

## 5.9 Summary of Assessment of Potential Environmental Effects

Potential environmental effects of the Proposed Project and associated key mitigation measures are presented in Table 5.9-1. A summary of predicted residual environmental effects and residual cumulative environmental effects are presented in Table 5.9-2.

**Table 5.9-1: Summary of Potential Environmental Effects and Associated Key Mitigation Measures**

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
<b>Fisheries and Freshwater Habitat</b>				
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Operations Reclamation and Closure	Loss of habitat	M-5.1-01	Implementation of the Fish Habitat Offset Plan (Volume 4, Part G – Section 22.0: Appendix 5.1-B). Extension of the lower segment WC 2 will collect surface flow diverted through loss of the upper segment and will increase the wetted area within the extension and the lower segment of WC 2.
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Operations Reclamation and Closure	Loss of habitat	M-5.1-02	Designing the pit lake such that lake elevation can be used to manage hydrostatic pressure through the course of operations so changes to groundwater flow does not lead to a loss of flow within McNab Creek.
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Operations Reclamation and Closure	Loss of habitat	M-5.1-03	Similarly, the elevation of the pit lake will be used to manage baseflows in the natural groundwater watercourses below the pit lake.
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Construction Reclamation and Closure	Changes to Surface Water Quality - Suspended Sediments	M-5.1-04	Disturbed areas should be vegetated as soon as possible and where possible by planting and seeding with native trees, shrubs, and grasses.
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Construction Reclamation and Closure	Changes to Surface Water Quality - Suspended Sediments	M-5.1-05	Disturbed areas adjacent to watercourses should be covered with mulch for sediment control.
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Construction Operations Reclamation and Closure	Changes to Surface Water Quality - Suspended Sediments	M-5.1-06	Develop and implement an Erosion and Sediment Control Plan (See Volume 4, Part G – Section 22.0: Appendix 3).
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Operations	Changes to Surface Water Quality - Suspended Sediments	M-5.1-08	Fines/silt cakes berm should be vegetated as soon as possible and where possible by planting and seeding with native trees, shrubs, and grasses.
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Construction Operations Reclamation and Closure	Changes to Surface Water Quality - Suspended Sediments	M-5.1-09	Placement of erosion control blankets to keep soil in place.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Operations	Changes to Surface Water Quality - Suspended Sediments	M-5.1-11	Crushing area should receive water-misting during dry weather events to reduce dust release.
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Construction	Changes to Surface Water Quality - Cementitious (alkaline) Material	M-5.1-12	Complete isolation of work area is required to ensure waterbodies do not become more alkaline.
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Construction	Changes to Surface Water Quality - Cementitious (alkaline) Material	M-5.1-13	pH should be monitored in surrounding waterbodies during concrete pouring.
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Construction	Changes to Surface Water Quality - Cementitious (alkaline) Material	M-5.1-14	BMPs should be implemented during setting, mixing, and pouring of concrete to ensure activities meet requirements of applicable legislation.
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Construction	Changes to Surface Water Quality - Cementitious (alkaline) Material	M-5.1-15	Pre-cast concrete structures whenever possible.
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Construction	Changes to Surface Water Quality - Cementitious (alkaline) Material	M-5.1-16	Keep carbon dioxide tank with regulator, hose, and gas diffuser readily available during concrete works.
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Construction Operations Reclamation and Closure	Effects of Artificial Lighting	M-5.1-17	Lighting for the purposes of the aggregate mining will not be permitted between dusk to dawn at seasonally appropriate times.
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Construction Operations Reclamation and Closure	Effects of Artificial Lighting	M-5.1-18	All Lighting nearby waterbodies will have baffles to direct light away from the water surface.
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Construction Operations Reclamation and Closure	Effects of Artificial Lighting	M-5.1-19	Limited Lighting will be maintained through the night only for safety purposes.
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Construction Operations Reclamation and Closure	Changes to Surface Water Quality - Suspended Sediments	M-5.7-01	Develop and implement an Air Quality and Dust Control Management Plan (Volume 3, Part E - Section 16.0) that will detail measures to control fugitive particulates (e.g., watering and speed controls).

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Resident Cutthroat Trout and their Habitat	Construction Operations Reclamation and Closure	Loss of habitat	M-5.1-01	Implementation of the Fish Habitat Offset Plan (Volume 4, Part G – Section 22.0: Appendix 5.1-B). Extension of the lower segment WC 2 will collect surface flow diverted through loss of the upper segment and will increase the wetted area within the extension and the lower segment of WC 2.
Resident Cutthroat Trout and their Habitat	Construction Operations Reclamation and Closure	Loss of habitat	M-5.1-02	Designing the pit lake such that lake elevation can be used to manage hydrostatic pressure through the course of operations so changes to groundwater flow does not lead to a loss of flow within McNab Creek.
Resident Cutthroat Trout and their Habitat	Construction Operations Reclamation and Closure	Loss of habitat	M-5.1-03	Similarly, the elevation of the pit lake will be used to manage baseflows in the natural groundwater watercourses below the pit lake.
Resident Cutthroat Trout and their Habitat	Construction Reclamation and Closure	Changes to Surface Water Quality - Suspended Sediments	M-5.1-04	Disturbed areas should be vegetated as soon as possible and where possible by planting and seeding with native trees, shrubs, and grasses.
Resident Cutthroat Trout and their Habitat	Construction Reclamation and Closure	Changes to Surface Water Quality - Suspended Sediments	M-5.1-05	Disturbed areas adjacent to watercourses should be covered with mulch for sediment control.
Resident Cutthroat Trout and their Habitat	Construction Operations Reclamation and Closure	Changes to Surface Water Quality - Suspended Sediments	M-5.1-06	Develop and implement an Erosion and Sediment Control Plan (See Volume 4, Part G – Section 22.0: Appendix 3).
Resident Cutthroat Trout and their Habitat	Operations	Changes to Surface Water Quality - Suspended Sediments	M-5.1-08	Fines/silt cakes berm should be vegetated as soon as possible and where possible by planting and seeding with native trees, shrubs, and grasses.
Resident Cutthroat Trout and their Habitat	Construction Operations Reclamation and Closure	Changes to Surface Water Quality - Suspended Sediments	M-5.1-09	Placement of erosion control blankets to keep soil in place.
Resident Cutthroat Trout and their Habitat	Operations	Changes to Surface Water Quality - Suspended Sediments	M-5.1-11	Crushing area should receive water-misting during dry weather events to reduce dust release.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Resident Cutthroat Trout and their Habitat	Construction	Changes to Surface Water Quality - Cementitious (alkaline) Material)	M-5.1-12	Complete isolation of work area is required to ensure waterbodies do not become more alkaline.
Resident Cutthroat Trout and their Habitat	Construction	Changes to Surface Water Quality - Cementitious (alkaline) Material)	M-5.1-13	pH should be monitored in surrounding waterbodies during concrete pouring.
Resident Cutthroat Trout and their Habitat	Construction	Changes to Surface Water Quality - Cementitious (alkaline) Material)	M-5.1-14	BMPs should be implemented during setting, mixing, and pouring of concrete to ensure activities meet requirements of applicable legislation.
Resident Cutthroat Trout and their Habitat	Construction	Changes to Surface Water Quality - Cementitious (alkaline) Material)	M-5.1-15	Pre-cast concrete structures whenever possible.
Resident Cutthroat Trout and their Habitat	Construction	Changes to Surface Water Quality - Cementitious (alkaline) Material)	M-5.1-16	Keep carbon dioxide tank with regulator, hose, and gas diffuser readily available during concrete works.
Resident Cutthroat Trout and their Habitat	Construction Operations Reclamation and Closure	Effects of Artificial Lighting	M-5.1-17	Lighting for the purposes of the aggregate mining will not be permitted between dusk to dawn at seasonally appropriate times.
Resident Cutthroat Trout and their Habitat	Construction Operations Reclamation and Closure	Effects of Artificial Lighting	M-5.1-18	All lighting nearby waterbodies will have baffles to direct light away from the water surface.
Resident Cutthroat Trout and their Habitat	Construction Operations Reclamation and Closure	Effects of Artificial Lighting	M-5.1-19	Limited Lighting will be maintained through the night only for safety purposes.
Resident Cutthroat Trout and their Habitat	Construction Operations Reclamation and Closure	Changes to Surface Water Quality - Suspended Sediments	M-5.7-01	Develop and implement an Air Quality and Dust Control Management Plan (Volume 3, Part E - Section 16.0) that will detail measures to control fugitive particulates (e.g., watering and speed controls).
<b>Marine Resources</b>				
Marine Water and Sediment Quality Benthic Communities	Construction	Habitat Loss Changes in Habitat Quality	M-5.1-01	Develop a Fish Habitat Offset Plan to offset unavoidable permanent alteration or destruction

