B. Slave Geologic Province Transportation Corridor

B.1 Consultations

An initial Stakeholder Workshop was held in Yellowknife on June 4, 1998, to discuss issues and opportunities surrounding this corridor. The workshop was attended by approximately 70 stakeholders.

Following the workshop a Stakeholder Advisory Committee was set up. This committee consisted of eleven individuals from industry, Aboriginal organizations and government. A list of the committee members is provided below.

- Henry Zoe, Treaty 11 Council;
- Charlie Lyall, Kitikmeot Corporation;
- Darrel Beaulieu, Yellowknife Dene;
- Bob Dowdall, North Slave Metis;
- Bob McKinnon, City of Yellowknife;
- Chris O:Brien, Ecology North;
- Marvin Robinson, NWT Construction Association;
- John Zigarlik, Nuna Logistics;
- Gerry Avery, NWT Chamber of Commerce;
- Ray Anderson, NWT Trucking Association; and
- Mike Vaydik, NWT Chamber of Mines.

This committee met on July 20, 1998, to discuss the studies proposed by the Department. A second meeting of the committee was held on March 16, 1999, in which the status of the initiative and the results-to-date were presented.

Formal consultations were also undertaken as part of the Need and Feasibility Study and the Environmental Scoping Study. For the Need/Feasibility Study consultations were conducted directly with key stakeholders, either in-person or by telephone.

For the environmental scooping study, the study consultants and Department representatives traveled to each of the affected communities for public meetings to discuss socio-economic and environmental issues. A schedule of the meetings is provided below.

- Yellowknife – January 27, 1999
- Rae/Edzo – January 28, 1999
- Bathurst Inlet – February 8, 1999
- Umingmaktok – February 8, 1999
- Cambridge Bay – February 10, 1999
- Kugluktuk – February 11, 1999
- Dettah – February 16-17, 1999
- Lutsel k'e – May 19, 1999

In addition, the Department has held a number of formal and informal discussions with various interest groups to discuss the studies.

B.2 Studies Undertaken

Summaries of the following four studies undertaken by the Department on the Slave Geologic Province Transportation Corridor are attached.

- Need/Feasibility Study
- Environmental Scoping Study
- Mapping and Route Analysis Study
- Cost Estimates Study

A fifth study on economic impact and benefit cost analysis of future developments will be undertaken later this year, after updating of the Northwest Territories Input/Output model is complete.

B.3 Executive Summary of the Need/Feasibility Study Slave Geologic Province Transportation Corridor

SLAVE GEOLOGIC PROVINCE TRANSPORTATION CORRIDOR NEED/FEASIBILITY STUDY

FINAL REPORT

Government of the Northwest Territories

Arthur Andersen LLP
Simons International Corporation
Aboriginal Engineering Limited
Enfotec
McCormick Rankin Corporation

March 29, 1999

EXECUTIVE SUMMARY

A strategic objective of the Department of Transportation of the Government of the Northwest Territories (GNWT) is to create new transportation infrastructure to promote economic development. To meet that objective, the Department of Transportation is undertaking a number of transportation planning initiatives and studies including need and feasibility assessments, and engineering, environmental, benefit-cost analyses and financing studies. One of the transportation initiatives being studied is the Slave Geologic Province (SGP) Transportation Corridor.

Arthur Andersen in association with Simons International, Aboriginal Engineering Limited, Enfotec, and McCormick Rankin Corporation* were contracted in September, 1998 to undertake the Slave Geologic Province Transportation Corridor Need / Feasibility Study. The Slave Geologic Province (SGP) covers approximately 190,000 square kilometres of land in the region of the Northwest Territories extending north from Yellowknife to the Arctic Coast in a band approximately 300 kilometres wide. The SGP is generally rich in mineral deposits and is recognized as having significant potential for gold, base metals and diamond production. Mineral development in the SGP, however, has been somewhat constrained by the existing transportation system. Specifically, while the southern portions of the Province are accessible by all-weather roads, parts of the northern portion are only accessible by privately developed winter roads, and no road access is available in many other parts of the SGP.

The overall purpose of this study is to examine the need and the feasibility of a transportation corridor into or through the SGP, and to propose appropriate structures for implementing the project. Specifically, the objective of this study is to take a 'high-level' look at the need and feasibility of improved transportation infrastructure in the SGP, and provide recommendations for advancing the project. The study involves an assessment of project need, routing, level of service, construction phasing, major constraints to development, financial viability and financial arrangements. This study will provide strategic direction for future transportation investments in the SGP for the Government of Northwest Territories and, as of April, 1999, for the

* Peer review capacity.

newly created Government of Nunavut, whose mandate will include transportation planning responsibilities for the northern portion of the SGP.

Key analyses of the study are outlined below.

Mining Potential of the Slave Geologic Province is Enormous

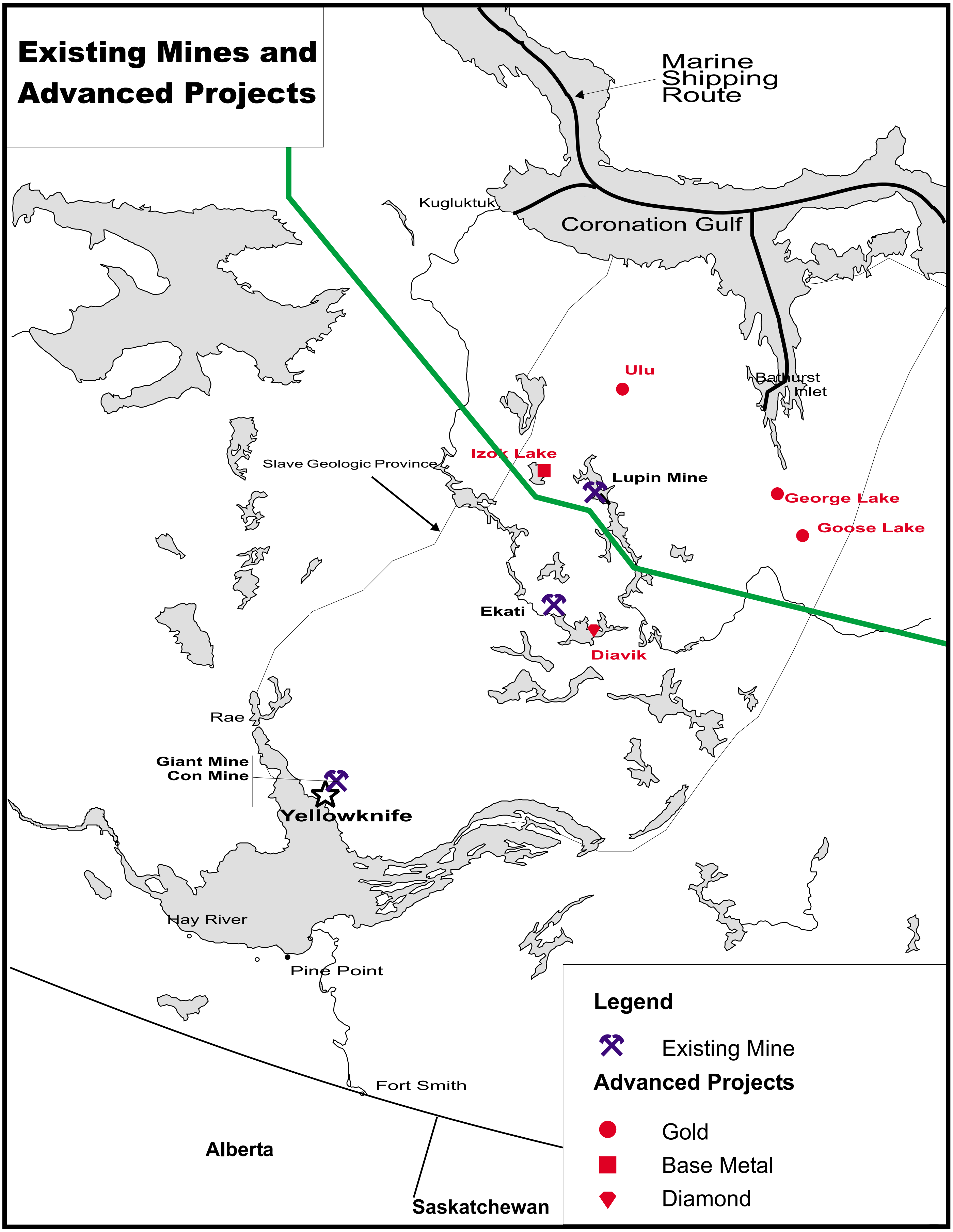
The Northwest Territories was ranked as having the greatest mineral potential of all of the provinces and territories in Canada based on a survey of mining companies undertaken by the Fraser Institute in 1997. The SGP is the richest and most promising mining region within the Northwest Territories.

Over the past couple of years the exploration expenditures in the Northwest Territories represented over 20 percent of the total dollars spent on mineral exploration in Canada. This is because of both the increased level of activity and the higher cost of exploration as a result of limited seasonal access.

The importance of recent discoveries as a factor in the funding of future explorations is best illustrated by the increase in exploration activity in Newfoundland and the Northwest Territories following the discoveries of Voisey's Bay and Ekati. Exploration expenditures in the Northwest Territories increased from $43 million to $101 million between 1992 and 1993. In Newfoundland, expenditures increased from $12 million in 1994 to $71 million in 1995.

To place the mineral potential of the SGP in the long term context, the SGP can be compared to the Abitibi Geologic Province in northern Ontario and Quebec, where more than 100 mines have been developed over the last 100 years. Thus, much of the SGP and surrounding areas are yet to be explored.

Currently there are over 30 mining "projects" in the SGP at various stages of development (see the attached table and map). The table itemizes the existing projects, commodity of interest and the stage of development. The map shows the location of the existing mines and projects.



Existing Mines and Advanced Projects
Marine Shipping Route
Kugluktuk
Coronation Gulf
Ulu
Bathurst Inlet
Izok Lake
Slave Geologic Province
Lupin Mine
George Lake
Goose Lake
Ekati
Diavik
Rae
Giant Mine
Con Mine
Yellowknife
Hay River
Pine Point
Fort Smith
Alberta
Saskatchewan
Legend
Existing Mine
Advanced Projects
Gold
Base Metal
Diamond

The foregoing show that a large number of the projects are still in the exploration stages, and of these, only about five are currently considered active. The reasons that the others are inactive include lack of exploration funds due to poor economic conditions, the resource/reserve estimates are currently economically unviable without either additional drilling or improved infrastructure, or current owners are restructuring and properties are in the process of being vended. The improvement of transportation infrastructure in the north will reduce the costs of exploration and increase the probability of some of these properties being put into production. However, it should be noted that a property in the exploration phase can be five to ten years away from production.

