



Environmental Protection Operations  
Environmental Stewardship Branch  
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November 9, 2016

ECPT: 16-0601

Brent Maracle  
Panel Manager  
Canadian Environmental Assessment Agency  
160 Elgin St. 22<sup>nd</sup> Floor  
Ottawa, ON K1A 0H3

Dear Mr. Maracle:

**Re: Environmental Assessment of the Proposed Pacific Future Energy Refinery Project – Environment and Climate Change Canada Comments on the Draft Environmental Impact Statement Guidelines (draft EIS Guidelines)**

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Environment and Climate Change Canada (ECCC) has completed a review of the following document provided by the Canadian Environmental Assessment Agency (Agency) on October 11, 2016:

- *Draft Guidelines for the Preparation of an Environmental Impact Statement pursuant to the Canadian Environmental Assessment Act, 2012. Pacific Future Energy Refinery Project Proposed by Pacific Future Energy Corporation.*

Departmental comments on the draft EIS Guidelines are offered in Appendix A, and are based upon the expertise available for the review period. Please note that additional comments are pending in the subject areas of water quality, wildlife and wildlife habitat; due to the importance of these components within the context of this project, ECCC requests that these additional comments be considered by the Agency once they are received.

Supplemental to the comments provided in Appendix A, please find the following appendices attached as they pertain to ECCC mandate and guidance:

- Appendix B provides an overview of the departmental mandate for migratory birds and species at risk as context for comments offered in Appendix A.
- To further assist the Agency in fulfilling their obligations under Section 79 of the *Species at Risk Act* (SARA), and in support of the comments provided in Appendix A for Marbled Murrelet and Western Toad, additional guidance is provided for these species in Appendix C.

ECCC also provides the following discussion relating to the transportation of all final and by-products from the refinery, for the information of both the Agency and the Proponent.

### **Incidental Components**

ECCC notes page 61 of the Project Description<sup>1</sup> states "Early third-party studies suggest a marine terminal could be situated along the Portland Inlet.... If such a marine terminal were to be developed, we anticipate that two (one for gasoline and one for diesel) short (275 km) pipelines.... could be built to support the marine terminal's operations."

Further, page 5 of the draft EIS Guidelines states:

"Under the authority of paragraph 19(1)(j) of CEAA 2012, the Agency also requires consideration of the following additional factors:

- the environmental effects of any incidental activities associated with the Project, such as receiving raw product and transporting all final and by-products from the refinery..."

Understanding that the process of identifying alternatives for the transportation of refined products is still under development, but recognizing that these alternatives may include a marine terminal such as that described and noted above, the following general advice related to Disposal at Sea is proactively offered as it may benefit the Proponent to be aware of the applicable regulatory requirements when advancing project plans, particularly in relation to incidental components of the Project to be considered under Section 19(1)(j) of CEAA 2012, as above.

### Disposal at Sea

The draft EIS Guidelines (Page 15) discuss potential dredging as a component of the Pacific Future Energy Refinery Project (Project). If disposal at sea is contemplated, for dredged or any other material, this activity will be subject to permitting under the *Canadian Environmental Protection Act* (CEPA) and must be recognized as part of the Project and subject to environmental assessment under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012).

Therefore, for any proposed disposal at sea activities, an EIS that addresses CEAA 2012 requirements should:

- provide an estimate of maximum volume of materials that may be disposed at sea
- provide characterization of material to be disposed
- provide an assessment of alternative options for managing any material considered for disposal at sea
- provide a waste prevention audit for any material proposed for disposal at sea
- confirm whether drilling muds and/or lubricants will form part of any excavated or blasted material proposed for disposal at sea

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<sup>1</sup> Project Description. Pacific Future Energy Refinery. June 2016. Prepared by SNC-Lavalin Inc. for Pacific Future Energy Corporation. Submission to British Columbia Environmental Assessment Office and Canadian Environmental Assessment Agency.

- if drilling muds/lubricants could form part of any material proposed for disposal at sea, identify the chemical constituents and/or industry name of material to be used, and
- describe and assess the potential environmental effects of any disposal at sea activities taking into account the proposed location of disposal activities

The proponent is referred to the Environment and Climate Change Canada Disposal at Sea website at <https://www.ec.gc.ca/iem-das/> which includes access to the *Applicant's Guide to Disposal for Dredged Material*.

Thank you for providing the opportunity to comment on the draft EIS Guidelines. Please do not hesitate to contact Nadine Parker at <contact information removed> or Marc LaPointe at <contact information removed> if you have any questions or concerns.

Yours/sincerely,  
<Original signed by>

**Mary Taylor**

Executive Director, Environmental Assessment Division  
Environment and Climate Change Canada / Government of Canada

Attach. (4)



**APPENDIX A**

**ENVIRONMENT AND CLIMATE CHANGE CANADA COMMENTS –  
PACIFIC FUTURE ENERGY REFINERY PROJECT DRAFT ENVIRONMENTAL IMPACT STATEMENT GUIDELINES**

Topic	dEISg Section/Title	Comment
2.0 Project Justification and Alternatives Considered	2.2 Alternative means of carrying out the Project	<p>ECCC recommends the addition of the following bullets to section 2.2:</p> <ul style="list-style-type: none"> <li>- Provide details as to how/if the biomass or geothermal options will be integrated into the plant design, described in the generic Gas Turbine Combined Cycle schematic #2 of the Project Description.</li> <li>- Provide a cross-comparison of the emission profiles under various scenarios (e.g. NG fired, NG / biomass-fired, biomass only, NG / geothermal, geothermal only, etc.).</li> <li>- Provide a discussion/justification as to why electricity from the grid is not being considered for this refinery; e.g., is it a cost issue, or distance from transmission lines, etc.</li> </ul>
3.0 Project Description	3.1 Designated Project	<p>ECCC recommends the addition of the following bullets to section 3.1:</p> <ul style="list-style-type: none"> <li>- Identify all project components located on-site as described in Table 4-1 in Project Description document.</li> <li>- Briefly describe each process.</li> <li>- Identify all project components that are not located on-site, but are needed to enable production, including 3rd party facilities in which services are used to enable production.</li> <li>- Provide crude slate for the facility. The availability of crude feedstock and the potential change of crude slate.</li> <li>- GHG emissions associated with the transportation of bitumen via rail to the facility.</li> <li>- Provide details on the power plant components to be installed (e.g. class of turbines, heat recovery steam generator (HRSG), number of HRSGs, number of and megawatts (MW) of steam turbines, etc.)</li> </ul>

- Provide a definitive quantification of the power rating of the gas and steam turbines (in MW).
- Provide a listing/description of the emission control technologies to be used at the power plant.

3.0 Project Description

3.2. Project Activities

ECCC recommends the addition of the following bullets to section 3.2 (and notes that departmental comments provided for section 6.6.1 are also applicable to section 3.2):

- Provide the frequency of equipment turnarounds for major emission sources of air pollutants and GHG. Turnarounds are not regular maintenance.
- Provide the frequency of regular maintenance on process equipment
- Provide regular maintenance frequency for control technologies of air pollutants and/or GHG.
- Identify major sources of air pollutants from all project components and provide maximum annual facility emission rates of following air pollutants from all project components: PM10, PM2.5, carbon monoxide CO, sulphur oxides SO<sub>x</sub>, nitrogen oxides NO<sub>x</sub>, hydrogen sulphide H<sub>2</sub>S, volatile organic compounds VOC, and ammonia NH<sub>3</sub>. (Maximum emission rates are the loading when refining capacity utilization is 100% and emissions reach their worst-case maximum. Project components include oil refinery, rail yard, tank farm, refined fuel delivery pipelines, marine terminal, co-generation facility, and all other components.)
- Provide details of the expected operating regime, percent (%) load and percent (%) of annual capacity.
- Detail the emission factors / emission intensities, operating hours, methodologies / calculations / assumptions for determining GHG emissions.
- Provide estimates of pollutants and GHGs to be emitted during construction phase, operational phase, and decommissioning and abandonment (e.g. power plant, transmission lines, etc.).
- Provide a quantification of the planned heat withdrawal (i.e., is the power plant to be a co-gen, combined heat and power (CHP), or classic natural gas combined cycle (NGCC)?). Since the proponent is advocating, as an option, the export of some of the steam generated from the power plant for heating

the bitumen, there is a need to identify how much steam is being proposed to be used for electricity vs. refining purposes, i.e., what is the estimated heat versus power ratio during operation?

- Provide details on the proposed biomass facility, e.g., how will the biomass combustor be integrated with the NGCC
- Provide details on the transportation of biomass to the power plant, fuel preparation (e.g., drying and storage to be considered) and the estimated GHG emissions from these activities.
- Provide details on the emission profiles as based on various scenarios of power output (25 MW or 75 MW, or in between), and the type of biomass fuel to be used (pulp wood, or hog fuel, or a combination).
- Given the proponent's comment that their demand for biomass fuel may exceed what's available from the local pulp mills, provide details on the project contingency for making up the shortfall in biomass and the environmental implications thereof.
- Regarding the emergency power backup system, the proponent should describe the components, power output, type of fuel to be used, estimated emissions based on fuel type, operating hours, etc., if the system is to use natural gas, or fuel gas to be considered for fugitive emissions.

4.0 Public Participation and Concerns

4.3 Study Strategy and Methodology

ECCC recommends the addition of the following bullets to section 4.3:

- Provide estimation methods and method uncertainty for annual facility GHG emissions and air pollutant emissions. The emissions shall include emissions from all sources from all project components.
- Provide validated air dispersion modeling concentrations at fence line and key receptors for air pollutants and GHG emissions. The application of dispersion models and modeling results shall be validated.
- Provide baseline air quality concentrations before implementing any project components at fence line and key downstream receptors.