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Marine Fish Marine Mammals Marine Birds				of fish habitat from Project works (Volume 4, Part G – Section 22.0: Appendix 5.1-B).
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Reclamation and Closure	Habitat Loss Changes in Habitat Quality	M-5.1-01 M-5.2-01 to M-5.2-27	Maintain mitigation measures implemented during construction.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.1-20	Develop and implement a Spill Prevention and Emergency Response Plan (Volume 3, Part E - Section 16.0) to manage hydrocarbons and other chemicals during the construction and operational activities.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Operations	Habitat Loss Changes in Habitat Quality	M-5.1-20	Develop and implement a Spill Prevention and Emergency Response Plan (Volume 3, Part E - Section 16.0) to manage hydrocarbons and other chemicals during the construction and operational activities.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-01	Mitigation through design: <ul style="list-style-type: none"> <li>- Utilize existing disturbed features - installation of barge load-out jetty in low value habitat (existing log dump)</li> <li>- Use of piles instead of fill to reduce seabed disturbance</li> <li>- Height and orientation of walkway/conveyor designed to maximize ambient light penetration</li> <li>- Maintain tree buffer on foreshore to limit noise and dust emissions to marine environment.</li> </ul>

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Operations	Habitat Loss Changes in Habitat Quality	M-5.2-01	Mitigation through design: - Utilize existing disturbed features - installation of barge load-out jetty in low value habitat (existing log dump) - Use of piles instead of fill to reduce seabed disturbance - Height and orientation of walkway/conveyor designed to maximize ambient light penetration - Maintain tree buffer on foreshore to limit noise and dust emissions to marine environment.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-02	Develop and adherence to Construction Environmental Management Plan (CEMP; Volume 3, Part E – Section 16.0).
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-03	Develop and adherence to Pile Construction Management Plan (Volume 3, Part E – Section 16.0).
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-04	Environmental monitoring by a qualified EM
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-05	Prevent release of construction debris and deleterious substances into the marine environment.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-06	Adherence to BMP for Pile Driving and Related Operations (DFO 2003).
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-07	Adherence to Erosion and Sediment Control Plan (Volume 4, Part G – Section 22.0: Appendix 3) during road and other facilities construction, maintenance and upgrade.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Operations	Habitat Loss Changes in Habitat Quality	M-5.2-07	Adherence to Erosion and Sediment Control Plan (Volume 4, Part G – Section 22.0: Appendix 3) during road and other facilities construction, maintenance and upgrade.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-09	Optimal use of pre-cast concrete for construction and installation of facilities within the intertidal and subtidal zones.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-10	Concrete will be poured during suitable tides.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-11	Concrete is not to be poured directly into tidal waters.



Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-12	Pumping hoses will be equipped with a shut-off valve to stop flow should a spill occur.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-13	Short term portable concrete batch plant will be constructed onsite, so no concrete pumping will be conducted by barge.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-14	Use of tight-fitting formwork that is lined (e.g., with polyethylene) and that has gasket joints to prevent contact between concrete and tidal water.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-15	Barriers will be used as appropriate to prevent splashing of the concrete over the forms and into the water or intertidal area during pouring.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-16	Fast curing concrete intended/formulated for marine applications will be used.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-17	Following placement of concrete, forms will be left in place isolating the concrete from tidal waters for a minimum of 24 h or time required for the particular material used such that the concrete is cured before it is exposed to tidal waters.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-18	Wash down of equipment and tools that have come into contact with concrete will be conducted in a designated area away from intertidal drainages so that concrete products are prevented from entering watercourses.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-19	Excess or spilled concrete will be immediately cleaned up / removed from the intertidal area.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-20	During removal and storage of creosote pilings, adherence to DFO BMP "Guidelines to Protect Fish and Fish Habitat from Treated Wood Used in Aquatic Environments in the Pacific Region".
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-21	Vessels involved in in-water works will be positioned in a manner to prevent disturbance to benthic communities and benthic habitats.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Operations	Habitat Loss Changes in Habitat Quality	M-5.2-21	Vessels involved in in-water works will be positioned in a manner to prevent disturbance to benthic communities and benthic habitats.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-22	Work crews will monitor the position of barges and account for height of tidal waters, magnitude of prevailing winds, and direction of tidal currents or other factors that may influence vessel positioning.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Operations	Habitat Loss Changes in Habitat Quality	M-5.2-22	Work crews will monitor the position of barges and account for height of tidal waters, magnitude of prevailing winds, and direction of tidal currents or other factors that may influence vessel positioning.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-23	Manoeuvring of vessels in shallow areas will be minimized in order to avoid propeller scour and potential re-suspension of sediments or physical disturbance to shallow submerged marine vegetation.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Operations	Habitat Loss Changes in Habitat Quality	M-5.2-23	Manoeuvring of vessels in shallow areas will be minimized in order to avoid propeller scour and potential re-suspension of sediments or physical disturbance to shallow submerged marine vegetation.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-24	All equipment will be maintained in proper conditions to prevent leaking or spilling of hydrocarbons and other potentially toxic substances in the marine environment.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Operations	Habitat Loss Changes in Habitat Quality	M-5.2-24	All equipment will be maintained in proper conditions to prevent leaking or spilling of hydrocarbons and other potentially toxic substances in the marine environment.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-25	All hydrocarbon products, fuelling equipment and other chemical substances will be stored and handled in accordance with all applicable legislation, guidelines and BMP's to prevent their release and toxic effect in the marine environment.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Operations	Habitat Loss Changes in Habitat Quality	M-5.2-25	All hydrocarbon products, fuelling equipment and other chemical substances will be stored and handled in accordance with all applicable legislation, guidelines and BMP's to prevent their release and toxic effect in the marine environment.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Construction	Habitat Loss Changes in Habitat Quality	M-5.2-27	During in-water works with potential to result in increased turbidity or suspended sediment, specific water quality performance objectives (based on BC WQG) will be applied at set distances from in-water works. In-water works will be halted if objectives are not achieved. Where objectives cannot be practically met, work areas will be isolated from tidal waters with silt curtains or other silt control measures.
Marine Water and Sediment Quality Benthic Communities Marine Fish Marine Mammals Marine Birds	Operations	Habitat Loss Changes in Habitat Quality	M-5.2-44	Prevent release of debris and deleterious substances into the marine environment.
Marine Fish	Construction	Injury / Disturbance from Underwater Noise	M-5.2-30	Impact pile driving should not exceed 30 kPa at 10 m from pile. Otherwise, additional mitigation will be implemented such as the use of a vibratory hammer in place of an impact hammer or installation of bubble curtains around the wetted pile.
Marine Fish	Construction	Injury / Disturbance from Underwater Noise	M-5.2-31	Impact pile driving activities will be temporarily suspended if aggregations of fish (e.g., herring or salmonids) are spotted within the immediate work area or if any herring spawn is observed attached to equipment or structures in the water.
Marine Fish Marine Mammals	Construction	Injury / Disturbance from Underwater Noise	M-5.2-28	Implementation of ramp-up / soft-start procedure during impact pile driving

