

**BENEFIT – COSTS ANALYSIS UPDATE**

**DEH CHO Bridge Project**

Submitted to:

**GNWT Department of Transportation**

By:

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# 1. INTRODUCTION

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## Background

The Deh Cho bridge project (the Project), proposed by the Deh Cho Bridge Corporation, is located near Fort Providence on Highway 3 and about 314 kilometres from Yellowknife. Once built, the Deh Cho bridge will replace the ferry that provides access across the river from approximately May to December and the ice bridge that provides access from approximately January to April.

The main elements of the Project are as follows:

- a total construction cost of \$155 million in \$2007 dollars, plus a \$10 million pre-funded contingency;
- a bridge construction period of three years, and a project concession period of 35 years, after which the bridge becomes owned by the GNWT;
- an annual operating cost (excluding debt servicing) of \$600,000; and
- a toll of \$6.50 per tonne (\$2007) on commercial vehicles crossing the bridge.<sup>1</sup>

## Previous Economic Studies of the Deh Cho Bridge Project

The Deh Cho Bridge Project was the subject of a Benefit-Cost analysis in 2002.<sup>2</sup> This analysis concluded that the benefits of the project outweigh its costs, making the project economically attractive. The Benefit – Cost analysis was updated in 2003 to reflect higher traffic

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<sup>1</sup> The financing plan of the project assumes no increase in tolls, except for inflation. The toll was set at \$6/tonne in 2002. Adjusting for inflation the toll is estimated at \$6.50 in \$2007 and at \$7.10 per tonne in 2011, when the bridge is expected to be open for traffic. In other words, the toll is set at \$6/tonne in \$2002. The nominal value of this toll is \$6.50 in 2007 and \$7.10 in 2011.

<sup>2</sup> Nichols Applied Management, *Benefit-Cost Analysis of the Deh Cho Bridge*, prepared for the Department of Transportation, Government of the Northwest Territories, September, 2002.

forecasts than were originally assumed.<sup>3</sup> This increase in traffic volumes is influenced, among other factors, by:

- updated information on mining construction and operations along the Tibbit to Contwoyto Winer Road; and
- inclusion of a small impact of pipeline activities in the Mackenzie Valley on traffic on Highway 3.

The 2003 update further strengthened the conclusion in the original benefit-cost analysis that the project is economically viable.

### **Material Changes to the Capital Costs**

The original capital cost estimate of the Project was \$55 million in 2003 dollars. Since then the cost of the Project has escalated to \$165 million, plus a pre-funded contingency of \$10 million (all in 2007 dollars).

### **Scope of the 2007 Update**

This update provides a mostly order-of-magnitude assessment of the impact of the changes in the capital costs on the findings of the Benefit/Cost analyses. It will also discuss the attribution of the benefits and the costs among different stakeholders and sectors.

The document was prepared by Nichols Applied Management, an Edmonton-based management and economics consulting firm that prepared the original Benefit/Costs analysis of 2002 and the 2003 Update.

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<sup>3</sup> Nichols Applied Management, *Update, Benefit-Cost Analysis of the Deh Cho Bridge*, prepared for the Department of Transportation, Government of the Northwest Territories, February 2003.

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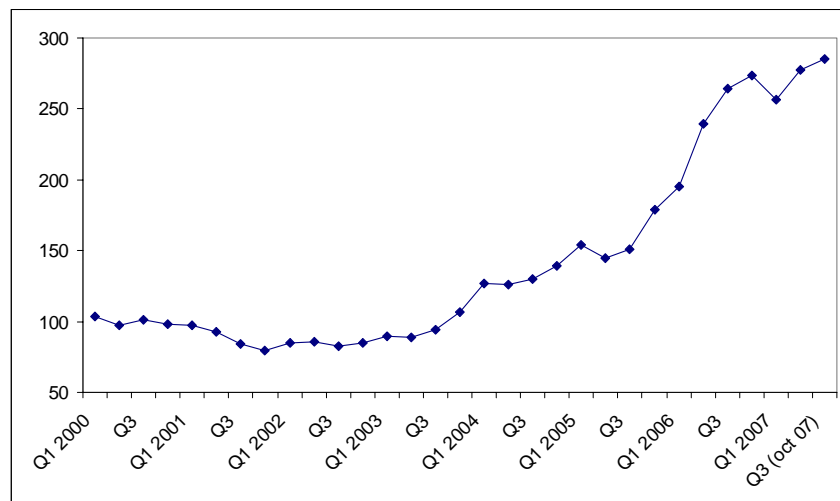
## 2. COST ESCALATION AND BENEFIT/COSTS ANALYSIS

