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**Alaska Canada Rail Link Project**
**Feasibility Study Report**
**Rail Route Evaluation**
**Eastern and Western British Columbia**
**Work Package B1(d)**


Prepared by:

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May 2006

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May 30, 2006

File Name: F750-001-00-

Kells Bolland
Alaska Canada Rail Link
210, 212 Main Street
Whitehorse, YT V1A 2A9

Dear Mr. Bolland:

**Re: Alaska Canada Rail Link Project**
**Feasibility Study Report**
**Rail Route Evaluation**
**Eastern and Western British Columbia**
**Work Package B1(d)**

UMA Engineering Ltd. (UMA) is pleased to submit our final copy of the Rail Route Evaluation for the Eastern and Western British Columbia Routes (Work Package B1(d). This report compares two proposed rail routes through British Columbia and examines the feasibility of the development of each.

We thank you for the opportunity to complete this work on your behalf. Should you have any questions or require additional information, please contact the undersigned at (780) 486-7000.

Sincerely,

**UMA Engineering Ltd.**

Rudy Schmidtke, M.Sc., P.Eng.
Regional Manager, Earth & Environmental
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RHS:mr

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## 1. Eastern and Western British Columbia (WP B1d)

### *1.1 Introduction*

#### 1.1.1 General

Work package B1 (d) consisted of a technical engineering and construction analysis of proposed rail routes through British Columbia (BC), Canada. Two rail routes were identified within this work package: Fort Nelson, BC to Watson Lake, Yukon Territory (YT) and Minaret, BC to Watson Lake, YT. These routes were analyzed using available geologic mapping information to evaluate the difficulty in constructing a rail line along the route. UMA Engineering Ltd. (UMA) developed a system to classify the terrain, construction difficulty, and locate civil structures required to reasonably construct a rail line along a selected route. The results of each route analysis were compared to each other to attempt to identify the most favourable route in terms of construction and engineering feasibility. The information presented in this work was to support the preparation of cost estimates for railway construction in Work Package B1 (g).

#### 1.1.2 Scope of Work

The scope of work for Work Package B1 (d) involved conceptual engineering design for typical rail construction over varying terrain along the selected routes through BC. Information from the ALCAN data warehouse was to be used to assess the routes. A terrain analysis utilizing the available information was performed to identify terrain units, magnitude of construction, and potential location of civil structures such as major bridges, tunnels, and other specialty railway works along each proposed route.

### *1.2 Methodology*

The work methodology consisted of assigning a team of geological engineers and geologists to develop terrain classifications along each specified route. Control points were established to select a horizontal alignment and railway profile. This step was critical for other work packages and this construction evaluation. The routes identified a horizontal alignment on NTS maps at 1:50,000 scale. Additionally, mile markers (5000 ft miles) were used as reference points. A 5000 ft mile was used to account for the variability and optimization of locating the rail line during the next level of study.

The selected routes were compared with publicly available surficial geology maps to assign geological terrain units. Locations of potential ballast and aggregate sources were also identified along or near each proposed route using the available surficial and bedrock geology maps. When insufficient geological mapping sources were available, information obtained from the NTS maps and available satellite imagery were used to estimate the terrain units.

The terrain units, in combination with contour density obtained from the NTS maps, were used to estimate the magnitude of construction required to develop the route. Although the NTS maps provided elevation contours of 30 m, it was often difficult to interpret the magnitude of construction required. UMA used Google Earth software to aid the classification process and developed flight lines along each route.

For each terrain classification, a specific roadbed design standard was developed. These standards were based on typical construction methods and materials required to construct over the various terrains.

Locations where potential civil structures would be required were identified during the terrain analysis. These areas included unstable ground, tributaries, creeks, rivers, tunnels, and other difficult terrain situations.

Once the terrain analysis was completed, a summary of each route was developed. The results of each route summary were compared to each other to attempt to identify the most favourable route in terms of construction and engineering feasibility. This information was passed on to work package B1(g) for estimating the costs associated with construction along each proposed route.

## *1.3 Terrain Classification*

### 1.3.1 General

Nine different terrain units were used to classify the ground along the selected routes. These terrain units included: organics, permafrost, fluvial, alluvial, eolian, colluvial, lacustrine, till and bedrock deposits.

Each route was analyzed using the 1:50000 NTS and available geological mapping information. Figures 1 and 2 show the identical route alignment plotted over NTS and surficial geology maps respectively.

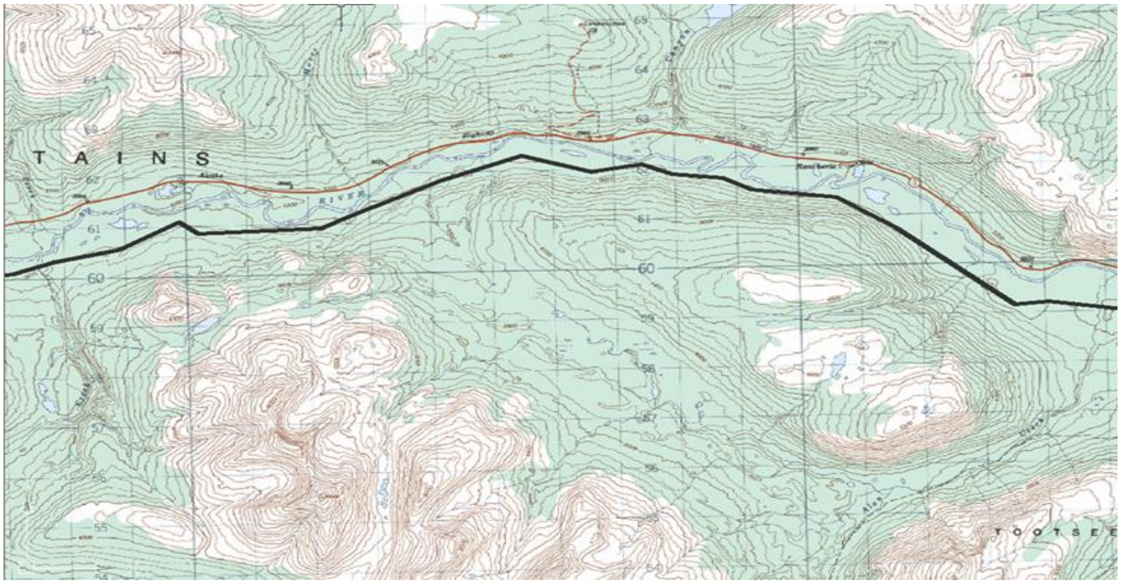



**Figure 1: NTS Mapping Alignment**

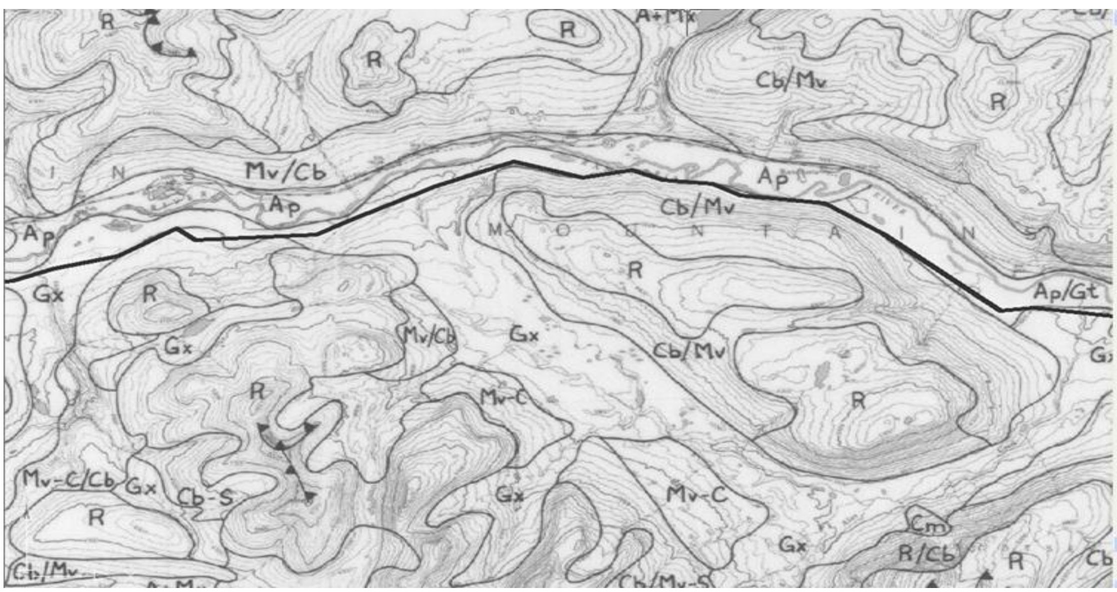



**Figure 2: Surficial Geology Mapping Alignment**

The terrain types were identified from surficial geology maps obtained from the Earth Sciences Information Centre. When insufficient geological mapping sources were available, information obtained from available satellite imagery were used to estimate the terrain units. The following sections are a summary of each identified terrain unit.

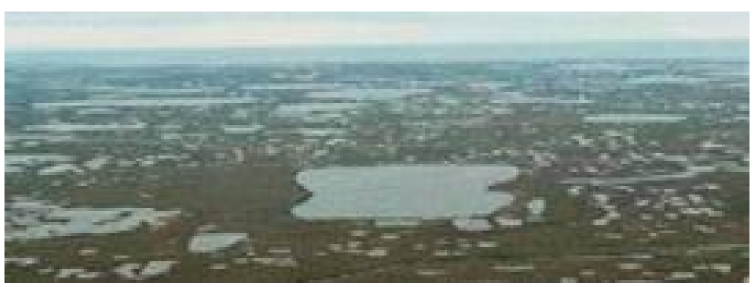
### 1.3.2 Organic Deposits (Holocene)

The organic deposits consist of material resulting from vegetative growth, decay and accumulation in and around closed basins or on gentle slopes, where the rate of accumulation exceeds that of decay. Two types of organic material are recognized. The first is commonly saturated with water and consist mainly of the accumulated remains of mosses, sedges, or other hydrophytic vegetation. The second is rarely saturated with water and consist typically of leaf litter, twigs, branches, and mosses (folisols). Picture 1 shows a typical organic deposit.


**Picture 1: Organic Deposit**

### 1.3.3 Permafrost

Permafrost forms in locations where the mean annual ground temperature remains below $0^{o}$C for several years. Features such as solifluction lobes, thermokarst, and pingos are typical of permafrost terrain. Large portions of the alignments are in the discontinuous permafrost zone. Picture 2 shows typical permafrost terrain.

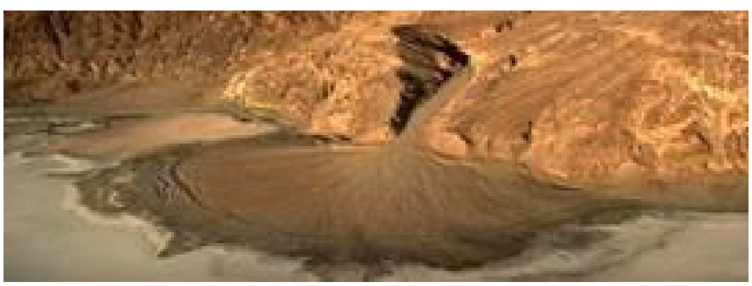


**Picture 2: Permafrost Terrain**

### 1.3.4 Fluvial/Alluvial Deposits (Holocene and Pleistocene)

Fluvial deposits are formed when sediment is transported and deposited by streams and rivers. The term is synonymous with alluvial, however, alluvial deposits are generally referred to when there is a large change in hydrologic flow causing deposition of sediment in fan-like forms. Generally, these deposits consist of gravel and/or sand and/or silt (and rarely clay). Gravel is typically rounded and contains interstitial sand. Fluvial sediment is commonly moderately too well-sorted and displays stratification, although massive, non-sorted fluvial deposits do occur. Fluvial deposits in the large valley bottoms typically have a sandy texture because of the abundance of reworked glaciolacustrine sediment. Pictures 3 and 4 show typical fluvial and alluvial deposits.


**Picture 3: Fluvial Deposit**



**Picture 4: Alluvial Deposit**

### 1.3.5 Eolian (Holocene)

Eolian deposits form when sediment is transported and deposited by wind action. It generally consists of medium to fine sand and coarse silt that is well-sorted, non-compacted and may contain internal structures such as cross-bedding or ripple laminae, or may be massive. Individual grains may be rounded and exhibit frosting. Eolian landforms may be active or vegetated and inactive. Picture 5 shows a typical eolian deposit:


**Picture 5: Eolian Deposit**

### 1.3.6 Colluvial Deposits (Holocene and Pleistocene)

Colluvial deposits are products of mass wastage that have reached their present position by gravity induced movements without the action of wind or water. They generally consist of massive to moderately well stratified, non-sorted to poorly sorted sediments with any range of particle size from clay to boulders and blocks. The character of any particular colluvial deposit depends upon the nature of the material from which it was derived and the specific process by which it was deposited. Talus cones form as a result of rock falls and are also included under this classification. Talus tends to accumulate at the base of a slope and form conical piles along natural ravines in the faces of cliffs as shown in Picture 6.

**Picture 6: Colluvial Deposit, Talus Cones**

### 1.3.7 Lacustrine (Pleistocene)

Lacustrine deposits form when sediment is deposited in or along the margins of lakes including sediments that were released by melting or floating ice. Generally, glaciolacustrine sediments include: lake bed sediments consisting of stratified fine sand, silt, and/or clay. They commonly contain ice-rafted stones and lenses of till and/or glaciofluvial material, and moderately sorted to well sorted, stratified sand and coarser beach sediment transported and deposited by wave action along the margins of lakes. Picture 7 shows a typical lacustrine deposit.


**Picture 7: Lacustrine Deposit**

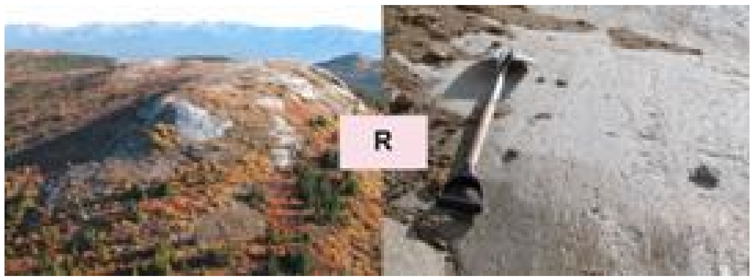
### 1.3.8 Glacial Deposits - Till (Pleistocene)

Till deposits form when sediment is deposited directly by glacier ice without modification by any other agent of transportation. Generally, till can be transported beneath, beside, on, within, and in front of a glacier. The mineralogical, textural, structural, and topographic characteristics of till deposits are highly variable and depend upon both the source of material incorporated by the glacier and the mode of deposition. In general, till consists of well compacted to non-compacted material that is non-stratified and contains a heterogeneous mixture of particle sizes, commonly in a matrix of sand, silt and clay. Picture 8 shows a typical till deposit.


**Picture 8: Till Deposit**

### 1.3.9 Bedrock (Pre-Quaternary)

Bedrock was defined as any consolidated material unable to be removed using conventional mechanical construction methods. Bedrock was identified as outcrops or areas of rock covered by a thin mantle of unconsolidated or organic materials. Picture 9 shows a typical bedrock deposit.




**Picture 9: Bedrock Deposit**

### 1.3.10 Terrain Classification Route Summary

Each route was analyzed and the terrain classified along the proposed alignments. A terrain summary was produced by adding all the areas of similar terrain to determine the total length of each terrain unit. For example, Figure 3 shows a portion of the route over a connected series of surficial geology maps.

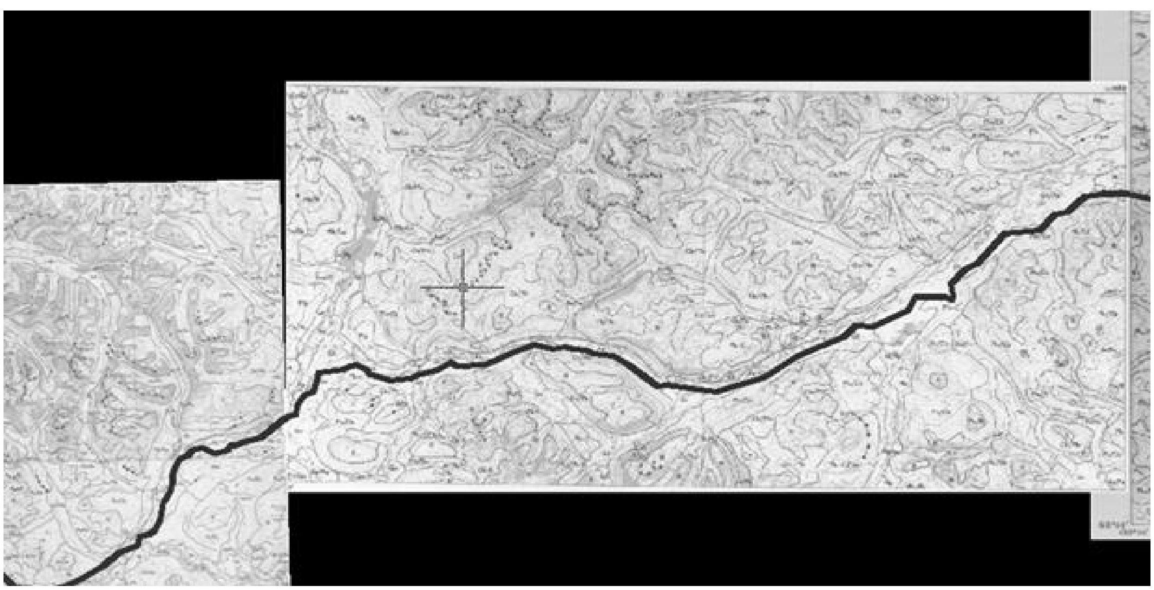


**Figure 3: Connected Surficial Geology Maps with Route Alignment**

A typical route summary is shown in Table 1:

| Terrain Unit | Total Distance (Miles) |
|---|---|
| Organic | 39.3 |
| Permafrost | 32.7 |
| Fluvial | 122.1 |
| Alluvial | 113.2 |
| Eolian | 26.4 |
| Colluvial | 19.4 |
| Lacustrine | 53.2 |
| Till | 218.6 |
| Bedrock | 12.6 |

**Table 1: Terrain Classification - Typical Route Summary**

A detailed analysis and summary for each evaluated route is in Appendix A.

## *1.4 Construction Classification*

### 1.4.1 General

A construction classification system was developed to determine the level of effort required to construct over the terrain. Seven different construction classifications to estimate the degree of difficulty of building over the terrain were used. The seven construction classifications developed include: average, heavy, and very heavy grade construction; construction over organics, permafrost, and bedrock; and locations requiring tunnels.

The terrain units in combination with topographic contour density obtained from the NTS maps were used to classify the degree of construction difficulty. Although the NTS maps provided elevation contours of 30 m, it was often difficult to interpret the magnitude of construction required. Figure 4 and Picture 10 show the difficulty of interpreting NTS contour information with respect to the actual site condition at a location on the Yukon River near the Tatchum River, YT.

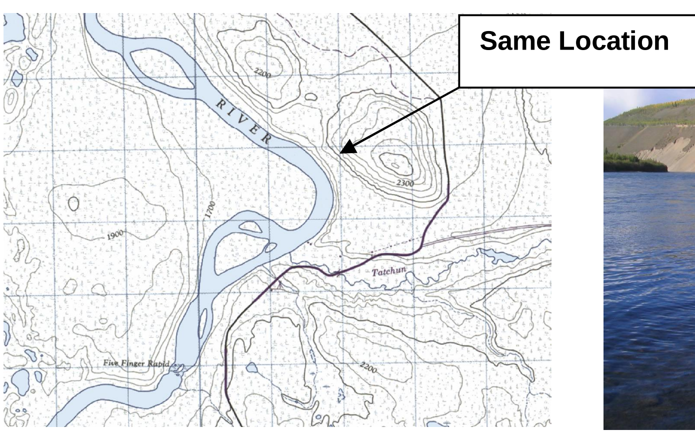
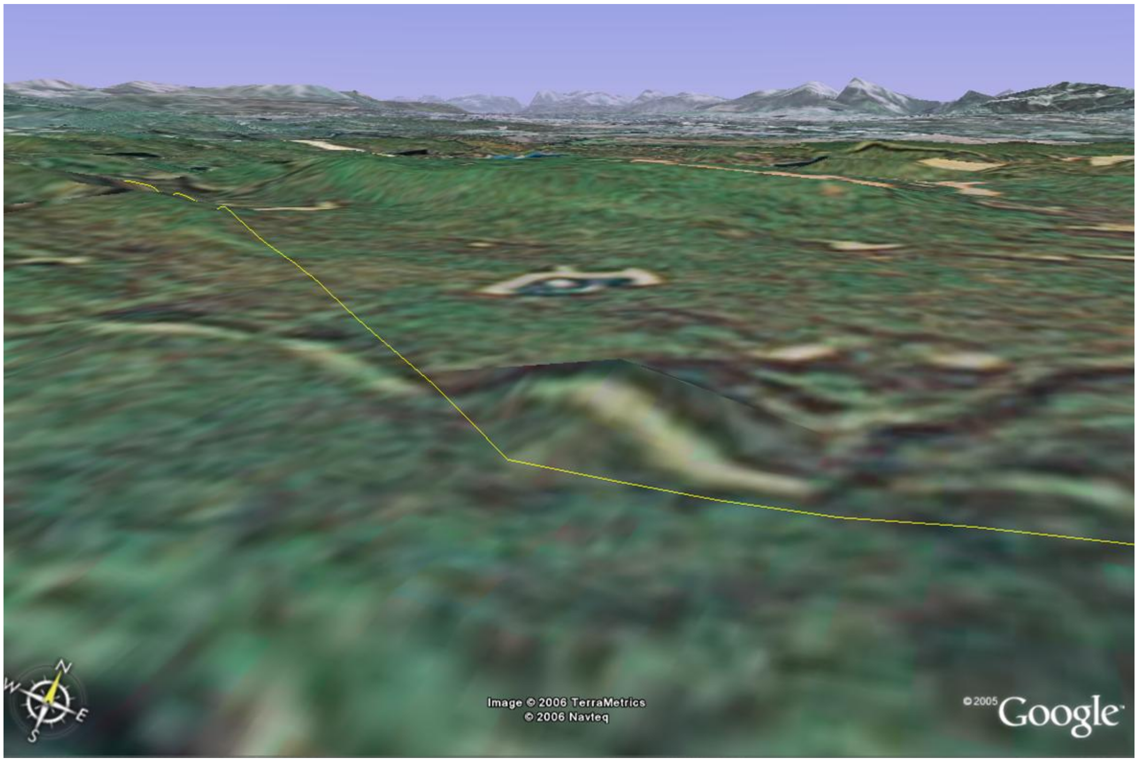



**Figure 4: NTS Mapping**

**Picture 10: Actual Site Conditions**

Google Earth software was also used to aid the classification process.  This software allowed the view of the terrain to be rotated, and vertically exaggerated to provide for a more comprehensive perception of the actual site conditions.  Picture 11 shows the Google Earth rotated and vertically exaggerated terrain surface.




**Picture 11:  Google Earth Rotated Terrain Image**

The Google Earth software also allowed the import of the established control points of the routes over the terrain surface.  Once imported, the routes could be flown, rotated at any angle, and zoomed in or out to any desired elevation.  UMA also developed flights along each route and recorded these flights onto a DVD which is appended to this report.

## *1.5 Roadbed Design Standards*

### 1.5.1 General

For each construction classification, a typical roadbed design standard was developed. These design standards were developed by assuming the required quantities and materials to construct over the identified terrain.  Consideration for the difficulty and volume of cut and fill, small culverts, geosynthetic materials, potential bedrock content, and specialty works associated with each design standard was applied.

These design standards were based on the AREMA standards and consistent with the railway standards of major railways in BC.

- Gradients limited to 1 percent against loads and empties.
- Curvature limited to a maximum of 6 degree. Limit to 3 degrees where possible.
- No. 16 turnouts for sidings or passing tracks.
- A minimum railway Right of Way width of 100-200 ft (30.5 - 61.0 m).
- Subgrade roadbed width of 26 ft (7.93 m) (at 2'-6" from the top of rail).
- Embankment slopes or cuts at 2H:1V in soils.
- A standard earth cut width at subgrade level of 64 ft, to provide an adequate ditch width (not applicable in permafrost zones).
- In rock cuts an embankment slope of 1H:5V.
- Ditch Width in rock cuts to be a minimum of 10 ft.
- Earth roadbed embankments along major river systems to be protected against annual floods and erosion by Riprap sized against 1 in 100 year return frequency floods.
- A minimum of 7.5 ft (2.29 m) from centreline of track to edges of bridges, tunnels, rock & snow shed structures.
- Maximum carloads of 286,000 lbs (130,000kg).
- 136 lb (61.8 kg) premium Continuous Welded Rail (CWR).
- 8 ft (2.44 m) long soft wood ties with 14" (350 mm) tie plates on tangent supplemented with hardwood ties on curves.
- Minimum sub-ballast thickness of 12" (300 mm) in combination with a ballast thickness of at least 12" (300 mm) below the ties.

### 1.5.2 Site Preparation

Typical grade construction over competent subgrade should consider the following:

- Suitable side slopes for embankments and cut slopes will generally depend on several factors including, the shear strength (angle of repose) of the soil, ground water conditions and any structural weakness present in native soils and rock.
- The subgrade fill should consist of well graded soil free of boulders, cobbles, organics, frost or other deleterious materials placed as follows:
  - In areas of new construction all surficial vegetation, topsoil, peat and deleterious material within the footprint of the subgrade fill should be stripped and removed;
  - Following stripping, the exposed surface should be scarified and recompacted to 95 percent Standard Proctor Maximum Dry Density (SPMDD) and moisture conditioned as required.

- The roadbed embankment should have side slopes of 2H:1V or flatter. This will increase the stability of the subgrade and reduce loss of granular material along the shoulder.
- Cut slopes in granular soil or stiff clay will generally support slopes as steep as 2H:1V. Where seepage is noted or in areas with soft to firm clays or loose sand the slopes should be benched or flattened as required to maintain stability.
- Frost susceptible soils such as silt or fine silty sand should be avoided for use as embankment fill where possible.
- The top of subgrade should be crowned in the centre towards the ditch at a minimum slope of 4 percent to provide drainage and reduce ponding of water on the subgrade, which could result in swelling, softening and possible frost heave of the subgrade. In areas of super elevation, a 4 percent cross fall should be used. It is recommended that roadbed grades be maintained as high as possible particularly through low areas.
- The crown of the subgrade should be a minimum of 0.9 m (3 ft) above the ditch bottom.
- Ditch drainage should have adequate capacity to handle storm flows and prevent ponding of water. The width, depth, and gradient of the ditch will depend on the designed flow rate (Q). The flow rate should be fast enough to maintain relatively dry embankment but not too fast to cause erosion of silt into the water course. This may also require installation of culverts or extension of existing culverts at access crossings. In areas where slides or material sloughing is expected, the ditch should be width should be increased so that it does not have to be cleaned out too frequently.

### 1.5.3 Average Grade Construction

Average grade construction was considered in locations where cut and fill volumes are less than 2.29 m (7.5 ft) in height. Terrain associated with average grade construction is typically located on flat competent ground with a low water table. The roadbed design standard developed to correspond with average grade construction includes the following items:

- Rock excavation (10 percent of common)
- Granular sub-ballast - 300 mm
- Culverts (10 percent of grading)
- Access road, reclamation, slope stabilization (10 percent of grading)
- Additional structures 15 percent

Picture 12 shows a typical average grade construction terrain.

**Picture 12: Average Grade Construction**

Figures 5 and 6 show the average grade construction roadbed design standards for cut and fill respectively.