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Marine Fish Marine Mammals	Construction	Injury / Disturbance from Underwater Noise	M-5.2-29	Avoid concurrent multiple underwater noise generating activities (sequence where possible).
Marine Mammals	Construction	Injury / Disturbance from Underwater Noise	M-5.2-32	Monitoring for MM during all impact pile driving activities by a qualified and experienced MMO.
Marine Mammals	Construction	Injury / Disturbance from Underwater Noise	M-5.2-33	Implementation of a MM Safety Zone based on injury threshold criteria (180 dB re 1 $\mu$ Pa SPLrms for cetaceans and 190 dB re 1 $\mu$ Pa SPLrms for pinnipeds). The occurrence of MM within the safety zone will trigger specific mitigation actions (e.g., shut-downs).
Marine Mammals	Construction	Injury / Disturbance from Underwater Noise	M-5.2-34	Shut-down procedures – impact pile driving will be temporarily suspended when a MM is located within the safety zone until which time it moves outside the safety zone.
Marine Mammals	Construction	Injury / Disturbance from Underwater Noise	M-5.2-35	Conduct a pre-operational search for MM prior to start-up of active impact pile driving. If a MM is spotted within the safety zone during the pre-ops search, the ramp-up procedure will be delayed 20 minutes from the time the MM left the safety zone, or was last sighted in the safety zone
Marine Mammals	Construction	Injury / Disturbance from Underwater Noise	M-5.2-36	MMO will periodically verify underwater sound levels in the field using a hydrophone and a real-time sound monitor to confirm that sound levels at the modeled safety zone radius are below the established injury thresholds for MM. If necessary, the safety zone distance will be adjusted accordingly.
Marine Mammals	Construction	Injury / Disturbance from Underwater Noise	M-5.2-37	Plan operations during daylight hours to maximize detection ability of MM in Project Area.
Marine Mammals	Construction	Injury / Disturbance from Underwater Noise	M-5.2-38	Avoid peak seasonal timing when MMs are most likely to be in or adjacent to the Project Area.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Marine Mammals	Construction	Mortality/Injury from Vessel Strikes	M-5.2-39	Speed restrictions for tug-assisted barges in RSA (<12 knots).
Marine Mammals	Construction	Mortality/Injury from Vessel Strikes	M-5.2-40	Vessels will follow established shipping lanes/navigational routes in RSA.
Marine Mammals	Construction	Mortality/Injury from Vessel Strikes	M-5.2-41	Vessels will maintain a constant course and constant speed in RSA.
Marine Mammals	Construction	Mortality/Injury from Vessel Strikes	M-5.2-42	Project vessels will not approach within 100 m of any MM.
Marine Mammals	Construction	Mortality/Injury from Vessel Strikes	M-5.2-43	If MMs approach within 100 m of a Project vessel, the vessel will reduce its speed and, if possible, cautiously move away from the animal. If it is not possible for a vessel to move away from or detour around a stationary MM or group of MM, the vessel will reduce its speed and wait until the animal(s) moves at least 100 m from the vessel prior to resuming speed.
Marine Mammals	Operations	Mortality/Injury from Vessel Strikes	M-5.2-39 to M-5.2-43	Maintain mitigation measures implemented during construction.
Marine Mammals	Reclamation and Closure	Mortality/Injury from Vessel Strikes	M-5.2-39 to M-5.2-43	Maintain mitigation measures implemented during construction.
Marine Birds	Construction	Disturbance from In-Air Noise	M-9.2-01 to M-9.2-09	Refer to Volume 2, Part B - Section 9.2 (Noise).
Marine Birds	Operations	Behavioral Disturbance from In-Air Noise	M-9.2-01 to M-9.2-09	Refer to Volume 2, Part B - Section 9.2 (Noise).
Marine Birds	Reclamation and Closure	Disturbance from In-Air Noise	M-9.2-01 to M-9.2-09	Refer to Volume 2, Part B - Section 9.2 (Noise).

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
<b>Terrestrial Wildlife and Vegetation</b>				
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Habitat loss	M-5.1-06	Develop and implement an Erosion and Sediment Control Plan (See Volume 4, Part G – Section 22.0: Appendix 3).
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Habitat loss	M-5.1-20	Develop and implement a Spill Prevention and Emergency Response Plan (Volume 3, Part E - Section 16.0).
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Habitat loss	M-5.3-01	Identify and retain, where feasible, wildlife habitat features.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Habitat loss	M-5.3-02	Utilize existing disturbed areas.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Habitat loss	M-5.3-03	Maintain riparian vegetation, vegetation buffers and other important habitat features.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Habitat loss	M-5.3-04	Minimize clearing through Project planning.



Valued Component	Phase	Potential Effect	Key Mitigation Measures	
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Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Habitat loss	M-5.3-05	Develop a Vegetation Management Plan including an Invasive Plant Species Management Plan (Volume 3, Part E - Section 16.0).
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Habitat loss	M-5.3-06	Avoid clearing wildlife habitat during sensitive wildlife periods such as breeding and calving periods, bird nesting periods, and Roosevelt elk overwintering.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Habitat loss	M-5.3-07	Restrict construction to daylight hours.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
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Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Habitat loss	M-5.3-08	Limit Proposed Project Area access to a single point, and to employees and contractors.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Habitat loss	M-5.3-09	Manage noise through implementation of BMPs and mitigation outlined in Volume 2, Part B - Section 9.2.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Habitat loss	M-5.3-10	Maintain vegetation linkages and buffers.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Habitat loss	M-5.3-11	Demarcate habitat features to be retained.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Habitat loss	M-5.3-12	Identify habitat features (i.e., woody debris) to retain.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Habitat loss	M-5.3-15	Follow appropriate BMPs.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Habitat loss	M-5.3-16	Fall trees away from sensitive habitat.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Habitat loss	M-5.3-17	Develop a Wildlife Management Plan (Volume 3, Part E - Section 16.0).
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Operations	Habitat loss	M-5.3-18	Develop and implement a progressive Reclamation Plan (Volume 4, Part G – Section 22.0: Appendix 3).

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Operations	Habitat loss	M-5.3-19	Develop and implement a water quality monitoring program in remaining amphibian breeding ponds.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Operations	Habitat loss	M-5.3-20	Develop and implement a wildlife monitoring program with the objective of measuring the effectiveness of mitigation and restoration measures on wildlife VCs within the LSA.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Operations	Habitat loss	M-5.3-21	Minimize fugitive dusts from exposed soil, equipment and Project facilities.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Operations	Habitat loss	M-5.3-22	Monitor water quality in the pit lake.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Operations	Habitat loss	M-5.3-23	Limit operational hours to daylight hours. Limit nighttime lighting to where lighting is required for safety and security.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Operations	Habitat loss	M-5.3-24	Night time lights will be fitted with shades to direct light towards the ground.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Operations	Habitat loss	M-5.3-25	Monitor water quality in the Pit Lake and other water bodies in and around the Proposed Project Area .
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Reclamation and Closure	Habitat loss	M-5.3-26	Develop and implement a Habitat Compensation Plan to address the loss of amphibian breeding habitat and Roosevelt elk habitat.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Reclamation and Closure	Habitat loss	M-5.3-27	Reclaim the Proposed Project Area to enhance wildlife habitat.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Reclamation and Closure	Habitat loss	M-5.3-28	Develop and implement a progressive Reclamation Plan (Volume 4, Part G – Section 22.0: Appendix 3).
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Change in mortality	M-5.3-33	Develop and implement a Material Storage, Handling and Waste Management Plan and Develop and implement an Erosion and Sediment Control Plan (See Volume 4, Part G – Section 22.0: Appendix 3).
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Change in mortality	M-5.3-34	Prohibit harassment and feeding of wildlife by Project employees.



Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Change in mortality	M-5.3-35	Report wildlife observations.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Change in mortality	M-5.3-36	Develop a Wildlife Management Plan (Volume 3, Part E - Section 16.0).
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Change in mortality	M-5.3-37	All employees and contractors will be prohibited from hunting, including Roosevelt elk and grizzly bear, within the LSA.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Change in mortality	M-5.3-38	Install amphibian isolation fencing along roadways.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Change in mortality	M-5.3-39	Clear during avifauna least risk windows; avoid clearing during sensitive wildlife periods.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Change in mortality	M-5.3-40	Control traffic speeds on roads.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Change in mortality	M-5.3-20	Develop and implement a wildlife monitoring program with the objective of measuring the effectiveness of mitigation and restoration measures on wildlife VCs within the LSA.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Change in mortality	M-5.3-43	Train staff to be Bear Aware™.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Change in mortality	M-5.3-44	Post educational signage.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Change in mortality	M-5.3-37	All employees and contractors will be prohibited from hunting, including Roosevelt elk and grizzly bear, within the LSA.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Change in mortality	M-5.3-46	Conduct a pre-clearing salvage of amphibians in amphibian ponds within the Proposed Project Area.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Operations	Change in mortality	M-5.3-49	Restrict public access to the Proposed Project Area.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Operations	Change in mortality	M-5.3-51	Develop a wildlife mortality reporting program.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Operations	Change in mortality	M-5.3-52	Obtain a yearly permit to salvage amphibians.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Operations	Change in mortality	M-5.3-53	Limit nighttime road travel.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Operations	Change in mortality	M-5.3-54	Maintain vegetative buffers around all raptor nests and other active bird nests.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Operations	Change in mortality	M-5.3-55	Design the perimeter of the pit lake to allow for an escape route for large mammals.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Common nighthawk Northern goshawk Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Operations	Change in mortality	M-5.3-56	Develop a Material Storage, Handling and Waste Management Plan (Volume 3, Part E - Section 16.0).
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Roosevelt elk	Construction Operations	Barriers to movement	M-5.3-29	Store equipment in designated areas.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Roosevelt elk	Construction Operations	Barriers to movement	M-5.3-30	Design and establish amphibian passageways, where appropriate.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Roosevelt elk	Construction Operations	Barriers to movement	M-5.3-31	Maintain vegetation linkages and buffers.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Roosevelt elk	Construction Operations	Barriers to movement	M-5.3-32	Bury linear features.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Band-tailed pigeon Marbled murrelet Roosevelt elk Grizzly bear	Construction Operations	Habitat loss Change in mortality	M-5.3-77	Communication and planning with other proponents within McNab Valley.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Roosevelt elk	Construction Operations	Barriers to movement	M-5.3-77	Communication and planning with other proponents within McNab Valley.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Grizzly bear	Construction Operations	Habitat loss	M-5.3-78	Access management planning with other proponents within McNab Valley.
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog) Western screech owl Band-tailed pigeon Marbled murrelet	Construction Operations	Change in mortality	M-5.3-78	Access management planning with other proponents within McNab Valley.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Western screech owl	Construction Operations	Habitat loss	M-5.3-17a	Mature forest to be cleared will be surveyed for tree cavities that may provide suitable nesting opportunities for Western screech-owl. A density of potentially suitable nest trees will be estimated for the mature forest that will be cleared.
Western screech owl	Construction Operations	Habitat loss	M-5.3-17b	Construct and install nest boxes for Western screech-owl in nearby forest habitat, where appropriate.
Roosevelt elk	Construction Operations	Barriers to movement	M-5.3-78	Access management planning with other proponents within McNab Valley.
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction Operations	Surface runoff	M-5.1-06	Develop and implement an Erosion and Sediment Control Plan (See Volume 4, Part G – Section 22.0: Appendix 3).
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction Operations Reclamation and Closure	Invasive Species	M-5.1-20	Develop and implement a Spill Prevention and Emergency Response Plan (Volume 3, Part E - Section 16.0).
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction	Loss of extent	M-5.3-57	Project design aims to utilize disturbed areas and avoid sensitive ecosystems.
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction	Loss of extent	M-5.3-58	Activities will be contained within surveyed Project boundary.



Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction	Loss of extent	M-5.3-59	Standing vegetation will be retained for as long as possible.
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction	Loss of extent	M-5.3-60	Reclamation planning will aim to re-establish functional listed ecosystems at the same proportion at which they were removed, where final design allows.
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction	Loss of extent	M-5.3-61	Ecological units will be created during the reclamation phase similar to those present prior to Project construction.
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction	Loss of extent	M-5.3-62	Develop and implement a vegetation monitoring program to assess the success of mine reclamation.
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction Operations	Surface runoff	M-5.3-64	An independent Environmental Monitor (EM) will be onsite during sensitive works.
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction Operations Reclamation and Closure	Introduction of Dust	M-5.3-65	An Air Quality and Dust Control Management Plan will be prepared and implemented during construction, operations and reclamation.
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction Operations Reclamation and Closure	Introduction of Dust	M-5.3-66	Progressive reclamation to be conducted during operations to reduce ambient dust.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction Operations Reclamation and Closure	Invasive Species	M-5.3-67	A site specific Invasive Plant Management Plan will be developed.
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction Operations Reclamation and Closure	Invasive Species	M-5.3-68	Progressive reclamation to be conducted during operation to reduce risk of invasive species establishment.
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction Operations Reclamation and Closure	Soil disturbance	M-5.3-69	A Soil Management Plan, including the Reclamation Plan, will be developed and implemented during construction. The Soil Management Plan will be employed during reclamation and closure.
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction Operations	Increased windthrow	M-5.3-70	Trees susceptible to windthrow will be removed from treeline edges.
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction Operations	Increased windthrow	M-5.3-71	Sensitive receptors (i.e., streams) will be buffered so that impacts are minimized.
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction Operations	Increased windthrow	M-5.3-72	Monitoring of treeline edges will be conducted in order to evaluate potential windthrow effects and adaptive management will be employed, if necessary.
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction Operations Reclamation and Closure	Invasive Species	M-5.3-73	A Construction Environment Management Plan (CEMP) will be developed which will include regular inspections of equipment.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction Operations Reclamation and Closure	Invasive Species	M-5.3-75	An independent Environmental Monitor (EM) will be onsite.
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest) Ecosystems at-risk Plant Species at Risk	Construction Operations Reclamation and Closure	Invasive Species	M-5.3-76	An Operation Environmental Management Plan will be prepared that includes regular scheduled equipment inspections.
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest). Ecosystems at-risk Plant Species at Risk	Construction Operations	Loss of extent	M-5.3-77	Communication and planning with other proponents within McNab Valley.
<b>Geotechnical and Natural Hazards</b>				
Earthquakes and tsunamis	Construction	Increased ground movement during earthquake event  Increased shoreline erosion and offshore debris deposition during earthquake or landslide generated tsunami  Initiation of submarine landslides	M-5.4-01	Conduct detailed geotechnical subsurface investigations (drilling and geophysical programs) where required.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Earthquakes and tsunamis	Construction	<p>Increased ground movement during earthquake event</p> <p>Increased shoreline erosion and offshore debris deposition during earthquake or landslide generated tsunami</p> <p>Initiation of submarine landslides</p>	M-5.4-02	Prepare approved engineered design and plans to achieve Proposed Project engineering design and performance requirements and for mitigation, as required by provincial and federal accepted standards
Earthquakes and tsunamis	Operations	<p>Increased ground movement during earthquake event</p> <p>Increased shoreline erosion and offshore debris deposition during earthquake or landslide generated tsunami</p> <p>Initiation of submarine landslides</p>	M-5.4-09	Conduct operations in conformance with detailed geotechnical designs.
Earthquakes and tsunamis	Operations	<p>Increased ground movement during earthquake event</p> <p>Increased shoreline erosion and offshore debris deposition during earthquake or landslide generated tsunami</p> <p>Initiation of submarine landslides</p>	M-5.4-10	Monitor performance during operations and update or modify designs if required to achieve Proposed Project performance requirements and for mitigation, as required.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Earthquakes and tsunamis	Reclamation and Closure	<p>Increased ground movement during earthquake event</p> <p>Increased shoreline erosion and offshore debris deposition during earthquake or landslide generated tsunami</p> <p>Initiation of submarine landslides</p>	M-5.4-13	Conduct reclamation and closure in conformance based on detailed geotechnical designs, monitor performance during reclamation and update or modify designs if required to achieve Proposed Project performance requirements and for mitigation, as required.
Terrain stability	Construction	Land-based Mass Movement - Terrain Stability: changes to slope morphology or drainage conditions	M-5.4-03	Conduct appropriate detailed investigations of terrain stability and geotechnical conditions.
Terrain stability	Construction	Land-based Mass Movement - Terrain Stability: changes to slope morphology or drainage conditions	M-5.4-04	Prepare approved engineered design and plans to achieve Proposed Project performance requirements and for mitigation, as required.
Terrain stability	Construction	Land-based Mass Movement - Terrain Stability: changes to slope morphology or drainage conditions	M-5.4-05	Conduct appropriate onsite assessments to identify connectivity of site earth works to watercourses.
Terrain stability	Construction	Land-based Mass Movement - Terrain Stability: changes to debris flow-debris flood transport or run out zones	M-5.4-06	Conduct onsite assessment of terrain stability conditions along watercourse banks and connectivity to planned site activities.
Terrain stability	Construction	Land-based Mass Movement - Terrain Stability: changes to debris flow-debris flood transport or run out zones	M-5.4-07	Conduct appropriate debris flow/ flood hazard and effect assessments including hydrotechnical assessments that would include peak discharge and sediment concentration estimates.
Terrain stability	Construction	Land-based Mass Movement - Terrain Stability: changes to debris flow-debris flood transport or run out zones	M-5.4-08	Prepare engineered designs and plans by qualified and experienced professionals for mitigation (e.g., diversion and catchment structures), as required.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Terrain stability	Operations	Land-based Mass Movement - Terrain Stability: changes to slope morphology or drainage conditions	M-5.4-11	Conduct appropriate monitoring and ongoing investigations of terrain stability and geotechnical conditions to achieve Proposed Project performance requirements and for mitigation, as required.
Terrain stability	Operations	Land-based Mass Movement - Terrain Stability: changes to debris flow-debris flood transport or run out zones	M-5.4-12	Conduct recommended monitoring and ongoing debris flow/ flood hazard assessments of watercourse side banks and drainage of changing site conditions were warranted.
Terrain stability	Reclamation and Closure	Land-based Mass Movement - Terrain Stability: changes to slope morphology or drainage conditions Land-based Mass Movement - Terrain Stability: changes to debris flow-debris flood transport or run out zones	M-5.4-14	Based on stockpile location and earth works affecting or indirectly connected to side banks of watercourses, conduct site assessment of terrain stability conditions and soil erosion plans.
Terrain stability	Reclamation and Closure	Land-based Mass Movement - Terrain Stability: changes to slope morphology or drainage conditions Land-based Mass Movement - Terrain Stability: changes to debris flow-debris flood transport or run out zones	M-5.4-15	Includes conducting appropriate onsite assessments to identify connectivity of site earth works to watercourses. For potential debris flow / flood catchment structures, conduct appropriate decommissioning or ongoing monitoring of structures where warranted.
Terrain stability	Reclamation and Closure	Land-based Mass Movement - Terrain Stability: changes to slope morphology or drainage conditions Land-based Mass Movement - Terrain Stability: changes to debris flow-debris flood transport or run out zones	M-5.4-16	As required, prepare engineered designs and plans by qualified and experienced professionals for removal or ongoing mitigation of site.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
<b>Surface Water Resources</b>				
Surface Water Flow	Construction Operations Reclamation and Closure	Changes in baseflow in WC2	M-5.1-01	Implementation of the Fish Habitat Offset Plan (Volume 4, Part G – Section 22.0: Appendix 5.1-B). Extension of the lower segment WC 2 will collect surface flow diverted through loss of the upper segment and will increase the wetted area within the extension and the lower segment of WC 2.
Water Quality	Construction Operations Reclamation and Closure	Changes to Water Quality – Suspended Sediments	M-5.1-06	Develop and implement an Erosion and Sediment Control Plan (See Volume 4, Part G – Section 22.0: Appendix 3).
Water Quality	Construction Operations Reclamation and Closure	Changes to Water Quality – Suspended Sediments	M-5.5-01	Proposed Project design elements
Water Quality	Construction Operations Reclamation and Closure	Changes to Water Quality – Spills	M-5.5-03	Material Storage, Handling and Waste Management Plan (Volume 3, Part E – Section 16.0)
Water Quality	Construction Operations Reclamation and Closure	Changes to Water Quality – Spills	M-5.5-04	Site specific Spill Prevention and Emergency Response Plan (Volume 3, Part E – Section 16.0)
Aquatic Health	Construction Operations Reclamation and Closure	Direct Toxicity-Related Effects	M-5.1-06	Develop and implement an Erosion and Sediment Control Plan (See Volume 4, Part G – Section 22.0: Appendix 3).
Aquatic Health	Construction Operations Reclamation and Closure	Nutrient Enrichment-Related Effects	M-5.1-06	Develop and implement an Erosion and Sediment Control Plan (See Volume 4, Part G – Section 22.0: Appendix 3).
Aquatic Health	Construction Operations Reclamation and Closure	Direct Toxicity-Related Effects	M-5.5-03	Material Storage, Handling and Waste Management Plan (Volume 3, Part E – Section 16.0)