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The key reason to revisit the results of the original and updated Benefit/Cost analyses is the increase in construction capital costs from \$55 million in 2003 dollars to \$165 million in 2007 dollars.

This escalation reflects general cost inflation in the NWT and Canadian economy, especially in the area of large scale infrastructure and industrial projects. As an illustration, Figure 1 shows the price inflation in the metals markets. It shows that metal prices have increased 2.7 times since 2000 and that most of this increase has occurred since 2003, when the original Project cost estimates were made.

**Figure 1.1 Metals Index (2000=100)**



Source: Economist, various issues

Table 2.1 presents the approximate impact of the capital costs increase on the key benefit-cost analysis results. Because both the costs and especially the benefits occur over time, the costs and benefits are shown on a net present value basis, calculated using a 5% real discount rate.

**Table 2.1 Comparison of Key Benefit-Cost Analysis Results**

	<b>2003 Update (\$2003)</b>	<b>2007 Update (\$2007)</b>
Construction Capital Costs (\$ million)	55	155
Internal Rate of Return	8.5%	3.2%
Total Costs (NPV 5%) (\$ million)	59.4	160.6
Total Benefits (NPV 5%) (\$ million)	98.0	110.5
Net Benefit (NPV 5%) (\$ million)	38.6	(50.1)

Notes:

- 1 Cost increases as per new capital cost estimate for Project construction, Increases in benefits assumed to on par with general price increases over the 2003 to 2007 period, which were 9% over the period
- 2 Results do not reflect any changes in traffic volumes or traffic volume forecasts between 2003 and 2007.

The information in the table shows the following:

- inflation in the costs has outstripped the inflation-related increase in the benefits;
- the internal rate of return, which is the discount rate at which the net present value of the costs and the benefits are equal has fallen from 8.5% in 2003 to 3.2% in 2007;
- the net benefits (using a real discount rate of 5%) have fallen from \$38.6 million in 2003 to minus \$50.1 million in 2007.

The substantially higher level of inflation in the Project cost as compared to the benefits has reduced the IRR to a level that is low relative to 5% that is often deemed acceptable for many Canadian public sector projects. Generally, higher construction costs and lower traffic volumes in the NWT contribute to lower IRRs of projects as compared to the rest of Canada.

The low IRR or the negative net benefits (using a 5% real discount rate) do not address who gains or who pays for the Project. The allocation of costs and benefits among different stakeholders is discussed in the next section.

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### 3. COST ESCALATION AND FINANCIAL IMPACT ANALYSIS

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As originally conceived, the cost of the Project was to be borne mostly by the Government of the Northwest Territories (GNWT) and commercial users of the bridge. The contribution of the GNWT includes the monies otherwise spent on operating the ferry and the contribution of commercial users was captured by means of a toll, set at \$6 per tonne (in \$2003). The estimated inflation-adjusted toll is \$6.50 per tonne (in \$2007).<sup>4</sup>

The \$165 million construction costs requires an additional \$2.0 million per year from the GNWT to make the bridge financially viable. This represents approximately 0.17% of the annual expenditure of the GNWT.<sup>5</sup> No increase in the toll is being considered other than inflation, indicating the GNWT absorbs the total financial impact of the bridge costs escalation.

Table 3.1 provides both estimated transportation and other business benefits for the first year of bridge operations. In the 2003 Update, the first year of operation was assumed to be 2006. The 2007 Update assumes the first year of operations to be in 2011.