Mineral Projects in the SGP

Project/ Mining Operations	Commodity	Status
Lupin	Gold	Operations currently suspended due to decline in gold prices. Estimated mine life of 6 – 8 yrs.
Ekati	Diamonds	Began production in October 1998.
Advanced Projects – feasibility Study underway or completed		
Diavik	Diamonds	Feasibility study near completion.
Ulu	Gold	Feasibility study complete, awaiting improvement in gold prices.
Izok Lake	Base metals	Feasibility study complete, current owners looking to sell property. Feasibility study indicates that the project economics cannot withstand the additional infrastructure costs.
George Lake	Gold	Feasibility study started but put on hold due to decline in gold price. Will benefit from improved infrastructure.
Thor Lake	Rare Earth	Application has been made for a Water Licence.
Advanced Exploration Projects – Pre-feasibility study stage		
Boston	Gold	Awaiting improvement in economics before going to feasibility study. This project is on the eastern shores of Bathurst Inlet and will only benefit from the port infrastructure.
Damoti Lake	Gold	May move to pre-feasibility or feasibility. Awaiting for improvements in gold price.
Gondor	Base Metal	Associated with Izok Lake deposit. Would be mined after Izok Lake deposits.
Jericho	Diamonds	Drilling program underway and initial studies completed.
Nicholas Lake	Gold	Property could go to feasibility study, if gold prices improve.
Exploration Projects		
Boot Lake	Gold	Status of property unknown.
Back Lake	Diamonds	Exploration programs underway, work on the property is progressing
Coronation Gulf	Gold	Diamond drilling complete and preliminary ore resource calculation completed.
Camsell Lake	Diamonds	Exploration programs underway, work on the property is progressing

		The collection of a bulk sample is planned in 1999.
Epworth	Base Metal	Exploration programs underway, work on the property is progressing
High Lake	Base Metal	Diamond drilling complete and calculation of ore resources done.
Hood River	Base Metal	Could possibly be exploited if Izok put into production.
Kennady Lake	Diamonds	Work on this property is progressing. The collection of a bulk sample is planned in 1999.
Kim / Cass	Gold	Status of property unknown.
Mackay Lake	Diamonds	Exploration program underway, work on the property is progressing.
Mazenod Lake	Base Metal	A scoping study was completed in 1998. This project is also near existing transportation infrastructure.
Musk	Base Metal	Requires additional exploration work before moving project forward.
Pistol Lake	Gold	Western shores of Bathurst Inlet would only benefit from port infrastructure.
Russell Lake	Gold	Near the highway between Rae and Yellowknife.
Sunrise	Base Metal	Diamond drilling complete and preliminary resource estimates calculated.
Tundra (Fat)	Gold	Exploration program currently underway.
Turner Lake	Gold	Some diamond drilling completed.
Wreck Lake	Copper	Early exploration stage.
Yava	Base Metal	Early exploration stage.

Source: Simons International 1998

Availability and Cost of Transportation is an Impediment to Mining Developments

The accessibility of transportation infrastructure is an important aspect in all phases of a mining project, from initial grassroots exploration through to operations. Accessibility to good transportation infrastructure can result in easier project planning, reductions in capital and operating costs, and reduction in project risks. Without good transportation access, generally only the richest gold and diamond ore bodies will be developed and the development of any base metal operations is unlikely.

Transport costs are part of the cost of all mining developments from the initial exploration through construction to ongoing operations. The relative importance of transport costs to the overall mine economics varies with the location of the mine and the size and type of mineral(s) being mined. Transportation costs are estimated at 1 percent to 2 percent of the cost of construction for all mines. During the mine operation phase, transportation costs make up a much higher proportion of the costs: 10 percent to 15 percent for a diamond or gold mine, and 20 percent to 25 percent for a base metal mine.

EXECUTIVE SUMMARY

The following general points can be made about the impact of availability and cost of transportation infrastructure on mining development in the Northwest Territories.

- The capital costs associated with the transportation typically include the costs for an airstrip and in some cases, particularly base metal mines, the costs for roads and ports and the cost of additional storage facilities associated with winter road access.

- Limited (seasonal) access translates into increased working capital requirements for supply inventories, and in the case of base metal mines, product inventories.

- Most mines do not require an all-weather road during the construction phase. An all-weather road would reduce construction schedule risks, but have only a marginal impact on the project's capital cost.

- During the operations phase of diamond, gold and base metal mines, the vast majority of inbound cargo consists of fuel for power generation. The products of gold and diamond mines are transported by air. However, the ore concentrates produced by base metal mines must be transported to smelters, largely based in Canada, and accessed primarily by ocean going ships.

- For diamond mines, an all-weather road is not required. The high quality of the ore reserves and the limited supply requirements mean that winter roads can be used, as long as the winter road(s) can handle the increased traffic volumes. This is also true for a majority of gold mine projects.

- The base metal mines ship out large quantities of ore concentrate, and must therefore have access to a port and preferably an all-weather road. It should be noted that most of the base metal mines developed in the Northwest Territories to date, including Polaris and Nanisivik, are on tidewater.

Whether lower transport (truck and air freight) costs incurred in the SGP will turn a given mineral deposit in the SGP into a viable mine cannot be determined without assessing the specifics of each case. Although transport costs are known to be high in remote regions, the costs may be offset by higher grade ores or other factors that make the overall mine costs competitive. What can be generalized is that lower transport costs will always enhance the economics of a mine. In some cases, assuming other factors being equal, then the availability of cheaper transportation infrastructure elsewhere in Canada or abroad may be the deciding factor in where the mining companies may invest.

Forecast of Mineral Development Scenarios and their Transportation Needs

Four phases of mining development in the SGP were forecast over the next 20 years, based on consultation with the mining companies operating in the SGP, and a review of current mining activity, and the current status of the projects. It should be noted that a mineral property in the exploration phase can be five to ten years away from production, assuming everything falls into place as expected.

The transport needs for each assumed phase of development is as follows:

Phase #1 (year 1999) represents the current scenario, with two mines, Ekati and Lupin, in operation (for this analysis it has been assumed that the Lupin mine is operational). There are no compelling additional transport needs for this phase. No all-weather road is required. Improvements to the Lupin winter road would be welcomed by the existing mine owners provided they would lower annual costs.

Phase #2 (years 2000 - 2010) assumes that Ekati and Lupin, as well as a second diamond mine (Diavik) and one base metal mine (Izok Lake) are operating. All-weather transportation infrastructure would have to developed in order for the base metal mine to be put into production. An Arctic port accessed by an all-weather road from a point near the new base metal mine and new ice-breaking bulk carriers are prerequisite transport needs to service the base metal mine. The existing Lupin winter road has the capacity to handle the construction and operation of Diavik's new diamond mine. Some improvements to the capacity and/or operations of the winter road would be helpful.

The existence of the northern port and all-weather road is likely to mean that the majority, but not all, of the fuel currently brought from Edmonton via the winter road, could start being transported via the northern port and all-weather road because of cost savings. Most of the supplies for all mines, including Izok Lake, will continue to be transported from southern Canada via the winter road.

Phase #3 (2005 to 2015) assumes that a third diamond mine and an additional gold mine (possibly George Lake) are in operation.

A new winter road from the south to the new mines and/or improvements to the existing winter road will be required to service the increased traffic.

No detailed analysis has been undertaken in this study relative to the winter road capacity but it is a critical issue which needs to be followed up. A separate study which examines the existing design and operating rules and reviews the options available for increasing the capacity of the winter road should be carried out. Possible options include: improving the portages, extending the all-weather road north by 30 km, twinning the lake sections, and changing the operating rules.

The location and magnitude of additional winter road capacity can only be determined when the number, location, timing, and size of the new mines is known.

Phase #4 (years 2010 - 2020) assumes that an additional base metal mine (in the Nunavut part of SGP) is in production and one of the diamond projects proceeds to the underground phase of development. Thus seven mines will be operating in the SGP.

The forecast tonnages indicate that if seven mines are operating in the SGP (in Phase 4) the inbound tonnages, although still relatively small, would almost certainly require more winter road capacity than exists at present. Each mine will need to have at least winter road access from the south for both the construction and operation phases when most commodities other than fuel and some of the fuel would still be sourced from southern Canada. The outbound tonnages by road in Phase 4 are made up solely of concentrates from two base metal mines and must rely on the northern all-weather road and port.

At this level of activity it would be beneficial to upgrade the southern winter road connection to an all-weather standard. It should be noted that the relatively small amount of traffic generated by the diamond and gold mines will not be sufficient to finance the southern all-weather road through tolls alone.

Tourism

Key findings related to tourism are as follows:

- Improved access, particularly to the scenic areas such as along the East Arm of the Great Slave Lake and other lakes in the SGP, could benefit tourism by providing opportunities for further development of trails, parks and eco-tourism opportunities. Some types of tourism, such as recreational vehicle based tourism, may benefit from improved access, while other types, such as those that are dependent on remoteness, may be adversely affected.

- Ultimately, the level of economic benefit from increased tourism associated with a new transportation corridor will depend on whether the development will result in additional people visiting the region or visitors extending their length of stay – either of which would have a positive effect, as more money would be spent in the Region.

- Further analysis of impacts on the tourism industry and the extent and distribution of benefits should be undertaken as part of a detailed benefit-cost analysis study. An assessment should be undertaken of whether the availability of a transportation corridor would encourage visitors to extend their length of stay and visit parts of Nunavut (or the NWT) via the SGP transportation corridor. Consideration should also be given to the need and demand for additional tourism infrastructure along specific areas of the SGP, and near the port at Bathurst Inlet. Finally, consideration should be given to the impact and opportunities for tourism that would be associated with the presence of a port facility at Bathurst Inlet.

Financing Feasibility of an All-Weather Road

Key findings of the Financial analysis are noted below:

- A mine located near Contwoyto Lake is assumed to pay tolls on 320,000 tonne/year ore concentrate at an estimated unit price of $0.125 per tonne-km, and at $0.10 per km of fuel for the use of an all-weather road to a port on Bathurst Inlet. On that basis, the all-weather road from Contwoyto Lake to a port at Bathurst Inlet (similar to that proposed by Nuna Logistics) could be mostly self-financing.

At an assumed private sector borrowing rate of 12.5 percent, the toll revenues would cover 93 percent of capital costs at $300,000/km road construction cost, and 56 percent of capital costs at $600,000/km road construction cost.

At the government borrowing rate of 5.5 percent, the corresponding figures would be 179 percent and 108 percent, respectively.

- Because the traffic volumes generated by diamond and gold mines are much smaller, the corresponding figures for an all-weather road for the southern section of the corridor from Rae/Yellowknife would between 2 percent and 8 percent.

- If an all-weather northern road and port are built, an estimated 80 percent of the fuel import by the SGP mines could come from the north; and the remaining 20 percent from the south via the winter road. The reason as explained below is a substantial saving in cost. Most of the other mine supplies are assumed to continue to be shipped from southern Canada via the winter road.

  The following table compares the overall costs to the Ekati mine under the existing winter road system to the costs under a new port and all-weather road system.

	Existing System Fuel Cost at Ekati (¢ per liter)	New System Fuel Cost at Ekati (¢ per liter)
Purchase Cost in Edmonton / Off-shore	22¢	20¢-22¢
Ocean Freight to Port	-	7¢
Rail Costs to Hay River	3¢	-
Trucking Costs Hay River to Yellowknife	5¢	-
Trucking Costs Yellowknife to Ekati / Port to Ekati	7¢	4¢
Toll / User Fee for Winter Road	4¢	0¢
NWT Petroleum Taxes	0 – 10¢	0 – 10¢
Total Purchase Cost	41¢ - 51¢	31¢ - 43¢

The cost savings could be as much as 10¢ per liter which equals $119 per tonne. A single mine using 40,000 tonnes of fuel per year could save up to $4.8 million per year in transport costs alone using the new system. In Phase 4, the total savings of all the mines could be as much as $24 million per year. In addition, a single mine such as Ekati could save up to $20 million in working capital if fuel could be brought in year round. A large portion of these savings could be used to pay for the operating costs of the new transport system in the form of a toll or user fee which in the above table were assumed to be 0¢.

Further savings for the base metal mines could be realized if the concentrate trucks could be designed to carry fuel back from the port on the return journey to the mine. These savings would accrue to the mine developers and stimulate more investment.

