August 24, 2004

Ms. Kimberly Cliffe-Philips,
Environmental Assessment Officer
MVEIRB
Box 938, 5102 – 50 Avenue
Yellowknife, NT X1A 2N7
Tel: 867 766-7062
Fax: 867 766-7062

Dear Ms. Cliffe-Philips,

Deh Cho Bridge – Environmental Assessment Information Requests 2.1.1 – 2.1.21

Attached are responses to the second round of information requests (IRs) 2.1.1 to 2.1.20, prepared on behalf of the proponent, the Deh Cho Bridge Corporation. The response of IR 2.1.21 will be forthcoming shortly.

Please do not hesitate to contact us for any further information that may assist in the process.

Sincerely,

Jivko I. Jivkov, P.Eng.
Principal,
Jivko Engineering

c Albert J. Lafferty, DCBC
  Andrew Gamble, Andrew Gamble & Associates

attachment

Response to Mackenzie Valley Environmental Impact Review Board <u>Information Request</u>

IR Number: **2.1.1**

Response:

a) It should be noted that the Peer Review Committee (PRC) was retained by, and is reporting to the GNWT. The main objective of the PRC's work is to carry out an independent design review and to check the conformity of the DCBC design with the current Canadian Bridge Code. The final PRC Report will be a public document and will be posted on a GNWT web site in early September 2004. If required, the DCBC could print and provide hard copies of the report to the interested parties of the EA. Alternatively the DCBC could provide the name of the GNWT web site.

b) Consulting firms providing specialised design information include:

- EBA Engineering Consultants of Yellowknife, NT – geotechnical information for foundation design; embankment material; concrete aggregate testing; and pavement design
- Trillium Engineering of Edmonton, AB – river engineering, ice forces, elevations of flood and ice-action, scour, etc.
- Golder Associates of Edmonton AB – environmental considerations, impact on aquatic and terrestrial wildlife, water quality monitoring program, etc.

Final Reports from these consultants were enclosed with the DAR submitted in May 2004 and are posted on a MVEIRB web site.

Scientific labs providing specialised design information include:

- Davenport Engineering Group of University of Southern Ontario, London ON – wind tunnel testing of model sections of the bridge to establish vibrations, oscillations and other parameters of the bridge lateral stability. Interim reports submitted by Davenport indicate suitability of the proposed structure. Final report is due in the first week of September, 2004. All interested EA parties will be provided with copies of the report.
- University of Calgary, Calgary AB – Model testing of the suspension system of the main span including portals, stays, articulated attachments, etc. Testing the suspension system is part of the construction process and will be carried out after the award of the construction contract.

c) The design submitted with DAR, May 2004 is final and is not a subject to further modifications. The Pier Foundations, the Steel Superstructure, the Bridge Deck and the Road Approaches will be tendered as single design options as defined in the presented design. The Pier Shafts (the above-water portion of the piers) will be tendered with steel and pre-cast concrete options. Most of the consulted contractors are favouring the steel option, but few still believe that the concrete structure will be more economical.

The DCBC was not able to identify any difference in environmental or socio-economic impact resulting from either pier-shaft option.

d) After 35 years, this bridge it will become the property of the GNWT. While it has a 'design life' of 75 years, it may be in service much longer. A bridge of this size <u>may</u> be replaced after their useful life, if replacement becomes more economic than rehabilitation or upgrading. Otherwise, the bridge may be rehabilitated and its life extended (The Lion's Gate Bridge in Vancouver for example, is over 100 years old. There are bridges in use all over the world that are many centuries old). In any case, the partial or complete dismantling of the structure would be a (minor) part of the cost of its replacement.

e) The general contractor will be required to provide performance bonding for the construction and warranty phase. The project will also be fully insured against accident and liability throughout the construction and operations phases. The project will be financed by $5 million in developer equity and $55-60 million in debt to be provided by TD Securities. The proponent, Contractor, bonding company, TD Securities and GNWT will have considerable 'security' at risk and incentive to ensure project completion. Any additional securities bond will add an unnecessary cost that would be passed on to the user.

f) Median crash barriers are not used on two lane roads or bridges. The road width on the bridge is the same as the width of the highway for several hundred kilometres on either side. The two lanes plus shoulders provides enough width for three vehicles. A median barrier would split the road into two one-way single lanes, with no ability to pass. A single disabled vehicle would effectively close that lane, with the barrier preventing any following vehicles and emergency vehicles from detouring around it.

Response to Mackenzie Valley Environmental Impact Review Board
Information Request

IR Number: 2.1.2

Response:

a) Geotechnical analysis on Pier Site #6 has not been carried out.

b) Geotechnical analysis on Pier Site #6 will be carried out.

c) For the purpose of tendering and commencement of construction, the bridge design and construction plans are finalised. There is foundation design for Pier #6 based on the anticipated scenario of geotechnical conditions observed on the remaining pier locations. The selected foundation design is versatile and easily adjustable to the geotechnical conditions specific for each pier.

   Construction of pier foundations begins with drilling of several hundred holes at every pier location for installation of the sheet piling and for excavation on the riverbed. The results of the drilling will be quickly evaluated by the geotechnical engineer and the designer and the design will be adjusted accordingly if required.

