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Ms. Kimberley Cliffe-Phillips
Environmental Assessment Officer
Mackenzie Valley Environmental Impact Review Board
Yellowknife, NT

September 7, 2004

Dear Ms. Cliffe-Phillips;

Deh Cho Bridge – Developer's Assessment Report, IR 2.1.21

Further to Mr. Jivkov's submission of August 24th, attached is our response to Information Request 2.1.21, submitted on behalf of the Deh Cho Bridge Corporation.

Please do not hesitate to contact me for any further information.

Sincerely,

Andrew Gamble

attachment

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Response to Mackenzie Valley Environmental Impact Review Board
Information Request

IR Number: **2.1.21**

Response:

Attached is revised Section K – Cumulative Impacts. This rewrite provides a more rigorous analysis and definitive conclusions of the potential cumulative impacts, using the approach outlined in the MVEIRB's publication *Environmental Assessment Guidelines (March 2004) - Appendix H.*

We note that the MVEIRB's *Addressing Cumulative Environmental Effects in Environmental Assessments* (Interim Guide, Sept. 2000), explicitly exclude impacts that are not adverse in the test of 'significance'. Since many of the potential project impacts identified in Sections I & J are beneficial (or insignificant) rather than adverse, we have identified and eliminated these from further cumulative impacts analysis.

The focus of the analysis is on those valued components (VCs) of the human and physical/biological environment for which this development has potential significant adverse impacts and on the cumulative effects of this development combined with past, present and future developments that affect these parts of the environment within the same spatial and temporal boundaries. Mitigation/management measures are also identified.

It is noted that most potential adverse project impacts are both local and short-term. It is also noted that this project is an incremental addition/improvement to the development of the overall transportation corridor and, aside from this corridor development, there are few other projects identified that contribute significantly to potential cumulative adverse impacts within the noted VCs and boundaries.

Attachment – DAR Section K, revised Sept. 7, 2004 (pp 138 – 148)

K Cumulative Impacts (revised):

Predict the cumulative impacts that might result from the proposed development impacts in combination with other past, present or reasonably foreseeable future developments and activities.

K.1 Context

This project has several important distinctions from resource exploration/exploitation projects which form the majority of proposals reviewed by the MVEIRB under the MVRMA. Understanding these differences is important to assessing the contribution of this project to cumulative environmental and socio-economic impacts.

- Resource development projects include exploration, construction and an extended period of extraction. A mining development will typically involve continuous disturbance and production and accumulation of waste material and waste water throughout its operating life. Resource projects must also consider eventual closure and abandonment.

  This project includes about 2 years of construction activity and disturbance. This bridge is designed to remain stable after this construction phase. While the bridge may require rehabilitation over the long term, once built it is unlikely to be abandoned in the foreseeable future. It will be a permanent fixture.

- This is an incremental improvement to an existing transportation corridor. The bridge will replace the existing ferry and ice bridge crossing and does not provide 'new' access. Independent analysis by PROLOG Canada Inc. (Appendix 13) indicates that this improvement will have a relatively minor impact on traffic volumes. They estimate a 2 - 5% 'uplift' (increase) in total traffic due to the bridge. This would largely be commercial and non-commercial traffic diverted from air mode. This traffic will be more spread out, since the road will be open for 365 days per year, 24 hours per day. Currently the ferry schedule is 18 hours per day (for about 7 months) and the crossing is closed to all traffic for an average of 5 weeks per year.

- Resource development projects typically involve a trade-off between a positive economic benefit and potential adverse environmental impacts. In this case, the proponent believes that in addition to the economic benefit, the project has a net environmental benefit. Replacing the ferry and ice crossing with a bridge will reduce the long-term disturbance and risk to the environment. In this case, the trade offs for the both human and physical valued components tend to be more between managed short-term disturbance/disruption and long-term benefits.

K.2 Spatial boundaries

The spatial boundaries used in assessing impacts of this project differ for the Human and Physical/Biological components as noted below. In both cases, the most pronounced potential impacts are local. 'Downstream' regional economic impacts would generally follow the transportation corridor while Biological impacts would generally follow the river. For assessing cumulative impacts, 'upstream' developments must also be considered. The following are used for defining spatial boundaries:

Human Environment

- ***Local*** – the Community of Ft Providence
- ***Regional*** – the North Slave Region

Physical and Biological environment

- ***Local*** – the immediate vicinity of the bridge construction site
- ***Regional*** – the Mackenzie River downstream of the bridge

K.3 Temporal Boundaries

The temporal boundaries used in assessing impacts of this project differ for the Human and Physical/Biological components as noted below. For assessing cumulative impacts, relevant past and future developments must also be considered. The following limits are used for defining temporal boundaries:

Human Environment

- ***Short-term*** – The two year construction phase
- ***Medium-term*** – The 35 year concession period. (During this period, a tolls is collected from commercial users, the debt is retired and the community earns dividends.)
- ***Long-term*** – Year 37 onwards. (Ownership is transferred to the GNWT. Tolls are no longer required to service debt and dividend flow to the community stops.)

