement.

In Section 4 of the draft access management plan, Teck stated that in order to respect the traditional knowledge sharing agreements with Indigenous communities, maps of mine progression and current land and resource use locations for each Indigenous community were not included as part of the draft AMP at this time. All potentially-affected Indigenous communities have submitted maps of their use of the Project Development Area as part of community-led Project studies that are available on the public record and Teck has previously provided maps of mine progression in the Project Update (see Volume 3, Section 17, Appendix 17-G).

Figures 4.5-1 to 4.5-19 in Volume 1 of the Project Update show the mining sequence and the mine advance from the preproduction period to the end of mining and about ten years after mine operations. The location of access gates are not included in these figures nor have they been mapped in Appendix 17-G of Volume 3 of the Project Update. It is not clear where access gates will require each Indigenous group to be granted access to and through the Project site.

Indigenous groups have raised concerns that oil sands development along the Athabasca River has greatly restricted the ability of land users to access current land and resource use locations via the river.

Figure 4.1-1, Volume 1 of the Project Update provides a general site layout map. This map does not show the location of the bridge or the utility corridor (refer to Teck's response to JRP IR 4.7). A single map displaying all proposed project-related infrastructure has not been provided.

In Table 1.3-1, Volume 1 of the Project Update, Teck predicts that closure will be complete in 2081. Teck indicates that closure will be considered complete when major closure works and reclamation have been completed; this includes pit lakes being fully integrated with the surrounding receiving waters. Teck later states in Section 13.6.4.1 of Volume 1 of the Project Update that no active oil sands mine sites have been completely reclaimed and closed. It is unclear when Teck plans to provide Indigenous groups with access to reclaimed landscapes and what conditions may delay that access.

#### Information Request:

- a) Provide a map, similar to Figure 4.1-1 of Volume 1 of the Project Update, illustrating the spatial boundaries of the proposed access management plan, all proposed project-related facilities and infrastructure, including but not limited to: the plant site; work camp; aerodrome; mine services facilities; bridge; utility corridor; roads; river water intake and all other project-related infrastructure proposed to be constructed. Each feature should be labelled.

- b) Using the complete list of facilities and infrastructure mapped in the request above, provide additional maps that show:
- the project fence line and the location of gates that will control access around project-related facilities, and
  - infrastructure and mining activities for the entire period of time that the project is anticipated to affect access to the Project site. Include any locations that would have limited access for safety reasons and any areas where access from the Athabasca River will be impeded (for example, during the construction of the river water intake and/or bridge).
- c) If the location of the project fence line and access gates is anticipated to change as the mine progresses, provide a map that illustrates the progression of the areas of restricted access and the location of gates over the life of the Project, identify how many years the access will be restricted for each location and describe the reasons for the position modification (for example, mine progression or areas reclaimed).
- d) List all known existing land user groups (both aboriginal and non-aboriginal) within the project development area.
- e) Identify, using likely scenarios as well as a worst case scenario, when access to the Project site may be provided following reclamation and how long access to the Project site may be delayed if conditions are not achieved when anticipated. Provide a description of the minimum reclamation conditions Teck is committed to achieving before access to reclaimed landscapes is restored for Indigenous groups. Discuss the uncertainty surrounding the achievement of those reclamation conditions.

## **10.10**

### Rationale:

The access management plan must provide mitigation or alternative access options for all current users. The existing River Road runs through the PDA and Teck proposes to locate some mine infrastructure where the road is currently located.

### Information Request:

Describe how the existing River Road will be preserved or re-configured and maintained to permit access for current users. If Teck proposes to relocate the road, provide preliminary alternative locations. Discuss how Teck has considered the potential effects of relocating the existing River Road in its environmental assessment.

## **10.11**

### Rationale:

The Panel's Terms of Reference requires it to accept, review, and report on information it receives from Aboriginal groups related to the nature and scope of asserted or established Aboriginal or treaty rights in the area of the Project, as well as information on the potential adverse effects the project may have

on asserted or established treaty rights, and information regarding any measures proposed to avoid or mitigate potential adverse effects of the Project on asserted or established Aboriginal or treaty rights.