   Please note that according to commonly adopted geotechnical practice the pier foundation design is based one the results of one test hole drilled per every pier location. This hole usually is, but in some cases may not be fully representative for the geotechnical conditions under the several hundred square meter large pier footing. The results of the sheet pile drilling at all piers will be monitored and evaluated to confirm that the anticipated geotechnical conditions are consistent under the entire footing area.

Response to Mackenzie Valley Environmental Impact Review Board
<u>Information Request</u>

IR Number: **2.1.3**

Response:

a) The material of the sand lenses and generally the till found in all test holes are competent foundation materials, but are of slightly inferior capacity than anticipated during the preliminary design stage. It was considered that flat footing would be more suitable foundation for this type of material.

b) The encountered sand lenses are of limited size and extent. The sand lenses originally identified while possibly being porous resulted to be of viable strength and will not have any effect on the sheet piling particularly if the work is conducted in tremie. For the piers constructed over the sand lenses the design contemplates increase the thickness of the concrete footing and placing the concrete in tremie.

c) The piers and footings constructed over the sand lenses will be stable and equal to all other footings in strength and resistance.

Environmental Assessment of Deh Cho Bridge

Response to Mackenzie Valley Environmental Impact Review Board
Information Request

IR Number: **2.1.4**

Response:

a) The 100 year event for peak discharge and 50 year event for ice thickness were established by Trillium Engineering and were reviewed and accepted by the Design Engineer, by the ice experts of the Peer Review Committee and by the Committee itself. We believe that they are suitable for the evaluation of the river conditions.

b) There is approximately 40 years of recorded data on the Mackenzie River. The 50 year and 100 year events are extrapolated and are on the conservative side. In addition, there is large security factor over and above these conservatively extrapolated results.

c) We believe that 100 year event for peak discharge and 50 year event for ice thickness are suitable for the life expectancy of this bridge.

d) The design has addressed all possible conditions identified by the investigations.

Response to Mackenzie Valley Environmental Impact Review Board
Information Request

IR Number: **2.1.5**

Response:

a) The bridge abutments will be constructed on top of the bridge approaches, in excess of 4 metres above the high water level. As described in item C of DAR there is no excavation associated with the abutments construction.

b) It is considered impractical and of prohibitive cost the installation of cofferdams for the excavation of the north ferry landing and the south haul-out. In order to reduce the amount of TSS discharges into Mackenzie River the DCBC is considering to carry out the work as follows:

- North Causeway: Most part of the area subject to excavation is surrounded by existing sheet pile wall. The downstream part including the ferry landing is in relatively calm water and could be surrounded by a silt curtain during removal of the concrete and significant part of the backfill. However during extraction of the sheet piling and excavation of the backfill behind it, some material will inevitably be washed out downstream. The rate of excavation of this material will be done in controlled condition so the amount of TSS does not exceed the permissible.
- South Haul-out Area: This area is protected from the current by the south causeway and could be surrounded by a silt curtain during all period of excavation.

Response to Mackenzie Valley Environmental Impact Review Board
Information Request

IR Number: **2.1.6**

Response:

a) The Department of Transportation has contracted Dillon Consulting Ltd. to conduct a Phase 1 and Phase 2 environmental assessment of the sites. The Dillon study (Dillon 2004) has been completed and the report is now available to the public. DCBC has reviewed the report and assessed the relevance of the findings to the bridge project. The results of the Phase 1 and 2 ESA investigations by Dillon indicate that the north and south ferry landings are not contaminated by hydrocarbons and metals. However, three areas of concern were noted: elevated conductivity in soils at one site on the south landing (due to road salt), elevated conductivity of soils at two locations on the north landing (due to road salt), and possible PCB contamination associated with a transformer on the southern edge of the south landing.

Based on their findings, Dillon (2004) concluded and recommended the following:

- "Given the soils located in the drainage ditch on the southern landing and the low-lying areas on the northern landing are potentially impacted with road salt, proper disposal of those soils should be considered if further site development occurs".
- The stained soils in the vicinity of the western winch house should also be properly disposed of and treated during future site development".
- The electrical transformer on the southern landing that may contain PCBs should be properly decommissioned when it is removed from the site".

The above-specified potentially contaminated areas are not within the limits of excavation by the DCBC. The remediation of these areas remains the responsibility of the Government of Northwest Territories.

b) The water quality monitoring program scheduled to occur during removal of the existing ferry infrastructure at the north causeway and the removal of the ferry haul out area on the south approach will include hydrocarbons. However, based on the results of Dillon (2004) hydrocarbon parameters will be assessed at a synoptic level (i.e., representative samples collected prior to and during construction to confirm the absence of significant hydrocarbon levels). The primary focus of the monitoring program (as expressed elsewhere) will be the tracking of TSS/turbidity.

Response to Mackenzie Valley Environmental Impact Review Board
<u>Information Request</u>

IR Number: **2.1.7**

Response:

a) There will be four containment ditches, two on each side of each approach. The ditches will be located 400 m to 500 m distant from the corresponding bridge abutment and not less than 50 m beyond the high water mark. Each ditch will be 20 m long 5 m wide, 0.5 m deep and of capacity exceeding 50 cu m. The longitudinal slope of the gutter that flows into the ditch is only 0.8%. In order to stabilize and protect the bed and banks from erosion the dykes around the ditches will be dressed with cobble size blasted rock and will be shaped and vegetated according to NT highway standards. Plan, profile, and details of the ditches are presented on Fig 1 and Fig 2.