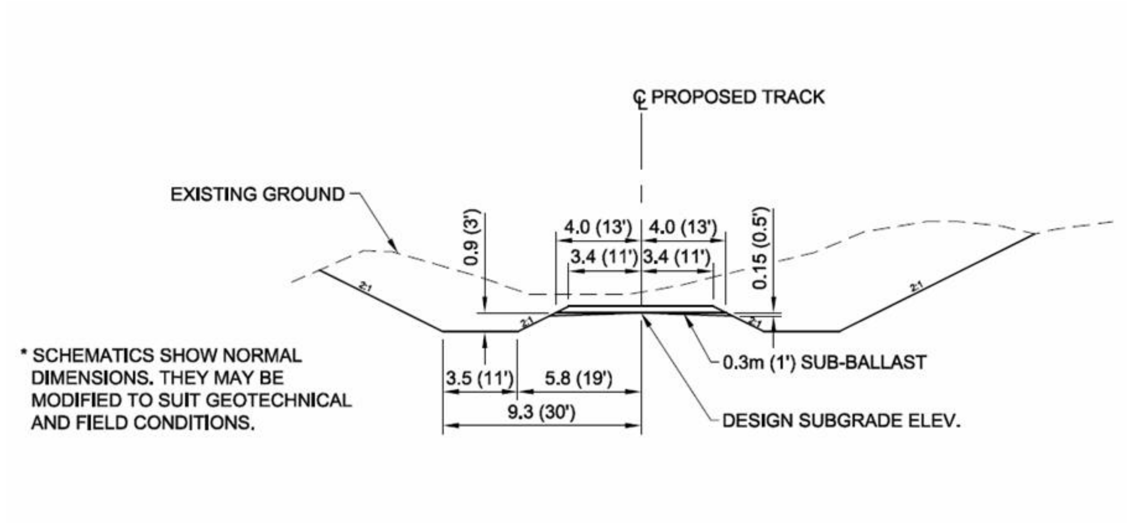



**Figure 5: Typical Cut – Average Construction**

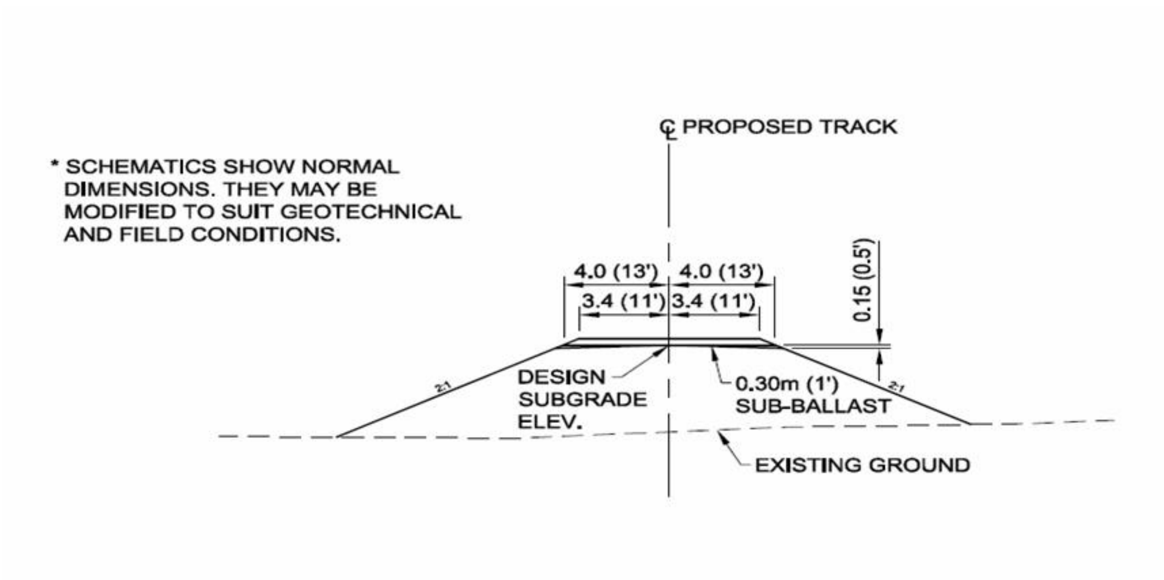



**Figure 6: Typical Fill – Average Construction**

### 1.5.4 Heavy Grade Construction

Heavy grade construction was considered in locations where cut and fill volumes average 3.66 m (12 ft) in height. Terrain associated with heavy grade construction is typically located in undulating competent ground with a low water table. The roadbed design standard developed to correspond with heavy grade construction includes the following items:

- Rock excavation (15 percent of common)
- Granular sub-ballast - 300 mm
- Culverts (10 percent of grading)
- Access road, reclamation, slope stabilization (10 percent of grading)
- Additional structures 25 percent

Picture 13 shows a typical heavy grade construction terrain.

**Picture 13: Heavy Grade Construction**

Figures 7 and 8 show the heavy grade construction roadbed design standards for cut and fill respectively.

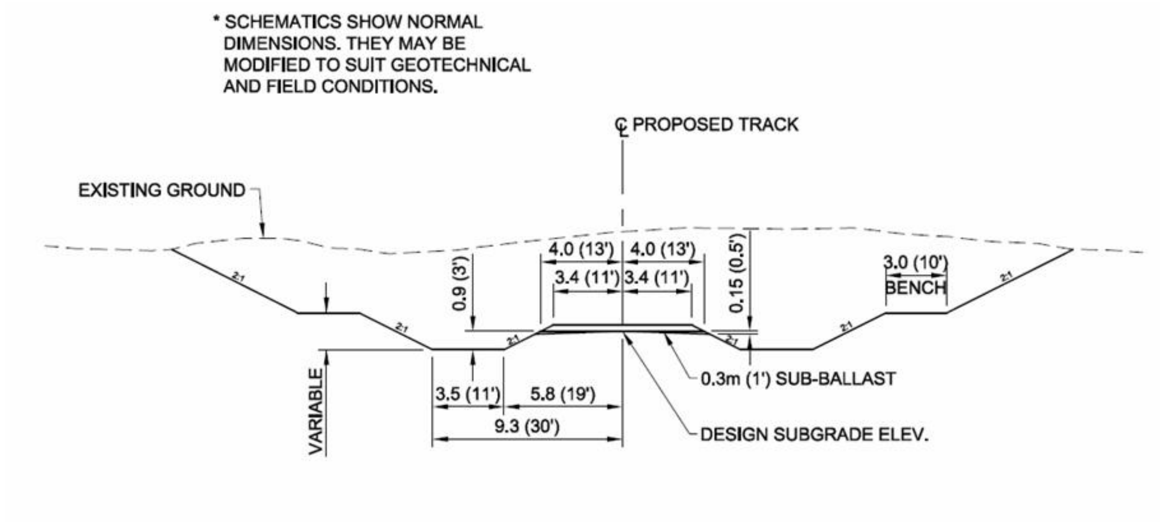



**Figure 7: Typical Cut - Heavy Construction**

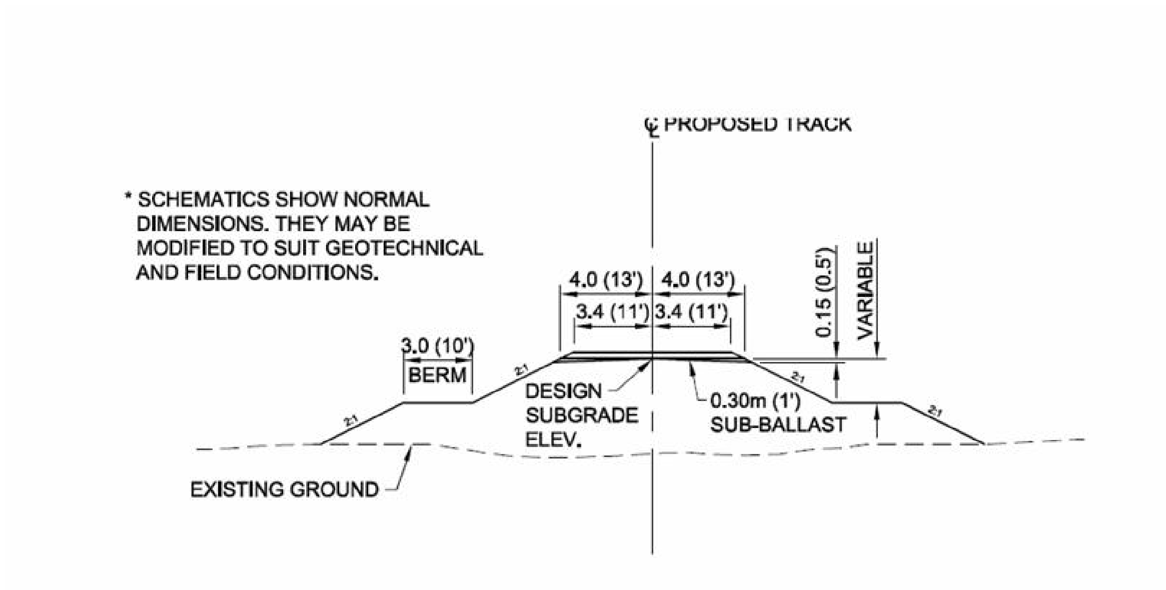


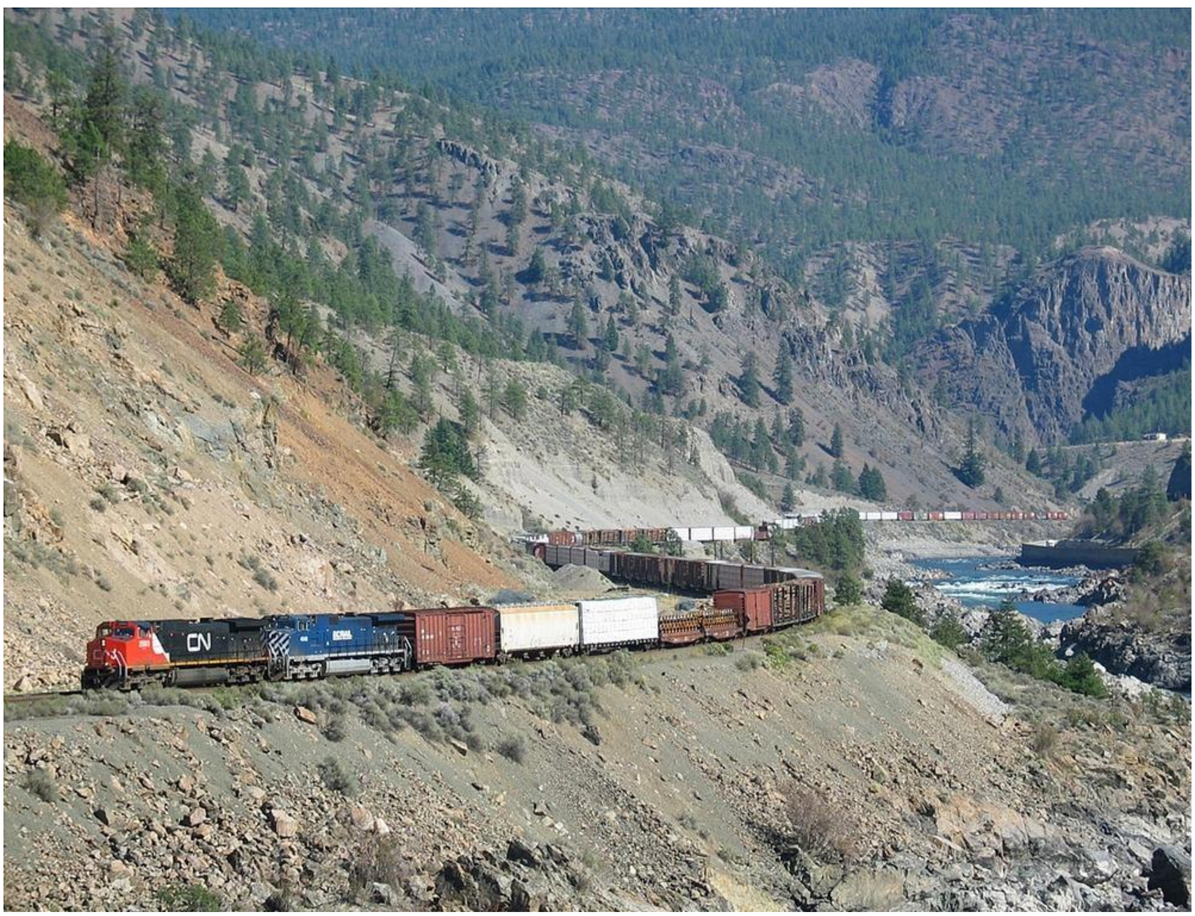

**Figure 8: Typical Fill - Heavy Construction**

### 1.5.5 Very Heavy Grade Construction

Very heavy grade construction was considered in locations where cut and fill volumes average 7.3 m (24 ft) in height. Terrain associated with very heavy grade construction is typically located in mountainous or hummocky competent ground with a low water table. The roadbed design standard developed to correspond with very heavy grade construction includes the following items:

- Rock excavation (20 percent of common)
- Granular sub-ballast - 300 mm
- Culverts (10 percent of grading)
- Access road, reclamation, slope stabilization (10 percent of grading)
- Additional structures 35 percent

Picture 14 shows a typical very heavy grade construction terrain.




**Picture 14: Very Heavy Grade Construction**

Figures 9 and 10 show the very heavy grade construction roadbed design standards for cut and fill respectively

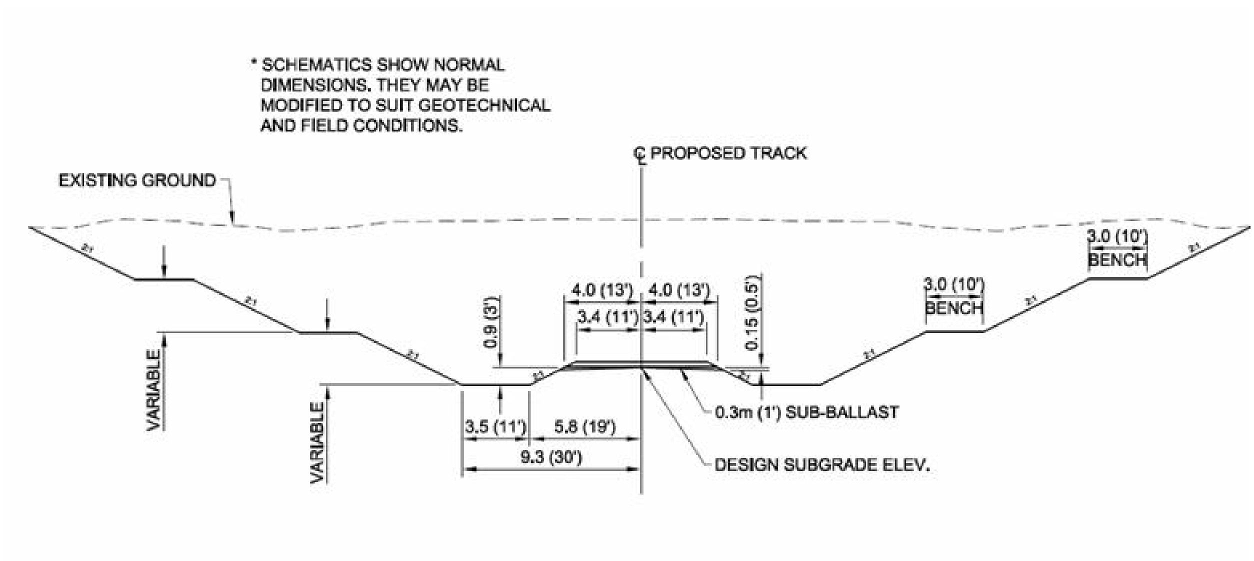



**Figure 9: Typical Cut – Very Heavy Construction**

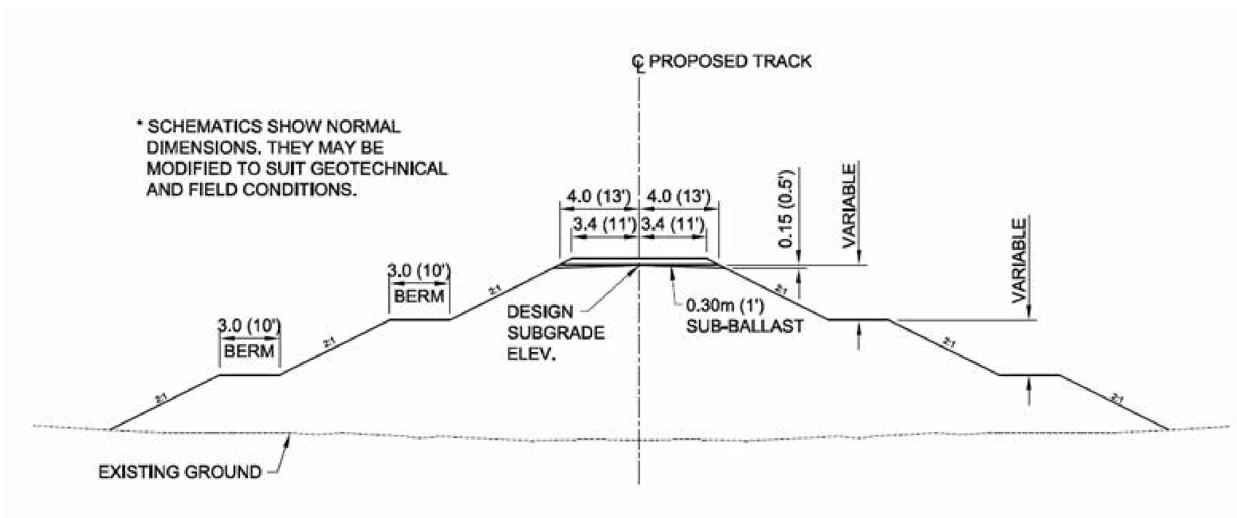



**Figure 10: Typical Fill – Very Heavy Construction**

### 1.5.6 Construction over Organics (Peat)

Due to flat grades, railways often find it difficult to avoid organic terrain. Generally, higher class railways with tangent track, flat grades, and curves have limited ability to avoid the organic deposits. A floating fill in combination with pre-loading was selected for this preliminary assessment.

Other methods of traversing peat include excavation and replacement, displacement methods and bridging. Excavation and replacement or displacement methods are most suitable where the depth of peat is shallow and can lead to lower long term maintenance costs particularly where competent soils are present underlying the peat. Bridging should only be used where other alternatives are not possible.

Each situation is unique and each of the above noted methods or a combination of methods may be most suitable for different types of peat terrain encountered. At the detailed design stage geotechnical drilling and testing should be conducted, to determine the extent, depth, and characteristics of the peat. Drainage ditches should be implemented along the edges of the right of way in advance of construction. Drawdown of the water table will increase the effective weight of the peat and initiate some preconsolidation of the peat itself along with any underlying soft soil. The improved drainage will also strengthen the peat as it dries out. Ditches located along the toe of the embankment will tend to destabilize the fill and should be avoided.

In summary, the following should be considered in peat areas:

- A drainage system should be established a season before actual embankment construction to allow the peat to dry and consolidate.
- The vegetation mat at the surface should be left intact and undisturbed.
- A synthetic geogrid or a timber corduroy should be placed over the ground surface prior to placement of embankment fills.
- It would be preferable to construct the embankment fill in the winter.
- The embankment fill should consist of granular soil such as sand which would facilitate larger lift sizes and winter placement.
- A minimum embankment height of 1.25 m (4 ft) should be maintained where the rail grade will allow. The embankment height is defined as distance between the top of peat and top of subgrade.
- The embankments should maintain a minimum side slope of 4H:1V to distribute the load over the surface of the peat. Alternatively, toe berms at half the embankment height may be considered.

Figure 11 shows the organic grade construction roadbed design standard.

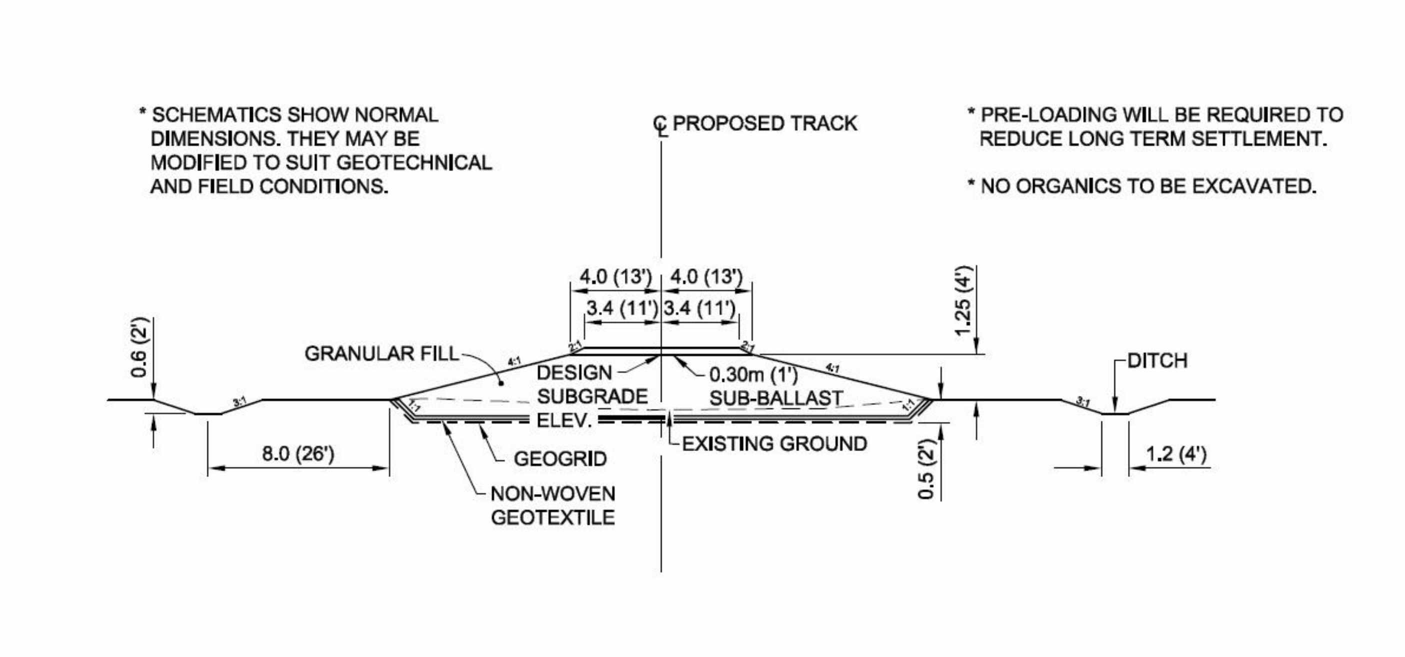



**Figure 11: Construction over Organics**

### 1.5.7 Construction over Permafrost

Portions of the routes are within the discontinuous permafrost zone which will present challenges unique to this type of terrain. Generally, extreme care must be taken to prevent thawing of all permanently frozen soils.

- Cuts are to be avoided in permafrost soils due to high ice content.
- The design and placement of fills is critical across this type of terrain. The basis of the design is to prevent degradation of permafrost under the centre of the embankment. Adequate insulation must be provided by the embankment. To prevent degradation of the permafrost, the fill height must be a minimum of 2.4 m (8 ft) along these sections. Alternatively, rigid polystyrene insulation could be used but is not expected to be economical.
- During placement of fill, the upper organic layer must not be disturbed. Removal of this insulating top stratum will cause degradation of the permafrost.
- Drainage structures built through the fills must be designed so as not to impede, funnel or divert natural drainage. If the drainage is impeded, ponding of water adjacent to the embankment will result in degradation of permafrost and erosion of embankment slopes.
- Fill operations should be conducted in the winter to prevent damage to permafrost soils and for easier access. Following completion of construction, maintenance will be required at regular intervals. During the first three to five years, careful inspection and repair work will be necessary periodically, particularly in late summer. Placement of fill and grading will be required on the embankment slopes to fill cracks and maintain a uniform slope.

Figure 12 shows the permafrost grade construction roadbed design standard.

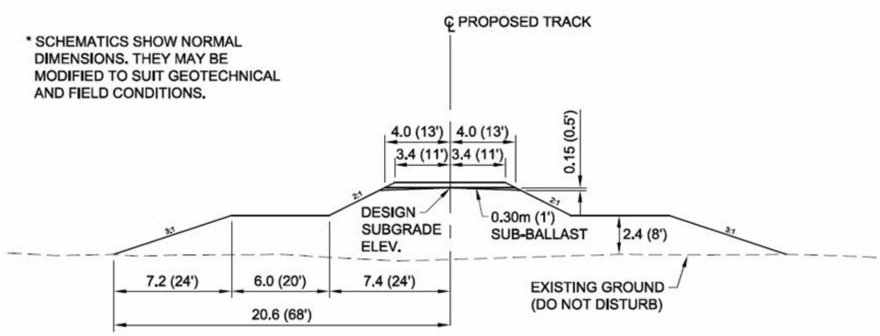


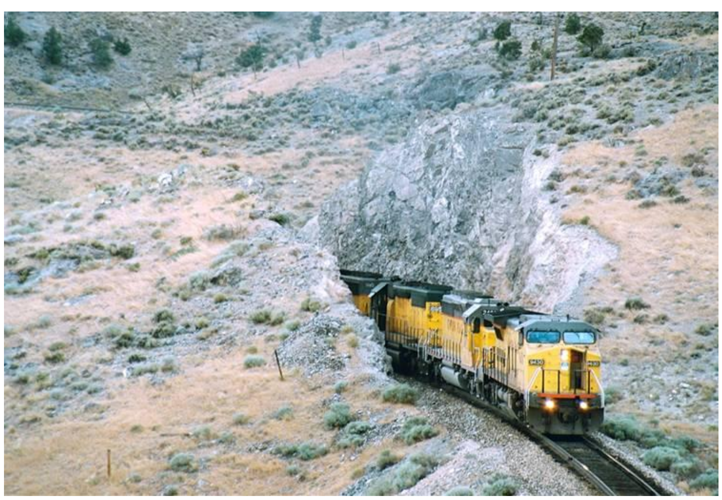

**Figure 12: Construction over Permafrost**

### 1.5.8 Rock Grade Construction

Rock grade construction was considered in locations identified as bedrock in the terrain analysis. The roadbed design standard developed to correspond with rock grade construction includes the following items:

- Average 5.5 m high by 11 m wide;
- Common excavation of 15 percent rock;
- Granular sub-ballast - 300 mm;
- Scaling and rock bolting (20 percent of excavation);
- Small culverts (5 percent of grade);
- Access road, reclamation (5 percent of grading).

Picture 15 shows a typical rock grade construction terrain.



**Picture 15: Rock Grade Construction**

Figures 13 and 14 show the rock grade construction roadbed design standards for cut and fill respectively.