The Panel's terms of reference also states that for the purposes of its report, the Joint Review Panel shall summarize claims of Aboriginal or treaty rights as presented and consider the effects of the project on the Aboriginal or treaty rights.

JRP IR 4.8 required that Teck consolidate all of the information it had received pertaining to asserted or established Aboriginal or treaty rights for each Indigenous group, including any updated information from Traditional Land Use (TLU) studies and Cultural Impact Assessments (CIA) completed by Indigenous groups. In response, Teck provided a table which listed all of the submissions made by each Indigenous group up to the date of Teck's response.

Information Request:

From the sources listed in the Table 4.8 submitted in response to JRP IR 4.8, and any additional information submitted by Indigenous groups to date, provide a summary of the asserted or established Aboriginal or treaty rights described by each Indigenous group.

**10.12**

Rationale:

JRP IR 4.4 required Teck to provide, for each Indigenous group a full list of mitigation measures that it commits to implement, should the Project be approved, including proposed mitigation measures that have resulted from discussions with Indigenous groups throughout the EA process. These were to include mitigation measures within the Local Study Area (LSA) and RSA as well as mitigation measures for specific uses, practices or activities that occur outside of the boundaries of the RSA where a potential effect of the Project may occur.

The list of mitigation measures provided in Teck's response to JRP IR 4.4 appears to be incomplete. Teck's reliance on a concordance table and reference to draft mitigation and monitoring plans do not provide sufficient specificity and clarity on the commitments made by Teck to allow the Panel to consider the measures proposed to avoid or mitigate effects of the Project on asserted or established Aboriginal or Treaty rights and interests. As Indigenous communities' customs, practices, culture and rights are distinctly different they should be assessed individually.

Information Request:

For each Indigenous group that Teck has consulted with and may be affected by the Project, provide the following:

- a) A list of the potential adverse environmental effects the Project may have on asserted or established Aboriginal or treaty rights, current use of lands and resources for traditional purposes or physical and cultural heritage.

- b) A list of specific mitigation measures proposed by each Indigenous group in their TLU and CIA studies to mitigate potential adverse effects on asserted or established Aboriginal or treaty rights, current use of lands and resources for traditional purposes or physical and cultural heritage.
- c) A list of specific commitments made by Teck to mitigate potential adverse effects on asserted or established Aboriginal or treaty rights, current use of lands and resources for traditional purposes or physical and cultural heritage, including any measures proposed by the groups, above.

The information should be submitted to the Panel in the table format provided below.

Indigenous group	Potential adverse effect	Mitigation proposed by Indigenous group, if applicable (include reference to source document)	Mitigation Teck commits to implement

## Economics

### 10.13

Rationale:

In Volume 1, Section 16.3.3.2 of the Project Update, Table 16.3-2 shows Operation Expenditure in Alberta to be \$1,522 million. Table 5.1b-3 in Teck’s response to JRP IR 5.1, shows Operations expenditure in Alberta (CAN\$ million) (average annual) to be \$66,875 million. The 2017 value provided in the IR response is significantly higher than the 2015 values provided in the Project Update.

Information Request:

Discuss the reason for the difference between the Operation Expenditure values.

### 10.14

Rationale:

JRP IR 5.1 instructed Teck to provide an update of the socio-economic effects of the Project under each of two scenarios: one incorporating current Alberta and Federal carbon pricing policies, and one not incorporating Alberta and Federal carbon pricing policies. As part of its response to the IR, Teck states that the Project “will be developed in two phases, with the first phase planned to start-up in 2026 and Phase 2 planned to start-up in 2037”.

In Volume 1, Section 16.3.3.2 Of the Project Update, Teck states that “The Project construction cost of \$20.6 billion is based on preliminary engineering estimates and is subject to change.”