- It is noted that the construction of an all-weather road in the north and port at Bathurst Inlet will be to the Western NWT's eventual benefit. It will lower costs and spur additional development both east and west of the border, which may eventually lead to the upgrading of the southern winter road to an all-weather road. In addition, the flow of supplies from southern Canada to mines on both sides of the border will occur through the Western NWT, and benefit the economy.

Route Location (Rae vs Yellowknife)

There has been much local discussion related to the issue of whether an all-weather road from the south to the north should start at Rae or at Yellowknife. In addressing this issue, which cannot be resolved at this point, there are many factors which should be considered:

- The Rae versus Yellowknife question does not need to be answered yet. There is no compelling short-term reason for this road from a transport needs perspective. Long-term needs will depend on the amount of mining development in the SGP and whether a base metal mine/port/road development proceeds in Nunavut.

- The routing of the all-weather road would have to be agreed jointly by the financing parties. Until these parties are known, the route, which will also depend on the mines to be accessed, cannot be finalized.

- The costs of the road could vary considerably depending on its start point.

- A number of socio-economic, environmental and cost factors will need to be considered in determining the optimal route for the transport corridor.

Transport System Vision

It is recommended that the governments of both Nunavut and the Western NWT have a clear vision of the overall SGP transport system that will best suit both their needs. Such a vision can be used to solicit both public and private support for the difficult financing and approval processes which lie ahead.

Assuming that a base metal mine, Arctic port, and all-weather road goes ahead in Nunavut, what should the transport vision be for the Western NWT? Given that there is no pressing need for new transport facilities and no immediate prospect of a base metal mine requiring additional transport facilities in the Western NWT, the vision must be a long-term one that takes advantage of the opportunities created by the Nunavut system. In particular, there could be significant savings to Western NWT mines if fuel was imported through the port. However, those savings could be realized only by the mines with winter road connections to Nunavut. An all-weather road connecting the Rae/Yellowknife area with the Nunavut all-weather road (into which the mines could connect) would lower both fuel transport and fuel inventory costs for the mines. Also, an all-weather road would allow year-round tourist and local traffic and could eliminate the short winter trucking season for new mines under construction throughout the SGP.

Although the benefits described can only be estimated until the number, location, timing, and type of new mines are better known, it is recommended that the long term transport vision for the Western NWT be an all-weather road that connects into the Nunavut all-weather road from the Rae/Yellowknife area.

Nunavut Transport System

The transport system proposed for Nunavut is a deep-sea port on Bathurst Inlet connected by an all-weather road to a point on the south end of Contwoyto Lake. This system, shown on Exhibit 4.6, would be required from the year 2000 to 2010 to meet the transport needs of Phase 2.

The transport system could be put in place immediately if the Nunavut government wished to take on the risk associated with constructing the transport infrastructure without a specific mine development to support it. Given the extremely high costs, a more acceptable alternative would be to find a base metal mine and port developer and shipper with a willingness to partner with the Nunavut government in financing the transport system and to proceed jointly with the mine and transport system development.

The expected level and type of traffic and the cost considerations of the public/private partners would dictate the design of the port road. The financing partners would determine the specific routing of the road.

Western NWT Transport System

The transport system proposed for the Western NWT is improvements to the existing winter road as dictated by the findings of a detailed winter road capacity study as previously suggested and an all-weather road from the Rae/Yellowknife area to join the Nunavut all-weather port road. The all-weather road should only start when the Nunavut road is in place and be completed to meet the needs of Phase 4 expected in the year 2010 to 2015.

Summary and Follow-Up Studies Required

The following points are provided to summarize the follow-up activities required.

The SGP Transportation Corridor should be marketed as Investment in Long Term Well-being of Canada and the North

Some 31 mining projects are at various stages of development in the Slave Geologic Province, including one project which is currently operational, one on stand-by, five projects which have feasibility studies either underway or completed, five additional projects which are at the pre-feasibility stage, and 19 projects which are at the exploration stage.

Clearly, the development of the SGP Transportation Corridor will improve the operating economics of a number of these projects, through a combination of reduced transportation costs and reduced fuel costs, and the combination of these potential savings may cause a number of projects to proceed to more advanced stages.

As a result, the proposed roadway should not be viewed in isolation of the broader direct benefits which it is able to generate, including the increased tax revenues which would therefore accrue to the Federal Government from increased mineral exploration and mining activity, and which presumably could then be redirected from Ottawa to the NWT and Nunavut as their contribution to this roadway. As stated previously, the magnitude of such impacts should be reviewed as part of any subsequent research initiated to more precisely quantify the expected financial performance of the roadway.

Cooperation between the Western GNWT, Nunavut Government is Essential

The Slave Geologic Province transportation corridor is a single "transportation system" located in two territories. The portions in one territory cannot be developed in isolation of the other. Therefore, it is essential that formal coordinating mechanisms be established between the responsible departments in the two territorial governments.

Continued Liaison with the Aboriginal Groups, Federal Government and the Mining Industry is Required

Additional Studies and Analyses are Required

These include, among others:

- Economic Impact, Taxation Revenue and Benefit-Cost Analysis;
- Winter Road Capacity Analysis;
- Discussion and Analysis of Policy and Operational Aspects of the Winter Road from a Western GNWT Viewpoint;
- A Detailed Tourism Opportunity and Impact Study ;
- An Investment-Calibre Financial Analysis (to be conducted after further discussions with the federal government, Nunavut government, Aboriginal Groups, Mining Industry, etc.).

B.4 Executive Summary of the Environmental Scoping Study Slave Geologic Province Transportation Corridor

1 EXECUTIVE SUMMARY

1.1 Background

The Department of Transportation (DOT) of the Government of the Northwest Territories (GNWT) is preparing a highway strategy to plan for the development of a transportation corridor through the Slave Geological Province (SGP) for the purpose of mineral development and transshipment. Significant mineral resources have been identified in the SGP; however, little development has occurred. Improved infrastructure would enhance the economics of these deposits by lowering access and production costs in the SGP (DOT 1998). The corridor under consideration encompasses the North Slave communities of Rae-Edzo and Yellowknife, the existing Lupin Winter Road alignment, current and proposed mining development properties, and the location of known and favourable mineral resources in the SGP (Fig 1.1).

Existing transportation infrastructure in the SGP is limited. NWT Highways # 3 and # 4 provide all – weather road access to the communities of Yellowknife, Rae -Edzo, and Dettah. A public winter road is built annually from Rae-Edzo to the communities of Wha Ti and Rae Lakes. Until recently, Royal Oak Mines annually constructed a winter road north of Rae -Edzo to their Colomac Gold Mine. The GNWT took advantage of this winter road to resupply Wekweti with fuel and construction materials by transporting materials from the winter road to the community by cat train. With the suspension of operations at Colomac in 1997, the winter road to this site is no longer constructed. The Lupin Winter Road, built and operated by Echo Bay Mines, is built annually from the terminus of Highway # 4 at Tibbit Lake to the Lupin Mine on Contwoyto Lake, has come to serve as an essential re-supply route for the operating mines and numerous exploration sites within the SGP. Each of the private operators in the SGP is required to construct their own access to the Lupin Winter Road. The winter road is approximately 500 kilometres long and provides access for a maximum of three months each year.

The idea of improving the transportation infrastructure in the SGP has been pursued, albeit intermittently, since the 1950s, when a report by Commissioner R. G. Robertson suggested building an extensive road network in the SGP to enhance development of mineral reserves. In the late 1970s, the Department of Indian Affairs and Northern Development (DIAND) undertook an analysis of future transportation infrastructure in the region, with a focus on encouraging mining development. In the early 1990s, Metall Mining examined potential transportation alternatives for accessing their base metal property at Izok Lake in the northern part of the SGP. A common theme in these studies was the inadequacy of the existing transportation system in supporting the development of base metal and other mineral deposits in the SGP, and the consequent need for an all -weather road.

To provide a long-term plan for the development of transportation in the Northwest Territories, DOT developed the Northwest Territories Transportation Strategy (DOT 1990). The strategy was updated in 1994. One of the strategic objectives of the Transportation Strategy, titled "Building New Transportation Corridors for Economic Development," involves the development of new roads and ports to provide low cost, reliable access that will encourage and sustain resource and other economic developments. Several new road initiatives were identified in the 1990 strategy; however, the Strategy Update (DOT 1995) and the New Roads Initiative (DOT 1998) refines the focus to: a road from Yellowknife to a port on the Arctic Coast, the extension of the Mackenzie Valley Highway from Wrigley to Inuvik and the construction of an all-weather between Inuvik and Tuktoyaktuk.

1.2 The Proposed Slave Geological Province Transportation Corridor

In March 1998, the GNWT announced its new roads initiative and dedicated funds for the socio-economic, environmental, and pre-engineering investigation of four new roads in the NWT, including the Slave Geological Province Transportation Corridor (SGP TC). At this early stage, the project remains conceptual with potential routing, design, and construction practices to be determined as part of the initial planning and scoping process.

Construction of a transportation route in the corridor would provide all-weather access to the SGP from the existing all-weather territorial highway transportation system in the south and the Arctic Coast in the north. As part of the proposed transportation corridor project, a port capable of handling ocean-going ships would be built at tidewater: Bathurst Inlet is the proposed site. Several corridor routes have been advanced, primarily by developers focusing on the logistics of providing access to their respective properties. A specific route has not been identified; however, several groups are reviewing potential routes and port locations in terms of cost, practicality, logistics, and potential financial contributors. If constructed from the end of the territorial highway system in the south to an Arctic Coast port, the transportation corridor could be approximately 850 kilometres in length. Figure 1.1 illustrates the general routing of transportation corridors presently being investigated.

The corridor would be expected initially, to consist of an all-weather road; however, future linear developments, such as communication or power transmission facilities, could also be located within the corridor. As it would be constructed primarily to serve industrial needs, the road would be built to industrial standard, incorporating design considerations related to terrain conditions and operational requirements. Preliminary costs to construct the road are estimated at $550 million, whereas port construction costs are estimated at approximately $50 million (DOT 1995). While the GNWT supports the development of a transportation corridor in the SGP, it has not made any commitment to develop the project.

1.3 Environmental Scoping of the Transportation Corridor

Ferguson Simek Clark, in association with Jacques Whitford Environment Limited, Lutra Associates Limited, and Aimm North Heritage Consulting, were retained by the DOT to conduct an environmental scoping study of the proposed SGP TC. In addition to the environmental scoping study, the DOT is also undertaking the following studies:

- Need/Feasibility analysis;
- Multi level Mapping, Route Analysis and Preliminary Cost Estimates; and
- Economic Impact, Benefit Cost and Taxation Revenue Analysis.

This Environmental Scoping Study was undertaken for the DOT in advance of any commitment by the GNWT or any other proponent to proceed with the SGP TC. This scoping study, in combination with the other studies identified above, is intended to assist the DOT in developing a strategy for transportation infrastructure in the SGP. Additionally, the scoping study will assist future proponents and regulators in preparing for the environmental assessment of the potential project.

Central to the scoping project was the identification of biophysical, social, economic, and cultural issues and concerns of project stakeholders regarding the potential development of the SGP TC. Issue identification necessitated the dissemination of project information to project stakeholders through a variety of fora. Issues identified would serve to focus a future environmental assessment, should the project proceed to development. Determination of the type of environmental assessment to which the potential SGP TC may be subject was also an objective of the study.

