The Golden Ears Bridge

Greater Vancouver Transportation Authority

Golden Ears Bridge

Reference Case Report

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NOTE: This Report must be read in conjunction with the Reference Case Supplementary Information as provided in the following section.

Golden Ears Bridge Reference Case Report

November 4, 2005

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Executive Summary

This report presents the compilation of data for and calculation of the Net Present Value of estimated Reference Case construction and operating period costs and revenues for the Golden Ears Bridge Project. It documents, in particular:

- The compilation and calculation of the Raw NPV and the risk-adjusted NPV
- The project's material risks, both quantifiable and unquantifiable
- The methodology for the quantification of project risks, and
- The results of the financial analysis.

The purpose of the Reference Case is to provide a benchmark against which TransLink can compare private sector proposals, and to assist in assessing whether project delivery by the private sector represents value-for-money.

The Reference Case estimates the risk-adjusted, total cost if the project were to be financed, owned and implemented by TransLink. The costs reflect an efficient and most likely and achievable form and means of delivery by the public sector (TransLink) and a payment mechanism and risk allocation appropriately reflecting the Reference Case scenario.

The following table shows the Raw NPV and the risk-adjusted NPV values expressed at the 50th, the 70th and the 90th Percentile confidence levels.

Reference Case NPV [CAD$M]			
Raw (Non Risk-Adjusted)	**50th Percentile**	**70th Percentile**	**90th Percentile**
$287	$197	$177	$143

1. Report Objectives

A. Purpose of Reference Case Report

The purpose of the Reference Case is to provide a tool for determining whether the preferred design-build-finance-operate (DBFO) proposal represents value-for-money to TransLink and its stakeholders. The issue of value-for-money is to be considered in the context of the decision to either accept or reject the DBFO proposal. The information developed in the Reference Case will also be used in the conduct of due diligence on, and test for reasonableness of, the financial offers and financial models submitted by the Proponents.

Specifically, this report sets out to:

1) Establish the nature of delivery of all components of the project,

2) Estimate the costs of delivering the project and its associated services,

3) Estimate the revenue forecast impacts resulting from the Reference Case,

4) Identify and quantify key risks, and show the expected risk allocation, and

5) Determine the Net Present Value of all project cash flows (including risks) over the 35 year project term,

in order to accurately reflect the above in the event that the TransLink Board chooses to reject the DBFO procurement model and proceed with a more traditional capital project procurement model.

B. Summary of Ensuing Sections

This report presents the Reference Case and documents the approach and assumptions in nine subsequent sections:

Section 2: Project Overview

Section 3: Reference Case Development

Section 4: Delivery Model

Section 5: Reference Case – Construction Period Costs

Section 6: Reference Case – Operating Period Costs

Section 7: Project Financing

Section 8: Reference Case Raw NPV (non-risk-adjusted)

Section 9: Risk Valuation

Section 10: Sensitivity Analysis

Section 11: Valuation Terms of the Reference Case

Section 12: Adjustments to the Reference Case

2. Project Overview

A. Project Description

TransLink is currently undertaking a process to select a DBFO Contractor to effect the completion of a six-lane bridge over the Fraser River. Located approximately 45 kilometers east of the City of Vancouver, the project also includes a number of controlled access arterial roads connecting the bridge to the existing road network on both sides of the Fraser River, and municipal road upgrades to improve traffic flows and facilitate the integration of the new crossing into the existing road network.

Referred to as the Golden Ears Bridge (GEB) Project, this facility will connect the north side communities of Pitt Meadows and Maple Ridge with Langley and Surrey on the south side and will provide an alternative fixed crossing of the Fraser River to the Pitt River/Port Mann and Mission Bridges. The Albion Ferry crossing service, operated by the Fraser River Marine Transportation Ltd., a subsidiary of TransLink, currently provides the only direct link between Langley and Maple Ridge. Upon completion of the new bridge facility, the Albion Ferry crossing service will be discontinued.

The project's general location and extent is shown in Figure 1. Consisting of approximately 40 lane-km of grade-supported roadway and 20 lane-km of roadway on bridge structures, the GEB Project is a significant component of the TransLink's Three Year Plan and Ten Year Outlook. It supports the regional growth strategy, air quality and economic development objectives of the Greater Vancouver Regional District (GVRD)'s Livable Region Strategic Plan.

The GEB Project is expected meet the following objectives and service needs:

- Reduce travel times and traffic congestion for commuters and goods movement
- Promote residential and industrial development
- Improve accessibility to and from residential and industrial developments
- Minimize impacts on green space and agricultural land
- Improve transit connections across the Fraser River
- Link existing pedestrian and cycling networks
- Connect Highways 1, 7 and 15

B. Brief History of the Project to Date

A new crossing of the Fraser River has for many years been part of the long-term plans of the Greater Vancouver Regional District (GVRD) and the Province. With the creation of TransLink in 1998, the new crossing project fell within TransLink's mandate to plan and finance the regional transportation system. In September 2000, the TransLink Board endorsed in principle the development of a tolled high-capacity crossing of the Fraser River in the 200th Street corridor. The Board directed staff to confirm the feasibility and desirability of such a crossing and to bring forward recommendations on the optimal configuration, required road network improvements and financing and development strategy.

In May 2002, TransLink presented to its Board the findings of the initial consultation, traffic, financial and technical analyses supporting the feasibility and desirability of the GEB Project. The Board authorized the establishment of a project team and approved the expenditures necessary to proceed with developing the project specifications and commencing the procurement process. The Board further directed that the project be undertaken at no net cost to TransLink. The user tolls must, therefore, be sufficient to cover all project costs.

Following the exploration of a number of delivery models, in October 2003 the Board approved a business model whereby a new wholly owned subsidiary of TransLink would be responsible for entering into a Design-Build-Operate contract with a selected contractor.

A subsequent study commissioned in spring 2004 to review the business model decision raised concerns about the risk exposure to TransLink in the approved model. Consequently, in October 2004 TransLink staff recommended, and the Board approved, the following alternative business model for the GEB Project:

- The GEB Project will use a DBFO delivery model for the design, construction, financing, operation, maintenance and rehabilitation (OMR) of the GEB Facility, excepting Owner's Costs.

- TransLink will be responsible for the direct financing of Owner's Costs, including property acquisition, project development and third party commitments.

- TransLink will enter into a separate design-build-operate-maintain (DBOM) contract with a tolling equipment and system supplier.

- The toll rates and structure will be set by TransLink by By-Law, and TransLink will receive all net revenues.

- The DBFO contractor will be paid directly by TransLink and the costs will be recovered through toll revenues and the Albion Ferry subsidy.

The design, construction, financing and OMR of the GEB Facility will be contracted to a single private contractor over a term anticipated to be approximately 35-year period (assuming approximately 3 years to substantial completion followed by the fixed 32-year operations period). The approved contract term was determined through a financial feasibility analysis. Based on projected cash flows, including initial capital costs, OMR costs, toll revenues, Albion Ferry subsidy, and costs of financing, the Project is anticipated to achieve full cost recovery over 35 years. This 35-year term begins in 2006 and terminates in 2040.

As TransLink is responsible for the planning and preliminary engineering of the project, environmental certification, property acquisition and the procurement process and negotiation of a DBFO agreement, the GEB Project is under the direction of TransLink. The Project Team is led by TransLink staff and includes technical and financial advisors.

A Request for Qualifications stage was completed with three proponent teams short-listed to proceed to the Request for Proposals (RFP) stage, and to submit proposals for the DBFO components of the Project Facility. The key recent and future procurement milestones are as follows:

- The RFP was released in January 2005.

- One of the proponent teams resigned from the competition in February 2005.

- Binding technical proposals were submitted on September 13, 2005.

- A technical completeness review, evaluation review and due diligence was completed on October 19, 2005.

- Both proponents were advised on October 21, 2005 of a change in the RFP process, requiring that they both include TransLink's conceptual design of the Lougheed

Highway Interchange in their Financial Submission; Financial Submission deadline was extended by one week.

- Notification of technical compliance was delivered on October 21, 2005.
- Binding financial offers are due November 4, 2005.
- A financial completeness review, evaluation review and due diligence will be carried out between November 4 and November 21, 2005.
- The announcement of the Preferred Proponent is scheduled for December 7, 2005.
- Commercial Close is targeted for February 1, 2006.

3. Reference Case Development

A. Definition

The Reference Case provides a hypothetical, risk-adjusted estimate of the cost of procuring the GEB project using traditional, or recently used public sector procurement and financing methods, assuming a level of management responsibility and allocation of risks that are typical under such methods. The chosen delivery model and the rationale for this choice are detailed in Section 4(B).

The Reference Case takes into account:

- all of the assets, services, staff, consumables and other elements required for the public sector to deliver the project
- all costs and revenues associated with the project,
- potential efficiencies that may be available to the public sector, and
- an appropriate allowance for risk.

Due to the inherent uncertainty in modeling costs over a 35-year horizon, the Reference Case considers the distribution of the net cost to reflect the potential range of values for the Project NPV.

B. Framework

The Reference Case has been prepared under the following guidelines:

- It is prepared on the basis of meeting the same required level of performance or output that the private sector is required to deliver under the RFP to the extent possible;
- It provides a like-to-like comparison to the DBFO in terms of the standards, specifications and project term,
- It reflects a delivery and management structure that is capable of being implemented by TransLink; and
- It reflects the most-likely procurement that would be used in delivering the GEB Project under a non-DBFO scenario, including reasonable efficiencies and innovative methods to the extent that can currently be expected in implementing traditional DB and DBB construction contracts. The Reference Case does not assume efficiencies or innovative design or construction methods that are typically delivered only by the private sector under a DBFO.

The Reference Case does not address affordability. It is assumed that the question of affordability has already been satisfactorily addressed during the process up to and including the review of GEB Project business models culminating in the Board's decision to proceed with the project.

This report follows the principles in the May 2003 Industry Canada Document "The Public Sector Comparator – a Canadian Practices Guide" and is considered to reflect current best practice. Section 3.0 of this report, "Best Practices of the PSC" is attached in Appendix A.

In addition, technical guidance was gained from principles applied in developing similar comparators from recently awarded P3 projects in B.C. (e.g. Sea-to-Sky Highway and the

RAV Project). Project consultants experienced with Canada-based P3 projects were instrumental in the development of the Reference Case. In particular, KPMG provided their guidance and expertise throughout the process. The Partnerships Victoria (Australia) Public Sector Comparator Technical Note was also referenced to provide guidance on this report.

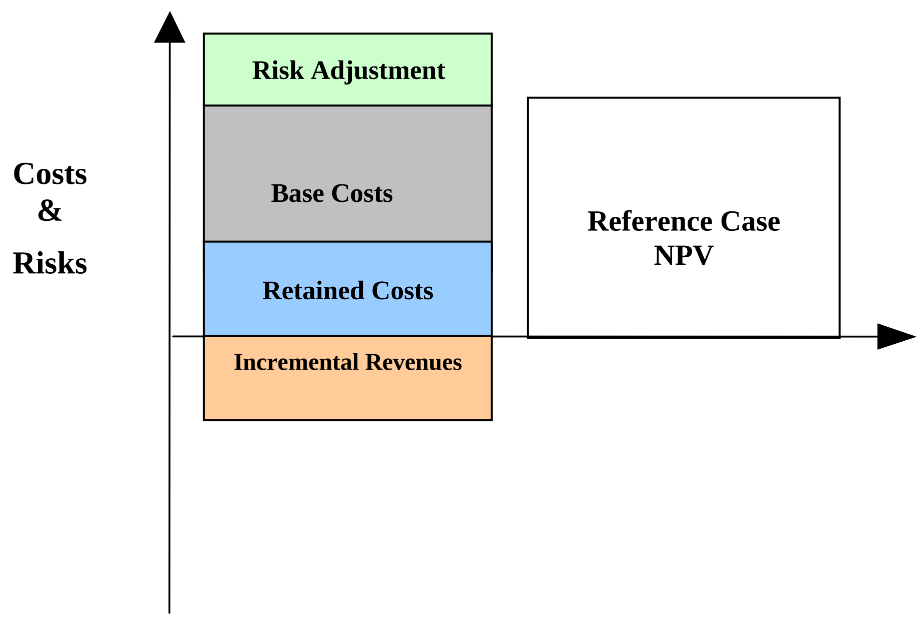
C. Valuation

The cost of the Reference Case is presented as the net present value of the cash flow forecasts over the project term, including:

- Estimate of project Base Costs before consideration of risk
- Estimate of (TransLink -) retained costs
- Estimate of Incremental Revenues generated by the project
- Estimate of Risk Adjustment

These elements are shown together in Figure 3.1 and described below.

Figure 3.1: Components of a Generic Reference Case NPV (Note that relative costs and revenues as shown are NOT representative of the GEB Reference Case)



Base Costs

The Project Base Costs are all the costs that can be reasonably quantified and that are likely to be materially different between the Reference Case and the DBFO proposals.

Retained Costs

The (TransLink) retained costs are for work paid and directly administered by TransLink, not through the services of a contractor. These costs can be divided into fixed costs and contract-related costs.

Incremental Revenues

The incremental revenues are the positive cashflows expected through user paid tolls and the redirected Albion Ferry subsidy.

Risk Adjustment

The Reference Case quantifies, to the extent possible, the risks that are transferred to the DBFO Contractor. The Risk Adjustment is, therefore, the sum of the financial risks that:

- TransLink would incur under the Reference Case,
- that can be reasonably quantified and
- that are likely to be materially different between the Reference Case and the DBFO proposals.

The risks that are retained by TransLink under both the Reference Case and the DBFO proposals are not quantified for the Reference Case. It is assumed that the DBFO proposals are based on the same scope of retained risk as the Reference Case so the retained risk cost will be constant under either procurement model.

Table 3.1 below provides a framework for comparing the DBFO proposals and the Reference Case.

Table 3.1 Cost and Revenue Items Included in Reference Case NPV and the DBFO Model equivalents

Costs to TransLink	**Cost/Revenue Items**		
	DBFO Proposals	**Reference Case**	**Report Section**
Base Costs	In Financial Offer	• Construction Period Costs • Operating Period Costs	5B,C 6B,C
Retained Costs – fixed	• Property acquisition • First Nations • Environmental Agreements • Municipality Agreements • Sunk Costs (Project Development costs incurred up to Dec. 2005 • DBFO Honorarium	• Property acquisition • First Nations • Environmental Agreements • Municipality Agreements • Sunk Costs (Project Development costs incurred up to Dec. 2005 • DBFO Honorarium	5A, 6A
Retained Costs – contract related	• TransLink project management	• TransLink project management • Design Fees • Resident Engineering • Honorarium Payments • Bonding & Insurance (Construction	5A, 6A

Costs to TransLink	Cost/Revenue Items		
	DBFO Proposals	Reference Case	Report Section
		Period)	
Incremental Revenues	Tolling Revenue Albion Ferry Subsidy	Tolling Revenue Albion Ferry Subsidy	6E
Risk Adjustment	In Financial Offer	• Construction Period Risks • Operating Period Risks • Global Risks	9A-F

Note 1: Fixed costs common to both the DBFO and the Reference Case scenarios but not included in either are:

- Operating period insurance – see discussion in Section 4A.

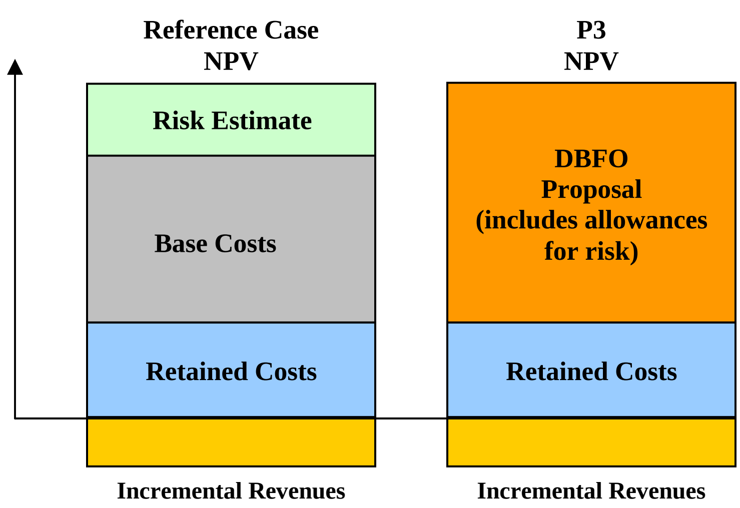
- OMR costs for non-TransLink assets. Some of the constructed roads will be handed over to the municipalities and become part of the Major Road Network and eligible for cost sharing.

D. Application - Value for Money

The purpose of the Reference Case is to provide a benchmark against which TransLink can compare private sector proposals, and to assist in assessing whether project delivery by the private sector represents value for money.

Figure 3.2 illustrates such a comparison assuming that the private sector proposal costs come in at exactly the level of the NPV after allowing for proponents' assessment of risk and efficiencies.

Figure 3.2 Comparison of Reference Case NPV with Public Private Partnership (P3) NPV



E. Limitations

The Reference Case seeks to provide a means for a financial comparison only. It does not consider the following in its quantification of the Reference Case NPV:

- Socio-economic impacts such as transportation benefits, job creation, land use shaping, qualitative benefits of having the Facility open for use during the Winter 2010 Olympics, etc.
- Any differences in service delivery which cannot be quantified and adjusted for
- The likely sustainability of service delivery
- Business "fit"
- The credit standing and proven reputation of TransLink in delivering large scale public infrastructure projects
- TransLink policy objectives
- The residual value of assets and toll revenues at the end of the contract period (the residual values for the Reference Case and the preferred DBFO proposal are assumed to be identical)
- The potential impacts due to the one-year delay in procuring the tolling system contract (i.e. competition arising due to other tolling projects underway in B.C. in 2006, loss of confidence in/credibility of TransLink by tolling contract bidders)
- Total Project Costs and Total Project Risks (required for assessing affordability but not required for the Reference Case)
- The non-quantifiable costs of opportunities that may have been lost due to time spent and resources used in the DBFO procurement to date

It should be noted that the value for money assessment should consider the above relevant qualitative factors in addition to the Reference Case quantitative results.

F. Reference Case Development Team

The Reference Case was developed under the management of the GEB Project Team and included TransLink staff, consultants, and technical and management accountant advisors.

The Reference Case Development Team included representatives from the following organizations:

- GEB Project
- TransLink
  - Engineering & Project Services
  - Roads and Bridges
  - Finance
- KPMG (Toronto and Vancouver)
- Collings Johnston Inc.
- Associated Engineering (B.C.) Ltd.
- Infrastructure Financial Advisory Services Ltd.
- Toronto Dominion Securities (TDSI)

4. Delivery Model

A. Scope of Project

As mentioned previously, to provide a true value for money comparison the Reference Case must deliver the GEB project to the same standards and performance levels as required of the private sector under the current RFP. The Reference Case is prepared on these terms. The overall scope of work considered for the Reference Case is therefore identical, to the extent possible, to that required under the DBFO model.