Physical and Biological Environment

- ***Short-term*** – The two year construction phase.
- ***Long-term*** – From completion of construction onwards (indefinitely).

K.4 Adverse versus Beneficial Impacts

Section I of this report identifies potential impacts of the project on various components of the human environment, while Section J identifies potential impacts on the physical and biological environment. The approach used in cumulative effects assessment follows the four key steps outlined in Appendix H of the *MVEIRB Environmental Assessment Guidelines (March 2004):*

a. Identifying the valued components (VCs) that are potentially affected by the development.
b. Determining what past, present or foreseeable future developments will affect these same VCs.
c. Predicting the combined effects of these developments.
d. Identifying ways to manage the combined impacts

As noted in sections I and J this project has many potential positive impacts on valued components. These include for example:

- ✓ Employment, training and business opportunities during construction.
- ✓ Overall cost and time savings and increased reliability to the public, business and government.
- ✓ Long-term investment income and benefits of reinvestment for the community.
- ✓ Long-term reduction in fossil fuel consumption and improvement to air quality.
- ✓ Long-term improvement in water quality.
- ✓ Long-term improvement in aquatic habitat.

While the positive impacts are fundamental to the merits of the project, the potential adverse impacts are of more concern to reviewers, when considering cumulative impacts. The MVEIRB's interim guide on cumulative effects considers only adverse impacts as significant.

The focus of the following cumulative impact analysis is therefore limited to potential adverse impacts.

K.5 Potential Adverse Effects of the Development

K.5.1 Human Environment

Table K1 lists all potential adverse impacts of the project on Human Environment VCs, as identified in Section I (Tables I1 – I4). Of the 6 VCs identified, 5 are local and none have a high magnitude or significance. Mitigation measures are proposed for 4 of the 6.

Table K1 – Potential Adverse Impacts on Human Environment

Category	Valued Components	Extent (Spatial)	Duration (Temporal)	Magnitude	Significance	Confidence	Rationale/ Comments	Mitigation
Direct Economic Impacts	1. Local employment	L	L	M	M	M	Estimate loss of 6 local PYs and gain of 2-10 PYs, depending on toll system. Offset by long-term opportunities resulting from investment of dividends	Yes
Indirect Economic Impacts	2. Exploration & Mining Sector Economics	R	M	L	L	M	Toll costs may exceed benefits from transportation savings and improved access, reducing investment in sector.	No
Direct and Indirect Socio-Cultural Impacts	3. Local social impacts during construction	L	S	L	M	M	Some concern about possible negative social impacts from non-resident workforce during construction phase.	Yes
	4. Local and Regional accessibility/ reliability of access	L	L	M	L	M	Some local concern about potential negative impacts of improved access.	Yes
	5. Local impacts of traffic patterns and volume	L	L	L	L	M	Marginal increase in traffic, noise and activity	No
Impacts on Land Use and Visual/Aesthetic Resources	6. Impacts on existing uses and activities	L	S	M	M	M	Some disturbance due to construction activity and noise. Potential for disturbance to subsistence and recreation fishery in immediate vicinity of north ferry landing	Yes

Extent: Local Regional **Duration:** Short-term(2 yrs) Medium-term (35 yrs) Long-term (+35 yrs)
Magnitude, Significance, Confidence: Low Medium High

K.5.2 Physical and Biological Environment

Table K2 lists all potential adverse impacts of the project on the physical and biological environment, as identified in Section J (Tables J3 – J13), excluding those impacts of negligible significance. Of the 5 identified, all are local, short-term, reversible and of low significance. Mitigation measures are proposed for each.