6.0 Effects Assessment

6.1.1 Atmospheric Environment

ECCC recommends the addition of the following bullets to section 6.1.1:

- Provide baseline air quality concentrations before implementing any project components at fence line and key downstream receptors.

- Identify major sources of air pollutants from all project components and provide maximum annual facility emission rates of following air pollutants from all project components: PM10, PM2.5, carbon monoxide CO, sulphur oxides SOx, nitrogen oxides NOx, hydrogen sulphide H2S, volatile organic compounds VOC, and ammonia NH3. (Maximum emission rates are the loading when refining capacity utilization is 100% and emissions reach their worst-case maximum. Project components include oil refinery, rail yard, tank farm, refined fuel delivery pipelines, marine terminal, co-generation facility, and all other components.)
- Identify major and minor sources of GHG from all project components and provide an annual facility total of GHG emissions
- Provide the distance from facility to the Canada/US border.
- Identify services that will be provided by third parties and potential indirect air pollutant and greenhouse gas emissions from 3<sup>rd</sup> party services.
- Provide options that have been investigated concerning the use of alternative energy sources.
- Provide current provincial/territorial/federal regulatory emission limits for air pollutants and greenhouse gases.
- Provide current provincial ambient air quality standards, CAAQS, and NAAQO standards for air pollutants.
- Provide comparison of GHG emissions and the energy intensity of the proposed project to other similar projects (using gasification) around the world.
- Include calculations and compare GHG emissions from existing upgrading technologies.
- Identify all sources of fugitive VOC emissions from all project components (e.g., tanks, wastewater treatment plant, cooling tower, etc.).
- Identify any planned activity to implement Leak Detection and Repair (LDAR) program. This should include leak definition, frequency for testing leaks and repair schedules etc.

- Identify any planned activity to measure VOC emissions along the fenceline of the facility.

6.0 Effects  
Assessment

6.1.2 Geology and geochemistry

ECCC notes the use of the term “deposit” in bullet one of section 6.1.2, and recommends the term be revised to accurately reflect the type of Project (oil and gas infrastructure as opposed to a mine).

ECCC also recommends the addition of the following bullets to section 6.1.2:

- Describe the regional geology and site-specific geology for the project site/footprint.
- Conduct geochemical characterization for areas where there are significant excavations, rock exposures, or importation of quarry/borrow material, including:
  - o Describe any known or identified mineral occurrences, including the presence of sulphides and secondary mineralization containing metals/metalloids, which may result in metal leachate or acid rock drainage generation due to Project-related disturbances.
  - o Support the geological/geochemical description with diagrams, tables, and geological plan maps and cross-sections.
  - o Provide a rationale for the methodologies chosen in describing the geological/geochemical/geotechnical characteristics for the Project site.
- Detail major structural features (e.g. faulting, folding) at the local scale including maps and figures (plan and cross-sections) at suitable scale to convey important structural geology.

With respect to bullet four on page 22 of section 6.1.2, ECCC requests clarification of the intent of the bullet. As currently written, the bullet suggests the requirement for the EIS to provide baseline water chemistry, as opposed to information specific to geology and geochemistry. ECCC therefore recommends that the environmental media(s) of interest (water, soils, etc) be specified in this bullet. For example, is the Agency interested in metal (other Contaminants of Potential Concern) content for soils or rock in the study area?

Additionally, ECCC notes that the highlighted contaminants of concern in Footnote 10 are not reflective of anticipated contaminants of concern from the project, and recommends these be revised accordingly.

6.0 Effects  
Assessment

6.1.5 Groundwater and surface  
water

ECCC notes that section 6.1.5 reflects the groundwater and surface water quality requirements for a mining project (e.g., bullet 13 requests "... surface water quality ... including all sites to receive **mine effluents** ...."). In addition, the important parameters listed in the section appear to be limited in scope.

ECCC recommends section 6.1.5 be revised to accurately reflect the type of Project (oil and gas infrastructure as opposed to a mine), and include a bullet requiring the proponent to provide a description of baseline surface water quality and groundwater quality obtained from multiple years of surface and subsurface investigations to include all Contaminants of Potential Concern (COPC's) related to the construction, operation, and closure of the Project. In the context of the Project ECCC notes that this would include hydrocarbons, for example.

6.0 Effects  
Assessment

6.1.4 Riparian, Wetland and  
Terrestrial Environment

and

6.2.3 Riparian, Wetland and  
Terrestrial Environment

As part of the analysis of potential effects of the Project on wetlands, ECCC recommends the Proponent consider the following:

1. Include wetlands as a valued ecosystem component (VC) in the EIS.
2. Identify wetlands likely directly or indirectly impacted (provide GIS files, if available) that are:
  - o Situated on federal land and waters; and
  - o Likely situated within the scope of federal permits, authorizations, or funding, etc. (effect captured by ss. 5(2) of CEAA 2012).
3. Determine if the wetlands described in "2" above are situated in a geographic area of Canada where wetland loss or degradation has reached critical levels, or considered ecologically or socio-economically important to a region.
4. Describe the site-specific ecological attributes associated with wetland functions, based on available information and/or baseline surveys for each potentially affected wetland identified in "2" above, and predict likely effects on key wetland functions. Provide baseline indices of relative abundance for wetland migratory birds and species at risk. Wetland functions assessment should follow the guiding principles of Hanson *et al.* (2008) 'Wetland

*Ecological Functions Assessment: An Overview of Approaches'* (accessible at: <http://publications.gc.ca/site/eng/343283/publication.html>) by which to determine the most appropriate functions assessment methodology to use.

5. For each wetland identified in 2 above, provide an assessment of effects (direct, indirect, and cumulative) for each phase of the project that includes, but is not limited to, the identification of loss or impairment of wetland ecological functioning in relation to: hydrology, water quality, plant community, wildlife and wildlife habitat, traditional use, and socioeconomic functions. The assessment will consider impacts and effects related to migratory birds and species at risk.
6. Consider and adopt the best technically and economically feasible mitigation approaches for wetlands that follow the mitigation hierarchy: 1. avoid potential impact; 2. minimize potential impact; 3. provide biodiversity offsets to either address any significant residual adverse environmental effects that cannot be avoided or sufficiently minimized. The federal government has a goal of no net loss of wetland function.

6.0 Effects  
Assessment

6.1.8 Migratory birds and their  
habitat

and

6.3.4 Migratory birds and their  
habitat

ECCC notes that site preparation was listed as one of the project activities that could cause direct and indirect adverse effects on migratory birds (section 6.3.4; pdf pg 37). ECCC requests that this be changed to *site preparation and construction*, consistent with section 3.2.1 (pdf pg 22). Activities associated with construction have the potential to affect feeding and movement of migratory birds and species at risk by creating physical barriers and causing sensory disturbance (e.g. noise, light).

As part of the analysis of potential effects on Migratory Birds, ECCC recommends that the Proponent consider the following:

1. For the scientific assessment of potential impacts on migratory birds, the EIS should follow the guiding principles as presented in this technical report: Hanson *et al.* 2009, *A framework for the scientific assessment of potential project impacts on birds* - CWS Technical Report series No. 508. Available online at: [http://publications.gc.ca/site/archivee-archived.html?url=http://publications.gc.ca/collections/collection\\_2010/ec/CW69-5-508-eng.pdf](http://publications.gc.ca/site/archivee-archived.html?url=http://publications.gc.ca/collections/collection_2010/ec/CW69-5-508-eng.pdf)
2. Identify Bird Conservation Region (BCR) and other conservation priority species likely to be affected by Project-related activities as VCs. Refer to BCR strategies to determine which BCR the project overlaps with, and to

help design baseline studies that will capture conservation priority species. These strategies are available at: <https://www.ec.gc.ca/mbc-com/default.asp?lang=En&n=1D15657A-1>. Identify bird guilds likely to be affected by Project-related activities for each habitat type as VCs.

3. Present robust pre-construction information on each migratory bird species that reflects natural inter-annual variation to provide sufficient baseline information with which to assess potential impacts from all aspects of the project, develop appropriate mitigation measures and assess and monitor the effectiveness of these measures. Report in detail: the species likely to be affected, relative abundance, distribution, and density estimates of the avian community within each specific habitat type or ecosystem of the project area and its zone of influence.
4. For each species and/or bird guild, use widely accepted protocols and survey designs, and include methodology information on the baseline studies, including spatial scale, time of day and year of surveys, etc.
5. Identify and describe, as part of the EIS baseline studies all areas of concentration, conservation lands, and habitat types for migratory birds that may be impacted during any phase of the project.
6. Explain and justify the prediction of direct, indirect and cumulative effects for each phase of the project and its associated activity on the bird community based on all available literature and data for the project area and its zone of influence. More specifically, the analysis should address how project activity and infrastructure will affect:
  - displacement and/or mortality rates of birds
  - each VC as defined above.
  - amount and type of habitat, including conservation areas
  - the bird-habitat relationships; the change in diversity, abundance, and density of the avian community that utilise the various habitat types or ecosystems.