The scope of work has the following components:

- TransLink Retained Obligations
- Civil Works – Design and Construction
- Tolling - Infrastructure and Operation
- TransLink Assets – Operations, Maintenance and Rehabilitation (OMR)

<u>TransLink Retained Obligations</u>

As the ultimate owner of the GEB Project facility, TransLink retains the following responsibilities and therefore incurs the costs directly for:

- *Procurement and Construction Period Project Management and Monitoring* – TransLink staff and resources required to develop the project, procure the contracts to carry out the work, and manage the construction contracts
- *Property Acquisition* – the purchase of property and the compensation for local business losses
- *Municipality Agreements* – the compensation for construction of the Airport Connector and 96th Avenue
- *200th Street Interchange* – the compensation to BC MoT for improvements to the interchange to accommodate six lanes
- *Katzie Benefitting Agreement* – agreed compensation for project impacts on local native band
- *Unnamed Creek Compensation* – agreed compensation for impact to local waterway
- *Fraser River Port Authority Lease* – a yearly compensation to the port authority for the duration of the project term
- *Honorarium* – compensation to be paid to losing proponent to offset some of their proposal costs
- *Operations Period Project Management and Monitoring* – TransLink staff and resources required to administer the O&M contracts, specialist and legal consulting work, condition surveys and inspections
- *Operations Miscellaneous costs* – for electric power, electric maintenance, line repainting and radio and telecommunications systems

- *Operating Period Insurance* - Under the current RFP process, the DBFO contractor would need to obtain All Risks Property Insurance (insurable value capped at $300 Million) insurance coverage during the Operating Period of the GEB project. Under a Reference Case Scenario, TransLink would likely not obtain a separate All Risks Property Insurance for GEB to the full insurable value. Instead, TransLink would add the GEB asset to its insurance for existing assets, and which are not insured individually. As the DBFO proposals will not include costs for OMR insurance, the Reference Case will likewise exclude any costs for insurance coverages during the operating period.

Civil Works – Design and Construction

The civil works consist of the design and construction of a six-lane bridge across the Fraser River, controlled access arterial roads and municipal road upgrades. RFP Document "Volume One – Main document" provides the detailed scope of the civil works. Section 2.3 of this document provides a summary of the overall facility and is provided in Appendix B.

Some of the constructed assets will be turned over to the municipalities for ongoing operation, maintenance and rehabilitation (Municipal Handover Facilities). Other assets will, once constructed, be turned over to the BC MoT for ongoing operation, maintenance and rehabilitation (Provincial Handover Facilities). Similarly, new water main and sewer crossings under the GEB will be turned over to the GVRD for ongoing operation, maintenance and rehabilitation (GVRD Handover Facilities) The remaining assets, referred to as TransLink Assets, will be owned, operated, maintained and rehabilitated by TransLink. Further details on which of the constructed assets will become TransLink assets are provided in the RFP document "Volume Three – Technical Documents, Document 3-1, Facility Description".

For both the Reference Case and the DBFO scenarios, some of the tolling related infrastructure, including an Intelligent Transportation Systems (ITS) communications facility and the gantries upon which the tolling cameras will be mounted, is to be designed and constructed by the civil contractor(s) as identified in Document 3-4: Road Design Requirements, Section 3.10.

Tolling - Infrastructure and Operation

The toll system requirements have been derived from the Toll Rate Regulatory Framework as introduced July 7, 2004 (The Tolling Bylaw has since been approved by the GVRD in July 2005), the results of stakeholder consultation and the traffic forecasts from the Steer Davies Gleave report dated May 13, 2004. The Golden Ears Bridge shall utilize a point based tolling at a single location on the bridge only. The toll system will provide free flow open lane tolling and will be fully electronic and automatic without manual or cash lanes. The broad scope of work required to establish and maintain the tolling system includes:

- Design and installation of lane devices, tolling cameras, vehicle identification and classification systems and a system that electronically records the vehicle types and license plate numbers.

- The ongoing operation and maintenance of the tolling system over the project term. This includes the operations and maintenance of the gantries and ITS/communications system, i.e. the tolling facilities constructed by the civil works contractor

Tolling facilities and services for the GEB Project are currently covered under an agreement between a Tolling Operator and TransLink separate from the DBFO contract. A Tolling Operator will not be selected until after the other DBFO Agreements have been executed. As the Tolling Contract RFP is in development and not due for release until early 2006, the details of the operational and performance requirements of the Tolling System are not available.

For the Reference Case, it is assumed that the procurement procedure for establishing a contract with a Tolling Operator and the technical specifications for the Tolling System will remain unchanged from the current (DBFO) model.

TransLink Assets – Operations, Maintenance and Rehabilitation (OMR)

The following aspects of work are included in the OMR of the TransLink Assets:

- Periodic Inspections,
- Operations and Maintenance, and
- Rehabilitation

for each of the following components of the facility:

- Roads
- Structures, and
- Electrical

To ensure that Reference Case costs can be fairly compared with the private sector proposals, it has been assumed that the same road operation, maintenance and rehabilitation standards apply for the Reference Case as for the DBFO scenario (i.e. BC MoT road/highway standards).

B. Number & Types of Contracts

Civil Works – Construction

A number of Reference Case Delivery Models were considered for the construction of the civil works. Six delivery options, including advantages and disadvantages of each, are summarized in Appendix C. A list of the known, large-sized (greater than $10M), road or road-and-bridge projects awarded in British Columbia up to August 2005 is also provided in Appendix C. This was relevant for determining the maximum contract size that road and bridge contractors are typically able to pursue locally.

Considering the timing requirements, the potential economies of scale, and the logical combination of work packages, the Delivery Model was determined to be two Design-Bid-Build (DBB) contracts and three Design-Build (DB) contracts. The type of contract chosen for each section is based on the complexity and type of construction work, and potential opportunities for innovation and scheduling improvements. Sections dominated by or with significant structural and utility works have been designated for design-build (DB). Sections with traditional civil infrastructure content, similar to municipal road projects, have been designated for design-bid-build (DBB).

For the purposes of this report the construction contracts will be referred to as Contracts 1 through 5 as follows:

- Contract 1 – DBB – South Shore Municipal Facilities
- Contract 2 – DB – 176 St to Telegraph Trail

- Contract 3 – DB – Fraser River Crossing and 113B Interchange
- Contract 4 – DB – Lougheed Interchange
- Contract 5 – DBB – Abernethy Connector

Option 3 in Appendix C represents the general nature of the Reference Case delivery model. A more detailed explanation of this Delivery Model and the geographical extent of each of the above five contracts is presented in Appendix D.

Tolling - Infrastructure and Operation

Under the current (DBFO) procurement model for the civil works of the GEB Project, an RFP for the construction of the Tolling System and operation and maintenance of the System throughout the Operations Period is in preparation and will be issued in early 2006 to selected qualified bidders. The tolling contract will be in the form of a Design, Build, Operate and Maintain (DBOM) agreement.

For the Reference Case, the nature of the tolling contract is expected to be unchanged from the current (DBOM) model. A comparison between the DBFO model and the Reference Case in terms of the key aspects of the tolling system revenue model and the infrastructure requirements reflects this assumption and is provided in Appendix E.

TransLink Assets – Operations, Maintenance and Rehabilitation

A number of procurement options for the Operations, Maintenance and Rehabilitation of the TransLink Assets were explored. These are summarized, including the advantages and disadvantages of each, in Appendix F. The TransLink Roads and Bridges team carefully studied each option and recommended Option 1A for the Reference Case, whereby Translink administers directly the O&M contracts it engages in with private contractors. It is anticipated that the O&M contracts will have duration of 5 years initially, with contracts renewed or new contracts awarded of the same or longer duration beyond this time.

Rehabilitation works are required less frequently and often require a specialist contractor to carry out the work. These works will be procured when needed as determined by regular inspections and condition surveys, consistent with TransLink practice for rehabilitation for existing bridge assets.

C. Schedule

The Reference Case timing is developed based upon a December 2005 Board decision not to proceed with a DBFO procurement model. Assuming the Board adopts the Reference Case at the same meeting, the procurement process according to the Reference Case delivery model outlined in Section 4B would be initiated beginning in January 2006 with an in service date of June 2010. Due to the need to re-initiate a new procurement process, the overall construction schedule is impacted by a one-year delay.

Table 4.1 summarizes the procurement and construction schedule for the civil works.

The critical timeline is that of Contract 3, the Fraser River Crossing. This task is expected to take a total of 4.5 years from the start of the Reference Case Procurement on January 2006. The construction of the new facility is scheduled to be completed in stages, with Contracts 4 and 5 to the north of the bridge crossing scheduled for completion on October 2009 and December 2009 respectively. However, the opening of the entire facility to traffic will be synchronous with the Contract 3 completion date of June 30, 2010. Further comments on the rationale for this schedule are provided in Appendix D.

Table 4.1 Golden Ears Bridge Reference Case - Procurement and Construction Schedule Summary

Contract / Task	DBB Contract 1 South Shore Municipal Facilities	DB Contract 2 176 to Telegraph	DB Contract 3 Fraser River Crossing	DB Contract 4 113B to Lougheed	DBB Contract 5 Abernathy Connector
Reference Case Start	**January 2006**				
DBB Design	Feb 07–Feb 08 1 yr				Nov 07–Jun 08 8 mos
DBB Procurement	Dec 07-May 08 6 mos				Apr 08-Oct 08 6 mos
DBB Construction	Jun 08-Jun 10 2 yrs 1 mo				Oct 08-Dec 09 1 yr 3 mos
DB EOI		Jan 07-Mar 07 3 mos	Jan 06-Mar 06 3 mos	Apr 06-June 06 3 mos	
DB Procurement		Apr 07-Dec 07 9 mos	Mar 06-Dec 06 9 mos	Jul 06-Mar 07 8 mos	
DB Design & Construction		Jan 08-Jun 10 2 yrs 6 mos	Jan 07-Jun 10 3 yrs 6 mos	Apr 07-Oct 09 2 yrs 6 mos	
In Service	**June 2010**				
Total Duration	Feb 07–Jun 10 2 yrs 4 mos	Jan 07-Jun 10 3 yrs 5 mos	Jan 06-Jun 10 4 yrs 6 mos	Apr 06 –Oct 09 3 yrs 6 mos	Nov 07 – Dec 09 2 yrs 1 mo

Note: Some tasks have overlapping durations.

For the Tolling contract, the following timeline is assumed given that the bridge is scheduled for completion on June 30, 2010 under the Reference Case:

- DBOM Procurement: January 2007 – August 2007 (8 mos)
- Construction: September 2007 – December 2009 (2 yrs 3 mos)
- 6 Month Testing Period: January 2010 – June 2010
- In Service: June 30, 2010

For the O&M of the TransLink Assets the following timeline is assumed given the June 2010 opening:

- O&M Procurement: July 2009 – March 2010 (7 mos)
- O&M Contract Begins: June 2010

The project procurement schedules shown in Appendix G illustrate the detailed Reference Case Schedule for Contracts 1-5 and for the Tolling and OMR contracts.

Project Term

The Reference Case project term is to end December 31, 2040, the same end date as for the DBFO proposals. Setting the same project term end date provides the most like-to-like comparison to the preferred DBFO proposal.

Schedule Impacts

The Reference Case has the following schedule effects when compared with the current DBFO model:

- 1 year delay in the start of construction (January 2007 vs. January 2006)
- 1 year delay in bridge opening (June 2010 vs. June 2009)
- 1 year delay in the commencement of the Operations Period (and the start of Operations and Maintenance contracts)
- No collection of toll revenue during 2009 and half of 2010 (30.5 years' revenue to 2040 vs. 31.5 years' revenue to 2040)

The following Sections 4 through 9 develop the Reference Case Costs assuming the schedule as outlined in Appendix G.

Summary

The delivery model and schedule of the Reference Case has been prepared on the premise that the specifications and level of performance of the delivered project are the same as those required of the DBFO Contractor and as outlined in the current RFP documents.

A key distinction between the Reference Case and the DBFO model that has significant cost implications is the delay in the start of construction and therefore in project delivery that would be incurred under the Reference Case were the DBFO model to be rejected in December 2005 and the Reference Case procurement approach adopted.

D. Other Assumptions

Where specific to a certain cost item, the assumptions are stated in the appropriate section of the report. However, the following are categories of 'global' assumptions that apply to the Reference Case as a whole:

- Project Approvals/Agreements
- Inflation Rate
- Discount Rate
- TransLink risk tolerance
- Taxation

Project Approvals/Agreements:

The Reference Case is developed on the assumption that no barriers or delays or consequent cost implications are imposed either internally, or by any organization or individual external to TransLink.

Consequently, it is assumed that the following approvals required to re-initiate the procurement process will be granted without cost or schedule delay:

- Approvals to re-initiate procurement process for revised business model and full project financing including TransLink Board and GVRD Board approvals as required.
- Approvals for any legislative amendments required to provide TransLink with the appropriate authority to proceed with the GEB Project under the new delivery model.

It is further assumed that the following agreements will be amended or accepted without cost or schedule delay:

- Municipal Agreements with Maple Ridge, Pitt Meadows, Surrey and Langley
- GVTA – Katzie Benefit Agreement
- GVRD - TransLink Agreement
- Onni Agreement
- TransLink - BC MoT Letter of Understanding
- GVTA - Fraser River Port Authority lease agreement, as required for the main river crossing
- Project Certification under the Environmental Assessment Act – it is assumed that re-application is not required for environmental certificate (granted by the BC Environmental Assessment Office on August 6, 2004) to reflect the change in procurement method.
- Any other agreements not mentioned above or new agreements required arising from the Reference Case scenario.

The following have also been assumed in the development of the Reference Case:

- The GEB Project Office would continue to operate as a TransLink special project office during the construction period.

- Fraser River Marine Transportation Ltd. would continue to operate the Albion Ferry service until the bridge is open to traffic (delayed by 1 year). There is no need to reflect an additional cost to operate the ferry over July 2009 to July 2010 in the Reference Case (see Albion Ferry subsidy below).

- The Albion Ferry subsidy – already determined at $5,218,000 ($2004) as the avoided annual operating cost for the ferry crossing service – would be maintained from opening of bridge in July 2010 to the end of the project term. Therefore this subsidy would begin one year later under the Reference Case than it would under the DBFO scenario.

Inflation Rate

General Rate of Inflation

The general rate of inflation between 2003 and 2040 is applied to the following for the Reference Case:

- Toll Rate Adjustments – to be applied annually to the base vehicle toll rate by the CPI in Canada. CPI assumed to remain at 2.5% between 2010 and 2040.

- Tolling System Operation and Maintenance Payments – to be semi annually paid starting July 2010. Inflation to be applied annually at the CPI rate in Canada, but assumed to remain at 2.5% between 2010 and 2040.

- The Albion Ferry subsidy - is modeled as semi-annual payments and inflated at the CPI rate in Canada, but assumed to remain at a rate of 2.5% between 2010 and 2040.

Construction Industry Inflation

- Facility Construction – a subjective review of historical and predicted trends within the infrastructure construction industry was completed. Based on the available information and discussions with the Reference Case Development Team a yearly construction cost inflation rate of 6% has been assumed for the years 2005 to 2010 (see Appendix D).

- Facility Operations and Maintenance Contracts and Rehabilitation work – given that the construction inflation rate represents labour, materials and equipment in the construction industry, a rate of 6% consistent with the construction industry inflation rate has also been assumed in inflating the $2005 O&M estimates to 2010. Beyond 2010, the construction inflation rate is assumed to return to and remain at 2.5% (i.e., the anticipated CPI) until 2040.

Discount Rate

TransLink currently uses a discount rate of 6% for computing the Net Present Value for its capital projects. This rate will be applied to both the Reference Case and the DBFO proposals.

<u>TransLink risk tolerance</u>

The risk-adjusted Reference Case NPV is shown at a number of different risk confidence levels. The value-for-money comparison between the Reference Case and the preferred DBFO proposal will adopt a specific confidence level to be determined by TransLink management and to be documented in the value-for-money report.

<u>Taxation</u>

TransLink is not subject to income tax for any project related revenue streams.

GST is paid on most services at a rate of 7% and the TransLink is entitled to a full GST refund from the CCRA for any GST paid. However, as the DBFO contractor is also entitled to a GST refund at the same rate and on the same terms, GST presents no material difference for the Reference Case.

<u>Municipal taxes for property and improvements</u>

The GEB Project is exempt from municipal taxes. As this would be the case under either the DBFO or the Reference Case scenario, municipal taxes are not considered for the Reference Case.

5. Reference Case – Construction Period Costs

A. Construction Period Costs – TransLink Retained

The construction period – TransLink Retained costs were developed by Associated Engineering (BC) Ltd. and the GEB Project Team. The costs are documented in Appendix D.

The following Construction Period costs that the TransLink directly has incurred or will incur have been determined for the Reference Case:

1. TransLink – Retained Project Costs including project management, design fees, resident engineering and honorarium payments to the losing bidders for Contract 3 (Fraser River Crossing), and

2. TransLink – Retained Fixed Costs including project development costs to date, property acquisition, municipality construction agreements, honorariums to be paid to both (unsuccessful) DBFO proponents, environmental impact compensation, and the costs committed under the Katzie Benefitting Agreement.

A few key assumptions made in estimating the direct TransLink costs under the Reference Case are as follows.

- Honorariums - Under the Reference Case scenario, each of the two DBFO proponents would be paid an honorarium of $1.2M. (This assumes that both proponents have, in the sole opinion of TransLink, submitted a bona fide responsive Proposal (technical submission and financial submission) and have not violated any provision of the RFP documents) In addition, once Contract 3 (DB – Fraser Crossing) is tendered, it is expected that, given current market conditions, three contractors would bid for the work, two of which would be paid an honorarium of $1.2M each (assuming each has submitted a proposal compliant with the RFP for the contract). This totals to $4.8M in honorarium payments (vs. $1.2M total honorarium payment under the DBFO model).

- Soft Costs - For the two DBB contracts, the TransLink would directly incur the costs for bonding and insurance, preliminary and detailed design and resident engineering (under the DBFO model these costs fall to the DBFO contractor). Interest During Construction (IDC) and financing costs are covered in Section 7 of this report.

- Property Acquisition Costs and Schedule - are assumed to be the same as the DBFO model. Most of the property acquisitions are complete or underway, therefore the one-year delay in the Reference Case schedule is not expected to materially impact the acquisition schedule for the remaining properties.

- Municipality construction agreements, environmental costs and First Nations agreements – are assumed to be the same as for the DBFO model

B. Construction Period Costs – Civil Works

The construction period – TransLink Retained costs were developed by Associated Engineering (BC) Ltd. The costs are documented in Appendix D.

The following contract costs for the Construction Period have been determined for the Reference Case:

1. The raw (unadjusted for risk) Construction Costs of Contracts 1 through 5, and

2. The construction costs of the civil engineering infrastructure required for the Tolling System.

A few key assumptions made in estimating the contract costs are:

- Method of costing - is based on the B.C. Ministry of Transportation's elemental parametric cost estimating methodology. Originally designed by Ernest Wolski, formerly of the BC MoT, this spreadsheet-based costing template is known as the Wolski Model.

- Unit Rates – are based on historical (DBB based) roads projects data collected by the B.C. Ministry of Transportation current to 2005.

- Construction Cost Inflation - 6% for the Years 2005-2010, compounded to the year of the bid of a given contract (as per the schedule in Appendix G).

- Bonding and Insurance Costs – are already included in contract rates for DBB contracts, and Bonding to be 0.5% of construction costs and Insurance to be 3.1% of construction costs for DB contracts. There is a potential for the GEB Project to save up to 5% on the estimates for insurance coverage if TransLink Construction Master Program is implemented.

- Unit Rate and Quantity Allowance – is based on historical data compiled by the Ministry of Transportation and assumed to be 15% of construction costs for the DBB contracts and 12% of construction costs for the DB contracts. This contingency accounts for uncertainty in unit rates and quantities assumed in the cost estimates. This uncertainty is considered to be part of the Base Costs of the Reference Case (referred to as Construction Contingency in Appendix D).