In order to ensure a stable site, rock rip rap material will be incorporated into the design (e.g., at the interface between the sloped concrete gutters and the containment ditch). The ditches will be built of gravel capable to drain the water runoff and to contain the fuel in case of spill. The degree of soil contamination in and around the ditch in case of spill will depend on the moisture content of the gravel and on the time of response of the spill cleaning personnel mobilised by the responsible party.

b) The structures as designed are expected to be very effective in handling accidental spills and runoff from the bridge surface during rainfall events. The containment and clean-up of accidental spills occurring during the operational life of the bridge are the responsibility of the carriers. However, the proposed structures have been designed to facilitate a more effective and rapid clean-up (i.e., contaminated materials directed away from the river channel, and contained while equipment is mobilized).

The two containment ditches located along each bridge approach will have a combined capacity sufficient to contain the contents of a typical fuel tanker truck. Note: a B Train tanker truck usually carries 40 cu m of fuel (two tanks @ 20 cu m per tank). If the fuel does escape the containment structures and contaminate the surrounding terrain (or river), it will be the responsibility of the carrier to implement an effective spill clean-up program.

c) The structure and performance of the containment ditches will be monitored on an annual basis and after a major rainfall to ensure they are functioning as designed.

d) In the event of a significant fuel spill there may be potential for the development of soil contamination and stability issues. The structures placed by DCBC (pre-cast concrete gutters, containment ditches etc.) are designed to conduct away from the river and contain spills, and also to facilitate clean-up of spilled fuel. It will be the responsibility of the carrier to remove and dispose of contaminated soil an environmentally acceptable manner, and restore the proper functioning of the site following a spill event.

e) DCBC has no plans to remove the snow or ice from the containment ditches on an ongoing basis. This would seem to be impractical but, if required, could be done by the carrier as part of their due diligence and preparedness in the event of a spill. The carrier would also be responsible for the removal, replacement and treatment of contaminated soil in and around the containment ditches resulting from an accidental spill.

f) To our knowledge, the specific design has not been applied on other bridges of this type. However, Best Management Practices for Protection of Surface Waters in the United States call for the incorporation of similar structures (i.e. Guidelines for Location and Design of Hazardous Spill Basins). These guidelines provide location (i.e. proximity to waterbodies) and design requirements with respect to the volume of spill containment storage (i.e. maximum volume of spill anticipated), the means of interrupting normal at the basin outlet (e.g. earth berm, sand bags). The goals and function of the Deh Cho Bridge containment structures is consistent with the U.S. guidelines

g) A risk-benefit analysis was not conducted by DCBC. To be effective, a spill contingency plan would require a means of concentrating and containing the spill (i.e., concrete gutters, containment ditches designed and constructed by DCBC), and conventional large river spill equipment provided on-site and operated by the carrier.

In the understanding of the DCBC, the owner of the road (or bridge) is responsible to meet prescribed codes and standards for construction and maintenance, and follow good engineering practice. What is being proposed incorporates spill containment features far exceeding anything found on any other NWT bridge and exceeding what is found on most, if not all, other bridges in Canada.

Current legislation and regulation make it the responsibility of the carrier to ensure the safe transport of dangerous goods, including provisions for spill response and cleanup. The DCBC does not plan to assume responsibility for spill response on behalf of the carriers.

h) To the knowledge of the DCBC the Peer Review Team will not be commenting on this aspect of the bridge design. Their focus covers aspects related to the conformity of the proposed design with the current bridge codes and accepted construction practices. The reviewers are retained by, and report to the GNWT.

Response to Mackenzie Valley Environmental Impact Review Board
Information Request

IR Number: **2.1.8**

Response:

a) As described in item C8 of DAR, only concrete fragments and backfill material will be disposed of in the South Borrow Area. The cleanness of this material and its suitability for disposal are responsibility of the GNWT and are the main objective of a study commissioned by the GNWT and recently completed by the Dillon Consulting.

b) Item C8 of DAR also describes in detail the method of disposal of steel and timber extracted from the reclamation area. The steel will be shipped to a smelter in Edmonton and sold for scrap iron. The timber is a property of the GNWT. An estimated 80% of this timber will be salvaged for use on other ferry landings. The remaining fragments will be piled and burned on site.

c) An inventory of materials and quantities disposed of at each location will be implemented and maintained.

Response to Mackenzie Valley Environmental Impact Review Board
Information Request

IR Number: **2.1.9**

Response:

a) As noted in the DAR Section A.1.2, The Deh Cho Bridge Act (Appendix 10) and the Deh Cho Bridge Memorandum of Intent (Appendix 11), the GNWT will own and operate the toll facility (if any) and collect the toll.

Response to Mackenzie Valley Environmental Impact Review Board
<u>Information Request</u>

IR Number: **2.1.10**

Response:

a) The GNWT is currently investigating the most effective toll collection system, in consultation with the trucking industry and considering its overall highway licensing and enforcement responsibilities. A decision has not yet been made.