1.4 Stakeholders' Concerns

Project stakeholders include residents and users of the SGP and its resources, industry, government, regulators, Aboriginal organizations, and non-government organizations. Existing documentation was reviewed and consultations with stakeholders were undertaken to identify Valued Ecosystem Components (VECs), Valued Social Components (VSCs), and issues and concerns related to the potential effects of the SGP TC on the VECs and VSCs. The VECs, VSCs, and issues are documented in the report and are summarized below:

- Need for and purpose of project;
- Need for increased public consultation and discussion about the project;
- Desire by Aboriginal organizations for involvement and control in project;
- Cumulative environmental and social effects of the project:
- Effects of the project on the Bathurst Caribou Herd;
- Effects of providing all-weather access to SGP;
- Effects of access on harvesting and the sustainability of resources;
- Effects of the project on fish and wildlife and habitat, especially eskers;
- Effects of climate change on the project and the project on climate change;
- Effects on marine environment and resources, caribou and people of shipping in the Arctic and, Bathurst Inlet specifically;
- Effects of project on existing tourism operations in the SGP;

- Need for training, jobs, and business opportunities; and
- Potential social costs of the project, including drug and alcohol abuse, health and well being, and family stability.

The VECs, VSCs, and associated issues identified are intended to provide a focus for an environmental assessment of the SGP TC should it proceed.

1.5 Regulatory and Environmental Review Requirements

An important consideration in the planning for the development of a transportation corridor includes an examination of the regulatory and environmental assessment requirements that must be satisfied to achieve project approval. There has been considerable change and evolution of the regulatory framework for environmental assessment, land use planning, and resource management in Canada's North in recent years, due to:

- New and revised federal legislation (*e.g.*, the *Canadian Environmental Assessment Act* (*CEAA*) and regulations, the *Mackenzie Valley Resource Management Act* (*MVRMA*) and regulations);
- The creation of Nunavut; and
- The finalization of Aboriginal land claims agreements (*e.g.*, Nunavut Land Claims Agreement (NLCA), Inuvialuit Final Agreement, Gwich'in Comprehensive Land Claim Agreement, Sahtu Dene and Metis Comprehensive Land Claim Agreement).

The permits, licences, and authorizations potentially required for development and operation of the SGP TC have been identified. As presently conceived, the proposed SGP TC transects both Nunavut and the Northwest Territories, and would be subject to environmental assessment processes established in each jurisdiction. Additionally, the *Canadian Environmental Assessment Act* (*CEAA*) may also apply, depending on the project scope. The Nunavut, Mackenzie Valley, and *CEAA* environmental review processes are described and discussed in terms of how they may apply to the proposed SGP TC.

The review of regulatory and environmental review processes concludes that the SGP TC may generate significant public concern, and may have potentially significant adverse local and/or transboundary environmental effects. Therefore, it is likely that the SGP TC would be subject to review pursuant to *CEAA* and the *MVRMA* and the *Nunavut Land Claim Settlement Act* (*NLCSA)*. It also is likely that the SGP TC would be subject to review by a (joint) panel.

1.6 Data Gaps

The scoping project involved the identification of information sources related to an environmental assessment of the SGP TC. Available documents were reviewed and noted as appropriate in sections of the report. Deficiencies related to specific VECs and VSCs are noted in the report. In general, the collection of site specific data will be required once a route or routes have been identified. All data sources are identified in this report, and in an additional volume which references dat a sources to topic areas.

LIST OF ACROYNYMS

CEAA	*Canadian Environmental Assessment Act*
CEAA	Canadian Environmental Assessment Agency
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CSR	Comprehensive Study Report
DIAND	Department of Indian Affairs and Northern Development
DOT	Department of Transportation
DFO	Department of Fisheries and Oceans
EIS	Environmental Impact Statement
GNWT	Government of the Northwest Territories
HTO	Hunters' and Trappers' Organization
KIA	Kitikmeot Inuit Association
KC	Kitikmeot Corporation
MVEIRB	Mackenzie Valley Environmental Impact Review Board
MVL&WB	Mackenzie Valley Land and Water Board
MVRMA	*Mackenzie Valley Resource Management Act*
NEB	National Energy Board
NGO	Non-Government Organization
NIRB	Nunavut Impact Review Board
NLCA	Nunavut Land Claim Agreement
NPC	Nunavut Planning Commission
NTI	Nunavut Tungavik Incorporated
NSMA	North Slave Metis Association
NWT	Northwest Territories
RA	Responsible Authority
ROW	Right-of-Way
SGP	Slave Geological Province
SGP TC	Slave Geological Province Transportation Corridor
TK	Traditional Knowledge
VEC	Valued Ecosystem Component
VSC	Valued Social Component
WKSS	West Kitikmeot Slave Study
WSC	Water Survey of Canada
YKDFN	Yellowknives Dene First Nation

B.5 Executive Summary of the Mapping and Route Analysis Study Slave Geologic Province Transportation Corridor

MULTI-LEVEL MAPPING & ROUTE ANALYSIS SLAVE GEOLOGICAL PROVINCE TRANSPORTATION CORRIDOR

Volume 1 - Executive Summary

Prepared for:

Highways and Engineering Division
Department of Transportation
Government of Northwest Territories
Yellowknife, NWT
X1A 2L9

Submitted by:

Geowest Environmental Consultants Ltd.
Suite 203, 4209 - 99 Street
Edmonton, Alberta
T6E 5V7

January, 1999

Table of Contents

List of Figures

List of Tables

1.0 INTRODUCTION

1.1 Project Background

The ***Multi-level Mapping and Route Analysis, Slave Geological Province Transportation Corridor*** project is an initiative of the Department of Transportation, Government of the Northwest Territories. It is in response to interest in examining the feasibility of developing an all-season road between the Yellowknife and Rae-Edzo areas in the south and Bathurst Inlet along the southern shore of the Arctic Ocean in the north (Figure 1).

For the purpose of this study, five distinct Work Areas were identified within the general transportation corridor as shown on Figure 1. The Work Areas include (approximate lengths of each route are shown in parenthesis):

(i) Work Area 1 Yellowknife area to Exeter Lake / Lac de Gras (~ 340 km),
(ii) Work Area 2 Exeter Lake / Lac de Gras to Contwoyto Lake / Lupin Mine area (~ 210 km),
(iii) Work Area 3 Contwoyto Lake / Lupin Mine area to Bathurst Inlet (~ 350 km),
(iv) Work Area 4 Rae-Edzo area to Colomac Mine / Snare Lake area (~ 200 km), and
(v) Work Area 5 Colomac Mine / Snare Lake area to Exeter Lake / Lac de Gras area (170 km)

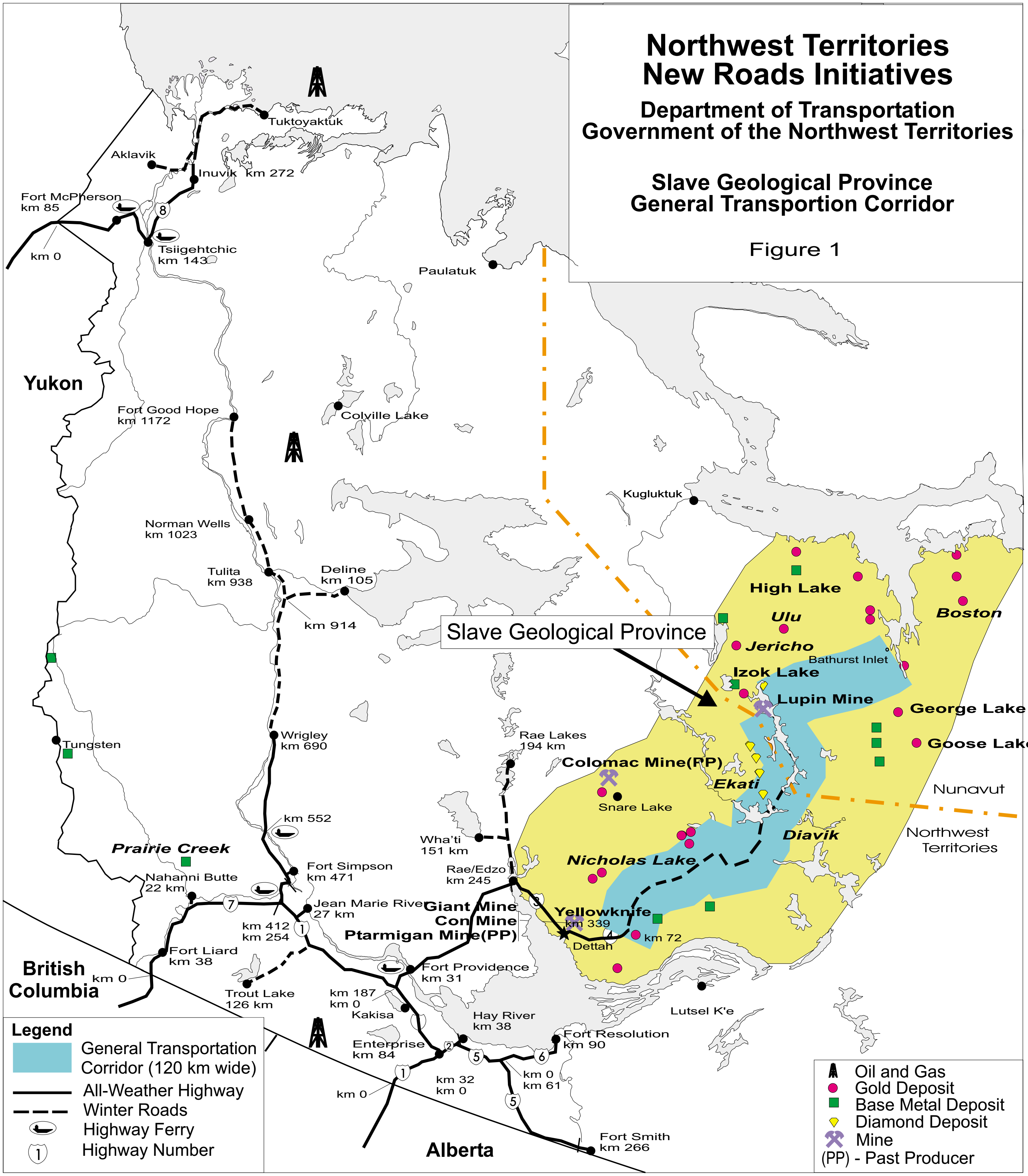
This document is meant to provide an Executive Summary (Volume 1); it provides a summary of the detailed findings presented in both the Technical Report (Volume 2) and on the 1:60 000 Strip Mosaics (Volume 3).

1.2 Project Objectives

Four specific phases were identified for the overall project. These include;

- Phase 1, Route Identification
  - identify three to five routes within each of the five Work Areas listed above on 1:250 000 NTS maps,

- Phase 2, Route Evaluation
  - conduct an analysis of 1:60 000 scale aerial photographs to obtain detailed information for each of the routes identified,


Northwest Territories
New Roads Initiatives
Department of Transportation
Government of the Northwest Territories
Slave Geological Province
General Transportion Corridor
Figure 1
Slave Geological Province
Tuktoyaktuk
Aklavik
Inuvik km 272
Fort McPherson km 85
km 0
Tsiigehtchic km 143
Paulatuk
Yukon
Fort Good Hope km 1172
Colville Lake
Kugluktuk
Norman Wells km 1023
Tulita km 938
Deline km 105
km 914
High Lake
Ulu
Boston
Jericho
Bathurst Inlet
Izok Lake
Lupin Mine
George Lake
Goose Lake
Tungsten
Wrigley km 690
Rae Lakes 194 km
Colomac Mine(PP)
Ekati
Snare Lake
Nunavut
km 552
Wha'ti 151 km
Diavik
Northwest Territories
Prairie Creek
Nahanni Butte 22 km
Fort Simpson km 471
Rae/Edzo km 245
Nicholas Lake
Jean Marie River 27 km
Giant Mine
Con Mine
Yellowknife km 339
Ptarmigan Mine(PP)
km 412 km 254
km 72
Dettah
Fort Liard km 38
Fort Providence km 31
British Columbia
km 0
Trout Lake 126 km
km 187 km 0
Kakisa
Hay River km 38
Lutsel K'e
Enterprise km 84
Fort Resolution km 90
km 32 km 0
km 0 km 61
km 0
Fort Smith km 266
Alberta
Legend
General Transportation Corridor (120 km wide)
All-Weather Highway
Winter Roads
Highway Ferry
Highway Number
Oil and Gas
Gold Deposit
Base Metal Deposit
Diamond Deposit
Mine
(PP) - Past Producer

☞ Phase 3, Detailed Route Evaluation
- further identification of specific routes from production and analysis of 1:10 000 and 1:20 000 scale air photos, and

☞ Phase 4, Route Refinement
- refinement of Right-of-Way (ROW) location along specific or competing routes.