C. Construction Period Costs – Tolling System

The costs for constructing the tolling infrastructure have been determined for the Reference Case. Two key assumptions made in estimating the tolling infrastructure costs are:

1. Costs and Method of costing - were developed by TransLink's toll technology / operations technical advisor, Delcan Corporation. Delcan's report "Systems Concept and Concept of Operations – Final Report" dated May 27, 2005 outlines the full operational capabilities, performance requirements and capital cost estimates of a compliant Tolling System.

2. Construction Cost Inflation – an inflation rate of 2.5% is assumed to determine the \$2005 cost from the \$2003 Delcan estimates.

D. Cost Summary

A summary of the base costs incurred in constructing the project facility is provided in Table 5.1.

Table 5.1 Capital Cost Estimates Before Consideration of Risk

Category		**Cost ($2005, millions)**
TransLink Retained	Project Costs	16.37
TransLink Retained	Fixed Costs	180.20
Civil Works	DBB – Contract 1	18.74
Civil Works	DB – Contract 2	58.97
Civil Works	DB – Contract 3	535.38
Civil Works	DB – Contract 4	133.36

Table 5.1 Capital Cost Estimates Before Consideration of Risk

Category		**Cost ($2005, millions)**
Civil Works	DBB – Contract 5	8.23
Tolling Infrastructure	Capital Costs	7.33
Total Capital Costs		**958.58**

Further details of the costs provided in Table 5.1, along with the assumptions made, are provided in Appendix D.

6. Reference Case – Operating Period Costs and Revenues

A. Operating Period Costs - TransLink Retained

The operating period – TransLink Retained costs were developed by TransLink staff in consultation with technical consultants. The costs are documented in Appendix H.

It is anticipated that TransLink will incur the following costs directly during the Operating Period under the Reference Case:

1. Electric Power

2. Electrical Maintenance

3. Line Repainting

4. Administration of O&M and rehabilitation contracts – efforts would be required from July 2009 to begin the procurement of the first O&M contract.

5. Legal and Specialist Consulting work – responding to 3rd Party or contractor vs. TransLink claims, pursuing TransLink vs. 3rd Party claims, environmental issues, structural and electrical inspection, detailed soundings and scour surveys

6. Radio and Telecommunications System - telecommunications supply requirements including corridor control hub building with communications hub with T3/modified T1 WAN connection

A few key assumptions made in estimating the direct TransLink Operating Period Costs under the Reference Case are as follows:

- TransLink costs for procurement of first O&M contract and setting up the administrative (between June 2009 and June 2010) procedure for the GEB Project are considered to offset the anticipated low level of effort required over the early period of the O&M contract (GEB will be a new facility and will not required any rehabilitation or major maintenance in the early stages of operations). Therefore, no TransLink contracts administration costs have been applied to the period prior to the opening day of June 30, 2010.

- Starting July 2010 and during the entire project term, the TransLink administrative effort is assumed to be at the level of one Full Time Equivalent (FTE) Contract Administrator (who would, as the Owner's Representative, take on the contract management and communications role to contractors and stakeholders and would coordinate inspections, rehabilitation work and all specialist consultant work) and one FTE Contract Monitor who would provide a supporting role to the Contract Administrator, monitor traffic and revenue, and maintain databases for incidents, accidents, claims, and current and planned maintenance work.

B. Operating Period Costs – O&M Contractor and Rehabilitation Work

The operating period contractor costs were developed by TransLink staff in consultation with technical consultants. The costs are documented in Appendix H.

As discussed in Section 4B, for the Reference Case the operations and maintenance contracts and the rehabilitation work would be administered by the TransLink Road and Bridges

Department. The O&M work would be procured as renewable 5-year contracts and the rehabilitation works would be procured on an as needed basis.

The operating, maintenance and rehabilitation costs include the following:

- Routine Maintenance (O&M Contract)
- TransLink Retained (Overhead)
- Rehabilitation – Pavement/Shoulder (not bridge) and Bridge including pavement

In developing the costs for the operations, maintenance and rehabilitation (OMR) of the TransLink Assets, the following assumptions have been made:

- The operations period will begin on June 30, 2010 and will terminate on December 31, 2040.
- Non-availability penalties – will be built into the OMR contracts and will be unchanged from the penalty regime imposed currently on the DBFO contractor as per the current RFP documents
- Road maintenance standards – will be to BC Road Standards and unchanged from current RFP documents
- The O&M contract includes the regular inspection of the roadway and the operations and maintenance of the road and structures is assumed to be a constant annual charge.
- Rehabilitation of (non-bridge) paved road surface – is based on current industry practice. Assumes complete reconstruction at year 16 and year 30 of operations. Rate is $3,400/lane-km for 39.7 km lane-km.
- Rehabilitation of structures - is based on current industry practice. Assumes complete rehabilitation at year 18 and year 33. Rate includes pavement rehabilitation and is $120 per square meter bridge deck area per rehab works for 151,960m^2.
- O&M and Rehabilitation Costs Inflation rate – has been assumed to be 7.5% to reach the $2005 price from the original $2003 price estimate, 6% between 2005 and 2010 and 2.5% thereafter.
- Insurance – it is assumed that the O&M contractor(s) would be responsible for Professional Errors and Omissions, Comprehensive Crime Policy and Directors and Officers Insurance. However, the DBFO proposals will not include costs for OMR insurance. In order to offer a fair comparison, the Reference Case will likewise exclude any costs for insurance coverages during the Operating Period.

The estimated OMR costs for the GEB Project are summarized in Table 6.1.

The above costs are shown in Appendix H as individual costs and as yearly cashflow over the project term.

C. Operating Period Costs – Tolling System

The costs for operating and maintaining the tolling system have been determined for the Reference Case.

The key assumptions made in estimating the tolling system operating period costs are:

1. Costs and Method of Costing – were developed by TransLink's toll technology / operations technical advisor, Delcan Corporation. Delcan's Report "Systems Concept and Concept of Operations – Final Report" dated May 27, 2005 outlines the system operational requirements and performance / operational personnel requirements of a compliant Tolling System.

2. Operating Period Cost Inflation – an inflation rate of 2.5% is assumed to determining the future costs from the $2004 estimates.

3. Transponder Penetration Scenario – is the ratio of transponder to video based toll user and has been assumed at 70/30.

D. Cost Summary

A summary of the anticipated base costs incurred in operating and maintaining the Project Facility is provided in Table 5.1.

Table 6.1 Operating Period Costs

Category	**Cost ($2003, millions)**
Routine Maintenance (O&M Contract)	$702,960 annually
TransLink Retained (Overhead)	$400,000 annually
Rehabilitation – Pavement/Shoulder (not bridge)	$5.4M twice over project term
Rehabilitation – Bridge including pavement	$18.2M twice over project term
Tolling System Operation and Maintenance	$6.837M annually

E. Operating Period Revenues

Over the operating period, revenue will be derived from the following sources:

- Toll and Video – tolls collected on a per vehicle per trip basis through the use of transponders or video captures of license plates

- Albion Ferry Subsidy - operating subsidy currently paid to offer a ferry crossing service to be redirected to help TransLink fund the GEB Project following Substantial Completion.

- Transponder Revenue – payments for transponder maintenance fees and security deposit. This revenue has been used to offset the operating costs and is therefore ignored for revenue calculation purposes.

- Interest on cash – 2% charged per month on uncollected tolls. This revenue is ignored for the revenue calculation.

The revenue model assumed for the Reference Case makes use of the daily traffic forecasts reported in Appendix A1 of Steer Davies Gleave (SDG) "FRC Traffic and Revenue Forecasts Final Report" dated May 13, 2004. This study modeled traffic over years 2003 to 2010.

The key assumptions made in estimating the operating period revenues for the Reference Case are:

- The period over which revenue will be collected is from August 2, 2010 to December 31, 2040.

- The traffic forecasts and ramp-up factors for the Reference Case vary slightly from the DBFO procurement scenario. For the Reference Case, it is assumed that there is no additional traffic nor increased ramp-up due to the one year-delay in bridge opening. Therefore the anticipated traffic flow at bridge opening in June 2010 is assigned the forecast traffic flow for June 2009. The toll rates, however, are assumed to have been inflated by seven years from the 2003 rates, rather than by 6 years to June 2009 as assumed for the DBFO scenario.

- Base Toll Rate:

  - Cars $2.50 ($2003)

  - Light Trucks $3.75 ($2003)

  - Heavy Trucks $5.00 ($2003)

  [Note that according to a new Tolling By-Law was approved by the TransLink Board and ratified by the GVRD Board in July 2005, non-transponder users pay extra ($0.50 for "prepayment users" and $1.00 for "video users") and the Light Truck rate has been amended to 2xbase rate = $5.00 and Heavy Truck rate has been amended to 3xbase rate = $7.50. However these changes are not implemented in the Reference Case or the DBFO Financial revenue models.]

  This assumption is unchanged from the DBFO procurement scenario.

- Revenue Leakage (i.e. unpaid tolls): assumed at

  - 5%(for cars),

  - 10% (for light trucks), and

  - 10% (for heavy trucks).

  This assumption, unchanged from the DBFO procurement scenario, reflects revenue loss due to uncaptured and foreign license plates.

- Video Surcharge Revenue – the additional revenue gained from non-transponder users. This is based on the KPMG memo dated May 19, 2005 and assumes a 4.37% increase as a percentage of non-video (i.e. transponder user) revenue. This assumption is unchanged from the DBFO procurement scenario.

- Non Payment Penalty Revenues (i.e. fines)– expected revenues from non-payment of tolls is not included in the Reference Case revenue model. However, the amount is not expected be materially different under the DBFO scenario.

- Transponder Licensing Revenues – These are not included in the Reference Case revenue model. However, the amount is not expected be materially different under the DBFO scenario.

The operating period revenue model for the Reference Case is different from that of the DBFO procurement model due only to the changed revenue period. This effect results in a one year less revenue (collected in June 2009-June 2010 in the DBFO scenario).

Table 6.2 Operating Period Revenues

Category	Revenue
Toll & Video	Grows each year due to redistribution and steady growth of traffic and due to inflation of toll rates; see Appendix I for SDG traffic and revenue forecast.
Albion Ferry Subsidy	$5,218,000 [$2004]; grows annually with inflation
Transponder Revenue	Assumed 0 for revenue model
Interest on Cash	Assumed 0 for revenue model

A copy of Appendix A1 showing Traffic and Revenue Forecasts from SDG's report is attached in Appendix I.

7. Project Financing

A. TransLink Capital Projects and Financing

TransLink currently establishes an Annual Capital Program, subject to Board approval, with projects in the following categories:

- Transit and ITS Infrastructure
- Vehicles/Fleet
- Road Programs
- Bridges Program

These projects are generally funded on a short-term basis through surplus funds (working capital) or borrowings from the GVRD. Interest during construction (IDC) and project costs in connection with capital acquisitions accrue to the project starting on the date of advancement of funds and ending when the assets are ready for service. The costs spent on 'work-in- progress' capital projects are tracked separately for each project. The interest rate for charging the project IDC is based on the interest rate that the GVRD pays TransLink on surplus funds held and invested on behalf of TransLink or charges TransLink for funds that TransLink borrows on a short-term basis. This interest rate is the same for both invested funds or borrowed monies and is re-set on a monthly basis. TransLink incurs the risk for these monthly fluctuations in interest rates. The funds available for short-term borrowing are dictated by TransLink's lines of credit. Current this line of credit is with the GVRD and no formal limit has been set. However, traditionally TransLink has operated in a surplus cash postion with only very brief periods of shortfalls. More formal lines of credit are currently being negotiated for TransLink to borrow short-term directly from the MFA.

For long term TransLink borrows from the MFA with the GVRD providing the conduit for the joint and several security required by the MFA. On a semi-annual basis TransLink determines it's long-term borrowing requirements and approaches the MFA to raise the necessary funds through a long-term debenture issue. Once these debentures are issued the interest rate is fixed for the term of the debenture. Interest paid on these debentures is made semi-annually (in arrears) and principal is repaid annually (in arrears) in the form of a sinking fund payment. Sinking fund payments are set based on a conservative estimate of the investment return that the MFA, which manages the sinking fund, considers that they can achieve to ultimately grow the fund, over the term of the debenture, to a value equal to the debenture's maturity value. These payments (interest and principal) are funded from TransLink's operating budget. The MFA borrowing rate is determined based on the capital market conditions at the time of the issue and the fact that the MFA has a superior credit rating (AAA) and has traditionally been able to borrow money at a lower rate than a rate available for a comparable debt financed by a private financial institution. TransLink incurs the risk for future MFA rates rising significantly above the current rate unless it enters into an interest rate hedge, which it has done on a number of occasions.

B. Special Financial Considerations for GEB Reference Case

The GEB Reference Case Project requires special financing considerations (i.e., different from the standard funding means as described above) due to its following unique characteristics:

- Full Cost Recovery. This project is the first tolled bridge to be built by TransLink. Under either the Reference Case or the current DBFO scenario, TransLink will set the toll rates, collect the tolling revenue, and incur the revenue risk (similar to most TransLink capital asset purchases). The TransLink Board has directed that the project be undertaken at no net cost to TransLink. This is a new and unique directive for a TransLink capital project and does not leave room for potentially fluctuating borrowing rates, particularly over the short term (construction period between 2006 and 2010).

- Project Size. The capital cost of this project, at upwards of $959M before risk, far exceeds the cost of any other of TransLink's existing or planned projects. This level of capital spent in the next five years will expose TransLink to potentially significant short-term (IDC) interest costs and long-term debt repayment interest charges. While these costs are accounted for in other capital projects with an added contingency to the borrowing rates, a project of this scale warrants consideration of fixing the short and long-term interest rates.

- Borrowing Term. As mentioned previously, the TransLink Board recently decided that the GEB Project would be awarded to a DBFO contractor as an estimated 35 – year contract for the design, construction, financing and operation of the Facility. To assess whether or not the DBFO proposals offer value for money to TransLink, the Reference Case financing plan must reflect the same project term as wells as the means of financing that is the most likely and achievable by TransLink.

- Albion Ferry Subsidy. As mentioned earlier, once the Golden Ears Bridge is open to traffic, the Albion Ferry crossing service will cease and the annual operating costs will become a subsidy to the GEB Project. The value of the subsidy is based on the Albion Ferry operating expense as reported in the TransLink 2004 Annual report. Under the Reference Case TransLink will pay this subsidy, valued at $5,218,000 in 2004 dollars, from the middle of 2010 to the end of the project term. Under the DBFO procurement scenario, the subsidy has the same value but will begin one year earlier coincident with the bridge opening in 2009. Therefore the Albion Ferry subsidy is included in the Reference Case financial model.

For other capital projects of significant cost TransLink has implemented alternative financing strategies. For the Trolley Bus Replacement Project, at a budget of $272 million, interest rate hedging was considered (but not done) and hedging against the Canadian Dollar-Euro exchange was carried out. TransLink has used an interest rate hedging facility for their obligation on the RAV project, valued at $370 Million.

C. Reference Case Financing Plan

The Reference Case Financing Plan was developed by TransLink Finance Department staff in consultation with specialized financial services including consultants, MFA, ScotiaBank and TD Securities. While a number of financing options were considered for the Reference Case, the most likely strategy was to make use of the advantageous interest rates available through the MFA. It is assumed that TransLink would finance the costs incurred until the end of the project term by utilizing a combination of short-term and long-term financing facilities for GVTA "Owner" costs, Construction Period costs and Operations Period costs.

The Reference Case Financing Plan is divided into three financing periods:

1. GVTA Retained Costs incurred to December 2005

   These costs are currently being funded out of TransLink short-term working capital (i.e. GVRD borrowing/GVTA surplus funds). The reason for this was up to the recent BOD decision on the financing of these costs it was expected that TransLink would ultimately recover these costs via a licensing fee from the successful proponent under the DBFO process. However, as it is now the intention that these costs will be financed internally it is proposed that they be financed in line with how TransLink normally finances it's other capital projects as follows:

- refinancing of this debt would likely occur in Spring 2006 (effective date December 31, 2005 assumed for the Reference Case Financial Model)

- As the assumed refinancing will occur in two months' time, hedging of the interest rate is required to fix the long-term borrowing rate

- The refinancing will take the form of a debenture via the MFA using the MFA's conventional sinking fund approach of repayment.

- No repayments on principle are made for five years so payments would start in 2011 and would be annual payments

- Interest payments would not be deferred and would be paid semi-annual in arrear.

2. New RFP Process and Construction Period – January 2006 to June 2010

The costs over this period include GVTA retained costs and contractor payments for constructing the road, bridge and tolling facilities.

The following financing plan is proposed for this period:

- Short-term financing would be via the MFA's Commercial Paper Program. Maximum short-term funding over this period would be $220M.

- To stay under the maximum, refinancing of the short-term debt would be done every six months. The short-term debt will be replaced with a debenture via the MFA using the MFA's conventional sinking fund approach of repayment Hedging of the interest rate using interest rate swaps would be done to fix the long-term borrowing rate for each of the nine bonds taken out over this period, with the first taken in June 2006 and the last in June 2010.

- Interest would be charged between bond takeouts.

- No repayments on principle are made for five years from the time the bond is taken out. The principle payments are made on an annual basis.

- Interest payments would not be deferred and would be paid semi-annual in arrear.

3. Operations Period – July 2010 to December 2040

The costs over this period include GVTA retained costs in addition to OM&R contractor payments and tolling operator O&M costs. The financial modeling indicates that these projected Operations Period costs together with the interest and principal payments on the long-term borrowing (bonds) taken out during 2006-2010, the project does not break even from a cash flow perspective until 2019 (9 years into operations). Therefore to finance the shortfalls until 2019 the following financing plan is proposed:

- Financing would be via the MFA's Commercial Paper Program on a revolving basis, i.e. Commercial Paper (CP) is issued, which generates funding, for term up to twelve months and then on maturity more CP is issued to repay the maturity value including accrued interest. Maximum short-term funding over this period would be $105M.

- Drawdowns under this facility will likely begin in the June-December 2010 period, and all interest will be capitalized (added to the amount owing) as the facility is rolled-over (anywhere from monthly to every twelve months).

- Re-payments on this facility will begin once there is sufficient cash available to do so, i.e. once there is revenue net of long-term debt and interest payments. According to the Reference Case Financial Model, principal revolver payments will be made starting in 2018 and ending in 2025.

The above Financing Plan was proposed to the MFA who are in agreement with it in principal. A further discussion of the Financial Plan and the MFA letter confirming of the feasibility of this plan is attached in Appendix J.

A summary of the interest rates assumed for the Reference Case is provided in Table 7.1.

Table 7.1 Reference Case Financing Rates

Financing Period	Facility Type	Interest Rate
1. GVTA Retained Costs incurred to December 2005	short-term debt long-term bond #1(sinking fund) hedge premium bond #1 MFA Debt Reserve Payments	Current IDC rate @ 4% 4.78% 0.02% 2.00% of issue[1]
2. New RFP Process and Construction Period January 2006- June 2010	interest charged between takeouts long-term bonds #2-10 (sinking fund) hedge premium bonds #2-10 MFA Debt Reserve Payments	4.29% 4.78% varies 0.06% - 0.26% 2.00% of issue[1]
3. Operations Period – July 2010 to December 2040	revolver interest for balance owing MFA Debt Reserve Repayments	6.00% 3.50%

The Financial Plan as outlined and the rates shown above have been incorporated into the Reference Case Financial Model. A further discussion on the Reference Case Financial Plan is provided in Appendix J.

