Chapter 7 provides an assessment of the effects of the Project, focusing on the following:

- Overview of Approach;
- Identification of Valued Components;
- Assessment of Environmental and Socio-Economic Effects; and
- Other Effects.

### 7.1 OVERVIEW OF APPROACH

This chapter provides an assessment of the environmental and socio-economic effects of the Project to determine whether, after the implementation of mitigation measures, the Project is likely to result in significant adverse residual effects (including significant adverse cumulative effects) on identified VCs. The effects assessment builds on the framework established in earlier chapters, including:

- the assessment approach as reviewed in Chapter 3;
- the public consultation and involvement program (PIP) as described in Chapter 4;
- the results of an environmental and socio-economic scan provided in Chapter 5; and,
- the Project Description as discussed in Chapter 6.

More detailed information related to the environmental and socio-economic setting in the Project Study Region is provided in appendices to this Chapter, as follows:

- Appendix 7A - Fisheries and Aquatic Resources Report
- Appendix 7B: Terrestrial Resources Report
- Appendix 7C: Socio-Economic Setting
- Appendix 7D: Heritage Resources Impact Assessment
- Appendix 7E: Preliminary Assessment of Potential Erosion Impacts Associated with Two Water Level Simulations for Mayo Lake
- Appendix 7F: Further Heritage Resources Site Investigations
- Appendix 7G: Comparison of Historical Ariel Photography at Roop Lakes

There are three main pathways for effects from the Project on VCs:

- **Project-related direct and indirect changes to the aquatic and terrestrial environment:** Changes to the aquatic and terrestrial VCs (including associated wildlife and aquatic life) result from Project-related activities such as construction, operation and maintenance. Environmental changes can also be linked indirectly to subsequent socio-economic effects (e.g., resource use, economic and social change).
- **Project-related direct socio-economic effects:** Effects on people and communities can accumulate directly from the Project (i.e., direct local employment and training opportunities and local business expenditures during Project construction, operation and maintenance; and supply of lower cost grid electricity to displace diesel electricity generation during Project operation).

- **Overall effects on people and communities:** All of the specific socio-economic effects from the Project through different pathways accumulate on the affected people and communities. The results can be described overall as resource use effects, economic effects and social effects.

Residual environmental and socio-economic effects are examined for phases of the Project’s life-cycle from construction to operation and maintenance. The closure and decommissioning phase has been excluded from the assessment due to the long operational horizon for the project (50-100 years). Both beneficial and adverse environmental and socio-economic effects are considered, where appropriate, along with the potential effects of the environment on the Project, and the potential effects of accidents and malfunctions.

The assessment focuses on effects of the Project that are considered “likely” to occur. Based on the approach set out in Chapter 3, the expected effects of Project activities are assessed for each environmental and socio-economic VC, focusing initially on the expected geographic extent, duration and magnitude of each effect.

The Project effects for any environmental or socio-economic VC may fall within three distinct geographic areas and for the purpose of assessment their significance may be measured as low, medium or high, based on the described geographic ranges:

- **Construction Footprint Area: Low Geographic Extent:** This describes the footprint areas needed for the Project construction, operation and maintenance. Most of the Project effects during construction are confined to the Construction Footprint Area and stem from the actual physical work performed during construction and maintenance, as well as the physical presence of the Project infrastructure.

- **Project Study Region: Moderate Geographic Extent:** This describes the broader Project Study Region for examining environmental and socio-economic effects occurring throughout the region, and is defined as the portion of the Northern Tutchone Planning Region between and including the Village of Mayo and Mayo Lake that is generally in the vicinity of the Mayo River, Mayo Lake and Mayo Lake Access road. The maximum geographic extent of most potential environmental and socio-economic effects is expected to be included in this region, including the effects of changing water levels and flows at Mayo Lake and along the upper Mayo River.

- **Beyond the Project Study Region: High Geographic Extent:** This is the area beyond the Project Study Region that covers the entire Yukon Territory. It is anticipated that no likely adverse environmental or socio-economic effects of the Project will impact on this broader region outside of the Project Study Region. However, some positive socio-economic effects are expected to extend to this broader region.
Three broad categories are considered for the duration of effects related to Project activities for the purpose of assessing significance of effects within any of the above three geographic areas:

- **Short-term effects (low duration)** tend to last not much longer than the specific construction or maintenance activities undertaken. These effects are related to the construction activities in each portion of the Construction Footprint Area (clearing, excavating, construction of new facilities), and the subsequent infrequent brief maintenance activities (mainly clearing and brushing maintenance along the transmission line routes and along the canal).

- **Medium-Term effects (moderate duration)** tend to be related to secondary effects of the new facilities and operating regime, where these changes induce a period of adaptation or reestablishment of ecosystem components.

- **Long-term effects (high duration)** tend to be related to the on-going existence of new Project components in the Construction Footprint Areas, and to the operation of the Project components as it relates to ongoing water levels and flows. For the purposes of assessing significance of effects, long-term effects are considered to be of high duration.

Within the context of the above geographic area and duration categories, three categories for the magnitude of effects (level of detectability or acceptability) are considered for the purposes of assessing the significance of effects related to Project activities:

- **Low magnitude effects** are unlikely to be detectable or measurable, or are below established thresholds of acceptable change;

- **Moderate magnitude effects** could be detectable within the normal range of variation with a well designed monitoring program, or are below established thresholds or acceptable change; and

- **High magnitude effects** would be readily detectable without a monitoring program and outside the normal range of variation, or exceed established thresholds of acceptable change.

Significance for the Project’s effects on any VC is determined using the approach and criteria set out in Chapter 3 based on scientific analysis of ecosystem effects including traditional and local knowledge, socio-economic research and professional judgment. Noted deficiencies in the information base about potential effects on VCs are addressed further in Chapter 8 Monitoring and Follow-Up Programs.

### 7.2 Identification of Valued Components

As discussed in Chapter 3, a VC based approach is intended to ensure that potential significant adverse effects to important environmental and social components will be detected and mitigated through the assessment process. The YESAB Guides provide considerable guidance for scoping for VCs. Consistent with the YESAB Guides, VCs for this assessment were identified based on the following considerations:

- Focal species and habitat (e.g. defining landscape attributes required to meet the needs of biota, and also the management regimes that should be applied to them);
• Socio-economic context (e.g. a socio-economic component recognized as being important because of its integral connection to, or reflection of, the socio-economic system; its commercial or economic value; and/or its role in maintaining quality of life in a community);

• Representation (i.e. seeking to maintain an appropriate representation of ecosystem networks and populations on the landscape over time, while recognizing and managing for natural temporal fluctuations in composition that occur);

• Special elements (for example rare or under-represented ecosystems, rare and/or threatened flora or fauna species, important harvested species, and unique landforms);

• Ecological processes (processes of social or environmental importance); and

• First Nation/Resident/Community values or concerns.

The selection of VCs helped to focus the assessment on components deemed to be of particular importance or of special interest to residents or to the ecosystem. The VC selection process also helped to define and describe effects pathways, and to identify temporal and spatial boundaries for the assessment of Project effects.

In this assessment, the analysis focuses on those environmental and socio-economic components that may potentially be affected by the Project. As such, the VCs selected for this assessment must be valued in environmental or socio-economic terms, and have some connection to or overlap with the Project that could create a pathway for effects to occur. VCs were identified through:

• Consultation with interested parties (as described in Chapter 4);

• Consideration of the environmental and socio-economic setting (as discussed in Chapter 5 as well as appendices to this Chapter). This includes field studies undertaken within the terrestrial and aquatic environments; heritage resources field studies; socio-economic fieldwork and data collection; a consideration of TK and local knowledge and plans and policies applicable to the Project Study Region; and

• Consideration of the Project Description (as described in Chapter 6) and likely pathways of effect on the environmental and socio-economic setting.

As set out in the YESAA legislation, the assessment focuses primarily on potentially negative or adverse effects of the Project. However, there are two key benefit streams related to the Project that are also addressed via selection and assessment of VCs. The first benefit stream includes positive socio-economic effects related to renewable energy development, electrical system reliability, economic development and the development and strengthening of local infrastructure. The second potential benefit stream relates to the opportunity to improve the existing limiting conditions with respect to habitat for Chinook salmon. Other ancillary positive effects are not described and VCs were not defined to capture those potential positive effects. For example, erosion effects of the Project were initially considered as a potential pathway of adverse effect from the Project. However, further study, as summarised in Appendix 7E, indicated that potential erosion-related effects of the Project in relation to the baseline condition (as described in Chapter 3) would be positive. As a result no VC was selected to specifically address potential erosion-related effects of the Project.
During the consultation process, certain issues were identified that are of social or environmental importance related to the existing environment, but that do not have pathways of effect flowing from the Project. These topics are discussed in Chapter 4 (Dam Safety related to the Wareham Dam; Fish passage at the Wareham Dam; Icing and Inland Water Inundation around the Village of Mayo and Wareham Lake levels near the Minto Bridge). The proposed Project is not anticipated to have effects related to these existing environmental concerns and as such no VCs have been defined related to these concerns for the current assessment.

Consistent with Environment Canada’s Environmental Assessment Best Practice Guide for Wildlife at Risk in Canada (Lynch Stewart, 2004), all species at risk (that are either listed federally under the Species at Risk Act, or by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC)) that may be present in the proposed Project Study Region were initially considered in the environmental VC scoping. Those species at risk that could potentially interact with the Project and that are included in the impact effects assessment include grizzly bear, wolverine, Common Nighthawk, Olive-sided Flycatcher and Rusty Blackbird. During the initial environmental studies, it was determined that Woodland Caribou occurrence within the zone of influence of the Project is unlikely. Nesting of Peregrine Falcons in the terrestrial study area is also unlikely and even if nesting did occur, effects of the Project on Peregrine Falcons or their habitat are extremely unlikely. As such Woodland Caribou and Peregrine Falcons, which are species at risk, are not considered as VCs for the purposes of this assessment. Similarly, although the environmental surveys included a survey of raptor nests to determine their relative abundance and distribution in the Project Study Region, nest trees were located above the waterline in taller trees that are not expected to be affected by the Project. Therefore raptors are not considered a VC for this assessment.

Similarly, berry picking and the collection of medicinal plants was identified by NND as an important socio-economic consideration. However, during the scoping review, it was determined that the Construction Footprint Area falls outside any areas identified as prime areas for berry picking or the collection of medicinal plants or similar activities. Therefore there is no pathway of effect from the Project to these activities, and plant and berry collection has not been included as a socio-economic VC in this assessment.

Finally, well chosen VCs can provide a representative measure of the Project’s effects on the non-selected environmental and socio-economic components. Further, measures designed to mitigate adverse effects on VCs also serve to minimize the likelihood of adverse impacts on other environmental and social components. For example, in this assessment two key aquatic environmental VCs were identified: Chinook salmon and lake trout. While there are other aquatic species that may potentially be affected by the Project, the assessment related to these two VCs substantially addresses potential pathways of effect of the Project on other aquatic species. The Mayo Lake population of lake trout was selected as a VC as they appear to be more sensitive to increased drawdown changes and measures to protect or evaluate impacts for these species would also cover any shallow lake spawning by lake whitefish. It is anticipated that mitigation measures adopted relative to potential effects on these VCs will also be effective for other aquatic species.

The following sections summarize and characterize the VCs considered in this assessment.
7.2.1 Environmental Valued Components

This section provides a description of the environmental VCs considered in the effects assessment. Environmental VCs include both aquatic environment VCs and terrestrial environment VCs that are of particular concern in the Project Study Region and that may potentially be affected by the Project. Table 7-1 summarizes the Environmental VCs, the characterization of potential effects on the VC and the parties who identified the VC as a potential concern.