Alternatives such as incorporating toll collection within existing facilities (at Enterprise) and utilizing electronic monitoring would have no additional land requirements. A toll collection facility could be located on the northbound approach to the bridge or at a remote site. All required infrastructure, egress and exit ramps, parking area and toll plaza structure would occupy a footprint approximately 250 m by 20 m situated parallel to the existing highway mostly or wholly within the highway right-of-way as established by the NWT Highways Act. The toll plaza structure would be self-contained with trucked services. The administration functions will likely be conducted remotely at an existing GNWT facility

Response to Mackenzie Valley Environmental Impact Review Board
Information Request

IR Number: **2.1.11**

Response:

a) The toll will be restricted to northbound commercial vehicles. The toll will be paid directly by commercial truckers. To the extent that the toll exceeds trucking cost savings, truckers will pass the costs on to their business customers. Net costs or savings for these businesses may in turn, be passed on to retail consumers (in the retail price for milk or gasoline, for example)or may be reflected in operating costs (for a mine). In relation to tolls, the 'user groups' therefore include the commercial trucking industry, businesses and consumers.

As noted in DAR Table G1 and Appendix 2, consultation efforts have included:

- Trucking industry – NWT Motor Transport Association and RTL Robinson's Trucking.
- Business – NWT & Nunavut Chamber of Mines, Yellowknife Chamber of Commerce, NWT Chamber of Commerce, Meet the North Conference.
- Consumers – Elected representatives, including NWT Association of Communities, MLAs, Yellowknife City Council, Tli Cho (Dogrib) Chiefs, Dene Chiefs and 'affected communities' (as defined by MVEIRB). Informal discussions with local retailers.

The proponent has also held several press briefings and public meetings. In addition to proponent consultation, the GNWT has consulted with these groups through the department and Legislative Committee public hearings.

b) User groups would rather have 'free' service. However, most have recognized that a toll is required to make the bridge a reality. The NWT Association of Communities, NWT Legislature, NWT Motor Transport Association and Dene Nation have formally supported the proposed toll (This support has been subject to assurances that the toll will not exceed what is being proposed).

c) No user groups opposed the toll structure during the NWT Legislature's public hearings on the Deh Cho Bridge Act. In the preliminary project screening conducted by the MVLWB, the NWT and Nunavut Chamber of Mines initially objected to the toll (Sept. 16, 2003), but later withdrew this objection (Jan. 26, 2004).

d) The NWT Chamber of Mines initial objection was largely based on their view that the cost to the mining industry would exceed the potential benefits. However, this objection was formally withdrawn.

e) This is not new information.

The cost of operating the toll collection system will be paid by the GNWT from its savings and will not be added to the tolls or deducted from the toll payments to the proponent.

The GNWT has agreed to pay the proponent an amount representing its <u>net</u> cost savings from suspension of the ferry and ice bridge service operating costs. The GNWT and proponent have agreed that the estimated savings of $1.7 million will be partially offset by the costs of toll collection and have allowed $0.3 million for this purpose. This results in a net estimated GNWT savings of $1.4 million.

The toll facility will be owned and operated by the GNWT, at its cost. It has not yet been fully defined or costed - it may be partially or fully integrated with the existing GNWT highway licensing and enforcement system. However, this will have no impact on toll rates.

Response to Mackenzie Valley Environmental Impact Review Board
Information Request

IR Number: **2.1.12**

Response:

a) Section J of the DAR outlines the analysis conducted to support this statement. It is the proponent's view that:

✓ The key potential impacts will be on the water quality of the Mackenzie River.

✓ Once built, a bridge will provide a more stable and less disruptive crossing than the current ferry and ice bridge operation, including;
- Reduced fossil fuel consumption
- Reduced consumption of gravel for maintenance of ferry landings and ice road access
- Reduced river sedimentation/contamination form ferry prop-wash and erosion of ferry landings
- Increased fish habitat.
- Reduced risk of major spill (ferry and ice crossing)

✓ Measures proposed to mitigate and monitor potential impacts during construction will ensure that the short term environmental 'costs' are exceeded by the long term environmental 'benefits'.

The proponent's consultants (Golder), reviewing agencies, including DFO, Environment Canada, DIAND and RWED and affected communities have reviewed the project proposal during preliminary screening and during the EA process. None have suggested or provided any evidence that this assumption is faulty.

b) We believe that the DAR (Sections C, I, J and K, supported by Appendix 14) identifies all predictable significant impacts and risks, both short-term and long-term.

Response to Mackenzie Valley Environmental Impact Review Board
Information Request

IR Number: 2.1.13

Response:

a) This project financing and security arrangements include the proponent (DCBC), the GNWT, TD Securities, the general contractor (selection to be approved by GNWT, TD and the proponent), the contractor's bonding company and the contractor's and owner's insurer(s). All partners have and will exercise considerable due diligence in managing the collective risk. Together, these partners have considerable financial capacity.

Project failure is extremely unlikely. (The proponent is not aware of a failure of any comparable project in Canada).

The current capital cost estimate is $57.1 million. This will be updated once the design review has been finalized and permit conditions are known. It will also be reviewed after tenders are received and prior to a final decision to begin construction. (interest rates will be fixed at this time).