[1] As added protection for investors in securities (debentures) issued by the MFA, it has established a debt reserve fund into which each client sharing in the proceeds of a securities issue having a term to maturity of five years or over must contribute an amount equal to one percent of the principal amount borrowed (TransLink contributes two percent) into this fund. Monies paid into the debt reserve fund, and interest earned thereon, are obligations of the MFA to its client and must be refunded to them when the final instalments of their loans have been repaid.
If, at any time, the MFA lacks sufficient funds to meet principal, interest, or sinking fund payments due on its obligations, it must utilize the debt reserve fund. All or any part of this fund is available to satisfy MFA obligations, regardless of the sources of the money in the fund. In the event that payments are made from the debt reserve fund, the MFA will recover such payments from the regional districts and regional
hospital districts involved to restore the debt reserve fund. If the Trustees are of the opinion that payments made from the debt reserve fund will not be recovered within a reasonable period, they will levy upon all taxable land and improvements in the province a tax sufficient to restore the fund. It is mandatory

8. Reference Case Raw NPV (non-risk-adjusted)

The Reference Case Financial Model is spreadsheet-based and incorporates the project costs, project schedule, and financing plan details as outlined previously. The Financial Model calculates the net present value (NPV) of project cash flows over the Construction and Operation Periods. A full printout of the Financial Model is contained in Appendix L.

The base costs reported in Sections 5-7 are summarized below in NPV terms where the sum of the itemized NPV values represents a "raw" (unadjusted for risk) NPV.

Table 8.1 RAW NPV – Construction, Operating and Financing Costs

Cost Item	**NPV @ 6%** **[$Thousands]**
Costs Incurred up to 2005 and New RFP Process and Construction Period	
TransLink Retained Costs up to 2005	($105,883)
TransLink Retained Costs 2006-2010	($87,963)
Capital Costs – Civil Works and Tolling	($647,145)
Sub-Total without Financing Costs	(840,991)
Financing	
Debt Service Payments	($97,574
Accrued interest between bond takeouts	($7,535)
Bond Takeouts	$946,099
Total Construction Period	*$0*
Operations Period - Costs	
Payments to Tolling Concessionaire	($165, 649)
OMR - Routine Maintenance	($15,949)
OMR – TransLink Retained (Overhead)	($9,075)
OMR – Risk	($587)
OMR - Rehabilitation	($29,912)
Financing	
Debt Servicing	($788,670)

Cost Item	**NPV @ 6% [$Thousands]**
Revolver Interest Payments	($34,004)
Revolver Draws	$74,572
Revolver Repayment	($41,039)
Total Operating Period	*($1,010,313)*
Revenues	
Toll & Video	$1,208,653
Albion Ferry Subsidy	$88,776
Total Revenues	*$1,297,430*
Total Raw NPV	**$287,117**

9. Risk Valuation

A. Background

This section develops and reports the total risk adjustment used in computing the Reference Case Net Present Value.

An initial risk analysis was performed in 2003 based on preliminary project information. Since that time a great deal of fine tuning of the project extent, scope, costs and risks have occurred. Therefore, a second iteration of the risk analysis process has been done to include the new project information.

The report in Appendix K "Summary Analysis of Project Risks, GEB Reference Case" provides a full description of the risk analysis process and findings. This section and Section 10 rely heavily on details contained Appendix K, most of which are not repeated here.

The following sections provide a summary of the risk analysis.

B. Objectives

The objective of the risk assessment process is to identify and quantify the risks associated with the GEB Reference Case that are different from those associated with the DBFO procurement scenario. That is, risks that are identical for both procurement scenarios are not considered for the Reference Case. As stated earlier, the total project risk is relevant when assessing affordability, but is not valued in developing the Reference Case.

C. Risk Analysis Methodology

The risk analysis process adopted for the GEB Reference Case is summarized in the following steps:

1. Define Reference Case scope
2. Identify and categorize risks related to Reference Case Scope
3. Quantify range of impacts of individual risks
4. Determine the distribution of outcomes within the risk ranges and
5. Conduct a Monte Carlo evaluation of the cumulative outcome of all the risks for each risk category
6. Assess cumulative impacts of risks

Reference Case Scope

The scope of work for the Reference Case is detailed in Section 4.

Risk Identification and Characterization

Individual risks that could potentially affect the initial capital costs or the ongoing operating, maintenance and rehabilitation ("OMR") costs were developed through Risk Management Committee discussions. The baseline (non risk-adjusted) costs were developed in Sections 5 and 6. The identified risk categories and individual Reference Case risk elements are reported in Section 9D.

Risk Quantification

In quantifying each risk, the (non-risk-adjusted) cost, the potential range of impacts and the probability distribution of outcomes within that range are required. The risk ranges are summarized in Section 9E.

Distribution of outcomes

Once the range of the potential impact of each risk has been identified, it is necessary to assign a probability distribution to that range. The Project Risks report in Appendix K explains how the type and shape of distribution was assigned.

Monte Carlo evaluation

To compute a risk adjustment for each category, the individual risks ranges and distributions are combined using a Monte Carlo sampling technique. The simulation process is further detailed in Appendix K.

Cumulative Impacts of Risks

The assessment of the Net Present Value of the risk adjusted cash flows at the mean, 70^{th} and 90^{th} percentile are reported in Section 10.

D. Risk Identification

The identified risks categories are:

1. Construction Contract-specific risks.
2. Global Risks
3. OMR Risks

Construction Contract Risks

The risks that can be allocated specific contracts are shown in Tables 9.1 to 9.7.

Global Risks

The following risks are considered to apply to the GEB Reference Case project as a whole and are therefore referred to as Global Risks:

- Integration of five Construction Contracts
- Construction Schedule Delay
  - Time delay (GVTA at fault)
  - Lost Tolling Revenue
  - IDC impacts
  - Impact of Inflation

Operations Period Risks

- Latent (Material) Defects
- Delayed Rehabilitation

- Different Heavy Vehicle Traffic Volume

E. Risk Quantification

The potential range of impacts for each identified risk is identified by the low, probable and high estimate. These three parameters are arrived at using expert opinions to answer the following questions:

1. Low: Under perfect (P) conditions, what impact would this risk have on project schedule or cost?

2. Probable: Under likely (L) conditions, what impact would this risk have on project schedule or cost?

3. High: Under outrageous (O) conditions, what impact would this risk have on project schedule or cost?

The P, L and O parameters have been established for the each of the identified Reference Case risk elements. The risk elements are summarized by risk category in Tables 9.2-9.7.

Table 9.1 Contract 1 Risk Ranges

Contract 1 - South Shore Municipal Facilities Construction Cost = $14M [Risk Ranges shown in millions ($2005), or % of Constr. Costs]			
	P = Perfect Outcome	**L = Likely Outcome**	**O = Outrageous Outcome**
Contractor Costs			
Municipal Extras	**0.0**	**1.0**	**2.0**
Utility Unknowns	**0.0**	**0.2**	**0.4**
Traffic Management	**(0.1)**	**0.1**	**0.4**
Contingency		**15%**	
Inflation on Contractor Costs	**5.0%**	**6.0%**	**10.0%**
GVTA Costs			
Project Mgmt.	**1.5%**	**1.5%**	**3.0%**
Design	**6.0%**	**6.0%**	**7.5%**
Resident Engineering	**6.0%**	**6.0%**	**6.0%**
Inflation on GVTA Costs	**5.0%**	**6.0%**	**10.0%**

Table 9.2 Contract 2 Risk Ranges

Contract 2 - 176 to Telegraph Construction Cost = $39M [Risk Ranges shown in millions ($2005), or % of Constr. Costs]			
	P = Perfect Outcome	**L = Likely Outcome**	**O = Outrageous Outcome**
Contractor Costs			
Noise Mitigation	**0.0**	**0.6**	**0.8**
Staging Adjustments	**0.0**	**0.5**	**1.0**
South Port Kells Connector	**0.0**	**0.5**	**1.0**
Geotech – Preload CN and Hwy 1 Underpass	**0.0**	**0.2**	**0.6**
Environmental	**0.0**	**0.1**	**0.2**
Utilities – Oil Pipeline and Fibre-Optic Cable	**0.0**	**0.1**	**1.3**
Traffic Management	**(0.1)**	**0.0**	**0.2**
Project Management	**3.5%**	**3.5%**	**3.5%**
Resident Engineering	**3.0%**	**3.0%**	**3.0%**
Bonding and Insurance	**3.6%**	**3.6%**	**4.1%**
Design	**5.8%**	**5.8%**	**5.8%**
Contingency		**12%**	
Inflation on Contractor Costs	**5.0%**	**6.0%**	**10.0%**
GVTA Costs			
Project Mgmt.	**2.0%**	**2.0%**	**3.0%**
Inflation on GVTA Costs	**5.0%**	**6.0%**	**10.0%**

Table 9.3 Contract 3 Risk Ranges

Contract 3 - Fraser River Crossing Construction Cost = $372M [Risk Ranges shown in millions ($2005), or % of Constr. Costs]			
	P = Perfect Outcome	**L = Likely Outcome**	**O = Outrageous Outcome**
Contractor Costs			
Emergency Services	**0.0**	**1.6**	**5.0**
Suicide Prevention	**0.0**	**0.0**	**0.5**
Noise Attenuation	**0.0**	**0.0**	**0.3**
Foundation Conditions	**(7.5)**	**(4.0)**	**4.0**
Project Management	**3.5%**	**3.5%**	**3.5%**
Resident Engineering	**3.0%**	**3.0%**	**3.0%**
Bonding and Insurance	**3.6%**	**3.6%**	**4.1%**
Design	**5.8%**	**5.8%**	**5.8%**
Contingency		**12%**	
Inflation on Contractor Costs	**5.0%**	**6.0%**	**10.0%**
GVTA Costs			
Project Mgmt.	**2.0%**	**2.0%**	**3.0%**
Inflation on GVTA Costs	**5.0%**	**6.0%**	**10.0%**

Table 9.4 Contract 4 Risk Ranges

Contract 4 - 113B to Lougheed Construction Cost = $9.3M [Risk Ranges shown in millions ($2005), or % of Constr. Costs]			
	P = Perfect Outcome	**L = Likely Outcome**	**O = Outrageous Outcome**
Contractor Costs			
Lougheed Eastbound @ Maple Meadows Way	**0.0**	**0.0**	**2.0**
Noise Mitigation	**0.0**	**0.3**	**0.5**
Golf Course Property Take	**(1.0)**	**1.0**	**1.0**
Utility (Terasen Pipeline)	**(0.2)**	**0.5**	**2.0**
BCH Transmission Lines	**(0.5)**	**0.0**	**0.5**
GVRD Water Line	**0.0**	**0.3**	**1.5**
Traffic Management	**0.0**	**0.1**	**0.2**
Project Management	**3.5%**	**3.5%**	**3.5%**
Resident Engineering	**3.0%**	**3.0%**	**3.0%**
Bonding and Insurance	**3.6%**	**3.6%**	**4.1%**
Design	**5.8%**	**5.8%**	**5.8%**
Contingency		**12%**	
Inflation on Contractor Costs	**5.0%**	**6.0%**	**10.0%**
GVTA Costs			
Project Mgmt.	**2.0%**	**2.0%**	**3.0%**
Inflation on GVTA Costs	**5.0%**	**6.0%**	**10.0%**

Table 9.5 Contract 5 Risk Ranges

Contract 5 - Abernathy Connector Construction Costs = $6M] [Risk Ranges shown in millions ($2005), or % of Constr. Costs]			
	P = Perfect Outcome	**L = Likely Outcome**	**O = Outrageous Outcome**
Contractor Costs			
Landscaping	**0.0**	**0.1**	**0.3**
Paving 4 lanes versus 2 lanes	**0.0**	**0.0**	**0.8**
Bridge (Hampton)	**(0.4)**	**0.0**	**1.3**
Noise Mitigation	**0.0**	**0.0**	**0.1**
Archaeological Find	**0.0**	**0.0**	**1.0**
Flood Protection	**0.0**	**0.1**	**0.3**
GVTA Costs			
Project Mgmt.	**1.5%**	**1.5%**	**3.0%**
Design	**6.0%**	**6.0%**	**7.5%**
Resident Engineering	**6.0%**	**6.0%**	**7.5%**
Inflation on GVTA Costs	**5.0%**	**6.0%**	**10.0%**

Table 9.6 Global Risk Ranges

Global Risks [$2005, millions]				
		P = Perfect Outcome	**L = Likely Outcome**	**O = Outrageous Outcome**
Contract Integration		**0.0**	**0.5**	**1.0**
Schedule Delay	GVTA at Fault	**0 yr**	**0 yr**	**1.0 yr**
	Tolling Revenue	**0.0**	**0.0**	**80.0**
	IDC	**0.0**	**0.0**	**14.0**
	Inflation on Construction Costs	**0.0**	**0.0**	**17.0**

Table 9.7 Operations Period Risk Ranges

Operations Period [$2005, millions]			
	P = Perfect Outcome	**L = Likely Outcome**	**O = Outrageous Outcome**
Material (Latent) Defects	**0.0**	**0.5**	**25.0**
Delayed Rehabilitation	**0.0**	**3.6**	**9.0**
Different Heavy Vehicle Traffic Volume	**0.0**	**7.0**	**17.5**

F. Risk Sensitivity

The output of the Monte Carlo sampling is summarized in a cumulative probability chart and associated statistics (one set of statistics for each risk category identified in Section 9D). In addition, a "tornado chart" summarizes the sensitivity of the analysis to an individual risk factor. This information provides an indication of the specific risk elements that may require further evaluation and/or the development of a mitigation strategy.

The risk adjustment to the NPV is computed by summing the risk amounts for each category at chosen confidence level. The confidence level is chosen on a scale between 0 and 100 percentile and is based on the level of risk tolerance acceptable to TransLink. For example, a choice of the 90^{th} percentile can be interpreted as an acceptance that, on a balance of probabilities, the cost will not exceed the calculated value more than once out of ten times.

This report has used the mean, 70^{th} and 90^{th} percentile as being relevant levels of confidence in the results. By reporting the NPV values at a number of confidence levels, one can compare them and assess the sensitivity of the NPV to the confidence level. In addition, it is the intent of the Reference Case report to enable the confidence level for the Value for Money comparison to be chosen from a wide range.

10. Results

Table 10.1 contains a summary of the analysis of the capital cost risks. The analysis yielding these results considers the risk elements for Contracts 1-5 and for Global Risks. The total (risk-adjusted) capital costs are shown at the mean, 70th and 90th percentile confidence levels.

Table 10.1 Capital Cost Risk

Capital Cost [CAD$M]			
Raw **Non Risk-Adjusted Capital Cost**	**Mean**	**70th Percentile**	**90th Percentile**
958.6 (see Table 5.1)	$1,058.1 (see Appendix K)	$1,072.2 (see Appendix K)	$1,108.3 (see Appendix K)

The principal risks relating to the differential between risk adjusted and non-risk adjusted capital cost estimates include:

- The potential for significant construction cost inflation between 2005 and 2010,
- Uncertainties around GVTA project management costs,
- Uncertainties around the cost of bonding and construction insurance,
- Uncertainties around GVTA design costs, and
- The potential for further delays (with the attendant loss of toll revenue and increased construction costs).

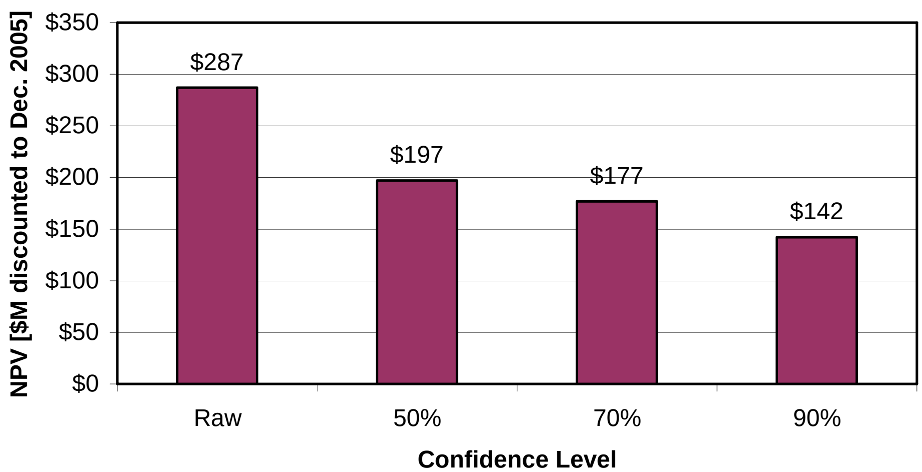
Table 10.2 shows the Reference Case Project NPV values for the raw (non risk-adjusted) cash flows, and the 50th, 70th and 90th percentiles of risk adjusted cash flows.

Table 10.2 Reference Case Project NPV

NPV [CAD$M]			
Raw **Non Risk-Adjusted**	**50th Percentile**	**70th Percentile**	**90th Percentile**
$287	$197	$177	$143

Chart 10.1 illustrates the results from Table 10.2 in graphical form.

Chart 10.1. Reference Case Project NPV



11. Adjustments to the Reference Case

The development of the GEB Reference Case was undertaken between May and October 2005, and the report will be completed by October 28, 2005. Subsequent to this date, the Reference Case may be adjusted under the following conditions:

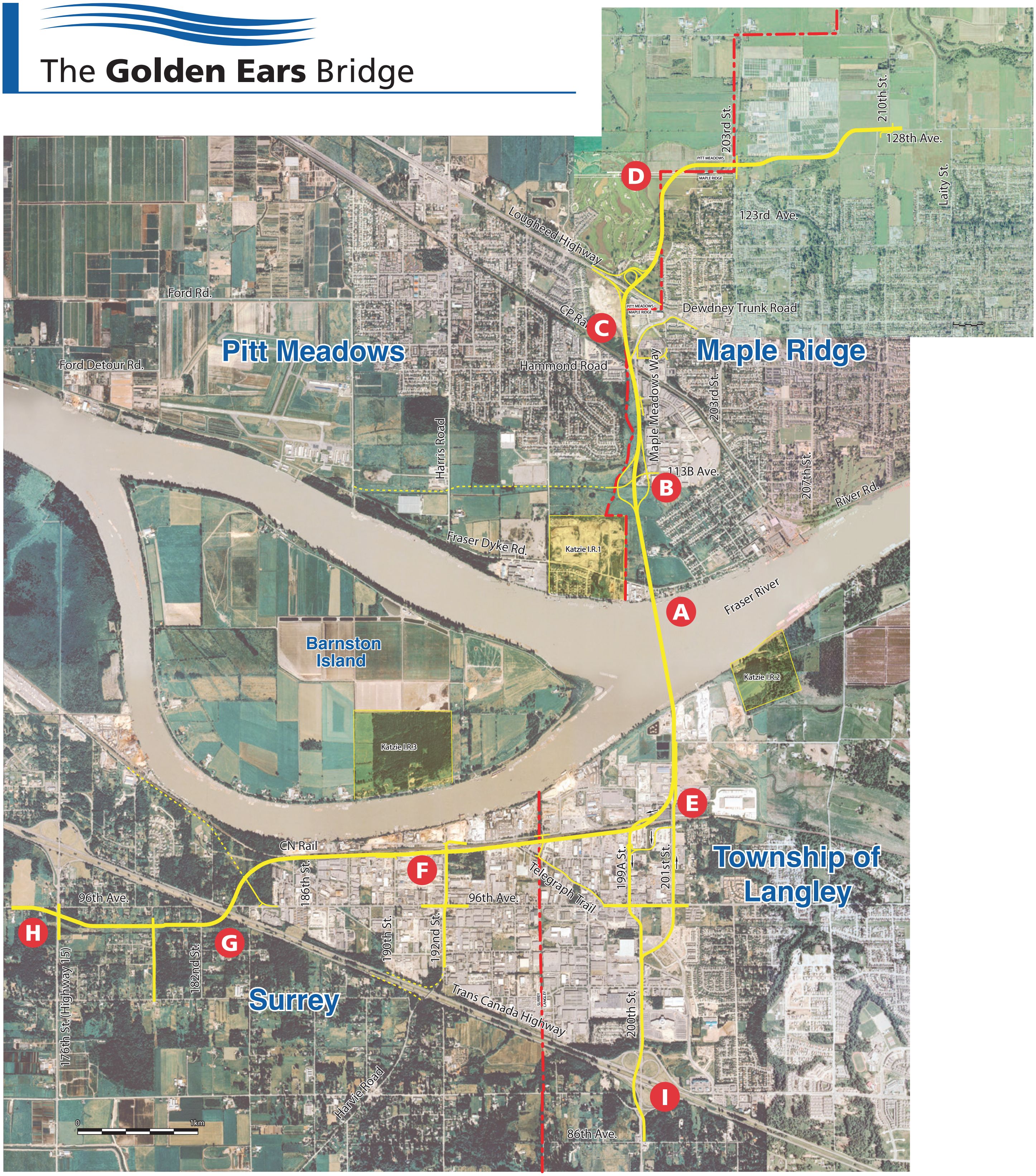
- If the scope of the project changes
- If it becomes apparent that a significant component has been mispriced or omitted
- To update financing rates in order to be comparable to proponent proposals
- To correct errors of fact including omissions
- To update for market information that is discovered upon review of proposals

All adjustments made to the Reference Case will be fully documented and defended via the financial evaluation supported by the Reference Case Development Team, to the Due Diligence Committee.