With respect to avoidance and mitigation measures, ECCC recommends that the Proponent:

1. Identify measures to prevent and mitigate the risk of engaging in destructive or disruptive activities, in key sensitive periods (e.g. migration and nesting) and locations, to migratory birds, their nests and eggs. Consider avoidance guidelines available on ECCC website: <http://ec.gc.ca/paom-itmb/default.asp?lang=En&n=C51C415F-1>
2. Identify measures to avoid the deposit of harmful substance to migratory birds in water or areas frequented by migratory birds.
3. Provide best technically and economically feasible mitigation approaches to migratory bird habitat that follow the mitigation hierarchy: 1. Avoid potential impact; 2. Minimize potential impact; 3. Provide biodiversity offsets to address any significant residual adverse environmental effects that cannot be avoided or sufficiently minimized. Provide justification for moving from one mitigation alternative to the next.
4. Include a description of the measures to be used and their potential effectiveness.
5. Identify and describe any residual adverse effect to migratory birds and their habitat.

6.0 Effects  
Assessment

6.1.9 Species at Risk  
and

ECCC notes that the predicted effects that must be assessed for migratory birds in section 6.3.4 may also apply to species at risk (migratory birds and other wildlife) in section 6.3.5.

6.3.5 Species at Risk

ECCC recommends that the addition of the following bullets in the list of predicted effects in section 6.1.9:

- Direct and indirect adverse effects on species at risk, including but not limited to: site preparation and construction, deposit of harmful substances in waters that are frequented by species at risk, flaring of gas, and creation of settling ponds that may attract and be used by species at risk.
- Collision risk of species at risk with any project infrastructures.

- Indirect effects caused by increased disturbance (e.g. noise, light, presence of workers), relative abundance movements, and losses or changes in species at risk habitat.

As part of the analysis of potential effects on Species at Risk, ECCC recommends that the Proponent consider the following:

1. Complete an in-depth literature review of relevant information sources to determine if COSEWIC and SARA-listed species and their critical habitat (if applicable) occur or are expected to occur within the proposed project area and the project area's zone of influence.
2. Identify all COSEWIC and SARA-listed wildlife species likely to be affected from Project-related activities as valued components (VCs), and include them among the species to be assessed in the EIS.
3. If there are information gaps for certain species, provide baseline survey results relevant for the assessment of impacts of each species at risk and its critical habitat (if applicable) in the project area and its zone of influence. Note that survey protocols should optimize detectability and sufficient survey effort should be provided to obtain comprehensive coverage at appropriate time of the year. The baseline information should account for natural inter-annual variation. Include in the baseline information:
  - a) Survey results, including: assessment of presence/not detected status, relative abundance, potential breeding (if applicable) and distribution where presence is confirmed.
  - b) The identification and/or the mapping at an appropriate scale of residences, seasonal movements, movement corridors, habitat requirements, key habitat areas, critical habitat including biophysical attributes and general life history (e.g., breeding, foraging, etc.).
4. Provide a rationale for the scope and the methodology used for surveys including design, sampling protocols and data manipulation.
5. For each phase of the project, separately describe the project's potential effects on each COSEWIC and SARA-listed wildlife species and its habitat

including all habitat components described in 3 b. above, with rigour and detail, reflecting the current understanding of the ecology of the species and potential conflict with project activities. Consider all direct, indirect and cumulative effects in the analysis. A quantitative assessment of adverse effects is required. The proponent should discuss with ECCC the scope of the effects assessment for species whose range goes beyond the regional study area.

6.0 Effects Assessment

6.2.1 Changes to the Atmospheric Environment

ECCC recommends modifying the following bullets in section 6.2.1 (modifications identified in **bold**):

- The proponent will carry out atmospheric dispersion modelling of the main contaminants in order to estimate the contaminant concentrations present in the entire area that could potentially be affected by atmospheric emissions (Part 2, section 6.1.1) resulting from various Project-related activities (sources), including the use of heavy machinery during construction; the operation of the refinery and marine terminal; fugitive emissions from the pipelines, **rail and marine transportation; and combustion emissions from road, rail and marine transportation**. The proponent will be required to compare anticipated air quality against the Canadian Ambient Air Quality Standards (CAAQS) for fine particulate matter **and relevant provincial ambient standards for NO<sub>2</sub> and SO<sub>2</sub>**.
- A description of all methods and practices (e.g., control equipment, heat or gas recovery systems) that will be implemented to minimize and control atmospheric emissions throughout the project life cycle. If the best available technologies are not included in the Project design, the proponent will need to provide a rationale for the technologies selected.
- **Identify all relevant federal, provincial or municipal regulations which apply to structures, vehicles, vessels, engines or other equipment which will be used in the project area.**

6.0 Effects Assessment

6.2.1 Changes to the Atmospheric Environment

ECCC recommends the deletion of the last three checkmarks under bullet three in section 6.2.1, and the addition of the following bullets to the section:

- An estimate of the upstream greenhouse gas emissions associated with the operation of the Project. This information is to be presented by individual

pollutant and should also be summarized in CO2 equivalent per year. The proponent must provide the following information:

- An estimate of greenhouse gas emissions associated with the supply of all raw feedstock and all fuels used in the facility operations to the proposed project. This estimate should include all emissions from processes upstream of the refinery. "Upstream" includes, but is not limited to, the production of raw feedstock and all fuels used in the facility, and their processing and transport to the refinery by rail and pipeline, where applicable. The estimate should include all GHG emissions during the operational lifetime of the proposed project, on an annual basis. In cases where raw feedstock and fuels to be used have not yet been determined, the Proponent should estimate using a typical or average feedstock and fuel sources.
- A clear explanation of all assumptions and emission intensity factors used.
- Emission factors for all upstream stages which are recent and pertinent to the region.
- Reference for all data sources.
- A market assessment outlining the conditions under which the upstream emissions could have occurred in the absence of the project.
- For the purposes of this discussion, the applicant could frame a discussion of incrementality around the degree to which the refinery increases demand for bitumen production in Canada. A discussion of incrementality could include a comparison of different scenarios, including a base case in which the refinery is not built.
- The market assessment should provide an analysis of potential end-markets for the refined products of the proposed project.
- The market assessment should also provide a qualitative and/or quantitative assessment of how building the refinery would affect the global market for refined products and the degree to which additional supply from the project could lower global prices and lead to an overall increase in refined petroleum product consumption globally.

This discussion should be related to potential impacts on global GHG emissions.

- This discussion could incorporate a comparison of well-to-tank emissions associated with refined petroleum product production at various petroleum refineries to quantify a net impact, as well as a discussion of emissions impact from any resulting additional consumption that could occur as a result of project.

With reference to the electrical power infrastructure capable of producing 300 megawatts (MW) of clean energy during operations, ECCC also notes the following:

- the proponent must provide information related to the Project's electrical demand and sources of electrical power for facilities and equipment, i.e., the Project's main source and any other additional sources (generators, etc.), as appropriate.

6.0 Effects  
Assessment

6.4 Mitigation  
(Species at Risk, Air Quality and  
GHGs)

In accordance with Section 19(1) d of CEEA 2012, ECCC recommends that the Proponent:

- Demonstrate that avoidance (i.e., rationale that best solutions have been adopted to address impacts on the species) and minimization (i.e., rationale that all feasible measures will be taken to further reduce the impacts) measures will be applied for each COSEWIC and SARA-listed wildlife species and its critical habitat (if applicable).
- Identify and quantify the residual impacts/residual effects to the species that are reasonably likely to result from the project after avoidance and minimization measures have been applied.
- Describe measures to be taken to eliminate any remaining effects to threatened and endangered species or address the risk of species of special concern becoming endangered or threatened in the short, medium and long term after the above avoidance and minimization measures have been applied within the proposed project area and its zone of influence.
- Provide an account of how the project and mitigation measures are consistent with the recovery strategy, action plan, or management plan for

the species.

- Provide control measures or control technologies that are being considered to mitigate environmental impact caused by air pollutant and GHG emissions.
- EIS shall describe mitigation measures that are specific to each environmental impact identified
- Provide the quantity of air pollutant and GHG emissions.
- Compare the emissions to existing provincial and federal standards.
- Identify the significance of impact on air quality.

6.0 Effects Assessment

6.6.2 Effects of the environment on the Project

ECCC recommends modification of the wording in section 6.6.2 as follows (noting the **bold** type indicates wording to be added, and ~~strike-throughs~~ indicating wording to be deleted):

The EIS will take into account how local conditions (including other nearby human ~~activity~~ **activities**) and natural hazards, such as severe and/or extreme weather conditions and external events (e.g., flooding, drought, ice jams, landslides, avalanches, erosion, subsidence, fire, outflow conditions, **sea level and storm surge** and seismic events), could adversely affect the Project and how this in turn could result in effects to the environment (e.g., extreme environmental conditions ~~that~~ **could** result in malfunctions and accidental events). These events will be considered in different ~~probability~~ **frequency** patterns (e.g., 5-year flood vs. 100-year flood) **under a range of future climate states. The potential impact of climate change will be considered over the lifetime of the project and the discussion will include a description of the climate data and projections used.**

The EIS will provide details of planning, design, **optimum siting** and construction strategies intended to minimize the potential environmental effects **and vulnerabilities** ~~of the environment on the Project.~~

6.0 Effects Assessment

6.6.3 Cumulative effects assessment

ECCC recommends the modification of bullets two and six in section 6.6.3 as follows (noting the **bold** type indicates wording to be added, and ~~strike-throughs~~ indicating wording to be deleted):

- Identify the sources of potential cumulative effects. Specify other projects or activities that have been or that are likely to be carried out that ~~could~~ **would**

cause effects on each selected VC within the **[cumulative effects]** boundaries defined, and whose effects would act in combination with the residual effects of the Project.

- Develop a follow-up program to **Provide details on the development and implementation of a follow-up program to monitor and** verify the accuracy of the assessment, and **to monitor and** verify the effectiveness of mitigation measures for certain cumulative effects.