Information Request:

- a) Confirm that this estimated Project construction cost provided in the Project Update is still valid.
- b) Using the table below, provide the breakdown of construction costs between the 2 phases identified in Teck’s response to JRP SIR 5.1. Identify and state any costs, per phase, that would be different between the “with Carbon Pricing” and “without Carbon Pricing” scenarios

	Phase 1- with Carbon Pricing	Phase 2- with Carbon Pricing	Total with Carbon Pricing	Phase 1- without Carbon Pricing	Phase 2- without Carbon Pricing	Total without Carbon Pricing
Capital Expenditure In Alberta (total)						
Capital Expenditure In Alberta (NPV)						

**10.15**

Rationale:

In Volume 1, Section 16.8.1 Teck stated “The annual GDP and household income effects in Alberta of Project operations are estimated at \$2.1 billion and \$2.2 billion, respectively.” In its response to JRP IR 5.1, Teck’s updated values for the reference case (listed in table 5.1b-3, (for both “with Carbon Pricing” and “without Carbon Pricing”) are much lower at \$1,520 million and \$790 million, respectively.

Information Request:

Provide the reason for the values listed in the response to JRP IR 5.1 being significantly lower than the values provided in the Project Update.

**10.16**

Rationale:

In Volume 1, Section 16.3.3.2 of the Project Update, Teck stated “In Alberta, the direct, indirect and induced effect of Project construction on gross domestic product (GDP) is estimated at \$18.3 billion and the direct, indirect and induced effect of Project construction on household income is estimated at \$13.2 billion, based on published statistics from Alberta Treasury Board and Finance (ATF 2014).”

In Table 5.1a-3 of Teck’s response to JRP IR 5.1, the updated values for the reference case (for both “with Carbon Pricing” and “without Carbon Pricing”) are much lower than those listed in the Project Update, at \$12,300 million and \$7,500 million, respectively.

Information Request:

Discuss the reason for the values provided in the response to JRP IR 5.1 being significantly lower than the values provided in the Project Update.

**10.17**

Rationale:

Tables 5.1a-1, page 5-7 to Table 5.1a-3 in Teck's response to JRP IR 5.1 state that the exchange rate used is "(US\$/CAN\$)."

Information Request:

Confirm that the exchange used in tables 1a-1, page 5-7 to Table 5.1a-3 are "US\$/CAN\$" and not "CAN\$/US\$."

**10.18**

Rationale:

In its response to JRP IR 5.1 Teck states "The economic scenario used for the Project Update (average oil price scenario of US\$95 per barrel WTI) aligns with the IEA (2016) New Policies Scenario. Teck also uses low oil price case and high oil price case guidance from several independent, third-party global crude oil supply and demand models and price forecasts to determine the low oil price scenario of US\$76.51 per barrel WTI and the high oil price scenario of US\$115 per barrel WTI."

Information Request:

- a) Provide the corresponding WCS (Western Canada Select) values for the low, reference and high price scenarios identified in the response to JRP IR 5.1.
- b) For each price scenario, identify and explain the factors used to determine the values.

**Reclamation**

**10.19**

Rationale:

The draft reclamation monitoring plan described methods to monitor vegetation, soils and wildlife in the reclaimed landscape. If the Project is approved, a detailed reclamation monitoring plan will be submitted by Teck that will detail methods, performance measures and indicators for monitoring areas as they are progressively reclaimed. Because a mine's operational approval is for a period of 10 years, Teck's reclamation practices including monitoring or reclaimed areas will be evaluated every 10 years during approval renewals.

However, uncertainties exist on how tailings deposits will affect final reclamation outcomes and timelines. The rate and degree of settlement on reclaimed areas will have an effect on final landscapes including timelines to final closure and return of the land to Albertans. Teck's high level draft reclamation monitoring plan failed to address all the potential risks associated with achieving successful reclamation outcomes of all disturbed areas to achieve targeted end landscapes, ecosystems and species. Continued settlement on reclaimed areas located on tailings deposits such as centrifuge cake tailings can affect reclamation outcomes. The plan failed to address the question of how the rate and degree of settlement on tailings deposits will be monitored.