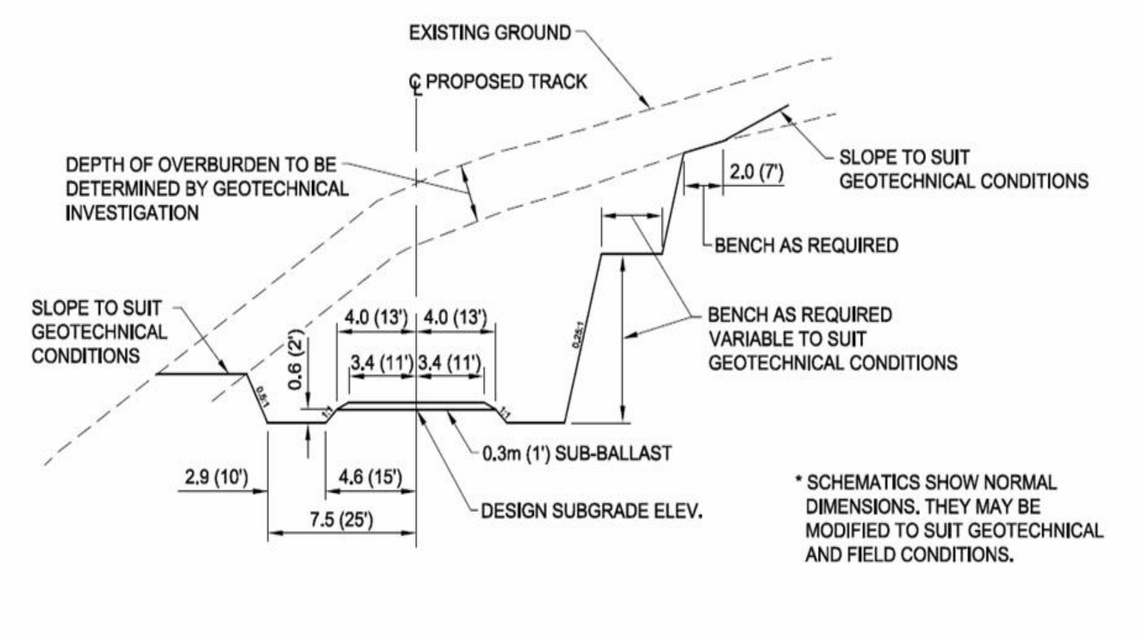



**Figure 13: Typical Cut – Rock Grade Construction**

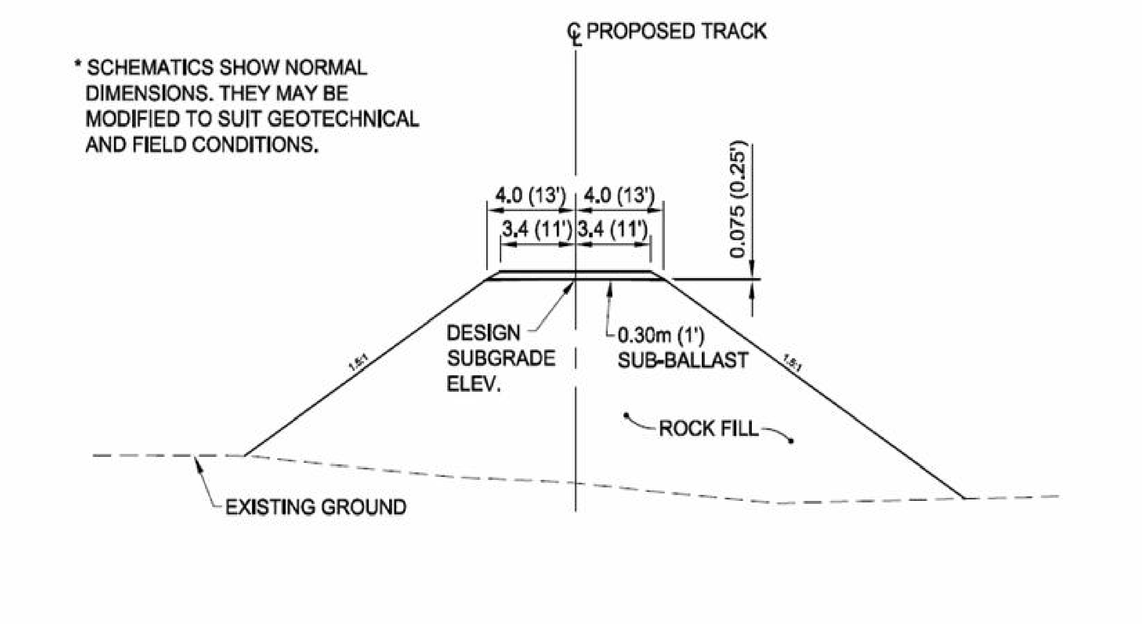



**Figure 14: Typical Fill – Rock Construction**

### 1.5.9 Tunnel

Tunnels are used when it is not feasible or economical to construct grade at the required track standards around difficult terrain. The proposed alignments identified locations where tunnels would be required to traverse difficult terrain. The roadbed design standard developed to correspond with tunnel construction includes the following items:

- Designed to accommodate double stack containers;
- Constructed using sequential excavation;
- Tunnels lined where applicable;
- Ventilated where required;
- Rock bolted where required;
- Emergency access where required.

Figure 15 shows the tunnel roadbed design standard.

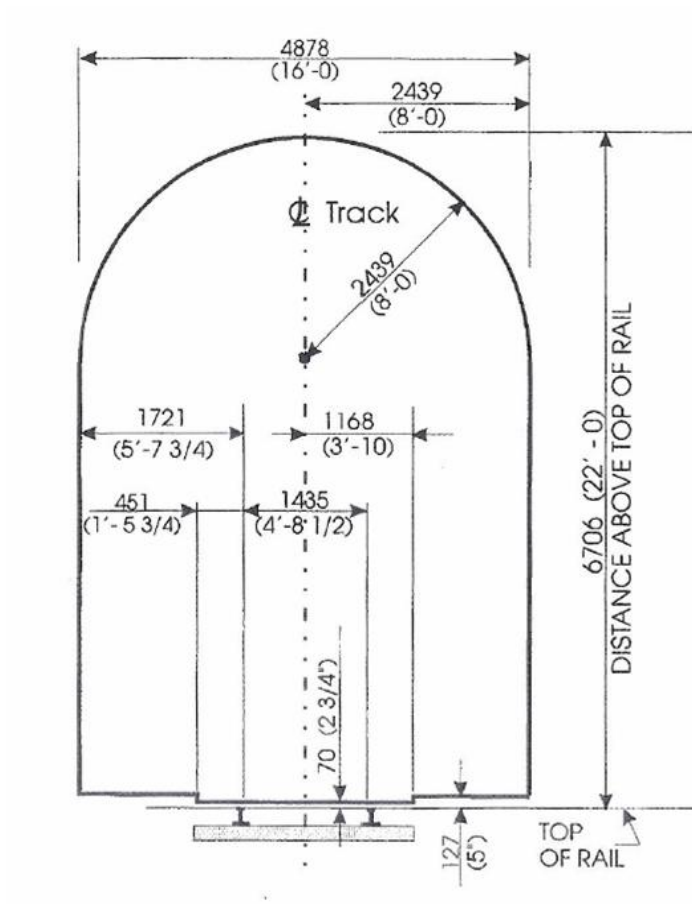



**Figure 15: Typical Tunnel Design**

Picture 16 shows a typical short tunnel.

**Picture 16: Short Tunnel and Buttress at Portal**

### 1.5.10 Construction Classification Route Summary

Each route was analyzed to determine the level of effort required to construct along the proposed alignment. Each route was summarized by adding all the areas of similar construction difficulty to determine the total length of construction classification. A typical construction classification route summary is shown in Table 2.

| Construction | Total Distance (Miles) |
|---|---|
| Average | 68.8 |
| Heavy | 336.7 |
| Very Heavy | 147.4 |
| Organics | 39.3 |
| Permafrost | 32.7 |
| Rock | 9.6 |
| Tunnel | 3 |

**Table 2: Construction Classification - Typical Route Summary**

A detailed analysis and summary for each route is in Appendix A.

## *1.6 Seismic Hazards*

The seismic risk of constructing a rail line through an active mountainous area is to be considered prior to design of the route. Although the effects of seismic events may pose significant risk to the maintenance of a rail line, the risk can be decreased by engineering for the potential effects. The Canadian Government plotted locations of previous seismic events to identify areas subject to increased risk of seismic events as shown on Figure 16.

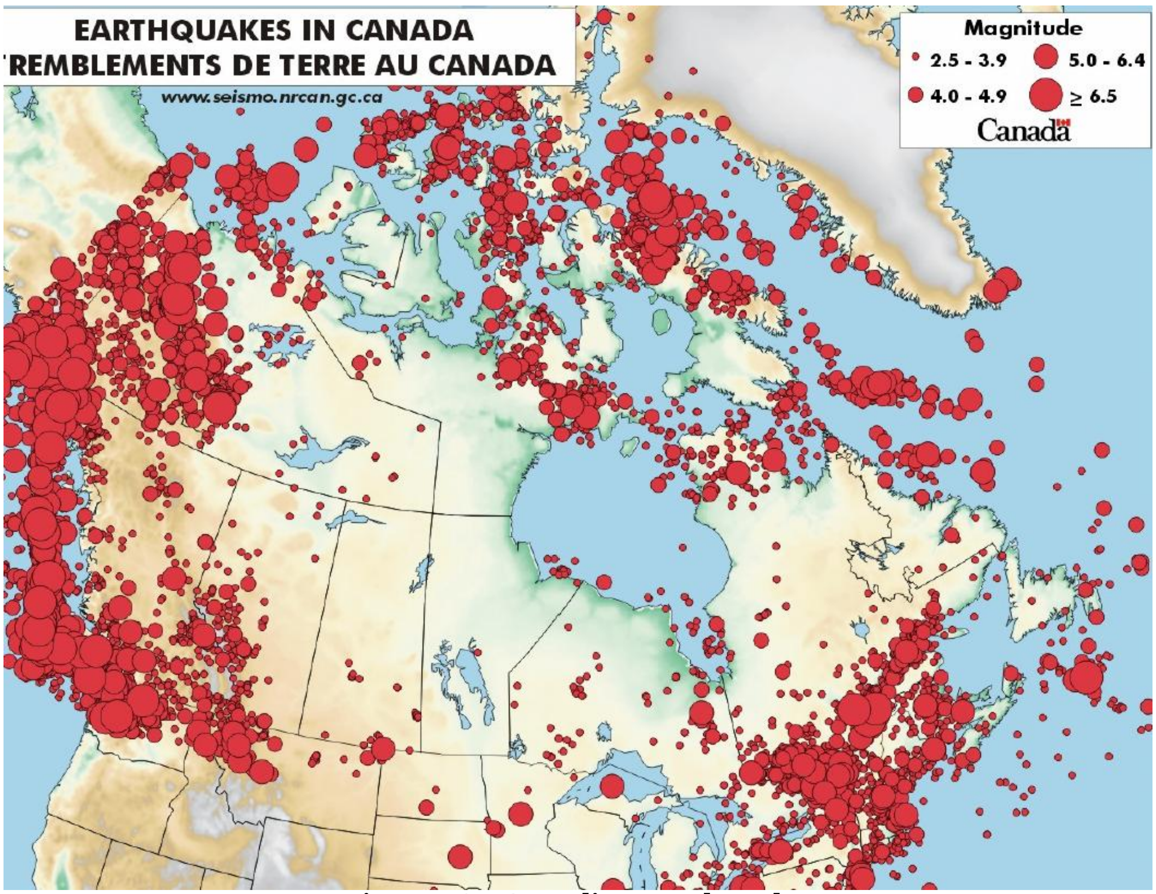



**Figure 16: Canadian Earthquakes**

The locations of previous earthquakes were used to develop a map indicating the areas of increasing risk of seismic events as shown on Figure 17.

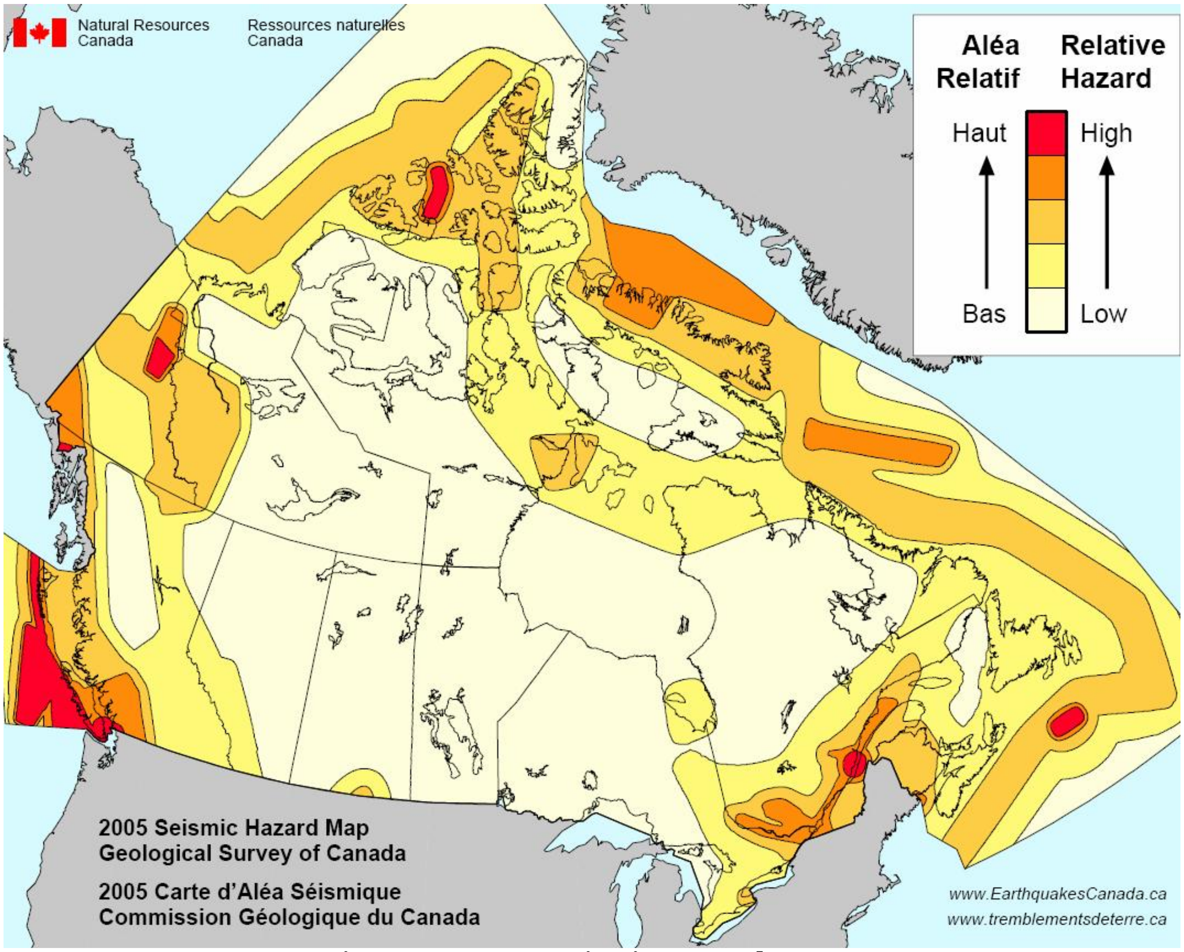
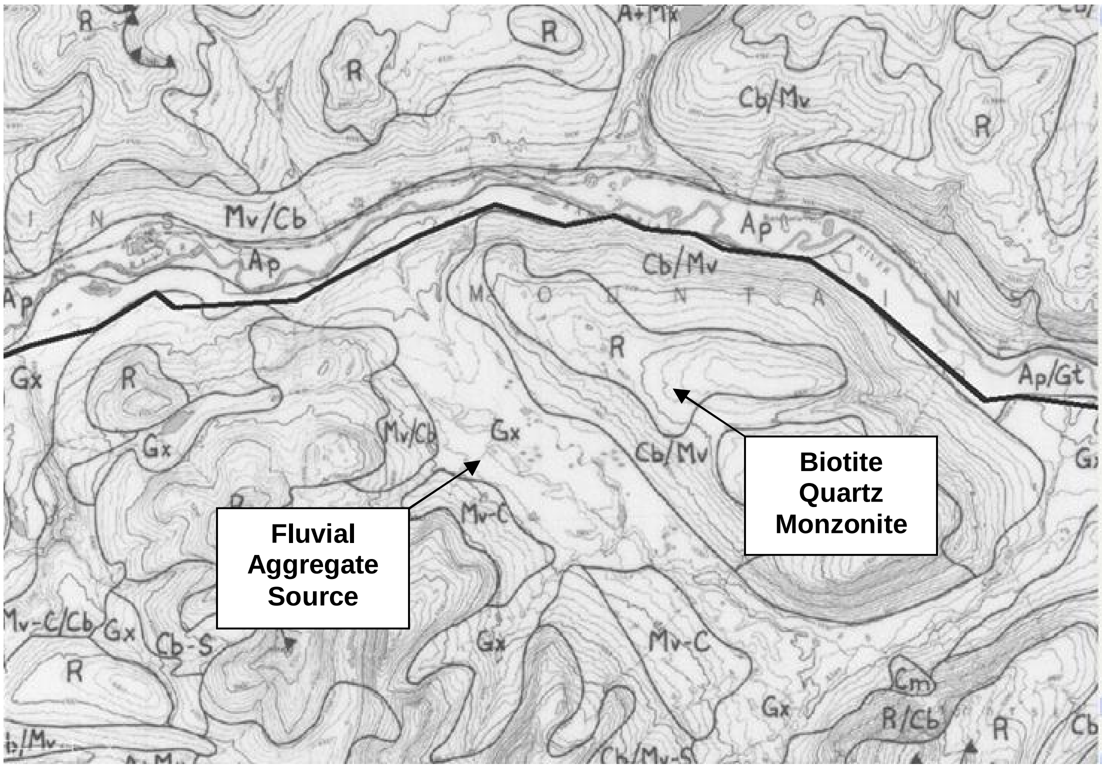



**Figure 17: 2005 Seismic Hazard Map**

Development of a railway through the areas of increased seismicity should be engineered to reduce the risk associated with potential earthquakes.

## *1.7 Aggregate Sources*




### 1.7.1 Ballast

A preliminary study was completed to identify locations near the proposed routes as potential ballast sources for rail line construction. The scope of this study consisted of examining published geological maps and selecting areas near to the proposed routes that contain favourable rock types. Areas with favourable rock types were selected are either adjacent to the proposed alignments or within a relatively short truck haul distance from the alignment with no physical barrier (river or lake) between the ballast source and the proposed alignment route.

Ballast is a selected crushed and graded aggregate material which is placed upon the railroad roadbed for the purpose of providing drainage, stability, flexibility, uniform support for the rail and ties and distribution of the track loadings to the subgrade and facilitating maintenance. To meet the above listed functions of ballast, the preferred aggregate should be a hard, dense, angular particle with sharp corners and cubicle shape with a minimum of flat and elongated pieces. These qualities will provide for proper drainage of the ballast with the angular shape providing interlocking qualities that will grip the ties and provide a stable ballast section. The ballast must have a high wear and abrasive qualities to withstand the impact of traffic loads without excessive degradation. The ballast must also provide high resistance to temperature changes, chemical attack, exhibit a high electrical resistance, low water absorption properties, and be free of cementing properties. In addition, the ballast must be free of minerals that may degrade the environment when exposed to air and precipitation.

To meet all of the qualities of good ballast, the source rock of the aggregate should have the following characteristics:

1. ***Mineral Hardness*** **–** The hardness of the minerals should be at least five on the Moh's Scale of Hardness (a qualitative scale for common rock forming minerals). Minerals with a five hardness will withstand the grinding force that occurs between the aggregate particles when subjected to the train load.
2. ***Moderate to High Specific Gravity*** **–** The rock, and by extension the minerals that compose the rock, should have a specific gravity higher than 2.60. A higher specific gravity will mean the aggregate particles will remain stable in the roadbed under loading.
3. ***Toughness*** **–** The ability of the rock to withstand the impact forces delivered by the train passing over the ballast. Toughness is primarily imparted by the shape of the minerals; elongated minerals that interlock have a higher toughness than minerals that abut each other.
4. ***Lack of Foliation*** **–** Foliated rocks have the long axis of the minerals aligned along one principle direction. This reduces the toughness of the rock as well as produces flat and elongated pieces.
5. ***Lack of Porosity*** **–** Pores within the rock will trap water that will then undergo freeze-thaw cycles that will break-up the rock particles in the ballast.
6. ***Lack of Hydrating Minerals*** **–** Certain minerals (e.g. chlorite) can absorb water into their crystal structure. These minerals are then susceptible to freeze-thaw and wetting drying degradation.
7. ***Resistance to Chemical Weathering*** **–** Certain minerals (e.g. calcite) are susceptible to chemical weathering (dissolution) from rainwater. In addition, alteration minerals (i.e. minerals formed from the decomposition of their parent mineral such as chlorite forming from the alteration of hornblende) are susceptible to chemical weathering.
8. ***Lack of Sulphide Minerals*** **–** Sulphide minerals (such as pyrite) can undergo chemical weathering and produce acidic water that can leach metals out of the rock. This would present an environmental concern particularly if present along a long section of the railway's roadbed.

The rock types that meet the top seven characteristics are found in igneous rocks. Plutonic rocks are preferred as a medium grain size imparts a rough texture to an aggregate particle. Coarse grained rocks can have a lower toughness due to fracturing in the large, elongate minerals within the rock. Volcanic rocks can also acceptable but their fine grain size may make them less stable in the track roadbed. Note that sulphide minerals tend to occur in igneous rocks, hence, a detailed petrographic analysis would be required for any potential ballast source to select a source that does not contain sulphide minerals.

The following is a list of rock types (based on the International Union of Geological Sciences classification scheme) that typically can meet the characteristics of good ballast:

<u>Plutonic Rocks</u>
Gabbro
Diorite
Monzonite
Syenite
Some granodiorites if quartz content is low
Ultramafic rocks such as dunite and pyroxenite

<u>Volcanic Rocks</u>
Basalt
Andesite
Latite
Trachyte
Some dacites if quartz content is low

In addition, a metamorphic rock called amphibolite can have the characteristics of a good ballast rock if it does not contain a high degree of foliation (common in metamorphic rocks).

Tables were developed to identify areas of specific rock types that could produce high quality ballast along the proposed alignments. As the identified rock types may represent a large area, and most are not directly adjacent to the alignment, the referenced mileage provides an approximate location; Mileage 120 may mean rock outcroppings from Mile 115 to 130. As most alignments trend roughly east-west descriptions such as north of the alignment should also be taken as meaning east if in that localized location the alignment is north-south, and south of the alignment will also mean west if the localized location of the alignment is north-south. The ballast source location tables are in Appendix B.

### 1.7.2 Concrete Aggregates

Areas near the proposed routes for potential concrete aggregate were identified. Terrain units known to contain sand and gravel deposits were noted for further investigation during the terrain analysis. Likely sources of concrete aggregate include fluvial, alluvial, and colluvial deposits.

The selection of a concrete aggregate is dependant on the following characteristics:

1. ***Rock Type*** – Shape and texture, gradation, moisture content, and specific gravity are the properties important for high quality aggregate. These are a function of the rock type that comprise the aggregate. Certain rock types will natural form flat or elongated shapes, can contain natural pores that will hold moisture, and have a low specific gravity; all features that are not desirable for concrete aggregate.

2. ***Resistance to Abrasion*** **–** A good aggregate will be hard, dense and strong and free of soft, porous or friable particles.
3. ***Resistance to freeze-thaw and wetting-drying*** - Concrete deterioration will be caused by aggregate particles that are susceptible to freeze-thaw or wetting drying cycles. Volume changes to the aggregate from these cycles will cause concrete cracking. Aggregate with a high porosity, permeability and the presence of hydrating minerals will be susceptible to freeze-thaw or wetting drying cycles.
4. ***Presence of Deleterious/Organic Material*** **–** Clay lumps, shale particles, coal and chert are some materials that are classified as deleterious materials that will perform poorly as a concrete aggregate.
5. ***Reactivity***
   - ***Alkali-Silica (chert, quartzites)*** **–** silica rich minerals can react with the alkali cement to form a silica gel within the cement. This gel has the ability to imbibe considerable amounts of water, which is accompanied by volume expansion.
   - ***Alkali-Carbonate (dolomites/limestones)*** **–** carbonate rocks that contain dolomite (a calcium-magnesium carbonate mineral) and interstitial clay can undergo de-dolimitization in the presence of alkali cement. The de-dolimitization process is expansive' hence causing cracking in the concrete.

## *1.8 Civil Structures*

### 1.8.1 General

Civil structures are required along all routes to traverse water courses, roads, and along areas subject to unstable ground conditions. Available mapping information was used to identify areas that would likely require civil structures along each route. Eight typical civil structures were used to classify the areas subject to additional construction requirements. These included areas requiring bridges, bridge pipes, road crossings, erosion protection, rock/snow sheds, rock fall protection and retaining walls. A description of each civil structure is discussed in the following sections. The locations of civil structures that may be required are identified in the detailed analysis and summary of each route in Appendix A.

### 1.8.2 Bridges

Bridges are used to cross large water courses, or areas that may be subject to large flows capable of transporting debris. UMA designated all the following areas as requiring bridges:

- Rivers
- Creeks
- Large tributaries capable of transporting debris

Based on the profiles generated from the control points, an estimate of the height and length of the required bridge was noted. Pictures 17 and 18 show a small and large bridge respectively.


**Picture 17: Small Bridge over Tributary**

**Picture 18: Large Bridge over River**

### 1.8.3 Bridge Pipes

Bridge pipes are used to convey surface water under the track when bridges are not cost effective and the location is not subject to large debris flows. All tributaries were designated as requiring bridge pipes unless they appeared to be subject to debris flows, or the traverse was greatly elevated above the alignment profile thus requiring a bridge. Picture 19 shows a typical bridge pipe structure under an existing track.

**Picture 19: Bridge Pipe**

### 1.8.4 Road Crossings

The alignment crosses existing roadways at several locations along each alignment. Railway road crossing are required to mitigate the potential of accidents with motorists. Based on the alignment profile developed, road crossings were assigned either as at-grade level road crossing or as requiring a grade separated road crossing. Pictures 20 and 21 show a level road crossing and a grade separated road crossing respectively.

**Picture 20: Level Road Crossing**

**Picture 21: Grade Separated Road Crossing**

### 1.8.5 Erosion Protection

Erosion protection is required to minimize disturbance of slopes subject to river erosion. Riprap protection is typically used to protect slopes, shorelines and bridge abutments from flooding, wave action and erosion of material. Locations where routes follow close proximity to major water courses typically require an abundance of erosion protection. Picture 22 shows typical riprap slope protection. Picture 23 shows the potential effects of not having adequate protection.

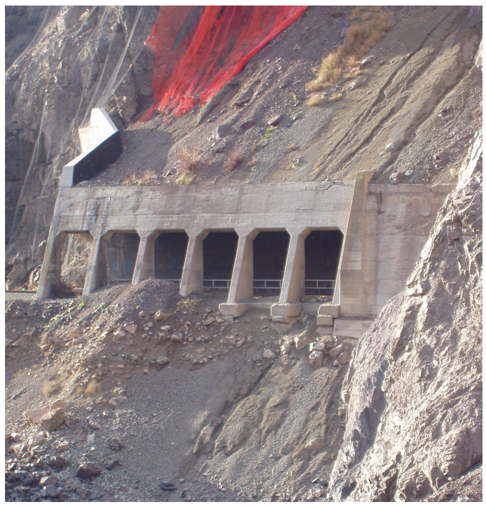
**Picture 22: Riprap Erosion Protection**

**Picture 23: Inadequate Erosion Protection**

### 1.8.6 Rock/Snow Sheds

Rock sheds will be necessary where rock falls can not be controlled by other means. The rock shed is typically a robust reinforced concrete structure with an earthen covered roof. The structure must be sufficiently durable to withstand rock falls and direct them over the track.

Snow sheds are similar to rock sheds and are required in mountainous terrain where avalanche chutes are present along the alignment. These areas are typically identified in air photos as scars in the forest cover where past avalanches were active and have damaged the terrain. Pictures 24 and 25 show a rock shed and snow shed respectively.



**Picture 24: Rock Shed**

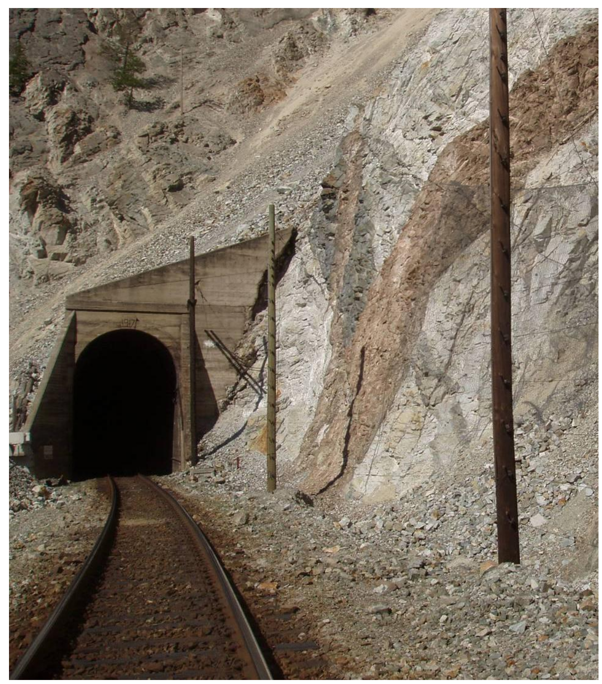
**Picture 25: Snow Shed**

### 1.8.7 Rock Fall Protection

Rock fall protection typically consists of a wire mesh placed over colluvial material. This is typically required where a veneer of loose rock is present over bedrock. The loose rock or talus will tend to tumble down the slopes and collect in the ditch or on the track.

The goal of the protection is to capture the rock and prevent it from tumbling down the slope and landing on the track. Wire mesh needs to be in close proximity to where rock dislodges in order to contain and dissipate the energy individual rocks collect as they fall. Generally anchors are installed along the slope above the anticipated source. Rock fall signals are often used to warn oncoming trains of fouled track areas. Pictures 26 and 27 show typical rock fall protection and rock fall signals respectively.

**Picture 26: Rock Fall Protection**



**Picture 27: Rock Fall Signals**

### 1.8.8 Retaining Wall

Retaining walls are used to stabilize the grade or slopes where space is limited. Tie back anchor walls can be used where the colluvial material is relatively thin such as in a veneer or mantle where the bedrock is relatively shallow. However, where soils are present it is often more economical to use gravity walls or mechanically stabilized Earth (MSE) walls. There are a large variety of MSE wall systems with different reinforcement options and facings available. Picture 28 shows a concrete-faced retaining wall, and Figure 18 shows a benched tie-back anchor retaining wall design.