<table>
<thead>
<tr>
<th>Key Interests</th>
<th>Valued Component (VC)</th>
<th>Identified by1:</th>
<th>Characterization of Potential Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmon</td>
<td>Chinook Salmon</td>
<td>NND, OP, OG</td>
<td>Reducing water flows in Zone 2 could result in reduced spawning and rearing habitat availability. Modified flow regimes in Zone 1 could alter the quantity of habitat.</td>
</tr>
<tr>
<td>Spawning Freshwater Fish</td>
<td>Lake Trout</td>
<td>NND, OP, OG</td>
<td>Increase in winter draw-down range of Mayo Lake may result in exposure of lake trout spawning areas, resulting in loss of eggs from freezing or de-watering.</td>
</tr>
<tr>
<td>Wetlands</td>
<td>Wetlands</td>
<td>NND, OP, OG</td>
<td>Increase in winter draw-down range of Mayo Lake may alter wetland habitat in the Roop Lakes area, and at the end of the Nelson Arm. Wetlands are also important habitat for Waterfowl and waterbirds. Increased winter draw-down range may affect waterfowl breeding and staging areas in the wetland areas at the end of Roop Arm and Nelson Arm. There are also potential effects on habitat for Rusty Blackbird.</td>
</tr>
<tr>
<td>Aquatic Mammals</td>
<td>Aquatic Furbearers - Beaver</td>
<td>NND, OG</td>
<td>Increased winter draw-down of Mayo Lake water levels may directly affect habitat, leading to effects on populations, for example, of beaver &amp; muskrat.</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Rare and Listed Plants Habitat</td>
<td>OG</td>
<td>The project will have direct effects on terrestrial habitats in the Construction Footprint Area and potential indirect effects on surrounding habitats.</td>
</tr>
</tbody>
</table>

1 NND = Government and Citizens of the First Nation of Nacho Nyak Dun; OP = Other Interested Persons; and OG = Federal, Territorial, or Municipal, Government
### Key Interests

<table>
<thead>
<tr>
<th>Valued Component (VC)</th>
<th>Identified by¹:</th>
<th>Characterization of Potential Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wildlife</td>
<td>NND, OG</td>
<td>Construction and maintenance of Project works may directly affect habitat and movement. Enduring access may indirectly increase potential hunting.</td>
</tr>
<tr>
<td>Other Species of Concern including Grizzly Bear Wolverine, Common Nighthawk and Olive-sided Flycatcher</td>
<td>OG</td>
<td>Construction and operation of the project may overlap with habitat for Species at Risk not captured by the Wetlands VC.</td>
</tr>
</tbody>
</table>

#### 7.2.2 Socio-economic Valued Components

This section provides a description of the Socio-economic VCs considered in the effects assessment. Socio-economic VCs include components related to resource use (including traditional, domestic and commercial resource use); heritage resources; local and regional economy; and social context that are of particular concern to individuals and communities in the region and that may potentially be affected by the Project. Table 7-2 summarizes the Socio-economic VCs, the characterization of potential effects on the VC and the parties who identified the VC as a potential concern.
### Table 7-2

**Socio-Economic Valued Components**

Considered for the Assessment of the Mayo B Project

<table>
<thead>
<tr>
<th>Key Interests</th>
<th>Valued Component (VC)</th>
<th>Identified by:</th>
<th>Characterization of Potential Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional &amp; Domestic Resource Use</td>
<td>Hunting</td>
<td>NND, OG</td>
<td><strong>Construction Phase:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Noise, air emissions (e.g. fugitive dust, vehicle exhaust), and traffic from construction may cause wildlife to avoid the Construction Footprint Area temporarily during construction.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>An influx of workers at the Work Camp may result in increased harvesting pressure on wildlife resources</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Operations &amp; Maintenance Phase:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Presence and maintenance of the new powerhouse and associated infrastructure may result in certain species of wildlife avoiding the immediate area.</td>
</tr>
<tr>
<td>Fishing</td>
<td>NND, OG</td>
<td></td>
<td><strong>Construction Phase:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Direct effect of access limitations for people who fish in the lower Mayo River adjacent to the Construction Footprint Area</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>An influx of construction workers may result in fishing during non-working hours, increasing harvesting pressure on fish resources.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Operations &amp; Maintenance Phase:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Restricted access to the Construction Footprint Area may create challenges to fishing in the Mayo River in the area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Changes in flows in the lower Mayo River may impact fishing success.</td>
</tr>
<tr>
<td>Key Interests</td>
<td>Valued Component (VC)</td>
<td>Identified by:</td>
<td>Characterization of Potential Effect</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-------------------------------</td>
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<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Traditional & Domestic Resource Use  | Trapping                      | NND, OG        | **Construction Phase:** Construction activities will limit the ability of community members to access a small portion of RTC 407 (a community concession area encircling the Village of Mayo). Noise, air emissions, and traffic from construction may cause wildlife to avoid the Construction Footprint Area temporarily during construction.  
**Operations & Maintenance Phase:** The long-term presence of the access road, powerhouse, and surface-run canal will permanently modify an area as small furbearing mammal habitat. The distribution line ROW may increase habitat for small furbearing species that prefer open, low vegetation environments. |
| Other Resource Use                   | Tourism, Outfitting and Outdoor Recreation | NND, OP        | **Construction Phase:** Increased traffic and noise from construction activities may prevent some tourists from deciding to travel the Silver Trail. Increased traffic and noise from construction activities may be audible at the campgrounds.  
**Operations & Maintenance Phase:** Increased winter flows may affect snowmobiling and access to trails along the Mayo River Zone 4 if suspended ice occurs in late winter/early spring. Increased draw-down of Mayo Lake may affect timing and ability to use beach and boat launch at west end of Mayo Lake. Decreased flows in Zone 2 may affect recreational boating. |
| Placer Mining                        | OP                            |                | **Operations & Maintenance Phase:** Project effects within the Project Study Region in relation to accessing placer claims by barge during the early portion of the season when the lake will be at its lowest elevation. |
### Environment and Socio-Economic Effects Assessment

<table>
<thead>
<tr>
<th>Key Interests</th>
<th>Valued Component (VC)</th>
<th>Identified by:</th>
<th>Characterization of Potential Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Resource Use</td>
<td>Private &amp; Commercial Land Use</td>
<td>OP, OG</td>
<td><strong>Operations &amp; Maintenance Phase:</strong>&lt;br&gt;Increasing the bottom storage range of Mayo Lake may affect water access to commercial and private lease-holders and property owners at Mayo Lake.&lt;br&gt;Increased winter flows from Mayo Lake to Wareham Lake may potentially affect the property owner near Minto Bridge.</td>
</tr>
<tr>
<td>Heritage Resources</td>
<td>Heritage Resources</td>
<td>NND, OP, OG</td>
<td><strong>Construction Phase:</strong>&lt;br&gt;Activities in the Project Construction Footprint Area may result in the discovery of unknown heritage sites. Known valued sites will be avoided or recorded.</td>
</tr>
<tr>
<td>Local Economy</td>
<td>Local Employment and Training</td>
<td>NND, OP, OG</td>
<td><strong>Construction Phase:</strong>&lt;br&gt;Workforce estimates suggest that there will be opportunities for residents of the area to benefit from employment and possible training.</td>
</tr>
<tr>
<td>Local Economy</td>
<td>Local Business</td>
<td>NND, OP, OG</td>
<td><strong>Construction Phase:</strong>&lt;br&gt;Construction activities will result in opportunities for local business (including NND businesses) to provide services (e.g., fuel hauling, camp services, clearing, heavy equipment operations etc.)&lt;br&gt;An influx of workers may be beneficial to businesses in Mayo as the customer base will increase over the two-year construction phase.</td>
</tr>
<tr>
<td>Key Interests</td>
<td>Valued Component (VC)</td>
<td>Identified by:</td>
<td>Characterization of Potential Effect</td>
</tr>
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<td>------------------------</td>
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<td>--------------------------------------</td>
</tr>
</tbody>
</table>
| Regional Economy       | Government Fiscal Flows| NND, OG        | **Construction Phase:**
|                        |                       |                | There may be direct expenditures incurred, and increases in direct and indirect tax and/or royalty revenue. |
|                        |                       |                | **Operations & Maintenance Phase:**
|                        |                       |                | YEC is presently in the process of discussing opportunities for NND to participate in the Project through investment. If a mutually acceptable agreement can be arranged, there could be material benefits to NND in the form of financial returns commensurate with their investment. |
| Utility Ratepayers     | NND, OP, OG           |                | **Operations & Maintenance Phase:**
|                        |                       |                | Improved system capability and reliability through new renewable power generation at stable costs, and reduced diesel fuel generation costs to service future load growth. |
| Social Context         | Community and Family Life | NND, OP, OG | **Construction Phase:**
|                        |                       |                | Construction of the Project will require a work camp (max. peak capacity of 50-75 persons) on YEC property. An influx of workers has social implications for the community such as increased alcohol related incidents. |
|                        | Community Infrastructure & Services | OG | **Construction Phase:**
|                        |                       |                | Construction activities over a two year period will impact local community infrastructure and services. This could include increased reliance and stress on local infrastructure and social services (i.e., waste removal, water supply, wear & tear on road infrastructure etc). |
|                        | Traffic               | NND, OP, OG   | **Construction Phase:**
|                        |                       |                | Increased traffic during construction phase may result in a potential increase in traffic accidents, and increased wear and tear on highway and local road infrastructure. |
|                        | Worker Health and Safety | OG | **Construction Phase:**
|                        |                       |                | Potential concerns with health and safety of workers during construction activities. This could include increased reliance on local health services such as ambulance and nursing station services. |
7.3 ASSESSMENT OF EFFECTS

As reviewed in Chapter 3 (Section 3.3.1), Project effects on baseline conditions are predicted separately for each environmental and socio-economic VC by comparing (a) “what would be expected without the Project” (the baseline), and (b) “what would be expected with the Project”.

7.3.1 Assessment of Effects on Environmental Valued Components

Section 7.3.1 provides assessment of Project effects and mitigation measures with regard to the following environmental VCs:

- Chinook salmon;
- Lake trout;
- Wetlands (waterfowl and waterbirds; and Rusty Blackbird);
- Aquatic Mammals – Beaver;
- Other Species of Concern (Common Nighthawk, Olive-sided Flycatcher, Wolverine, Grizzly Bear);
- Moose;
- Vegetation-Rare and Listed Plants Habitat.

With respect to cumulative effects, the effects assessment considers several existing environment activities, including fishing and recreation, and sediment related to various existing activities in the Project Study region. No specific future changes to these baseline conditions are identified based on other projects known to be occurring in the future.