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
<b>Groundwater Resources</b>				
Groundwater Flow	Operations	Changes in groundwater flow	M-5.6-01	Limit excavation to the southern portion of the delta/fan.
Groundwater Flow	Operations	Changes in groundwater flow	M-5.6-01	Limit excavation to the southern portion of the delta/fan.
Groundwater Flow	Operations	Changes in groundwater flow	M-5.6-02	Implementation of a progressive Reclamation Plan (Volume 4, Part G - Section 22.0: Appendix 3).
Groundwater Flow	Operations	Changes in groundwater flow	M-5.6-02	Implementation of a progressive Reclamation Plan (Volume 4, Part G - Section 22.0: Appendix 3).
Groundwater Flow	Reclamation and Closure	Changes in groundwater flow	M-5.6-03	Set overflow structure at 5.2m.
Groundwater Quality	Operations	Changes in groundwater quality	M-5.6-02	Implementation of a progressive Reclamation Plan (Volume 4, Part G - Section 22.0: Appendix 3).
Groundwater Quality	Reclamation and Closure	Changes in groundwater quality	M-5.6-02	Implementation of a progressive Reclamation Plan (Volume 4, Part G - Section 22.0: Appendix 3).
Groundwater Quality	Operations	Changes in groundwater quality	M-5.6-04	Fines deposited around the northern and eastern perimeter of the property but each year's deposition will be limited to small surface area. Fines will be mixed with a growing medium and seeded.
Groundwater Quality	Reclamation and Closure	Changes in groundwater quality	M-5.6-04	Fines deposited around the northern and eastern perimeter of the property but each year's deposition will be limited to small surface area. Fines will be mixed with a growing medium and seeded.



Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
<b>Air Quality</b>				
Air Quality Indicators	Construction	Fugitive particulate concentrations from construction activities: Bulldozing, material handling (material drops), fugitive road dust, and wind erosion from un-vegetated berms	M-5.7-01	Develop and implement an Air Quality and Dust Control Management Plan (Volume 3, Part E - Section 16.0) that will detail measures to control fugitive particulates (e.g., watering and speed controls).
Air Quality Indicators	Construction	Fugitive particulate concentrations from construction activities: Bulldozing, material handling (material drops), fugitive road dust, and wind erosion from un-vegetated berms	M-5.7-02	Establish and on-site Air Quality and Meteorology Monitoring Program.
Air Quality Indicators	Operations	Project activities will result in air emissions, which may cause changes in air concentrations and atmospheric deposition rates. Fuel combustion will result in air emissions	M-5.7-02	Establish and on-site Air Quality and Meteorology Monitoring Program.
Air Quality Indicators	Construction	Fugitive particulate concentrations from construction activities: Bulldozing, material handling (material drops), fugitive road dust, and wind erosion from un-vegetated berms	M-5.7-01	Develop and implement an Air Quality and Dust Control Management Plan (Volume 3, Part E - Section 16.0) that will detail measures to control fugitive particulates (e.g., watering and speed controls).
Air Quality Indicators	Operations	Fugitive particulate concentrations from fugitive road dust	M-5.7-01	Develop and implement an Air Quality and Dust Control Management Plan (Volume 3, Part E - Section 16.0) that will detail measures to control fugitive particulates (e.g., watering and speed controls).

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
Air Quality Indicators	Reclamation and Closure	Fugitive particulate concentrations from reclamation and closure activities: Bulldozing, material handling (material drops), fugitive road dust, and wind erosion from un-vegetated berms	M-5.7-01	Develop and implement an Air Quality and Dust Control Management Plan (Volume 3, Part E - Section 16.0) that will detail measures to control fugitive particulates (e.g., watering and speed controls).
Air Quality Indicators	Operations	Fugitive particulate concentrations from processing plant crushing units	M-5.7-04	Processing plant crushing units will be partially enclosed.
Air Quality Indicators	Operations	Fugitive particulate concentrations from wind erosion off the 10 mm crushed gravel and 10 mm crushed gravel stockpiles.	M-5.7-05	Watering of 10 mm crushed gravel and 20 mm crushed gravel stockpiles.
Air Quality Indicators	Operations	Fugitive particulate concentrations from processing plant dry screening units	M-5.7-06	Processing plant dry screening units will be partially enclosed.
Air Quality Indicators	Operations	Fugitive particulate concentrations from processing plant wet screening	M-5.7-07	Processing plant wet screening process.
Air Quality Indicators	Operations	Fugitive particulate concentrations from material handling (material drops)	M-5.7-08	Material handling will be partially enclosed with or without water (mist) spray.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
<b>Climate Change</b>				
GHG Emissions	Construction	The timescale of activities is too short (approximately two years), and will occur in the near future (2014-2015) therefore considerable climate-infrastructure interaction impacts are not expected	M-5.8-01	Major extraction and processing equipment such as the dredger, screens and crusher will be powered by electricity. Extracted and processed material will be transferred around the Project site using a network of electricity-powered conveyors instead of using haul vehicles.
GHG Emissions	Operations	The timescale of activities means that the operational phase is predicted to be completed by 2032 or 2033, which is considered too short for considerable climate-infrastructure interaction impacts	M-5.8-01	Major extraction and processing equipment such as the dredger, screens and crusher will be powered by electricity. Extracted and processed material will be transferred around the Project site using a network of electricity-powered conveyors instead of using haul vehicles.
GHG Emissions	Reclamation and Closure	The timescale of activities means that the closure/reclamation phase is predicted to be completed in 2033 or 2034, which is considered too short for considerable climate-infrastructure interaction impacts	M-5.8-01	Major extraction and processing equipment such as the dredger, screens and crusher will be powered by electricity. Extracted and processed material will be transferred around the Project site using a network of electricity-powered conveyors instead of using haul vehicles.
GHG Emissions	Construction	The timescale of activities is too short (approximately two years), and will occur in the near future (2014-2015) therefore considerable climate-infrastructure interaction impacts are not expected	M-5.8-02	Ongoing routine maintenance of vehicles.