## 8.0 Follow-up and Monitoring Programs

With respect to monitoring and adaptive management related to species at risk, ECCC advises that the following be included as part of the EIS in the context of SARA ss.79(2):

1. Describe follow-up program requirements to verify EA predictions regarding anticipated effects on COSEWIC and SARA-listed wildlife species and their critical habitat (if applicable) to ensure that mitigation measures are effective, as well as to determine whether any unanticipated effects are occurring within the proposed project area and the project zone of influence.
2. Conduct follow-up studies in accordance with standardized/established methods and in a manner that leads to sufficient resolution on effects.
3. Describe environmental monitoring requirements to ensure that mitigation measures, best management practices, and EA commitments are being implemented as intended and/or for the periodic or continuous surveillance or testing of one or more mitigation measures/environmental components and provide the accompanying schedule.
4. Identify circumstances and mechanisms under which corrective/adaptive measures may be implemented to address any issue or problem identified through the follow-up programs or environmental monitoring. For example, if unanticipated effects occur or the significance of the effects is greater than anticipated.

With respect to monitoring and adaptive management related to migratory birds, ECCC recommends that the Proponent:

1. Describe follow-up program requirements to verify EA predictions regarding anticipated effects on migratory birds and their habitat to ensure that mitigation measures are effective, as well as to determine whether any

unanticipated effects are occurring. Include a description of criteria to evaluate effects and effectiveness of measures.

2. Conduct follow-up studies in accordance with standardized/established methods and in a manner that leads to sufficient resolution on effects.
3. Describe environmental monitoring requirements to ensure that mitigation measures, best management practices, and EA commitments are being implemented as intended and/or for the periodic or continuous surveillance or testing of one or more mitigation measures/environmental components and provide the accompanying schedule.
4. Identify circumstances and mechanisms under which corrective/adaptive measures may be implemented to address any issue or problem identified through the follow-up programs or environmental monitoring. For example, if unanticipated effects occur or the importance of the effects is greater than anticipated.

8.0 Follow-up and  
Monitoring  
Programs

8.2 Monitoring

ECCC recommends the addition of the following bullets to section 8.2:

- Provide specific information on what monitoring program is used to provide accurate air emission and GHG emission data. Provide monitoring tools adopted such as CEM, stack testing, mass balance, etc.
- Compare the monitoring data to provincial and federal requirements on petroleum refining industry and on air quality.



## APPENDIX B

### ENVIRONMENT AND CLIMATE CHANGE CANADA MANDATE FOR MIGRATORY BIRDS AND SPECIES AT RISK

#### **MIGRATORY BIRDS**

*Migratory Birds Convention Act, 1994 (MBCA)*

The purpose of the MBCA is to implement the Migratory Birds Convention between Canada and the United States by protecting and conserving migratory birds, as populations and individuals. It is the responsibility of the Federal Government of Canada (GoC) to protect and conserve the roughly 500 species of migratory birds regularly occurring in Canada. ECCC's Canadian Wildlife Service (CWS) provides the list of bird species protected under the MBCA, which derives from Article I of the Convention. This list includes all seabirds (except cormorants and pelicans), all waterfowl, all shorebirds and most landbirds (birds with principally terrestrial life cycles).

Section 5.1 of the MBCA prohibits the deposit of a substance that is harmful to migratory birds in waters or an area frequented by migratory birds or in a place from which the substance may enter such waters or such an area. The Act prohibits the possession of a migratory bird, nest or egg without lawful excuse. The Migratory Birds Regulations (MBR) provide for the conservation of migratory birds and for the protection of individuals, their nests and eggs. A prohibition against hunting is set out in section 5 of the MBR. The term "hunt" is given a specific definition in section 2 of the Regulations and includes attempting in any manner to kill, injure or harass migratory birds. A prohibition against the disturbance, destruction, or taking of a nest, egg or nest shelter of a migratory bird is set out in subsection 6(a) of the MBR.

#### **Avoiding Incidental Take**

Migratory birds, the nests of migratory birds and/or their eggs can be inadvertently harmed or disturbed as a result of many activities—including but not limited to clearing trees and other vegetation, draining or flooding land, or using fishing gear. This inadvertent harming, killing, disturbance or destruction of migratory birds, nests and eggs is known as incidental take and is prohibited under the MBCA. Incidental take, in addition to harming individual birds, nests or eggs, can have long-term consequences for migratory bird populations in Canada, especially through the cumulative effects of many different incidents. For further details, please refer to the Avoidance Guidelines at: <http://ec.gc.ca/paom-itmb/default.asp?lang=En&n=C51C415F-1>

Extirpated, Endangered and Threatened migratory bird Species at Risk (species, subspecies, and distinct populations) also have federal legislative protection when listed under the Species at Risk Act (SARA).

ECCC advises that proponents should be aware that construction during the nesting period for migratory birds carries with it high risks of incidental take. Many bird nests are difficult to locate, even with highly trained observers. Proponents should be aware of the risks and take appropriate action to ensure they are in compliance with the MBCA.

#### **SPECIES AT RISK**

The purposes of the Species at Risk Act (SARA) are to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are Extirpated,

Endangered or Threatened as a result of human activity, and to manage species of Special Concern to prevent them from becoming Endangered or Threatened. SARA supports the federal commitments under the 1996 Accord for the Protection of Species at Risk, which outlines commitments by federal, provincial and territorial ministers to designate Species at Risk, protect their habitats and develop recovery plans as well as complementary legislation, regulations, policies and programs, including stewardship.

Environment and Climate Change Canada (ECCC) has responsibilities for overall administration of SARA (ss. 8(1)). As well, SARA defines "competent ministers" as the Minister responsible for the Parks Canada Agency (PCA) (with respect to individuals<sup>[1]</sup> of a wildlife species in or on federal lands administered by that Agency); the Minister of Fisheries and Oceans (with respect to aquatic species other than individuals on lands administered by the PCA); and, the Minister of the Environment and Climate Change (with respect to all other individuals of a wildlife species). Competent ministers have responsibilities regarding recovery planning, protection, permitting, and other activities identified within the legislation.

SARA sets out a process for an independent assessment of species potentially at risk and for their consideration by Governor in Council for listing on Schedule 1 of SARA as Extirpated, Endangered, Threatened, or of Special Concern. SARA requires that recovery strategies and action plans be developed by the competent minister for species listed as Extirpated, Endangered or Threatened. Management plans must be developed for species of Special Concern.

SARA also provides measures for the protection of listed threatened, endangered or extirpated species and their residences. Under section 32 and 33 of SARA, individuals and residences of aquatic species and birds protected by the MBCA are automatically protected anywhere they are found in Canada. These general prohibitions apply to all other Extirpated, Endangered or Threatened species listed on Schedule 1 of SARA when they are on federal lands in the provinces and on land under the authority of the Minister of the Environment and Climate Change or the Parks Canada agency in the territories. These prohibitions can also apply on non-federal (provincial, territorial and private) lands if the Governor in Council makes an order to that effect, based on a recommendation from the federal Minister of the Environment (SARA s. 34 and s. 35).

Based on the best available information, SARA requires an identification of critical habitat for Threatened, Endangered, and Extirpated (if recovery is feasible) species to the extent possible in a recovery strategy or action plan. SARA defines the critical habitat of a species as "the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or an action plan for the species." Once critical habitat is identified in a final recovery strategy or action plan, SARA sets out a process to evaluate existing protection mechanisms, and if necessary, to put in place additional protection under SARA. The timelines and instruments which can be used to achieve critical habitat protection vary depending on land ownership and the species involved. SARA is designed to turn first to existing laws and initiatives before contemplating using SARA prohibitions directly, looking to federal laws when critical habitat occurs on federal land and to laws of the province or territory or Acts of Parliament including SARA when critical habitat occurs on non-federal lands.

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<sup>[1]</sup> As defined in SARA, "individual" means an individual of a wildlife species, whether living or dead, at any developmental stage and includes larvae, embryos, eggs, sperm, seeds, pollen, spores and asexual propagules.

Finally, provisions of SARA refer specifically to environmental assessment of projects. Section 79 of SARA requires that the federal authorities responsible for the environmental assessment notify the competent minister(s) in writing if the project is likely to affect a listed wildlife species or its critical habitat and identify the adverse effects that the Project will have. If the Project is carried out, that authority must also "ensure that measures are taken to avoid or lessen those effects and to monitor them". The measures taken must be consistent with any applicable recovery strategy or action plan under SARA, which flow from the Act's requirements regarding protection and recovery implementation. A critical component of a recovery strategy is the delineation of population and distribution objectives that allow for the survival and recovery of a listed species. Any activity, such as the proposed project, that prevents or otherwise increases risk to the attainment of the population and distribution objectives outlined in a recovery strategy could jeopardize the survival or recovery of a listed species in Canada and result in a significant adverse effect. Such an outcome, if it occurred, could lead to a number of actions under SARA, including those related to the competent Minister's duties within SARA's safety net protection regime if protection was lacking. Accordingly, the results of this environmental assessment inform the responsible authority in the context of fulfilling the obligations of section 79 of SARA. In an environmental assessment context, it is important that the decision maker is aware of critical habitat information, which is available on the SARA Registry, in the area in which a project is located.

For more information on SARA and its policies please consult the Species at Risk Public Registry:

[http://www.sararegistry.gc.ca/search/advSearchResults\\_e.cfm?stype=doc&lng=e&advkeywords=&docid=32](http://www.sararegistry.gc.ca/search/advSearchResults_e.cfm?stype=doc&lng=e&advkeywords=&docid=32)

## APPENDIX C

### ENVIRONMENT AND CLIMATE CHANGE CANADA SPECIES-SPECIFIC ADVICE

#### **Marbled Murrelet**

Refer to attachment

ECCC-CWS\_Memo02\_MAMUStdAdviceForEA\_20160722 for detailed recommendations, as well as ECCC's responsibilities, related to Marbled Murrelet.