**Picture 28: Concrete Retaining Wall**

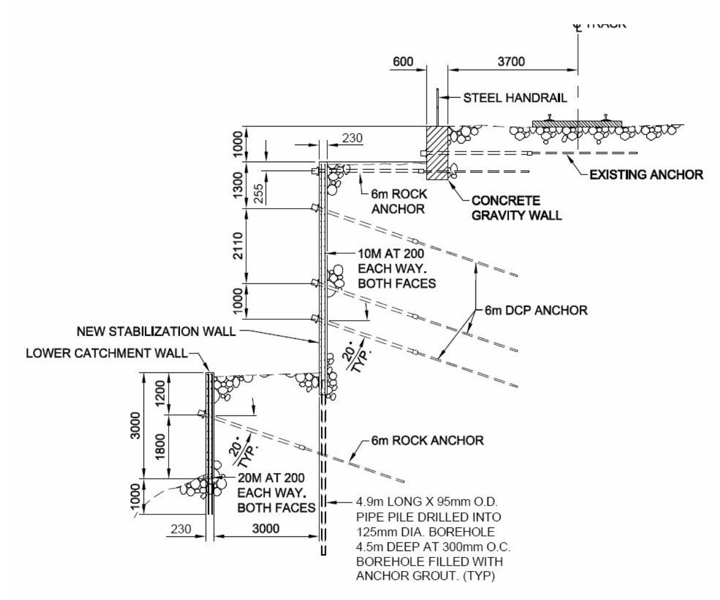



**Figure 18: Tie-back Retaining Wall Design**

### 1.8.9 Civil Structures Route Summary

Each route was analyzed to determine the locations that may require civil structures. Locations requiring bridges, bridge pipes, road crossings and stabilization/protection civil structures were identified along the proposed alignment. Each route was summarized into the number and potential size of bridges and bridge pipes, and the length of stabilization/protection civil structures. A typical civil structure route summary is shown in Table 3:

| **Civil Structures** | **Number** |
|---|---|
| Bridge Pipe | 146 |
| Level Road Crossing | 5 |
| Overpass Road Crossing | 2 |
| Bridges | 34 |
| **Civil Structures** | **Length (mile)** |
| Erosion Protection | 7.62 |
| Rock/Snow Sheds | 0.5 |
| Rock Fall Protection | 8.7 |
| Retaining Walls | 0.2 |

| **Bridges** | | | |
|---|---|---|---|
| **No. Req'd** | **Height (m)** | **Length (m)** | **Total Length** |
| 1 | 5 | 30 | 30 |
| 1 | 6 | 30 | 30 |
| 3 | 8 | 30 | 90 |
| 2 | 8 | 60 | 120 |
| 1 | 8 | 100 | 100 |
| 2 | 8 | 175 | 350 |
| 1 | 15 | 120 | 120 |
| 2 | 15 | 150 | 300 |

| **Bridge Pipes** | | |
|---|---|---|
| **No. Req'd** | **Length (m)** | **Total Length** |
| 55 | 20 | 1,100 |
| 23 | 28 | 644 |
| 4 | 32 | 128 |
| 1 | 36 | 36 |
| 12 | 40 | 480 |
| 2 | 44 | 88 |
| 13 | 68 | 884 |
| 1 | 74 | 74 |

**Table 3: Civil Structures – Typical Route Summary**

A detailed analysis and summary for each evaluated route is in Appendix A.

## *1.9 Route Evaluation*

### 1.9.1 General

Each route was evaluated with respect to the terrain, degree of construction difficulty, and location of civil structures. Typical route summaries were developed for each route with respect to the classification system. The following sections describe the results of the construction evaluation for both BC routes and a comparison of the two.

It should be noted the length of each railway route segment was determined by manual processes due to delays associated with receiving mapping information in electronic formats. As digital data became available, route mileages were recalculated, which resulted in slight differences in the lengths of routes. Therefore, mileages that describe various route details may differ somewhat from miles shown on the final alignments. Additionally, the alignments selected make no consideration of pipeline and utility crossings or cultural features.

## 1.9.2 Fort Nelson, BC to Watson Lake, YT

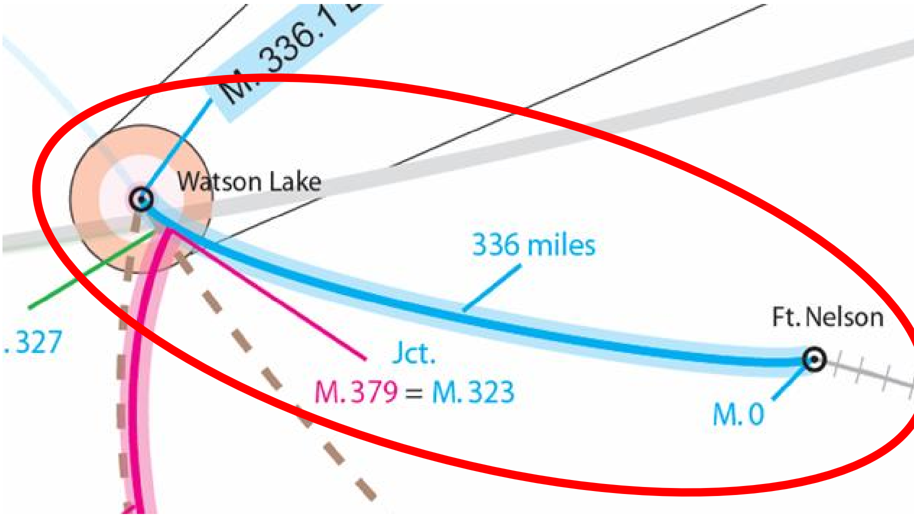



**Figure 19: Fort Nelson to Watson Lake Diagram**

The route alignment from Fort Nelson, BC to Watson Lake, YT shown on Figures 19 and 21 is approximately 336 miles long. Analysis of the route indicated primarily till, fluvial deposits and bedrock over terrain requiring mostly average to heavy grade construction with some very heavy and rock grade construction. This alignment traverses several major rivers including the Muskwa, Dunedin, Liard, and Dease Rivers. One tunnel would be required with a length of approximately 2 miles. Approximately 17 miles of stabilization/protection civil structures are estimated for construction to minimize hazards and maintenance. Some conflicts are expected with the Alaska Highway and will require road crossings. An illustrative summary of the Fort Nelson to Watson Lake terrain analysis is shown on Figure 20.

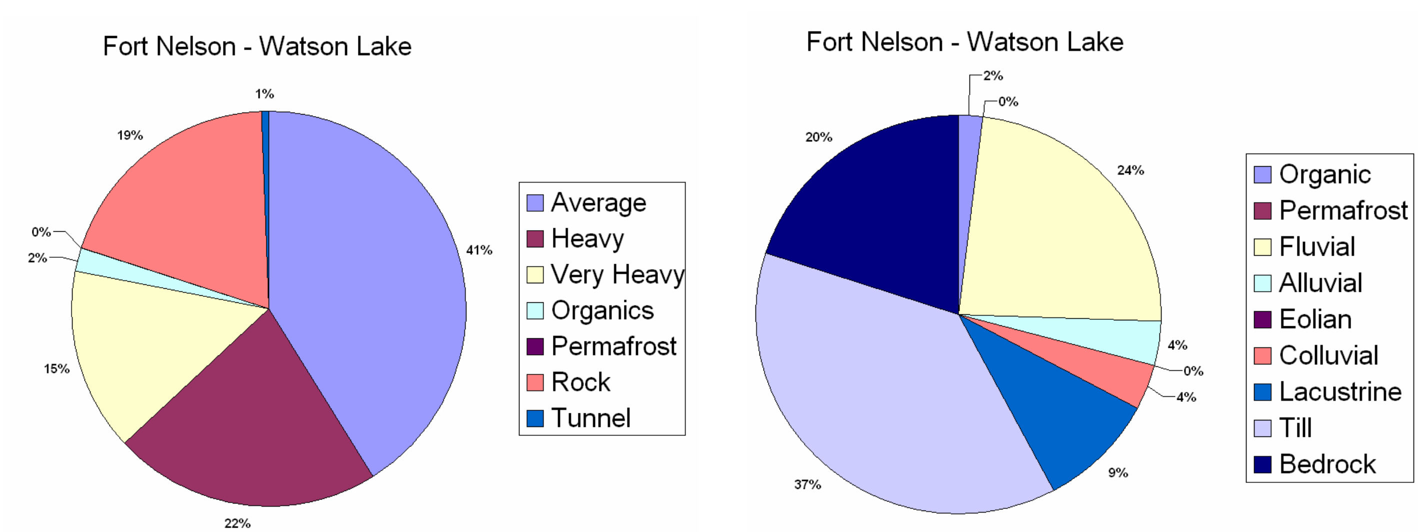



**Figure 20: Fort Nelson to Watson Lake Terrain Analysis**

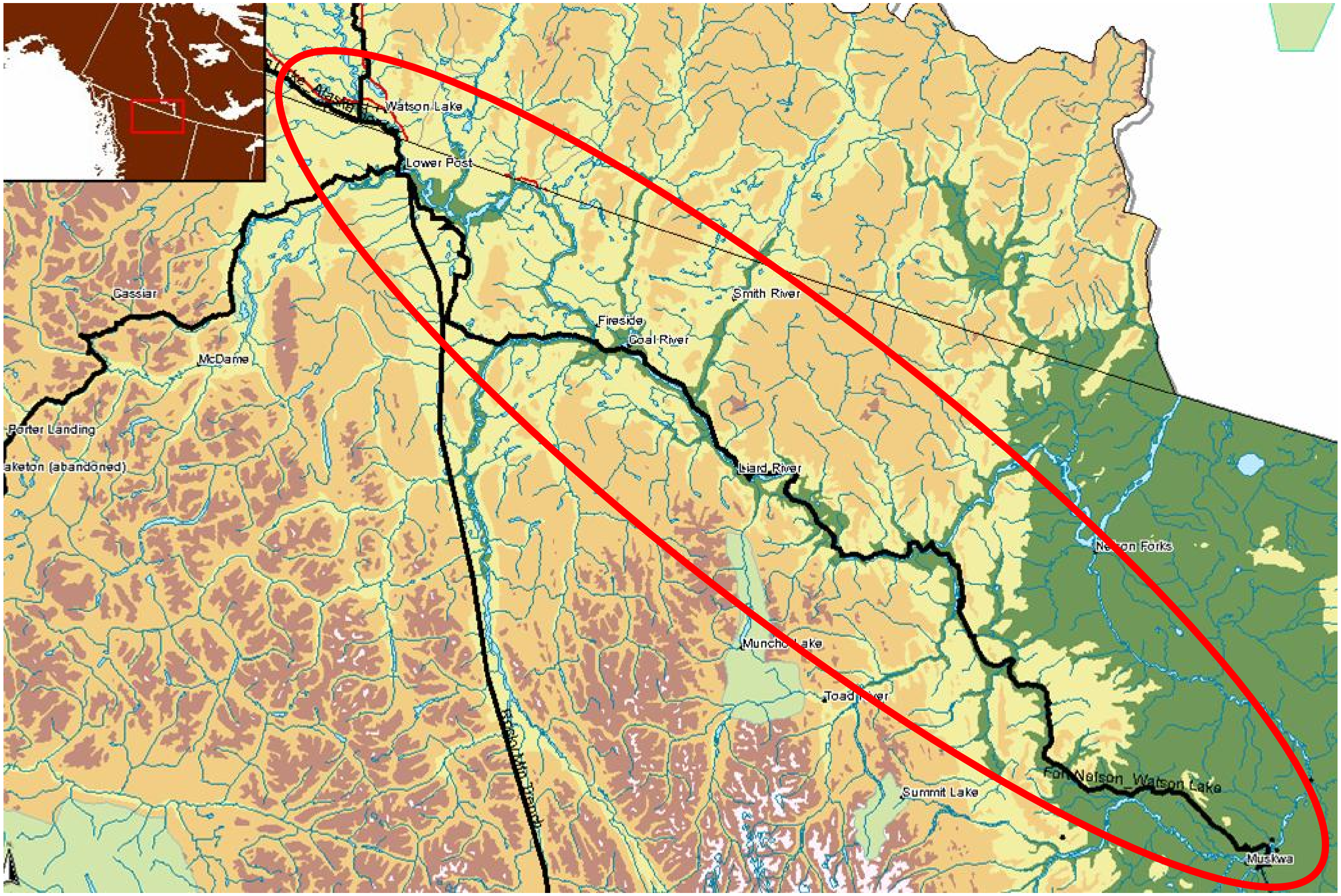



**Figure 21: Fort Nelson to Watson Lake Alignment**

Table 4 shows the complete route summary for the Fort Nelson to Watson Lake alignment. A detailed route analysis for the Fort Nelson to Watson Lake alignment is in Appendix A.

| Terrain Unit | Total Distance |
|---|---|
| Organic | 6.1 |
| Permafrost | 0 |
| Fluvial | 79.3 |
| Alluvial | 12.5 |
| Eolian | 0 |
| Colluvial | 12 |
| Lacustrine | 31.7 |
| Till | 126.1 |
| Bedrock | 67.3 |

| Construction | Total Distance |
|---|---|
| Average | 137.5 |
| Heavy | 74 |
| Very Heavy | 50.1 |
| Organics | 6.1 |
| Permafrost | 0 |
| Rock | 65.3 |
| Tunnel | 2 |

| Civil Structures | Number |
|---|---|
| Bridge Pipe | 146 |
| Level Road Crossing | 5 |
| Overpass Road Crossing | 2 |
| Bridges | 34 |

| Civil Structures | Length (mile) |
|---|---|
| Erosion Protection | 7.62 |
| Rock/Snow Shed | 0.5 |
| Rock Fall Protection | 8.7 |
| Retaining Walls | 0.2 |

| Bridges | | | |
|---|---|---|---|
| No. Req'd | Height (m) | Length (m) | Total Length |
| 1 | 5 | 30 | 30 |
| 1 | 6 | 30 | 30 |
| 3 | 8 | 30 | 90 |
| 2 | 8 | 60 | 120 |
| 1 | 8 | 100 | 100 |
| 2 | 8 | 175 | 350 |
| 1 | 15 | 120 | 120 |
| 2 | 15 | 150 | 300 |
| 1 | 16 | 150 | 150 |
| 1 | 18 | 120 | 120 |
| 1 | 18 | 250 | 250 |
| 1 | 20 | 700 | 700 |
| 1 | 21 | 190 | 190 |
| 1 | 21 | 200 | 200 |
| 1 | 25 | 325 | 325 |
| 1 | 28 | 400 | 400 |
| 1 | 30 | 700 | 700 |
| 1 | 35 | 1300 | 1,300 |
| 1 | 38 | 375 | 375 |
| 1 | 38 | 1100 | 1,100 |
| 1 | 40 | 900 | 900 |
| 1 | 42 | 300 | 300 |
| 1 | 45 | 325 | 325 |
| 1 | 46 | 350 | 350 |
| 1 | 48 | 450 | 450 |
| 1 | 48 | 800 | 800 |
| 1 | 58 | 425 | 425 |
| 1 | 60 | 325 | 325 |
| 1 | 70 | 200 | 200 |
| **34** | **Total Length** | | **11,025** |

| Bridge Pipes | | |
|---|---|---|
| No. Req'd | Length (m) | Total Length |
| 55 | 20 | 1,100 |
| 23 | 28 | 644 |
| 4 | 32 | 128 |
| 1 | 36 | 36 |
| 12 | 40 | 480 |
| 2 | 44 | 88 |
| 13 | 68 | 884 |
| 1 | 74 | 74 |
| 4 | 80 | 320 |
| 1 | 86 | 86 |
| 6 | 98 | 588 |
| 4 | 104 | 416 |
| 4 | 128 | 512 |
| 3 | 158 | 474 |
| 10 | 188 | 1,880 |
| 1 | 218 | 218 |
| 1 | 248 | 248 |
| 1 | 308 | 308 |
| **146** | **Total** | **8,484** |

**Table 4: Fort Nelson to Watson Lake Route Summary**

### 1.9.3 Minaret, BC to Watson Lake, YT

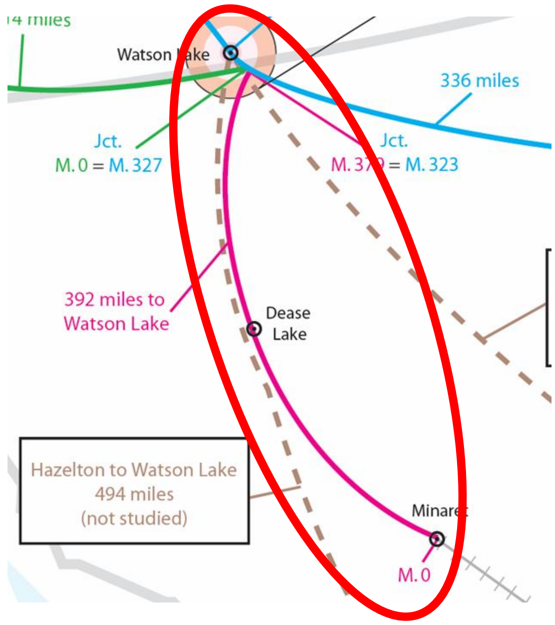
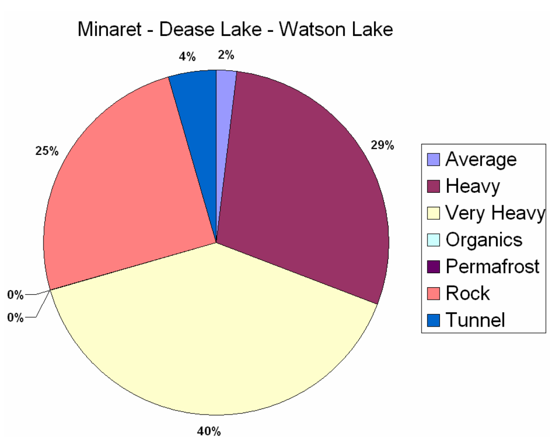



**Figure 22: Minaret to Watson Lake Diagram**

The route alignment from Minaret, BC to Watson Lake, YT shown on Figures 22 and 24 is approximately 392 miles long following the old BCR route via Dease Lake. Analysis of the route indicated primarily till, fluvial deposits and bedrock over terrain requiring mostly heavy, very heavy, and rock grade construction. This alignment traverses several major rivers including the Kluatantan, Spatsizi, Stikine, Tanzilla, Cottonwood, and Blue Rivers. Five tunnels would be required with a total length of approximately 16.5 miles. Approximately 56 miles of stabilization/protection civil structures are estimated for construction to minimize hazards and maintenance. Some conflicts are expected with Highway 37 and will require road crossings. An illustrative summary of the Minaret to Watson Lake Terrain Analysis is shown on Figure 23.



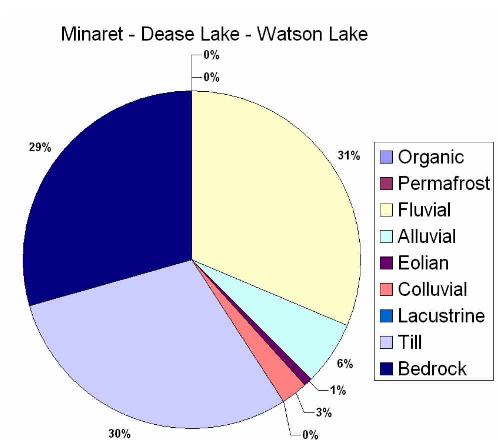




**Figure 23: Minaret to Watson Lake Terrain Analysis**

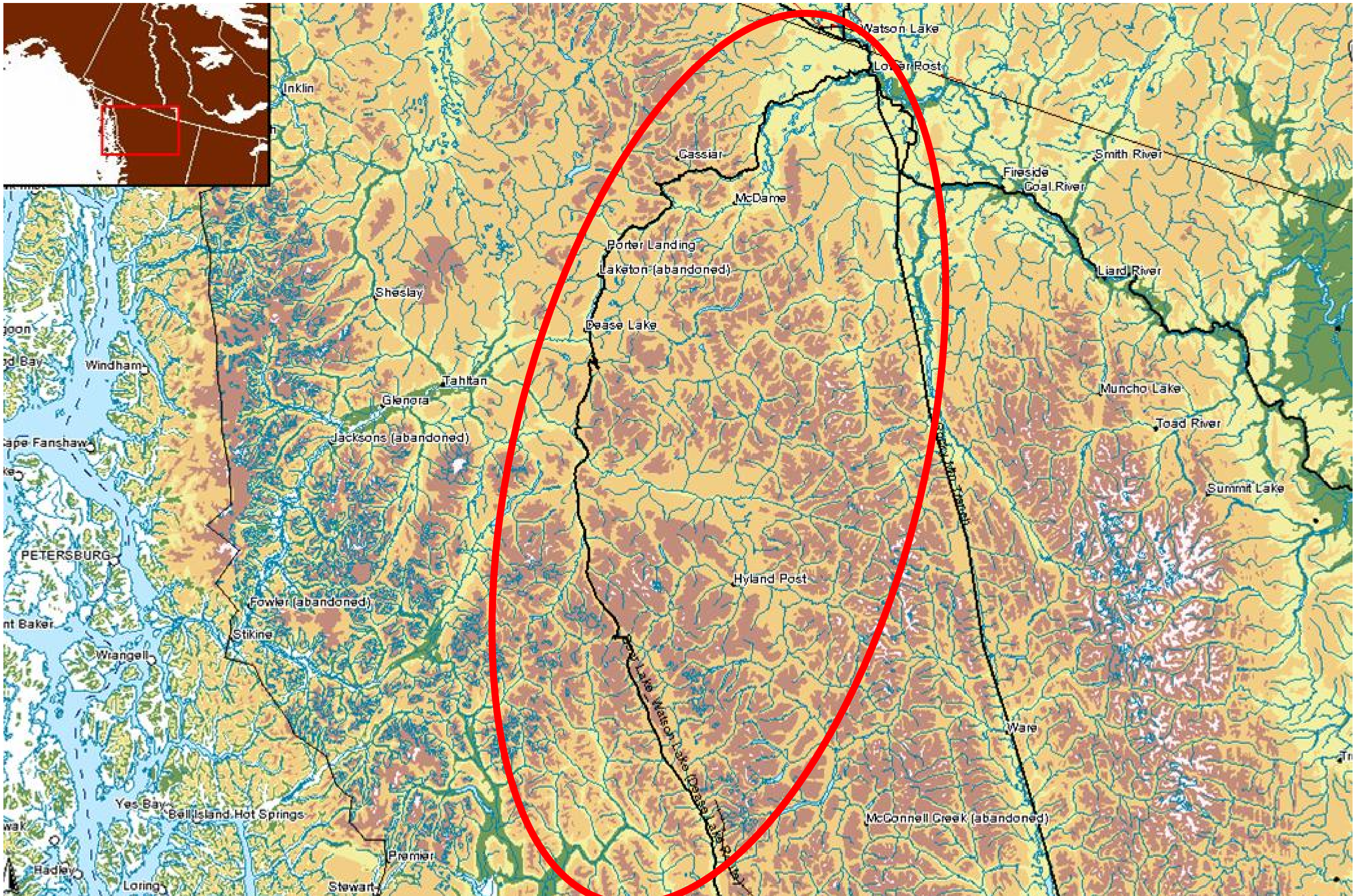



**Figure 24: Minaret to Watson Lake Alignment**

Table 5 below shows the complete route summary for the Minaret to Watson Lake alignment. A detailed route analysis for the Minaret to Watson Lake alignment is in Appendix A.

| Terrain Unit | Total Distance |
|---|---|
| Organic | 0.4 |
| Fluvial | 119.1 |
| Alluvial | 23.3 |
| Eolian | 3 |
| Colluvial | 9.8 |
| Till | 112.4 |
| Bedrock | 112 |

| Construction | Total Distance |
|---|---|
| Average | 7.1 |
| Heavy | 110.1 |
| Very Heavy | 150.4 |
| Organics | 0.4 |
| Rock | 95.5 |
| Tunnel | 16.5 |

| Civil Structures | Number |
|---|---|
| Bridge Pipe (m) | 127 |
| Road Crossing | 17 |
| Bridges | 96 |

| Civil Structures | Length (mile) |
|---|---|
| Erosion Protection | 7.945 |
| Rock/Snow Shed | 1.54 |
| Rock Fall Protection | 18.58 |
| Retaining Walls | 27.625 |

| Bridges | | | |
|---|---|---|---|
| **No Req'd** | **Height (m)** | **Length (m)** | **Total Length** |
| 7 | 6 | 30 | 210 |
| 21 | 8 | 30 | 630 |
| 1 | 8 | 50 | 50 |
| 1 | 8 | 100 | 100 |
| 1 | 8 | 140 | 140 |
| 1 | 10 | 60 | 60 |
| 2 | 12 | 140 | 280 |
| 1 | 13 | 110 | 110 |
| 1 | 13 | 150 | 150 |
| 1 | 13 | 175 | 175 |
| 1 | 15 | 120 | 120 |
| 1 | 15 | 140 | 140 |
| 3 | 15 | 150 | 450 |
| 1 | 15 | 225 | 225 |
| 1 | 17 | 175 | 175 |
| 1 | 17 | 180 | 180 |
| 1 | 18 | 120 | 120 |
| 1 | 18 | 150 | 150 |
| 1 | 18 | 160 | 160 |
| 1 | 18 | 175 | 175 |
| 1 | 18 | 200 | 200 |
| 1 | 20 | 175 | 175 |
| 1 | 20 | 200 | 200 |
| 1 | 21 | 200 | 200 |
| 1 | 22 | 200 | 200 |
| 1 | 23 | 200 | 200 |
| 1 | 24 | 200 | 200 |
| 1 | 25 | 150 | 150 |
| 2 | 25 | 200 | 400 |
| 1 | 26 | 200 | 200 |
| 1 | 26 | 220 | 220 |
| 1 | 26 | 250 | 250 |
| 1 | 27 | 160 | 160 |
| 1 | 27 | 200 | 200 |
| 1 | 27 | 220 | 220 |
| 1 | 28 | 170 | 170 |
| 2 | 28 | 200 | 400 |
| 1 | 28 | 220 | 220 |
| 1 | 30 | 60 | 60 |
| 1 | 30 | 120 | 120 |
| 1 | 30 | 200 | 200 |
| 1 | 30 | 220 | 220 |
| 1 | 30 | 225 | 225 |
| 1 | 32 | 250 | 250 |
| 1 | 32 | 300 | 300 |
| 1 | 35 | 250 | 250 |
| 1 | 35 | 300 | 300 |
| 1 | 36 | 275 | 275 |
| 1 | 36 | 325 | 325 |
| 1 | 38 | 350 | 350 |
| 1 | 42 | 350 | 350 |
| 1 | 43 | 250 | 250 |
| 1 | 44 | 310 | 310 |
| 1 | 45 | 300 | 300 |
| 1 | 45 | 400 | 400 |
| 1 | 46 | 260 | 260 |
| 1 | 48 | 350 | 350 |
| 1 | 50 | 300 | 300 |
| 1 | 53 | 400 | 400 |
| 1 | 69 | 480 | 480 |
| 1 | 70 | 475 | 475 |
| 1 | 70 | 500 | 500 |
| 1 | 80 | 500 | 500 |
| 1 | 80 | 600 | 600 |
| 1 | 94 | 800 | 800 |
| **96** | **Total Length** | | **16,915** |

| Bridge Pipes | | |
|---|---|---|
| **No Req'd** | **Length (m)** | **Total Length** |
| 40 | 20 | 800 |
| 5 | 28 | 140 |
| 3 | 32 | 96 |
| 3 | 40 | 120 |
| 10 | 68 | 680 |
| 1 | 74 | 74 |
| 3 | 80 | 240 |
| 4 | 86 | 344 |
| 9 | 98 | 882 |
| 4 | 104 | 416 |
| 1 | 110 | 110 |
| 3 | 116 | 348 |
| 1 | 122 | 122 |
| 6 | 128 | 768 |
| 1 | 134 | 134 |
| 3 | 140 | 420 |
| 2 | 158 | 316 |
| 2 | 164 | 328 |
| 1 | 170 | 170 |
| 1 | 176 | 176 |
| 1 | 182 | 182 |
| 2 | 188 | 376 |
| 1 | 200 | 200 |
| 5 | 218 | 1,090 |
| 2 | 224 | 448 |
| 1 | 236 | 236 |
| 3 | 278 | 834 |
| 2 | 308 | 616 |
| 1 | 320 | 320 |
| 1 | 332 | 332 |
| 1 | 368 | 368 |
| 1 | 416 | 416 |
| 1 | 428 | 428 |
| 1 | 440 | 440 |
| 1 | 458 | 458 |
| **127** | **Total** | **13,428** |

**Table 5: Dease Lake Route Minaret to Watson Lake Route Summary**

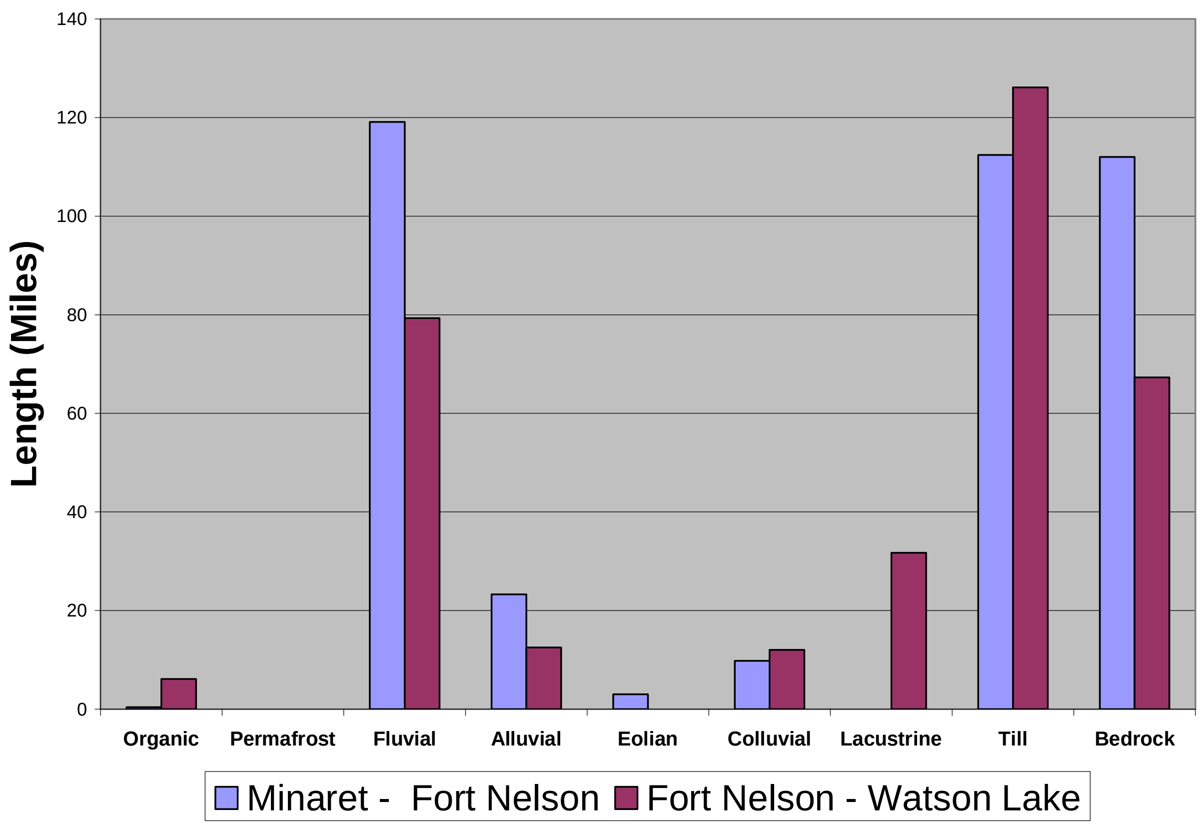
### 1.9.4 Route Comparison

Comparison of each route with respect to the terrain, degree of construction difficulty and location of civil structures is discussed below. It should be noted that each route may have pros and cons in terms of engineering evaluation, however, the length, cultural features, and politics may all affect the decision to select a more favourable or economic route.