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
GHG Emissions	Operations	The timescale of activities means that the operational phase is predicted to be completed by 2032 or 2033, which is considered too short for considerable climate-infrastructure interaction impacts	M-5.8-02	Ongoing routine maintenance of vehicles.
GHG Emissions	Reclamation and Closure	The timescale of activities means that the closure/reclamation phase is predicted to be completed in 2033 or 2034, which is considered too short for considerable climate-infrastructure interaction impacts	M-5.8-02	Ongoing routine maintenance of vehicles.
GHG Emissions	Construction	The timescale of activities is too short (approximately two years), and will occur in the near future (2014-2015) therefore considerable climate-infrastructure interaction impacts are not expected	M-5.8-03	Minimize idling of vehicles and tugs
GHG Emissions	Operations	The timescale of activities means that the operational phase is predicted to be completed by 2032 or 2033, which is considered too short for considerable climate-infrastructure interaction impacts	M-5.8-03	Minimize idling of vehicles and tugs

Valued Component	Phase	Potential Effect	Key Mitigation Measures	
			No.	Description
GHG Emissions	Reclamation and Closure	The timescale of activities means that the closure/reclamation phase is predicted to be completed in 2033 or 2034, which is considered too short for considerable climate-infrastructure interaction impacts	M-5.8-03	Minimize idling of vehicles and tugs

**Table 5.9-2: Summary of Assessment of Potential Residual and Cumulative Residual Environmental Effects**

Valued Component	Phase	Residual Effect Assessment		Cumulative Residual Effect Assessment	
		Potential Effect	Significance	Potential Effect	Significance
<b>Fisheries and Freshwater Habitat</b>					
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Construction	Changes to Surface Water Quality - Suspended Sediments	Negligible	n/a	n/a
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Construction	Changes to Surface Water Quality - Cementitious (alkaline) Material	Negligible	n/a	n/a
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Construction	Effects of Artificial Lighting	Negligible	n/a	n/a
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Operations	Loss of Habitat	Negligible	n/a	n/a
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Operations	Changes to Surface Water Quality - Suspended Sediments	Negligible	n/a	n/a
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Operations	Effects of Artificial Lighting	Negligible	n/a	n/a
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Reclamation and Closure	Changes to Surface Water Quality - Suspended Sediments	Negligible	n/a	n/a
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Reclamation and Closure	Effects of Artificial Lighting	Negligible	n/a	n/a
Anadromous Chum Coho and Cutthroat Trout and their Habitats	Reclamation and Closure	Loss of Habitat	Negligible	n/a	n/a

Valued Component	Phase	Residual Effect Assessment		Cumulative Residual Effect Assessment	
		Potential Effect	Significance	Potential Effect	Significance
Resident Cutthroat Trout and their Habitat	Construction	Changes to Surface Water Quality - Suspended Sediments	Negligible	n/a	n/a
Resident Cutthroat Trout and their Habitat	Construction	Changes to Surface Water Quality - Cementitious (alkaline) Material	Negligible	n/a	n/a
Resident Cutthroat Trout and their Habitat	Construction	Effects of Artificial Lighting	Negligible	n/a	n/a
Resident Cutthroat Trout and their Habitat	Construction	Loss of Habitat	Negligible	n/a	n/a
Resident Cutthroat Trout and their Habitat	Operations	Changes to Surface Water Quality - Suspended Sediments	Negligible	n/a	n/a
Resident Cutthroat Trout and their Habitat	Operations	Effects of Artificial Lighting	Negligible	n/a	n/a
Resident Cutthroat Trout and their Habitat	Operations	Loss of Habitat	Negligible	n/a	n/a
Resident Cutthroat Trout and their Habitat	Reclamation and Closure	Changes to Surface Water Quality - Suspended Sediments	Negligible	n/a	n/a
Resident Cutthroat Trout and their Habitat	Reclamation and Closure	Effects of Artificial Lighting	Negligible	n/a	n/a
Resident Cutthroat Trout and their Habitat	Reclamation and Closure	Loss of Habitat	Negligible	n/a	n/a
<b>Marine Resources</b>					
Marine Water and Sediment Quality	Construction	Changes in Marine Water and Sediment Quality	Negligible	n/a	n/a
Marine Water and Sediment Quality	Operations	Changes in Marine Water and Sediment Quality	Negligible	n/a	n/a
Marine Water and Sediment Quality	Reclamation and Closure	Changes in Marine Water and Sediment Quality	Negligible	n/a	n/a
Marine Benthic Communities	Construction	Changes in Habitat Quality - Propeller Scour	Negligible	n/a	n/a

Valued Component	Phase	Residual Effect Assessment		Cumulative Residual Effect Assessment	
		Potential Effect	Significance	Potential Effect	Significance
Marine Benthic Communities	Construction	Potential Mortality - Propeller Scour	Negligible	n/a	n/a
Marine Benthic Communities	Construction	Loss of Habitat	Negligible	n/a	n/a
Marine Benthic Communities	Construction	Changes to Habitat Quality - In-Water Works	Negligible	n/a	n/a
Marine Benthic Communities	Construction	Potential Mortality - In-Water Works	Negligible	n/a	n/a
Marine Benthic Communities	Operations	Changes in Habitat Quality - Propeller Scour	Negligible	n/a	n/a
Marine Benthic Communities	Operations	Potential Mortality - Propeller Scour	Negligible	n/a	n/a
Marine Benthic Communities	Reclamation and Closure	Changes in Habitat Quality - Propeller Scour	Negligible	n/a	n/a
Marine Benthic Communities	Reclamation and Closure	Potential Mortality - Propeller Scour	Negligible	n/a	n/a
Marine Benthic Communities	Reclamation and Closure	Changes to Habitat Quality - In-Water Works	Negligible	n/a	n/a
Marine Benthic Communities	Reclamation and Closure	Potential Mortality - In-Water Works	Negligible	n/a	n/a
Marine Fish	Construction	Changes in Habitat Quality - Propeller Scour	Negligible	n/a	n/a
Marine Fish	Construction	Loss of Habitat	Negligible	n/a	n/a
Marine Fish	Construction	Changes to Habitat Quality - In-Water Works	Negligible	n/a	n/a
Marine Fish	Construction	Potential Mortality - In-Water Works	Negligible	n/a	n/a
Marine Fish	Operations	Changes in Habitat Quality - Propeller Scour	Negligible	n/a	n/a
Marine Fish	Reclamation and Closure	Changes in Habitat Quality - Propeller Scour	Negligible	n/a	n/a



Valued Component	Phase	Residual Effect Assessment		Cumulative Residual Effect Assessment	
		Potential Effect	Significance	Potential Effect	Significance
Marine Fish	Reclamation and Closure	Changes in Habitat Quality - In-Water Works	Negligible	n/a	n/a
Marine Mammals	Construction	Changes in Habitat Quality - Propeller Scour	Negligible to Not Significant	Behavioural disturbance of marine mammals from Project-generated underwater noise (i.e., pile driving / vessel operations / barge loading)	Not Significant
Marine Mammals	Construction	Potential Mortality - Propeller Scour	Negligible to Not Significant	Behavioural disturbance of marine mammals from Project-generated underwater noise (i.e., pile driving / vessel operations / barge loading)	Not Significant
Marine Mammals	Construction	Changes in Habitat Quality - In-Water Works	Negligible to Not Significant	Behavioural disturbance of marine mammals from Project-generated underwater noise (i.e., pile driving / vessel operations / barge loading)	Not Significant
Marine Mammals	Construction	Potential Mortality - In-Water Works	Negligible to Not Significant	Behavioural disturbance of marine mammals from Project-generated underwater noise (i.e., pile driving / vessel operations / barge loading)	Not Significant
Marine Mammals	Operations	Changes in Habitat Quality - Propeller Scour	Negligible to Not Significant	Behavioural disturbance of marine mammals from Project-generated underwater noise (i.e., pile driving / vessel operations / barge loading)	Not Significant
Marine Mammals	Operations	Potential Mortality - Propeller Scour	Negligible to Not Significant	Behavioural disturbance of marine mammals from Project-generated underwater noise (i.e., pile driving / vessel operations / barge loading)	Not Significant