Under no condition will the Reference Case be adjusted to take into account any innovative approaches submitted by the DBFO Proponents.

Figure 1: Project Alignment

The **Golden Ears** Bridge



A A new high-level bridge across the Fraser River.

B An interchange at 113B Avenue.

C A new roadway heading north, crossing both the Lougheed Highway and the CPR tracks.

D The Abernethy Connector will head north and east from the new interchange at Lougheed Highway to 128th Avenue in Maple Ridge.

E An off-ramp to 199A Street and on-ramp from 201st Street connecting to 200th Street and Highway #1.

F A connection to 192nd Street, providing Port Kells access.

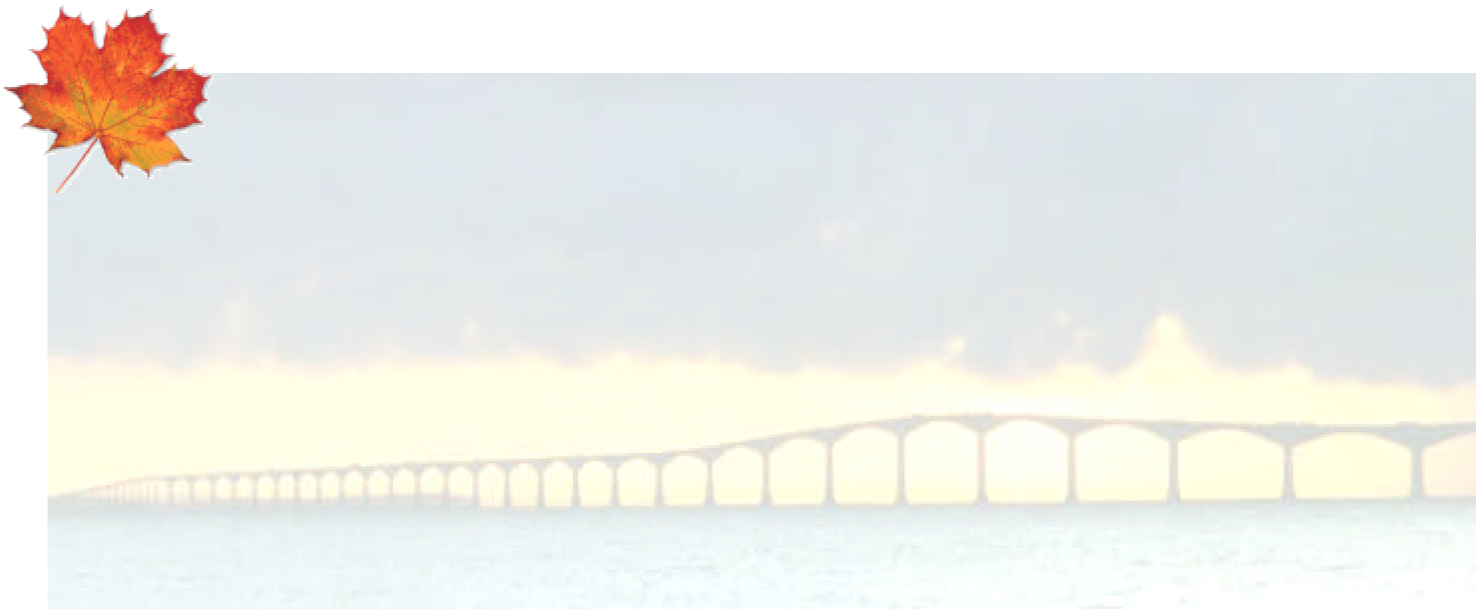
G A new east/west road connecting to Highway #15, after crossing under Highway #1.

H A new intersection at Highway #15, south of 96th Avenue.

I Widening of 200th Street from 201st Street to 86th Avenue.

Appendix A

The Public Sector Comparator, A Canadian Best Practices Guide(Section 3)



THE PUBLIC SECTOR COMPARATOR

A CANADIAN BEST PRACTICES GUIDE

Industry Canada Industrie Canada

MAY 2003

PREAMBLE

This is a self-help guidance document for the use of government officials and/or their advisors to provide one of many tools for assessing the viability of public-private partnership initiatives. Whether for the development of new infrastructure and associated services or the alternative delivery of existing public services, there is a need to evaluate proposals and compare submissions from prospective proponents and thereby to determine value for money for the Canadian taxpayer.

Industry Canada's public-private partnerships (P3) team is grateful for the valuable contributions to the development of this guide, by way of commentary, feedback and insights, of an informal working group of interested provincial and federal government representatives from across Canada.

We have operated under the shared premise that, in the interest of both time and money, it is not necessary to attempt to create a uniquely Canadian product. Rather, it is both more efficient and practical to draw upon the experience and best practices from various jurisdictions in Canada and other countries.

This draft was assembled with input from P3 Advisors Inc., an Ottawa based consulting firm specializing in providing strategic consulting advice to assess P3 viability and provide support during the development of P3s by all levels of government and the not-for-profit sector, (www.p3advisors.com).

This guidance material should be seen as a work-in-progress document that will be refined over time. Thus, for comment and further refinement to this version which is posted on Industry Canada's web site, (http://strategis.gc.ca/ppp) please contact:

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TABLE of CONTENTS

1. INTRODUCTION

In its ***Vision 2010: Forging tomorrow's public-private partnerships*** document, the Economist Intelligence Unit examined 12 governments across the world to determine how they are using public-private partnerships to cope with increasing public demands for higher quality services as well as to reduce their in-house costs. Among the findings was the following:

"Two-thirds of our survey respondents stated that the most successful government structure in 2010 will be one in which government focuses on policy and project/supplier management, allowing the private sector to deliver most traditional public services."[1]

In response to mounting worldwide evidence that public-private partnerships, prudently administered, can result in win-win results for both the private and public sectors, Industry Canada has been actively developing a tool kit for Canadian practitioners of public-private partnerships to ensure winning results are achieved for both the public and private participants. Whether for the development of infrastructure and ancillary services or for the delivery of existing public services by the private sector, this Best Practices Guide is specifically aimed at government administrators who need to assess options and make decisions which result in the most effective and efficient deployment of public monies, taking into account both financial and non-financial considerations.

The following best practices guidance material draws upon work undertaken in the United Kingdom by the Treasury Taskforce with respect to the U.K.'s ***Private Finance Initiative or PFI*** as well as more recent material developed for Australia's ***Partnerships Victoria***. Both organizations recognize the importance of addressing the key policy issue of ***how to ensure that value for money is achieved when a public-private partnership (P3) is undertaken.*** Thus, for all levels of government within Canada, the development of a "comparator", based on the fair and accurate valuation of internal or in-house costs, establishes a benchmark against which options can be compared and decisions can be made with respect to ensuring value is achieved for the Canadian taxpayer.

1.1. Why use a Public Sector Comparator?

Borrowing from Partnerships Victoria material "A **Public Sector Comparator (PSC)** is used by government to make decisions by testing whether a private investment proposal offers value for money in comparison with the most efficient form of public procurement." [2] In the Canadian context, this rationale is expanded to cover the assessment of options by internal and not-for-

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1 Vision 2010:Forging tomorrow's public-private partnerships. The Economist Intelligence Unit Limited and Andersen Consulting, 1999, Pg. 4

2 *Partnerships Victoria* Public Sector Comparator Technical Note, Department of Treasury and Finance, State of Victoria, 2001, Pg.1,

profit organizations as well as other levels of government and the private sector as prospective P3 proponents taking into account both financial and non-financial considerations.

A PSC thus assists government in assessing whether or not to use internal public or alternative financing for the development of infrastructure and ancillary services or for alternative delivery of existing services. Typically the PSC begins and ends with a rigorous examination of the "in-house" costs of implementing the project and assigning the various types of risks to the appropriate party that can best handle them. The development of a "comparator" results in a benchmark against which options are compared and value for money is assessed. Therefore, the PSC is a critical piece of the puzzle when embarking on an assessment of P3 options for infrastructure and services.

1.2. How has the PSC been used in other jurisdictions outside Canada?

In the UK, the central government enacted legislation to guide, facilitate and finance the development of Compulsory Competitive Tendering, Private Finance Initiatives (PFIs) and Public-Private Partnerships. These initiatives and their accompanying legislation, enabled the delivery of many new infrastructure projects, facilitated the introduction of private sector delivery of public services, and created a whole industry, including new companies, which focused on this market. An important component of the new regulations dealt with the affected public employees and the protection of their rights under PFI and P3 projects. This served to provide a level playing field for all prospective proponents. As part of its Treasury Task Force Technical Notes, the UK mandated that any initiative contemplating a PFI or a P3 had to develop a PSC based on a highly prescriptive process. This was necessary as funding for PFIs and P3s was provided by the central government from dedicated programs. As a result, a strict adherence to the prescribed methodology for the development of a PSC in the UK was an essential step to ensuring the forward progression of projects.

In the State of Victoria in Australia, the government enacted legislation to accelerate the development of P3s and it also provided the regulations for dealing with the various aspects that needed to be put in place for the successful introduction of P3s, including the funding mechanism. The State of Victoria PSC Technical Note is fashioned from the UK material and embeds the same type of prescriptive requirements to move the project forward, i.e. development of a PSC must be based on the Technical Note details before a P3 is considered to be adequately assessed and value for money determined.

As the UK and Australia have been implementing PFIs and P3s based on more structured approaches and methodologies than in other parts of the world, they have kept up with the related legislative and regulatory developments to sustain momentum, notwithstanding changes in government. An important distinction between the UK, the State of Australia and other jurisdictions is the fact that P3s were developed based on "central" policies accompanied by tools (legislation, regulations, funding) and a more mature P3 market.

1.3. The Canadian Context

P3s are not new in Canada, they have been in place under different names for many years. Canadian suppliers have been very successful in delivering P3s in Canada and abroad. Thus far, Canadian–based P3s have been developed without a 'central" agency, unlike the policy-driven UK model, which provided the tools and dedicated funding for the introduction of PFIs and P3s.

In Canada, we have, by and large, three levels of government that provide public services (federal, provincial - including territorial, and local - including municipal and regional) and a quasi-public, not-for-profit sector that provides certain public services, such as hospitals.

Each level of government has its own definition of what constitutes P3s, and its own approach to the development of the P3 business case and funding mechanism(s). To date, no level of government has initiated a program similar to the UK under PFI or P3, where tailored legislation and regulations were introduced and where predictable on-going long term funding is made available. Rather, in Canada, projects are assessed on a case-by-case basis, and in some instances, enabling legislation and regulations are developed as part of the P3 process. This should not be viewed entirely as a negative situation, for it is part of the Canadian fabric of delivering public services by the three levels of governments, where transfer payments, infrastructure funding programs and other mechanisms are in place. The trend evidenced in recent infrastructure funding programs is to promote the use of P3s as one of the tools to be analyzed in the development of project business cases.

The majority of the P3 projects developed in Canada will pass the scrutiny of a PSC value for money test. The notion of a PSC is, however, new in Canada, as different benchmarks have been used in the past to compare various options, such as in-house costs, internal costs, baseline costs, and in some cases, decisions were made without having completed a thorough assessment of the costs which would be incurred if the public sector delivered the infrastructure and ancillary services. In other cases, other non-financial considerations weighed heavier than pure internal costs, considerations such as regional industrial benefits opportunities, technology infusion, establishment of centres of excellence, special interest groups, etc.

In the next several years, with the public demanding higher quality infrastructure and services, P3s will become more prominent as a preferred tool to develop infrastructure and ancillary services, bringing with them ever increasing scrutiny of the approaches followed and the benchmarks used in determining best value for the taxpayers.

1.4. Structure of the Guide

This Guide, intended as a compendium of best practices material, was assembled with the view that each level of government and/or project type will develop its own specific approach to the preparation of a PSC. Therefore, the Guide is not intended as a rigorous step-by-step, prescriptive process for the preparation of a PSC.

Section 2 outlines the key objectives of this Guide, offers some insight into how it was assembled, and explains its intended audience and expected use.

Section 3 presents some of the best practices of the PSC, including the timing of the PSC, how to use the PSC in the procurement process, the need for accurate financial information, the importance of valuation when developing a PSC, what the differences are between the PSC and in-house costs and finally, some commentary on the impact which unsolicited proposals have on the PSC development.

Section 4 provides a checklist of financial information that is typically included in the PSC, such as direct costs, indirect costs, third party revenue, and life cycle costs. Also included is a discussion of some techniques for analyzing financial information, such as net present value.

Section 5 discusses some of the qualitative considerations when developing a PSC, such as how to deal with employment issues, including the transfer of existing staff, the importance of the economic development aspects, the relevance of technology infusion, and the interests of the respective levels of government and how to protect these interests.

Section 6 completes the guidance material by addressing some of the challenges that are inherent in the Canadian context, such as the lack of a formal policy for the development of a PSC, how to sell the PSC to public sector leaders, and how to deal with the challenges of indirect costs and risk quantification .

Key technical terms are defined in Appendix A: Abbreviations and Glossary

Appendix B presents a detailed costs checklist

Appendix C outlines a few tips and traps in developing the PSC

Appendix D presents some of the risk issues when developing the PSC

2. OBJECTIVE OF THIS GUIDE

2.1. Overall Objective

This document is intended to provide guidance on best practices for the development of a PSC. It is hopefully both "food for thought" and a user-friendly tool for public sector managers interested in developing a PSC and in understanding how a PSC is developed, used or interpreted in other Canadian or international jurisdictions. As a best practices guide, it explores some key factors necessary to ensure the integrity, and successful completion of a PSC.

This Guide is not intended to be too prescriptive in its approach; rather, it is intended that this Guide provide a kind of checklist for the public evaluation of P3 proposals. Moreover, it is hoped that the Guide proves to be both highly relevant and useful to government officials who are considering alternative service delivery and infrastructure development initiatives. The value of the guide material can be further enhanced when used in combination with P3 training now available in Canada. Please check Industry Canada's web site at http://strategis.gc.ca/ppp to find information with respect to training as well as informative P3 material and useful links to other P3-related sites.

2.2. Intended Audience

The intended audience of this guide is any public sector manager or public administrator contemplating a P3 initiative. As this is a tool, and a key piece of the puzzle to the development of P3s, care should be taken in applying the concepts of the PSC to ensure their relevancy to the project and to the legislative framework of the implementing government body.

For example, federal level managers can use this Guide to develop Level D costing for an intended project that could be developed as a P3. Alternatively, the guide could be used by a municipal administrator who is reviewing internal costs of delivery services to determine how they compare with other municipalities.

2.3. Intended Use

Ideally, this Guide is intended for use by the public sector manager to:

- Develop a PSC for a specific project under consideration;
- Compare an already developed PSC, or any of its derivatives, to the guidance material in this Guide, to identify gaps and update and revise the developed PSC;
- Provide contextual framework for the development of specific PSC policies or guidelines related to a particular level of government or sector that is considering P3s;
- Share examples of PSCs by any central agency or governmental department/ministry interested in P3s; and
- Provide a forum for commentary on the Guide in order to encourage the continuous

improvement of its content.

2.4. How the Guide was Compiled

This version of the Guide was compiled based on the following steps:

- A review of various references on the PSC from the UK and Australia;
- An assessment of the relevancy of the gathered information to the Canadian context;
- Comments from earlier draft versions that were circulated to interested public and private sector individuals;
- Discussion with P3 practitioners in the public and private sectors;
- Research on existing Canadian PSC best practices and PSC examples (notwithstanding the limited number of documented PSC examples); and
- Accessing consulting resources to review and fine-tune the Guide.

2.5. Limitations and Qualifications

Caution should be used when applying the best practices concepts of this Guide as each situation is different and various jurisdictions may have regulations, guidelines, freedom of information considerations or accounting principles that are not always consistent with the material herein. In some instances, it may be prudent to seek legal advice prior to starting the development of a PSC in order to determine the best course of action and appropriate procurement practices.

It should be noted that no level of government is mandating the use of this guidance material for the development of P3s, the evaluation of proposals or for deciding on procurement tactics. As best practices, they are presented for consideration only.

Industry Canada, its advisors and consultants are held harmless in the event of any dispute(s) concerning the application of the concepts of this Guide.

3. BEST PRACTICES OF THE PSC

3.1. Definition of the PSC

The U.K. material defines the PSC as a hypothetical, risk-adjusted costing by the public sector as a supplier, to an output specification produced as part of a procurement exercise. Accordingly, it:

- Is expressed in net present value terms;
- Is based on the required output specifications; and
- Takes into full account the risks which would be encountered by that style of procurement.

The public sector comparator serves the following purposes:

- To determine if the project is affordable to government by ensuring full life cycle costing at an early stage;
- As a means of testing whether a P3 is viable and demonstrated Value for Money;
- As a management tool during the project to communicate with partners on such key aspects as output specifications and risk allocation; and
- As a means of encouraging broader competition by creating greater confidence in the bidding process.

The evidence that value for money has been achieved is normally provided through the use of a public sector comparator; however, other factors may include any/all of risk transfer considerations, service quality and wider policy goals. Obviously, the more complex the procurement decision, the more factors, other than merely cost, which must be considered. These other factors come into play particularly when the comparator is close to or even less costly than the external bidder.

Each P3 project is unique. As such, there is no prescriptive formula or approach which universally applies to the determination of value. As a general practice, with respect to cost effectiveness, the amount of effort expended and degree of analysis undertaken in the determination of a comparator should be commensurate with the scale and scope of the proposed project.

3.2. When to Develop and Update the PSC

The PSC should be prepared as soon as practical, typically early on in the planning process to develop a P3. There are two broad types of P3 projects that involve the development of a PSC:

1. P3 projects intended to take over the ownership/operation of existing public facilities and services by the private sector. In this case, the direct base costs are usually known, a rough order of magnitude is constructed to get a general feel for the possible scale of the

P3, and the types of risks in order to conduct a pre-feasibility/review of the potential success of the P3. Once approval of the pre-feasibility/review is obtained a more in depth PSC should be constructed to capture as much as possible life cycle costs, direct and indirect costs and costs of the risks to be transferred (if any).