Table 7-3 summarises the effects assessment for each of the environmental VCs. More detail on certain specific effects on environmental VCs is provided below.
## Table 7-3 Summary of Project Effects and Significance on Aquatic and Terrestrial Environment

<table>
<thead>
<tr>
<th>Description/ Nature of Project Effect</th>
<th>Mitigation</th>
<th>Cumulative Effects Assessment</th>
<th>Residual Effects after Mitigation</th>
<th>Determination of Significance</th>
<th>Monitoring/ Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chinook Salmon</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Construction Phase:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect effects related to sediment mobilization affecting rearing/spawning habitat.</td>
<td>Appropriate erosion and sediment control measures to be in place during construction period.</td>
<td>None identified (i.e., the baseline condition includes a degree of sediment related to various factors. No specific future changes to those baseline conditions are predicted based on other projects known to be occurring in the future).</td>
<td>Potentially adverse effects related to sediment mobilization.</td>
<td>Low magnitude; Moderate geographic extent; Low duration. Low (-) Not Significant</td>
<td>Construction compliance monitoring.</td>
</tr>
<tr>
<td><strong>Operations &amp; Maintenance Phase: Modified flow regime in Zone 1</strong></td>
<td>None required.</td>
<td>None identified.</td>
<td>Potential effects on habitat may be positive or negative but on balance expected to be neutral.</td>
<td>Low Magnitude; Moderate Geographic Extent; High Duration. Neutral Not Significant</td>
<td></td>
</tr>
<tr>
<td>• Potential for effects on habitat as a result of modified flow regime.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operations &amp; Maintenance Phase: Modified flow regime with average lower flows in Zone 2</strong></td>
<td>Yukon Energy has committed to maintain a minimum flow of 5-6 cms downstream of the existing powerhouse.(^1)</td>
<td>None identified.</td>
<td>There are positive and negative effects, however the net habitat productivity should be maintained by providing a higher minimum flow than previous conditions during critical over-wintering periods.</td>
<td>Low magnitude, moderate geographic extent; High duration. Low (neutral) Not Significant</td>
<td>Spawning and rearing habitat use evaluation.</td>
</tr>
<tr>
<td>• Potential effects on habitat as a result of lower average flows.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) The current limiting factor in regards to mortality of overwintering eggs in this stretch of river is low flow levels that can occur during incubation of Chinook eggs. Refer to Chapter 7, Aquatic Report: Appendix E for examples of past flow regimes where flows went down to 3-4 cms (in entire lower river; current license limit of 2.8 cms) for periods in the fall and winter following high flows during the Chinook spawning period. Such occurrences are not optimal for incubation success. The proposed project includes a minimum flow of 5-6 cms in Zone 2 and as such incubation success for Chinook salmon will be enhanced. The US Fish and Wildlife Service Habitat Suitability Index Model indicates that where Average annual base flow during the late summer to winter low-flow period is 50% or higher of the average annual daily flow, that the Suitability Index is 1.0 or excellent for this variable. (US Fish and Wildlife Service. 1986).
### Description/Nature of Project Effect

#### Operations & Maintenance Phase: Implementation of the Tailrace Rearing Channel:
- Creation of high quality rearing habitat as needed to address any residual effects of modified flow regime in Zones 2 and 1, related to the productive capacity of the river and no net habitat loss.

#### Operations & Maintenance Phase: Modified flow regime throughout lower river (reduced peak flows) in all Zones:
- Potential long-term changes in river morphology.

#### Operations & Maintenance Phase: More frequent dewatering in Zone 3
- Potential adverse effect related to habitat loss and fish stranding.

### Mitigation

#### Operations & Maintenance Phase: Implementation of the Tailrace Rearing Channel:
- None (proposed as a potential mitigative activity)

#### Operations & Maintenance Phase: Modified flow regime throughout lower river (reduced peak flows) in all Zones:
- If necessary, planned flood events could be induced.

#### Operations & Maintenance Phase: More frequent dewatering in Zone 3:
- Ramping rules are currently in place during spawning season.

### Cumulative Effects Assessment

#### Operations & Maintenance Phase: Implementation of the Tailrace Rearing Channel:
- Positive effects related to high quality rearing habitat, as needed.

#### Operations & Maintenance Phase: Modified flow regime throughout lower river (reduced peak flows) in all Zones:
- Changes to flow regime.

#### Operations & Maintenance Phase: More frequent dewatering in Zone 3:
- Potential adverse effects related to residual fish habitat loss and stranding.

### Residual Effects after Mitigation

#### Operations & Maintenance Phase: Implementation of the Tailrace Rearing Channel:
- Low Magnitude; Low geographic extent; High duration. Low (+) Not Significant.

#### Operations & Maintenance Phase: Modified flow regime throughout lower river (reduced peak flows) in all Zones:
- Low magnitude; Moderate geographic extent; High duration. Low (-) Not Significant

#### Operations & Maintenance Phase: More frequent dewatering in Zone 3:
- Low magnitude; Low Geographic Extent; High duration. Low (-) Not Significant

### Determination of Significance

#### Operations & Maintenance Phase: Implementation of the Tailrace Rearing Channel:
- Monitoring to evaluate physical and biological success.

#### Operations & Maintenance Phase: Modified flow regime throughout lower river (reduced peak flows) in all Zones:
- Monitoring of long-term changes to geomorphology, as required.

#### Operations & Maintenance Phase: More frequent dewatering in Zone 3:
- Continued use of ramping rules and monitoring for fish stranding.

### Monitoring/Follow-Up

#### Operations & Maintenance Phase: Implementation of the Tailrace Rearing Channel:
- Monitoring to ensure health of population. Construction or cleaning of alternative spawning sites, if determined to be required based on monitoring results, along with other potential progressive staged mitigation measures.

#### Operations & Maintenance Phase: Modified flow regime throughout lower river (reduced peak flows) in all Zones:
- Monitoring to evaluate physical and biological success.

#### Operations & Maintenance Phase: More frequent dewatering in Zone 3:
- Monitoring to ensure health of population. Construction or cleaning of alternative spawning sites, if determined to be required based on monitoring results, along with other potential progressive staged mitigation measures.

---

2 The new flow regime in Zone 1 will be more stable with low flow events being notably higher than previous conditions. In Zone 1, the amount of fish habitat available is directly related to flow levels. As this section is unconfined, a low gradient and many side/back channels, the lower the flows, the less wetted habitat available for fish (including valuable juvenile Chinook rearing habitat). When flows go down in this section the main channel width may decrease and the number of wetted/charged side channels may be reduced. These changes, if they occurred, would be gradual over time. Planned flood events could help to alleviate these effects if necessary.

3 Zone 3 has 3 per cent of the habitat area available to Chinook Salmon in the lower Mayo River (Zones 1-3).
<table>
<thead>
<tr>
<th>Description/ Nature of Project Effect</th>
<th>Mitigation</th>
<th>Cumulative Effects Assessment</th>
<th>Residual Effects after Mitigation</th>
<th>Determination of Significance</th>
<th>Monitoring/ Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Species of Concern</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Construction Phase:</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Direct effects on Common Nighthawk and Olive-sided Flycatcher nest habitat and Wolverine and Grizzly Bear seasonal habitat.</td>
<td>- Clearing will take place outside of breeding season for Common Nighthawk and Olive-sided Flycatcher.</td>
<td>- Potential for adverse effects on nesting habitat for Common Nighthawk and Olive-sided Flycatcher and seasonal habitat for Wolverine and Grizzly Bear.</td>
<td>- Low magnitude, low geographic extent, high duration.</td>
<td>- Pre-construction nest survey.  4</td>
<td></td>
</tr>
<tr>
<td>Indirect Effects on Common Nighthawk, Olive-sided Flycatcher, Wolverine and Grizzly Bear due to construction disturbance and avoidance.</td>
<td></td>
<td></td>
<td>- Effect on nesting habitat may be negative (if nests are present) or neutral (if no nests present).</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Wetlands (including waterfowl and water birds)</strong></td>
<td>None identified.</td>
<td>None identified.</td>
<td>Low (-/neutral) Not Significant.</td>
<td>- Nest surveys during the breeding season are suggested to determine presence in the Project Study Region.</td>
<td></td>
</tr>
<tr>
<td><strong>Operations &amp; Maintenance Phase: Rusty Blackbird</strong></td>
<td>None identified.</td>
<td>None identified.</td>
<td>Low magnitude, moderate geographic area, high duration.</td>
<td>- Nest surveys during the breeding season are suggested to determine presence in the Project Study Region.</td>
<td></td>
</tr>
<tr>
<td>Lower water levels may affect vegetation characteristics of nest habitats.</td>
<td></td>
<td></td>
<td>Although effects on local Rusty Blackbird nesting in the Study Region may remain, in any event the Project would affect only a very small proportion (less than 1%) of available nesting habitat such that the effects from a species or regional perspective will not be significant.</td>
<td></td>
<td>Low (-) Not Significant.</td>
</tr>
<tr>
<td>There is uncertainty as to the possible presence of Rusty Blackbird in potentially affected wetlands, and their nesting and foraging ecology in the region.</td>
<td></td>
<td></td>
<td>Although effects on local Rusty Blackbird nesting in the Study Region may remain, in any event the Project would affect only a very small proportion (less than 1%) of available nesting habitat such that the effects from a species or regional perspective will not be significant.</td>
<td></td>
<td>Low (-) Not Significant.</td>
</tr>
<tr>
<td><strong>Operations &amp; Maintenance Phase: Waterfowl and Waterbirds</strong></td>
<td>None identified.</td>
<td>None identified.</td>
<td>Low magnitude, moderate extent, high duration.</td>
<td>- Pre-construction shoreline nesting waterfowl survey; Post construction monitoring of water levels in key nesting wetland areas to establish early-season effects are recommended.</td>
<td></td>
</tr>
<tr>
<td>Lower water levels in affected wetlands at start of nesting season could result in reduced local productivity for waterfowl by flooding of nests established early in nesting season before water levels stabilize.</td>
<td></td>
<td></td>
<td>Although effects on local waterfowl nesting in the Study Region may remain, in any event there are many other wetlands where waterfowl and waterbirds are known to nest in the Mayo region such that the effects from a species or regional perspective will not be significant.</td>
<td></td>
<td>Low (-) Not Significant.</td>
</tr>
<tr>
<td>There is an incomplete understanding of effects of new water level management on potentially affected wetlands (mainly Roops Lake) and presence/density of shoreline nesting waterfowl in the area potentially affected by the Project.</td>
<td></td>
<td></td>
<td>Although effects on local waterfowl nesting in the Study Region may remain, in any event there are many other wetlands where waterfowl and waterbirds are known to nest in the Mayo region such that the effects from a species or regional perspective will not be significant.</td>
<td></td>
<td>Low (-) Not Significant.</td>
</tr>
</tbody>
</table>

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4 Given the large range of wolverine and grizzly bear, and the small footprint of the project (<1% of either species' home range), the operation of the project in a previously and actively human-disturbed area, monitoring and follow-up for wolverine and grizzly bear response to the Project is not warranted.
### Aquatic Furbearing Mammals

**Operations & Maintenance Phase: Aquatic Mammals**

- Reduced water levels in late winter on Mayo Lake and associated wetlands may which may force aquatic mammals out of their lodges to create chip nests to remain closer to water and food caches underneath the ice. This behavior may expose them to predation.
- There is uncertainty both with respect to the frequency of maximum drawdown (which may occur either occasionally or at regular intervals) and on food cache size and depth, lodge entrance characteristics and historical behavior of aquatic mammals at late winter low water levels. Effects will be either negative (aquatic mammals will not adapt to changing water levels) or neutral (aquatic mammals will adapt to changing water levels).

**Mitigation**

None identified.

**Cumulative Effects Assessment**

- Potential for adverse effects on aquatic furbearers due to reduced water levels in winter.

**Residual Effects after Mitigation**

- Low magnitude, moderate extent, high duration.
- Although effects on local aquatic furbearers in the Study Region may remain, in any event there are substantial populations and habitat for aquatic furbearers throughout the Stewart River watershed such that the effects from a species or regional perspective will not be significant.

**Determination of Significance**

Low (-) Not Significant.

**Monitoring/ Follow-Up**

- Pre-construction surveys of food caches and lodges on Mayo Lake and areas in Roop Lake influenced by Mayo water levels; and Post-construction observation of animal responses to late winter low water levels are recommended.

### Moose

**Construction Phase:**

- Direct effects on seasonal habitat during clearing.
- Indirect effects related to seasonal habitat avoidance due to construction disturbance.

**Mitigation**

- Project design minimizes construction footprint to the extent feasible. For example this includes bundling of rights of way for the canal, road and transmission lines.
- Where feasible, reduce significant construction activities (e.g. blasting) when moose are known to be within 500 m of construction activity.

**Cumulative Effects Assessment**

None identified.

**Residual Effects after Mitigation**

- Direct adverse effects on seasonal habitat due to construction clearing.
- Indirect effects related to construction noise and disturbance.