Table K2 – Potential Adverse Impacts on Physical and Biological Environment

Category	Valued Components	Extent (Spatial)	Duration (Temporal)	Magnitude	Frequency	Confidence	Reversibility	Significance	Rationale/ Comments	Mitigation
Air Quality and Climate	7. Air Quality	L	S	L	L	M	Y	L	Increased fugitive dust and vehicle exhaust emissions can be expected during the construction period.	Yes
Overall Potential Impacts to Water Quality	8. Water Quality (sedimentation)	L	S	L	L	M	Y	L	The amount of construction is small and of short duration (few months of construction for each pier/structure) relative to the size of the Mackenzie River. Construction timelines will be staggered, not all structures will affect resources simultaneously. See Table J6 for details.	Yes
Potential Impacts to Water Quantity	9. River Channel	L	S	L	L	M	Y	L	The physical area occupied by temporary instream bridge construction structures is small, and structures will be in place for a short duration (a few months of construction for each pier/structure). Construction will be sequential, so not all structures will affect resources simultaneously.	Yes
Potential Impacts to Aquatic Resources	10.Aquatic Resources	L	S	L	L	M	Y	L	The area affected by instream activity is small relative to the size of the Mackenzie River, and construction events have a short duration. Construction timelines will be staggered; as such, not all structures will affect resources simultaneously. See Table J11 for details.	Yes
Potential Impacts to Noise	11.Noise (short-term)	L	S	M	L	M	Y	L	Increased noise emissions can be expected during the construction period.	Yes

Extent: 'L' = Local; 'R' = Regional; **Duration**: 'S' = Short-term; 'M' = Medium-term; 'L' = Long-term.
Magnitude: 'N' = Negligible; 'L' = Low; 'M' = Medium; 'H' = High. **Frequency**: 'L' = Low; 'M' = Medium; 'H' = High.
Confidence: 'L' = Low; 'M' = Medium; 'H' = High. **Reversibility**: 'Y' = Yes; 'N' = No.
Significance: 'N' = Negligible; 'L' = Low; 'M' = Medium; 'H' = High.

K.6 Cumulative Impacts

The following is a discussion of each of the 11 identified VCs for which this development has potential adverse effects, considering:

- other past present and predicted developments (within the same spatial and temporal boundaries) contributing to these adverse effects
- the combined effects of these developments and
- measures proposed to mitigate/manage the cumulative effects.

K.6.1 Long-Term Local Employment

Potential Adverse Effects - It is anticipated that the potential direct loss of local jobs due to shut down of the ferry will be more than offset by potential indirect jobs and business opportunities resulting from dividend income reinvestment and toll collection.

Other Developments - Key developments likely to affect local employment include an increase in regional oil & gas activity, increasing tourism and increasing population. All are expected to have a positive impact on local employment. No other past or anticipated future developments have been identified which would have an adverse effect on local employment.

Cumulative effects – Not applicable

Management of Impacts -Mitigation measures are proposed to manage potential direct job losses and maximize indirect job gains. These are outlined in the Community Benefits Commitment Plan (Appendix 7).

K.6.2 Exploration & Mining Sector Economics

Potential Adverse Effects - It is anticipated that toll costs will exceed the benefits from transportation savings and improved access for the mining sector. This would be a relatively minor cost increase. For example, the major commodity transported to mines is fuel and, in the worst case, the toll will add less than 0.3 cents to the cost of transporting a litre of fuel. This is a fraction of 1% of the delivered cost of fuel and far less than the market price fluctuation for the product.

Other Developments - Other past developments affecting mine economics include the construction and upgrading of the all weather transportation corridor (discussed in Section K.7 below) and the winter road, originally constructed to provide access to the Lupin mine and now providing access to exploration and development of this mineral region. Anticipated future developments include the eventual upgrading of the existing winter road to an all weather road, a new winter or all weather road providing access from the Arctic coast and supply of electrical power to the region. All of these developments have or would improve mining access and economics. No other 'developments' have been identified that would contribute to increased mining costs.

Cumulative effects – Not applicable

Management of Impacts -No mitigating measures are proposed.

K.6.3 Local social impacts during construction

Potential Adverse Effects - Some concerns have been identified about possible negative social impacts from a non-resident workforce during the construction phase. This will be short-term, over a period of six months in each of 2 years.

Other Developments - There are no other significant local developments anticipated during this period which would contribute additional adverse impacts.

Cumulative effects – Not applicable

Management of Impacts -Mitigation and monitoring measures are proposed and are outlined in the Community Benefits Commitment Plan (Appendix 7).

K.6.4 Local accessibility/ reliability of access

Potential Adverse Effects - Improved access is considered a positive impact by most users. However, some concerns have been identified about potential negative socio-cultural impacts of improved access, due to the loss of the imposed 'quiet time' when through traffic is reduced and the community becomes isolated from the south. Road access to the north (Yellowknife) is now uninterrupted and this will not change. Access to the South is interrupted for an average of 5 weeks per year and for 6 hours per day during the ferry season. This interruption will be eliminated.