This report pertains solely to the identification of routes at 1:250 000 and the subsequent analysis of 1:60 000 aerial photographs (Phases 1 and 2). It does not deal with either the Detailed Route Evaluation (Phase 3) or the Route Refinement (Phase 4) phases of the project.

1.3 Project Area Description

The Slave Geological Province lies entirely within the Precambrian or Canadian Shield, the largest physiographic region recognized in the Northwest Territories (Figure 1). It runs north/northeast from Great Slave Lake in the south to the Bathurst Inlet/Coronation Gulf area in the north. It's boundaries are defined by three distinct fault lines, including the Bathurst Fault along the east, the McDonald Fault along the south and the Wopmay Fault along the west. The Bathurst Fault is highly visible along Bathurst Inlet.

Throughout its mainland portion, the Canadian Shield rarely exceeds elevations of 600 m above sea level (masl), with maximum relief generally limited to 60 - 70 m. Two major bedrock structural subdivisions occur within the Slave Geological Province that are of importance to the transportation corridor; these include (1) Archean-age igneous intrusives and (2) Yellowknife Supergroup supracrustal strata, the former being more favorable for road construction and bed.

Bedrock materials are generally overlain by a thin cover of sandy till materials. In some areas, undulating bedrock materials predominate. Esker and to a lesser extent, kame complexes are scattered throughout the Slave Geological Province; the incidence of esker deposits is greater in the northern areas (i.e. north of Lac de Gras). Deglacially enlarged lake basins (i.e. Yellowknife and Drybones lakes) and localized ponding of ice-dammed waters generated thin glaciolacustine deposits throughout the study region. Patterned bogs, ribbed fens, and swampy terrain (of varied thickness) mantle large portions of the present landscape because of low relief and slow drainage, and thin surficial deposits overlying undulating bedrock.

2.0 METHODOLOGY

2.1 Pre-Mapping Activities

Upon award of the contract, project personnel met with the Department of Transportation, Government of Northwest Territories in Yellowknife to review the project Terms of Reference and to obtain background materials that were in the possession of the Department (i.e. 1:50 000 NTS maps, bedrock geology maps, etc). Members of the project team reviewed existing information (Douglas *et. al.* 1973, Fraser 1972 and 1992, Frith 1993, Henderson 1985, McGlynn 1977, Mollard 1997, Aylsworth and Shilts 1989, and Dredge *et. al.* 1995) and pre-selected a route to fly through Yellowknife - Exeter Lake - Contwoyto Lake - Bathurst Inlet - Burnside River - Contwoyto Lake - Snare Lake - Rae-Edzo - Yellowknife. Members of the project team flew this route on August 20, 1998. Selected oblique photographs are shown on subsequent pages.

Geometric and construction cost control parameters were reviewed prior to any mapping activities to ensure that all project personnel were consistent in mapping. The following parameters (Table 1) were considered in selecting and defining routes:

Table 1. Geometric and Construction Cost Control Parameters

Criteria	Implications
Topography	Route location should have little to no right-of-way excavation; embarkment construction should average 0.5 to 1.5 m in thickness (vertical and horizontal alignment considerations).
Bedrock surface	Route location should follow glacier-smooth surfaces with micro relief of 1.0 m or less.
Lakes	Vertical and horizontal alignment considerations.
River crossings	Route should minimize river crossings and locate crossings that are narrows and on suitable foundation conditions.
Wet organic terrain	Route location should avoid seasonally wet or permanent organic terrain wherever practical.
Granular borrow sources	Route location should consider location, volume and composition of potential sources (i.e. esker complexes)
Permafrost	Not considered a major factor in route location as entire area is zone of permafrost

2.2 Mapping and Aerial Photograph Interpretation

A combination of 1:250 000 and 1:50 000 NTS maps with 20 m and 10 m contours respectively were used in the Route Identification phase of the project. These maps show hydrology, limited surficial materials (eskers and occasional sand deposits, wetlands), and major access routes (i.e. Hwy 4, major winter highways, etc.). Project personnel began working south from the proposed Bathurst Inlet site (66° 32' 30" north latitude and 107° 31' 00" west longitude) as shown within the Nuna Logistics report (Smith and Tice 1998). Every attempt was made to conform to the geometric and construction control parameters presented above (in Table 1) as well as align proposed routes and adjoining segments "within contours" as opposed to "crossing contours".

Following the approval of the 1:250 000 Route Identification phase of the project by the Department of Transportation (September 10, 1998), 1:60 000 black and white aerial photographs from between 1953 and 1957 were obtained from the National Air Photo Library in Ottawa, Ontario. Two sets of photography were obtained; one set was required for route refinement and interpretation of surficial materials, slope, and drainage, while the other set was used to produce the north/south strip mosaics. Individual aerial photographs were interpreted to refine route placement and to delineate terrain units at the 1:60 000 scale. Minimum terrain unit size was 1 cm^2, an area equivalent to 36 ha (89 ac). No field work was undertaken to support this interpretation Each terrain unit was given a unique terrain classification call as per the following example:

Mvb(1) / Ru(2) - S(3)
6 - 9(4)
m(5)

where (1) Mvb represents morainal veneers and blankets (2) / Ru represents approximately 40 % undulating bedrock, (3) S, represents modifying process, solifluction, (4) 6 - 9, represents the slope class, 6 - 9 %, and (5) m, represents the drainage classes, moderate.

All terrain classification used coding (as shown above) as per the standards presented within the Canadian System of Soil Classification, Second Edition (1987). A terrain classification legend is provided on each strip mosaic.

A total of 64 uncontrolled north/south strip mosaics were produced following the delineation and refinement of routes on the 1:60 000 aerial photographs. Line work from the 1:60 000 aerial photographs was transferred to the uncontrolled mosaics using a combination of stereo transfer techniques. Following the creation of individual mosaics, individual routes were digitized in Microstation SE software with one kilometer interval

Due to size constraints the next 7 pages, containing pictures only, have been deleted. Sorry for any inconvenience this may cause.

markers being generated for each route. Controlled mosaics should be created for Phase 3 and 4 activities.

Summary tables were prepared to summarize landform, slope, bridge and curve information for each route. All measurements were taken directly from the uncontrolled mosaics, hence the distances should be considered "approximate". A qualitative assessment of aggregate potential (Table 2) for each segment and route was provided within the summary tables.

Table 2. Qualitative Ranking System for Aggregate Potential[1]

Rating Scale	Description
Nil	No eskers or glaciofluvial deposits were mapped within the segment/route on the 1:60 000 aerial photographs
Poor	Very few eskers or glaciofluvial deposits were noted along the segment/route on the 1:60 000 aerial photographs; eskers may be poorly spaced along route, for example, all eskers are grouped at one end of the segment/route.
Good	A significant number of eskers were noted along the segment/route on the 1:60 000 aerial photographs; these esker deposits are evenly distributed along the segment/route and are comprised mainly of sand.
Excellent	Significant esker and glaciofluvial deposits in the form of outwash plains were mapped on the 1:60 000 aerial photographs; these deposits are evenly distributed along the segment/route and are comprised of a combination of sand, gravels, cobbles and boulders .

1. All ratings have been developed from a review of the 1:60 000 black and white aerial photographs. A flight by the individuals undertaking the routing on August 20, 1998 suggested that most of the eskers are sand-based, however, no observations were made on texture of eskers at depth.

3.0 RESULTS AND DISCUSSION

3.1 Phase 1 - 1:250 000 Route Identification

Table 3 presents the total number of routes identified within each of the five Work Areas based upon the analysis of 1:250 000 and 1:50 000 NTS maps and background data and maps. These routes are depicted on Figure 2.

Table 3. Routes by Work Area based on 1:250 000 Analysis

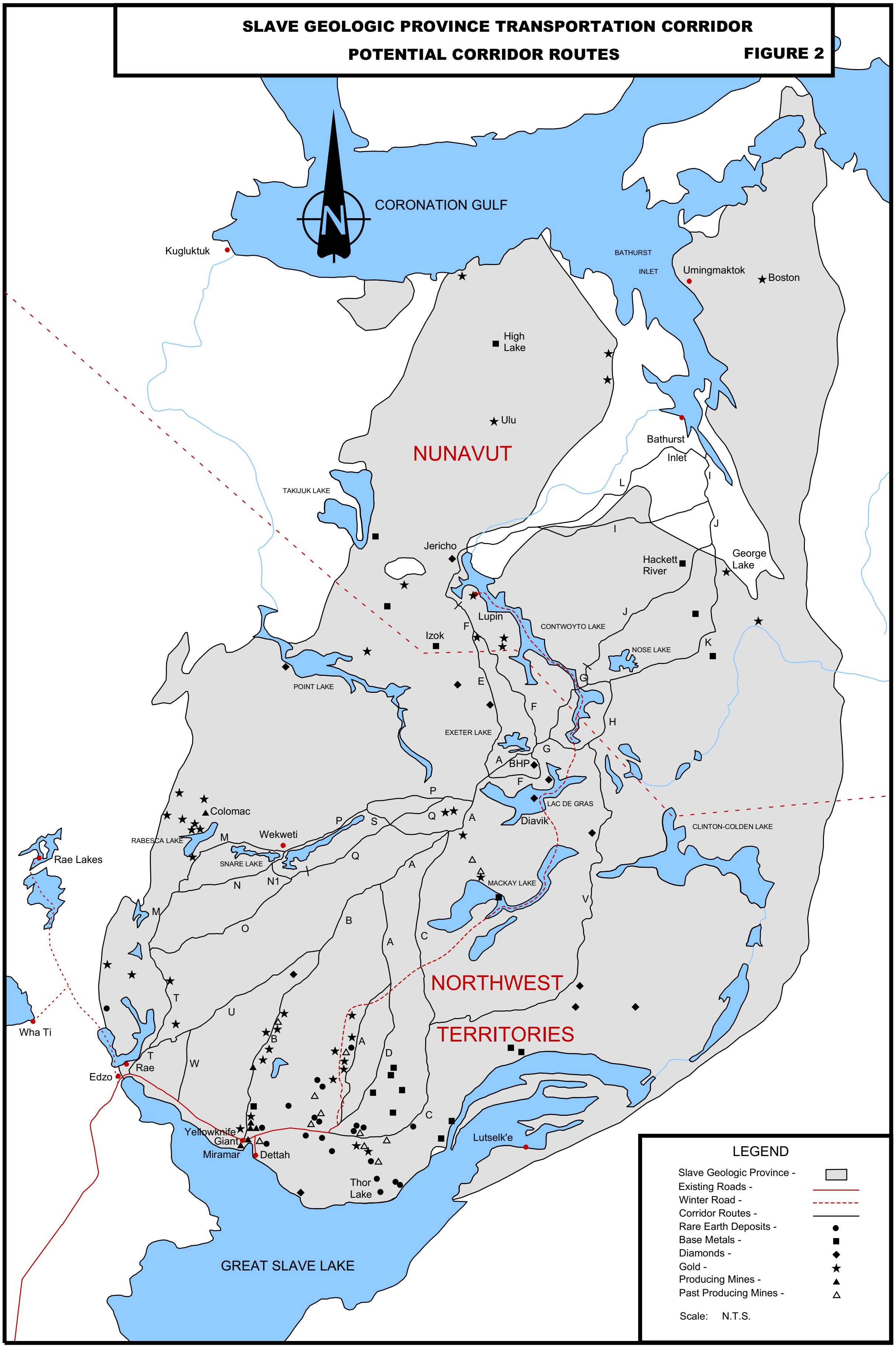
Work Area		Number of Routes	Route Identification
1	Yellowknife Area to Exeter Lake/Lac de Gras	5	A, B, C, D and V
2	Exeter Lake/Lac de Gras to Contwoyto Lake/Lupin Mine	4	E, F, G, and H
3	Contwoyto Lake/Lupin Mine to Bathurst Inlet	4	I, J, K, and L
4	Rae-Edzo to Colomac Mine/Snare Lake	6	M, N, O, T, U and W
5	Colomac Mine/Snare Lake to Exeter Lake/Lac de Gras	4	P, Q, R, and S