2. A new development of infrastructure and/ancillary services. In this case, once approval is obtained to conduct the analysis of the project, a full fledged PSC should be developed, based on in-house costs, and utilizing any data available from similar projects or from market intelligence or estimates obtained from a market sounding.

In all cases, the PSC should be constructed early on in the planning process at the highest level and updated and detailed throughout the planning process before embarking on the procurement process. The final version of the PSC is usually included in the project approval document to move forward to the procurement stage. The PSC is an integral component of the business case document and at this stage should be considered as the best estimate for the benchmark until submissions from the market are obtained. Only then, should any amendments to the PSC be considered.

3.3. The PSC and the Procurement Process

Depending on the type of procurement process (stages) followed, the PSC should be an integral part of a fair, open and transparent process.

In the case of a 1- or 2-step procurement process, i.e. RFP and Negotiation, or RFP with no negotiations, the PSC should be constructed before the issuance of an RFP document.

In the case of a 4-step procurement process: Request For Expression of Interest (RFEOI), Request for Qualifications (RFQ), Request for Proposal (RFP)and Negotiations, the PSC should be constructed and updated until the RFQ stage.

Once bids are received, it might be prudent to re-evaluate the business case, including the PSC, in order to ascertain affordability.

3.4. How to Use the PSC

As part of the procurement tactics, a strategy should be developed for the use and disclosure of the PSC. In a fair, open and transparent process, it is important to communicate that strategy as part of the process. Below are some situational examples indicating how the PSC might be used:

- In a mature P3 sector, a summary PSC should be disclosed as part of the procurement process while indicating that the government is looking for a minimum saving of X% over the PSC financial figures, given a specific set of non-financial considerations. Each prospective bidder might be required to sign a non-disclosure agreement before obtaining the PSC document.

- In a new P3 sector, especially with the first procurements, the PSC document may not be made available to the prospective bidders; rather, a general indicative budget may be provided as part of the RFQ or RFP documents.

- For P3 procurements that do not include new infrastructure development, the PSC detailed information is typically available in a data room as part of historical costs.

In all cases the PSC, as a project benchmark, is to be used as a comparison to the submission received from the market to assess the value for money test.

3.5. Accuracy of the PSC

Depending on the complexity of the project, size of the investment sought, degree of risk to be transferred, maturity of the P3 sector, maturity of the service providers' market and past experience with similar procurement, a PSC should be prepared to a level of detail that will allow sensitivity analysis to be conducted with a high degree of confidence.

Care should be used in determining the level of detail and accuracy. In all cases, detailed assumptions should form part of the PSC documents and disclosure of the source of information should also be included in the PSC document. For large size projects, it is not unusual to spend several months of effort constructing a PSC; however, common sense should prevail to determine the level of detail to be included.

3.6. Risks and the PSC

As the PSC is a risks-adjusted costing for the delivery of infrastructure and/or services based on public sector procurement techniques, the identification, analysis, quantification and allocation of risks often proves to be the most controversial aspect in developing a PSC. Examples from the UK, Australia and Canada confirm the sensitivity of how to tackle the risks elements in a PSC.

The degree of effort in identifying and evaluating risks should be commensurate with the complexity and scope of the proposed P3.

The risk analysis typically follows these steps:

- Construction of a risk matrix, i.e. categories of risks that might be encountered by the public sector entity in developing the project. For example delivery risks that the public sector will deliver the project later than planned;
- Identification of specific risks (see Table 3.6. below);
- Quantification/Calculation of the consequences of risks, i.e. the value assigned to each risk if the public sector is developing the project. This is probably the most contentious

issue in the analysis of risk as it is very much dependent on the availability of information pertaining to past project delivery by the public sector. For example, the value assigned the public sector to deliver the project later than planned can be expressed in terms of possible overruns, lost revenue if the project is late and additional transition if the P3 is replacing an existing project;

- Estimation of the probability of risks for each risk identified and quantified. For example, based on past public sector delivery techniques, what is the likelihood (probability) that the project will be delayed;
- Valuation of the cost of the risk, taking into consideration the quantification and the probability of each risk; and
- Allocation of risks. For example, which risks should be transferred to the P3 proponent and which ones retained based on the premise that risks should be borne by the party that can better manage it at the least cost.

Appendix D provides additional detail on risk considerations for a PSC. Simpler techniques have been used to assess risks in a project by utilizing a scale for each risk and a tiered system for the probability of occurrence. For example, all types of risks could be categorized as resulting in:

A. Catastrophic disruption to the services;
B. Significant disruption to the services;
C. Medium disruption to the services; and
D. Minimal disruption to the services.

Each risk could be subjected to a tiered system of occurrence: high, medium and low.

The analysis, while subjective and not quantitative, might provide for a quick filter to focus the analysis on the risks that are of types A or B and that have a high degree of occurrence, therefore spending effort to quantify those rather than ignoring the whole risk analysis.

Table 3.6.: Identification of specific risks

Construction risk	The risk that the construction of the physical assets is not completed on time, to budget and to specification.
Demand(usage) risk	The risk that demand for the service is lower than planned.
Design risk	The risk that the design cannot deliver the services at the required performance or quality standards in the output specifications.
Environmental risk	The risks that the project could have an adverse environmental impact which affects project costs not foreseen in the environmental impact assessment (EIA).
Financial risk	The risk that the private sector overstresses a project by inappropriate financial structuring.

Force majeure risk	An unanticipated unnatural or natural disaster such as war, earthquake or flood of such magnitude that it delays or destroys the project and cannot be mitigated.
Inflation risk	The risk that actual inflation differs from assumed inflation rates.
Legislative risk	The risk that changes in legislation increase costs. This can be sub-divided into general risks such as changes in corporate tax rates and those which may discriminate against P3 projects.
Maintenance risk	The risk that the costs of keeping the assets in good condition vary from budget.
Occupancy risk	The risk that a property will remain untenanted - a form of demand risk.
Operational risk	The risk that operating costs vary from budget, that performance standards slip or that the service cannot be provided as per output specs.
Planning risk	The risk that the implementation of a project fails to adhere to the terms of planning permission, or that detailed planning cannot be obtained, or, if obtained, can only be implemented at costs greater than in the original budget.
Policy risk	The risk of changes of policy direction not involving legislation.
Residual value risk	The risk relating to the uncertainty of the value of physical assets at the end of the contract.
Technology risk	The risk that changes in technology result in services being provided using non-optimal technology.
Volume Risk	The risk that actual usage of the service varies from the level forecast.

3.7. Baseline Costs and the PSC

Baseline costs are typically calculated for services that are currently being provided by a public entity and which are subjected to a review that could involve a P3 option. The baseline costs are a reflection of the historical costs for providing the services under review, based on a set of assumptions regarding future needs of these services in terms of growth, reduction, a new type of service based on changes in demographics, public policy or any other considerations.

The baseline costs are usually presented for the most recent year of operation assuming that the year under consideration is a "normal year" adjusted to take into account special activities and based on sound commercial practices. Adjustments to normalize the figures could be for a variety of reasons such as:

- A one time non-recurring activity;

- Major capital upgrade to facilities;
- Actual level of services were higher or lower than previous years because of weather; and
- Anticipated adjustments to wages based on the latest collective agreement negotiations.

The objective of the normalization is to present an adjusted baseline that reflects the most likely outcome in a typical year. A “normal year” should not be confused with an average year. An average year is simply a mathematical average of the information that is reviewed which could include several years of under/over spending, therefore the average may not be representative of a “normal year” of operations.

The normalized information pertaining to the “normal year” becomes the basis for forecasting future expenditures for a predetermined level of service. The forecasts should be for the same period of review as the PSC. The baseline costs become the raw costs that go into a PSC calculation to be adjusted for other factors such as hidden costs, assumed costs and risks.

Also, a Baseline document will cover non-financial information such as the level of service, performance standards, current organizational set-up and other qualitative information to describe the services under review. It is like creating an information repository for possible bidders who are interested in buying a business, where such information is usually available in a data room to assist in the conduct of a due diligence exercise.

3.8. In-house Bids and the PSC

There should be no distinction between in-house and private sector proposals. Typically, in-house bids are encouraged when the services are currently provided by the public sector rather than when new infrastructure is needed to provide services. Affected staff or other internal staff could form an in-house bid team.

For an open, fair and transparent competitive procurement process to prevail, work on the PSC or other internal baseline documents should be conducted by people that are not attached to the in-house bid. While early work may involve staff who may become part of the in-house bid team, their work should be communicated to all prospective bidders. Furthermore, as soon as an in-house bid team is formed, separation should be instituted between the in-house bid team and the project team managing the prospective procurement.

The PSC should be constructed in the same fashion, whether an in-house bid is contemplated or not, as the PSC is to be used as a benchmark to ascertain value for money.

In the case where in-house bids are anticipated, the PSC and other tools used during the procurement process should address issues like taxation, internal support and administrative services, capital usage charges and staff costs in order to achieve competitive neutrality.

3.9. Unsolicited Proposal and the PSC

Whether the public sector entity entertains an unsolicited proposal (UP) or not, a PSC should be constructed as part of the value for money test.

A PSC must reflect the public sector need and not simply use or necessarily adapt the private UP solution as the basis for costing. Accordingly, careful analysis and scrutiny of the UP technical output should be conducted and generally several additional approvals and disclosures will be required to ensure that fairness is maintained.

There are several policy frameworks for dealing with UPs, either the Swiss challenge, shadow bids or other mechanisms; notwithstanding, in all cases a properly constructed PSC is needed.

3.10. Value for Money and the PSC

While the PSC is basically a costing and a financial analysis document, value for money should not be considered merely from a monetary perspective; rather, value for money should also include other considerations that satisfy the guiding principles that the public sector entity has established to engage in a P3.

While the PSC should be used as a benchmark to compare life-cycle costs from various bidders, it may not be the only benchmark to determine the final outcome of the procurement process. Each case should be considered on its own merits and qualitative considerations, if they exist, should be communicated to the market before starting the bidding process. The next chapter presents a financial description or checklist of items that can be included in a PSC, followed by a short presentation of some of the qualitative considerations that may be considered in assessing value for money.

4. PSC FINANCIAL CHECKLIST

4.1. Life Cycle Costing Approach

The PSC is calculated on the basis of the net present value of the expected life-cycle costs to the public sector of what is typically articulated as a Reference Project. The Reference Project is generally described in terms of the output specifications for the design, construction, operation and maintenance of a project over the expected length of the contractual arrangement and covering all the costs associated with it. Typically, the direct costs cover:

- Initial Capital Outlay;
- Operating and maintenance costs; and
- Capital upgrades.

The costs should be expressed in constant dollars based on the year that they are likely to occur. Added to the above direct costs are indirect costs associated with the delivery of the infrastructure and services, those indirect costs could cover such items as:

- Administrative overhead;
- Assumed or hidden costs;
- The cost of transferred risks;
- Other costs, such as surplus property or equipment; and
- Expected third party revenues that could be shared between the parties.

The above indirect costs/third party revenue should also be expressed in constant dollars and allocated to the year in which their impact will occur.

Adding the direct and indirect costs year by year will present the expected total costs of the project over its expected life, hence, its life-cycle costs. The total costs per year or cashflows, expressed in constant dollars, are imputed by the appropriate discount rate to obtain the net present value of the life-cycle costs.

As a very simple illustration of the above, assume a project that has a five year life span, costing $100m in year one to build, $20 million in years two to five to operate, requiring a capital upgrade of $10 million in year 3. The indirect costs are estimated at $1 million in overheads per year starting in year 1 and $3 million in assumed or hidden costs per year. The property will be transferred to the public sector at the end of year 5 at which time it will be disposed of for $50 million. It has been assumed that the costs will be incurred at the same time during each year. The discount rate (cost of capital) is assumed to be 6%. Table 4.1 provides a way to present the above information in discounted cashflow fashion:

Table 4.1 – Illustrative Cashflow Example

Year	Capital	Operating	Indirect	Disposal	Total	Discount Factor	Discounted Cashflow
1	100		4		104	1.0000	104.00
2		20	4		24	0.9434	22.64
3	10	20	4		34	0.8900	30.26
4		20	4		24	0.8396	20.15
5		20	4	-50	-26	0.7921	-20.59
Total	110	80	20	-50	160		156.46

In this simple illustrative example, the net present value of the life-cycle costs of the project is $156.46 million. If no other considerations are used to compare the PSC to the P3 bids, value for money could be achieved if the lowest price private sector bid is less than $156.46 million in discounted net present value cashflow terms.

The discount rate to be used should reflect the public sector value of money plus a possible premium for the systematic risk inherent in the project. It can be argued that the public sector should use the private sector’s cost of capital which takes the risk into account. (The public sector’s internal cost of borrowing inevitably reflects an implicit tax subsidy).

4.2. Direct Costs

Direct costs are those that can be traced or assigned to particular project elements. The PSC should include all the assumptions underlining the estimation of the direct costs, their source and their accuracy if available. Direct costs should reflect the best estimates based on public sector traditional procurement methods and not on the assumed efficiency of the private sector.

Direct costs of a project could be grouped under two major headings: Capital and Operating.
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4.2.1 *Direct Capital Costs*

Capital costs are those needed to construct or upgrade the facility, these costs typically include:

- Design;
- Land;
- Construction;
- Material;
- Plant and Equipment;

- Demolition;
- Inspection;
- Modification/Improvement/Upgrades throughout the life of the project;
- Transition costs;
- Permits; and
- Public Procurement Processes including external consulting.

Estimates for the sale or disposal of assets and or the residual value of assets at the end of the useful life of the project, should either be deducted from the direct capital costs or included in third party revenues.

4.2.2. *Direct Operating Costs*

These are the costs that are necessary to operate and maintain the facilities based on a set of performance standards and service levels. It is important to address any anticipated changes in the services over the life of the project, for example if demographics impact the types and levels of services in future years, their impacts need to be described in terms of estimated deceases or increases in the operating costs. This is normally true for municipal recreation services, where the types and expected quantity of services will change over a twenty year typical life span for a new facility. Consideration must be given to additional or different services when needed to address demographic changes.

Direct operating costs can include the following:

- Staff wages, salaries and benefits
- Material and consumables
- Tools and equipment
- Rentals
- Utilities
- Support subcontracts, such as cleaning, HVAC, landscaping, snow removal, etc..
- Repairs and Maintenance (preventive and corrective)
- Security
- Emergency and unplanned repairs
- Quality assurance and Audits

4.3. Indirect Costs

Indirect costs are those that can be incurred which are not directly related to the provision of services or those assumed by the public sector entity.

Typically, indirect costs fall under two headings: Overheads and Hidden or Assumed Costs.

4.3.1 *Overheads*

Overhead costs include a portion of corporate and administrative costs that can be allocated to services. These overhead costs are usually for centrally provided support services such as:

- IT support;
- Accounting;
- Human Resources;
- Project Management;
- Space, if co-located with other units;
- A portion of senior management time; and
- Shared Services, such as procurement.

Each case is unique and requires a thorough analysis to determine the best way to estimate overhead costs. Techniques for estimating overhead costs include allocation methods based on a variety of factors that act as drivers to support the services, or more elaborate activity-based costing methods which capture the costs of the services according to the consumption of each activity. In other instances, some public organizations have determined a certain percentage multiplied by its direct costs, based on historical trends, serves as a proxy to its overhead costs. Care should be exercised in determining the overhead costs and their estimation methodology.

4.3.2. *Hidden or Assumed Costs*

These are indirect costs that cover items such as:

- The provision of services by another level of government that otherwise would not be available from a private sector entity at the same cost, such as normalization of grants-in-lieu of taxes as a proxy for property taxes.
- Insurance costs for assets and services that are typically not insured by a public sector entity as it was deemed from a risk management perspective to self insure the facilities.
- Assumed costs which include any Government Furnished Equipment (GFE) to be provided to the facility at a lower cost than market value.

The intent of these indirect, hidden or assumed costs, is to normalize the costs between the way a public sector entity might deliver infrastructure and related services and the way a private sector provider might establish its comprehensive costs for the project.

4.4. Risks Adjustments

As described above in Section 3.6 – Risks and the PSC, the assumption of certain risks that the private sector is better equipped to manage and mitigate is one of the fundamental principles of P3s.

The quantification of these risks is generally both complex and controversial, thus care needs to be exercised in attempting to assign value to risks. Consensus building between all affected stakeholders will ensure that the project risks have been validated and the success of the project is enhanced. Several P3s have either stalled, delayed or cancelled because of the subjectivity involved in the quantification of certain risk elements of a project.

Based on the illustrative example used in Table 4.1 of this section, the risks of this project are assumed to be the following:

- *Construction risk*: an overrun of 20% of the capital costs is anticipated based on historical trends of the public sector delivery history, 50% of the time. Therefore the construction risk will be $100 million multiplied by 20% overrun multiplied by 50% probability, which makes it $10 million in year one.
- *Life cycle capital allowance risk:* $10 million in year three carries a moderate degree of risk, as the technologies are changing rapidly; therefore, it is assumed that these costs might be higher by 50%, with a probability of 50% of this happening. Therefore, the cost of this risk is quantified at $2.5 million.
- *Operating Cost risk:* given the new types of services to be delivered, operating costs will increase by 50% in year two, 25% in year three and 12.5% in years four and five. The probability of the increase occurring is 20% based on past public sector experience; therefore, in year two, an additional $2 million should be included in the operating costs, $1 million for year three and $0.5 million for years four and five.
- *Indirect Costs risks:* are deemed to be very minimal and given that the total life cycle indirect costs are 12.5% of the total life cycle costs, it was determined not to quantify these risks.
- No other risks were identified as significant.

Based on the above scenario, the previous Table 4.1 is expanded to include risk adjustments in Table 4.4 as follows:

Table 4.4 – Illustrative Cashflow Example Including Risk Adjustments

Year	Capital	Operating	Indirect	Disposal	Risk Adjustment	Total	Discount Factor	Discounted Cashflow
1	100		4		10	114	1.000	114.00
2		20	4		2	26	0.9434	24.52
3	10	20	4		3.5*	37.5	0.8900	33.38
4		20	4		0.5	24.5	0.8396	20.57
5		20	4	-50	0.5	-25.5	0.7921	-20.20

* The sum of $1.0M (operating cost risk) and $2.5M (Life cycle capital allowance risk)

Total	110	80	20	-50	16.5	176.5		172.27

Thus, taking the risk adjustments into account, a further $16.5 million ($15.8 million in net present value terms) is added to the total costs. The risks effectively increase total project costs by 10 per cent.

4.5. Third Party Revenues

Forecasting potential third party revenues can be a particularly difficult aspect of the PSC especially where there is little or no historic data available. The two key variables of price and quantity should be identified separately but the inter-relationship between these two variables (or demand curve) should not be overlooked. The need for specialist advisers should be considered. Notwithstanding, the amount of time and money put into this exercise should reflect the materiality of the amounts involved.

A possible area for third party revenues which could have a positive impact on the bottom line cost of the PSC, is the potential for the private sector proponent (to be allowed to) provide other complementary services on the site, such as additional floors within the facility to attract other tenants, thereby reducing the cost to the public sector tenant (or anchor tenant). This will largely depend on the private sector proponent's risk appetite. Historical trends have shown that third party revenues are generally not a very material part of a public sector facility. Nevertheless, care should be exercised in addressing this issue of third party revenue. Detailed assumptions need to be presented to substantiate the results, as private sector bidders accept the notion of third party revenue. It is important to undertake a thorough due diligence on this item as it might represent a major risk element in the deal.