#### **Western Toad**

Refer to attachment

ECCC-CWS\_Memo03\_WesternToadStandardGuidance EnvironmentalAssessments (Environment Canada Standard Guidance for Environmental Assessment – Western Toad (*Anaxyrus boreas*)) for ECCC's standard guidance environmental assessment advice for western toad.

# Environment and Climate Change Canada Standard Guidance for Environmental Assessments

## Marbled Murrelet (*Brachyramphus marmoratus*)

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### Purpose

This document has been developed to assist proponents of proposed developments, as well as those responsible for reviewing proposed developments, in addressing concerns related to Marbled Murrelet (*Brachyramphus marmoratus*) that may arise in environmental assessment processes in British Columbia. The document provides the context within which the species is considered: the *Migratory Birds Convention Act* (MBCA), the *Species at Risk Act* (SARA), and the recovery strategy for Marbled Murrelet developed under SARA and published on the SARA Public Registry (<https://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=24F7211B-1>). This document also provides recommendations regarding how to address Marbled Murrelet within the stages of the environmental assessment process.

### Marbled Murrelet Protection, MBCA, and SARA

#### Marbled Murrelet under the MBCA

Marbled Murrelet is protected under the *Migratory Birds Convention Act* (MBCA), which implements the Migratory Birds Convention between Canada and the United States and, together with the *Migratory Bird Regulations*, protects migratory birds, as populations and as individual birds.

Migratory birds, the nests of migratory birds and/or their eggs can be inadvertently harmed or disturbed as a result of many activities—including but not limited to clearing trees and other vegetation, draining or flooding land, or using fishing gear. This inadvertent harming, killing, disturbance or destruction of migratory birds, nests and eggs is known as incidental take and is prohibited under the MBCA. Incidental take, in addition to harming individual birds, nests or eggs, can have long-term consequences for migratory bird populations in Canada, especially through the cumulative effects of many different incidents. For further details, please refer to the guidance on how to avoid incidental take at the website: <http://ec.gc.ca/paom-itmb/default.asp?lang=En&n=C51C415F-1>

Environment and Climate Change Canada (ECCC) further advises that proponents should be aware that construction during the nesting period for migratory birds carries with it high risks of incidental take. Many bird nests are difficult to locate, even with highly trained observers. Proponents should be aware of the risks and take appropriate action to ensure they are in compliance.

### Marbled Murrelet Recovery Strategy and Critical Habitat under SARA

The Marbled Murrelet is a small seabird that spends most of its time at sea within 0.5 km of shore. Marbled Murrelets are secretive and nest as solitary pairs at low densities, typically in old-growth forests within 30 km of

the sea. In Canada, Marbled Murrelets are found only on Canada's Pacific coast. The Marbled Murrelet was assessed as Threatened in 2012 by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and is currently listed on Schedule 1 of SARA as Threatened.

The main threat to Marbled Murrelet is the direct loss of old-growth nesting habitat through forest harvesting, or clearing of land. These activities can also cause indirect impacts to Marbled Murrelet – clearing can create hard forest stand edges adjacent to remaining suitable habitat that increase opportunities for nest predator access (e.g., from crows and jays) into suitable nesting sites. It can also alter the microclimate (e.g., light, wind, moisture) necessary to support microhabitat attributes such as mossy platforms for nesting. Most of the microclimate effects occur within the first 50-100 m of forest adjacent to the hard edge.

Other main threats are related to the development of energy infrastructure, including collision risks and increases in predator concentrations. Marine threats include chronic and catastrophic oil spills; entanglement in fishing gear (mainly gill-nets); and current and future boat traffic and shipping which disrupt foraging and marine distributions.

Individuals and residences of migratory bird species listed on Schedule 1 of SARA as Threatened, Endangered or Extirpated have additional federal legislative protection under SARA wherever they are found. SARA requires the development of a recovery strategy document for such species. A recovery strategy provides strategic direction for recovering the species and, to the extent possible, identifies its critical habitat. The final federal recovery strategy for the Marbled Murrelet ([http://www.sararegistry.gc.ca/document/default\\_e.cfm?documentID=1290](http://www.sararegistry.gc.ca/document/default_e.cfm?documentID=1290)) was posted June 3, 2014.

#### Terrestrial Critical Habitat

The Marbled Murrelet Recovery Strategy includes population and distribution objectives for recovery; a partial identification of terrestrial (nesting) critical habitat; the geographical location and biophysical (ecological) attributes of that habitat; and activities likely to destroy critical habitat. Broad strategies for recovery and a schedule of studies for completing the identification of critical habitat are also included. The broad strategies captured in the Recovery Planning Table provide general approaches to achieve the population and distribution objectives (recovery) for the listed species. These measures will assist in the development of subsequent action plans to address refinement of the nesting critical habitat identification and habitat management, to better understand and mitigate marine threats, and to refine methods for tracking trends in Marbled Murrelet populations and habitat. The schedule of studies concentrates on the identification of marine critical habitat.

Critical habitat for the Marbled Murrelet is identified as that portion of the suitable habitat required for the survival and recovery of the species as specified by the population and distribution objectives in the Recovery Strategy. While Marbled Murrelets require terrestrial habitat (i.e., coniferous old-growth forest within 50 km of the ocean to support nesting) and marine habitat (0.5 to 2 km off the shore for foraging and moulting), information to identify and map suitable marine habitat was not yet available at the time of posting the Recovery Strategy in June 2014. Both habitat types, however, need to be considered in recovering and managing the species. It is important to note that marine critical habitat may be identified within a timeframe that overlaps with that of construction and operation of proposed development; ECCC recommends the Responsible Authority (RA) ensure that the Proponent seek and consider the most up-to-date information on species at risk recovery planning in the development and implementation of project activities.

The Recovery Strategy further specifies that terrestrial critical habitat is identified as a state where greater than 70% of the 2002 suitable nesting habitat (SNH) coast-wide remains. This objective should not be interpreted as an intent to manage nesting habitat down to 70% of 2002 levels; rather, the quantification of SNH and losses over

the period between the baseline year of 2002 and the present is an agreed upon starting point against which to measure progress to recovery. Based on this, and the degree of historic habitat loss, minimum retention levels for each of six conservation regions have been determined as follows:

Marbled Murrelet Conservation Region	Minimum Nesting Critical Habitat Retention Level (as a percentage of 2002 suitable nesting habitat) as described in the Marbled Murrelet Recovery Strategy
Northern Mainland Coast	68%
Haida Gwaii	68%
Central Mainland Coast	68%
West and North Vancouver Island	68%
East Vancouver Island	90%
Southern Mainland Coast	85%

Although determining Marbled Murrelet occupancy of a given area is important to avoid and lessen project impacts to the species (consistent with ss.79(2) of SARA), occupancy is not a component of the identification of Marbled Murrelet terrestrial critical habitat. Terrestrial critical habitat is identified based on habitat features within identified critical habitat polygons using the methodology described above.

Marine Critical Habitat

In the marine environment, Marbled Murrelets can be impacted by chronic and catastrophic oil spills and are also easily disturbed by the passage of boats. Proposed increases in natural resource exports via B.C. ports and increases in shipping traffic have the potential to increase risks to the species in the core of the Marbled Murrelet’s range and is likely to cause Marbled Murrelets to avoid otherwise suitable foraging habitat. While marine critical habitat has not yet been identified for Marbled Murrelet, it may be identified in an amended recovery strategy or action plan within a timeframe that overlaps with that of construction and operation of development projects. It is recommended, at all project stages, that project proponents be aware of any updates regarding species at risk, including those on the Species at Risk registry: [http://www.sararegistry.gc.ca/sar/index/default\\_e.cfm](http://www.sararegistry.gc.ca/sar/index/default_e.cfm).

**Environmental Assessment Considerations of Marbled Murrelet Critical Habitat Destruction**

Critical habitat is defined in SARA as habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as critical habitat in a recovery document for the species.

If critical habitat is destroyed, this may affect the survival and recovery of the species in the following ways:

- reduced habitat availability and function for nesting, especially given the long time it takes for forests to develop the biophysical attributes necessary to support nesting (coniferous old-growth forests take decades to regenerate), which results in multi-generation impacts to the species;
- increased risk of predation on Marbled Murrelet and their eggs and chicks resulting from increased predator access and/or increased predator concentrations; and
- reduced reversibility of effects due to the compounding effects of long-term habitat loss, increased predation, and the biologically limiting factors of late onset of first reproduction (Marbled Murrelets do

not begin to breed until they are 2-3 years of age) and low reproductive output typical of Marbled Murrelet.

In an environmental assessment context, project activities that would adversely impact the survival or recovery of Marbled Murrelet would be considered on a case by case basis. It is possible that the adverse effect would be significant if not fully mitigated because it may jeopardize the survival or recovery of the species.

## **Environment and Climate Change Canada Recommendations for Marbled Murrelet**

In order to assist project decision makers and project proponents, ECCC provides the following recommendations to help address potential impacts to Marbled Murrelet within the environmental assessment process.

### **Scoping**

#### Recommendation 1

ECCC recommends that the Proponent determine if the project has the potential to impact Marbled Murrelet, either directly or indirectly. If the project has potential to impact Marbled Murrelet, this species should be included as a Valued Ecosystem Component (terrestrial and/or marine) and included as a requirement in the environmental assessment guidelines.