Based on current interest rates and the agreed maximum toll rate of $6, this project remains economically viable at a cost of up to $90 million. (A cost overrun of over 50% would not impact the user, GNWT or lender)

Response to Mackenzie Valley Environmental Impact Review Board
<u>Information Request</u>

IR Number: **2.1.14**

Response:

a) While in place, the pH of water within the cofferdam is expected to increase beyond natural background levels (values ranged from 7.2 to 8.7 in summer/fall 2003) due to the release of calcium hydroxide during the concrete curing process. The range of pH considered safe for freshwater aquatic life is 6.5 – 9.0 (DFO Reference). The pH levels that may develop behind the pier cofferdams are difficult to predict, but it is possible that they will exceed 9.0. However, because of the large volume of water available for dilution (6,000 to 10,000 cu m per cofferdam) it is assumed that they will not reach levels associated with concrete wash water in the construction industry (pH's between 10 and 12). Levels between 10 -12 can be harmful, and potentially lethal, to fish when introduced into sensitive habitats with limited flow-though. Under the DCBC water quality monitoring plan, pH will be measured at a reference site located immediately upstream of the coffer dam, immediately downstream of the cofferdam and within the cofferdam (measurements taken with a portable pH meter). This information will be used as a basis for regulating the dewatering process.

b) If the water behind the cofferdam is basic (i.e., exceeding 9.0), it will be neutralized in place. Adjusting the pH, prior to dewatering will be accomplished by one or all of the following methods: flooding the area behind the coffer dam with fresh river water (dilution), addition of neutralizing chemicals such as hydrochloric acid or industry alternatives (salt based, non-hazardous), or injection of gaseous carbon dioxide. Whether the neutralizing materials are introduced using a "batch" or in-line injection method will depend on the site characteristics. However, it is likely that the treatment will carried out using a "batch" method because it is easier to control the pH of the treated outflow. Regardless of the method selected, the objective will to bring the pH of the affected water in line with background levels prior to release (i.e., pH at or below 9.0).

c) The pH levels at the three sample sites (upstream reference, immediately downstream, within confines of cofferdam) will be measured and tracked in order to determine the effectiveness of the neutralization process, prior to and during dewatering at the eight in-stream pier construction sites. Measurements will be taken on site with a portable pH meter and the results will be available on a timely basis (i.e., will allow immediate feedback to construction and environmental personnel).

Response to Mackenzie Valley Environmental Impact Review Board
Information Request

IR Number: **2.1.15**

Response:

a) According to Section C of DAR (page 38) the vertical clearance under the main span is set 22.67 m above the HWL, referring the Average High Navigational Water Level during the sailing season.

Water elevations in the bridge waterway are discussed in detail in item 2.7, page 10 of the Trillium Engineering Report. The water levels and the discharge durations are established on a basis of the recorded data. The 100 year events are extrapolated.

Response to Mackenzie Valley Environmental Impact Review Board
Information Request

IR Number: **2.1.16**

Response:

a) Calcium chloride. Prior to paving in recent years the accesses to the ferry were treated with CaCl by the GNWT.

b) The maintenance of the access to the ferry landings and the application of the dust control agent will be applied according to DOT highway maintenance standards. It is expected that the agent would be applied once (possibly twice) during each of the 2005 and 2006 summer seasons. The alternative, watering the road surface every four hours (approximate) during the summer, was considered to be less practical due to the higher costs and the potential for introduction of suspended sediment to the near-shore aquatic habitat downstream of the road. The potential for the CaCl to enter the river, in sufficient quantities to adversely affect fish and fish habitat is very unlikely. However, the presence and concentrations of CaCl in the habitat unit immediately downstream will be monitored during the water quality program to confirm this assumption.

c) The agent would be applied to two areas:

- The North Detour Road (appx 400 m in length), which will parallel the north approach (located on downstream side). This detour will remain in place after construction of the bridge.
- The South Detour Road (appx 100 m in length), which will parallel the south approach and will cross the existing ferry haul-out.

Short sections of access roads in the gravel pits and within the Construction Corridor will be watered occasionally for the duration of the gravel hauls. During construction, backfill material for the embankment will be watered in layers for better compaction.

Response to Mackenzie Valley Environmental Impact Review Board
Information Request

IR Number: **2.1.17**

Response:

a) The total area to be cleared, including the construction camp, concrete plant, borrow pits and gravel sources amounts to less than 10 hectares or $1/10^{th}$ of a square kilometre. These are shown on the drawings in DAR appendix 1A. All areas are for temporary use and are outside of the bridge 'footprint'. The worksites and could be allowed to re-vegetate. Borrow pits will typically fill with water and become waterfowl habitat.

b) The 'footprint' of the project could be considered as the 60 metre wide right of way between the limits of construction (2.7 km) or about 16 hectares. Of this more than half is in the river, while about 6 hectares was cleared for the existing highway right-of-way.

For comparison purposes, the right-of-way for one kilometre of highway requires the clearing of 6 hectares, while the highway from Ft. Providence to Rae access required the permanent clearing of over 1,300 hectares (excluding borrow sources and camp sites).