3.2 Phase 2 - 1:60 000 Route Evaluation

Based upon the review of 1:60 000 black and white aerial photographs and selected 1:125 000 surficial geology maps, the following recommendations have been developed for each Work Area. Distances for each route are not presented as route distance is not comparable between routes (i.e. Route 'B' joins Route 'A' to get from Yellowknife to Exeter Lake).

3.2.1 Work Area 1

The Yellowknife to Exeter Lake segment is approximately 340 km in length (direct line distance). Elevations increase from 160 m adjacent Great Slave Lake to 439 m at Exeter Lake. J.D. Mollard and Associates (1997) identified four possible routes (A, B, C and D) within the Yellowknife to Exeter segment; Route "V" was subsequently added to this Work Area. Route "A" appears to be the most favorable of the five routes as there is a greater incidence of the more favorable Archean granites and granodiorites and a higher number of esker complexes, especially within the northern segment of this proposed route. The other four routes



SLAVE GEOLOGIC PROVINCE TRANSPORTATION CORRIDOR
POTENTIAL CORRIDOR ROUTES **FIGURE 2**

have more significant limitations, including a greater incidence of less favorable Yellowknife Supergroup bedrock, fewer and smaller eskers, increased number of stream crossings (i.e. Route "B" and "V"), and quite often greater distances (i.e. Route "C" and "V"). Table 4 summarizes presents a summary of the total distance (of each individual route), the number of bridge crossings, curves, a qualitative assessment of aggregate potential and the percentage of proposed route by slope class for routes within Work Area 1.

Table 4. Statistical Summary of Routes within Work Area 1[1]

Route	Total[2] Distance (km)	Number of Bridge Crossings	Bridge Crossings every (km)	Major Curve every (km)	Aggregate Potential	Percentage of Proposed Route by Slope Class			
						< 10	10 - 15	16 - 30	> 30
A	337	3	112	7	poor	83	11	3	3
B	220	7	29	5	poor	81	10	4	4
C	272	7	39	4	poor	64	18	16	3
D	140	4	35	4	poor	76	15	3	6
V	289	9	32	7	good	73	20	5	1

[1] Statistics have been rounded; distances calculated through Microstation software.

[2] Total distance represents total length of individual route segments; these measurements do not, in most cases, represent the total distance between Yellowknife/Ingraham Trail Terminus and the Exeter Lake/Lac de Gras area (only Route segment 'A' presents the total distance).

Recommendations

(1) Based upon the review of 1:60 000 aerial photographs and background data, it is recommended that Route "A" be flown to acquire 1:10 000 and 1:20 000 aerial photography for further route refinement. This combined route will allow a direct path to be established between the Ingraham Trail terminus and the Exeter Lake / Lac de Gras area. The total route would be approximately 337 kilometers in length. Approximately 94 % of the proposed path resides upon favorable topography (slopes less than 15 %). Compared to the three other major routes, Route "A" is clearly the straightest; containing a major curve only every 7.2 kilometers (on average). In addition, it is expected that Route "A" will be the least costly to construct because only three (3) bridges are required. A small segment, known as "A3" should be flown because it offers a shorter, more linear path to Starfish Lake, in addition to containing a very high percentage (98 %) of very low relief terrain along the route.

(2) It is also recommended that Route "B" be flown to acquire 1:10 000 and 1:20 000 aerial photography

for further route refinement. This route will allow a direct path to be established northward between Yellowknife and Exeter Lake / Lac de Gras (utilizing the northernmost portion of Route “A”). The combined route (‘B’ and northern portion of ‘A’) would be approximately 264 kilometers in length. Approximately 91 % of the proposed path resides upon favorable topography (slopes less than 15 %). Route “B” has a higher number of stream crossings (7) than ‘A’; this is expected to make it more costly to construct. However, the initial 36 % of Route “B” (to Giauque Lake) would follow an existing hydro corridor (with service roads). This is expected to drastically reduce construction costs, as well as limit additional environmental impacts within the initial 94 kilometers of the new highway. In addition, Route “B” offers a more linear path (major curve every 4.9 kilometers) than Route ‘A’.

3.2.2 Work Area 2

The Exeter Lake / Lac de Gras - Contwoyto Lake / Lupin Mine segment is approximately 210 km in length. Elevations range from a low of 439 m at Exeter Lake to 620 m atop the Peacock Hills to the north; most of the topography is less than 525 m. Four (4) possible routes (E, F, G and H) have been identified between Exeter Lake the Contwoyto Lake / Lupin Mine area. The first two routes (E and F) run north from Exeter Lake to the west of Contwoyto Lake to the Lupin Mine area; the remaining two routes (G and H) run northeast from Exeter Lake to Pellatt Lake and the south end of Contwoyto Lake (G) and from Exeter Lake towards Ghurka Lake. Table 5 summarizes presents a summary of the total distance (of individual routes), the number of bridge crossings, curves, a qualitative assessment of aggregate potential and the percentage of proposed route by slope class for routes within Work Area 2.

Recommendations

(1) It is recommended that 1:10 000 and 1:20 000 photography be acquired for Route “G”. Route “G” is preferred to Route “H” as it is shorter in length (78 versus 105 km). Furthermore, Route “G” lies upon more favorable low-relief topography with 90 % of the slopes being less than 15 %; in comparison, only 74 % of the topography along Route “H” is less than 15 %. Route “G” also provides immediate access to the Contwoyto Lake Winter Road north of Pellatt Lake. Only two bridges would need to be constructed along Route “G” (as opposed to seven required for Route “H”). Both routes are considered to have poor aggregate potential.

Table 5. Statistical Summary of Routes within Work Area 2[1]

Route	Total[2] Distance (km)	Number of Bridge Crossings	Bridge Crossings every (km)	Major Curve every (km)	Aggregate Potential	Percentage of Proposed Route by Slope Class			
						< 10	10 - 15	16 - 30	> 30
E	128	1	128	4	poor	55	40	3	2
F	209	7	30	5	good	84	14	2	0
G	78	2	39	4	poor	45	50	4	1
H	100	7	14	4	good	65	10	17	9

[1] Statistics have been rounded; distances calculated through Microstation software.

[2] Total distance represents total length of individual route segments; these measurements do not represent the total distance between the Exeter Lake/Lac de Gras area and the Lupin Mine area.

(2) If it is warranted to have an all-season road running along the western side of Contwoyto Lake to access the Lupin Mine site, it is recommended that Route "F" be flown to acquire 1:10 000 and 1:20 000 photography. A comparison of Routes "E" and "F" suggests that Route "F" is preferred especially with regards to suitable low-relief topography. Approximately 98.4 % of Route "F" occurs on topography less than 15 %, of which 84.5 % is less than 10 %. Aggregate potential is considered good for Route "F" (as opposed to Route "E" which is considered poor). The major drawback of Route "F" however, is the number of bridges that would need to be constructed.

3.2.3 Work Area 3

The Contwoyto Lake / Lupin Mine to Bathurst Inlet segment varies from 180 - 350 km in length (depending upon which route segment is chosen). Elevations range from approximately 480 m near the southeast corner of Contwoyto Lake to sea level at Bathurst Inlet. The most rugged topography is found in the Bathurst Inlet/Bathurst Lake area where volcanic intrusions extend approximately 200 m. above sea level. Four routes (I, J, K and L) have been evaluated. Route "I" is thought to be the best route if a route is chosen to go around the north end of Contwoyto Lake to Bathurst Inlet; this route provides good access to the Lupin mine and the Jericho and Izok Lake deposits. Routes "J" and "K" are equally "good" routes if access is required form the south end of Contwoyto Lake. Route "K" is somewhat longer than "J" as it swings further to the south and east to provide access to both Hackett River and George Lake/Goose lakes projects. Table 6 presents a summary of the total distance (of individual routes), a summary of the number of bridge crossings, curves, a qualitative assessment of aggregate potential and the percentage of proposed route by slope class for routes within Work Area 3.

Table 6. Statistical Summary of Routes within Work Area 3[1]

Route	Total[2] Distance (km)	Number of Bridge Crossings	Bridge Crossings every (km)	Major Curve every (km)	Aggregate Potential	Percentage of Proposed Route by Slope Class			
						< 10	10 - 15	16 - 30	> 30
I	344	14	25	3	poor	73	6	8	13
J	171	1	171	3	good	50	22	18	10
K	162	4	40	4	good	33	42	14	11
L	179	5	36	3	good	86	7	3	3

[1] Statistics have been rounded; distances calculated through Microstation software.

[2] Total distance represents total length of individual route segments; these measurements do not represent the total distance between the Lupin Mine area and Bathurst Inlet.

Recommendations

(1) It is recommended that Route "J" and selected portions of Route "I" (kilometers 0 - 64) be flown to acquire 1:10 000 and 1:20 000 aerial photography for further route refinement. This route will allow a direct route to be established between the south end of Contwoyto Lake and the proposed Bathurst Inlet port site. This route would be approximately 235 km in length of which nearly 75 % of the proposed route has favorable topography (slopes less than 15 %) with aggregate potential being considered "good" throughout most of the route.

(2) If it is warranted to have an all-season road running from the Lupin Mine site north around Contwoyto Lake to Bathurst Inlet, then it is recommended that Route "L" be flown at 1:10 000 and 1:20 000. While Route "L" presents a viable alternative to Route "J" (to the south), the topography in and near (especially along the northern end of) Contwoyto Lake would be extremely difficult to construct a road. The topography becomes considerably more favorable east of the Peacock Hills.

3.2.4 Work Area 4

The Rae-Edzo to Colomac Mine / Snare Lake segment is approximately 200 km in length. Elevations range from 213 m southwest of Bigspruce Lake to approximately 437 m northeast of the Colomac Mine site. Six (6) routes were identified, including routes "M", "N", "O", "T", "U" and "V". Table 7 presents a summary of the total distance (of individual routes), the number of bridge crossings, curves, a qualitative assessment of aggregate potential and the percentage of proposed route by slope class for routes within Work Area 4.