**Table 3.1 Transportation and Business Benefit, First Year of Bridge Operations**

	2003 Update (\$2003)	2007 Update (\$2007)
	(\$/tonne)	
Community Re-Supply	7.17	7.88
Mine Supply Ice Bridge	2.18	2.39

Notes:

- 1 Benefits pertain to the first year of operation.
- 2 2003 Update assumed the first year of operations to be 2006. The 2007 Update assumed the first year of operations to be 2011.
- 3 Increases in benefits assumed to be on par with general price increases over the 2003 to 2007 period, which were 9% over the period
- 4 Results do not reflect any changes in traffic volumes or traffic volume forecasts between 2003 and 2007.

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<sup>4</sup> The nominal value of the toll when the bridge opens in 2011 is expected to be \$7.10 per tonne (in \$2011).

<sup>5</sup> Based on a total estimated GNWT expenditure of 1.15 billion for the 2007/08 fiscal year. GNWT. 2007 – 2008 Main Estimates Volume 1

The information in the table shows that the community re-supply benefits are estimated to total \$7.88 per tonne (in \$2007). In line with the results of previous studies, this benefit exceeds the \$6.50 toll (in \$2007) that will be levied against the community re-supply tonnage. It follows that a net benefit of \$1.38 per tonne (in \$2007) accrues to business, mostly in Yellowknife and, ultimately, to consumers there.

The information in the table also shows that the benefit per tonne of mine re-supply is estimated at \$2.39 (in \$2007). The Project benefit to the re-supply of the mines is lower than the benefit for the community re-supply because most of the mine re-supply takes place now when the ice bridge is operational. Transportation costs are lower when the ice bridge is in than when the ferry is in operation.

The mine re-supply benefit is lower than the \$6.50 per tonne toll (in \$2007), indicating that the mines will be net contributors to the cost of the bridge. This observation was true in the \$60 million Project originally conceived and holds for the current \$155 million Project.



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## 4. CONCLUSION

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The escalation of the construction capital costs of the Deh Cho Bridge projects from \$55 million in 2003 dollars to \$155million in 2007 dollars has reduces the internal rate of return of the project from 8.5% to 3.2%. At 3.2% the IRR, which is the discount rate that equalizes the stream of costs and benefits, is low relative to what is often deemed appropriate for public sector projects. Generally, higher construction costs and lower traffic volumes in the NWT contribute to lower IRRs of projects as compared to the rest of Canada.

The financial burden of the cost increase is borne by the GNWT by means of an additional annual \$2.0 million contribution to the Bridge Corporation. The additional GNWT contribution does not affect the other elements of the financial plan for the Project, which includes:

- a net contribution by the mines, as the mine re-supply benefit is less than the \$6.50 per tonne toll (in \$2007) on commercial traffic;
- a net gain by business and ultimately people in Yellowknife, as the community re-supply benefit is larger than the \$6.50 per tonne toll (in \$ 2007) on commercial traffic; and
- a net gain for all non-commercial traffic, as the Project reduces travel time and costs without any additional financial burden.

Assuming that all community re-supply savings are passed on to consumers, the distributional effect of the bridge is expected to lower the cost-of-living in Yellowknife marginally. The capital cost inflation of the project does not affect this conclusion as it doesn't affect the toll charged for the bridge's use.

The relatively low economic return of the project and the distributional effect of the toll system can be seen in the context of the following not quantified benefits, defined by the Department of Transportation:

- reduced energy consumption and greenhouse gas emissions due to the elimination of the diesel-powered ferry and idling vehicles waiting to cross the river;

- reduced risk of fuel spills in a fragile ecosystem;
- reduced impacts that will result from climate change;
- improved relations between businesses and residents due to improved service and lower transportation costs;
- reduced sense of isolation due to improved connections with the region and to southern Canada, especially during freeze up and break up;
- improved access to government services and employment opportunities; and
- increased opportunities for Aboriginal training, employment, business development and equity investment.

The Deh Cho Bridge project supports the Department of Transportation's twin objectives of creating opportunities for economic development and connecting communities.