**Determination of Significance**

Low magnitude, low geographic extent, high duration.

**Monitoring/ Follow-Up**

Low (-) Not Significant.

**Operations Phase:**

- Seasonal habitat avoidance due to road/site maintenance activities.

**Mitigation**

- Operational activities will be limited to regular maintenance/adjustment at control structures at Mayo and Wareham Lakes; indoor activities at the new and old powerhouses and travel along access roads.

**Cumulative Effects Assessment**

None identified.

**Residual Effects after Mitigation**

- Potential for seasonal habitat avoidance during disturbances related to ongoing operational or maintenance activities.

**Determination of Significance**

Low magnitude, low geographic extent, high duration.

**Monitoring/ Follow-Up**

Low (-) Not Significant.
### Rare and Listed Plant Habitat

<table>
<thead>
<tr>
<th>Description/Nature of Project Effect</th>
<th>Mitigation</th>
<th>Cumulative Effects Assessment</th>
<th>Residual Effects after Mitigation</th>
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<tbody>
<tr>
<td><strong>Construction Phase:</strong></td>
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<tr>
<td>Direct effects on vegetation including wildlife habitat within the construction footprint.</td>
<td>• Project design minimizes construction footprint to the extent feasible. For example this includes bundling of rights of way for the canal, road and transmission lines.</td>
<td>None identified.</td>
<td>Clearing during construction will result in direct effects including loss of vegetation within the construction footprint and potentially rare/listed plant species mortality.</td>
<td>Effects will be Moderate magnitude, low geographic extent, high duration (once cleared the areas will remain altered from their existing state). Relative abundance of similar habitats in the region and small project footprint (i.e. relative habitat loss &lt;&lt; 1%).</td>
<td>• One-time evaluation of total wildlife and rare plant habitat lost. Reclaim sites to allow re-vegetation where possible.</td>
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<tr>
<td>Indirect Effects may include dust accumulation inhibiting growth.</td>
<td>• Avoidance of sensitive areas to the extent feasible, consistent with the construction environmental management plans.</td>
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<tr>
<td><strong>Operation Phase:</strong></td>
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<tr>
<td>Direct and indirect effects related to road and site/maintenance.</td>
<td>• Maintenance activities (e.g. snow clearing, grading, etc) will be limited to the cleared ROW.</td>
<td>None identified.</td>
<td>Maintenance activities will result in direct effects on vegetation and wildlife habitat, particularly in the cleared ROW.</td>
<td>Effects will be low magnitude, low geographic extent and low duration.</td>
<td>• None.</td>
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<tr>
<td></td>
<td>• Rare plant sites will be delineated and where possible maintenance activities will be limited.</td>
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</tbody>
</table>

Effects will be Moderate magnitude, low geographic extent, high duration (once cleared the areas will remain altered from their existing state). Relative abundance of similar habitats in the region and small project footprint (i.e. relative habitat loss << 1%).

Low (-) Not Significant.
Chinook Salmon

Chinook salmon is a valuable species that is harvested by First Nations and for commercial and recreational purposes both in the Yukon and Alaska. Notable numbers of adult Chinook return to the Mayo River each summer and spawn within zones 1 and 2. Juveniles are found throughout the lower Mayo River and use a wide range of habitats. Changes in flow regimes in Zones 1-3 have the potential to impact this important species. Chinook salmon can also serve as a representative species to evaluate how changing environmental conditions expected to arise as a result of the Project may affect other species in the lower Mayo. Of the fish species in the lower Mayo River, Chinook were found to be the most widespread, and likely the most sensitive to changes in flow regimes. Egg incubation occurs in the fall/winter, a particularly harsh time in terms of flow levels and ice conditions. Chinook depend on the Mayo River for spawning, incubation, and juvenile rearing and overwintering for a year before migrating to the ocean. Unlike the other species in the Mayo River, they only spawn once during their life cycle. The Project is anticipated to have different effects on Chinook in different Zones.

In Zone 1, the revised water management regime will modify flows compared to baseline conditions. The amount of fish habitat available is directly related to flow levels. As this section of the river is unconfined, has a low gradient and many side/back channels, the lower the flows, the less wetted habitat available for fish (including valuable juvenile Chinook rearing habitat). When flows decrease in this section the main channel width decreases (more than Zone 2 and 3) and the number of wetted/charged side channels is reduced. The new flow regime is expected to have both positive and negative impacts on habitat quantity and quality in Zone 1, with the total effect being neutral.

In Zone 2, the limiting factor to fish production is low flow levels that can occur during incubation of Chinook eggs. The proposed project includes a minimum flow of 5 to 6 cms in Zone 2, compared to a current baseline minimum licenced flow of 2.8 cms. The US Fish and Wildlife Service Habitat Suitability Index Model indicates that where average annual base flow during the late summer to winter low-flow period is 50% or more of the average annual daily flow, that the Suitability Index is 1.0 or excellent for this variable (US Fish and Wildlife Service. 1986). Results of Project modeling indicated that in Zone 2, flows are maintained above 50% of average flows for every year in the sequence. The worst year in the sequence is 52% with the median being 82%. While there are positive and negative effects, the net impact on Chinook habitat is expected to be positive, since the minimum flow in Zone 2 will be higher than the current condition (5-6 cms compared to 2.8 cms for the current license as described in Section 6.8.1). Monitoring studies are recommended to confirm this assessment and are described in more detail in Chapter 8.

In Zone 3, more sustained dewatering conditions are expected to occur as a result of the Project. Absent appropriate operating procedures, this could lead to fish stranding. However, Zone 3 has only 3 percent of the habitat area available to Chinook salmon in the lower Mayo River (Zones 1-3) and Yukon Energy has ramping procedures for this spillway (see Appendix 5-D). Therefore effects are not expected to be

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2 Refer to Aquatics Report, Appendix 7A for more information.
3 Refer to Aquatics Report, Appendix 7A for more information for examples of past flow regimes where flows went down to 3-4 cms (in entire lower river; the current license limit is 2.8 cms).
4 Refer to section 6.8.2 for more information.
significant. Follow-up programs related to fish stranding, where appropriate, are a component of Yukon Energy’s ramping procedures.

In all zones there will be a modified flow regime which could lead to long-term effects related to changes in river morphology and associated habitat. There are potentially positive and negative effects expected. In Zones 2 and 3 a narrower channel will likely develop over several decades with riparian vegetation creeping in. Such a change will likely have positive impacts in terms of riparian influence on the wetted channel. In Zone 1, there is potential that the channel may become less complex over time. Such changes will have to be evaluated over the long term to determine if the changes are having positive and/or negative effects. Mitigation (a planned flood event) could alleviate such processes if needed. Follow-up programs consistent with YEC’s on-going efforts to review environmental changes in the water systems are recommended. More details with respect to this follow-up program are provided in Chapter 8.

Implementation of a Tailrace Rearing Channel is described in Section 6.6.5 and Section 6.7.6.3. The purpose of such a channel is to provide new fish habitat where determined to be required using a stable flow regime, to create optimal habitat for juvenile Chinook rearing and possibly adult Chinook spawning. The construction of channels downstream of hydro project tailraces, in order to provide fish habitat can be a ready means of providing for mitigation for hydroelectric developments. The Tailrace Rearing Channel is expected to have positive effects on Chinook salmon by creating high quality rearing habitat. Monitoring is required to ensure that the anticipated effects emerge as predicted by this assessment. Further detail on this monitoring program is provided in Chapter 8.

In summary, there are different effects expected to impact Chinook salmon habitat in each Zone (1 through 3); however the net effects of the Project on Chinook salmon are expected to be positive. With the mitigation proposed, the Project will meet or exceed DFO’s No Net Loss policy. Actual quantification of habitat quantities and qualities will be completed to demonstrate this in a manner acceptable to DFO.

**Lake Trout**

No Project effects on lake trout in the Construction Phase were identified.

The proposed drawdown may impact egg survival for lake trout in Mayo Lake on a regularly reoccurring basis. Ripe lake trout were captured to depths of 7m at the one known spawning location during the spawning period; however, it is not known at what precise depths egg deposition actually occurs. Lake trout are a long-lived species and as such are somewhat resilient to variable year to year spawning success. They are also known to be able to adapt to changing conditions.⁵ Existing sources of data for the lake indicate that there are normal distributions of age and size ranges of lake trout in Mayo Lake from the period of time predating 1988.

Maintaining the existing maximum water level drawdown (as described in Section 6.8.1) in at least one out of a three year period should, at a minimum, allow for successful spawning and incubation in these years. However, there is sufficient uncertainty with respect to the total impact on the long-term viability of the Mayo Lake population, that adverse effects could potentially be significant if this mitigation alone is

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⁵ Refer to Aquatic Report Section 5.1.2, Appendix 7A.
not effective. Therefore, monitoring is required to ensure that the Project effects are consistent with the analysis in this assessment. As set out in Chapter 8, in the event that the monitoring program identifies concerns with respect to age class distribution, and key measures regarding the stock health are determined to be below a reasonably expected range in relation to the observed potential for Mayo Lake, a series of sequenced mitigation measures will be implemented. Progressive, or staged response, mitigation measures are considered appropriate, despite the stated uncertainty, due to the fact that the effects of the Project on fish populations are reversible. Details on these mitigation measures are discussed further in Chapter 8.

In summary, considering the fact that Lake Trout are a long lived species and that there are considerable further mitigation options available, reversibility potential is high. As a result, considering the suite of potential mitigation options, including ultimately altering the operating conditions of the Project if necessary, the magnitude of the effects on Lake Trout can be considered low in the long-term. Therefore the residual effects of the Project following mitigation are determined to be not significant with respect to Lake Trout.

Species of Concern

There is potential breeding habitat for Common Nighthawk and Olive-sided Flycatcher within the construction footprint. However, the overall effects on available habitat within the breeding range of these species are < 1%, and effects of this Project on overall species’ habitat are not significant. Wolverine and grizzly bear have large home ranges, and the habitat represented by the construction footprint is <1% of that for individuals of either species. The project is occurring in a previously and continuously disturbed area. Effects of this development are considered not significant for wolverine and grizzly bear.

No Project effects on species of concern in the Operations and Maintenance Phase were identified.

Wetlands (Including Waterfowl and Waterbirds)

No Project effects on wetlands in the Construction Phase were identified.

Key wetland areas for waterfowl in the Project Study Region include the wetland area at the upper end of Wareham Lake by the Minto Bridge; aquatic studies reach 11 on the upper Mayo River, and the Roop Lake wetlands. There is an incomplete understanding of the influence of Mayo Lake water levels on the Roop Lakes wetlands areas. Aerial photography from 1948, 1996 and 2008 indicates that the Roop Lakes wetlands complex has existed for several decades, including before the Mayo Lake dam was originally constructed in the 1950s (see Appendix 7G). Over time, the lower portion of the wetlands has increased in size, commensurate with the higher water levels in the reservoir post-flooding. The majority of the Roop Lakes complex does not exhibit notable increases in wetted extent over the period covered by the photos notwithstanding the raising of Mayo Lake in the 1950s. While aerial photography cannot precisely indicate other changes, such as potential changes to the depths of the various water bodies, it is apparent that wetland habitat is an enduring feature of this area under each Mayo Lake regime, including the natural regime when lake elevations were well below the levels anticipated to occur under the proposed licence revision. Consequently, it is anticipated that the revised water management regime for the Project will not drain or “cut-off” the Roop Lakes wetlands.
There may be effects of this Project on waterfowl nesting in the Mayo Lake/Mayo River area. However, there are many other wetlands where waterfowl and waterbirds are known to nest in the Mayo region (refer to Terrestrial Studies report and chapter 7), and thus the overall effects of this project on regional waterfowl productivity is expected to be not significant.