Other Developments - The major past developments contributing to improved access (reduced isolation) are the various projects to open and improve this transportation corridor (see section K.7).

Cumulative effects – This project provides a marginal improvement to access, by providing uninterrupted year round access south with no seasonal interruptions and by providing 24 hour access versus the existing 18 hour access to cross the river during the ferry season. This represents an increase of about 10% in days per year and 23% in hours per year. Future developments cannot improve on this.

Management of Impacts – The Community benefits Plan (Appendix 7) identifies measures to invest in community social program priorities. This could include mitigation of any negative socio-cultural impacts resulting from improved access.

Table K3 – Cumulative Impacts on Community access

Road Access	Before Highway Construction	%	Current	%	With Bridge	%
Access North	none	0%	uninterrupted	100%	uninterrupted	100%
Access South	none	0%	- No access for 5 weeks avg. - No access for 6 hours per day, 7 months per year	77%	uninterrupted	100%

K.6.5 Local impacts of traffic patterns and volume

Potential Adverse Effects - There will be marginal increase in total traffic, noise and activity as well as a changed pattern of this traffic. As noted in Section K.1, expected traffic uplift is 2-5% (about 2 years of normal traffic growth). This will be spread out over 52 weeks instead of the current 47 weeks, so that the average daily traffic will decline. Most of this traffic will be highway through traffic, bypassing the Ft. Providence access at a distance of 5 kilometres from the community itself. The magnitude and significance are considered low.

Other Developments - Again, the major past development contributing to local traffic is the project to open this transportation corridor (see section K.7). Regional population growth, the establishment of Yellowknife as the Territorial Capital, commercial centre and transportation hub and the development of the minerals in the Slave Province have resulted in a steady increase in the volume of through traffic, passing near (not through) the community. Future developments and population growth are expected to result in an annual traffic increase of 1 to 2%.

Cumulative effects – The cumulative effect is the presence of highway traffic. The bridge will contribute to an increase of 2-5%.

Management of Impacts -No mitigating measures are proposed.

K.6.6 Local disturbance due to construction activity and noise.

Potential Adverse Effects - There will be some local disturbance due to construction activity and noise, including potential disturbance to the subsistence and recreation fishery in immediate vicinity of north ferry landing. This disturbance is limited to the construction phase.

Other Developments - Past development of the north causeway, during initial highway construction and subsequent repairs to the causeway and ferry landing have altered the river flow characteristics at this location. No other projects are expected to contribute to local disturbance during this period.

Cumulative effects – The improved access provided by the highway and causeway have increased the attraction and use of this area for subsistence and recreational fishery. During construction, the ferry will continue to operate, contributing the existing level of activity and disturbance of ferry landing maintenance and ferry operations. The net effect is expected to include some inconvenience to users during peak construction activities. Following construction, the ferry landing maintenance and ferry operations will cease.

Management of Impacts -Mitigating measures include locating camp, plants and storage areas away from high use areas and contracting procedures to minimize inconvenience to existing users, particularly on the north ferry landing and in the area of seasonal cabins on the north ice crossing access. Construction activity is also to be managed to minimize any potential disruption to ferry operations, local and through traffic. It is also noted that the majority of users in the area are local Dene and Metis residents, who are also equity owners in the development.

K.6.7 Air Quality - dust and vehicle exhaust emissions during construction

Potential Adverse Effects - Increased fugitive dust and vehicle exhaust emissions can be expected during the construction period. This is local and short-term. The magnitude and significance of impacts on air quality are considered low.

Other Developments - The main past development contributing to dust and vehicle exhaust emissions is the initial construction and upgrading of the highway corridor and the resulting highway traffic and ferry operation. Paving of the highway has reduced the dust emissions from original levels (as well as the potential dust emissions from construction of the bridge). Increasing traffic and extended ferry operations have resulted in an increase in vehicle exhaust emissions. There are no other local developments anticipated during this period which will contribute to increased air emissions. Following construction, fuel consumption and exhaust emission will be reduced by the resulting reduction in vehicle trip distances and

wait times and elimination of the ferry operation.

Cumulative effects – The annual fuel consumption for the project is estimated at 2.3 million litres. This is about 2 - 4 times that consumed each year for ferry operations and local traffic. For comparison, it is the amount consumed for 10-20 km of highway reconstruction or about 2-5% of the fuel consumed by a typical mine in a year.