Response to Mackenzie Valley Environmental Impact Review Board
Information Request

IR Number: **2.1.18**

Response:

a) Baseline studies on wildlife utilization of the footprint and project areas were not included in the overall project evaluation. However, a review of published reports and available survey data for the area was undertaken in order to gain insight into the species utilization of the surrounding area for application to the current project setting. The rationale for not carrying out a systematic wildlife evaluation at the site was based largely on the fact that wildlife habitat will not be displaced or altered by the bridge infrastructure (i.e., the structures will be constructed within the existing footprint of the ferry approaches and landing areas). Also, any remaining wildlife concerns can be effectively circumvented, or alleviated, using mitigation strategies that have been applied elsewhere on bridge projects (e.g., pre-construction surveys to identify any raptor nests or bear dens). The removal of rock and gravel from off-site quarries may have wildlife implications. However, this activity will occur at or adjacent to existing, permitted quarries which will require only minor changes to the present configuration. Activity at these quarries directly related to the bridge will be relatively short-term (2-3 weeks at individual sites). Based on the development scenario described above the impact on wildlife resulting from off-site development is expected to be negligible.

Response to Mackenzie Valley Environmental Impact Review Board
Information Request

IR Number: **2.1.19**

Response:

a) This request requires two scenarios to be developed. Climate changes can only anticipate increased or decreased temperatures:

- Increased Temperatures: This would probably result in increased precipitation and higher flows with reduced ice thicknesses. Such an eventuality may create a rise of up to 0.5 m in the lake which may increase the H.W.L. proportionately. The higher water level would result in higher elevation of the ice impact, thus increasing the overturning moment for the piers. The reduced ice thickness would tend reduce the magnitude of the impact force, thus offsetting the effect of the higher water level.
- Decreased Temperatures: This would probably result in reduced precipitation and reduced flows with increased ice thickness. The resulting decrease in the level of the lake would reduce the H.W.L. proportionately. The lower water level would result in lower elevation of the ice impact, thus decreasing the overturning moment for the piers. The increased ice thickness would tend to increase the impact force, thus offsetting the effect of the lower water level.

In general, moderate climate changes would not affect the bridge performance, since the pier foundations and the rip rap on the causeways are designed with an ample safety factor.

In conversations with climatologists there were no indications that changes of the magnitude described above have occurred even during the large temperature increases of the 15th century when Greenland was aptly named and when Iceland was generally free of ice. There is no record of these perceived catastrophies every occurring, and while one cannot discount the possibilities, the cost of providing for this would probably render the project uneconomical for the anticipated lifespan.

Response to Mackenzie Valley Environmental Impact Review Board
Information Request

IR Number: **2.1.20**

Response:

a) With respect to the disposal of river bed materials excavated during the pier construction, DCBC would prefer to return the material to the river channel rather than haul it to an off-site gravel pit for disposal. The rationale for returning the spoil to the river is based on the following:

- the material is natural and will be quickly assimilated into the riverbed downstream,
- most of the sediment content will be released into the area contained by the cofferdam prior to release of the coarse material in the channel,
- removing the material to off-site gravel pits will be logistically difficult and costly,
- the disposal of the riverbed material on land could be perceived as an impact on terrestrial resources (wildlife, vegetation).

The proposed excavation and disposal operation will be controlled in order to maintain water quality standards for TSS/turbidity (CCME guidelines). The proposed water quality sampling program with a "feedback monitoring" objective is designed for this purpose. Preliminary assessment of the amount of sediment liberated from the glacial till riverbed material during pier excavation was undertaken by EBA (2004). They determined (using a "shake test" method) that approximately 3 % of the soil mass was liberated as sediment; also, it was estimated that the material if added gradually would result in an increase of less than 1 mg/l to the background suspended solids levels in the river. Although, their methods were admittedly crude, the results indicate that it should be possible to maintain CCME water quality standards during construction.

b) As indicated, there is a requirement to ensure that releases of water from the within the cofferdams are non-deleterious. To maintain compliance with respect to suspended solids, the contained water will be returned to the river on a "controlled release" basis (pumped out at a known rate in conjunction with a systematic water quality sampling program). Under this scenario, the turbidity and/or TSS values recorded downstream of the release will be used to control pumping rate in order to stay within CCME guidelines. It should be pointed out that most of the sediment released from the river bed material during excavation will be allowed to re-settle on the bottom of the cofferdam, and will be covered by the concrete footings.

Increases in the pH of the contained waters may occur, and will be managed as described in Section 2.1.14. The potential for increased ammonia levels behind the cofferdams is not expected to be a concern because the structure will be formed by steel sheet piles rather than blasted rock and fill. An apron of blasted rock will be placed around each of the piers for scour control, but this material will be placed after the pier construction is complete, and after the sheet piling has been removed. However, blasted rock will be used as a base for the north detour road, the south approach extension and for protecting the bridge abutments. Samples of blasted rock from the various quarries will be tested to determine ammonia residue levels prior to their use. Also, the water quality monitoring program will include ammonia as a sampled parameter, particularly if ammonia residues are detected in the samples submitted to the laboratory. The field program will include reference and potentially affected sites; measurements will be taken with a portable meter. EBA (2004) reviewed available information on ammonia residue content in quarried rock, with reference to the proposed Deh Cho Bridge. Although they did not locate any ammonia data specific relating to quarried rock along the Mackenzie Highway system, they did quote from Millard (2003) who investigated quarried rock used for road construction at the Ekati Mine. These investigators determined that total ammonia (N) levels in runoff water were well-below the appropriate CCME guidelines. EBA (2004) did, however, recommend that a monitoring program be carried out. Although it is unlikely that there will be situations where elevated pH and ammonia will coincide, the potential for increased risk should this occur is recognized. As pointed out, ammonia becomes more toxic as pH increases (not less toxic as indicated earlier).