Rusty Blackbird may breed in shoreline/wetland areas that may be affected by changes to water level management and probable reduced water levels at the start of the nesting season. However, the overall effect on available habitat within the breeding range of all species is < 1%, and effects of this Project on overall species habitat are not significant.

**Aquatic Mammals**

No Project effects on aquatic mammals in the Construction Phase were identified.

Aquatic mammals, in particular beaver, activity was observed throughout the aquatic portions of the study area. Beaver food caches were observed on Mayo Lake, and beaver use occurs in the Roop Lake wetlands in areas that may be affected by the revised water management regime on Mayo Lake. In particular, water levels in late winter that are lower than the baseline condition may force aquatic mammals out of their lodges where they may create “chip nests” to remain closer to water and food caches underneath the ice. This behaviour may expose them to predation.

In respect of aquatic mammals, there may be effects on the individuals using Mayo Lake and those wetlands that may be affected by the revised Mayo Lake water management regime. Further studies would be required in order to confirm the specific effects related to the Project on these individuals. A program of follow-up studies as noted in Chapter 8 could provide this information.

Relative to the aquatic mammal population of the Stewart River watershed, effects of the Project will not be significant.

**Moose**

Moose are found in the Project area, in particular use was noted in the burn area adjacent to the upper Mayo River area, and Roop Lakes area. The Construction Footprint was not an area noted as an area of regular use by moose, but moose tracks were noted along the shoreline of the Mayo River below Wareham Lake. The habitat that will be removed within the Construction Footprint Area does not appear to provide significant thermal cover or forage habitat, and does not appear to provide a critical component of moose habitat in the Mayo region. The potential effects of low water levels in later winter/early spring in the Roop Lake area will not have any predictable effect on the use of the area by moose. Construction activity will disturb moose in the immediate area, but the effects are short term and limited in area. Overall the Project will have no measurable effect on regional moose populations. Therefore, adverse Project effects on moose during the Construction and Operation and Maintenance Phases are expected to be low and not significant.

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6 Refer to the Terrestrial Studies Report, Appendix 7B.
Rare and Listed Plant Habitat

The Project will have localised effects during the Construction Phase on rare and listed plant habitat that is generally available throughout the region. No one habitat type will be significantly affected because there are no unique habitats within the Construction Footprint or within the area that may be affected by indirect effects related to construction and operation activities. Some localised sites that may provide habitat for rare plants will require site investigation prior to construction, and mitigation (e.g., site-specific protection) may be considered as appropriate. The adverse Project effects during Construction and Operations will be low and not significant.

7.3.2 Assessment of Effects on Socio-Economic Valued Components

This section generally focuses on those VCs of the socio-economic environment that are of particular concern in the Project Study Region and that may be potentially affected by the Project based on the above noted pathways. For the socio-economic components, potential Project effects of construction, operation and maintenance often extend beyond the Construction Footprint Area and the areas in close proximity to this footprint, reflecting the mobility of people to engage in, for example resource use and employment opportunities. Some effects of the Project can extend beyond the Project Study Region (e.g., construction expenditure effects and utility ratepayer effects) to affect the overall Yukon economy in particular. Figure 7-1 illustrates the pathways of effects on people and communities.

Section 7.3.2 provides assessment of Project effects and mitigation measures with regard to the following socio-economic VCs:

- Hunting;
- Fishing;
- Trapping;
- Tourism, Outfitting and Outdoor Recreation;
- Placer mining;
- Private & Commercial Land Use;
- Heritage Resources;
- Local Employment and Training;
- Local Business;
- Government Fiscal Flows;
- Utility Ratepayers;
- Community and Family Life;
- Community Infrastructure & Services;
- Traffic; and
- Worker Health and Safety.
Table 7-4 provides the effects assessment for each of the above socio-economic VCs.
## Table 7-4 Summary of Project Effects and Significance on the Socio-Economic Environment

<table>
<thead>
<tr>
<th>Description/ Nature of Project Effect</th>
<th>Mitigation</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Traditional and Domestic Resource Use</strong></td>
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<tr>
<td><strong>Hunting</strong></td>
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<tr>
<td>Construction Phase:</td>
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</tbody>
</table>
| Direct adverse effects on the people who hunt in the immediate Construction Footprint Area: | • Avoidance of critical wildlife areas  
• A “no firearms policy” will be enforced within the Construction Footprint Area for safety concerns; and to inconvenience workers wishing to hunt during off-work hours  
• Yukon Energy designated liaison person to triage any concerns that may arise during construction  
• Community notification of construction activities and timing. | Information gathered during the public consultation process indicated there is increased hunting pressure from southern recreational hunters coming to the Mayo region  
Information gathered during the public consultation process indicated that the voluntary no hunting request at McQuesten Lake has resulted in increased pressure on Mayo Lake resources | • Ability to hunt in the Construction Footprint Area will be affected during construction (includes restrictions due to safety concerns for construction & maintenance crews).  
Wildlife may temporarily avoid the area. | Direct effects will be Short-term, Low Magnitude, Small geographic extent (portions of Construction Footprint Area).  
**Low (-)**  
**Not Significant** | Yukon Energy designated liaison person to triage any concerns that may arise during construction. |
| Operations & Maintenance Phase:       |            |                               |                                  |                              |                       |
| Presence and maintenance activities for the new powerhouse and associated infrastructure may result in wildlife avoiding portions of the immediate area. | None required – very little hunting occurs in the Construction Footprint Area. | None. | Ability to hunt in the Construction Footprint Area will be directly affected during long-term operations. (gated and fenced access)  
Wildlife may avoid portions of the area (i.e., access road, powerhouse) | Presence and maintenance activities effects will be Long-term, Low Magnitude, Small geographic extent (portions of Construction Footprint Area)  
**Negligible**  
**Not Significant** | None. | Water level fluctuations for Mayo Lake and Mayo River will be Short-term, Low Magnitude, Project Study Region  
**Low (-)**  
**Not Significant** |                       |                       |                       |                       |                       |
<table>
<thead>
<tr>
<th>Description/Nature of Project Effect</th>
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<tbody>
<tr>
<td><strong>Fishing</strong></td>
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<tr>
<td><strong>Construction Phase:</strong></td>
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<tr>
<td>Direct adverse effects on the local people who fish in the lower Mayo River adjacent to the Construction Footprint Area (according to the public consultation process, numbers are small)</td>
<td>• Work with Mayo RRC, NND and the Village to identify alternate fishing locations for camp workers to avoid potential competition with local community members</td>
<td>None</td>
<td>Ability to fish will be restricted on the east side of the lower Mayo River.</td>
<td>Direct effects will be Short-term, Low Magnitude, Small geographic extent (Construction Footprint Area)</td>
<td>Yukon Energy designated liaison person to triage any concerns that may arise during construction</td>
</tr>
<tr>
<td>• Restricted access to the east side of the lower Mayo River within the Construction Footprint Area (Yukon Energy is acquiring all property for the construction of Project infrastructure)</td>
<td></td>
<td></td>
<td>Competition for fishing locations from camp workers.</td>
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</tr>
<tr>
<td>• Most Chinook salmon fishing is on the Stewart River; limited recreational fishing is generally south of the Construction Footprint Area</td>
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<tr>
<td>Indirect adverse effects on fishing in the Project Study Region:</td>
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<tr>
<td>• An influx of construction workers may wish to fish in their non-working hours</td>
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</tr>
<tr>
<td>None Ability to fish will be restricted on the east side of the lower Mayo River.</td>
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<tr>
<td><strong>Operation &amp; Maintenance Phase:</strong></td>
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<tr>
<td>Long-term direct effects due to restricted access to Yukon Energy property (Construction Footprint Area)</td>
<td>None required – almost all fishing occurs outside the Construction Footprint Area</td>
<td>None</td>
<td>Continued restricted access to Yukon Energy property and portions of the lower Mayo River</td>
<td>Long-term, Low Magnitude, Project Study Region</td>
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<tr>
<td>Long-term indirect effects on fishing in the Project Study Region</td>
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<td>• Abundant and more favourable fishing lakes in the vicinity of Mayo, including Janet &amp; Ethel Lakes</td>
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<tr>
<td>• No Project effects on the ability to fish or access to fishing at Mayo Lake or along the upper Mayo River (Zone 4)</td>
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<tr>
<td><strong>Trapping</strong></td>
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<td><strong>Construction Phase:</strong></td>
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<tr>
<td>Short-term direct effects on the ability of community members to access small portion of Community Trapline 407.</td>
<td>• Avoidance of critical wildlife habitat</td>
<td>None</td>
<td>Ability to trap within portions of RTC 407 in the Construction Footprint Area during the construction period</td>
<td>Short-term, Low Magnitude, portions of Construction Footprint Area</td>
<td></td>
</tr>
<tr>
<td>• Small number of community members use this trapline on an annual basis (approximately 5 Assistant Licenses are allotted on an annual basis)</td>
<td>• Local notification of work schedule</td>
<td></td>
<td>Wildlife may temporarily avoid the area</td>
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<tr>
<td>• Decreased opportunities within small portion of RTC 407 for educational activities associated with elders teaching youth about trapping</td>
<td>• Trapper compensation for construction period (if required)</td>
<td></td>
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<tr>
<td>Noise, fumes and traffic from construction equipment may cause wildlife to avoid the Construction Footprint Area temporarily during construction.</td>
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</tbody>
</table>
### Description/Nature of Project Effect

**Operation & Maintenance Phase:**

- Long-term presence of the access road, powerhouse and surface-run canal will permanently remove these areas as small fur-bearing habitat within the Construction Footprint Area.

- The transmission line ROWs may increase habitat for small fur-bearing species that prefer open, low-vegetation environments.
  - Approximately 3% of RTC 407 will be removed from the community trapline. This is in a previously disturbed environment.

- Project Study Region: Access to trapping activities at Mayo Lake will not be adversely affected. Water levels of Mayo Lake will see gradual drawdowns over the winter months potentially resulting in adverse effects on beaver’s ability to access their food caches.

- The Project includes a revised water management regime including winter drawdown provisions as set out in Chapter 6.

**Other Resource Use**

**Placer Mining**

- Direct Project effects within the Project Study Region in relation to accessing placer claims by barge during the early portion of the season when the lake will be at its lowest elevation.
  - Short-term Project effects in late May/early June will affect placer miners using barge access – access likely delayed approximately two weeks.
  - Other forms of access include truck/snowmobile in winter

**Tourism, Outfitting and Recreation**

- The Village of Mayo is a staging and jumping off point for many activities related to tourism, outfitting and recreation. Most of these activities occur outside the Construction Footprint Area, and outfitting activities beyond the Project Study Region.

- Recreation activities are generally outside the Construction Footprint Area, but within the Project Study Region, including: picnicking, hiking, canoeing, camping, cross-country skiing and snowmobiling. McIntyre Park and Five Mile Lake Campground are within the Project Study Region. Indirect short-term effects during the construction phase relate to noise, fumes and traffic overlapping with tourism season.

- Confined location of Project infrastructure within an already disturbed environment, outside the Village of Mayo boundaries.

- Construction Footprint Area avoids both McIntyre Park and Five Mile Lake campground.

- Notification of construction activities will be posted in the community.

### Mitigation

- Yukon Energy’s EMS best practices for ROW maintenance and access.

- None required

- None

- Confined location of Project infrastructure within an already disturbed environment, outside the Village of Mayo boundaries.