<u>Terrain Analysis:</u>

Construction over different terrain units is dependant on many factors. Groundwater, soil composition, density or stiffness may all affect the difficulty in constructing over different terrain units. For comparison purposes of the terrain units, the analysis is considered to be on flat terrain, with no water table and similar soil consistency. Comparisons of the routes are illustrated in Figure 25.

**Figure 25: Terrain Analysis Route Comparison**



Based on the terrain analysis of both BC routes, the Minaret route (112 mi) has 45 miles more bedrock terrain than the Fort Nelson Route (67 mi). Very little organics or permafrost is present on either route. The length of the Minaret – Watson Lake Route (392 mi) is 56 miles longer than the Fort Nelson to Watson Lake Route (336 mi).

<u>Construction Classification:</u>

Analysis of the routes based on construction classification gives an estimate of the level of effort required to construct railway grade. Comparison of the routes should consider the following table with respect to the level of effort required for different construction classifications.

| Construction | Level of Effort |
|---|---|
| Average | **Decreasing** |
| Organics | ↓ |
| Heavy | |
| Permafrost | |
| Very Heavy | |
| Rock | |
| Tunnel | **Increasing** |

**Table 6: Construction Classification Comparison Assessment**

Table 6 is for comparison purposes only and is not a direct relationship to cost or consider specific areas requiring greater level of effort, i.e. organic area requiring similar level of effort as very heavy construction. Comparisons of the routes are illustrated in Figure 26.

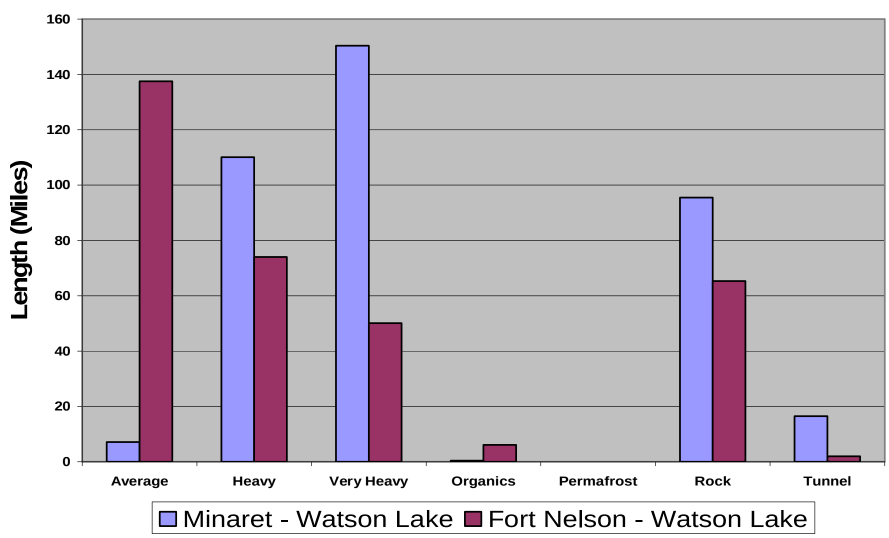



**Figure 26: Construction Classification Route Comparison**

Based on the construction classification of both BC routes, the Minaret route to Watson Lake Route has 100 miles more very heavy construction, 50 miles more rock construction, and 14 more miles of tunnel construction.

Civil Structure Comparison:

Comparison of required civil structures may be the dominating factor in selecting a more favourable route due to the high costs of civil structures. A route involving several large bridges over average terrain may be discarded when compared to a route over difficult terrain without any bridges. Comparisons of the civil structures required along each route are illustrated on Figure 27.

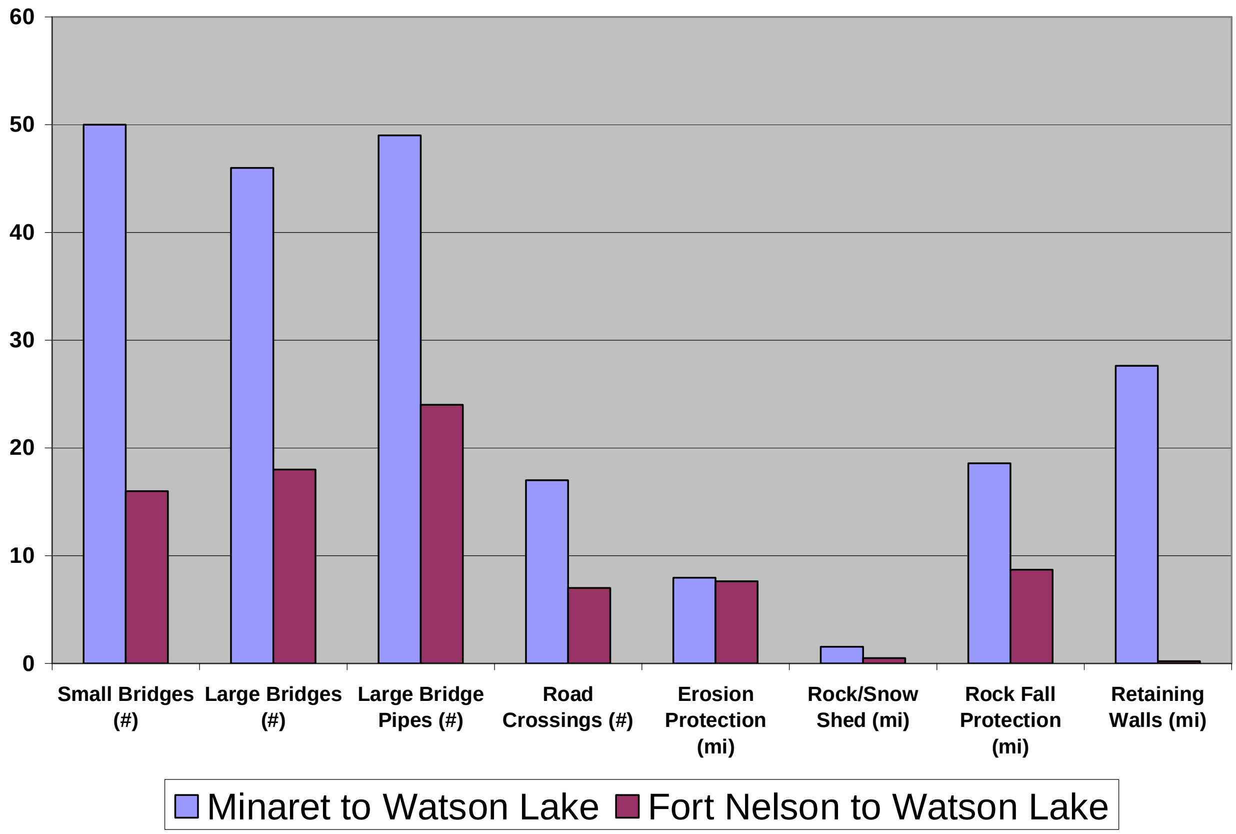



**Figure 27: Civil Structure Route Comparison**

For comparison purposes, bridges were divided into small bridges (less than 20 m high) and large bridges and only bridge pipes in excess of 100 m in length were compared.

The results of the civil structures comparison indicate the Minaret to Watson Lake Route exceeds that of the Fort Nelson to Watson Lake Route in all categories. Of greatest note is the number of large bridges in which the Minaret route (46) exceed the Fort Nelson route (18) by 28.

## *1.10 Conclusion*

A classification system was developed to perform an engineering evaluation of potential rail routes using available mapping information. Selected BC route alignments were manually plotted by establishing control points on NTS maps at a 1:50,000 scale to develop rail line profiles. These alignments and profiles were analyzed to perform the engineering and construction evaluation of the selected routes. The system developed by UMA included performing a terrain analysis of the surficial geology along the alignment, a construction classification to determine the level of effort required to construct the route, and identification of civil structures that may be required. Analysis of each route was performed and classified according to the system using available surficial geology maps, NTS maps, and Google Earth software. Route alignments were digitally plotted over existing mapping information and within the Google Earth software. Flight paths along each route were developed using Google Earth software and recorded onto a DVD appended to this report to support the interpretation of the terrain along each route.

A summary of each route was developed to analyze the total lengths of each terrain unit, construction classification and civil structures. Using the route summaries, comparison of each engineering evaluation was performed. Based on the comparison of the two BC routes, the following conclusions have been made:

- The length of the Minaret - Watson Lake Route (392 mi) is 56 miles longer than the Fort Nelson to Watson Lake Route (336 mi).
- The terrain analysis indicated the Minaret route has 45 miles more bedrock terrain than the Fort Nelson Route. Very little organics or permafrost is present on either route.
- The construction classification indicated the Minaret route has 100 miles more very heavy construction, 50 miles more rock construction, and 14 more miles of tunnel construction than the Fort Nelson Route.
- The results of the civil structures comparison indicate the Minaret Route exceeds that of the Fort Nelson Route in all categories. Of greatest note is the number of large bridges in which the Minaret route (46) exceed the Fort Nelson route (18) by 28.

Based on these comparisons, the Fort Nelson to Watson Lake route is a preferred route through British Columbia in terms of construction and engineering feasibility.

## *1.11 References*

**ENERGY, MINES AND RESOURCES CANADA, NATIONAL TOPOGRAPHIC SYSTEM, SURVEYS AND MAPPING BRANCH.** Etopo map system

**GARTNER LEE, GEOPORTAL WEBSITE.** Mapping information obtained from https://geoportal.gartnerlee.com/universityAlaskaFairbanks

**GOOGLE EARTH PROFESSIONAL, VERSION 3.0**

**INTERNATIONAL UNION OF GEOLOGICAL SCIENCES.** Information obtained from http://www.iugs.org/

**NATURAL RESOURCES CANADA, EARTHQUAKES CANADA.** Earthquake information retrieved from http://earthquakescanada.nrcan.gc.ca

**NATURAL RESOURCES CANADA, EARTH SCIENCE INFORMATION CENTRE, GEOSCAN.** Mapping information retrieved from http://ess.nrcan.gc.ca/esic/geoscan_e.php

**RAILPICTURES.NET.** Descriptive photographs obtained from http://www.railpictures.net

**YUKON GEOLOGICAL SURVEY, ENERGY, MINES AND RESOURCES.** Descriptive photographs obtained from Geoscience Map 2005-5 Surficial Geology of Robinson (NTS 105D/07), Yukon (1:50 000 scale) by J.D. Bond, S.R. Morison and K. McKenna

## *1.12 Closing*

**Limitations**

This report has been prepared by UMA Engineering Ltd. ("UMA") for the benefit of Alaska Canada Rail Link Project (ALCAN). The information and data contained herein, represents UMA's best professional judgment in light of the knowledge and information available to UMA at the time of preparation.

Except as required by law, this report and the information and data contained herein are to be treated as confidential and, unless otherwise agreed to by UMA and ALCAN, may be used and relied upon only by ALCAN, its officers and employees. UMA denies any liability whatsoever to other parties who may obtain access to this report for any injury, loss or damage suffered by such parties arising from their use of, or reliance upon, this report or any of its contents without the express written consent of UMA and ALCAN.

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# Appendix A -
# Detailed Engineering Evaluation of Routes

## Fort Nelson to Watson Lake

| Terrain Analysis | | | | | | | Size of Civil Structure | | | | | | | | | | | | | | | Grade Construction | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Bridge Dimensions | | Bridge Length (ft.) by Height Class | | | | Bridge Pipes | Erosion Protection | Rock/Snow Shed | Rock Fall Protection | Retaining Walls | Road | | | Tunnel | Average | Heavy | Very Heavy | Rock Grade | Organic | Permafrost |
| **Start M.P.** | **Miles** | **End M.P.** | **Terrain Unit** | **Construction** | **Features Requiring Civil Structures** | **Comments** | Height (m) | Length (m) | < 50' high | 51' - 100' high | 101' - 200' high | 201' - 300' high | Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Level Xings | Overpass Length (m) | Rail Bridge Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) |
| 0 | 1.3 | 1.3 | Fluvial | Average | | Review for potential aggregate source | | | | | | | | | | | | | | | | 1.3 | | | | | |
| 1.3 | 0.5 | 1.8 | Fluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 0.5 | | | |
| 1.8 | 1.2 | 3 | Fluvial | Average | | Review for potential aggregate source | | | | | | | | | | | | | | | | 1.2 | | | | | |
| 3 | 0.6 | 3.6 | Till | Very Heavy | | | | | | | | | | | | | | | | | | | | 0.6 | | | |
| 3.6 | 0.4 | 4 | Alluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 0.4 | | | |
| 3.8 | | | Bridge Pipe | 86 m | Tributary | | | | | | | | 86 | | | | | | | | | | | | | | |
| 4 | 1.9 | 5.9 | Till | Very Heavy | | | | | | | | | | | | | | | | | | | | 1.9 | | | |
| 5.9 | 0.7 | 6.6 | Fluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 0.7 | | | |
| 5.9 | | | Bridge | 35 m x 1300 m | River | Muskwa River, 200 ft riprap erosion protection | 35 | 1300 | | | 4,265 | | | 0.04 | | | | | | | | | | | | | |
| 6.6 | 1.1 | 7.7 | Till | Very Heavy | | | | | | | | | | | | | | | | | | | | 1.1 | | | |
| 7.7 | 1.3 | 9 | Alluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 1.3 | | | |
| 8 | | | Bridge Pipe | 248 m | Tributary | | | | | | | | 248 | | | | | | | | | | | | | | |
| 8.8 | | | Bridge Pipe | 308 m | Tributary | | | | | | | | 308 | | | | | | | | | | | | | | |
| 9 | 4 | 13 | Till | Average | | | | | | | | | | | | | | | | | | 4.0 | | | | | |
| 9.8 | | | Crossing | Road Overpass | Rail | Alaska Highway (10 m x 56 m) | | | | | | | | | | | | | 56 | | | | | | | | |
| 11.7 | | | Crossing | Road Overpass | Rail | town road (8 m x 48 m) | | | | | | | | | | | | | 48 | | | | | | | | |
| 13 | 1.3 | 14.3 | Till | Average | | | | | | | | | | | | | | | | | | 1.3 | | | | | |
| 14.3 | 0.3 | 14.6 | Alluvial | Average | | Review for potential aggregate source | | | | | | | | | | | | | | | | 0.3 | | | | | |
| 14.5 | | | Bridge Pipe | 32 m | Tributary | | | | | | | | 32 | | | | | | | | | | | | | | |
| 14.6 | 2.4 | 17 | Lacustrine | Average | | | | | | | | | | | | | | | | | | 2.4 | | | | | |
| 17 | 2 | 19 | Till | Average | | | | | | | | | | | | | | | | | | 2.0 | | | | | |
| 18.5 | | | Bridge Pipe | 40 m | Tributary | | | | | | | | 40 | | | | | | | | | | | | | | |
| 19 | 1.5 | 20.5 | Lacustrine | Average | | | | | | | | | | | | | | | | | | 1.5 | | | | | |
| 20.5 | 0.2 | 20.7 | Alluvial | Average | | Review for potential aggregate source | | | | | | | | | | | | | | | | 0.2 | | | | | |
| 20.6 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 20.7 | 9.3 | 30 | Lacustrine | Average | | | | | | | | | | | | | | | | | | 9.3 | | | | | |
| 21.8 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 23.2 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 23.8 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 28.2 | | | Bridge Pipe | 40 m | Tributary | | | | | | | | 40 | | | | | | | | | | | | | | |
| 29.7 | | | Bridge Pipe | 40 m | Tributary | | | | | | | | 40 | | | | | | | | | | | | | | |
| 30 | 2.5 | 32.5 | Lacustrine | Heavy | | | | | | | | | | | | | | | | | | | 2.5 | | | | |
| 32.5 | 5 | 37.5 | Lacustrine | Average | | | | | | | | | | | | | | | | | | 5.0 | | | | | |
| 33 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 33.1 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 33.9 | | | Bridge Pipe | 40 m | Tributary | | | | | | | | 40 | | | | | | | | | | | | | | |
| 34.4 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 37.5 | 0.5 | 38 | Fluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 0.5 | | | |
| 37.7 | | | Bridge | 28 m x 400 m | Creek | Raspberry Creek | 28 | 400 | | 1,312 | | | | | | | | | | | | | | | | | |
| 38 | 1 | 39 | Till | Average | | | | | | | | | | | | | | | | | | 1.0 | | | | | |
| 38.2 | | | Crossing | Road Relocation | Road | Alaska Highway | | | | | | | | | | | | | | | | | | | | | |
| 38.8 | | | Crossing | Road Relocation | Road | Alaska Highway | | | | | | | | | | | | | | | | | | | | | |
| 39 | 1.5 | 40.5 | Lacustrine | Average | | | | | | | | | | | | | | | | | | 1.5 | | | | | |
| 39.6 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 40.5 | 1 | 41.5 | Organics | Organic | | | | | | | | | | | | | | | | | | | | | | 1.0 | |
| 41.3 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 41.5 | 7.5 | 49 | Lacustrine | Average | | | | | | | | | | | | | | | | | | 7.5 | | | | | |
| 41.8 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 42.1 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 42.5 | | | Bridge Pipe | 40 m | Tributary | | | | | | | | 40 | | | | | | | | | | | | | | |
| 43.3 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 43.6 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 43.8 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 43.9 | | | Crossing | Level | Road | Alaska Highway | | | | | | | | | | | | 1 | | | | | | | | | |
| 45.2 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 45.5 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 46.2 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 46.7 | | | Bridge Pipe | 44 m | Tributary | | | | | | | | 44 | | | | | | | | | | | | | | |
| 48.7 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 49 | 2 | 51 | Lacustrine | Heavy | | | | | | | | | | | | | | | | | | | 2.0 | | | | |
| 50.5 | | | Bridge Pipe | 98 m | Tributary | | | | | | | | 98 | | | | | | | | | | | | | | |
| 51 | 3 | 54 | Colluvial | Very Heavy | | Rock Fall Protection along 15% of grade length | | | | | | | | | | 0.4 | | | | | | | | 3.0 | | | |
| 54 | 4.3 | 58.3 | Colluvial | Heavy | | | | | | | | | | | | | | | | | | | 4.3 | | | | |
| 55 | | | Bridge Pipe | 40 m | Tributary | | | | | | | | 40 | | | | | | | | | | | | | | |
| 58.3 | 0.8 | 59.1 | Fluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 0.8 | | | |
| 58.7 | | | Bridge | 38 m x 375 m | Creek | | 38 | 375 | | | 1,230 | | | | | | | | | | | | | | | | |
| 59.1 | 1 | 60.1 | Till | Heavy | | | | | | | | | | | | | | | | | | | 1.0 | | | | |
| 59.9 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 60.1 | 0.2 | 60.3 | Colluvial | Very Heavy | | Rock Fall Protection along 100% of grade length | | | | | | | | | | 0.2 | | | | | | | | 0.2 | | | |

## Fort Nelson to Watson Lake

| Start M.P. | Miles | End M.P. | Terrain Unit | Construction | Features Requiring Civil Structures | Comments | Bridge Dimensions Height (m) | Bridge Dimensions Length (m) | Bridge Length (ft.) by Height Class < 50' high | 51' - 100' high | 101' - 200' high | 201' - 300' high | Bridge Pipes Length (m) | Erosion Protection Length (mile) | Rock/Snow Shed Length (mile) | Rock Fall Protection Length (mile) | Retaining Walls Length (mile) | Road Level Xings | Road Overpass Length (m) | Road Rail Bridge Length (m) | Tunnel Length (mile) | Grade Construction Average Length (mile) | Heavy Length (mile) | Very Heavy Length (mile) | Rock Grade Length (mile) | Organic Length (mile) | Permafrost Length (mile) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60.3 | 0.8 | 61.1 | Colluvial | Heavy | | | | | | | | | | | | | | | | | | | 0.8 | | | | |
| 61.1 | 15.6 | 76.7 | Till | Heavy | | | | | | | | | | | | | | | | | | | 15.6 | | | | |
| 61.6 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 62.1 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 62.6 | | | Bridge Pipe | 104 m | Tributary | | | | | | | | 104 | | | | | | | | | | | | | | |
| 63 | | | Bridge Pipe | 74 m | Tributary | | | | | | | | 74 | | | | | | | | | | | | | | |
| 65.2 | | | Bridge Pipe | 104 m | Tributary | | | | | | | | 104 | | | | | | | | | | | | | | |
| 68.9 | | | Bridge Pipe | 44 m | Tributary | | | | | | | | 44 | | | | | | | | | | | | | | |
| 69.3 | | | Bridge Pipe | 80 m | Tributary | | | | | | | | 80 | | | | | | | | | | | | | | |
| 69.8 | | | Bridge Pipe | 98 m | Tributary | | | | | | | | 98 | | | | | | | | | | | | | | |
| 70.4 | | | Bridge Pipe | 98 m | Tributary | | | | | | | | 98 | | | | | | | | | | | | | | |
| 71.1 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 71.8 | | | Bridge Pipe | 40 m | Tributary | | | | | | | | 40 | | | | | | | | | | | | | | |
| 72.5 | | | Bridge Pipe | 158 m | Tributary | | | | | | | | 158 | | | | | | | | | | | | | | |
| 73.1 | | | Bridge Pipe | 128 m | Tributary | | | | | | | | 128 | | | | | | | | | | | | | | |
| 74 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | 68 | | | | | | | | | | | | | | |
| 74.9 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 75.6 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 76.7 | 0.4 | 77.1 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 0.4 | | |
| 76.9 | | | Bridge | 25 m x 325 m | Creek | Odayin Creek | 25 | 325 | | 1,066 | | | | | | | | | | | | | | | | | |
| 77.1 | 2.7 | 79.8 | Till | Heavy | | | | | | | | | | | | | | | | | | | 2.7 | | | | |
| 79.3 | | | Bridge Pipe | 32 m | Tributary | | | | | | | | 32 | | | | | | | | | | | | | | |
| 79.8 | 0.5 | 80.3 | Colluvial | Very Heavy | | Rock Fall Protection along 100% of grade length | | | | | | | | | | 0.5 | | | | | | | | 0.5 | | | |
| 80.3 | 1.4 | 81.7 | Till | Average | | | | | | | | | | | | | | | | | | 1.4 | | | | | |
| 80.5 | | | Bridge Pipe | 40 m | Tributary | | | | | | | | 40 | | | | | | | | | | | | | | |
| 81.1 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | 68 | | | | | | | | | | | | | | |
| 81.6 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 81.7 | 0.5 | 82.2 | Colluvial | Heavy | | Rock Fall Protection along 100% of grade length | | | | | | | | | | 0.5 | | | | | | | 0.5 | | | | |
| 82.2 | 1.5 | 83.7 | Till | Heavy | | | | | | | | | | | | | | | | | | | 1.5 | | | | |
| 83.5 | | | Bridge Pipe | 36 m | Tributary | | | | | | | | 36 | | | | | | | | | | | | | | |
| 83.7 | 2.7 | 86.4 | Colluvial | Very Heavy | | Rock Fall Protection along 90% of grade length, Erosion Protection along 60% of grade length | | | | | | | | 1.9 | | 2.4 | | | | | | | | 2.7 | | | |
| 86.4 | 3.6 | 90 | Till | Heavy | | | | | | | | | | | | | | | | | | | 3.6 | | | | |
| 90 | 0.8 | 90.8 | Till | Very Heavy | | | | | | | | | | | | | | | | | | | | 0.8 | | | |
| 90.7 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 90.8 | 0.9 | 91.7 | Till | Average | | | | | | | | | | | | | | | | | | 0.9 | | | | | |
| 91.7 | 1 | 92.7 | Till | Very Heavy | | | | | | | | | | | | | | | | | | | | 1.0 | | | |
| 91.9 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 92.7 | 3.6 | 96.3 | Bedrock | Rock Grade | | Rock Fall Protection along 30% of grade length | | | | | | | | | | 1.3 | | | | | | | | | 3.6 | | |
| 92.7 | | | Bridge | 58 m x 425 m | River | Dunedin River, 200 ft riprap erosion protection | 58 | 425 | | | 1,394 | | | 0.04 | | | | | | | | | | | | | |
| 96.3 | 0.7 | 97 | Till | Heavy | | | | | | | | | | | | | | | | | | | 0.7 | | | | |
| 97 | 7 | 104 | Till | Average | | | | | | | | | | | | | | | | | | 7.0 | | | | | |
| 100.1 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 101.1 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 101.9 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 103 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 104 | 1.4 | 105.4 | Till | Heavy | | | | | | | | | | | | | | | | | | | 1.4 | | | | |
| 105.4 | 0.2 | 105.6 | Organics | Organic | | | | | | | | | | | | | | | | | | | | | | 0.2 | |
| 105.4 | | | Bridge Pipe | 98 m | Tributary | | | | | | | | 98 | | | | | | | | | | | | | | |
| 105.6 | 0.7 | 106.3 | Till | Heavy | | | | | | | | | | | | | | | | | | | 0.7 | | | | |
| 106.3 | 1.5 | 107.8 | Organics | Organic | | | | | | | | | | | | | | | | | | | | | | 1.5 | |
| 107.8 | 12.9 | 120.7 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 12.9 | | |
| 108 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 109 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 110.1 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 110.5 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 111.7 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 113.6 | | | Bridge Pipe | 218 m | Tributary | | | | | | | | 218 | | | | | | | | | | | | | | |
| 113.9 | | | Bridge Pipe | 188 m | Tributary | | | | | | | | 188 | | | | | | | | | | | | | | |
| 115.2 | | | Bridge Pipe | 188 m | Tributary | | | | | | | | 188 | | | | | | | | | | | | | | |
| 115.4 | | | Bridge Pipe | 98 m | Tributary | | | | | | | | 98 | | | | | | | | | | | | | | |
| 118.2 | | | Bridge | 8 m x 30 m | Tributary | debris flow | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | |
| 120.7 | 0.2 | 120.9 | Bedrock | Rock Grade | | Rock Shed along 100% of grade length | | | | | | | | | 0.2 | | | | | | | | | | 0.2 | | |
| 120.9 | 8.6 | 129.5 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 8.6 | | |
| 120.8 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 122 | | | Bridge Pipe | 128 m | Tributary | | | | | | | | 128 | | | | | | | | | | | | | | |
| 122.6 | | | Bridge Pipe | 188 m | Tributary | | | | | | | | 188 | | | | | | | | | | | | | | |
| 123.1 | | | Bridge Pipe | 32 m | Tributary | | | | | | | | 32 | | | | | | | | | | | | | | |
| 124.9 | | | Bridge Pipe | 128 m | Tributary | | | | | | | | 128 | | | | | | | | | | | | | | |
| 126.7 | | | Bridge Pipe | 188 m | Tributary | | | | | | | | 188 | | | | | | | | | | | | | | |
| 127 | | | Bridge Pipe | 158 m | Tributary | | | | | | | | 158 | | | | | | | | | | | | | | |
| 128.4 | | | Bridge Pipe | 40 m | Tributary | | | | | | | | 40 | | | | | | | | | | | | | | |