4.6. Financial Analysis Techniques

As illustrated above, a discounted cashflow yielding a net present value (NPV) over the expected life of a project is the major technique used in presenting the results of the PSC analysis. Other techniques may be used to develop certain aspects of the PSC, such as the return on investment for a specific investment, or the pay-back period when analyzing capital funding of various utilities upgrade options during the life span of a project.

In all cases, sensitivity analysis should be conducted to verify the robustness of key assumptions and to determine the vitality of the PSC when exposed to potential changes in those assumptions, risk factors and the predicted operating environment over the life cycle of the project. Sensitivity analysis can be used for the following purposes:

- for comparison with bids to identify the changes in base assumptions which would result in a different evaluation decision being reached; and
- to determine the relative robustness of the PSC to differing bids. This may be assessed as a qualitative factor if the PSC is close to the lowest bid.

Again, as a general rule, the amount of sensitivity analysis performed should reflect the materiality of key variables, the complexity of the PSC and the proximity of the PSC to the lowest cost bid. Variables that are typically analysed using sensitivity analysis include:

- length of the project (both the construction and concession periods);
- discount factor; as a proxy to a private sector debt versus equity ratio;
- construction costs, schedule and completion dates;
- total service demand;
- total operating costs;
- indirect costs;
- third-party revenue; and
- residual value.

Where possible, the financial model should be developed to allow different values for key variables over time.

4.7. Funding Sources

Various provincial governments are encouraging the consideration of P3s. Moreover, the federal government has recently established several infrastructure initiatives which promote P3 developments.

In establishing the PSC, it will be very difficult and at times, inappropriate to assume that there will be funding available for P3s from the various levels of government. The analysis should be constructed based on a best public sector solution and if other sources of funding become available during the procurement process these should be used to reduce the costs to the public sector and not necessarily as a prerequisite for embarking on a P3.

5. PSC QUALITATIVE CONSIDERATIONS

A PSC is often viewed as a one-dimensional approach to project assessment that focuses primarily on financial factors, investment appraisals and accounting issues.

This tends to overlook a broad range of social, economic and environmental factors in adapting a P3 approach as a means to generate social and economic well being and encourage an innovative role in environmental stewardship.

In any event, a public sector comparator is not the only determinate for assessing value for money for a public sector investment (s).

5.1. Socio-economic Policy

A PSC should be developed from an option appraisal conducted during the planning phase and in advance of the bidding and proposal assessment stage. The principal definitions in the analysis include:

- specific assumptions underlying the comparator; and
- variables that will have significant impact on full-cycle costs

The construction of a PSC for a P3-based project is seldom a straightforward exercise. The analytical framework within which PSCs are applied is based on the creation of a hypothetical design, build, operate contract using empirical evidence, recent experience, and judgment (which involves comparison, discrimination and insight) to estimate and create representative measurements or benchmarks.

In practice, many of these estimates can vary substantially. Each project will have a different dynamic and require considerable analysis to get things right. Small alterations to financial assumptions, or minor changes to annual operating cost assumptions, can reflect significant differences in full-cycle costs. As well, not every model of prior infrastructure investment can be copied, automatically imitated or be deemed relevant in all respects.

Beyond financial considerations in the assessment of whether or not a proposed P3 offers value for money, policy imperatives may require the inclusion of social-economic performance criteria within particular projects. Determining the all-in, life-cycle costs to the public sector not only includes financing, overheads, maintenance, self-insurance and so on but may require the inclusion of costs related to the promotion of, or adherence to, social, economic or environmental stewardship policy considerations. Furthermore, case projects are viewed as a consistent whole rather than from a single perspective.

Social-economic factors are crucial because the implementation of a P3-based initiative is based primarily on an assessment of whether or not a particular project has economic or social value. Most P3-based initiatives have underlying social and economic development objectives.

Project design can be influenced by considerations from a number of perspectives.:

- the advancement of regional development goals, e.g. the siting of fixed infrastructure or on-going service operations;
- the advancement of social benefits; e.g.:
  - equal and equitable service access;
  - skills transfer and the creation of sustainable local employment;
  - assurance of employment equity (affirmative action, non-discrimination employment practices, etc.);
  - equality of access for language, cultural or regional interests; and
  - offsets or application of set asides for aboriginal or local businesses.
- the imposition of privacy and security considerations, e.g. information technology infrastructure building and operation;
- the creation of economic benefits, e.g.:
  - nurturing and supporting vertical and horizontal linkages among small, medium and large-size enterprises; and
  - (to the extent permissible under trade agreements) the integration of commitments to support the participation by local/regionally-based businesses such as:
    - identification and promotion of technology diffusion or transfer opportunities; or
    - development of local expertise/skills and export capabilities.
- establishing linkages between public sector investment and construction industry capacity for participation in P3-based initiatives; and
- facilitating technology transfer between public and private sectors.

5.1.1 *Accounting for social-economic policy imperatives in planning the project*

The environment within which public policy is being developed and deployed is becoming increasingly complex. Socio-economic policy considerations often form a significant part of the decision-making process in public sector infrastructure initiatives. The requirements reflected in the advancement of public sector investments are generally somewhat of a holistic “weighing up” of public interests.

While potential distortions in the development of a PSC can occur by reference to wider policy objectives, it is important within any P3 evaluation to assess the weight to be attached to various policy imperatives.

The wider the range of services requested under a P3, the wider the range of socio-economic considerations. This may mean organizing a P3 initiative around public policy themes, not just financial/operational considerations.

Where such over-riding policy considerations apply, the costs of implementation must be factored in the business model and financial arrangements.

It should be recognized that a PSC is only a partial method of assessment. P3s require a full and comprehensive social, economic and environmental review of public versus private sector options.

5.2. Balancing Public versus Private Sector Interests

A P3 is a legal arrangement between two or more parties who have agreed to work collaboratively towards shared or compatible objectives and in which there is shared authority and responsibility, joint investment of resources, allocated or shared liability and risk-taking, and mutual benefits.

A P3 requires criteria to establish the nature of the business relationship relative to its public versus private value. Operationally, in the case of a P3, partnering is commonly defined as delegating to the private sector some or all of the financing, design, development or operation of public infrastructure and services. Profitability for the private sector participant versus broader public policy concerns about technology transfer; equity of access; language or ethnic considerations; or educational, human development and community benefits, need to be clearly understood. The imposition of commercial criteria on public sector operations or vice versa may not be valid. In a public system, managers serve socio-political interests. In a private system, managers serve commercial interests. These interests could be in conflict from time to time, and need to be clearly identified in the analysis process.

The business planning process for a P3 engagement must facilitate a shared understanding of the intent of the partnering arrangement (e.g. access to capital, technology, and business know-how) while maintaining government's public policy interests and priorities. The elements of the project that represent the public interests should be identified during the planning phase as they will require definition in financial structures and legal agreements at the implementation stage.

Engaging the private sector may also require additional financial support to mitigate risks or requirements imposed by legislative or policy considerations that require tailoring the project to specific social-economic objectives.

Fulfillment of public policy commitments throughout the duration of the project may also represent a substantial contingent liability in the event of a failure of the project company.

5.3. Environment Stewardship

Environmental stewardship is a major public policy consideration in infrastructure development or regeneration projects. It encompasses:

- energy conservation and protection measures;
- adopting new architectural and maintenance technologies, i.e. eco-efficient infrastructure design requirements;
- incentives for the use of eco-efficient technologies; and
- facilitating the identification of eco-efficient technology choices.

When embarking on a P3, the costs required for compliance with such public policy obligations or objectives need to be quantified at the project planning stage.

5.4. Human Resources

Human resource considerations generally relate to one-time costs associated with entering into a P3. These may include:

- severance packages; and
- successor collective bargaining rights.

The application of fair wages and benefits policies may also form part of "the deal" and will have to be reflected in on-going operational costing scenarios.

5.5. Bridging National, Regional and Local Considerations within the Assessment Process

The community needs of a province, region or local area are an important element of federal P3 initiatives where it may be envisaged that the effects of increased local business participation in a P3 will multiply throughout the community. These may include:

- opportunities for local builders/investors to participate in innovative proposals; and
- scaling the project or its components in a manner that allows for local small and medium sized enterprises (SMEs) to participate.

Where such criteria are applied, PSCs will have to reflect such policy overrides.

Bridging national, regional and local considerations within the assessment process also requires pro-active communication between socio-economic development policymakers, project proponents and the broader community of stakeholders. This could include:

- meeting early in the project development cycle to discuss overlapping issues;
- promoting shared understanding of both financial and over-riding public policy objectives; and
- orchestrating collaboration and cooperation during the planning and design stage.

It is important to carefully consider the interests of the various parties involved and provide for participation by community leaders as well as consultation with potential business community participants.

5.6. Participation of Small and Medium Sized Enterprises (SMEs)

Small and medium sized enterprises, whether in design, engineering, technological developments or services are the source of significant innovation that can be captured within P3 initiatives.

Whether short-term optimization and the subsequent conditions for financing P3s provide opportunity for participation by small and medium sized enterprises (SMEs), or limit participation to large, mature firms is a significant policy consideration.

Where public policy considerations for the inclusion of SMEs (at the national, provincial or local level) are applied, the PSC must be prepared in such a manner that it recognizes the possible financing and contractual arrangements that would be required to engage or include these potential private sector players in the project.

SMEs may have limited capacity to participate in design/build requirements, particularly where a call for a P3 proposal includes financing, because of the limitations on their access to capital or their own capital structure. In addition to lacking the financial resources to invest in large infrastructure projects, they may not have the experience of participation in consortia or in managing specific project risks.

"Packaging" the design, build and operate work and the support of long-term relationships that recognize SME conditions would have to be addressed within a proper business dimension. The design of a P3 may have to devise special methods for estimating the costs of such requirements and assessing the impact on operational and financing designs.

Canadian companies, particularly at the SME level; (a) may have no experience in P3 deal making, (b) limited experience in constructing or participating in multi-discipline consortia, and (c) face limited experience within local financial institutions who could potentially support their participation.

Engaging smaller local firms may increase risk and costs – the opposite of value for money in the traditional sense – and perhaps more importantly may also preclude the allocation of risks to those best placed to manage them. If transfer of risk is paramount, then some firms can not play.

If local participation is an objective, and there is an assessment that the number of potential local suppliers is limited, then the planning also requires the project be structured in a manner that can nurture participation by SMEs and stimulate local competition. This includes such factors as the length of contracts, appropriate allocation of risks; payment mechanisms and incentives and mechanisms that afford SMEs to participate in offering innovative approaches to construction or service requirements.

While construction and finance costs may be higher, they may be offset by being more innovative in the design, construction, maintenance and operation of a project over the life of the contract.

5.6.1. *Tailoring Financial Arrangements/Benefits-Risk Sharing for SME Participation*

Financial models within the PSC and P3 modeling exercises are developed at a very early stage. These models are used both for risk and equity allocation and for benchmarking performance expectations and generally define:

- fundamental principles;
- investment and remuneration criteria (including any attribution of benefits);
- accounting principles;
- the acceptable term of financial arrangements (consistent with the requirements of the private sector to recover their investment and make a profit); and
- realistic discount periods based on the nature of the assets or infrastructure to be employed.

These financial models also adopt pricing as a mechanism for the transfer of risks, for example:

- payments referenced to benchmarked (current) costs of services;
- guarantees or assignments for statutory pricing provisions or social policy requirements; or

- output specifications and appropriate payment mechanisms that properly reflect the desired approach to risk allocation;
- transactional-based allocations;
- service availability versus volume/usage payments for core services;
- financial incentives for superior performance or penalties for non-compliance
- how private capital used in the creation/renewal of public assets or services can be secured based on the chain of financial rights and obligations in respect of the assets being created; and
- provisions to fairly protect the interests of all parties in the creation of the assets, particularly intellectual capital.

The design and structure of all these elements may be affected by the inclusion of a public policy imperative to use a P3 initiative to support SMEs. In that event, the form the PSC will take, will be based on specific financial arrangements tailored to SME participation.

The examination of factors relative to appropriate capitalization and operational capital requirements will also need to encompass conditions for financing, thus providing an opportunity for participation by small and medium sized enterprises (SMEs), or limiting participation to large, mature firms being reflected in the financial model.

The requirements in innovative financing models may also have to reflect financial surveillance of SMEs (contracted to long-term program delivery) to ensure long-term corporate stability.

5.7. Monitoring Costs

Fulfillment of public policy commitments has to be expressed in performance metrics (embodied in contract terms and supporting service level agreements) and may require the development and/or adoption of specific governance and accountability frameworks. These conditions create requirements for particular oversight mechanisms.

Oversight mechanisms add costs and have to be considered in the development of a PSC, from both public and private sector perspectives. These elements will have to be quantified, promoted and protected in a PSC to ensure competitive neutrality in the analysis.

Do not underestimate monitoring costs. Performance monitoring will place a higher administration burden on the project.

5.8. Impacts on the Partner Selection Process

The selection of a private sector partner for the development and advancement of longer term public sector objectives requires the development of criteria for partner selection that could operationally reflect an initiative as an instrument of public policy, as well as provide opportunity for private sector profitability.

These criteria (principles and values) are in turn embodied in the contractual control and performance monitoring mechanisms put in place to govern and manage a P3 initiative.

Private sector agents are organized into profit centers where, whatever their statements on social responsibility, the operating managers are under pressure to get relatively short-term financial results. However, where private sector partners are being held accountable for services, relevant checkpoints and performance standards have to be built into contracting arrangements. While no one knows yet how to assess social performance to the degree of objectivity and systemization used for financial performance, public sector interests and expectations (i.e. “standards”) have to be balanced with other objectives and integrated into the overall organization planning and control procedures.

It should also not be expected that a business accept responsibility for areas where it has no legitimate authority (e.g. program compliance and enforcement or government commitment to third parties). It may in fact be counter-productive for government to look to business for actions and solutions of which it is incapable, or which are commercially uneconomic and that are properly the responsibility of public institutions.

6. THE CANADIAN CHALLENGE

As indicated in Section 1 of this Guide, the Canadian environment presents an interesting test case, where P3s are implemented by various levels of government with very little coordination in terms of approaches and methodologies. One thing that is common in Canada is the desire of governments, irrespective of their political convictions, to explore various funding mechanisms, including P3s. The overall arching principle is to ensure that the public sector does not lose control during the process and that societal benefits are addressed in one manner or another.

6.1. No formalized Policy of PSC Development

Unlike the U.K. and Australia, there does not yet appear to be any formalized policy within any Canadian jurisdictions with respect to the development of a PSC; rather, what is evident, is a collation of guidance material on how to develop in-house costs, or how to conduct an activity-based costing of a service or a function.

This lack of a formalized process should not preclude the public sector from developing a PSC report, or any of its derivatives. The PSC should be based on the sound application of commercial business practices and detailed enough to allow decisions to be made based on qualitative and quantitative considerations including risks.

6.2. How to Sell the PSC to Public Sector Leaders

The PSC as an internal costing tool could be of interest to public sector leaders, administrators and politicians alike. Even if the political climate does not appear to be open for P3s, the PSC document could be an important tool to assess the value of the contemplated infrastructure and services. In some jurisdictions, the use of a PSC, or any of its derivatives, is used to calculate the overall and unit costs of the services in order to compare them with other jurisdictions or other benchmarks to make informed decision on value of the services received or to assess user fee implications.

The important message is to present the PSC as a management tool in deciding if there is a need to move forward using different delivery instruments such as P3s.

6.3. Disclosure of the PSC

Effective competition comes when all parties involved in the bidding process are provided consistent, timely and accurate information about the public sector intention. Consideration can be given to open disclosure when releasing the PSC, or parts of the PSC as part of the bidding process, in order to achieve an enhanced competitive process. Some of the advantages of an open disclosure include:

- Encouraging a higher degree of confidence in the public sector commitment, thus providing prospective bidders with checks and balances; and
- Spurring greater innovation from prospective bidders.

The general principle regarding the disclosure of the PSC is that disclosure should be open and transparent and should occur where it is likely to assist in the competitive bidding process. Therefore it is the level and timing of the disclosure that are the key considerations.

The level of disclosure is very much dependent on the project under consideration and the maturity of the provider market. As a general rule disclosing some of the aggregate figures (not including cost of risks) from the PSC and other non-financial considerations will provide a starting point for prospective bidders and does not generally compromise the negotiation position if risk transfer is expected to be a material factor in the evaluation process. Key financial and operating assumptions should also be disclosed.

The timing of the disclosure should be as early as possible in the process in order to provide a measure of comfort to prospective bidders that the public sector has applied life cycle costing to the infrastructure and services. Care should be taken to ensure that the timing of the disclosure does not weaken the public sector's negotiating position. For example, disclosure later in the bidding process, particularly at the preferred bidder (s) stage where there are only one or two bidders remaining, may weaken the public sector's negotiating position.

6.4. What Happens When There Is No PSC

The absence of a PSC, or its derivatives, creates a dilemma for the public sector to determine value for money and whether the received bids are reasonable and affordable.

At the very least, if a formal PSC, or a baseline costing does not exist, a benchmark should be established, maybe by analogy, or perhaps another plausible technique to ensure that the bids are in the rough order of magnitude range.

Several smaller P3 projects have been implemented without the scrutiny test of the PSC, where political will and non-financial considerations typically weigh heavier than value for money. Generally, larger projects need to establish a PSC, or any of its derivatives, to provide a value for money test.

6.5. Dealing with Indirect Costs

One of the more controversial issues which typically arises when developing a PSC, is the determination and valuation of indirect costs, especially corporate overheads and hidden or assumed costs particularly when these costs are not directly attributable to the infrastructure or services under consideration. One of the techniques that could be used is a pro-rata determination of the support services headcount to the line positions. Thus, if on average for every X line positions there are Y support service positions, this can be used as a proxy for some of the overheads. Where existing services delivered by the public sector are considered for a possible P3, there would also be some information on the indirect costs or an activity-based costing may provide input into these types of costs.

In the case of hidden or assumed costs, it may be a more subjective determination. One method to compute these costs is to get a quote from the parties that are providing services or obtain insurance quotes from the market in the case of self insurance in order to normalize these costs. In many cases, only a portion of these costs is included in the PSC.

6.6. Dealing with Risks

As described in Sections 3.6 and 4.4, the level of effort to quantify risks should be commensurate with the complexity and scope of the proposed P3. In many cases, especially smaller projects, risks are not quantified, but simply acknowledged and assessed qualitatively to determine the risk tolerance of the public sector to the specific project.

In larger projects, types of risks need to be identified, especially where project financing is required for the infrastructure portion of the P3. Therefore, a thorough understanding of the risks of the project will enhance its success and provide the market with a firmer commitment from the public sector to the P3 prospect. Risk identification, assessment and quantification requires specialized skills that are not always readily available within the public sector entity contemplating a P3. In such cases, it is very common for the public entity to hire external resources to tackle this, sometimes complex, activity.

6.7. Where to Start in the Development of the PSC

Creating a plan for the development of a PSC is typically a starting point. The PSC could be produced in phases and in various levels of detail as the project moves forward.

As a minimum, the plan to develop a PSC should include the major sections of the document, the author of each section and a timeframe. Consideration should be given to obtaining internal approval on major assumptions and on the issue of using external resources.

The PSC should commence as a very high level document to gauge internal acceptance of the endeavor and then move into a detailed assessment of each section within the PSC. Depending on the project complexity and scope, more time and resources should be allocated to the items that appear more challenging and complex.