- None

### Cumulative Effects Assessment

- None

- Long-term reduction in ability to trap portions of RTC 407

- None

### Residual Effects after Mitigation

- Improved access along transmission line ROW and access road

- Long-term, Low Magnitude, Construction Footprint Area

### Determination of Significance

- Low (-)

### Monitoring/Follow-Up

- Not Significant

- Not Significant

- Not Significant

- Not Significant

- Not Significant
<table>
<thead>
<tr>
<th>Description/ Nature of Project Effect</th>
<th>Mitigation</th>
<th>Cumulative Effects Assessment</th>
<th>Residual Effects after Mitigation</th>
<th>Determination of Significance</th>
<th>Monitoring/ Follow-Up</th>
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</thead>
<tbody>
<tr>
<td><strong>Operation &amp; Maintenance Phase:</strong></td>
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<tr>
<td>Increased winter flows may affect snowmobiling and access to trails along the Mayo River Zone 4 if suspended ice occurs in late winter/early spring.</td>
<td>None required</td>
<td>None</td>
<td>Changes in winter flows may affect snowmobiling and access to trails along Zone 4.</td>
<td>Long-term, Low Magnitude, Project Study Region</td>
<td></td>
</tr>
<tr>
<td>Increased drawdown of Mayo Lake may affect timing and ability to use beach and boat launch at west end of Mayo Lake.</td>
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<td></td>
<td>Increased drawdown may affect timing and use of boat launch and beach at west end of Mayo Lake over short window in spring.</td>
<td>Low (-) Not Significant</td>
<td></td>
</tr>
<tr>
<td>Decreased flows in Zone 2 may affect recreational boating.</td>
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<td></td>
<td>Decreased flows in Zone 2 may affect recreational boating.</td>
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<tr>
<td><strong>Private and Commercial Land Use</strong></td>
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<tr>
<td><strong>Construction Phase:</strong></td>
<td>Yukon Energy will initiate specific negotiations with the landowner towards acquisition of the lands, if and to the extent necessary, in advance of construction</td>
<td>None</td>
<td>None</td>
<td>Long-Term, Construction Footprint Area</td>
<td>Negligible (-) Not Significant</td>
</tr>
<tr>
<td>Land not presently owned by Yukon Energy is required for the Project, including Crown lands adjacent to the existing YEC parcel and two privately-owned parcels.</td>
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<tr>
<td>No additional Project effects on private or commercial land within the Construction Footprint Area or the Project Study Region.</td>
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<tr>
<td><strong>Operation &amp; Maintenance Phase:</strong></td>
<td>None</td>
<td>None</td>
<td>Potential effects related to changes in water levels for commercial and private lease-holders and property owners.</td>
<td>Long-term, moderate frequency, low magnitude, Project Study Region</td>
<td></td>
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<tr>
<td>Increasing the bottom storage range of Mayo Lake may potentially affect water access to commercial and private lease-holders and property owners along the shores of Mayo Lake, including Gull and Peggy's Island.</td>
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<td>Low (-) Not Significant</td>
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<tr>
<td>• This affect will occur prior to spring freshet when Mayo Lake starts to refill, and will be short-lived.</td>
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<td>Increased winter flows from Mayo Lake to Wareham Lake may potentially affect the property owner near Minto Bridge.</td>
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</table>
## Heritage Resources

### Construction Phase:

Short-term construction activities may impact known or unknown heritage resources within the Construction Footprint Area.

- Known heritage resources will be avoided by either a 15 m or 30 m buffer (depending on the type of resource) if feasible; otherwise additional data recovery after consultation with Heritage Branch and NND
- YEC’s EMS best practices for Heritage Site Investigation and Avoidance will be followed
- Additional heritage investigations along the final canal route, transmission line route and powerhouse location will be conducted prior to construction.

### Local Economy

#### Local Employment & Training

**Construction Phase:**

Employment and training opportunities will exist over the course of the two year construction phase. Employment opportunities will include a variety of skill sets including general labour, heavy equipment operators, trucking, camp catering, linemen, carpenters and other skilled trades.

- No mitigation is required.
- Future development of the Bellkeno Mine project could result in a temporal overlap of construction workforces for the two projects of about two years. This could result in competition for local labour.
- Job skills acquired through employment and training may be applied to other employment opportunities.

**Operation & Maintenance Phase:**

Yukon Energy does not anticipate any additional need for additional operational staff.

- No mitigation is required.
- Employment of local people for maintenance activities associated with the transmission line corridor.

#### Local Business

**Construction Phase:**

Local contractors will have an opportunity to bid on various components of the construction activities, including clearing and grubbing various Project areas, building the access road, excavating the canal etc.

- No mitigation is required.
- Yukon Energy is committed to employing local contractors wherever possible.

**Local Business**

- Local contractors will benefit from the opportunity to participate on the Project.
- Local businesses will benefit from spending by the construction workforce within the Mayo community.
<table>
<thead>
<tr>
<th>Description/ Nature of Project Effect</th>
<th>Mitigation</th>
<th>Cumulative Effects Assessment</th>
<th>Residual Effects after Mitigation</th>
<th>Determination of Significance</th>
<th>Monitoring/ Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operation &amp; Maintenance Phase:</strong> Local contractors may have the opportunity to provide maintenance services for the transmission line routes and access road.</td>
<td>No mitigation is required.</td>
<td></td>
<td>Local contractors may benefit from infrequent maintenance activities.</td>
<td>Short-term, Project Study Region, Low Magnitude Low (+) (increased employment) and (-) (potential for labour competition) Not Significant</td>
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<tr>
<td><strong>Regional Economy</strong></td>
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<td><strong>Government Fiscal Flows</strong></td>
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<tr>
<td><strong>Construction Phase:</strong> The Territorial Government or Federal Government may incur expenditures (related to contributions to project funding). The Territorial government and/or Federal government may experience increases in direct and indirect tax or royalty revenues.</td>
<td>None.</td>
<td>None.</td>
<td>Potentially expenditures related to Project funding and increases in tax and/or royalty revenues.</td>
<td>Short-term, effects could extend beyond the Project Study Region, low magnitude. Low (+) Not Significant</td>
<td></td>
</tr>
<tr>
<td><strong>Operation &amp; Maintenance Phase:</strong> YEC is currently engaged in a process of determining potential opportunities for NND to participate in the Project by way of investment or ownership interest.</td>
<td>None</td>
<td>None</td>
<td>Potentially participation in the Project by NND including financial returns commensurate with their investment.</td>
<td>Long-term, Project Study Region, Moderate magnitude. Moderate to High (+) Potentially Significant</td>
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<tr>
<td><strong>Utility Ratepayers</strong></td>
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<tr>
<td><strong>Operation &amp; Maintenance Phase:</strong> Operation of the Project will benefit ratepayers by providing a cost-effective source of renewable energy and improving grid reliability.</td>
<td>None.</td>
<td>None.</td>
<td>Lower cost (relative to alternative sources of supply), renewable energy and enhanced system reliability.</td>
<td>Long-term, effects extend beyond the Project Study Region, moderate magnitude. Moderate to High (+) Potentially Significant</td>
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<tr>
<td><strong>Social Context</strong></td>
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<tr>
<td><strong>Community and Family Life</strong></td>
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<tr>
<td><strong>Construction Phase:</strong> The Project includes a work camp located outside the municipal boundaries, with peaks of 50-75 workers during portions of the two-year construction schedule.  Possible adverse effects include social implications such as an increase in alcohol-related incidents from an influx of workers into town. Potential positive effects include participation of construction workers in the recreation programs offered through the Village’s community centre (e.g., badminton, soccer, curling etc.)</td>
<td>Yukon Energy designated liaison person to triage any concerns that may arise during construction Yukon Energy will establish a “drug and alcohol” policy for the camp. Such a policy could include, among other elements, a “zero tolerance” policy for construction workers who cause alcohol related disturbances in town.</td>
<td>Future development of the Bellkens Mine project could result in a temporal overlap of construction workforces coming into the Village of Mayo for recreation or other purposes.</td>
<td>Potential increase in alcohol related incidents in the community. Potential increase in social mixing through participation in recreational programs</td>
<td>Short-term, Project Study Region, Moderate Magnitude Low (-)/(+) Not Significant</td>
<td>Yukon Energy designated liaison person to triage any concerns that may arise during construction</td>
</tr>
<tr>
<td>Description/ Nature of Project Effect</td>
<td>Mitigation</td>
<td>Cumulative Effects Assessment</td>
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<tr>
<td><strong>Community Infrastructure &amp; Services</strong></td>
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<td><strong>Construction Phase:</strong></td>
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<tr>
<td>Construction activities could result in increased reliance and stress on local infrastructure and social services (i.e., waste removal, water supply, wear &amp; tear on road infrastructure etc).</td>
<td>• Yukon Energy will consult with the Village to determine an appropriate fee for use of the sewage lagoon and landfill.  • Construction materials will be recycled/re-used on site as much as is practicable to reduce the amount of construction waste.  • All special and hazardous wastes generated at the project site will be recycled or disposed of in an approved manner.  • Adherence to Workplace Health &amp; Safety regulations; and job safety training.</td>
<td>Future development of the Bellkano Mine project could result in a temporal overlap of construction workforces coming into the Village of Mayo for recreation or other purposes such as the health centre.</td>
<td>Yukon College may have increased enrolment from community workers seeking training opportunities in anticipation of employment. Increased stress on community health centers.</td>
<td>Short-term, Project Study Region, Low/Moderate Magnitude</td>
<td>Low (-)/(+) Not Significant</td>
</tr>
<tr>
<td>Construction workforce may potentially use the Village’s recreational facilities.  Job-site related accidents may increase the pressure on local community health, police and emergency response services.</td>
<td>• Yukon Energy will consult with the Village to determine an appropriate fee for use of the sewage lagoon and landfill.  • Construction materials will be recycled/re-used on site as much as is practicable to reduce the amount of construction waste.  • All special and hazardous wastes generated at the project site will be recycled or disposed of in an approved manner.  • Adherence to Workplace Health &amp; Safety regulations; and job safety training.</td>
<td>Future development of the Bellkano Mine project could result in a temporal overlap of construction workforces coming into the Village of Mayo for recreation or other purposes such as the health centre.</td>
<td>Yukon College may have increased enrolment from community workers seeking training opportunities in anticipation of employment. Increased stress on community health centers.</td>
<td>Short-term, Project Study Region, Low/Moderate Magnitude</td>
<td>Low (-)/(+) Not Significant</td>
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<tr>
<td>Traffic</td>
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<td><strong>Construction Phase:</strong></td>
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<td>In order for the Project to proceed, equipment, materials and personnel will be transported into the job site over the course of the two year period. This will result in an increase in traffic over the Klondike and Silver Trail Highways.</td>
<td>• YG highways will be made aware of the Project, and its anticipated use of the Silver Trail Highway for hauling of equipment and materials.</td>
<td>Future development of the Bellkano Mine project could result in a temporal overlap of traffic use of the Silver Trail Highway, resulting in a potential increase in accidents and increased wear and tear on local road infrastructure.</td>
<td>Increased traffic may result in a potential increase in traffic accidents and wear and tear on road infrastructure.</td>
<td>Short-term, within and beyond the Project Study Region, Low Magnitude</td>
<td>Low(-) Not Significant</td>
</tr>
<tr>
<td>• Current traffic capacity of the Silver Trail Hwy is 10% and the Klondike Hwy. less than 20%. Bridges are in good repair.</td>
<td>• YG highways will be made aware of the Project, and its anticipated use of the Silver Trail Highway for hauling of equipment and materials.</td>
<td>Future development of the Bellkano Mine project could result in a temporal overlap of traffic use of the Silver Trail Highway, resulting in a potential increase in accidents and increased wear and tear on local road infrastructure.</td>
<td>Increased traffic may result in a potential increase in traffic accidents and wear and tear on road infrastructure.</td>
<td>Short-term, within and beyond the Project Study Region, Low Magnitude</td>
<td>Low(-) Not Significant</td>
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<tr>
<td><strong>Worker Health &amp; Safety</strong></td>
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<td><strong>Construction Phase:</strong></td>
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<tr>
<td>Construction activities could result in job-related accidents. This could result in increased reliance on local health services such as ambulance and nursing station services.</td>
<td>Adherence to the Occupational Health and Safety Act and the Yukon Health &amp; Safety regulations; and job safety training.</td>
<td>Safety concerns over job-related accidents may continue for the short-term.</td>
<td>Safety concerns over job-related accidents may continue for the short-term.</td>
<td>Short-term, Construction Footprint Area, Low Magnitude</td>
<td>Low(-) Not Significant</td>
</tr>
<tr>
<td>Operations and maintenance of the Project will follow the same worker health and safety policies and practices currently in place.</td>
<td>• Yukon Energy’s EHS manual on transmission and powerhouse infrastructure.  • Access to YEC’s property will be fenced and gated at the access road.  • Intersections of the canal and penstock will be fenced.  • Safety signage.</td>
<td>Safety concerns over new infrastructure may continue for the short-term as the local community adjusts.</td>
<td>Safety concerns over new infrastructure may continue for the short-term as the local community adjusts.</td>
<td>Long-term, Construction Footprint Area, Low Magnitude</td>
<td>Low(-) Not Significant</td>
</tr>
</tbody>
</table>
Traditional and Domestic Resource Use