## Fort Nelson to Watson Lake

| Terrain Analysis | | | | | | | Size of Civil Structure: Bridge Dimensions | | Bridge Length (ft.) by Height Class | | | | Bridge Pipes | Erosion Protection | Rock/Snow Shed | Rock Fall Protection | Retaining Walls | Road | | | Tunnel | Grade Construction: Average | Heavy | Very Heavy | Rock Grade | Organic | Permafrost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Start M.P.** | **Miles** | **End M.P.** | **Terrain Unit** | **Construction** | **Features Requiring Civil Structures** | **Comments** | Height (m) | Length (m) | < 50' high | 51' - 100' high | 101' - 200' high | 201' - 300' high | Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Level Xings | Overpass Length (m) | Rail Bridge Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) |
| 129.5 | 2.2 | 131.7 | Bedrock | Rock Grade | | Rock Fall Protection along 25% of grade length | | | | | | | | | | 0.5 | | | | | | | | | 2.2 | | |
| 131.3 | | | Bridge | 48 m x 800 m | River | Liard River, 200 ft riprap erosion control | 48 | 800 | | | 2,625 | | | 0.04 | | | | | | | | | | | | | |
| 131.7 | 0.3 | 132 | Bedrock | Rock Grade | | Rock Shed along 100% of grade length | | | | | | | | | 0.3 | | | | | | | | | | 0.3 | | |
| 132 | 2.5 | 134.5 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 2.5 | | |
| 134.5 | 2 | 136.5 | Bedrock | Rock Grade | | Rock Fall Protection along 100% of grade length, Erosion Protection along 60% of grade length | | | | | | | | 1.3 | | 2 | | | | | | | | | 2.0 | | |
| 136.5 | 5 | 141.5 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 5.0 | | |
| 137.5 | | | Bridge | 18 m x 250 m | River | Grayling River, 200 ft riprap erosion control | 18 | 250 | | 820 | | | | 0.04 | | | | | | | | | | | | | |
| 138.9 | | | Bridge | 15 m x 150 m | Creek | | 15 | 150 | 492 | | | | | | | | | | | | | | | | | | |
| 139.1 | | | Bridge | 15 m x 150 m | Creek | | 15 | 150 | 492 | | | | | | | | | | | | | | | | | | |
| 140.1 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | 68 | | | | | | | | | | | | | | |
| 141.5 | 1.5 | 143 | Bedrock | Rock Grade | | Erosion Protection along 50% of grade length | | | | | | | | 0.8 | | | | | | | | | | | 1.5 | | |
| 143 | 6.2 | 149.2 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 6.2 | | |
| 142.8 | | | Bridge Pipe | 188 m | Tributary | | | | | | | | 188 | | | | | | | | | | | | | | |
| 144 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 144.5 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 145.4 | | | Bridge Pipe | 188 m | Tributary | | | | | | | | 188 | | | | | | | | | | | | | | |
| 146 | | | Bridge | 18 m x 120 m | Creek | Brimestone Creek | 18 | 120 | | 394 | | | | | | | | | | | | | | | | | |
| 148.4 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 149.2 | 0.1 | 149.3 | Bedrock | Rock Grade | | Retaining Wall along 100% of grade length | | | | | | | | | | | 0.1 | | | | | | | | 0.1 | | |
| 149.3 | 2 | 151.3 | Bedrock | Tunnel | | | | | | | | | | | | | | | | | 2.0 | | | | | | |
| 151.3 | 0.1 | 151.4 | Bedrock | Rock Grade | | Retaining Wall along 100% of grade length | | | | | | | | | | | 0.1 | | | | | | | | 0.1 | | |
| 151.4 | 2.5 | 153.9 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 2.5 | | |
| 151.7 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | 68 | | | | | | | | | | | | | | |
| 152.1 | | | Bridge | 45 m x 325 m | Tributary | debris flow | 45 | 325 | | | 1,066 | | | | | | | | | | | | | | | | |
| 153.1 | | | Bridge | 46 m x 350 m | Tributary | debris flow | 46 | 350 | | | 1,148 | | | | | | | | | | | | | | | | |
| 153.9 | 0.9 | 154.8 | Alluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | 0.9 | | | | |
| 154 | | | Bridge Pipe | 80 m | Tributary | | | | | | | | 80 | | | | | | | | | | | | | | |
| 154.8 | 0.5 | 155.3 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 0.5 | | |
| 154.8 | | | Bridge | 48 m x 450 m | River | Liard River, 200 ft riprap erosion control | 48 | 450 | | | 1,476 | | | 0.04 | | | | | | | | | | | | | |
| 155.3 | 1.1 | 156.4 | Alluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | 1.1 | | | | |
| 156.4 | 0.2 | 156.6 | Alluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 0.2 | | | |
| 156.5 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 156.6 | 3.8 | 160.4 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 3.8 | | |
| 157.6 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 160.4 | 0.6 | 161 | Bedrock | Rock Grade | | Rock Fall Protection along 65% of grade length | | | | | | | | | | 0.4 | | | | | | | | | 0.6 | | |
| 161 | 2 | 163 | Alluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 2.0 | | | |
| 161.3 | | | Bridge | 60 m x 325 m | Creek | Sulphur Creek | 60 | 325 | | | 1,066 | | | | | | | | | | | | | | | | |
| 163 | 1.1 | 164.1 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 1.1 | | |
| 164.1 | 0.2 | 164.3 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 0.2 | | |
| 164.2 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 164.3 | 1.5 | 165.8 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 1.5 | | |
| 164.9 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 165.6 | | | Bridge Pipe | 188 m | Tributary | | | | | | | | 188 | | | | | | | | | | | | | | |
| 165.8 | 2.5 | 168.3 | Fluvial | Average | | Review for potential aggregate source | | | | | | | | | | | | | | | | 2.5 | | | | | |
| 168.3 | 1.2 | 169.5 | Fluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 1.2 | | | |
| 168.5 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 168.8 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 169.5 | 0.3 | 169.8 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 0.3 | | |
| 169.8 | 1.2 | 171 | Fluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 1.2 | | | |
| 171 | 1.8 | 172.8 | Fluvial | Average | | Review for potential aggregate source | | | | | | | | | | | | | | | | 1.8 | | | | | |
| 171.7 | | | Bridge Pipe | 188 m | Tributary | | | | | | | | 188 | | | | | | | | | | | | | | |
| 172.5 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 172.8 | 0.6 | 173.4 | Organics | Organic | | | | | | | | | | | | | | | | | | | | | | 0.6 | |
| 173.4 | 2.6 | 176 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 2.6 | | |
| 174.4 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 174.8 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 175.8 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | 68 | | | | | | | | | | | | | | |
| 175.9 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | 68 | | | | | | | | | | | | | | |
| 176 | 2.7 | 178.7 | Bedrock | Rock Grade | | Erosion Protection along 35% of grade length | | | | | | | | 1 | | | | | | | | | | | 2.7 | | |

## Fort Nelson to Watson Lake

| Terrain Analysis | | | | | | | Size of Civil Structure | | | | | | | | | | | | | | | Grade Construction | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Bridge Dimensions | | Bridge Length (ft.) by Height Class | | | | Bridge Pipes | Erosion Protection | Rock/Snow Shed | Rock Fall Protection | Retaining Walls | Road | | | Tunnel | Average | Heavy | Very Heavy | Rock Grade | Organic | Permafrost |
| **Start M.P.** | **Miles** | **End M.P.** | **Terrain Unit** | **Construction** | **Features Requiring Civil Structures** | **Comments** | Height (m) | Length (m) | < 50' high | 51' - 100' high | 101' - 200' high | 201' - 300' high | Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Level Xings | Overpass Length (m) | Rail Bridge Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) |
| 178.1 | | | Bridge | 30 m x 700 m | River | Liard River, 200 ft riprap erosion control | 30 | 700 | | 2,297 | | | | 0.04 | | | | | | | | | | | | | |
| 178.7 | 1.3 | 180 | Fluvial | Very Heavy | | Erosion Protection along 25% of grade length; Review for potential aggregate source | | | | | | | | 0.3 | | | | | | | | | | 1.3 | | | |
| 179.2 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | 68 | | | | | | | | | | | | | | |
| 179.8 | | | Bridge | 15 m x 120 m | Creek | Canyon Creek | 15 | 120 | 394 | | | | | | | | | | | | | | | | | | |
| 180 | 1.3 | 181.3 | Fluvial | Average | | Review for potential aggregate source | | | | | | | | | | | | | | | | 1.3 | | | | | |
| 181.3 | 1.7 | 183 | Fluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 1.7 | | | |
| 181.7 | | | Bridge | 21 m x 200 m | River | Deer River, 200 ft riprap erosion control | 21 | 200 | | 656 | | | | 0.04 | | | | | | | | | | | | | |
| 183 | 2.3 | 185.3 | Fluvial | Average | | Review for potential aggregate source | | | | | | | | | | | | | | | | 2.3 | | | | | |
| 184.4 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | 68 | | | | | | | | | | | | | | |
| 185.3 | 0.3 | 185.6 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 0.3 | | |
| 185.6 | 0.4 | 186 | Alluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | 0.4 | | | | |
| 185.8 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | 68 | | | | | | | | | | | | | | |
| 186 | 1 | 187 | Fluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 1.0 | | | |
| 187 | 2 | 189 | Fluvial | Average | | Review for potential aggregate source | | | | | | | | | | | | | | | | 2.0 | | | | | |
| 188.3 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | 68 | | | | | | | | | | | | | | |
| 189 | 1.5 | 190.5 | Fluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 1.5 | | | |
| 189 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 189.5 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 190.5 | 2 | 192.5 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | 2.0 | | | | |
| 192.5 | 1.5 | 194 | Fluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 1.5 | | | |
| 194 | 2.4 | 196.4 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 2.4 | | |
| 194.1 | | | Bridge Pipe | 80 m | Tributary | | | | | | | | 80 | | | | | | | | | | | | | | |
| 196.4 | 6.7 | 203.1 | Fluvial | Average | | Review for potential aggregate source | | | | | | | | | | | | | | | | 6.7 | | | | | |
| 197.1 | | | Bridge Pipe | 104 m | Tributary | | | | | | | | 104 | | | | | | | | | | | | | | |
| 197.8 | | | Bridge Pipe | 104 m | Tributary | | | | | | | | 104 | | | | | | | | | | | | | | |
| 200.3 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 200.5 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 203 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 203.1 | 0.3 | 203.4 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | 0.3 | | | | |
| 203.4 | 0.5 | 203.9 | Fluvial | Very Heavy | | Rock Fall Protection along 100% of grade length, Erosion Protection along 100% of grade length | | | | | | | | 0.5 | | 0.5 | | | | | | | | 0.5 | | | |
| 203.9 | 3.1 | 207 | Fluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 3.1 | | | |
| 204.5 | | | Bridge | 8 m x 30 m | Tributary | debris flow | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | |
| 206.3 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 206.5 | | | Crossing | Level | Road | Alaska Highway | | | | | | | | | | | | 1 | | | | | | | | | |
| 206.9 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 207 | 7.8 | 214.8 | Fluvial | Average | | Review for potential aggregate source | | | | | | | | | | | | | | | | 7.8 | | | | | |
| 207.3 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 207.7 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 208.6 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 212.8 | | | Bridge | 8 m x 100 m | River | Smith River, 200 ft riprap erosion control | 8 | 100 | 328 | | | | | 0.04 | | | | | | | | | | | | | |
| 214.8 | 0.7 | 215.5 | Fluvial | Average | | Erosion Protection along 100% of grade length; Review for potential aggregate source | | | | | | | | 0.7 | | | | | | | | 0.7 | | | | | |
| 215.5 | 4.3 | 219.8 | Fluvial | Average | | Review for potential aggregate source | | | | | | | | | | | | | | | | 4.3 | | | | | |
| 216.1 | | | Crossing | Level | Road | Alaska Highway | | | | | | | | | | | | 1 | | | | | | | | | |
| 218.4 | | | Crossing | Level | Road | Alaska Highway | | | | | | | | | | | | 1 | | | | | | | | | |
| 219.8 | 1.2 | 221 | Alluvial | Average | | Review for potential aggregate source | | | | | | | | | | | | | | | | 1.2 | | | | | |
| 220 | | | Bridge Pipe | 32 m | Tributary | | | | | | | | 32 | | | | | | | | | | | | | | |
| 220.8 | | | Bridge Pipe | 40 m | Tributary | | | | | | | | 40 | | | | | | | | | | | | | | |
| 221 | 0.8 | 221.8 | Alluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 0.8 | | | |
| 221.3 | | | Crossing | Road Relocation | Road | Alaska Highway | | | | | | | | | | | | | | | | | | | | | |
| 221.8 | 0.7 | 222.5 | Fluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 0.7 | | | |
| 222.5 | 8.5 | 231 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | 8.5 | | | | |
| 227.3 | | | Bridge Pipe | 80 m | Tributary | | | | | | | | 80 | | | | | | | | | | | | | | |
| 228.1 | | | Crossing | Level | Road | Alaska Highway | | | | | | | | | | | | 1 | | | | | | | | | |

## Fort Nelson to Watson Lake

| Terrain Analysis | | | | | | | Size of Civil Structure | | | | | | | | | | | | | | | Grade Construction | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Bridge Dimensions | | Bridge Length (ft.) by Height Class | | | | Bridge Pipes | Erosion Protection | Rock/Snow Shed | Rock Fall Protection | Retaining Walls | Road | | | Tunnel | Average | Heavy | Very Heavy | Rock Grade | Organic | Permafrost |
| **Start M.P.** | **Miles** | **End M.P.** | **Terrain Unit** | **Construction** | **Features Requiring Civil Structures** | **Comments** | Height (m) | Length (m) | < 50' high | 51' - 100' high | 101' - 200' high | 201' - 300' high | Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Level Xings | Overpass Length (m) | Rail Bridge Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) |
| 231 | 0.5 | 231.5 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 0.5 | | |
| 231.2 | | | Bridge | 20 m x 700 m | River | Liard River, 200 ft riprap erosion control | 20 | 700 | | 2,297 | | | | 0.04 | | | | | | | | | | | | | |
| 231.5 | 3.5 | 235 | Fluvial | Average | | Review for potential aggregate source | | | | | | | | | | | | | | | | 3.5 | | | | | |
| 231.8 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | 68 | | | | | | | | | | | | | | |
| 235 | 1 | 236 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | 1.0 | | | | |
| 236 | 2.5 | 238.5 | Fluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 2.5 | | | |
| 236.2 | | | Bridge | 5 m x 30 m | Creek | Niloil Creek | 5 | 30 | 98 | | | | | | | | | | | | | | | | | | |
| 237.7 | | | Bridge | 8 m x 175 m | River | Rabbit River, 200 ft riprap erosion control | 8 | 175 | 574 | | | | | 0.04 | | | | | | | | | | | | | |
| 238.5 | 1.5 | 240 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | 1.5 | | | | |
| 240 | 0.4 | 240.4 | Till | Very Heavy | | | | | | | | | | | | | | | | | | | | 0.4 | | | |
| 240.4 | 0.4 | 240.8 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 0.4 | | |
| 240.4 | | | Bridge | 8 m x 175 m | River | Kechika River, 200 ft riprap erosion control | 8 | 175 | 574 | | | | | 0.04 | | | | | | | | | | | | | |
| 240.8 | 1.2 | 242 | Till | Very Heavy | | | | | | | | | | | | | | | | | | | | 1.2 | | | |
| 242 | 0.5 | 242.5 | Organics | Organic | | | | | | | | | | | | | | | | | | | | | | 0.5 | |
| 242.5 | 1.3 | 243.8 | Till | Heavy | | Erosion Protection along 35% of grade length | | | | | | | | 0.4 | | | | | | | | | 1.3 | | | | |
| 243.4 | | | Bridge Pipe | 40 m | Tributary | | | | | | | | 40 | | | | | | | | | | | | | | |
| 243.5 | | | Bridge Pipe | 40 m | Tributary | | | | | | | | 40 | | | | | | | | | | | | | | |
| 243.8 | 0.4 | 244.2 | Alluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | 0.4 | | | | |
| 244 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | 68 | | | | | | | | | | | | | | |
| 244.2 | 2.2 | 246.4 | Till | Heavy | | | | | | | | | | | | | | | | | | | 2.2 | | | | |
| 246.4 | 0.3 | 246.7 | Alluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | 0.3 | | | | |
| 246.5 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 246.7 | 4.2 | 250.9 | Till | Average | | | | | | | | | | | | | | | | | | 4.2 | | | | | |
| 250.9 | 0.6 | 251.5 | Alluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | 0.6 | | | | |
| 251.1 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 251.5 | 7.3 | 258.8 | Till | Very Heavy | | | | | | | | | | | | | | | | | | | | 7.3 | | | |
| 256.3 | | | Bridge Pipe | 188 m | Tributary | | | | | | | | 188 | | | | | | | | | | | | | | |
| 258.8 | 0.3 | 259.1 | Bedrock | Rock Grade | | | | | | | | | | | | | | | | | | | | | 0.3 | | |
| 259 | | | Bridge | 70 m x 200 m | Creek | Kitza Creek (Deep gorge) | 70 | 200 | | | | 656 | | | | | | | | | | | | | | | |
| 259.1 | 5.9 | 265 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | 5.9 | | | | |
| 262 | | | Bridge Pipe | 128 m | Tributary | | | | | | | | 128 | | | | | | | | | | | | | | |
| 264.3 | | | Bridge Pipe | 98 m | Tributary | | | | | | | | 98 | | | | | | | | | | | | | | |
| 265 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 265 | 4.8 | 269.8 | Fluvial | Average | | Review for potential aggregate source | | | | | | | | | | | | | | | | 4.8 | | | | | |
| 268 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 269.6 | | | Bridge | 8 m x 60 m | Creek | Mustela Creek | 8 | 60 | 197 | | | | | | | | | | | | | | | | | | |
| 269.8 | 2.1 | 271.9 | Till | Average | | | | | | | | | | | | | | | | | | 2.1 | | | | | |
| 271.8 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 271.9 | 0.4 | 272.3 | Till | Heavy | | | | | | | | | | | | | | | | | | | 0.4 | | | | |
| 272.3 | 1.3 | 273.6 | Organics | Organic | | | | | | | | | | | | | | | | | | | | | | 1.3 | |
| 273.6 | 10.1 | 283.7 | Till | Average | | | | | | | | | | | | | | | | | | 10.1 | | | | | |
| 274 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 274.6 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 274.7 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 276 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 281.1 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 283.7 | 0.3 | 284 | Organics | Organic | | | | | | | | | | | | | | | | | | | | | | 0.3 | |
| 284 | 2 | 286 | Till | Average | | | | | | | | | | | | | | | | | | 2.0 | | | | | |
| 285.1 | | | Bridge Pipe | 188 m | Tributary | | | | | | | | 188 | | | | | | | | | | | | | | |
| 286 | 5.8 | 291.8 | Till | Heavy | | | | | | | | | | | | | | | | | | | 5.8 | | | | |
| 286.4 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 286.9 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 287.7 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 288.7 | | | Bridge Pipe | 158 m | Tributary | | | | | | | | 158 | | | | | | | | | | | | | | |
| 290.3 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 291.8 | 0.7 | 292.5 | Organics | Organic | | | | | | | | | | | | | | | | | | | | | | 0.7 | |
| 292.5 | 4.1 | 296.6 | Till | Heavy | | | | | | | | | | | | | | | | | | | 4.1 | | | | |
| 293.2 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 294.2 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 294.7 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 296.3 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | 68 | | | | | | | | | | | | | | |
| 296.6 | 3.7 | 300.3 | Till | Average | | | | | | | | | | | | | | | | | | 3.7 | | | | | |
| 298.4 | | | Bridge Pipe | 188 m | Tributary | | | | | | | | 188 m | | | | | | | | | | | | | | |
| 300.3 | 0.7 | 301 | Fluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 0.7 | | | |
| 300.6 | | | Bridge | 42 m x 300 m | Creek | Kaska Creek | 42 | 300 | | | 984 | | | | | | | | | | | | | | | | |
| 301 | 8.5 | 309.5 | Till | Average | | | | | | | | | | | | | | | | | | 8.5 | | | | | |
| 305.4 | | | Bridge | 6 m x 30 m | Creek | Malcolm Creek | 6 | 30 | 98 | | | | | | | | | | | | | | | | | | |
| 309.5 | 0.5 | 310 | Till | Very Heavy | | | | | | | | | | | | | | | | | | | | 0.5 | | | |
| 309.8 | | | Bridge | 8 m x 60 m | Creek | Black Angus Creek | 8 | 60 | 197 | | | | | | | | | | | | | | | | | | |
| 310 | 2 | 312 | Till | Average | | | | | | | | | | | | | | | | | | 2.0 | | | | | |

## Fort Nelson to Watson Lake

| Terrain Analysis | | | | | | | Size of Civil Structure | | | | | | | | | | | | | | | Grade Construction | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Bridge Dimensions | | Bridge Length (ft.) by Height Class | | | | Bridge Pipes | Erosion Protection | Rock/Snow Shed | Rock Fall Protection | Retaining Walls | Road | | | Tunnel | Average | Heavy | Very Heavy | Rock Grade | Organic | Permafrost |
| **Start M.P.** | **Miles** | **End M.P.** | **Terrain Unit** | **Construction** | **Features Requiring Civil Structures** | **Comments** | Height (m) | Length (m) | < 50' high | 51' - 100' high | 101' - 200' high | 201' - 300' high | Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Level Xings | Overpass Length (m) | Rail Bridge Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) |
| 312 | 0.2 | 312.2 | Till | Very Heavy | | | | | | | | | | | | | | | | | | | | 0.2 | | | |
| 312.1 | | | Bridge | 21 m x 190 m | Creek | Trepanier Creek | 21 | 190 | | 623 | | | | | | | | | | | | | | | | | |
| 312.2 | 5.5 | 317.7 | Till | Average | | | | | | | | | | | | | | | | | | 5.5 | | | | | |
| 313.1 | | | Bridge | 16 m x 150 m | Creek | Kloye Creek | 16 | 150 | | 492 | | | | | | | | | | | | | | | | | |
| 315.4 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | 20 | | | | | | | | | | | | | | |
| 315.8 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | 28 | | | | | | | | | | | | | | |
| 317.7 | 2.4 | 320.1 | Alluvial | Average | | Review for potential aggregate source | | | | | | | | | | | | | | | | 2.4 | | | | | |
| 318.4 | | | Bridge | 8 m x 30 m | Creek | Liard Tom Creek | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | |
| 319.7 | | | Bridge | 40 m x 900 m | River | Dease River, 200 ft riprap erosion control | 40 | 900 | | | 2,953 | | | 0.04 | | | | | | | | | | | | | |
| 320.1 | 0.9 | 321 | Till | Average | | | | | | | | | | | | | | | | | | 0.9 | | | | | |
| 321 | 1.3 | 322.3 | Till | Very Heavy | | | | | | | | | | | | | | | | | | | | 1.3 | | | |
| 322.3 | 2.2 | 324.5 | Till | Average | | | | | | | | | | | | | | | | | | 2.2 | | | | | |
| 324.5 | 1.5 | 326 | Till | Very Heavy | | | | | | | | | | | | | | | | | | | | 1.5 | | | |
| 326 | 1 | 327 | Till | Average | | | | | | | | | | | | | | | | | | 1.0 | | | | | |
| 327 | 1.3 | 328.3 | Till | Very Heavy | | Erosion Protection along 15% of grade length | | | | | | | | 0.2 | | | | | | | | | | 1.3 | | | |
| 328.3 | 5.5 | 333.8 | Till | Average | | | | | | | | | | | | | | | | | | 5.5 | | | | | |
| 333.8 | 0.5 | 334.3 | Fluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 0.5 | | | |
| 333.9 | | | Bridge | 38 m x 1100 m | River | Liard River, 200 ft riprap erosion control | 38 | 1100 | | | 3,609 | | | 0.04 | | | | | | | | | | | | | |
| 334.3 | 0.7 | 335 | Till | Average | | | | | | | | | | | | | | | | | | 0.7 | | | | | |
| | 335 | | | | | | | 11,025 m | 3,738 ft | 9,957 ft | 21,816 ft | 656 ft | 8,484 m | 7.6 M | 0.5 M | 8.7 M | 0.2 M | 5 Xings | 104 m | 0 m | 2.0 M | 137.5 M | 74.0 M | 50.1 M | 65.3 M | 6.1 M | 0.0 M |
| | | | | | | | | 36,171 ft. | Total bridge length | | | 36,167 ft | 27,835 ft. | | 2,640 ft | | 1,056 ft | | 341 ft. | 0 ft. | Total Route Segment Length (miles) | | | | | | 335.0 M |
| | | | | | | Count | | 34 | 13 | 9 | 11 | 1 | 146 | 7.62 | 0.5 | 8.7 | 0.2 | 5 | 2.0 | | 2.0 | 137.5 | 74.0 | 50.1 | 65.3 | 6.1 | |
| | | | | | | Check Summary | | 11,025 m | 1,140 m | 3,035 m | 6,650 m | 200 m | 8,484 m | | | | | | | | | | | | | | |
| | | | | | | | | | 3,740 ft. | 9,957 ft. | 21,818 ft. | 656 ft. | 27,835 ft. | | | | | | | | | | | | | | |