#### Recommendation 2

If the project has the potential to impact Marbled Murrelet, the local and regional study areas for baseline studies should include Marbled Murrelet habitat (terrestrial and marine, as appropriate) as part of their scope, and this should be reflected in the environmental assessment guidelines.

### **Baseline**

#### Recommendation 3

ECCC recommends that the Proponent conduct baseline studies for Marbled Murrelet to determine the potential impacts of the project on Marbled Murrelet as part of the environmental assessment. Baseline studies should include, but not be limited to:

- a) an indication of which conservation region the project overlaps (refer to the Marbled Murrelet Recovery Strategy) and if there is overlap between the project and identified critical habitat polygons;
- b) a determination of whether suitable nesting habitat (SNH) for Marbled Murrelet is present within or near the project area. For guidance on this, please contact ECCC for the most up to date information. Note that identification of SNH is not dependent on Marbled Murrelet being present in the area. Identification is based on : the biophysical attributes of SNH and where potential nesting platforms occur, or where there is an indication of likely Marbled Murrelet nesting or the presence of a nest, where a nest site is confirmed; and
- c) if suitable nesting habitat is present within or near the project area, or if a nest has been identified, Marbled Murrelet surveys during the breeding season to determine whether Marbled Murrelets are likely nesting in the project area. For guidance on the type and effort of surveys that should be conducted, please contact ECCC for the most up to date information.

## Effects Assessment and Mitigation

### Recommendation 4

ECCC recommends that the Proponent identify and describe any potential direct or indirect impacts to Marbled Murrelet and its critical habitat arising from project activities. This should include, but not be limited to:

- a) A determination of whether the project has the potential to impact SNH. This should include a description of how the biophysical attributes of SNH may be directly or indirectly impacted.
- b) Where the species has been detected, or where there is evidence of breeding, the environmental assessment should identify and describe any potential direct or indirect impacts to Marbled Murrelet, its eggs, or nests.

Where no impacts are anticipated, this should be documented as part of the environmental assessment and a rationale provided.

### Recommendation 5

ECCC recommends that the Proponent determine whether impacts to SNH would compromise the minimum nesting critical habitat retention level (including any conservation areas identified by the province, such as Wildlife Habitat Areas (WHAs)) for the conservation region where the project occurs. In particular, the proponent should consult with, and seek evidence from the province of BC in making this determination. This determination should be documented as part of the environmental assessment and include a consultation report, as well as an explanation of how the evidence was interpreted based on the following steps (A, B and C). The following only applies to terrestrial critical habitat. ECCC will provide advice on Marbled Murrelet marine critical habitat as this information becomes available through an updated recovery strategy.

#### A. CRITICAL HABITAT POLYGONS

1. Does the project have the potential to impact SNH within polygons identified as containing critical habitat for MAMU?

- If the response to A.1 is YES, proceed to step B.
- If the response to A.1 is NO, the project is unlikely to compromise the minimum nesting critical habitat retention level and no further steps are required under Recommendation 5.

#### B. MINIMUM RETENTION LEVELS

**To determine if there is evidence that confirms the minimum nesting critical habitat retention level is compromised:**

1. Does the project impact SNH within an area which has been designated as habitat for Marbled Murrelet (such as a Wildlife Habitat Area)?
2. Is there evidence from implicated provincial or federal authorities that indicates the potential impacts from the project would compromise the minimum nesting critical habitat retention level for the Conservation Region within which the project is located?

- **If the response to either B.1 or B.2 is YES, the advice from ECCC would be that destruction of critical habitat is likely. ECCC recommends the Proponent take a precautionary approach and avoid activities likely to destroy critical habitat, consistent with the Recovery Strategy.**

In general, where project activities may impact critical habitat for species at risk, measures

to offset those impacts may be considered. However, in the case of Marbled Murrelet, offsetting all impacts is likely not possible (see further discussion of offsets below, Recommendation 6). As such, avoidance of Marbled Murrelet critical habitat remains ECCC's recommendation.

Despite the limitations of offsets in addressing impacts to critical habitat for Marbled Murrelet, in the case where avoidance is not fully incorporated into the project, a commitment by the proponent to avoid or lessen any impacts to the species and its critical habitat, consistent with the Marbled Murrelet Recovery Strategy, is still appropriate to assist the RA in meeting its obligations under ss. 79(2) of SARA.

In the context of potential impacts to critical habitat, this commitment should include measures that aim to avoid any increase in the risk to the survival and recovery of the species.

**To determine if there is evidence that confirms the minimum nesting critical habitat retention level *is not compromised*:**

3. Is there evidence from the from implicated provincial or federal authorities that indicates the potentially impacted SNH would not be used to make up the minimum nesting critical habitat retention level for the Conservation Region within which the project is located? Evidence from the province should provide a clear rationale why the SNH would not be part of the minimum retention level. The rationale should be science-based and may incorporate information from modeling and land-use planning that demonstrates how the province has come to this decision.

- **If the response to B.3 is YES, the advice from ECCC would be that destruction of CH is not likely. ECCC would, however, recommend the Proponent to take measures to avoid or lessen adverse effects to Marbled Murrelet and its habitat, and monitor those effects, consistent with the Marbled Murrelet Recovery Strategy.**

Early consultation with ECCC is recommended if any destruction of Marbled Murrelet critical habitat is anticipated as a result of project activities.

As indicated above, identification of critical habitat is not dependent on Marbled Murrelet being present; identification is based solely on the biophysical attributes of SNH in identified critical habitat polygons and the minimum retention levels.

Recommendation 6

ECCC recommends that the Proponent identify and describe measures to avoid, minimize, or offset for each potential impact identified. With respect to this mitigation hierarchy, the environmental assessment should describe how the hierarchy was applied and provide a rationale for moving from avoidance to minimization to offset. Given the long time it takes for forests to develop the biophysical attributes necessary to support nesting (coniferous old-growth forests with appropriate microclimate conditions take decades to regenerate), it may not be possible to fully compensate for impacts to habitat of Marbled Murrelet that would compromise the minimum retention level of critical habitat. This is because of the time lag between when impacts would occur and the time when compensated habitat would become suitable for nesting.

Recommendation 7

ECCC recommends that the Proponent identify and describe measures to protect and avoid harming, killing or disturbing Marbled Murrelets or destroying or taking their nests or eggs that are consistent with the MBCA and its *Regulations* as well as with the general prohibitions of SARA. Proponents should refer to ECCC's guidance to avoid Incidental Take of Migratory Birds in Canada, and in particular the section dealing with the General Nesting Periods of Migratory Birds in Canada. These advisories can be found at: <http://www.ec.gc.ca/paom-itmb>.

#### Recommendation 8

With respect to mitigating the impacts to SNH, ECCC recommends that the Proponent maintain a buffer around SNH in a manner that reduces the edge/SNH area ratio to minimize effects from hard edges such as increased predation risk and microclimate effects. Where clearing of vegetation adjacent to SNH cannot be avoided, any removal or alteration of vegetation should proceed in stages to minimize hard edge effects at any given time around the SNH area as well as at the landscape level. Note that while the measures above may help to reduce impacts to SNH from hard edges, in the case where the impacted SNH is identified as critical habitat, the mitigation measures above may still lead to destruction of critical habitat. As above, ECCC recommends avoidance of activities likely to destroy critical habitat.

#### Recommendation 9

ECCC recommends that the Proponent implement measures to avoid any increase in predators in the project area, including but not limited to waste management.

#### Recommendation 10

ECCC recommends that the Proponent identify cumulative effects of the project and other existing and future foreseeable activities in the regional assessment area on Marbled Murrelet and its critical habitat. Where no cumulative effects are anticipated, this should be documented as part of the environmental assessment and a rationale provided.

### **Monitoring and Follow-up**

#### Recommendation 11

Project monitoring should include monitoring of Marbled Murrelet and its habitat and be conducted in accordance with standardized methods, including but not limited to RISC 2001.

## **References**

Environment Canada. 2014. Recovery Strategy for the Marbled Murrelet (*Brachyramphus marmoratus*) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. v + 49 pp.

Malt and Lank. 2007. Temporal dynamics of edge effects on nest predation risk for the marbled murrelet. *Biological Conservation*, 140: 160-173

# Environment and Climate Change Canada Standard Guidance for Environmental Assessments

## Western Toad (*Anaxyrus boreas*)

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### **Purpose**

This document has been developed to assist proponents of proposed developments, as well as those responsible for reviewing proposed developments, in addressing concerns related to Western Toad (*Anaxyrus boreas*) that may arise in environmental assessment processes in British Columbia. The document provides the context for this species under the *Species at Risk Act* (SARA). It also provides recommendations regarding how to address Western Toad within the stages of the environmental assessment process.

### **Western Toad and SARA**

Western Toad is listed as Special Concern on Schedule 1 of SARA and is declining over much of its range (COSEWIC 2012). One of the reasons that Western Toad was assessed as Special Concern is habitat fragmentation due to resource extraction and road networks; these factors can affect the Western Toad population over a much greater area than the actual project footprint (COSEWIC 2012).

Environment and Climate Change Canada (ECCC) notes that, while this species is SARA-listed, the Province is the lead management jurisdiction for the species. Therefore, it is recommended to consult with the province of British Columbia regarding baseline studies and effects assessment for Western Toad.

Western Toad should also be considered in the context of the application of the Federal Policy on Wetland Conservation's goal of no net loss of wetland functions. Where the goal of no net loss may be relevant to a project, wetland functions that serve the Western Toad should be included as part of the wetland functions assessment.