Other uncertainties include risks posed by the presence of chemicals of potential concern (COPC) resulting from tailings will affect soils, quality of surface and ground waters and ultimately reclaimed vegetation communities at closure of the Teck Frontier project.

The focus of Teck's draft reclamation monitoring plan is on reclamation monitoring objectives and criteria for terrestrial vegetation and for soil and landforms. A large percentage of the areas to be reclaimed will contain tailings deposits in the form of centrifuge cakes and other tailings streams.

Information Request:

- a) Describe methods that Teck will use to monitor the rate and degree of settlement on reclaimed areas located on tailings deposits;
- b) Provide methods to implement corrective measures on tailings deposit areas that do not meet declared end land uses and timelines to final reclamation due to continued settlement.

## **Wildlife**

### **10.20**

Rationale:

JRP IR 7.5 e required Teck to calculate the winter range carrying capacity for the Ronald Lake bison herd, considering the most recent data since the Project update.

In its response to Joint Review Panel Information Request 7.5 e(i), Teck states that it has chosen to provide three interpretations of the core winter range for the Ronald Lake bison herd. The first interpretation, the winter Ronald Lake Bison Study Area, includes Mikisew Cree First Nation (MCFN) and Athabasca Chipewyan First Nation's bison information. The second interpretation ( population-level 95% utilization distributions) and third interpretation, (female winter 80% utilization distributions), primarily use utilization distributions based on radio-telemetry data collected between 2013 and 2017.

Tables 7.5c-1 and 7.5e-11 identify effects resulting from the first interpretation (winter Ronald Lake Bison Study Area) however the effects assessment discussion provided in response to the JRP IR 7.5 c focusses on the effects resulting from the second and third interpretations.

Environment and Climate Change Canada (ECCC) indicated that Teck's focus on the second and third interpretations has ignored earlier data. ECCC is of the opinion that the incorporation of all data sources, including Indigenous knowledge is important to understand the bison's range.

In addition, ECCC indicates that more recent (2016-2017) telemetry data (DeMars et al. 2017) may show that bison utilization distributions have shifted further north. According to ECCC, it is important to consider that the Ronald Lake bison range has experienced considerable disturbance due to oil sands exploration activities, logging and hunting during the period of time that the telemetry data has been collected. ECCC believes that it is possible that the DeMars et al. 2017 cumulative utilization distributions reflect the response of the Ronald Lake Bison to recent and ongoing disturbance, and may not reflect the herd's core range over the long term.

ECCC and Parks Canada recommend that Teck provide a series of figures and tables, using all available information sources, including MCFN's traditional knowledge on core bison range, baseline data collected for the Frontier and Pierre River Oil Sands Mine Projects and yearly utilization distributions to fully characterize the seasonal and yearly home ranges for the Ronald Lake bison in relation to the Project Development Area (PDA).

Information Request:

- a) Provide the following figures and tables using all available information sources including MCFN's traditional knowledge on core bison range, baseline data collected for the Frontier and Pierre River Oil Sands Mine projects and yearly utilization distributions:
  - (i). A figure showing all point source detections of the Ronald Lake bison relative to the PDA. The figure should show, at a minimum, all radio telemetry points (individual points from 2013-2017), baseline field data points (including sign and visual observations and number of detections), provincial survey data points, such as displayed in Government of Alberta (2012), and any other point source data that may be available. The PDA should be displayed as a background layer and not obscure the data points.
  - (ii). A figure showing all point source detections of the Ronald Lake bison as above, the PDA, the approximate boundary of core habitat/range for the Ronald Lake bison herd as delineated by MCFN (Figure 4 in Candler et al. 2015) and approximate boundaries for both "observed core bison habitat" and "known core bison habitat" as delineated by ACFN (Figure 10 in Candler et al. 2011).
  - (iii). A series of figures showing the seasonal (spring, summer, fall and winter) home ranges (one figure per season), based on 80% utilization distributions, relative to the PDA. When displaying seasonal home ranges, utilization distributions should be presented separately for each year that data are available, rather than cumulatively for all years combined, to show any change in the seasonal ranges across years. The figures should show the full extent of the seasonal home ranges (not just a portion of each range), all telemetry point locations for each season and the location of the PDA.
  - (iv). A series of figures showing the seasonal (spring, summer, fall and winter) home ranges (one figure per season), based on 95% utilization distributions, relative to the PDA. When displaying seasonal home ranges, utilization distributions should be presented separately for each year that data are available, rather than cumulatively for all years combined, to show any change in the seasonal ranges across years. The figures should show the full