## Dease Lake Route - Minaret to Watson Lake

| Start M.P. | Miles | End M.P. | Terrain Unit | Construction | Features Requiring Civil Structures | Comments | Bridge Dimensions Height (m) | Bridge Dimensions Length (m) | Bridge Length (ft.) by Height Class < 50' high | 51' - 100' high | 101' - 200' high | 201' - 300' high | > 300' high | Bridge Pipes Length (m) | Erosion Protection Length (mile) | Rock/Snow Shed Length (mile) | Rock Fall Protection Length (mile) | Retaining Walls Length (mile) | Road Level Xings | Road Overpass Length (m) | Road Rail Bridge Length (m) | Tunnel Length (mile) | Grade Construction Average Length (mile) | Heavy Length (mile) | Very Heavy Length (mile) | Rock Length (mile) | Organics Length (mile) | Permafrost Length (mile) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 2 | 2 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 2.0 | | | | |
| 0.1 | | | Bridge Pipe | 32 m | Tributary | | | | | | | | | 32 | | | | | | | | | | | | | | |
| 2 | 4 | 6 | Till | Heavy | | | | | | | | | | | | | | | | | | | | 4.0 | | | | |
| 2.4 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | | 28 | | | | | | | | | | | | | | |
| 6 | 1 | 7 | Till | Very Heavy | | | | | | | | | | | | | | | | | | | | | 1.0 | | | |
| 6.1 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 7 | 3.7 | 10.7 | Till | Heavy | | | | | | | | | | | | | | | | | | | | 3.7 | | | | |
| 7.4 | | | Bridge Pipe | 80 m | Tributary | | | | | | | | | 80 | | | | | | | | | | | | | | |
| 8.3 | | | Bridge Pipe | 122 m | Tributary | | | | | | | | | 122 | | | | | | | | | | | | | | |
| 9.7 | | | Bridge Pipe | 158 m | Tributary | | | | | | | | | 158 | | | | | | | | | | | | | | |
| 10.5 | | | Bridge Pipe | 170 m | Tributary | | | | | | | | | 170 | | | | | | | | | | | | | | |
| 10.7 | 0.8 | 11.5 | Till | Very Heavy | | Construction adjacent Skeena River, Riprap Protection along 20% Grade Length | | | | | | | | | 0.16 | | | | | | | | | | 0.8 | | | |
| 11.5 | 2 | 13.5 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 2.0 | | | | |
| 13.5 | 2.5 | 16 | Fluvial | Very Heavy | | Construction adjacent Skeena River, Riprap Protection along 20% Grade Length, Review for potential aggregate source | | | | | | | | | 0.5 | | | | | | | | | | 2.5 | | | |
| 14.7 | | | Bridge Pipe | 98 m | Tributary | | | | | | | | | 98 | | | | | | | | | | | | | | |
| 15.2 | | | Bridge | 8 m x 30 m | Tributary | Bridge over Small Lake | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 16 | 1.8 | 17.8 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 1.8 | | | | |
| 17.8 | 0.6 | 18.4 | Fluvial | Very Heavy | | Construction Next to Skeena River, Riprap Protection Along 30% of Grade Length, Retaining Walls along 10% of Grade Length | | | | | | | | | 0.18 | | | 0.16 | | | | | | | 0.6 | | | |
| 18.4 | 0.8 | 19.2 | Alluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 0.8 | | | | |
| 19.2 | 0.2 | 19.4 | Alluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | | 0.2 | | | |
| 19.3 | | | Bridge | 15 m x 225 m | River | Mosque River 200 ft Riprap Protection | 15 | 225 | 738 | | | | | | 0.04 | | | | | | | | | | | | | |
| 19.4 | 0.2 | 19.6 | Alluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 0.2 | | | | |
| 19.6 | 0.9 | 20.5 | Fluvial | Very Heavy | | Construction Next to Skeena River, Riprap Protection Along 30% of Grade Length, Retaining Walls along 10% of Grade Length | | | | | | | | | 0.27 | | | 0.09 | | | | | | | 0.9 | | | |
| 20.5 | 1.5 | 22 | Alluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 1.5 | | | | |
| 20.6 | | | Bridge Pipe | 116 m | Tributary | | | | | | | | | 116 | | | | | | | | | | | | | | |
| 22 | 2 | 24 | Alluvial | Very Heavy | | Construction Next to Skeena River, Riprap Protection Along 20% of Grade Length, Retaining Walls along 10% of Grade Length, Review for potential aggregate source | | | | | | | | | 0.4 | | | 0.2 | | | | | | | 2.0 | | | |
| 23.5 | | | Bridge Pipe | 40 m | Tributary | | | | | | | | | 40 | | | | | | | | | | | | | | |
| 24 | 1 | 25 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 1.0 | | | | |
| 25 | 0.4 | 25.4 | Fluvial | Very Heavy | | Construction Next to Skeena River, Riprap Protection Along 20% of Design Grade, Review for potential aggregate source | | | | | | | | | 0.08 | | | | | | | | | | 0.4 | | | |
| 25.4 | 1.1 | 26.5 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 1.1 | | | | |
| 26.5 | 5.5 | 32 | Fluvial | Very Heavy | | Construction Next to Skeena River, Riprap Protection Along 20% of Grade Length, Retaining Walls along 10% of Grade Length, Review for potential aggregate source | | | | | | | | | 1.1 | | | 0.55 | | | | | | | 5.5 | | | |
| 27.2 | | | Bridge | 8 m x 30 m | Tributary | Debris Flow | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 28.3 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | | 68 | | | | | | | | | | | | | | |
| 30 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 31 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 32 | 3 | 35 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 3.0 | | | | |
| 32.2 | | | Bridge Pipe | 86 m | Tributary | | | | | | | | | 86 | | | | | | | | | | | | | | |
| 33.2 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | | 28 | | | | | | | | | | | | | | |

## Dease Lake Route - Minaret to Watson Lake

| Terrain Analysis | | | | | | | Size of Civil Structure | | | | | | | | | | | | | | | | Grade Construction | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Bridge Dimensions | | Bridge Length (ft.) by Height Class | | | | | Bridge Pipes | Erosion Protection | Rock/Snow Shed | Rock Fall Protection | Retaining Walls | Road | | | Tunnel | Average | Heavy | Very Heavy | Rock | Organics | Permafrost |
| Start M.P. | Miles | End M.P. | Terrain Unit | Construction | Features Requiring Civil Structures | Comments | Height (m) | Length (m) | < 50' high | 51' - 100' high | 101' - 200' high | 201' - 300' high | > 300' high | Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Level Xings | Overpass Length (m) | Rail Bridge Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) |
| 34.3 | | | Bridge | 6 m x 30 m | Tributary | Debris Flow | 6 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 35 | 1.6 | 36.6 | Alluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 1.6 | | | | |
| 35.2 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 36.6 | 0.2 | 36.8 | Alluvial | Very Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | | 0.2 | | | |
| 36.7 | | | Bridge | 13 m x 175 m | Creek | Chipmunk Creek | 13 | 175 | 574 | | | | | | | | | | | | | | | | | | | |
| 36.8 | 1.2 | 38 | Alluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 1.2 | | | | |
| 38 | 8 | 46 | Fluvial | Very Heavy | | Construction Next to Skeena River, Riprap Protection Along 10% of Grade Length, Retaining Walls along 10% of Grade Length, Review for potential aggregate source | | | | | | | | | 0.8 | | | 0.8 | | | | | | | 8.0 | | | |
| 42.5 | | | Bridge Pipe | 74 m | Tributary | | | | | | | | | 74 | | | | | | | | | | | | | | |
| 43.1 | | | Bridge Pipe | 128 m | Tributary | | | | | | | | | 128 | | | | | | | | | | | | | | |
| 43.5 | | | Bridge | 25 m x 200 m | Tributary | Debris Flow | 25 | 200 | | 656 | | | | | | | | | | | | | | | | | | |
| 44.2 | | | Bridge | 48 m x 350 m | River | Duti River 200ft Riprap Protection | 48 | 350 | | | 1,148 | | | | 0.04 | | | | | | | | | | | | | |
| 46 | 8 | 54 | Colluvial | Very Heavy | | Construction next to Skeena River, Riprap Protection along 10% Grade Length, Rock Fall Protection along 20% of Grade Length, Retaining Walls along 10% of Grade Length, | | | | | | | | | 0.8 | | 1.6 | 0.8 | | | | | | | 8.0 | | | |
| 49.4 | | | Bridge Pipe | 188 m | Tributary | | | | | | | | | 188 | | | | | | | | | | | | | | |
| 52.5 | | | Bridge Pipe | 116 m | Tributary | | | | | | | | | 116 | | | | | | | | | | | | | | |
| 54 | 0.3 | 54.3 | Alluvial | Very Heavy | | River Crossing, Review for potential aggregate source | | | | | | | | | | | | | | | | | | | 0.3 | | | |
| 54.1 | | | Bridge | 42 m x 350 m | River | Kluatantan River 200ft Riprap Protection | 42 | 350 | | | 1,148 | | | | 0.04 | | | | | | | | | | | | | |
| 54.3 | 4.7 | 59 | Till | Heavy | | | | | | | | | | | | | | | | | | | | 4.7 | | | | |
| 56.5 | | | Bridge Pipe | 40 m | Tributary | | | | | | | | | 40 | | | | | | | | | | | | | | |
| 57.5 | | | Bridge | 21 m x 200 m | Creek | Duke Creek | 21 | 200 | | 656 | | | | | | | | | | | | | | | | | | |
| 58.5 | | | Bridge | 26 m x 250 m | Creek | Telfer Creek | 26 | 250 | | 820 | | | | | | | | | | | | | | | | | | |
| 58.6 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | | 68 | | | | | | | | | | | | | | |
| 59 | 6 | 65 | Till | Very Heavy | | Large Cuts and Fills, Steep Slopes | | | | | | | | | | | | | | | | | | | 6.0 | | | |
| 59.2 | | | Bridge Pipe | 98 m | Tributary | | | | | | | | | 98 | | | | | | | | | | | | | | |
| 59.7 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 60.3 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 60.6 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 61.5 | | | Bridge | 13 m x 110 m | Creek | Langlois Creek | 13 | 110 | 361 | | | | | | | | | | | | | | | | | | | |
| 63.3 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 64 | | | Bridge | 6 m x 30 m | Tributary | Debris Flow | 6 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 65 | 4 | 69 | Till | Heavy | | | | | | | | | | | | | | | | | | | | 4.0 | | | | |
| 65.5 | | | Bridge | 18 m x 200 m | Creek | Nannygoat Creek | 18 | 200 | | 656 | | | | | | | | | | | | | | | | | | |
| 66.3 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | | 28 | | | | | | | | | | | | | | |
| 67.6 | | | Bridge Pipe | 140 m | Tributary | | | | | | | | | 140 | | | | | | | | | | | | | | |
| 67.7 | | | Bridge Pipe | 176 m | Tributary | | | | | | | | | 176 | | | | | | | | | | | | | | |
| 68.5 | | | Bridge | 6 m x 30 m | Tributary | Debris Flow | 6 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 69 | 4 | 73 | Till | Very Heavy | | Large Cuts and Fills | | | | | | | | | | | | | | | | | | | 4.0 | | | |
| 69.5 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 70.5 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 71 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 71.5 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 72.5 | | | Bridge Pipe | 134 m | Tributary | | | | | | | | | 134 | | | | | | | | | | | | | | |
| 73 | 4 | 77 | Fluvial | Heavy | | Likely Permafrost Area | | | | | | | | | | | | | | | | | | 4.0 | | | | |
| 73.4 | | | Bridge Pipe | 224 m | Tributary | | | | | | | | | 224 | | | | | | | | | | | | | | |
| 74.3 | | | Bridge Pipe | 332 m | Tributary | | | | | | | | | 332 | | | | | | | | | | | | | | |
| 75 | | | Bridge Pipe | 368 m | Tributary | | | | | | | | | 368 | | | | | | | | | | | | | | |
| 75.4 | | | Bridge Pipe | 416 m | Tributary | | | | | | | | | 416 | | | | | | | | | | | | | | |
| 75.5 | | | Bridge Pipe | 440 m | Tributary | | | | | | | | | 440 | | | | | | | | | | | | | | |
| 75.9 | | | Bridge Pipe | 458 m | Tributary | | | | | | | | | 458 | | | | | | | | | | | | | | |
| 76.3 | | | Bridge Pipe | 218 m | Tributary | | | | | | | | | 218 | | | | | | | | | | | | | | |
| 77 | 12 | 89 | Till | Very Heavy | | Large Cuts and Fills, Steep Slopes, Possibly Lacustrine/clayey soils, Likely Permafrost, High Elevation, Snow Sheds over 1%, Retaining Walls over 10% | | | | | | | | | | 0.12 | | 1.2 | | | | | | | 12.0 | | | |
| 77.4 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 79.8 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 81.9 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 82.7 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 83.3 | | | Bridge | 28 m x 200 m | Creek | Garner Creek | 28 | 200 | | 656 | | | | | | | | | | | | | | | | | | |
| 84.4 | | | Bridge Pipe | 218 m | Tributary | | | | | | | | | 218 | | | | | | | | | | | | | | |
| 84.5 | | | Bridge Pipe | 218 m | Tributary | | | | | | | | | 218 | | | | | | | | | | | | | | |

## Dease Lake Route - Minaret to Watson Lake

| Terrain Analysis | | | | | | | Size of Civil Structure | | | | | | | | | | | | | | | | Grade Construction | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Bridge Dimensions | | Bridge Length (ft.) by Height Class | | | | | Bridge Pipes | Erosion Protection | Rock/Snow Shed | Rock Fall Protection | Retaining Walls | Road | | | Tunnel | Average | Heavy | Very Heavy | Rock | Organics | Permafrost |
| **Start M.P.** | **Miles** | **End M.P.** | **Terrain Unit** | **Construction** | **Features Requiring Civil Structures** | **Comments** | Height (m) | Length (m) | < 50' high | 51' - 100' high | 101' - 200' high | 201' - 300' high | > 300' high | Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Level Xings | Overpass Length (m) | Rail Bridge Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) |
| 84.7 | | | Bridge Pipe | 164 m | Tributary | | | | | | | | | 164 | | | | | | | | | | | | | | |
| 85.4 | | | Bridge Pipe | 140 m | Tributary | | | | | | | | | 140 | | | | | | | | | | | | | | |
| 85.8 | | | Bridge Pipe | 140 m | Tributary | | | | | | | | | 140 | | | | | | | | | | | | | | |
| 86.4 | | | Bridge Pipe | 104 m | Tributary | | | | | | | | | 104 | | | | | | | | | | | | | | |
| 89 | 2.7 | 91.7 | Fluvial | Very Heavy | | River Crossing Area, Permafrost Likely, Review for potential aggregate source | | | | | | | | | | | | | | | | | | | 2.7 | | | |
| 90 | | | Bridge | 70 m x 475 m | River | Spatsizi River 200ft Riprap Protection | 70 | 475 | | | | 1,558 | | | 0.04 | | | | | | | | | | | | | |
| 91.1 | | | Bridge Pipe | 104 m | Tributary | | | | | | | | | 104 | | | | | | | | | | | | | | |
| 91.7 | 2.5 | 94.2 | Bedrock | Rock | | Rock Fall Protection over 20%, Rock or Snow Shed over 1%, Likely Permafrost Area | | | | | | | | | | 0.029 | 0.58 | | | | | | | | | 2.5 | | |
| 92.6 | | | Bridge | 70 m x 500 m | Creek | Grizzley Creek | 70 | 500 | | | | 1,640 | | | | | | | | | | | | | | | | |
| 93.1 | | | Bridge Pipe | 104 m | Tributary | | | | | | | | | 104 | | | | | | | | | | | | | | |
| 93.4 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | | 68 | | | | | | | | | | | | | | |
| 94.2 | 3.3 | 97.5 | Bedrock | Tunnel | | 3.3 miles | | | | | | | | | | | | | | | | 3.3 | | | | | | |
| 97.5 | 10.5 | 108 | Fluvial | Very Heavy | | Large Cuts and Fills, Likely Permafrost Area, Review for potential aggregate source | | | | | | | | | | | | | | | | | | | 10.5 | | | |
| 97.8 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | | 68 | | | | | | | | | | | | | | |
| 98.8 | | | Bridge | 24 m x 200 m | Tributary | Debris Flow | 24 | 200 | | 656 | | | | | | | | | | | | | | | | | | |
| 101 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 102.8 | | | Bridge | 35 m x 250 m | Tributary | Debris Flow | 35 | 250 | | | 820 | | | | | | | | | | | | | | | | | |
| 103.4 | | | Bridge | 28 m x 200 m | Tributary | Debris Flow | 28 | 200 | | 656 | | | | | | | | | | | | | | | | | | |
| 105.5 | | | Bridge Pipe | 182 m | Tributary | | | | | | | | | 182 | | | | | | | | | | | | | | |
| 106.3 | | | Bridge Pipe | 218 m | Tributary | | | | | | | | | 218 | | | | | | | | | | | | | | |
| 107 | | | Bridge Pipe | 308 m | Tributary | | | | | | | | | 308 | | | | | | | | | | | | | | |
| 108 | 6 | 114 | Bedrock | Rock | | Rock Fall Protection along 20%, Retaining Walls along 30%, Snow Sheds along 1% Grade Length | | | | | | | | | | 0.06 | 1.2 | 1.8 | | | | | | | | 6.0 | | |
| 109.2 | | | Bridge | 6 m x 30 m | Tributary | Debris Flow | 6 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 110.3 | | | Bridge | 17 m x 175 m | Creek | Conglomerate Creek | 17 | 175 | | 574 | | | | | | | | | | | | | | | | | | |
| 110.8 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 111.7 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 112.9 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 113.3 | | | Bridge Pipe | 128 m | Tributary | | | | | | | | | 128 | | | | | | | | | | | | | | |
| 114 | 3 | 117 | Fluvial | Very Heavy | | Large Cuts and Fills, Likely Permafrost Area, Review for potential aggregate source | | | | | | | | | | | | | | | | | | | 3.0 | | | |
| 114.9 | | | Bridge Pipe | 320 m | Tributary | | | | | | | | | 320 | | | | | | | | | | | | | | |
| 115.5 | | | Bridge | 80 m x 500 m | Tributary | Debris Flow | 80 | 500 | | | | 1,640 | | | | | | | | | | | | | | | | |
| 115.6 | | | Bridge Pipe | 428 m | Tributary | | | | | | | | | 428 | | | | | | | | | | | | | | |
| 116.5 | | | Bridge Pipe | 308 m | Tributary | | | | | | | | | 308 | | | | | | | | | | | | | | |
| 117 | 7.3 | 124.3 | Bedrock | Rock | | Rock Fall Protection along 20%, Retaining Walls along 30%, Snow Sheds along 1% Grade Length | | | | | | | | | | 0.128 | 2.56 | 3.84 | | | | | | | | 7.3 | | |
| 117.8 | | | Bridge | 8 m x 30 m | Tributary | Debris Flow | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 118.4 | | | Bridge | 8 m x 30 m | Tributary | Debris Flow | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 119.2 | | | Bridge | 8 m x 30 m | Tributary | Debris Flow | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 119.5 | | | Bridge | 8 m x 30 m | Tributary | Debris Flow | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 119.9 | | | Bridge | 8 m x 30 m | Tributary | Debris Flow | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 120.5 | | | Bridge | 8 m x 30 m | Tributary | Debris Flow | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 120.7 | | | Bridge | 8 m x 30 m | Tributary | Debris Flow | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 121.3 | | | Bridge | 13 m x 150 m | Tributary | Debris Flow | 13 | 150 | 492 | | | | | | | | | | | | | | | | | | | |
| 122 | | | Bridge | 22 m x 200 m | Tributary | Debris Flow | 22 | 200 | | 656 | | | | | | | | | | | | | | | | | | |
| 122.6 | | | Bridge | 30 m x 225 m | Tributary | Debris Flow | 30 | 225 | | 738 | | | | | | | | | | | | | | | | | | |
| 123 | | | Bridge | 36 m x 275 m | Tributary | Debris Flow | 36 | 275 | | | 902 | | | | | | | | | | | | | | | | | |
| 123.3 | | | Bridge | 8 m x 30 m | Tributary | Debris Flow | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 123.7 | | | Bridge | 8 m x 30 m | Tributary | Debris Flow | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 124.3 | 5 | 129.3 | Bedrock | Tunnel | | 5.0 miles | | | | | | | | | | | | | | | | 5.0 | | | | | | |
| 129.3 | 1.1 | 130.4 | Bedrock | Rock | | | | | | | | | | | | | | | | | | | | | | 1.1 | | |
| 129.9 | | | Bridge | 94 m x 800 m | | | 94 | 800 | | | | | 2,625 | | | | | | | | | | | | | | | |
| 130.4 | 4.6 | 135 | Bedrock | Tunnel | | 4.6 miles | | | | | | | | | | | | | | | | 4.6 | | | | | | |
| 135 | 3 | 138 | Till | Heavy | | | | | | | | | | | | | | | | | | | | 3.0 | | | | |
| 136.3 | | | Bridge Pipe | 128 m | Tributary | | | | | | | | | 128 | | | | | | | | | | | | | | |
| 137.9 | | | Bridge Pipe | 236 m | Tributary | | | | | | | | | 236 | | | | | | | | | | | | | | |
| 138 | 1 | 139 | Alluvial | Very Heavy | | Large Fills, Permafrost Likely, Review for potential aggregate source | | | | | | | | | | | | | | | | | | | 1.0 | | | |
| 138.6 | | | Bridge | 44 m x 310 m | Creek | Eaglenest Creek | 44 | 310 | | | 1,017 | | | | | | | | | | | | | | | | | |
| 139 | 6 | 145 | Till | Very Heavy | | Large Cuts and Fills, Permafrost Likely | | | | | | | | | | | | | | | | | | | 6.0 | | | |
| 139.5 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | | 68 | | | | | | | | | | | | | | |
| 141.8 | | | Bridge | 20 m x 175 m | Tributary | | 20 | 175 | | 574 | | | | | | | | | | | | | | | | | | |
| 142.6 | | | Bridge Pipe | 200 m | Tributary | | | | | | | | | 200 | | | | | | | | | | | | | | |
| 143 | | | Bridge Pipe | 278 m | Tributary | | | | | | | | | 278 | | | | | | | | | | | | | | |

## Dease Lake Route - Minaret to Watson Lake

| Terrain Analysis | | | | | | | Size of Civil Structure | | | | | | | | | | | | | | | | Grade Construction | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Bridge Dimensions | | Bridge Length (ft.) by Height Class | | | | | Bridge Pipes | Erosion Protection | Rock/Snow Shed | Rock Fall Protection | Retaining Walls | Road | | | Tunnel | Average | Heavy | Very Heavy | Rock | Organics | Permafrost |
| **Start M.P.** | **Miles** | **End M.P.** | **Terrain Unit** | **Construction** | **Features Requiring Civil Structures** | **Comments** | Height (m) | Length (m) | < 50' high | 51' - 100' high | 101' - 200' high | 201' - 300' high | > 300' high | Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Level Xings | Overpass Length (m) | Rail Bridge Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) |
| 145 | 4.8 | 149.8 | Fluvial | Very Heavy | | Large Cuts and Fills, Construction Next to Klappen River, Riprap Protection along 20%, Retaining Walls along 20% Grade Length, Review for potential aggregate source | | | | | | | | | 0.96 | | | 0.96 | | | | | | | 4.8 | | | |
| 145.5 | | | Bridge | 8 m x 30 m | Tributary | | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 149 | | | Bridge | 8 m x 30 m | Creek | Tsanadto Creek | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 149.8 | 0.4 | 150.2 | Alluvial | Very Heavy | | Creek Crossing, Review for potential aggregate source | | | | | | | | | | | | | | | | | | | 0.4 | | | |
| 150 | | | Bridge | 8 m x 30 m | Tributary | | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 150.2 | 1.8 | 152 | Fluvial | Very Heavy | | Large Cuts and Fills, Construction Next to Klappen River, Riprap Protection along 20%, Retaining Walls along 20% Grade Length, Review for potential aggregate source | | | | | | | | | 0.36 | | | 0.36 | | | | | | | 1.8 | | | |
| 151.5 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 152 | 4.5 | 156.5 | Alluvial | Heavy | | Permafrost Likely, Review for potential aggregate source | | | | | | | | | | | | | | | | | | 4.5 | | | | |
| 153.2 | | | Bridge | 8 m x 30 m | Creek | McEwan Creek | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 154.5 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 155.8 | | | Bridge Pipe | 98 m | Tributary | | | | | | | | | 98 | | | | | | | | | | | | | | |
| 156.5 | 4.5 | 161 | Fluvial | Very Heavy | | Large Cuts and Fills, Construction Next to Klappen River, Riprap Protection along 20%, Retaining Walls along 30% Grade Length, Review for potential aggregate source | | | | | | | | | 0.9 | | | 1.35 | | | | | | | 4.5 | | | |
| 156.8 | | | Bridge Pipe | 98 m | Tributary | | | | | | | | | 98 | | | | | | | | | | | | | | |
| 158.5 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 159.3 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 159.8 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 161 | 0.9 | 161.9 | Bedrock | Rock | | Rock Fall Protection along 10%, Retaining Walls along 20%, Snow Sheds along 1% Grade Length | | | | | | | | | | 0.042 | 0.42 | 0.84 | | | | | | | | 0.9 | | |
| 161 | | | Bridge Pipe | 278 m | Tributary | | | | | | | | | 278 | | | | | | | | | | | | | | |
| 161.8 | | | Bridge | 45 m x 400 m | Tributary | | 45 | 400 | | | 1,312 | | | | | | | | | | | | | | | | | |
| 161.9 | 2.1 | 164 | Bedrock | Tunnel | | 2.1 miles | | | | | | | | | | | | | | | | 2.1 | | | | | | |
| 164 | 1.2 | 165.2 | Bedrock | Rock | | | | | | | | | | | | | | | | | | | | | | 1.2 | | |
| 164.6 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 165.2 | 1.3 | 166.5 | Fluvial | Very Heavy | | Large Cuts and Fills, Review for potential aggregate source | | | | | | | | | | | | | | | | | | | 1.3 | | | |
| 166.5 | 0.5 | 167 | Alluvial | Very Heavy | | Large Fills, River Crossing, Review for potential aggregate source | | | | | | | | | | | | | | | | | | | 0.5 | | | |
| 166.7 | | | Bridge | 80 m x 600 m | River | Stikine River 200ft Riprap Protection | 80 | 600 | | | | 1,969 | | | 0.04 | | | | | | | | | | | | | |
| 167 | 0.3 | 167.3 | Bedrock | Rock | | | | | | | | | | | | | | | | | | | | | | 0.3 | | |
| 167.3 | 1.5 | 168.8 | Bedrock | Tunnel | | 1.5 miles | | | | | | | | | | | | | | | | 1.5 | | | | | | |
| 168.8 | 6.2 | 175 | Bedrock | Rock | | Rock Fall Protection along 10%, Retaining Walls along 20%, Snow Sheds along 1% Grade Length | | | | | | | | | | 0.08 | 0.8 | 1.6 | | | | | | | | 6.2 | | |
| 169.1 | | | Bridge | 45 m x 300 m | Tributary | | 45 | 300 | | | 984 | | | | | | | | | | | | | | | | | |
| 171.9 | | | Bridge | 50 m x 300 m | Tributary | | 50 | 300 | | | 984 | | | | | | | | | | | | | | | | | |
| 172.6 | | | Bridge | 25 m x 150 m | Tributary | Debris Flow | 25 | 150 | | 492 | | | | | | | | | | | | | | | | | | |
| 172.9 | | | Bridge Pipe | 128 m | Tributary | | | | | | | | | 128 | | | | | | | | | | | | | | |
| 175 | 1 | 176 | Till | Heavy | | | | | | | | | | | | | | | | | | | | 1.0 | | | | |
| 176 | 9 | 185 | Bedrock | Rock | | Difficult Cuts | | | | | | | | | | | | | | | | | | | | 9.0 | | |
| 178 | | | Bridge | 18 m x 120 m | Tributary | Debris Flow | 18 | 120 | | 394 | | | | | | | | | | | | | | | | | | |
| 178.3 | | | Bridge | 46 m x 260 m | Tributary | Debris Flow | 46 | 260 | | | 853 | | | | | | | | | | | | | | | | | |
| 180.7 | | | Bridge | 15 m x 140 m | Tributary | Debris Flow | 15 | 140 | 459 | | | | | | | | | | | | | | | | | | | |
| 183.2 | | | Bridge | 6 m x 30 m | Tributary | Debris Flow | 6 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 185 | 1.5 | 186.5 | Till | Heavy | | | | | | | | | | | | | | | | | | | | 1.5 | | | | |
| 186.1 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 186.5 | 10.5 | 197 | Bedrock | Rock | | Difficult Cuts | | | | | | | | | | | | | | | | | | | | 10.5 | | |
| 187.2 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 187.8 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 188.2 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 191.6 | | | Crossing | Level | Road | Highway 37 | | | | | | | | | | | | | 1 | | | | | | | | | |
| 191.8 | | | Bridge Pipe | 80 m | Tributary | | | | | | | | | 80 | | | | | | | | | | | | | | |
| 192 | | | Crossing | Level | Road | Highway 37 | | | | | | | | | | | | | 1 | | | | | | | | | |