Management of Impacts -Mitigating measures will include use of appropriate dust control measures on unpaved roadways, in pits and on crushers, heavy equipment and trucks.

K.6.8 Water Quality - Siltation

Potential Adverse Effects - Sediments will be released during instream construction activities, specifically through excavation of the pier and abutment foundations and modifications to the north and south causeways. There may also be some additional sedimentation in the medium term as the new structure stabilizes. The anticipated magnitude and significance is low and effects are expected to be local. Natural suspended sediments in the river at this location are highest in the spring and early summer, due to high water levels and runoff from tributaries and lowest during the winter. Construction disturbance will largely be during the open water season.

Other Developments - Key past and current developments contributing to local suspended sediments include the construction and maintenance of the causeways and ferry landings. This has resulted in sedimentation from erosion of the ferry landing ramps and the propwash from ferry operations. Propwash from heavy barge traffic on the river may also contribute to disturbance of sediments. The individual and combined effects of these sources are relatively small, compared to the natural silt load during the open water season.

Cumulative effects – The combined effects of ferry propwash and construction disturbance will be small, compared to the natural silt load during the open water season.

Management of Impacts -The proposal includes a range of measures to control release of sediments. There will be a program to monitor suspended solids and other potential contaminants and contingency plans, in case levels exceed acceptable limits.

K.6.9 River Channel – Narrowing width

Potential Adverse Effects - The temporary cofferdams will narrow the river channel width. However, compared to the overall channel width this is relatively small. The magnitude and significance are considered low.

Other Developments - The key past development is the construction of the north and south causeways and ferry landings. The North landing extends about 430 meters while the south causeway extends about 165 metres from the natural shoreline. Together these causeways have reduced the overall river width at this location by 38%, from 1,560 to 966 metres. These have been in place and relatively stable for several decades. Each of the 8 piers will reduce the channel width by less than 1%. No other developments impacting channel width are anticipated.

Cumulative effects – There will be a further short-term restriction in the channel width during the construction phase. The effects are considered low in magnitude and significance.

Management of Impacts -The North causeway will be shortened, while the south causeway will be lengthened. The net effect will add about 30 metres to the overall river width,

offsetting the reduction due to the piers.

K.6.10 Aquatic Resources – Changes in suspended sediments and habitat

Potential Adverse Effects – There will be disturbance to the river bottom and aquatic habitat and some siltation due to in stream construction activity. This is short-term and local and considered to be of low magnitude and significance.

Other Developments – Once again, the key past development is the construction of the north and south causeways and ferry landings. These reduced and significantly altered the characteristics of the local habitat. Not all the past impacts are negative, as the changing river flow has improved the quality of habitat for some species. The new regime created by this past development has been in place and relatively stable for several decades.

Cumulative effects – The proposed development will result in a relatively small, short term added disturbance during construction.

Management of Impacts - The proposal includes a range of measures to control release of sediments and minimize disturbance of sensitive areas. There will be a program to monitor suspended solids and other potential contaminants and contingency plans, in case levels exceed acceptable limits. The modifications to the causeways and removal of the ferry landings will increase the net aquatic habitat.

K.6.11 Noise – due to construction activities

Potential Adverse Effects – Increased noise levels are expected in the immediate vicinity of the construction site and, to a lesser extent, at the quarry locations. This will be short term, during the six months of construction in each of two years and is considered of low significance.

Other Developments – The major past development contributing to local noise is the project to open this transportation corridor and the noise resulting from highway traffic and ferry operations.

Cumulative effects – Cumulative underwater noise levels would include contributions from the ferry props and passing tugs. The added contribution form the instream construction of cofferdams, piers and abutments will be relatively small, localized and short-term. Once complete the project will result in a net reduction in underwater noise levels. Current airborne noise from traffic and ferry operations will be increased by construction activities including heavy equipment operations (tractors, trailers, backhoes, loaders, cranes, drills). During construction of abutments, piling equipment will also be in use. There will be no blasting. Noise levels in the immediate vicinity of construction would be consistent with those found on a highway construction site.

Management of Impacts – The key mitigating measures will be ensuring that all equipment is has appropriate noise reduction measures and limiting construction noise during sensitive time periods.

K.7 Transportation Corridor

As noted, the most significant development contributing to the cumulative impacts on the VCs affected by this project is the highway corridor connecting Ft. Providence and the North Slave

region to the South.