- extent of the seasonal home ranges (not just a portion of each range), all telemetry point locations for each season and the location of the PDA.
- (v). A series of figures showing the seasonal (spring, summer, fall and winter) home ranges (one figure per season), based on 100% Minimum Convex Polygons (MCPs), relative to the PDA. When displaying seasonal home ranges, MCPs should be presented separately for each year that data are available, rather than cumulatively for all years combined, to show any change in the seasonal ranges across years. The figures should show the full extent of the seasonal home ranges (not just a portion of each range), all telemetry point locations for each season and the location of the PDA.
  - (vi). A figure showing the yearly (population-level) range, based on 95% utilization distributions, relative to the PDA. Utilization distributions should be presented separately for each year that data are available, rather than cumulatively for all years combined, to show any change in yearly range across years. The figure should show the full extent of the yearly home range (not just a portion of the range), all telemetry point locations and the location of the PDA.
  - (vii). A figure showing the yearly (population-level) range, based on 100% MCPs, relative to the PDA. MCPs should be presented separately for each year that data are available, rather than cumulatively for all years combined, to show any change in yearly range across years. The figure should show the full extent of the yearly home range (not just a portion of the range), all telemetry point locations and the location of the PDA.
  - (viii). A table summarizing the area and percentage of:
    - each 80% UD (by season and year) that overlaps with the PDA;
    - each 95% UD (by season and year) that overlaps with the PDA;
    - each 100% MCP (by season and year) that overlaps with the PDA;
    - each yearly 95% UD that overlaps with the PDA, and
    - each yearly 100% MCP that overlaps with the PDA.
- b) Discuss whether Teck’s use of the DeMars et al. 2017 telemetry data may underestimate the potential effects of the Project on the Ronald Lake bison herd.
- c) Considering the information provided in response to a) and b), discuss whether Teck’s conclusions regarding the potential effects of the Project on the core range of the Ronald Lake bison herd have changed. If they have, provide an updated assessment of potential effects of the Project on the Ronald Lake bison herd’s range.

## 10.21

### Rationale:

Waterbirds are protected under the Migratory Birds Convention Act and have been identified by Indigenous groups as an important component of traditional land use and culture. Indigenous groups have expressed concerns that the Project will impact migration routes and stopover areas, affecting their ability to practice traditional harvesting. In its July 24, 2017 submission to the Joint Review Panel, Parks Canada states that an increase in the number and size of industrial water bodies, coupled with a decrease in natural habitat availability, has the potential to adversely affect migratory bird species.

Parks Canada also states that bird populations and distribution within Wood Buffalo National Park may be changing. Potential causes of these changes associated with oil sands development, include regional habitat loss, air pollution from stacks, contacts with tailings ponds, and visual and audio disturbances.

Parks Canada believes there are knowledge gaps related to the cumulative effects of the regional habitat loss, disturbance and mortality of waterfowl migrating through the RSA which may be affecting migratory bird populations reaching Wood Buffalo National Park.

Information Request:

- a) Provide an assessment of the cumulative loss of migratory waterfowl habitat in the Regional Study Area and the Project's incremental contribution to the cumulative loss of migratory waterfowl habitat.
- b) Discuss knowledge gaps related to the potential cumulative effects on migratory bird populations from regional habitat loss through the RSA, which may be affecting bird populations and distribution within Wood Buffalo National Park.

## **10.22**

Rationale:

JRP IR 7.10 instructed Teck to provide a draft Waterfowl Protection Plan and adaptive management plan to ensure effective mitigation of the effects of the Project on migratory water birds. Teck's response did not include some of the details specified by the Panel in its request.