Valued Component	Phase	Residual Effect Assessment		Cumulative Residual Effect Assessment	
		Potential Effect	Significance	Potential Effect	Significance
Marine Mammals	Reclamation and Closure	Changes in Habitat Quality - Propeller Scour	Negligible to Not Significant	Behavioural disturbance of marine mammals from Project-generated underwater noise (i.e., pile driving / vessel operations / barge loading)	Not Significant
Marine Mammals	Reclamation and Closure	Potential Mortality - Propeller Scour	Negligible to Not Significant	Behavioural disturbance of marine mammals from Project-generated underwater noise (i.e., pile driving / vessel operations / barge loading)	Not Significant
Marine Mammals	Reclamation and Closure	Changes in Habitat Quality - In-Water Works	Negligible to Not Significant	Behavioural disturbance of marine mammals from Project-generated underwater noise (i.e., pile driving / vessel operations / barge loading)	Not Significant
Marine Mammals	Reclamation and Closure	Potential Mortality - In-Water Works	Negligible to Not Significant	Behavioural disturbance of marine mammals from Project-generated underwater noise (i.e., pile driving / vessel operations / barge loading)	Not Significant
Marine Birds	Construction	Changes in Habitat Quality - Propeller Scour	Negligible	n/a	n/a
Marine Birds	Construction	Changes to Habitat Quality - In-Water Works	Negligible	n/a	n/a
Marine Birds	Operations	Changes in Habitat Quality - Propeller Scour	Negligible	n/a	n/a
Marine Birds	Reclamation and Closure	Changes in Habitat Quality - Propeller Scour	Negligible	n/a	n/a
Marine Birds	Reclamation and Closure	Changes in Habitat Quality - In-Water Works	Negligible	n/a	n/a
Marine Birds	Accidents and Malfunctions	Toxic or hazardous material spills.	Not Significant	n/a	n/a

Valued Component	Phase	Residual Effect Assessment		Cumulative Residual Effect Assessment	
		Potential Effect	Significance	Potential Effect	Significance
Marine Birds	Accidents and Malfunctions	Aggregate spills.	Negligible	n/a	n/a
<b>Terrestrial Wildlife and Vegetation</b>					
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog)	Construction	Habitat loss.	Not Significant	Habitat loss.	Not Significant
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog)	Construction	Barriers to movement.	Not Significant	Barriers to movement.	Not Significant
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog)	Construction	Change in mortality.	Not Significant	Change in mortality.	Not Significant
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog)	Operations	Habitat loss.	Not Significant	Habitat loss.	Not Significant
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog)	Operations	Barriers to movement.	Not Significant	Barriers to movement.	Not Significant
Amphibian species at risk (i.e., red-legged frog, western toad, Pacific tailed frog)	Operations	Change in mortality.	Not Significant	Change in mortality.	Not Significant
Western screech owl	Construction	Habitat loss.	Negligible	n/a	n/a
Western screech owl	Construction	Change in mortality.	Negligible	n/a	n/a
Western screech owl	Operations	Habitat loss.	Negligible	n/a	n/a
Western screech owl	Operations	Change in mortality.	Negligible	n/a	n/a
Common nighthawk	Construction	Habitat loss.	Negligible	n/a	n/a
Common nighthawk	Construction	Change in mortality.	Negligible	n/a	n/a

Valued Component	Phase	Residual Effect Assessment		Cumulative Residual Effect Assessment	
		Potential Effect	Significance	Potential Effect	Significance
Common nighthawk	Operations	Habitat loss.	Negligible	n/a	n/a
Common nighthawk	Operations	Change in mortality.	Negligible	n/a	n/a
Northern goshawk	Construction	Habitat loss.	Negligible	n/a	n/a
Northern goshawk	Construction	Change in mortality.	Negligible	n/a	n/a
Northern goshawk	Operations	Habitat loss.	Negligible	n/a	n/a
Northern goshawk	Operations	Change in mortality.	Negligible	n/a	n/a
Band-tailed pigeon	Construction	Habitat loss.	Negligible	n/a	n/a
Band-tailed pigeon	Construction	Change in mortality.	Negligible	n/a	n/a
Band-tailed pigeon	Operations	Habitat loss.	Negligible	n/a	n/a
Band-tailed pigeon	Operations	Change in mortality.	Negligible	n/a	n/a
Marbled murrelet	Construction	Habitat loss.	Negligible	n/a	n/a
Marbled murrelet	Construction	Change in mortality.	Negligible	n/a	n/a
Marbled murrelet	Operations	Habitat loss.	Negligible	n/a	n/a
Marbled murrelet	Operations	Change in mortality.	Negligible	n/a	n/a
Roosevelt elk	Construction	Habitat loss.	Not Significant	Habitat loss.	Not Significant
Roosevelt elk	Construction	Barriers to movement.	Not Significant	Barriers to movement.	Not Significant
Roosevelt elk	Construction	Change in mortality.	Not Significant	Change in mortality.	Not Significant
Roosevelt elk	Operations	Habitat loss.	Not Significant	Habitat loss.	Not Significant

Valued Component	Phase	Residual Effect Assessment		Cumulative Residual Effect Assessment	
		Potential Effect	Significance	Potential Effect	Significance
Roosevelt elk	Operations	Barriers to movement.	Not Significant	Barriers to movement.	Not Significant
Roosevelt elk	Operations	Change in mortality.	Not Significant	Change in mortality.	Not Significant
Grizzly bear	Construction	Habitat loss.	Not Significant	Habitat loss.	Significant
Grizzly bear	Construction	Change in mortality.	Not Significant	Change in mortality.	Significant
Grizzly bear	Operations	Habitat loss.	Not Significant	Habitat loss.	Significant
Grizzly bear	Operations	Change in mortality.	Not Significant	Change in mortality.	Significant
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Construction	Spread of invasive species.	Negligible	n/a	n/a
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Construction	Introduction of deleterious substances.	Negligible	n/a	n/a
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Construction	Introduction of dust.	Negligible	n/a	n/a
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Construction	Surface runoff.	Negligible	n/a	n/a
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Construction	Loss of extent.	Not Significant	Loss of extent.	Not Significant
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Construction	Soil disturbance.	Negligible	n/a	n/a

Valued Component	Phase	Residual Effect Assessment		Cumulative Residual Effect Assessment	
		Potential Effect	Significance	Potential Effect	Significance
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Construction	Windthrow.	Negligible	n/a	n/a
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Operations	Spread of invasive species.	Negligible	n/a	n/a
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Operations	Windthrow.	Negligible	n/a	n/a
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Operations	Introduction of dust.	Negligible	n/a	n/a
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Operations	Surface runoff.	Negligible	n/a	n/a
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Operations	Soil disturbance.	Negligible	n/a	n/a
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Operations	Introduction of deleterious substances.	Negligible	n/a	n/a
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Operations	Introduction of deleterious substances.	Negligible	n/a	n/a
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Reclamation and Closure	Spread of invasive species.	Negligible	n/a	n/a
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Reclamation and Closure	Introduction of deleterious substances.	Negligible	n/a	n/a

Valued Component	Phase	Residual Effect Assessment		Cumulative Residual Effect Assessment	
		Potential Effect	Significance	Potential Effect	Significance
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Reclamation and Closure	Introduction of dust.	Negligible	n/a	n/a
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Reclamation and Closure	Soil disturbance.	Negligible	n/a	n/a
Environmentally sensitive ecosystems (wetlands, riparian ecosystems, old growth forest)	Reclamation and Closure	Spread of invasive species.	Negligible	n/a	n/a
Ecosystems at-risk	Construction	Spread of invasive species.	Negligible	n/a	n/a
Ecosystems at-risk	Construction	Introduction of deleterious substances.	Negligible	n/a	n/a
Ecosystems at-risk	Construction	Introduction of dust.	Negligible	n/a	n/a
Ecosystems at-risk	Construction	Surface runoff.	Negligible	n/a	n/a
Ecosystems at-risk	Construction	Loss of extent.	Not Significant	Loss of extent.	Not Significant
Ecosystems at-risk	Construction	Soil disturbance.	Negligible	n/a	n/a
Ecosystems at-risk	Construction	Windthrow.	Negligible	n/a	n/a
Ecosystems at-risk	Operations	Spread of invasive species.	Negligible	n/a	n/a
Ecosystems at-risk	Operations	Loss of extent.	Not Significant	Loss of extent.	Not Significant
Ecosystems at-risk	Operations	Introduction of dust.	Negligible	n/a	n/a
Ecosystems at-risk	Operations	Surface runoff.	Negligible	n/a	n/a
Ecosystems at-risk	Operations	Soil disturbance.	Negligible	n/a	n/a
Ecosystems at-risk	Operations	Windthrow.	Negligible	n/a	n/a