### **Western Toad Habitat**

#### ***Breeding Habitat***

Western Toads use aquatic habitat (ponds, stream edges, shallow margins of lakes) for breeding. They show strong breeding site fidelity, and will return to the same breeding site in successive years (Smith and Green 2005; Bull and Carey 2008). This species also uses communal breeding sites and can aggregate in large numbers at these breeding sites (COSEWIC 2012). Site fidelity and communal breeding may cause the Western Toad to only use one or a few potential breeding sites within a relatively large area (Slough 2004), emphasizing the importance of locating and protecting these breeding sites.

During the breeding season, which occurs from late April to late May depending on latitude and elevation, adult Western Toads spend only about a week at the water and this week can vary yearly within a 1 month period, depending on the weather. The egg masses are strings that can be easily overlooked. Tadpoles school

together in big black masses that can be easily seen; however, these schools sink to deeper water at a certain stage of development. These schools can also be hidden in smaller, shallower sections of the wetland.

### ***Summer Foraging and Winter Hibernation Habitat***

Western Toads use a variety of terrestrial and aquatic habitats during their life cycle. Western Toads can aggregate at all life stages, including during summer foraging and during hibernation and can therefore be vulnerable to mass mortalities (COSEWIC 2012).

After breeding, Western Toads use corridors to migrate to terrestrial habitats where they use a variety of habitat types, including marshes and riparian areas surrounding breeding sites, as well as forests, meadows, shrub lands, subalpine or alpine meadows, open forest patches, and older clear cuts (10-15 years) (Bartelt et al. 2004, COSEWIC 2012). These migration corridors are important to ensure safe movement of adults between breeding and terrestrial habitats. These corridors also provide a link between habitats; Western Toads are unlikely to move over open cleared areas to reach their breeding or terrestrial habitat. Western Toads need overhead cover, like shrubs, coarse woody debris, dense herb layers, boulders or mammal burrows, presumably to protect them from predation and desiccation (Davis 2000, Bartelt et al. 2004). Western Toads hibernate underground, below the frost line, and hibernacula include cavities under peat hummocks and spruce trees, mammal burrows and tunnels, natural crevices, under boulders, decayed root channels, Red Squirrel middens, abandoned Beaver lodges, logs, root wads, and stream or lakeshore bank cavities (Jones et al. 1998, Bull 2006, Browne and Paszkowski 2010). Most hibernation sites (68%) are communal (COSEWIC 2012).

Western Toad metamorphosis is usually complete by late July or early August. After metamorphosis, the toadlets form large post-metamorphic aggregations at the edge of the breeding sites. They also form large aggregations during their migration from the breeding sites to the terrestrial habitat (Black and Black 1969, Livo 1998, COSEWIC 2012). Identifying and protecting migration corridors are important in order to provide links between habitats and ensure safe movement of toadlets between breeding and terrestrial habitats.

Terrestrial habitats are important habitats for feeding and overwintering and the biological interdependence between terrestrial and aquatic habitats is essential for the persistence of populations (Semlitsch and Bodie 2003). Terrestrial habitats that surround wetlands are core habitats for semiaquatic species and it is important to determine and protect these areas to ensure the maintenance of amphibians (Semlitsch and Bodie 2003). Using criteria that are focused only on protecting water resources without considering habitats that are important to wildlife species, where many species spend extended periods of their time, creates a serious gap in the protection of biodiversity (Semlitsch and Bodie 2003).

## **Environment and Climate Change Canada Recommendations for Western Toad**

Subsection 79(2) of the SARA states that a person conducting an environmental assessment: “must identify the adverse effects of the project on the listed wildlife species and its critical habitat and, if the project is carried out, must ensure that measures are taken to avoid or lessen those effects and to monitor them. The measures must be taken in a way that is consistent with any applicable recovery strategy and action plans.”

In order to assist the Responsible Authority in fulfilling its obligations under SARA ss. 79(2), ECCC provides the following recommendations to help address potential impacts to Western Toad within the environmental assessment process.

## Scoping

### Recommendation 1 – Project effects :

ECCC recommends that the Proponent determine whether the project has the potential to impact Western Toad, either directly or indirectly, in their breeding and terrestrial habitats. This information can be acquired from various sources, including but not limited to: distribution maps, Conservation Data Centre data, conversations with local experts, various databases, habitat suitability mapping, and baseline studies. If the project has the potential to impact Western Toad, this species should be included as a Valued Ecosystem Component in the environmental assessment. ECCC suggests this recommendation be included as a requirement in the environmental assessment guidelines.

### Recommendation 2 – scoping

If the project has the potential to impact Western Toad, ECCC recommends that the local and regional study areas for baseline studies include Western Toad habitat (breeding, summer foraging, and winter hibernation) as part of their scope, and this should be reflected in the environmental assessment guidelines.

## Baseline Studies

The Provincial Management Plan for Western Toad in British Columbia recommends “*maintaining as much forest habitat as possible adjacent to breeding sites to allow for hibernation, foraging, and other essential life functions*” and identifies terrestrial habitat use as a knowledge gap that needs to be addressed to determine population viability and to improve best management practices (Provincial Western Toad Working Group, 2014).

### Recommendation 3 - Baseline Studies for Breeding and Terrestrial Habitat:

#### A. Breeding Habitat

ECCC recommends that baseline studies be conducted for Western Toad breeding habitat that follow Resources Inventory Committee Standards for pond dwelling amphibians (RIC 1998) (including timing and methods) during this EA, and include, but not be limited to, the following:

- a) presence/Not detected and distribution of Western Toad in the breeding habitat;
- b) identification of breeding sites;
- c) a minimum of three surveys per potential breeding site per year during the breeding season to accommodate variation in breeding timing due to weather and therefore to enhance the probability of detecting adults, egg masses and/or tadpoles;
- d) conduct surveys over multiple years to accommodate inter annual variation;
- e) identification of migration corridors used annually by adults and toadlets to move between breeding and terrestrial habitat (movement is often identified by a large number of individuals moving simultaneously between these habitats); and
- f) identification of migratory timing windows; recognizing the inter-annual variability in Western Toad migratory movements

#### B. Terrestrial Habitat

ECCC recommends that baseline studies be conducted for Western Toad terrestrial habitat during this EA. These studies could use methods such as habitat suitability mapping and/or telemetry and should include, but not be limited to, the following:

- a) determination of Presence/Not detected<sup>1</sup> and distribution of Western Toad in the terrestrial habitat;
- b) identification of summer foraging habitats; and
- c) identification of winter hibernation sites.

Semlitsch and Bodie (2003) proposed stratification around breeding habitat. Stratification should include three terrestrial protection zones next to the core aquatic and wetland habitats, namely 1) an aquatic buffer 2) the core habitat and 3) a terrestrial buffer of 50 m surrounding the core habitat to protect the core habitat from edge effect (Murcia 1995). In order to address all life stages of Western Toad and avoid impacts to the species, ECCC recommends avoidance of those activities that could destroy, alter or fragment terrestrial protection zones. As such, buffers around core wetlands and aquatic resources should therefore be at least 150-290 m to ensure the protection of a large percentage of Western Toad movement (Semlitsch and Bodie 2003, Bartelt et al. 2004). These terrestrial protection zones will assist in protecting Western Toad terrestrial summer and winter habitat.

ECCC also recommends that baseline studies for terrestrial habitat for Western Toads be conducted within a buffer of 150–290 m plus a 50 m buffer to protect the core habitat from edge effects, surrounding all potential breeding ponds within the LSA. To ensure the most effective baseline studies for Western Toads, ECCC recommends that the maximum range (i.e. 290 m + 50 m) be used and that the minimum range (i.e. 150 m + 50 m buffer) only be used if the habitat encompassed by the maximum range includes those habitats where there is certainty that it will not support Western Toads during summer or hibernation or where other factors do not allow for a wider buffer.

ECCC notes that Western Toads can travel distances beyond the proposed terrestrial protection zones and can use terrestrial habitat several kilometers from their breeding sites (Bartelt et al. 2004, Bull 2006, COSEWIC 2012).

ECCC therefore recommends that, if Western Toad terrestrial habitat exists outside of the terrestrial protection zones, travel corridors be maintained to connect these zones with other terrestrial habitat.

## **Effects Assessment and Mitigation**

### Recommendation 4 – Effects Assessment:

ECCC recommends that the effects assessment for terrestrial habitat for Western Toads be conducted within the LSA within a buffer of 150–290 m (depending on buffer identified during baseline) plus a 50 m buffer surrounding all breeding ponds identified during baseline studies. The effects assessment should include a description of all potential direct or indirect impacts to Western Toad arising from project activities. This description should include, but not be limited to:

- a) the types of impact (includes the components of the project from which these impacts arise; effects on amphibians in the event of an accident or malfunction within amphibian habitat should also be included);
- b) the predicted effects of these impacts on Western Toads;

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<sup>1</sup> ECCC recommends that the precautionary principle be followed where, even if Western Toads are not observed within the terrestrial protection zones (i.e. 150-290 m + 50 m or terrestrial habitat), but are observed in the riparian/breeding habitat, the assumption is made that Western Toads occur in the terrestrial protection zones and that an effects assessment should be conducted.

- c) the measures proposed to mitigate these effects; and
- d) the residual effects on Western Toad.

Where no impacts are anticipated, this should be documented as part of the environmental assessment and a rationale provided.

#### Recommendation 5 – Use of Mitigation Hierarchy

ECCC recommends that the Proponent identify and describe measures to avoid, minimize, or offset for each potential impact identified. With respect to this mitigation hierarchy, ECCC recommends that the Proponent describe how the hierarchy was applied and provide a full rationale for moving from avoidance to minimization to offset. Ultimately, mitigation measures shall eliminate the jeopardy of a species of special concern to become endangered or threatened.