Table 7. Statistical Summary of Routes within Work Area 4[1]

Route	Total[2] Distance (km)	Number of Bridge Crossings	Bridge Crossings every (km)	Major Curve every (km)	Aggregate Potential	Percentage of Proposed Route by Slope Class			
						< 10	10 - 15	16 - 30	> 30
M	170	5	34	4	poor	78	16	4	3
N	61	2	30	5	good	70	22	3	4
O	131	4	33	6	poor	85	9	3	2
T	84	2	42	6	nil	80	15	2	4
U	194	5	39	6	poor	73	14	7	6
W	32	2	16	5	poor	75	24	1	-

[1] Statistics have been rounded; distances calculated through Microstation software.

[2] Total distance represents total length of individual route segment; these measurements do not represent the total distance between the Rae-Edzo area to Colomac Mine / Snare Lake area.

Recommendations

(1) If it is preferred to have a route between Rae-Edzo and the Colomac Mines/Snare Lake area, it is recommended that routes “T”, “O”, a portion of “N” be flown to acquire 1:10 000 and 1:20 000 aerial photography for further route refinement. Route “O” (with Route “N1” and eastern portion of Route “N”) is preferred over either Route “M” or western “N” because of its’ more linear path, fewer bridge crossings, and high percentage (85.5 %) of low relief (0 - 10 %) topography.

(2) If a route is preferred between the Rae-Edzo area northeast to the Lac de Gras, it is recommended that Route “U”/“W” be flown to acquire 1:10 000 and 1:20 000 aerial photography for further route refinement. This combined route will allow a more direct and shorter path to be established between Rae-Edzo and the Lac de Gras/Exeter Lake area than any of the other routes identified within Work Areas 4 and 5. The total route would be approximately 226 kilometers in length (194 kilometers along Route “U” and 32 kilometers along Route “W”).

3.2.5 Work Area 5

The Colomac Mine / Snare Lake to Lac de Gras/Exeter Lake segment is approximately 170 km in length. Elevations range from 355 m at both Snare and Roundrock lakes to 439 m at Exeter Lake. Four (4) routes (P, Q, R, and S) have been identified between the Colomac Mine / Snare Lake area and Exeter Lake. Routes "P" and "Q" both appear to be "good" routes, however Route "P" occurs along the north side of Snare Lake, while Route "Q" is to the south of the lake. Both offer "good" potential aggregate sources. The two smaller routes, "R" and "S" represent segments between "P" and "Q" to a more southerly junction with Route "A". Both of these routes also appear to have "good" potential for aggregate. Table 8 presents a summary of the total distance (of individual routes), the number of bridge crossings, curves, a qualitative assessment of aggregate potential and the percentage of proposed route by slope class for routes within Work Area 5.

Table 8. Statistical Summary of Routes within Work Area 5[1]

Route	Total[2] Distance (km)	Number of Bridge Crossings	Bridge Crossings every (km)	Major Curve every (km)	Aggregate Potential	Percentage of Proposed Route by Slope Class			
						< 10	10 - 15	16 - 30	> 30
P	171	2	85	6	excellent	83	12	3	2
Q	144	3	48	4	good	77	14	7	3
R	67	-	67	5	good	87	3	8	2
S	31	1	31	16	excellent	73	17	3	6

[1] Statistics have been rounded; distances calculated through Microstation software.

[2] Total distance represents total length of individual route segments; these measurements do not represent the total distance between the Colomac Mine / Snare Lake area and the Exeter Lake / Lac de Gras area.

Recommendations

(1) Within Work Area 5 (Colomac Mines/Snare Lake - Lac de Gras/Exeter Lake region) it is recommended that Route "P" be flown to acquire 1:10 000 and 1:20 000 aerial photography for further route refinement. Route "P" is preferred over routes "Q", "R", and "S" (relevant portions only) because of its' few bridge crossings, linear path, excellent potential aggregate resources, and high percentage (83.5 %) of low relief (0 - 10 %) topography.

4.0 RECOMMENDATION

The recommendations provided below are based upon the analysis of 1:250 000 and 1:50 000 NTS maps and detailed terrain mapping of 1:60 000 aerial photographs.

(1) If a route is required between the Yellowknife area in the south and the Bathurst Inlet area in the north, then it is recommended that routes ***A - F - H - G - J - I*** be followed. These routes provide the most direct and shortest distance (715 km) between the Yellowknife area and the Bathurst Inlet area, and access to Contwoyto Lake and adjacent mine sites and mineral deposits (i.e. via winter roads, barges, etc.). In addition, these routes occur on the most favorable topography, have poor to good aggregate sources (south to north, respectively), and have the fewest number of bridge crossings. A statistical summary for this proposed route is found in Table 9.

Table 9. Statistical Summary of Recommended Routes A - F - H - G - J - I [1]

Route	Distance (km)	Number of Bridge Crossings	Bridge Crossings every (km)	Major Curve every (km)	Aggregate Potential	Percentage of Proposed Route by Slope Class			
						< 10	10 - 15	16 - 30	> 30
A	337	3	112	7	poor	83	11	3	3
F[4]	55	2	27	3	good	70	29	1	0
H[4]	10	0	0	2	nil - poor	25	0	57	18
G	78	2	39	4	poor	45	50	4	1
J	171	1	171	3	good	50	22	18	10
I[2]	64	5	13	2	nil[3]	90	7	0	3
Total	**715**	**13**	**55**	**4**	**-**	**68**	**22**	**6**	**4**

[1] Statistics have been rounded; distances calculated through Microstation software.
[2] Figures presented for Route I are only between it's junction with Route J and proposed Bathurst Inlet terminal.
[3] Although Route "I" has been rated as poor for aggregate, this particular segment is considered to have no potential for aggregate (at the 1:60 000 scale).
[4] Figures presented for routes F, and H are for those segments required to join various segments and do not represent total lengths.

(2) If a route initiating at or near Rae-Edzo is desired, then routes ***T - U - B - A - F -H - G - J - I*** is recommended. These routes provide the most direct and shortest distance between the Rae-Edzo area and the Bathurst Inlet area (781 km), and access to Contwoyto Lake and adjacent mine sites (i.e. via winter roads, barges, etc.). A statistical summary of this proposed route is found in Table 10.

Table 10. Statistical Summary of Recommended Routes T - U - B - A - F - H - G - J - I [1]

Route	Distance (km)	Number of Bridge Crossings	Bridge Crossings every (km)	Major Curve every (km)	Aggregate Potential	Percentage of Proposed Route by Slope Class			
						< 10	10 - 15	16 - 30	> 30
T[2]	15	1	15	1	nil	80	15	2	4
U	194	5	39	6	poor	73	14	7	6
B[2]	52	3	17	9	good	91	4	3	2
A[2]	142	1	93	7	good	93	3	4	0
F[2]	55	2	27	3	good	70	29	1	0
H[2]	10	0	0	2	nil - poor	25	0	57	18
G	78	2	39	4	poor	45	50	4	1
J	171	1	171	3	good	50	22	18	10
I[2]	64	5	13	2	nil[3]	90	7	0	3
Total	**781**	**20**	**39**	**6**	**-**	**75**	**16**	**5**	**4**

[1] Statistics have been rounded; distances calculated through Microstation software.
[2] Figures presented for routes A, B, F, H, I and T are for those segments required to join various segments and do not represent total lengths.
[3] Although Route "I" has been rated as poor for aggregate, this particular segment is considered to have no potential for aggregate (at the 1:60 000 scale).

(3) Block photography should be acquired for a number of areas, including all major water crossings (i.e. Mara River, Snare River, etc.) and the Bathurst Inlet area where the proposed route terminates.

B.6 Summary of the Cost Estimates Study Slave Geologic Province Transportation Corridor

SLAVE GEOLOGIC PROVINCE
TRANSPORTATION CORRIDOR

COST ESTIMATES

Prepared by:
Highways and Engineering Division
Department of Transportation

MAY 1999

TABLE of CONTENTS

INTRODUCTION

Cost estimates shown in this report were developed using standard engineering principles and standards along with, as much as possible, actual historic unit prices experienced by the Department over the past several years for similar type work. These prices were factored to take into account the remoteness of the project, the absence of public traffic, local soil conditions and the quality, quantity and location of natural granular deposits. An assessment on the aggregate potential for each route, or segment thereof, was made and a rating (poor, fair, good) was applied to these unit prices.

Factored unit prices for embankment construction and surfacing were determined for each route, or segment thereof. Each route was reviewed for drainage structure requirements (bridges and culverts) and estimated numbers and unit costs were applied. Costs for engineering, design and contract administration were then applied to establish an overall estimated cost per kilometre. These estimates are based on standard GNWT contracting policies and a 15 to 20 year construction period.

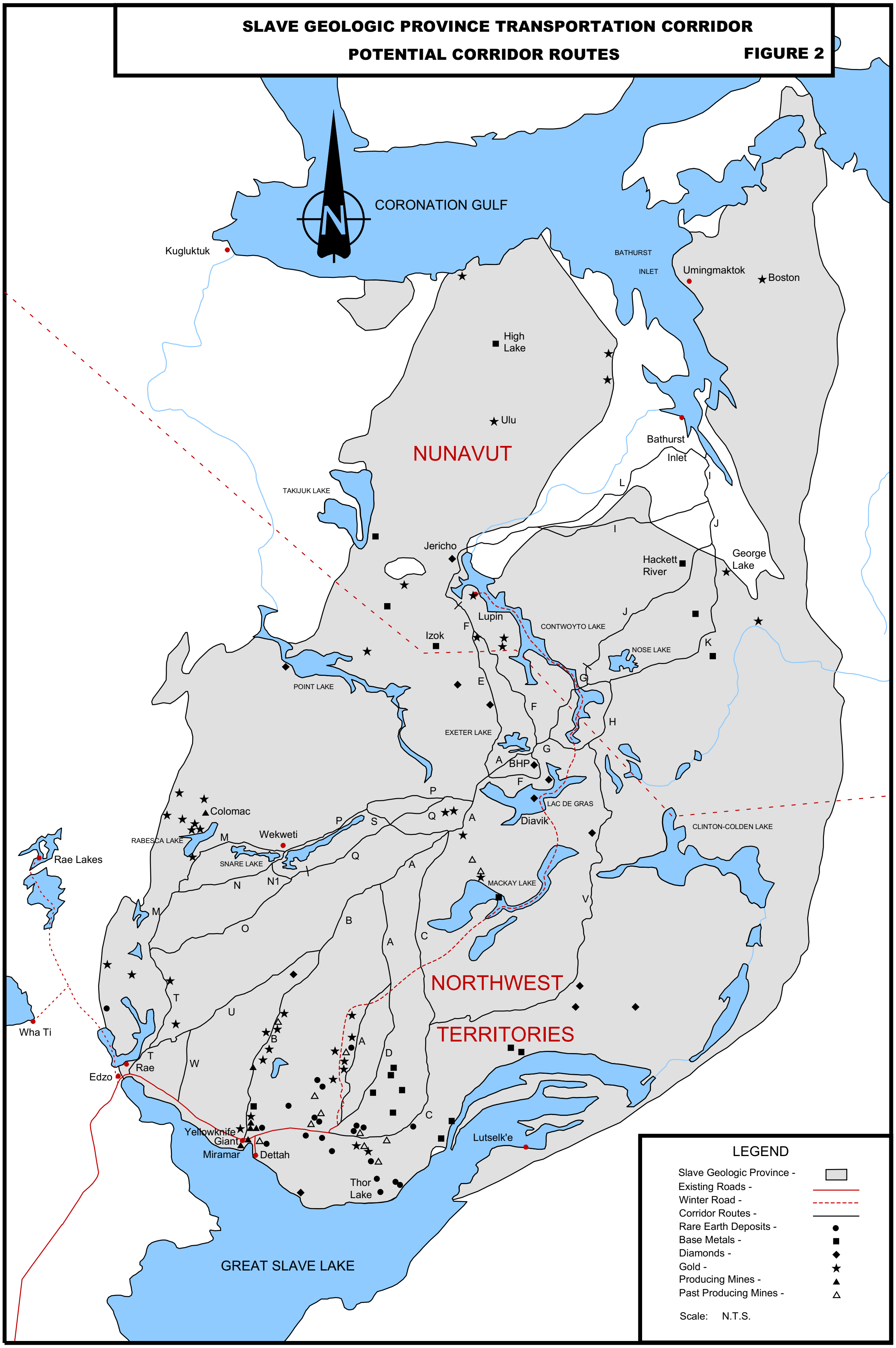
This estimated costs shown in this report were prepared to obtain a general idea of what the costs of this roadway would be and does not consider any definitive route or starting point, Rae/Edzo verses Yellowknife.