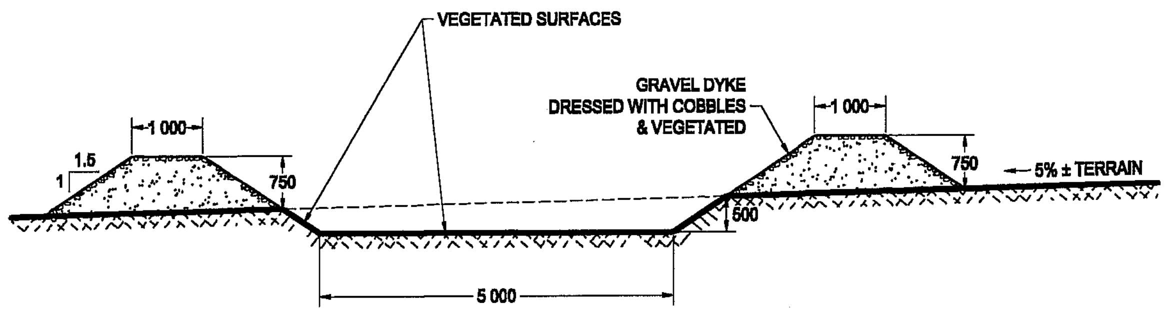
c) Alternative disposal means and locations (e.g., designated off-site areas) for water that is considered to be deleterious to aquatic life have not been identified. It is the intention of DCBC to restore the degraded water to an acceptable condition and adhere to current CCME guidelines.

Response to Mackenzie Valley Environmental Impact Review Board
<u>Information Request</u>

IR Number: **2.1.21**

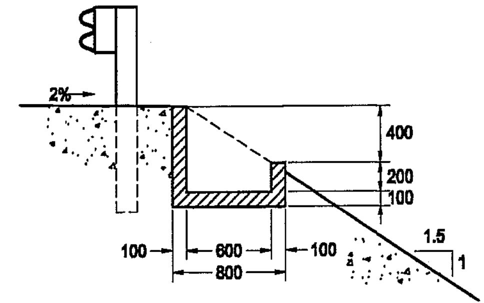
Response:

The response of this question will be forthcoming



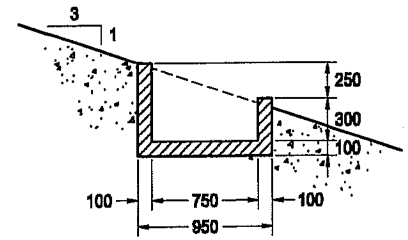
SECTION "C" - CONTAINMENT DITCH

1 : 100



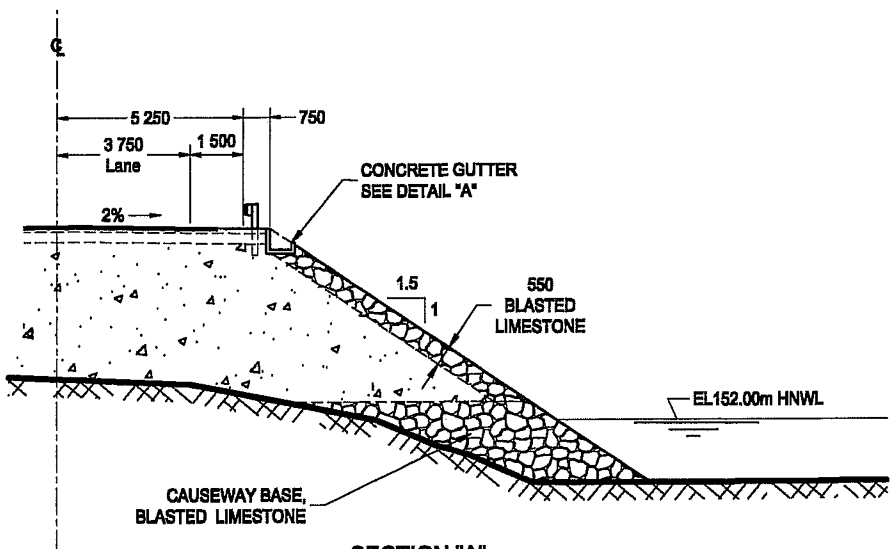
DETAIL "A"

1 : 50



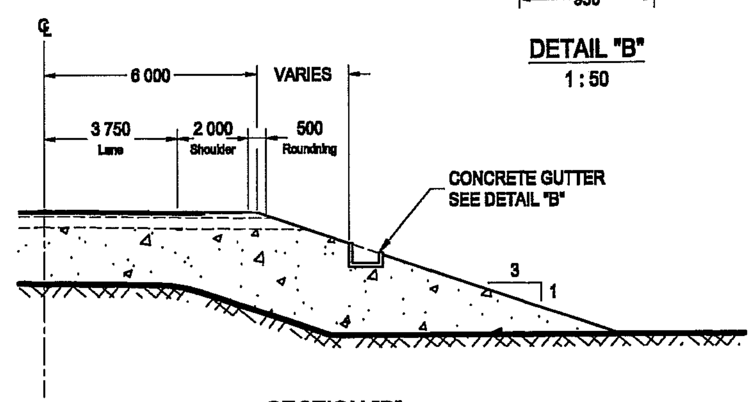
DETAIL "B"