#### Recommendation 6 – Mitigation Measures:

With respect to developing mitigation measures, ECCC recommends that:

- appropriate mitigation measures be put in place to protect breeding and terrestrial habitat as well as migration corridors. Mitigation measures may include, but should not be limited to: setting speed limits on the road, avoidance of the area during the migration period, installation of signs to identify migration corridors, installation of wildlife crossings, fencing and access control measures;
- mitigation measures be identified to maintain water quality, as a change in water quality can have an adverse effect on amphibian populations;
- protocols be followed to ensure that diseases are not spread from one pond to another. Please see: <http://www.env.gov.bc.ca/wld/frogwatch/ecology/diseases.htm>;
- mitigation measures/protocols be developed in case of an accident or malfunction in the construction or operation phases of the proposed Project within amphibian habitat; and
- avoid formation of ephemeral ponds and ditches in the project area as they are potential population sinks. Human-created roadside ponds as mitigation measures have been shown to potentially put populations of western toad at risk of decline (Stevens and Poszkowski 2006).

ECCC further recommends the following considerations in the development of the mitigation measures:

- potential loss of habitat due to habitat fragmentation, barriers and/or disturbances or degradation of habitat be considered in developing mitigation measures.
- avoid stocking western toad breeding habitats with fish as it can introduce predation where it did not exist before

#### Recommendation 7 – Salvage

Amphibian salvage and translocation should not be considered measures to mitigate the effects of habitat loss and mortality due to construction activities because the survival of translocated individuals is highly uncertain (Malt 2012). This can be explained, in part, by the fact that Western Toads have strong breeding site fidelity and will return to the same breeding ponds in successive years (Smith and Green 2005; Bull and Carey 2008). Western Toad also exhibits communal breeding behaviour. Communal breeding and site fidelity may cause Western Toad to select only one or a few of the potential breeding sites within a relatively large area (Slough 2004), emphasizing the importance of protecting known breeding sites. Despite the uncertain effectiveness of salvage, this technique may be appropriate in order to reduce direct impacts to the species and in situations where options for habitat mitigation are limited.

##### *A. Selection of Relocation Sites*

ECCC recommends that avoidance and minimization of impacts to Western Toad habitat be the first considerations. If salvage is carried out, ECCC recommends that suitable sites for potential relocations of Western Toad be identified prior to salvage activities. Identification of suitable sites should include surveys to determine whether potential relocation site(s) have the appropriate biophysical attributes for the Western Toad. ECCC recommends that the environmental assessment describe how relocation sites were selected and include, but not be limited to, the following:

- a) a rationale for the distance of relocation site from salvage site (travelling long distances should be avoided to the extent possible)
- b) a description of how presence of predators, such as but not limited to fish, was considered;
- c) a description of how the presence of existing amphibian populations and their respective densities (carrying capacity) were considered;
- d) a description of how protection from potential impacts (i.e., outside the area of impact) was considered; and
- e) a description of how the quality of habitat (equal or better habitat than salvage site) was considered.

#### *B. Salvage Operations*

Where salvage has been identified as an appropriate option and where relocation sites have been successfully identified, ECCC recommends that a salvage plan be developed as part of the environmental assessment and that this plan include, but not be limited to, the following:

- a) a description of the qualifications of the biologists who will be undertaking the salvage operations, which should include experience developing an amphibian salvage program;
- b) a description of how non-target species will be managed, which should include information on the need for an euthanization program to be put in place before the salvage operation starts in the event that a non-native species is captured;
- c) a description of the measures that will be implemented to prevent the spread of disease between wetlands;
- d) a description of the potential effects of genetic mixing between salvaged and local individuals; and
- e) a description of the monitoring measures that will be implemented post salvage to assess relocation success, which should include, but not be limited to monitoring methods and success criteria (e.g. mark-recapture at the relocation site and in the migration corridors).

#### Recommendation 8 – Cumulative Effects Assessment:

The environmental assessment should identify cumulative effects of the project and other existing and future foreseeable activities in the regional assessment area on Western Toad and its habitat. Where no cumulative effects are predicted, this should be documented as part of the environmental assessment and a rationale provided. ECCC recommends that identifying cumulative effects be included as a requirement in the environmental assessment guidelines.

#### **Monitoring**

##### Recommendation 9 – Monitoring

ECCC recommends that Western Toad be included in a Wildlife Management and Monitoring Program as part of the EIS/application to assess the recovery of Western Toads and their habitats post-construction and the effectiveness of any mitigation measures, and to implement adaptive management where necessary. Some examples include: using remote cameras and time-lapse photography to assess amphibian use of passageways and the effectiveness of the installed fencing (Malt 2012), counting carcasses during roadkill surveys (Malt 2012), using of mark-recapture methods to assess the local and introduced (salvaged) populations (Malt 2012), and monitoring water quality.

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**ENVIRONMENT AND CLIMATE CHANGE CANADA WATER QUALITY COMMENTS –  
PACIFIC FUTURE ENERGY REFINERY PROJECT DRAFT ENVIRONMENTAL IMPACT STATEMENT GUIDELINES**

Topic	dEISg Section/Title	Comment
6.1 Project Setting and Baseline Conditions	6.1.5 Groundwater and Surface Water	<p>ECCC recommends reorganizing this section into two separate sections: one for the baseline assessment of groundwater, and a separate section for the baseline assessment of surface water. This may require reordering the existing bullets (-) and sub-bullets (•) into separate sections for groundwater and surface water.</p> <p>In addition, ECCC recommends the addition of the following bullets to the separated groundwater and surface water sections, as applicable:</p> <ul style="list-style-type: none"> <li>• Provide a detailed conceptual diagram that illustrates how groundwater/surface water will be affected by the project components. The conceptual diagram should describe how processes, pathways and locations affect groundwater/surface water directly, and also take into account the interactions between groundwater and surface water.</li> <li>• Conduct the groundwater baseline assessment in the context of evaluating the feasibility of withdrawing process water (48,000m<sup>3</sup>).</li> <li>• Conduct the groundwater baseline assessment in the context of evaluating feasibility and risk of waste water discharges through deep well injection (if the proponent still considers this waste water disposal option, see page 46 of project description).</li> <li>• Conduct the surface water baseline assessment in the context of evaluating the potential for acidification of surface water bodies from direct discharge and atmospheric deposition (e.g. baseline assessment should measure pH, alkalinity, acidity, buffering capacity, etc).</li> <li>• Conduct a surface water hydrology baseline assessment in the context of evaluating the feasibility of withdrawing process water (48,000m<sup>3</sup>/d) from the Kitimat River.</li> </ul> <p>ECCC also recommends the following changes to existing bullets in section 6.1.5:</p> <ul style="list-style-type: none"> <li>• <b>Bullet 1:</b> Remove or clarify the last sub-bullet “<i>changes to surface water quality, including seasonal changes in run-off entering water courses</i>”. Seasonal variation of water quality parameters is covered in bullet 13, ECCC therefore suggests removing this sub-bullet from the hydrogeology section/bullet and providing a stand-alone bullet as follows: “ Characterize surface water run-off and drainage patterns in the project area, including seasonal variation”</li> </ul>

- **Bullet 6:** Include all contaminants of concern related to the proposed refinery project. ECCC recommends the following changes: “groundwater quality, including lab analytical results for **contaminants of concern specific to the proposed project as well as**, metals, major ions...”
- **Bullet 13:** Revise to: “seasonal surface water quality, including analytical results (e.g. **Contaminants of Concern, Hardness**, water temperature, turbidity, pH, **acidity/alkalinity**, dissolved oxygen profiles) and interpretation for ~~representative tributaries and water bodies including~~ all surface water bodies affected by the project. ~~sites to receive mine effluents or runoff.~~ “

6.1 Project Setting and Baseline Conditions	6.1.6 Marine Environment	<p>ECCC recommends the addition of the following bullets to section 6.1.6:</p> <ul style="list-style-type: none"> <li>• Provide a detailed conceptual diagram that illustrates how the project components interact with the marine environment. This should include but not be limited to, proposed shipping routes, shipping terminals and the proposed pipeline discharging process water into Douglas Channel.</li> <li>• The marine environment baseline assessment as described by the bullets in this section should be conducted for the regional study area as well as for the specific marine environment locations impacted by the project components.</li> </ul>
6.2 Predicted Changes to the Physical Environment	6.2.2 Changes to Groundwater and Surface Water	<p>ECCC recommends the addition of the following bullets prior to the existing bullets in section 6.2.2:</p> <ul style="list-style-type: none"> <li>• Changes to groundwater and surface water as described in the subsequent bullets should be predicted for all project phases and in consideration of seasonality and possible effects of climate change.</li> <li>• For all predicted changes, per subsequent bullets, the proponent should provide appropriate sensitivity case analysis, predicting a range of changes for worst case, best case and most likely scenarios.</li> </ul> <p>ECCC also recommends clarifying Bullet 2 – does this bullet relate to surface water or groundwater?</p>
6.3 Predicted Changes to the Physical Environment	6.3.2. Marine Environment	<p>Given the Marine Environment is considered a separate valued component (VC), ECCC recommends adding the Freshwater Environment as a separate VC.</p>
6.3 Predicted Changes to the Physical Environment	6.3.3. Marine Plants	<p>ECCC recommends the following changes to existing bullets in section 6.3.3:</p> <ul style="list-style-type: none"> <li>• <b><u>The effect of changes to the marine environment on</u></b> marine plants,</li> </ul>

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Environment

including .....

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