There is very little hunting, fishing and trapping within the Construction Footprint Area. Most fishing by NND members occurs at Fraser Falls on the Stewart River – a long-standing traditional fishing camp – or at other locations. The majority of moose hunting occurs along the Mayo River between Mayo Lake and Wareham Lake, as well as the area around Mayo Lake and to some extent Roop Lakes. Community members generally put in their boats downstream of the Mayo Lake control structure and float downstream to the Minto Bridge area, calling for moose from boats; conversely the Mayo Lake access road provides access to moose hunting areas adjacent to the road and river. The Community Trapping Concession is a five kilometre radius around the Village of Mayo that is available for elders and potentially youth an opportunity to go out on the land and experience and/or learn about trapping.

To address community concerns identified by NND and the Mayo District RRC, Yukon Energy will designate a Project Liaison Contact person if this Project proceeds. If issues arise due to increased resource use pressure from camp workers, the Project Liaison Contact person will work with NND and the Mayo RRC to address these concerns.

Project residual effects on the resource use VCs within the Construction Footprint Area are expected to be short-term and low in magnitude due to current levels of use, and not significant. Hunting, fishing and the ability to trap within approximately 3% of RTC 407 will be restricted due to safety concerns for crews and community members.

Potential long-term socio-economic effects relating to the existence of permanent structures, maintenance of the transmission line and canal corridor, and operation of facilities regarding water levels and flows include:

- Portions of the Construction Footprint Area will continue to be fenced and gated, thus removing these areas from local hunting and access to the east side of the Mayo River.
- Approximately 3% of RTC will be permanently removed from the community trapping concession.
- Indirect effects on fishing at Mayo Lake relate to healthy fish stock populations. There are no Project effects on the ability to fish, or access to fishing, at Mayo Lake.

Long-term adverse Project effects on resource use due to the presence of Project infrastructure and the revised water management parameters will be either low or negligible due to current levels of use, and abundant and more favourable opportunities for fishing and hunting within the Project Study Region.

It is expected that residual adverse long-term effects on resource use VCs within the Project Study Region will be low in magnitude and not significant.

Other Resource Use

Placer mining activity occurs at Mayo Lake, outside the Construction Footprint Area. Therefore there are no Project effects on placer mining during the construction phase. Operation and management of Mayo Lake water levels pursuant to the revised water management regime will result in a short-term affect on those placer miners accessing their claims by barge. The barges are used to haul heavy equipment, fuel...
drums and supplies out to placer claims, leaving from the west end of the lake. Mayo Lake must refill sufficiently to enable the barges to float off the mud-flats and subsequently get close enough to the placer claim property to off-load the equipment and supplies on site. Under the proposed management regime, the lowest lake levels will occur at the end of winter/early spring after the lake has been drawn-down to match load requirements. This will typically occur in early May, just prior to spring freshet in May/early June and prior to the normal ice free season on the lake. The net result will be a delay of roughly two weeks in the ability of placer miners to use their barges to access their claims – which is understood to be within the range of acceptability to those most active on the lake.

The long-term residual adverse effects on placer mining activity within the Project Study Region are expected to be low in magnitude and not significant.

The Village of Mayo, within the Project Study Region, is used as a starting/stopping point for several activities related to tourism, outfitting and recreation. Outfitting activities occur beyond the Project Study Region and will not be affected by this Project. Recreational activities in and around the Village of Mayo do not overlap with the Construction Footprint Area where the Project infrastructure is proposed. In addition, the Project has avoided both McIntyre Park and Five Mile Lake campground – areas currently used for picnicking, camping and cross-country skiing. Concern over noise, air emissions (e.g. fugitive dust, construction vehicle exhaust) and traffic as possible deterrents to tourism activity will be limited in extent and short-term (July and August for the two construction seasons).

The residual adverse short-term Project effects on tourism, outfitting and recreation are expected to be low in magnitude, within the Project Study Region and not significant.

During operations of the Project there will be increased winter flows which may affect crossings of the Mayo River Zone 4 if suspended ice occurs in late winter/early spring. The area adjacent to and surrounding the Mayo River and Mayo Lake access road provide abundant and suitable areas for snowmobiling, without concerns for late winter/early spring ice conditions. Requirements to cross the River will likely only require more care and attention by users and is not considered a significant potential effect.

In addition, an increased draw-down of Mayo Lake may affect timing and ability to use the beach and boat launch at the west end of the Mayo Lake. The lowest levels are anticipated to occur in early May, just prior to spring freshet in May/early June, which generally results in an increase in the lake elevation over a short time period. The potential affect on timing and ability to use the beach and the boat launch is expected to be short-term.

Decreased flows in Zone 2 may affect recreational boating. Currently, water levels and flows fluctuate during the summer season depending on inflows and precipitation. Although recreational canoeing does occur between the existing powerhouse and the Village, it is not considered “high use”. The lower Mayo River (Zone 1) and the upper Mayo River will remain available as alternate recreational canoeing and boating areas for community residents.

The residual adverse Project effects on outdoor recreational activities within the Project Study Region are expected to be long-term, low in magnitude and not significant.
It is unlikely that there will be any discernable Project effects on private or commercial land use within the Construction Footprint Area as Yukon Energy will initiate specific negotiations with the landowner towards acquisition of the lands, if and to the extent necessary, in advance of construction. No additional Project effects on private or commercial land within the Construction Footprint Area or the Project Study Region are expected.

Operation and management of Mayo Lake under the revised water management regime may potentially affect water access to commercial and private lease-holders and property owners along the shores of Mayo Lake. The timing of affected access will at most be a short window prior to the spring freshet. The majority of property owners and lease-holders are at the west end of the lake near the mouth lake, and have existing road access.

The residual long-term adverse Project effects on private and commercial land owners in the Project Study Region are low in magnitude, moderate in frequency and not significant.

**Heritage Resources**

A heritage resources impact assessment was conducted early in the field season within the Construction Footprint Area. Field investigations along the original conveyance options and transmission line were conducted to identify archaeological and historic sites. A shoreline survey was conducted along Mayo Lake to assess potential impacts to heritage resources if the lake level was increased up to an additional meter in elevation (an option since dropped from consideration). Several historic resources were found within the Construction Footprint Area and these have been documented and filed with the Heritage Resources Branch. Project mitigation includes avoiding these historic sites by a 15-30 buffer (depending on the type and size of resource) if feasible; otherwise data recovery and documentation will be undertaken, after consultation with the Heritage Branch and NND.

Yukon Energy has further committed to undertake a heritage resources inventory, prior to construction, of the final canal route (i.e., shovel testing along the ridge), transmission line and powerhouse location for possible unknown heritage resources (as per the Heritage Resources Impact Assessment report and direction from Heritage Resources Branch).

Mitigation measures related to the potential inadvertent discovery of unknown heritage sites during construction activities includes adherence to Yukon Energy’s EMS best practices for Heritage Site Investigations, as well as flagging of any newly discovered sites. Upon discovery of any new heritage site, construction activity in proximity to the site will cease until the Lands Inspector indicates work can proceed.

The residual adverse Project effects on heritage resources are expected to be short-term, within the Construction Footprint Area, low in magnitude and not significant.

There will be no Project effects on heritage resources by operation of the Project.

**Local Economy**

The construction phase of the Project will provide several opportunities for local employment, and potentially training for various aspects of the construction; as well as local businesses contracted for
portions of the work. Clearing and grubbing of the road access, canal and transmission line corridors, along with the work camp, equipment lay-down areas and powerhouse site will be the first types of activities in the construction schedule, and represent a substantial amount of the early construction activity. It is anticipated that the following types of skills will be required:

- General labourers;
- Truck drivers and heavy equipment operators; and
- Camp caterers.

The construction workforce for the canal/penstock, powerhouse and transmission line will require a more skilled labour force, including:

- Journeymen carpenters, lineman and technicians, and those experienced in concrete formwork; and
- Skilled trades (i.e., electrical and mechanical engineers).

Depending on the successful contractor(s) on the Project, Yukon Energy anticipates that several components of the construction may be sourced locally, including using local businesses and labour. Detailed work plans and worker requirements are not yet available, but the above local construction positions will be short-term (during the construction phase). Job skills acquired through employment on the Project may be applied to other employment opportunities.

There may be potential competition for local labour due to the potential for small-scale quartz mining at the Bellkeno property on the old UKHM site near Keno City. It is understood that the Bellkeno Project is anticipating a total workforce of about 200 people, with approximately 120 residing at an on-site work camp. Depending on the skills required for the Project, and the availability of local community members to work on either project, there is likely to be temporal overlap for local labour.

In summary, the Project’s effects on local employment, training and business within the Project Study Region are expected to be both positive (increased employment) and adverse (potential for labour competition), short-term (two year construction window), low in magnitude and not significant.

It is anticipated that normal operation of the new powerhouse will be handled by existing Yukon Energy staff; however, occasional maintenance of the transmission line route and canal areas are expected to recur every five years (depending on vegetation growth) and may be sourced locally from local contractors. Project effects on local employment and business during maintenance activities are expected to be positive, short-term, low magnitude and not significant.

**Regional Economy**

The Project is expected to provide regional economic benefits within the Project Study Region and the broader Yukon region. Expenditures as a result of the construction phase of the Project may result in increases in direct and indirect tax or royalty revenue. In addition, Federal and Yukon government funding is expected to be required if the Project is to proceed. No funding commitments have been made to date with regard to this Project. In summary, construction of the Project is expected to have positive,
short-term effects on government fiscal flows which are low in magnitude and would extend beyond the Project Study Region.

Yukon Energy is currently engaged in a process of determining potential opportunities for NND to participate in the Project by way of investment. Details on the type of arrangement or investment are not known at the present; however, there are potentially significant, positive benefits to NND including financial returns commensurate with their investment. Residual Project effects during the operation of the Project are expected to be positive, long-term, and moderate in magnitude and potentially significant.

As discussed in Chapter 6.5, benefits are expected to be realized by all utility ratepayers when Yukon Energy's grids become interconnected, new industrial loads and on-going domestic load growth can be serviced through additional renewable generation capacity on the system. There will be no Project effects on utility ratepayers during the construction phase; however, there will be long-term benefits of providing a lower cost (relative to diesel generation) renewable energy and improving grid reliability. Project effects during operation and maintenance are expected to be positive, long-term, moderate in magnitude and extend beyond the Project Study Region, and potentially significant.