1 : 50



SECTION "A"

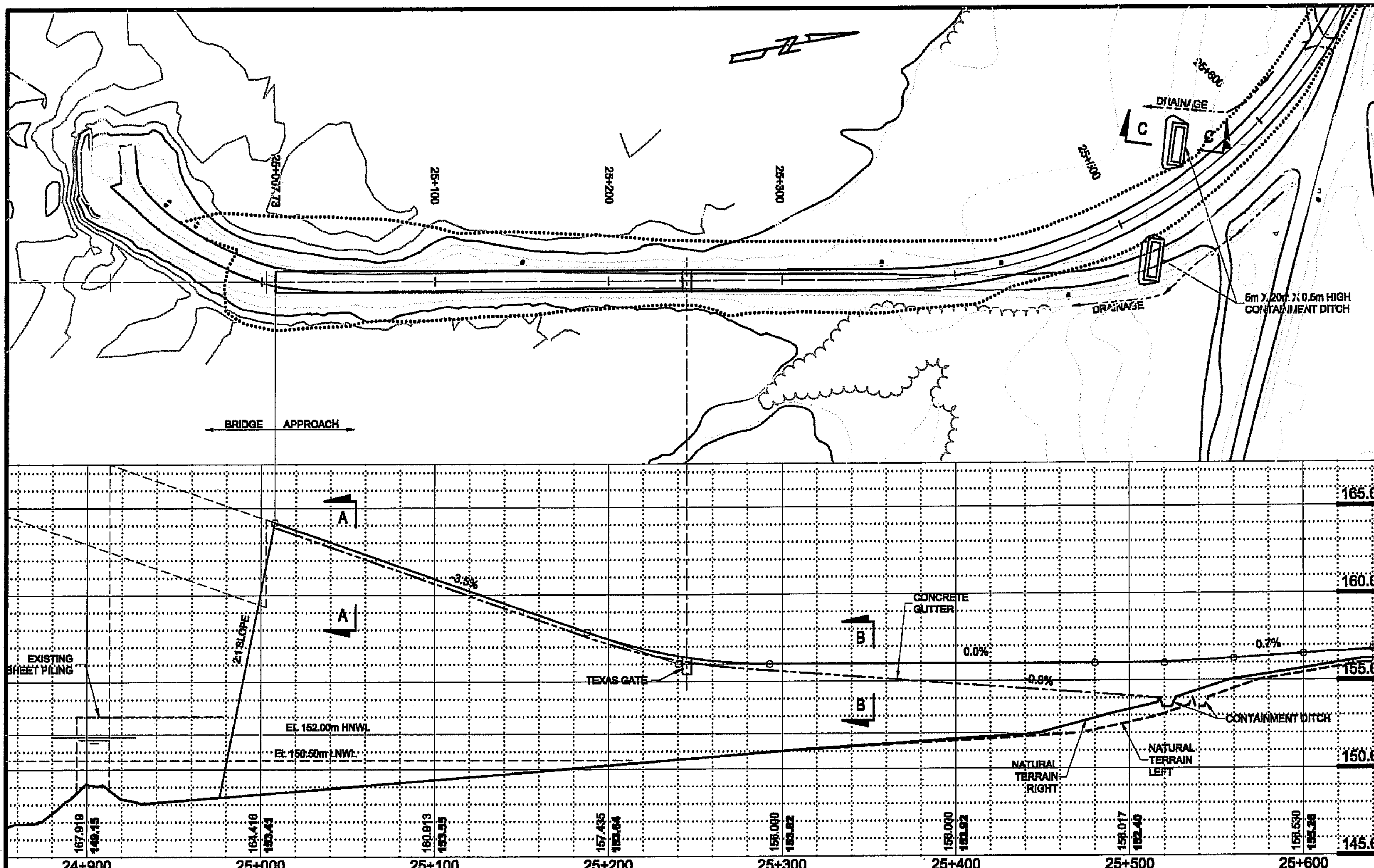
CONCRETE GUTTER ON 1.5:1 SLOPE



SECTION "B"

CONCRETE GUTTER ON 3:1 SLOPE

JIVKO ENGINEERING 5610, 50 "A" Avenue, Yellowknife, NT, X1A-1G3 Phone (867) 920-4455, Fax (867) 873-6090	Designed by: J. Jivkov		Title:	Yellowknife HWY #3, km 23 Deh Cho Bridge on Makenzie River **SURFACE DRAINAGE DETAILS**
	Drawn/Drafted by: K. Jivkov			
	Approved by:			
	Scale: 1:200	Date: Aug. 23, 2004	Project:	Drawing: Fig. 2



JIVKO ENGINEERING

5610, 50 "A" Avenue, Yellowknife, NT, X1A-1G3
Phone (867) 920-4455, Fax (867) 873-6090

Designed by:	J. Jivkov
Drawn/Drafted by:	K. Jivkov
Approved by:	
Scale: 1:3 000 Hor. 1:300 Vert.	Date: Aug. 23, 2004

Title: Yellowknife HWY #3, km 23
Deh Cho Bridge on Makenzie River

SURFACE DRAINAGE
GENERAL ARRANGEMENT - NORTH APPROACH

Project:

Drawing: Fig. 1