## Dease Lake Route - Minaret to Watson Lake

| Start M.P. | Miles | End M.P. | Terrain Unit | Construction | Features Requiring Civil Structures | Comments | Bridge Dimensions Height (m) | Bridge Dimensions Length (m) | Bridge Length (ft.) by Height Class < 50' high | 51' - 100' high | 101' - 200' high | 201' - 300' high | > 300' high | Bridge Pipes Length (m) | Erosion Protection Length (mile) | Rock/Snow Shed Length (mile) | Rock Fall Protection Length (mile) | Retaining Walls Length (mile) | Road Level Xings | Road Overpass Length (m) | Road Rail Bridge Length (m) | Tunnel Length (mile) | Grade Construction Average Length (mile) | Heavy Length (mile) | Very Heavy Length (mile) | Rock Length (mile) | Organics Length (mile) | Permafrost Length (mile) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 197 | 7 | 204 | Till | Heavy | | | | | | | | | | | | | | | | | | | | 7.0 | | | | |
| 200.5 | | | Crossing | Level | Road | Highway 37 | | | | | | | | | | | | | 1 | | | | | | | | | |
| 204 | 5.7 | 209.7 | Till | Very Heavy | | Construction next to Tanzilla River, Erosion Protection along 5%, Retaining Walls along 5% Grade Length | | | | | | | | | 0.285 | | | 0.285 | | | | | | | 5.7 | | | |
| 207.7 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | | 68 | | | | | | | | | | | | | | |
| 209.7 | 1.1 | 210.8 | Alluvial | Very Heavy | | River Crossing, Review for potential aggregate source | | | | | | | | | | | | | | | | | | | 1.1 | | | |
| 210.1 | | | Bridge | 8 m x 30 m | River | Tanzilla River 200 ft Riprap Protection | 8 | 30 | 98 | | | | | | 0.04 | | | | | | | | | | | | | |
| 210.8 | 3.2 | 214 | Till | Very Heavy | | Construction next to Highway, Difficult Cuts, Retaining Walls along 20% Grade Length | | | | | | | | | | | | 0.64 | | | | | | | 3.2 | | | |
| 211.2 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 211.5 | | | Bridge | 8 m x 30 m | Creek | Dalby Creek | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 211.7 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 214 | 8 | 222 | Till | Heavy | | | | | | | | | | | | | | | | | | | | 8.0 | | | | |
| 216.1 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | | 68 | | | | | | | | | | | | | | |
| 216.8 | | | Bridge | 18 m x 150 m | Creek | Hotel Creek | 18 | 150 | | 492 | | | | | | | | | | | | | | | | | | |
| 217.3 | | | Bridge Pipe | 116 m | Tributary | | | | | | | | | 116 | | | | | | | | | | | | | | |
| 218.3 | | | Bridge Pipe | 32 m | Tributary | | | | | | | | | 32 | | | | | | | | | | | | | | |
| 219.3 | | | Bridge | 15 m x 150 m | Tributary | Debris Flow | 15 | 150 | 492 | | | | | | | | | | | | | | | | | | | |
| 219.5 | | | Crossing | Level | Road | Highway 37 | | | | | | | | | | | | | 1 | | | | | | | | | |
| 220.8 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 221 | | | Bridge Pipe | 86 m | Tributary | | | | | | | | | 86 | | | | | | | | | | | | | | |
| 221.7 | | | Crossing | Rail Overpass | Road | Highway 37 (15 m x 146 m) | | | | | | | | | | | | | | | 146 | | | | | | | |
| 221.7 | | | Bridge Pipe | 86 m | Tributary | | | | | | | | | 86 | | | | | | | | | | | | | | |
| 222 | 6 | 228 | Till | Very Heavy | | Difficult Cuts and Fills | | | | | | | | | | | | | | | | | | | 6.0 | | | |
| 222.4 | | | Bridge Pipe | 80 m | Tributary | | | | | | | | | 80 | | | | | | | | | | | | | | |
| 224 | | | Bridge Pipe | 32 m | Tributary | | | | | | | | | 32 | | | | | | | | | | | | | | |
| 225 | | | Bridge | 30 m x 200 m | Creek | Serpentine Creek | 30 | 200 | | 656 | | | | | | | | | | | | | | | | | | |
| 225 | | | Crossing | Level | Road | Highway 37 | | | | | | | | | | | | | 1 | | | | | | | | | |
| 227.8 | | | Bridge | 8 m x 30 m | Tributary | Debris Flow | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 228 | 17 | 245 | Bedrock | Rock | | Rock Fall Protection along 20%, Retaining Walls along 20%, Rock Sheds along 1% Grade Length | | | | | | | | | | 0.17 | 3.4 | 3.4 | | | | | | | | 17.0 | | |
| 229.3 | | | Bridge | 18 m x 175 m | Tributary | Debris Flow | 18 | 175 | | 574 | | | | | | | | | | | | | | | | | | |
| 229.6 | | | Bridge | 15 m x 120 m | Tributary | Debris Flow | 15 | 120 | 394 | | | | | | | | | | | | | | | | | | | |
| 230.7 | | | Bridge | 26 m x 200 m | Tributary | Debris Flow | 26 | 200 | | 656 | | | | | | | | | | | | | | | | | | |
| 231 | | | Crossing | Level | Road | Highway 37 | | | | | | | | | | | | | 1 | | | | | | | | | |
| 232.6 | | | Bridge | 12 m x 140 m | Creek | Halfmoon Creek | 12 | 140 | 459 | | | | | | | | | | | | | | | | | | | |
| 232.8 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | | 68 | | | | | | | | | | | | | | |
| 233.3 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 233.8 | | | Bridge | 12 m x 140 m | Tributary | Debris Flow | 12 | 140 | 459 | | | | | | | | | | | | | | | | | | | |
| 234.5 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | | 68 | | | | | | | | | | | | | | |
| 235.4 | | | Bridge | 15 m x 150 m | Tributary | Debris Flow | 15 | 150 | 492 | | | | | | | | | | | | | | | | | | | |
| 236.6 | | | Bridge | 8 m x 30 m | Tributary | Debris Flow | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 237 | | | Crossing | Rail Overpass | Road | Highway 37 (13 m x 134 m) | | | | | | | | | | | | | | | 146 | | | | | | | |
| 239.4 | | | Bridge | 27 m x 220 m | Tributary | Debris Flow | 27 | 220 | | 722 | | | | | | | | | | | | | | | | | | |
| 239.6 | | | Bridge | 28 m x 220 m | Tributary | Debris Flow | 28 | 220 | | 722 | | | | | | | | | | | | | | | | | | |
| 241.1 | | | Bridge | 28 m x 170 m | Tributary | Debris Flow | 28 | 170 | | 558 | | | | | | | | | | | | | | | | | | |
| 242.7 | | | Crossing | Rail Overpass | Road | Highway 37 (15 m x 146 m) | | | | | | | | | | | | | | | 150 | | | | | | | |
| 243.2 | | | Bridge | 43 m x 250 m | Creek | Seyword Creek | 43 | 250 | | | 820 | | | | | | | | | | | | | | | | | |
| 244.2 | | | Bridge | 15 m x 150 m | Tributary | Debris Flow | 15 | 150 | 492 | | | | | | | | | | | | | | | | | | | |
| 245 | 3 | 248 | Till | Very Heavy | | Difficult Cuts and Fills | | | | | | | | | | | | | | | | | | | 3.0 | | | |
| 247.1 | | | Bridge Pipe | 104 m | Tributary | | | | | | | | | 104 | | | | | | | | | | | | | | |
| 247.6 | | | Bridge | 25 m x 200 m | Creek | Beady Creek | 25 | 200 | | 656 | | | | | | | | | | | | | | | | | | |
| 248 | 2 | 250 | Bedrock | Rock | | Rock Fall Protection along 20%, Retaining Walls along 20%, Rock Sheds along 1% Grade Length | | | | | | | | | | 0.02 | 0.4 | 0.4 | | | | | | | | 2.0 | | |
| 248.1 | | | Bridge | 6 m x 30 m | Tributary | Debris Flow | 6 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 250 | 2 | 252 | Till | Very Heavy | | Difficult Cuts and Fills | | | | | | | | | | | | | | | | | | | 2.0 | | | |
| 251.7 | | | Bridge | 8 m x 50 m | Creek | Packer Creek | 8 | 50 | 164 | | | | | | | | | | | | | | | | | | | |
| 252 | 2 | 254 | Bedrock | Rock | | Rock Fall Protection along 20%, Retaining Walls along 20%, Rock Sheds along 1% Grade Length | | | | | | | | | | 0.02 | 0.4 | 0.4 | | | | | | | | 2.0 | | |
| 254 | 1 | 255 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 1.0 | | | | |
| 255 | 1 | 256 | Alluvial | Very Heavy | | River Crossing, Review for potential aggregate source | | | | | | | | | | | | | | | | | | | 1.0 | | | |
| 255.2 | | | Crossing | Level | Road | Highway 37 | | | | | | | | | | | | | 1 | | | | | | | | | |

## Dease Lake Route - Minaret to Watson Lake

| Terrain Analysis | | | | | | | Size of Civil Structure | | | | | | | | | | | | | | | | Grade Construction | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Bridge Dimensions | | Bridge Length (ft.) by Height Class | | | | | Bridge Pipes | Erosion Protection | Rock/Snow Shed | Rock Fall Protection | Retaining Walls | Road | | | Tunnel | Average | Heavy | Very Heavy | Rock | Organics | Permafrost |
| **Start M.P.** | **Miles** | **End M.P.** | **Terrain Unit** | **Construction** | **Features Requiring Civil Structures** | **Comments** | Height (m) | Length (m) | < 50' high | 51' - 100' high | 101' - 200' high | 201' - 300' high | > 300' high | Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Level Xings | Overpass Length (m) | Rail Bridge Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) |
| 255.5 | | | Bridge | 38 m x 350 m | River | Dease River 200 ft Riprap Protection | 38 | 350 | | | 1,148 | | | | 0.04 | | | | | | | | | | | | | |
| 256 | 4 | 260 | Bedrock | Rock | | Rock Fall Protection along 20%, Retaining Walls along 20%, Rock Sheds along 1% Grade Length | | | | | | | | | | 0.04 | 0.8 | 0.8 | | | | | | | | 4.0 | | |
| 257.1 | | | Bridge | 23 m x 200 m | Tributary | Debris Flow | 23 | 200 | | 656 | | | | | | | | | | | | | | | | | | |
| 258.7 | | | Bridge | 30 m x 220 m | Creek | Anvil Creek | 30 | 220 | | 722 | | | | | | | | | | | | | | | | | | |
| 259.3 | | | Bridge Pipe | 164 m | Tributary | | | | | | | | | 164 | | | | | | | | | | | | | | |
| 260 | 2.5 | 262.5 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 2.5 | | | | |
| 261.5 | | | Bridge | 8 m x 140 m | Tributary | Debris Flow | 8 | 140 | 459 | | | | | | | | | | | | | | | | | | | |
| 262.5 | 2.5 | 265 | Fluvial | Very Heavy | | Construction next to Dease River, Riprap Protection along 10%, Retaining Walls along 10% Grade Length, Review for potential aggregate source | | | | | | | | | 0.25 | | | 0.25 | | | | | | | 2.5 | | | |
| 265 | 1 | 266 | Bedrock | Rock | | Rock Fall Protection along 20%, Retaining Walls along 20%, Rock Sheds along 1% Grade Length | | | | | | | | | | 0.01 | 0.2 | 0.2 | | | | | | | | 1.0 | | |
| 265.1 | | | Crossing | Road Overpass | Rail | Highway 37 (25 m x 116 m) | | | | | | | | | | | | | | 116 | | | | | | | | |
| 266 | 5 | 271 | Fluvial | Very Heavy | | Construction next to Dease River, Riprap Protection along 10%, Retaining Walls along 10% Grade Length, Review for potential aggregate source | | | | | | | | | 0.5 | | | 0.5 | | | | | | | 5.0 | | | |
| 266.3 | | | Crossing | Level | Road | Highway 37 | | | | | | | | | | | | | 1 | | | | | | | | | |
| 266.6 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | | 28 | | | | | | | | | | | | | | |
| 266.9 | | | Bridge Pipe | 28 m | Tributary | | | | | | | | | 28 | | | | | | | | | | | | | | |
| 267.5 | | | Bridge Pipe | 68 m | Tributary | | | | | | | | | 68 | | | | | | | | | | | | | | |
| 268.5 | | | Bridge Pipe | 110 m | Tributary | | | | | | | | | 110 | | | | | | | | | | | | | | |
| 269.3 | | | Bridge Pipe | 128 m | Tributary | | | | | | | | | 128 | | | | | | | | | | | | | | |
| 271 | 6 | 277 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 6.0 | | | | |
| 277 | 0.5 | 277.5 | Alluvial | Very Heavy | | River Crossing, Review for potential aggregate source | | | | | | | | | | | | | | | | | | | 0.5 | | | |
| 277.3 | | | Bridge | 69 m x 480 m | River | Cottonwood River 200 ft Riprap Protection | 69 | 480 | | | | 1,575 | | | 0.04 | | | | | | | | | | | | | |
| 277.5 | 4.5 | 282 | Till | Heavy | | | | | | | | | | | | | | | | | | | | 4.5 | | | | |
| 278.5 | | | Bridge Pipe | 98 m | Tributary | | | | | | | | | 98 | | | | | | | | | | | | | | |
| 281.7 | | | Bridge Pipe | 158 m | Tributary | | | | | | | | | 158 | | | | | | | | | | | | | | |
| 282 | 0.5 | 282.5 | Alluvial | Very Heavy | | Creek Crossing, Review for potential aggregate source | | | | | | | | | | | | | | | | | | | 0.5 | | | |
| 282.3 | | | Crossing | Rail Overpass | Road | Highway 37 (20 m x 176 m) | | | | | | | | | | | | | | | 176 | | | | | | | |
| 282.5 | 9 | 291.5 | Bedrock | Rock | | Rock Fall Protection along 20%, Retaining Walls along 20%, Rock Sheds along 1% Grade Length | | | | | | | | | | 0.09 | 1.8 | 1.8 | | | | | | | | 9.0 | | |
| 288.4 | | | Bridge | 8 m x 30 m | Tributary | | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 289.5 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 291.5 | 5.5 | 297 | Till | Very Heavy | | Large Cuts and Fills | | | | | | | | | | | | | | | | | | | 5.5 | | | |
| 291.6 | | | Crossing | Level | Road | Highway 37 | | | | | | | | | | | | | 1 | | | | | | | | | |
| 291.8 | | | Bridge | 10 m x 60 m | Tributary | Debris Flow | 10 | 60 | 197 | | | | | | | | | | | | | | | | | | | |
| 294.3 | | | Bridge Pipe | 218 m | Tributary | | | | | | | | | 218 | | | | | | | | | | | | | | |
| 294.4 | | | Crossing | Rail Overpass | Road | Highway 37 (30 m x 230 m) | | | | | | | | | | | | | | | 230 | | | | | | | |
| 295.6 | | | Bridge | 30 m x 120 m | Creek | Quartzrock Creek | 30 | 120 | | 394 | | | | | | | | | | | | | | | | | | |
| 296.9 | | | Crossing | Level | Road | Highway 37 | | | | | | | | | | | | | 1 | | | | | | | | | |
| 297 | 2.6 | 299.6 | Bedrock | Rock | | Rock Fall Protection along 20%, Retaining Walls along 20%, Rock Sheds along 1% Grade Length | | | | | | | | | | 0.026 | 0.52 | 0.52 | | | | | | | | 2.6 | | |
| 299.6 | 1.7 | 301.3 | Till | Heavy | | | | | | | | | | | | | | | | | | | | 1.7 | | | | |
| 299.6 | | | Bridge Pipe | 98 m | Tributary | | | | | | | | | 98 | | | | | | | | | | | | | | |
| 301.3 | 7.7 | 309 | Bedrock | Rock | | Rock Fall Protection along 20%, Retaining Walls along 20%, Rock Sheds along 1% Grade Length | | | | | | | | | | 0.077 | 1.54 | 1.54 | | | | | | | | 7.7 | | |
| 302.4 | | | Bridge | 30 m x 60 m | Creek | Hot Creek | 30 | 60 | | 197 | | | | | | | | | | | | | | | | | | |
| 304 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 304.6 | | | Bridge Pipe | 128 m | Tributary | | | | | | | | | 128 | | | | | | | | | | | | | | |
| 306.8 | | | Bridge | 32 m x 250 m | Creek | Dennis Creek | 32 | 250 | | | 820 | | | | | | | | | | | | | | | | | |

## Dease Lake Route - Minaret to Watson Lake

| Terrain Analysis | | | | | | | Size of Civil Structure | | | | | | | | | | | | | | | | Grade Construction | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Bridge Dimensions | | Bridge Length (ft.) by Height Class | | | | | Bridge Pipes | Erosion Protection | Rock/Snow Shed | Rock Fall Protection | Retaining Walls | Road | | | Tunnel | Average | Heavy | Very Heavy | Rock | Organics | Permafrost |
| Start M.P. | Miles | End M.P. | Terrain Unit | Construction | Features Requiring Civil Structures | Comments | Height (m) | Length (m) | < 50' high | 51' - 100' high | 101' - 200' high | 201' - 300' high | > 300' high | Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Level Xings | Overpass Length (m) | Rail Bridge Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) |
| 309 | 1.2 | 310.2 | Bedrock | Rock | | Rock Fall Protection along 100%, Rock Sheds along 50% Grade Length | | | | | | | | | | 0.6 | 1.2 | | | | | | | | | 1.2 | | |
| 310.2 | 1.8 | 312 | Colluvial | Very Heavy | | Rock Fall Protection along 20%, Retaining Walls along 20%, Rock Sheds along 1% Grade Length | | | | | | | | | | 0.018 | 0.36 | 0.36 | | | | | | | 1.8 | | | |
| 310.4 | | | Bridge | 26 m x 220 m | Tributary | | 26 | 220 | | 722 | | | | | | | | | | | | | | | | | | |
| 310.9 | | | Bridge | 53 m x 400 m | Tributary | | 53 | 400 | | | 1,312 | | | | | | | | | | | | | | | | | |
| 311.5 | | | Bridge Pipe | 278 m | Tributary | | | | | | | | | 278 | | | | | | | | | | | | | | |
| 312 | 3 | 315 | Till | Heavy | | | | | | | | | | | | | | | | | | | | 3.0 | | | | |
| 312.5 | | | Bridge Pipe | 224 m | Tributary | | | | | | | | | 224 | | | | | | | | | | | | | | |
| 315 | 4 | 319 | Bedrock | Rock | | Rock Fall Protection along 20%, Retaining Walls along 20%, Rock Sheds along 1% Grade Length | | | | | | | | | | 0.01 | 0.8 | 0.8 | | | | | | | | 4.0 | | |
| 315.9 | | | Bridge | 18 m x 160 m | Tributary | | 18 | 160 | | 525 | | | | | | | | | | | | | | | | | | |
| 319 | 3 | 322 | Till | Very Heavy | | Large Cuts and Fills | | | | | | | | | | | | | | | | | | | 3.0 | | | |
| 322 | 8 | 330 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 8.0 | | | | |
| 322.9 | | | Bridge Pipe | 98 m | Tributary | | | | | | | | | 98 | | | | | | | | | | | | | | |
| 323.8 | | | Bridge Pipe | 98 m | Tributary | | | | | | | | | 98 | | | | | | | | | | | | | | |
| 325.1 | | | Bridge Pipe | 40 m | Tributary | | | | | | | | | 40 | | | | | | | | | | | | | | |
| 326.7 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 328.4 | | | Crossing | Level | Road | Highway 37 | | | | | | | | | | | | | 1 | | | | | | | | | |
| 328.5 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 330 | 3 | 333 | Eolian | Heavy | | | | | | | | | | | | | | | | | | | | 3.0 | | | | |
| 330.5 | | | Bridge | 27 m x 160 m | Tributary | | 27 | 160 | | 525 | | | | | | | | | | | | | | | | | | |
| 333 | 1.6 | 334.6 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 1.6 | | | | |
| 333.3 | | | Bridge | 8 m x 100 m | Tributary | | 8 | 100 | 328 | | | | | | | | | | | | | | | | | | | |
| 334.6 | 2.7 | 337.3 | Till | Heavy | | | | | | | | | | | | | | | | | | | | 2.7 | | | | |
| 335.5 | | | Bridge | 6 m x 30 m | Tributary | | 6 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 337.3 | 0.3 | 337.6 | Alluvial | Very Heavy | | River Crossing, Review for potential aggregate source | | | | | | | | | | | | | | | | | | | 0.3 | | | |
| 337.5 | | | Bridge | 27 m x 200 m | River | French River 200 ft Riprap Protection | 27 | 200 | | 656 | | | | | 0.04 | | | | | | | | | | | | | |
| 337.6 | 4.4 | 342 | Till | Very Heavy | | Large Cuts and Fills | | | | | | | | | | | | | | | | | | | 4.4 | | | |
| 341.3 | | | Bridge Pipe | 98 m | Tributary | | | | | | | | | 98 | | | | | | | | | | | | | | |
| 342 | 1 | 343 | Till | Very Heavy | | Difficult Cuts and Fills | | | | | | | | | | | | | | | | | | | 1.0 | | | |
| 342.5 | | | Bridge | 17 m x 180 m | Tributary | | 17 | 180 | | 591 | | | | | | | | | | | | | | | | | | |
| 343 | 1 | 344 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 1.0 | | | | |
| 344 | 0.3 | 344.3 | Alluvial | Very Heavy | | Difficult Cuts and Fills, Review for potential aggregate source | | | | | | | | | | | | | | | | | | | 0.3 | | | |
| 344.2 | | | Bridge | 8 m x 30 m | Tributary | | 8 | 30 | 98 | | | | | | | | | | | | | | | | | | | |
| 344.3 | 3.2 | 347.5 | Fluvial | Average | | Review for potential aggregate source | | | | | | | | | | | | | | | | | 3.2 | | | | | |
| 347.5 | 3.3 | 350.8 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 3.3 | | | | |
| 350.8 | 0.9 | 351.7 | Alluvial | Very Heavy | | River Crossing, Review for potential aggregate source | | | | | | | | | | | | | | | | | | | 0.9 | | | |
| 351.1 | | | Bridge | 36 m x 325 m | River | Blue River 200 ft Riprap Protection | 36 | 325 | | | 1,066 | | | | 0.04 | | | | | | | | | | | | | |
| 351.7 | 2.3 | 354 | Alluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 2.3 | | | | |
| 354 | 2 | 356 | Alluvial | Very Heavy | | Difficult Cuts and Fills, Review for potential aggregate source | | | | | | | | | | | | | | | | | | | 2.0 | | | |
| 356 | 2.3 | 358.3 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 2.3 | | | | |
| 358.3 | 0.4 | 358.7 | Organics | Organics | | | | | | | | | | | | | | | | | | | | | | | 0.4 | |
| 358.4 | | | Bridge Pipe | 86 m | Tributary | | | | | | | | | 86 | | | | | | | | | | | | | | |
| 358.7 | 3.9 | 362.6 | Fluvial | Average | | Review for potential aggregate source | | | | | | | | | | | | | | | | | 3.9 | | | | | |
| 362.6 | 3.1 | 365.7 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 3.1 | | | | |
| 362.8 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 363.5 | | | Bridge Pipe | 20 m | Tributary | | | | | | | | | 20 | | | | | | | | | | | | | | |
| 364.5 | | | Bridge | 32 m x 300 m | Creek | Masidoor Creek | 32 | 300 | | | 984 | | | | | | | | | | | | | | | | | |
| 365.7 | 6.3 | 372 | Fluvial | Very Heavy | | Difficult Cuts and Fills, Retaining Walls over 10% Grade Length, Review for potential aggregate source | | | | | | | | | | | | 0.63 | | | | | | | 6.3 | | | |
| 368.4 | | | Bridge | 35 m x 300 m | Tributary | | 35 | 300 | | | 984 | | | | | | | | | | | | | | | | | |
| 370.8 | | | Bridge | 20 m x 200 m | Creek | | 20 | 200 | | 656 | | | | | | | | | | | | | | | | | | |
| 372 | 2.5 | 374.5 | Fluvial | Heavy | | Review for potential aggregate source | | | | | | | | | | | | | | | | | | 2.5 | | | | |

## Dease Lake Route - Minaret to Watson Lake

| Terrain Analysis | | | | | | | Size of Civil Structure | | | | | | | | | | | | | | | | Grade Construction | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Bridge Dimensions | | Bridge Length (ft.) by Height Class | | | | | Bridge Pipes | Erosion Protection | Rock/Snow Shed | Rock Fall Protection | Retaining Walls | Road | | | Tunnel | Average | Heavy | Very Heavy | Rock | Organics | Permafrost |
| **Start M.P.** | **Miles** | **End M.P.** | **Terrain Unit** | **Construction** | **Features Requiring Civil Structures** | **Comments** | Height (m) | Length (m) | < 50' high | 51' - 100' high | 101' - 200' high | 201' - 300' high | > 300' high | Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Level Xings | Overpass Length (m) | Rail Bridge Length (m) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) | Length (mile) |
| 374.5 | 5.5 | 380 | Fluvial | Very Heavy | | Difficult Cuts and Fills, Retaining Walls over 10% Grade Length, Review for potential aggregate source | | | | | | | | | | | | 0.55 | | | | | | | 5.5 | | | |
| 376.2 | | | Bridge Pipe | 188 m | Tributary | | | | | | | | | 188 | | | | | | | | | | | | | | |
| | 380 | | | | | | | 16,915 m | 9,304 ft | 18,864 ft | 16,302 ft | 8,382 ft | 2,625 ft | 13,428 m | 7.95 M | 1.54 M | 18.58 M | 27.63 M | 11 Xings | 116 m | 848 m | 16.5 M | 7.1 M | 110.1 M | 150.4 M | 95.5 M | 0.4 M | |
| | | | | | | | | 55,495 ft. | Total bridge length | | | | 55,477 ft | 44,055 ft. | | 8,131 ft | | 145,860 ft | | 381 ft. | 2,782 ft. | Total Route Segment Length (miles) | | | | | | 380.0 M |
| | | | | | | Count | 96 | 96 | 43 | 31 | 16 | 5 | 1 | 127 | | | | | | 1 | 5 | | | | | | | |
| | | | | | | Check Summary | | 16,115 m | 2,840 m | 5,750 m | 4,970 m | 2,555 m | 800 m | 13,428 m | 7.945 | 1.54 | 18.58 | 27.625 | 17 | | | 16.5 | 7.1 | 110.1 | 150.4 | 95.5 | 0.4 | |
| | | | | | | | | | 9,318 ft. | 18,865 ft. | 16,306 ft. | 8,383 ft. | 2,625 ft. | 44,055 ft. | | 8,131 ft | | 145,860 ft | | | | | | | | | | |
| | | | | | | | | | | | Bridge over major river | 1,969 | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | Bridges 201' - 300' | 6,414 ft. | | | | | | | | | | | | | | | | |

**Appendix B -**
**Potential Ballast Source Locations**

Ft. Nelson to Watson Lake Alignment

| **Mileage** | **Direction from Alignment** | **Distance from Alignment (km)** | **Rock Type** |
|---|---|---|---|
| 322 | South | Adjacent | Greenstone |

Dease Lake Alignment

| **Mileage** | **Direction from Alignment** | **Distance from Alignment (km)** | **Rock Type** |
|---|---|---|---|
| 0 | South | 5 | Calc-alkaline volcanics |
| 0 | South | 15 | Intrusive |
| 155 | East | 2 | Diorite and gabbro |
| 155 | East | 9 | Basalt |
| 158 | East | 1 | Calc-alkaline volcanics |
| 160 | East | 1 | Diorite and gabbro |
| 165 | East | 3 | Quartz diorite |
| 170 | East | 1.5 | Diorite |
| 175 | East | Adjacent | Diorite |
| 178 | East | Adjacent | Quartz monzonite |
| 182 | East | 3 | Volcanics |
| 185 | East | 6.5 | Quartz monzonite |
| 190 | West | 1.5 | Volcanics |
| 193 | East | 1.5 | Quartz monzonite |
| 195 | East | 1 | Volcanics |
| 205 | East | 2 | Volcanics |
| 211 | East | 3 | Ultramafics |
| 250 | East | Adjacent | Volcanics |
| 255 | East | Adjacent | Volcanics |
| 190 | West | Adjacent | Basalt |