Information Request:

Supplement the Waterfowl Protection Plan by providing the following information:

- a) A description of the potential for weather events to increase the likelihood of waterfowl interacting with tailings ponds, including the expected nature and frequency of such events.
- b) A detailed description of the uncertainties associated with bird deterrent systems and other mitigation measures that necessitate the use of adaptive management. Describe how deterrents and adaptive management will be implemented with respect to extreme weather events.
- c) A description of clear, measurable thresholds that will trigger the implementation of alternative management actions or mitigation measures.

## **Water**

### **10.23**

Rationale:

Table 8.3a-1 in Teck response to JRP IR 8.1 summarizes estimates of average changes in Peace Athabasca Delta water levels by distributing the change in annual inflow volume from the Athabasca River over the total surface area of the delta, including Lake Athabasca. This approach does not consider the relationship between lake level, Peace River flows, and lake outflow that largely governs how the water level of Lake Athabasca will respond to changes in lake inflow. This relationship has been formulated a number of times in the literature (for example, Muzik, 1991, Pietroniro et al., 2011, and

Kouwen, 2016). Peters and Buttle (2010) and Pietroniro et al., 2006 developed a full hydraulic model of the delta to evaluate impacts of climate change and upstream development on the delta.

Information Request:

Estimate the expected changes in Lake Athabasca water levels under development and climate change scenarios using an approach that includes the relationship between Lake Athabasca water levels, Lake Athabasca outflows, and flows in the Peace River.

**10.24**

Rationale:

JRP IR 8.39 sought information regarding the effects of seepage-affected groundwater discharge on chronic toxicity in surface water receptors, including the Fish Habitat Compensation Lake (FHCL). In its response, Teck provided tables of predicted far future concentrations for Redclay Creek and Big Creek, but not for the FHCL.

Information Request:

Provide predictions for water quality in the Fish Habitat Compensation Lake for the four scenarios: No Barrier, Base Case, Partial Barrier Failure and Increased Devonian Permeability

**10.25**

Rationale:

JRP IR 8.3 instructed Teck to provide a draft surface water hydrology and quality monitoring and adaptive management plan. In Appendix 8.33 (Draft Hydrology and Water Quality Mitigation, Monitoring and Adaptive Management Plan), Teck proposes a plan with monitoring, mitigation and adaptive management actions primarily based on operations at other oil sands developments and EPEA conditions. In addition, the mitigation measures described in the adaptive management plan rely primarily on passive treatment options as opposed to consideration of active treatment (e.g. treatment systems to remove elevated parameters of concern).

Information Request:

Provide an updated draft Hydrology and Water Quality Mitigation, Monitoring and Adaptive Management Plan which includes discussion of which COPCs will be used as indicators, choices of monitoring and sampling approaches, frequency of sampling, thresholds which would trigger corrective action, and an evaluation of active treatment technologies as potential mitigation measures.

**10.26**

Rationale:

In Teck's response to JRP IR 8.1, updated sections of the June 2015 Water Management Plan were provided a number of items were not provided or updated. For instance, Teck did not update section 7.7.4, Stream Diversion Channels, Page 7-17 within the June 2015 Water Management Plan to remove a

reference to Unnamed Creek 2 flow being used as the Project's contingency water supply. In addition, a full copy of the updated water management plan was not provided.

Information Request:

Provide an updated Water Management Plan to address the following items:

- a) Table 8.1-1, Page 8-2 identified an update to Appendix 7A-1, including Attachment 7A-1 in the Appendix, however the updated appendix was not included in the response. Provide the updated Appendix.
- b) Eliminate the water use reference from section 7.7.4 and confirm that all references to the unnamed Creek No. 2 diversion within the updated water management plan have been removed to match Teck's removal of Unnamed Creek 2 water diversion from the Water Act Licence Application.
- c) Provide an updated list of all corrections and updates to include the above requests within (a) and (b).
- d) Provide a full copy of the updated consolidated water management plan.