Valued Component	Phase	Residual Effect Assessment		Cumulative Residual Effect Assessment	
		Potential Effect	Significance	Potential Effect	Significance
Ecosystems at-risk	Operations	Introduction of deleterious substances.	Negligible	n/a	n/a
Ecosystems at-risk	Reclamation and Closure	Spread of invasive species.	Negligible	n/a	n/a
Ecosystems at-risk	Reclamation and Closure	Introduction of deleterious substances.	Negligible	n/a	n/a
Ecosystems at-risk	Reclamation and Closure	Introduction of dust.	Negligible	n/a	n/a
Ecosystems at-risk	Reclamation and Closure	Soil disturbance.	Negligible	n/a	n/a
Ecosystems at-risk	Reclamation and Closure	Windthrow.	Negligible	n/a	n/a
Plant species at-risk	Construction	Introduction of deleterious substances.	Negligible	n/a	n/a
Plant species at-risk	Construction	Loss of extent.	Negligible	n/a	n/a
Geotechnical and Natural Hazards					
Terrain stability	Construction	Land-based Mass Movement - Terrain Stability: changes to slope morphology or drainage conditions.	Negligible	n/a	n/a
Terrain stability	Construction	Land-based Mass Movement - Terrain Stability: changes to debris flow-debris flood transport or run out zones.	Negligible	n/a	n/a
Terrain stability	Operations	Land-based Mass Movement - Terrain Stability: changes to slope morphology or drainage conditions.	Negligible	n/a	n/a
Terrain stability	Operations	Land-based Mass Movement - Terrain Stability: changes to debris flow-debris flood transport or run out zones.	Negligible	n/a	n/a



Valued Component	Phase	Residual Effect Assessment		Cumulative Residual Effect Assessment	
		Potential Effect	Significance	Potential Effect	Significance
Terrain stability	Reclamation and Closure	Land-based Mass Movement - Terrain Stability: changes to slope morphology or drainage conditions.	Negligible	n/a	n/a
Terrain stability	Reclamation and Closure	Land-based Mass Movement - Terrain Stability: changes to debris flow-debris flood transport or run out zones.	Negligible	n/a	n/a
Earthquakes and tsunamis	Construction	Increased ground movement during earthquake event.	Negligible	n/a	n/a
Earthquakes and tsunamis	Construction	Increased shoreline erosion and offshore debris deposition during earthquake or landslide generated tsunami.	Negligible	n/a	n/a
Earthquakes and tsunamis	Construction	Initiation of submarine landslides.	Negligible	n/a	n/a
Earthquakes and tsunamis	Operations	Increased ground movement during earthquake event.	Negligible	n/a	n/a
Earthquakes and tsunamis	Operations	Increased shoreline erosion and offshore debris deposition during earthquake or landslide generated tsunami.	Negligible	n/a	n/a
Earthquakes and tsunamis	Operations	Initiation of submarine landslides.	Negligible	n/a	n/a
Earthquakes and tsunamis	Reclamation and Closure	Increased ground movement during earthquake event.	Negligible	n/a	n/a
Earthquakes and tsunamis	Reclamation and Closure	Increased shoreline erosion and offshore debris deposition during earthquake or landslide generated tsunami.	Negligible	n/a	n/a
Earthquakes and tsunamis	Reclamation and Closure	Initiation of submarine landslides.	Negligible	n/a	n/a

Valued Component	Phase	Residual Effect Assessment		Cumulative Residual Effect Assessment	
		Potential Effect	Significance	Potential Effect	Significance
<b>Surface Water Resources</b>					
Surface Water Flow	Operations	Changes in baseflow in WC2.	Negligible	n/a	n/a
Surface Water Flow	Reclamation and Closure	Changes in baseflow in WC2.	Negligible	n/a	n/a
Water Quality	Construction	Changes to Water Quality – Suspended Sediments	Negligible	n/a	n/a
Water Quality	Construction	Changes to Water Quality – Spills	Negligible	n/a	n/a
Water Quality	Operations	Changes to Water Quality – Suspended Sediments	Negligible	n/a	n/a
Water Quality	Operations	Changes to Water Quality – Spills	Negligible	n/a	n/a
Water Quality	Reclamation and Closure	Changes to Water Quality – Suspended Sediments	Negligible	n/a	n/a
Water Quality	Reclamation and Closure	Changes to Water Quality – Spills	Negligible	n/a	n/a
Aquatic Health	Construction	Direct Toxicity-Related Effects	Negligible	n/a	n/a
Aquatic Health	Construction	Nutrient Enrichment-Related Effects	Negligible	n/a	n/a
Aquatic Health	Operations	Direct Toxicity-Related Effects	Negligible	n/a	n/a
Aquatic Health	Operations	Nutrient Enrichment-Related Effects	Negligible	n/a	n/a
Aquatic Health	Reclamation and Closure	Direct Toxicity-Related Effects	Negligible	n/a	n/a
Aquatic Health	Reclamation and Closure	Nutrient Enrichment-Related Effects	Negligible	n/a	n/a

Valued Component	Phase	Residual Effect Assessment		Cumulative Residual Effect Assessment	
		Potential Effect	Significance	Potential Effect	Significance
<b>Groundwater Resources</b>					
Groundwater Flow	Operations	Changes in groundwater flow.	Negligible	n/a	n/a
Groundwater Flow	Reclamation and Closure	Changes in groundwater flow.	Negligible	n/a	n/a
Groundwater Quality	Operations	Changes in groundwater quality.	Negligible	n/a	n/a
Groundwater Quality	Reclamation and Closure	Changes in groundwater quality.	Negligible	n/a	n/a
<b>Air Quality</b>					
Air Quality Indicators	Construction	Increase in PM <sub>2.5</sub> – 24-hour Increase in PM <sub>2.5</sub> – Annual Increase in PM <sub>10</sub> – 24-hour Increase in TSP – 24-hour Increase in TSP – Annual Increase in NO <sub>2</sub> – 1-hour, tug boats Increase in NO <sub>2</sub> – Annual, tug boats Increase in SO <sub>2</sub> – 1-hour, tug boats	Negligible (NO <sub>2</sub> , SO <sub>2</sub> ) to Not Significant (PM, TSP)	Increase in PM <sub>2.5</sub> – 24-hour Increase in PM <sub>2.5</sub> – Annual Increase in PM <sub>10</sub> – 24-hour Increase in TSP – 24-hour Increase in TSP – Annual	Negligible
Air Quality Indicators	Operations	Increase in PM <sub>2.5</sub> – 24-hour Increase in PM <sub>2.5</sub> – Annual Increase in PM <sub>10</sub> – 24-hour Increase in TSP – 24-hour Increase in TSP – Annual Increase in NO <sub>2</sub> – 1-hour, tug boats Increase in NO <sub>2</sub> – Annual, tug boats Increase in SO <sub>2</sub> – 1-hour, tug boats	Negligible (NO <sub>2</sub> , SO <sub>2</sub> ) to Not Significant (PM, TSP)	Increase in PM <sub>2.5</sub> – 24-hour Increase in PM <sub>2.5</sub> – Annual Increase in PM <sub>10</sub> – 24-hour Increase in TSP – 24-hour Increase in TSP – Annual	Negligible

Valued Component	Phase	Residual Effect Assessment		Cumulative Residual Effect Assessment	
		Potential Effect	Significance	Potential Effect	Significance
Air Quality Indicators	Reclamation and Closure	Increase in PM <sub>2.5</sub> – 24-hour Increase in PM <sub>2.5</sub> – Annual Increase in PM <sub>10</sub> – 24-hour Increase in TSP – 24-hour Increase in TSP – Annual Increase in NO <sub>2</sub> – 1-hour, tug boats Increase in NO <sub>2</sub> – Annual, tug boats Increase in SO <sub>2</sub> – 1-hour, tug boats	Negligible (NO <sub>2</sub> , SO <sub>2</sub> ) to Not Significant (PM, TSP)	Increase in PM <sub>2.5</sub> – 24-hour Increase in PM <sub>2.5</sub> – Annual Increase in PM <sub>10</sub> – 24-hour Increase in TSP – 24-hour Increase in TSP – Annual	Negligible
<b>Climate Change</b>					
GHG Emissions	Construction	Change in GHG Emissions	Negligible	n/a	n/a
GHG Emissions	Operations	Change in GHG Emissions	Negligible	n/a	n/a
GHG Emissions	Reclamation and Closure	Change in GHG Emissions	Negligible	n/a	n/a