STUDY AREA

The Slave Geological Province, as shown in Figure 2, lies entirely within the Precambrian or Canadian Shield. It runs north / northeast from the north shore of Great Slave Lake to the Bathurst Inlet / Coronation Gulf. It's boundaries are defined by three distinct fault lines;

Bathurst Fault along the east
McDonald Fault along the south
Wopmay Fault along the west

Two major bedrock structural subdivisions occur within the Slave Geological Province. The archean-age igneous intrusives which occupies approximately 45% of the Slave Geological Province; lies mainly to the east of Mackay and Contwoyto Lake areas; typified by massive, unusually uniform, granitic intrusions and the Yellowknife Supergroup supracrustal strata which occupies approximately 30% of the Slave Geological Province; especially prominent in the central portion west of Contwoyto and Lac de Gras; typified by volcanic to metavolcanic intrusives (granites, tonalites and granitoid gneisses).



SLAVE GEOLOGIC PROVINCE TRANSPORTATION CORRIDOR

POTENTIAL CORRIDOR ROUTES **FIGURE 2**

Some areas are predominately bedrock which are generally overlain with a thin cover of sandy till materials. Eskers and kame (gravel ridges) complexes are scattered throughout (greater north of Lac de Gras). The area is basically a low lying area, rarely exceeding 600 metres above sea level, with a maximum relief that is generally in the 60 to 70 metre range. Lakes and localized ponding are found throughout the study area, along with bogs and marshlands blanketing large areas due to low relief and slow drainage and thin surficial deposits overlying the undulating bedrock.

WORK AREAS

Six main work areas were identified for the Slave Geological Province Transportation Corridor study area between the north shore of Great Slave and the Bathurst Inlet.

The six work areas are identified as follows:

- Tibbet Lake to Exeter Lake *(northwest corner of Lac de Gras)*
- Rae / Edzo area to Exeter Lake *(northwest corner of Lac de Gras via Wekweti (Snare Lake))*
- Exeter Lake to Lupin Mine area *(west side of Contwoyto Lake)*
- Exeter Lake to Bathurst Inlet *(around the south end of Contwoyto Lake)*
- Lupin Mine area to Bathurst Inlet *(around the north end of Contwoyto Lake*)
- Tibbet Lake to Bathurst Inlet (east side of Mackay Lake).

Route analysis results for each of these work areas are further explained in Volume 1 - Executive Summary and Volume 2 - Technical Report of the Multi-Level Mapping and Route Analysis for the Slave Geological Province Transportation Corridor, under separate covers, that are included as part of this study.

DESIGN PARAMETERS

For the Slave Geological Province Transportation Corridor, design parameters and the resultant cost estimates (Class D) were developed for an all-weather roadway with a design speed of 90 kilometres per hour. The design parameters and cross-section that was selected for the Slave Geological Province Transportation Corridor are described below and shown in Figure 1.

Design Speed
90 kilometres per hour

Horizontal Alignment

Minimum Radius (m)	300
Min. Stopping Sight Distance (m)	170

Vertical Alignment

Sag ‘K’ Value	40
Crest ‘K’ Value	55
Maximum Gradient (%)	8

Cross Section

Finished Roadtop Width (m)	10
Granular Base / Surfacing (mm)	250
Subgrade Width (m)	11.5
Min. Embankment Fill Height (m)	1.0
Cross-fall (%)	3
Max. Superelevation (%)	8
Side Slope Ratio	3 to 1

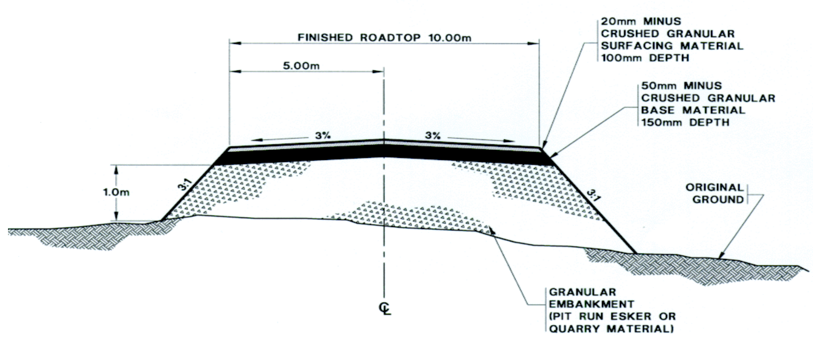


Figure 1 - Typical Design Cross-section

QUALITATIVE RANKING FOR AGGREGATE POTENTIAL

A qualitative ranking of aggregate potential for each route, or segment thereof, was developed from the review of the 1:60,000 black and white aerial photography. The following presents the qualitative description of the ranking system used; no quantitative assessments have been made of any esker/glaciofluvial deposit potential.

Poor

No or very few eskers or glaciofluvial deposits were identified on the aerial photographs; are poorly spaced along the route *(eskers are located only at one end of the route)*.

Fair
Significant number of eskers were identified on the aerial photographs; eskers are somewhat poorly spaced throughout the route; and are comprised mainly of sand.

Good
Significant esker and glaciofluvial deposits in the form of outwash plains were identified on the aerial photographs; deposits are evenly distributed along the route; and are comprised of a combination of sand, gravels, cobbles and boulders.

UNIT COSTS ESTIMATES

Estimated unit costs were developed using, as much as possible, actual or historic unit prices associated with recent highway construction projects of a similar nature. These prices were than factored to take into account the extra costs that could be expected due to the remoteness of the project, local soil conditions and the qualitative ranking for aggregate potential. Costs were also adjusted to reflect the potential savings expected due to the absence of public traffic and the probability of completing the work on a larger scale with each project being somewhere around 20 million dollars..

Table 1 provides the estimated factored unit costs for embankment construction and surfacing based on the qualitative ranking of aggregate potential as described above.

Description	**Estimated Unit Costs (per cu. M) (based on aggregate potential)**		
	Poor	**Fair**	**Good**
Embankment Construction	$27.50	$22.00	$18.00
Production/Application of Surfacing	$28.00	$22.00	$20.00

Table 1 - Estimated Unit Costs

ESTIMATED ROADWAY QUANTITIES

Although the design parameters identified a minimum of one (1) metre for structural embankment fill, quantity estimates were developed using an average embankment fill of 1.3 metres. This would allow for the extra fill quantities required to meet the vertical alignment criteria, to level out the undulating original ground surface and allow for consolidation of the natural ground cover and natural settlement of the road embankment.

Table 2 provides the estimated quantity requirements for each kilometre of embankment construction and surfacing as described above.

Description	Average Height (m)	Average Width (m)	cu. metres per Linear metre	cu. metres per kilometre
Embankment	1.30	12.40	16.20	16,200.00
Surfacing	0.25	10.40	2.40	2,600.00

Table 2 - Estimated Roadway Quantities

AVERAGE COST PER KILOMETRE

Estimated costs per kilometre of embankment construction were derived from the factored unit prices, as shown in Table 1, multiplied by the estimated quantities for embankment construction and surfacing, as shown in Table 2.

Table 3 provides the estimated average cost per kilometre for embankment construction and Surfacing only. These figures do not allow for any drainage/stream crossing structures, preliminary and design engineering or contract preparation and administration.

Description	Estimated Costs per km (based on aggregate potential)		
	Poor	Fair	Good
Embankment Construction	$445,500.00	$356,400.00	$291,600.00
Production/Application of Surfacing	$72,800.00	$57,200.00	$52,000.00
TOTAL	**$518,300.00**	**$413,600.00**	**$343,600.00**

Table 3 - Estimated Average Embankment Construction Cost Per Kilometre (based on Aggregate Potential)

STRUCTURES AND ENGINEERING COSTS

Single lane bridges were used in the development of cost estimates for the bridges required for this roadway. An estimated average of three culverts will be required for each kilometre of embankment construction. Engineering, design and contract preparation and administration costs were derived from historic costs associated with this type of activity.

Table 4 provides the estimated costs per structure or kilometre for drainage structures, engineering, design and contract administration.

Description	Cost per Structure	Cost per Kilometre
Bridges	$1,000,000.00	
Culverts / Drainage Improvements		$18,700.00
Engineering Surveys & Geotechnical		$20,000.00
Design & Contract Preparation		$10,000.00
Contract Supervision & Admin.		$10,000.00

Table 4 - Estimated Structures and Engineering Costs

ESTIMATE CONSTRUCTION COSTS

This section provides a summary of the estimated construction costs for each sample route, within each work area previously identified, of the roadway from the north shore of the Great Slave Lake to Bathurst Inlet. These routes or segments thereof are shown in Figure 2. Further details of these estimates can be found in the estimate work sheets included in this document under Appendix A.

Table 5 provides the estimated total costs for each sample route along with the average total costs per kilometre.

DESCRIPTION	LENGTH (KILOMETRES)	ESTIMATED STRUCTURES	AGGREGATE POTENTIAL	ESTIMATED COSTS PER KILOMETRE	ESTIMATED COSTS FOR ROUTE
Tibbet Lake Bathurst Inlet					
Route A / G / J / I (Nuna Logistics Route)	715	14	Poor/Fair	$538,006.99	$384,675,000.00
Tibbet Lake to Bathurst Inlet					
Route C / V / H / G1 / G / J / I	825	24	Fair	$498,528.48	$411,286,000.00
Tibbet Lake to Bathurst Inlet					
Route A / F / I / L / I	840	23	Poor/Fair/ Good	$522,276.79	$438,712,500.00
Yellowknife Hwy (km 271) to Bathhurst Inlet					
Route W / U / B / A / G / J / I	765	22	Poor/Fair	$551,013.07	$421,525,000.00
Rae Edzo to Bathurst Inlet					
Route T / U / B / A / G / J / I	780	21	Poor/Fair	$550,230.77	$429,180,000.00
Route T / M / N / P / A / G / J / I	810	19	Poor/Fair	$524,193.83	$424,597,000.00
Contwoyto Lake (East) to Bathurst Inlet (approximate location of Nuna Route)					
Route J / I	235	5	Fair/Poor	$488,576.60	$114,815,500.00

Table 5 - Estimated Construction Costs

CONCLUSION

The estimates, as provide in this report, indicate that any roadway, as defined earlier in this report, that is to be constructed within the Slave Geological Province over a 15 to 20 year construction period, will cost approximately $ 500,000 to $ 550,000 per kilometre, and the total length of roadway, between the north shore of Great Slave Lake and Bathurst Inlet, could cost in the neighborhood of between 380 and 440 million dollars dependant on the final route location.