Prior to the 1960s, access to Ft. Providence and the communities of the North Slave Region was limited to waterways, winter cat-train roads and air.

In 1968 an all-weather highway, including the ferry at Ft. Providence, was completed from Alberta to Yellowknife via Ft. Providence and Rae. This highway provided a major change to the accessibility of these communities and unprecedented access to the land traversed. The construction and subsequent maintenance and upgrading consumed significant quantities of granular resources, disturbed large areas of land (for the right of way and borrow sources) and altered local drainage systems. This initial construction had by far the greatest environmental and socio-economic impact of the corridor development.

Until the early 1980's, highway traffic was interrupted for 4 to 6 weeks during freeze-up and again at break-up. At that time, the ferry hull was strengthened and the ferry operations were extended into the fall and winter, operating in a channel in the ice, until the ice bridge reached capacity for heavy traffic. This improvement limited the interruption of service to spring breakup, with intermittent suspension in the fall. This improvement resulted in an incremental improvement in accessibility and costs to the region.

Beginning in the mid 1980's, the GNWT undertook to upgrade and pave this highway corridor. This work has been completed from the Alberta border north and only about 60 kilometres remains to be completed between Rae and Yellowknife. This improvement consumed significant quantities of granular materials, in excess of those used for the original construction. Additional land and habitat was disturbed to widen and realign the highway right-of way and to open and expand borrow pits, granular sources and rock quarries. Once completed, this paving has reduced dust emissions, reduced erosion of roadway embankments and consumption of granular materials used for maintenance. It has also eliminated the use of calcium chloride for dust control. The upgraded highway has provided a higher level of service, including improved safety, reduced cost and time savings.

The construction of the bridge to replace the current ferry operation will result in the consumption of local granular materials and rock and largely temporary disturbance of habitat. Compared to the impacts of the highway construction and reconstruction, the effects are almost insignificant. In the long term, the bridge will result in a reduction in local consumption of granular materials and fossil fuels. While the socio/economic/cultural impacts are considered significant (and positive overall), they pale by contrast to the impacts of the initial construction of the highway. The bridge (and all improvements since original highway construction) provided incremental improvements in access, costs and safety and have the potential to stimulate additional community economic activity. The bridge is not expected to have any significant stimulus (positive or negative) to mineral development in the region. It is expected to result in a small increase in total annual traffic and associated impacts.

Construction of this bridge will complete this highway corridor to current and foreseeable standards. Aside from ongoing maintenance and repair of the road surfaces, right-of-way and drainage structures, major work is not contemplated. It is unlikely that there will be any need to change the road alignment or width.

In the long term, there may be proposals to extend the all weather highway network to other North Slave communities and/or into the active mineral regions of the Slave Province.

Table K4 illustrates the relative contribution of the proposed bridge to cumulative environmental and socio-economic impacts of other highway developments.

Table K4 – Relative Transportation Corridor Impacts

Highway Corridor Development	Valued Components	Overall Impacts					
		Extent	Direction	Magnitude	Significance	Confidence	Rationale/ Comments
Initial Highway Construction	Environmental Impacts	R	-	H	H	H	Significant resource consumption, disturbance of habitat and drainage systems. Unprecedented access.
	Socio-economic Impacts	R	+	H	H	H	All weather highway access and significant reduction in costs and isolation. Stimulation of regional economy and mineral development.
Ferry Service extension	Environmental Impacts	L	-	L	L	H	Relatively minor change in operations
	Socio-economic Impacts	R	+	L	L	H	Relatively minor improvement in access
Highway Upgrading & Paving	Environmental Impacts	R	+	L	L	H	Significant resource consumption. Additional disturbance of habitat. Long term reduction in dust, erosion and granular consumption
	Socio-economic Impacts	R	+	M	M	H	Significant improvement in level of service and safety
Bridge Construction	Environmental Impacts	L	+	L	L	H	Short-term disturbance and consumption of resources. Long-term net reduction in siltation, fuel consumption and granular consumption. Increased fish habitat
	Socio-economic Impacts	R L	+ +	L M	M H	H H	Improved access and reliability. Reduction in cost, isolation. Significant local economic benefit
Future Highway Extensions	Environmental Impacts	R	-	H	H	L	Would result in significant resource consumption, disturbance of habitat and drainage systems. Unprecedented access.
	Socio-economic Impacts	R	+	H	H	L	Would likely be all weather access to communities and/or mineral developments

Extent: Local Regional Territorial **Direction:** + beneficial - adverse
Magnitude, Significance, Confidence: Low Medium High