**Community and Family Life**

During the construction phase of the Project, Yukon Energy will establish a work camp for a peak workforce of 50-75 workers during the two year construction period, located outside the Village of Mayo municipal boundaries. During the public consultation, Yukon Energy heard concerns about potential adverse effects from alcohol-related incidents from an influx of workers into the community. As one means of mitigating this concern, Yukon Energy will adopt a “drug and alcohol” policy for the camp. Such a policy could, among other elements, include a “zero tolerance” policy for construction workers who cause alcohol related disturbances in town. In addition, Yukon Energy has committed to provide a Project Liaison Contact Person during the construction period to triage any concerns that may arise.

The Village of Mayo has also suggested Yukon Energy consider encouraging construction workers residing at the camp to avail themselves of the recreational facilities and programs in town, offering opportunities for positive social mixing between community members and workers.

As noted previously, the Bellkeno Mine Project, if developed, may potentially have temporal overlap of construction workers coming into the Village for recreation or other purposes.

It is expected that residual Project effects on community and family life within the Project Study Region will be both adverse (social implications of alcohol-related incidents) and positive (increase in mixing through participation in recreational programs), short-term, moderate in magnitude and not significant. Operations and maintenance of the Project will entail a similar level of activity as the existing facilities and should not have any effect on community and family life (i.e., no Project effects).

**Community Infrastructure & Services**

Construction activities could result in increased reliance and stress on local infrastructure and social services (e.g., waste removal, water supply, wear and tear on roads etc.). In addition, construction workers may potentially use the community's recreation facilities; and job-related accidents may result in
increased pressure on local community health service providers, including policy, emergency response services and the local health centre.

Yukon Energy met with the Village Mayor and Council to discuss several of these potential impacts. Yukon Energy indicated a commitment to landfill bulky construction waste (including concrete, steel etc.) on YEC-owned property; incorporate recycling at the work camp; and re-use of as much rock and excavated material as possible, with the remaining spread over the equipment lay-down area (as required). There are several options for managing camp waste, including sewage, which could be trucked to the Village's sewage treatment and disposal facilities. Solid waste could be deposited at the local landfill. As further mitigation, Yukon Energy will continue consultation with the Village to determine the best strategy for waste disposal. All special and hazardous waste (including oil) will be recycled or disposed of in an approved manner.

Yukon Energy recognizes the responsibilities for health and safety are shared and accepts the responsibility of leadership of the health and safety program, for its effectiveness and improvement and for providing the safeguards required to ensure safe operations. In fulfilling this commitment to protect both people and property, Yukon Energy will provide and maintain a safe and health work environment in accordance with industry standards and in compliance with legislative requirements. Yukon Energy will strive to eliminate any foreseeable hazards that may result in property damage, accidents and/or personal injury/illness. Workers will be given the necessary instruction and training to complete the tasks; and will be adequately supervised while on the job-site. The job site will be in compliance with the Yukon's Occupational Health and Safety Act, the Yukon's Health and Safety Regulations and any other applicable territorial or federal laws or any other industry-specific requirements that may apply. Compliance with the above mitigation measures will help reduce the stress on community health and emergency response services.

As noted previously, the Bellkeno Mine Project, if developed, may potentially have temporal overlap of construction workers coming into the Village for some health services. It is not expected there will be any further overlap in terms of use of community infrastructure with the exception of the Silver Trail Highway.

The residual Project effects on community infrastructure and services are expected to be positive and adverse, short-term (i.e., construction phase), low magnitude, and not significant. Operations and maintenance of the Project will entail a similar level of activity as the existing facilities and should not have any effect on community infrastructure and services (i.e., no Project effects).

Traffic

Mayo B is a substantial construction Project requiring equipment, materials and personnel to be transported to the job site over the course of a two year construction schedule. This will result in an increase in traffic volumes over the Klondike and Silver Trail highways. There will be a temporal and geographic overlap between construction traffic and summer seasonal volumes on the Klondike and Silver Trail highways (i.e., tourists and seasonal workers). Discussions with YG Highways and Public Works indicate that according to the American Association of State Highway and Transportation Officials standards, traffic on the Silver Trail Hwy. (#11) is about 10% of its capacity; and traffic on the Klondike Hwy. (#2) is less than 20% of its capacity.
As noted previously, the Bellkeno Mine Project, if developed, may potentially have temporal and geographic overlap in terms of traffic volumes. Although details are not known at time of filing, it is understood by the Proponent that ore from the Bellkeno Mine will be transported out of the region by truck, thus increasing the traffic volume on the Silver Trail and Klondike highways. Given the current low level of capacity for the road infrastructure, it is expected that traffic volumes will be well within tolerance.

The residual adverse Project effects during the construction phase are expected to be short-term, low in magnitude, high in geographic extent (i.e., outside the Project Study Region), and not significant.

Operations and maintenance of the Project will entail a similar level of activity as the existing facilities and should not have any effect on traffic volumes (i.e., no Project effects).

**Worker Health & Safety**

As noted under Community Infrastructure and Services, construction activities could result in job-related accidents. This could result in increased reliance on local health services such as ambulance and nursing station services. The job site will be in compliance with the Yukon’s Occupational Health and Safety Act, the Yukon’s Health and Safety Regulations and any other applicable territorial or federal laws or any other industry-specific requirements that may apply. Although avoidance of all job-related accidents is impossible to guarantee, compliance with the above regulations, industry-specific requirements and Yukon Energy’s job safety training will assist in reducing the frequency and number of job-related accidents.

The residual adverse Project effects related to worker health and safety are expected to be short-term (two year construction period), within the Construction Footprint Area, low magnitude and not significant.

As described in Chapter 6, the Project will include a powerhouse with tailrace entering into the Mayo River, a surface-run canal, a 69 kV transmission line and a 12.5 kV distribution line and an access road as components of the Project infrastructure. Operations and maintenance of these facilities will follow Yukon Energy’s EMS manual, access to the property will be fenced and gated at the intersection with the existing access road, and safety signage will be posted where necessary. Where the canal and penstock meet, canal outlet structures will be a component of the construction and will be fenced to prevent people wandering into this area.

The residual adverse Project effects will be long-term, restricted to the Construction Footprint Area, low in magnitude and not significant.

**7.4 OTHER EFFECTS**

**7.4.1 Effects of the Environment on the Project**

In environmental assessment practice, the effect that the environment will have on the project is often considered as part of the environmental assessment and appropriate measures are applied to ensure that there will be no significant adverse effects in this regard. During the operational phase of the Project, for example, potential effects of the environment could occur as a result of seismic events or climate change.
Yukon Energy designs its dams to meet or exceed the Canadian Dam Association guidelines. Dam facilities are currently inspected monthly, annually and on a five-year cycle. On-site operations and engineering staff also perform ongoing, informal visual inspections as part of their normal routine. Monthly visual inspections are recorded at the same time instrument readings are taken. Formal annual inspections are made by qualified Yukon Energy staff. Outside engineers are hired to perform the five-year Dam Safety Reviews. The final designs for the proposed powerhouse, penstock, canal, access roads and transmission line structures will meet all relevant design standards in the applicable codes that apply to the specific facility. The final designs for all new components will incorporate consideration of the region’s climate and take into account any relevant effects of climate change during the expected life of this facility.

Water retaining structures are designed and re-certified on a periodic basis to the latest seismic standards and extreme water events (i.e., probably maximum flood events). Buildings will be constructed to the latest design standards for that type of facility in that type of environment.

It has been suggested that the impact of climate change and its potential effects on the boreal forest ecosystem may result in a long-term increase in the number of extreme weather events (i.e., forest fire hazards, flooding, ice storms), gradual change in permafrost (resulting in instability of the soil), and potential erratic water regimes resulting from more frequent or erratic weather events. Notwithstanding this uncertainty as to potential changes, based on current information and projections, it is not presently expected that climate change will have likely significant effects on the proposed Project in respect of any of the above noted changes.

The Yukon Government Climate Change Action Plan, released in February, 2009 and the Energy Strategy for Yukon, released in January, 2009 both note that increases in renewable generation support government objectives. The plan and strategy, which were developed to complement one another, set reduction of greenhouse gas emissions as a priority. The Yukon Government Climate Change Action Plan identifies renewable resource development, including hydro, as a mitigation strategy which will help reduce or delay global warming (2009b). The Energy Strategy for Yukon sets out the goal of increasing renewable energy supply, including hydro, in the Yukon by 20% by the year 2020. Furthermore, the Energy Strategy seeks to “...optimize the efficiency and reliability of electricity generation and distribution” (2009a) and recognizes the importance of investing in electricity infrastructure to meet future needs and leverage economic development in the Territory. “Investments in additional renewable energy infrastructure will be required in order to enhance the kinds of long term legacy benefits that are currently enjoyed with the existing hydro system. These investments will also buffer Yukon’s energy sector from volatile fossil fuel prices and help to minimize greenhouse gas emissions from diesel generated electricity” (2009a).

Yukon Energy monitors changes in the regional climate in the Project Study Region as necessary using climate information including measurements of temperature, precipitation, and wind speed provided by the Meteorological Service of Canada.

Yukon Energy expects to continue to monitor the capability of major Global Climate models and Regional Climate models to accurately represent climate change variables. As these models are calibrated to predict climate regimes with confidence they potentially may be able to predict the frequency and
magnitude of extreme events in the Project Study Region (e.g., severe storms, wind events, flooding). In the event such technological developments are successful, it is anticipated that the results of such models would form a component of Yukon Energy’s future planning.

7.4.2 Accidents and Malfunctions

YESAA\(^7\) and the various YESAB guides require that significance of accidents and malfunctions be considered as a part of the environmental and socio-economic effects assessment. In this assessment, possible accidents and malfunctions with regard to the Project were considered and appropriate mitigation is planned to be applied to ensure there is no significant adverse effects in this regard.

During the construction, operations and maintenance phases of the Project spills of hazardous materials could occur during refuelling of equipment or due to failure of substation components. Soil contamination, which affects soil productivity, could potentially occur when a hazardous substance is spilled or leaked. Where contaminants enter ground water or other water courses, there is a risk to public health and safety as well as potentially adverse effects on wildlife populations and habitat. The magnitude and duration of any potential effects of accidental spills depends on the nature of material spilled, the quantity spilled, the location of the spill, and the time of year in which the incident occurs.

The new powerhouse and tailrace will be constructed almost entirely in the dry to avoid the potential for spills and sedimentation of the Mayo River. Appropriate sediment control will be in place when the plug for the tailrace is removed, and will be timed so as to avoid Chinook salmon spawning.

Standard environmental protection practices, as described in Yukon Energy’s EMS (Appendix 6A) and Job Site Spill Contingency Plan, Reporting Procedures (Appendix 6B) commit Yukon Energy to store fuel, lubricants, and other potentially hazardous materials within dedicated storage areas in work camps and marshalling areas. Dedicated areas would be located away from sensitive features and would provide spill containment and necessary bermed storage areas, and spill response. Any products transferred from storage sites to work areas would not exceed the daily requirement. Yukon Energy also requires its contractors to have an emergency response plan in place that is consistent with Yukon Energy’s EMS and spill response procedure.

Adherence to Yukon Energy’s environmental protection practices and any additional specific mitigation measures identified as a condition of licence approval will further minimize the potential impact of accidents or malfunction on soil, wildlife or aquatic resources. As noted above, Yukon Energy designs and reviews its Projects to meet or exceed current relevant standards applicable to the specific generation or transmission facilities in question.

Water related accidents and malfunctions are covered in detail in Yukon Energy’s Mayo Lake and Wareham Dam Emergency Preparedness Plan which is described in Section 6.10.4.

\(^7\) Section 42(1)(c) of YESAA sets out that an examination is required of the significance of environmental and socio-economic effects of the project or existing project that have occurred or might occur in or outside of the Yukon, including the effects of malfunctions or accidents.