6.8. Format of the PSC

A typical PSC document should cover the following points:

1. Brief description of the project
2. Summary of the output specifications
3. Financial Component
   - 3.1. Capital Costs
   - 3.2. Operating and Maintenance Costs
   - 3.3. Indirect Costs
   - 3.4. Third party Revenue
   - 3.5. Costs of risk transferred
   - 3.6. Assumptions underlying the above costs
   - 3.7. Net present value calculation
   - 3.8. Sensitivity Analysis
4. Qualitative Consideration
   - 4.1. Socio-economic
   - 4.2. Labour
   - 4.3. Special Interest Groups
   - 4.4. Other
5. Value for Money Assessment Framework
6. Timescale
7. Other Information, such as the overall procurement process, approvals, needed legislation changes, etc.

6.9. Help is Available

Informal discussion with P3 practitioners, advisors and associations such as the Canadian Council for Public-Private Partnerships may prove to be very beneficial to understanding the complexities of the development of a PSC or any of its derivatives.

In preparing a PSC, a number of public sector entities have used external advisers, such as actuaries and accountants, in addition to internal resources and other source of public sector assistance. Within reasonable cost limits, the use of advisers is encouraged when there is a business case in which clear value will be added by external experts. In smaller projects, strategic type advice could be enough to get the process going, while in larger more complex projects, more support may be required where skills and experience (e.g. in financial modeling and risk assessment) are scarce within the public sector entity.

Industry Canada maintains an (unqualified) list of P3 practitioners. Please contact us to make yourself known to us or if you are seeking advice or direction to other sources of information on public-private partnerships. We can be reached at:

Services Industries Branch
Industry Canada
235 Queen Street, East Tower
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ABBREVIATIONS AND GLOSSARY

BAFO	Best And Final Offer
BBO	Buy-Build-Operate
Bidder	A respondent to a request for Expressions of Interest or an invitation to submit a bid in response to a Project Brief. Typically, a bidder will be a consortium of parties, each responsible for a specific element, such as constructing the infrastructure, supplying the equipment, or operating the business. Government normally contracts with only one lead party (bidder) who is responsible for the provision of all contracted services on behalf of the consortium. A private sector syndicate (or in-house team) bidding for a P3 procurement.
BLOT	Build-Lease-Operate-Transfer
BOO	Build-Own-Operate
BOT	Build-Operate-Transfer
BOOT	Build-Own-Operate-Transfer
C2P3	Canadian Council for Public-Private Partnerships
Client	A team of managers/procurers in the public sector responsible for PFI/P3 procurements.
Contingency	An allowance included in the estimated cost of a project to cover unforeseen circumstances.
DB	Design-Build
DBFO	Design-Build-Finance-Operate
DBO	Design-Build-Operate
DBOT	Design-Build-Operate-Transfer

DCMF	Design-Construct-Manage-Finance
Discounting	The application of a discount rate to allow comparison of quantities which are distributed over time by converting them to a present value.
.	
Discount Rate	The rate used to calculate the present value of future cash flows; usually determined on the basis of the cost of capital used to fund the investment from which the cash flow is expected.
Discounted cash flow	A general term for the analysis which discounts a stream of future cashflows in order to calculate a net present value.
EOI	Expression of interest
Estimate	Approximate judgement of amount
Fixed Cost	A cost that does not change with varying activity levels.
Gantt Chart	A diagrammatic representation of the timing and duration of the various sequential phases of a project, commonly used in project management, and routinely available in many project management software packages.
GDP Deflator	An index of the general price level in the economy as a whole, measured by the ratio of gross domestic product (GDP) in nominal (i.e., cash) terms to GDP at constant prices.
LDO	Lease-Develop-Operate
Monte Carlo	A statistical method of calculating the effect of risk on outcome by simulations producing a probability distribution of possible outcomes.
Net Present Cost (NPC)	The equivalent cost for a given time frame of a stream of future net cash outlays (calculated by discounting the actual values at the appropriate discount rate).
Net Present Value (NPV)	The aggregate value of cashflows over a number of time

periods discounted to today's value.

Opportunity cost Value of the most valuable alternative use (e.g., the value of an asset in the net best alternative use to which the asset could be put).

Optimism bias A tendency to budget for the best possible (often lowest cost) outcome rather than the most likely. This creates a risk that predicted outcomes do not fully reflect likely costs.

Output Specification The output specification sets out the range of services/requirements that government is seeking to procure and the performance levels required for each of those services.

PFI Private Finance Initiative (term used in the United Kingdom)

P3 Public-Private Partnerships

Probability The extent to which a certain event is likely to occur, measured by the ratio of the number of times that event does occur to the total number of cases possible.

Project Brief The Project Brief details the government's objectives, service delivery requirements, policy and commercial matters, material background information and the processes for lodging and evaluating submissions. It also sets out government's role and intentions for the infrastructure to be built, and explains how checks and balances are observed in the process to ensure impartiality.

Public Sector Comparator (PSC)
The Public Sector Comparator (PSC) represents the most efficient public procurement cost (including all capital and operating costs and share of overheads) after adjustments for Competitive Neutrality, Retained Risk and Transferable Risk to achieve the required service delivery outcomes. This benchmark is used as the baseline for assessing the potential value for money of private party bids in projects.

Residual Value The expected value of a capital asset at some future date, normally the end of a contract.

Retained Risk — The value of those risks or parts of a risk that government proposes to bear itself under a partnership arrangement.

RFEOI — Request for Expression of Interest

RFP — Request for Proposals

RFQ — Request for Qualifications

Risk — The possibility of more than one outcome occurring, and thereby suffering harm or loss.

Risk allocation — The process of assigning operational and financial responsibility for specific risks to parties involved in the provision of services under P3. Also see risk transfer.

Risk matrix — A table used as a management tool throughout the procurement process. It will usually constitute a listing of the various risks and uncertainties to which particular project options are exposed, together with an assessment of the likelihood of their occurring and the financial or other impact on the outcome of the project.

Risk Register — A document which identifies the bearer of a particular risk, (e.g. a risk matrix which will also contain quantitative assessments (e.g., costs and likelihoods) of the characteristics of the risks).

Risk transfer — The process of moving the responsibility for the financial consequences of a risk from the public to the private sector.

Sensitivity Analysis — Analysis of the effects on an appraisal of varying the projected values of important variables.

Transferable Risk — The value of those risks (from government's perspective) that are likely to be allocated to the private party under a partnership delivery method.

Turnkey project (public sector) — A project procured through private design and construction, according to public sector specifications and objectives.

	When the project passes completion tests, the public sector reimburses the private party/parties for design and construction.
Uncertainty	Arises when the outcomes of courses of action are indeterminate or subject to doubt.
Variability	A spread of possible outcomes around an expected outcome.
Variable cost	Cost that changes in proportion to volume levels, reflecting the direct relationship between cost and volume.
VFM	Value for Money

Detailed Costs Checklist

This appendix is intended to provide a starting point or a checklist for detailing cost items which typically make-up a PSC. Each project needs to prepare its own list based on its complexity, materiality, the relevance of costs and availability of information. For each of the cost items identified in the PSC, it is important to assess the timing, quantity, frequency and accuracy.

1. Direct Costs

1.1 Direct Capital Costs

	Timing	Quantity	Frequency	Accuracy
Land				
Demolition				
Design				
Construction				
Material				
Equipment				
Plant				
Inspection				
Project Management				
Modification				
Transition				
Permits				
Procurement Process				
External Advisors				
Life Cycle renewals				
Upgrades				
Others				

1.2 Direct Operating Costs

Full time staff				
Part time staff				
Casual staff				
Contract staff				
Performance bonuses				
Benefits, EI, CPP, insurance, pensions, etc.				
Training				
Travel				
Conferences				
Material				
Consumables				
Office supplies				
Parking				
Advertising and promotions				
Minor repairs				

	Timing	Quantity	Frequency	Accuracy
Major repairs				
Preventive maintenance				
Tools				
Equipment				
Rentals				
Utilities, Gas, hydro, water				
Telephone				
Telecommunication				
Support subcontractors, such as landscaping and snow removal				
Recycling				
Purchased services				
Security				
Alarms monitoring				
Emergency and unplanned repairs				
Insurance				
Quality Assurance				
Audits, technical, financial				
Others				

2. Indirect Costs

2.1 Overheads				
Management Support				
IT Support				
Accounting				
Human resources				
Project Management				
Space, if co-located with other units				
Shared services, such procurement				
Others				

2.2 Hidden or Assumed Costs

Insurance				
Depreciation for assets to be transferred to project if costs not captured in capital costs				
Services by other levels of public sector organizations				

Corporate and executive overheads, if not identified in indirect costs				
Others				

2.3 Risks

Transferred risks				
Retained risks				
Others				

	Timing	Quantity	Frequency	Accuracy
3 Third Party Revenue				
3.1 One time Items				
Sale of surplus land				
Sale of surplus plants and equipment				
Others				
3.2 Recurring Items				
Expected third party revenue				
Others				

Tips and traps to consider when constructing a PSC:

The following checklist may be helpful in verifying that a Public Sector Comparator (PSC) has been rigorously constructed according to the material provided in this guide.

TIPS

Disclosure: ensure that the PSC disclosure is open and transparent, and that it occurs where and when it is most likely to assist the competitive bidding process. The PSC should not be disclosed when the short-listed bidding field is not strong - this could compromise the government's negotiating position.

In-house bids: ensure that the in-house bid team is completely distinct from the government's procurement team. (Although in-house bids are not generally submitted often.)

Life Cycle Costing: the PSC and Life cycle represent the *full* and *true* cost to the government meeting the output specification proposed in the project.

Quantifying: ensure that the various elements of the PSC are taken into consideration, including all capital costs (upfront and ongoing) and operating and maintenance costs to deliver the service.

Risks: ensure that all identifiable risks are individually allocated to whoever is best able to manage them at the lowest cost to government. If risk is inappropriately transferred to the private sector, government may pay a premium or jeopardize the long-term sustainability of a partnership. Ensure that whichever party is allocated risk, that they have the freedom to choose how to handle and minimize it, subject to any statutory constraints and public interest considerations. Care should be taken to avoid double counting of the underlying risks.

Financial Assessment: material risk assessment may lead to a significant mispricing or underestimation of the PSC. This distortion could result in the best value for money option not being selected, significantly increasing the cost and ongoing exposure of government. In addition, it should be understood that the consequences associated with a particular risk may also change over time.

Sensitivity Analysis: used to determine the flexibility and robustness of the PSC model if changes are made in the key assumptions of the underlying project. A sanity check is performed on the various components of the model to verify that the assumptions are reasonable, including capital, operating and maintenance costs.

Audit trail: developed by maintaining a record of the key discussions and assumptions used in the PSC.

Financial Model: ensure that the model is built in a way to allow flexibility in changes and ease in conducting sensitivity analysis (i.e. different sections for inputs and outputs). Start with a high level model that will evolve with the project.

Availability of funds: ensuring that the PSC reflects the timing of the availability of public funds, e.g. phasing capital investment over 15 years on the basis that public capital would be available in that time scale is not a legitimate approach. It is better to assume up front funding and then conduct sensitivity analysis to assess whether conclusions drawn are robust in the face of delays in the availability of public capital.

Independent party: should be used to check the reasonableness of the assumptions and confirm that the assumptions made have been correctly incorporated into the model to produce an accurate result (both arithmetically and logically).

Form and Contents of Bids: ensure that bidders are provided with detailed instructions on how to prepare their bids to provide consistency and ease of evaluation.

TRAPS

Impractical scenarios: are included in the analysis and will consume unneeded resources; accordingly, they need to be discounted early in the process.

Inappropriate discount rate: use the public sector approved rate to ensure consistency in analyzing P3 projects.

Using costs from previous projects: ensure that costs from previous projects are still valid especially if the public sector has changed the way it procures goods and services internally. For example, if the public entity has adopted a design/build approach in its current procurement practices and information from past projects is derived solely from a more traditional procurement process, then design/build information should be used to estimate the costs to the public sector.

Indirect and hidden costs: internal costs not identified and/or un-quantified are unreasonable to compare with market bids.

Constant changes in personnel: changes in the public sector team during the construction of the PSC can make for difficulties; such problems can be minimized by being meticulous in maintaining appropriate documentation.

Inflation: ensure that the discount rate used in the PSC is nominal and before income tax, nominal costs rather than real costs need to be considered. Also ensure that the inflation rate specified in the PSC is also incorporated within the bids.

Depreciation and the PSC: ensure that depreciation is not included in the PSC – the only exception is where depreciation may affect tax payments.

Overestimating Third Party Revenues: if a project has significant third party revenue, then the reasons for undertaking it should be revisited. Third party revenue, with the exception of initial and end of project disposition of assets, should not be significantly material to the determination of the best value.

Underestimating costs: especially life cycle renewals, as typically many public sector entities do not create reserves for theses costs, rather these are funded from on-going annual operating and/or capital budgets which are subjected to annual approval. Accordingly, many public sector assets do not obtain sufficient funding to keep them up to par with comparable private sector facilities, resulting in significant major repair and maintenance backlogs.

Inconsistent Output Specifications: between the PSC and the P3 bids, make sure that P3 bids are not requested in terms of a different (higher) quality of services than what is expressed in the output specification and PSC documents.

Self-Insurance: not including this proxy premium in the PSC will distort the comparison between the market bids and internal costs.

RISKS AND THE PSC

1. RISK

This section deals with the identification and valuation of risk as well as the construction of a risk matrix. Risks are inherent in every project, no matter who owns it. In Australia's *Partnerships Victoria* PSC Technical Note, the valuation of risk is given in-depth consideration and is viewed as essential to forming the framework for the subsequent allocation of risks to the categories of transferable risk and retained risk. Given the complexity of this subject and the significance of risk to the formulation of a robust PSC, the following sections on risk are taken liberally from the PSC Technical Notes of both the U.K. and Victoria, Australia material. Some editing has been undertaken to improve relevancy to the Canadian context and enhance Canadian understanding.

As stated previously throughout this guide, the degree of effort in identifying and evaluating risks should be commensurate with the complexity and scope of the proposed procurement.

In order for the PSC to provide a meaningful test for "value for money" against private bids, it is absolutely essential that it include a comprehensive and realistic pricing of all quantifiable and material risks. The inclusion of a valuation for risk in the PSC forms part of the broader process of risk identification, allocation and management. Careful consideration of the implications of project risks and a determination of who is best able to manage them influences:

- Delivery of the output specification under the Reference Project;
- Construction of a PSC and its evaluation against other bids;
- Formulation of an appropriate payment mechanism to reflect the risk allocation and any incentives generated for cost-effective, high quality services;
- A department's or agency's understanding of the project risk and its risk management strategy; and
- Negotiation and the form of the partnership arrangement.

1.1 Risk Matrix

1.1.1 The construction of a risk matrix is a fundamental part of the P3 procurement process and is usefully integrated with the construction of a PSC. The construction of a risk matrix usually comprises the following broad steps:

- The identification of risks involved in the project;

- An assessment of the impact of these risks;
- An assessment of the likelihood of such risks arising; and
- The calculation of the financial impact (and ranges of possible outcomes).

1.1.2 The construction of the risk matrix enables the following to be considered:

- Sensitivity testing of risks, which generally follows the calculation of the impacts and the likelihoods of the individual risks and the construction of the discounted cash flow table;
- The categorization of these risks, especially in terms of the allocation of risks to possible transfer categories; and
- The development of policies and processes to manage and mitigate risks.

1.2 Identification of Risks

1.2.1 The first step is to compile a list of all the risks that may be relevant to a project. This list will provide a means for monitoring the evaluation and the eventual allocation of risk throughout the procurement exercise and will eventually build up into the risk matrix. The development of this project management tool is an iterative process which needs to be reviewed throughout the project life cycle. Further risks can be identified at any time during the procurement exercise. If the transfer of such risks is included in the price of the P3 option, the PSC must be adjusted to ensure that it also includes such risks.

1.2.2 For a large project, the process of risk identification is likely to be a complex exercise as the number of separate risks and the scope of the inter-relationships involved may be substantial. In these cases, workshop or brain-storming sessions will help to achieve a comprehensive coverage of all risk areas.

1.2.3 For these sessions, attempts should be made to get as many experienced people as possible involved from both the public and the private sectors. Possible participants include the managers of the potential procurement exercise, financial and economic advisers, design, engineering and insurance professionals, professional negotiators, actuaries, lawyers and especially the managers or operators of the business or service - these are the people who really understand all the risks that matter.

1.2.4 Where possible, for projects which are similar to existing P3 contracts, every effort should be made to contact the managers of those contracts and draw on their experience of risk identification, as well as consulting audits and post-project evaluations.

1.2.5 It may also be desirable to engage specialist consultants who have relevant expertise in facilitating a risk identification exercise. However it is important to remember that the engagement of consultants does not eliminate the need for substantial involvement by the project management team to ensure a searching examination of project-specific risks. The value of the input by specialist consultants will be directly proportional to the quality of the briefings they receive from client team members who fully understand the project specific risks. The full involvement of all team members at this stage is essential to ensure they fully understand the issues before they face the private sector across the negotiating table. It follows that the chief negotiator should be involved in the process of risk identification.

1.2.6 The risk register must be as comprehensive as possible. Even if it is considered difficult to quantify the impact or likelihood of a risk, e.g. force majeure, it is important to be able to demonstrate that the risk has not been overlooked.

1.2.7 It is easy to miss identifying risks - but being systematic will minimize this danger. One final imaginary walk through of the project as it develops over time can provide a useful check that no material risks have been left unrecorded.

1.2.8 Table 1.2.8. describes the main general types of risk that you are likely to encounter. The aim should be to explore each of these in further detail and produce a more detailed project specific breakdown.

Table 1.2.8. - Types of Project Risk

Types of Project Risk	
Construction risk	The risk that the construction of the physical assets is not completed on time, to budget and to specification.
Demand (usage) risk	The risk that demand for the service is lower than planned
Design risk	The risk that the design cannot deliver the services at the required performance or quality standards in the output specifications.
Environmental risk	The risks that the project could have an adverse environmental impact which affects project costs not foreseen in the environmental impact assessment (EIA)
Financial risk	The risk that the private sector overstresses a project by inappropriate financial structuring.
Force majeure risk	An unanticipated unnatural or natural disaster such as war, earthquake or flood of such magnitude that it delays or destroys the project and cannot be mitigated
Inflation risk	The risk that actual inflation differs from assumed inflation rates
Legislative risk	The risk that changes in legislation increase costs. This can be sub-divided into general risks such as changes in corporate tax rates and specific ones which may discriminate against P3 projects.
Maintenance risk	The risk that the costs of keeping the assets in good condition vary from budget.
Occupancy risk	The risk that a property will remain untenanted - a form of demand risk.
Operational risk	The risk that operating costs vary from budget, that performance standards slip or that the service cannot be provided as per output specs.
Planning risk	The risk that the implementation of a project fails to adhere to the terms of planning permission, or that detailed planning cannot be obtained, or, if obtained, can only be implemented at costs greater than in the original budget.
Policy risk	The risk of changes of policy direction not involving legislation.
Residual value risk	The risk relating to the uncertainty of the value of physical assets at the end of the contract.
Technology risk	The risk that changes in technology result in services being provided using non optimal technology.
Volume Risk	The risk that actual usage of the service varies from the level forecast.

1.3 Quantifying the Consequences of Risks

1.3.1 Having identified all of the relevant risks to be included in the risk matrix, it is necessary to quantify and assess the timing of the possible consequences. Some literature on this subject refers to quantified and un-quantified risks. *Partnerships Victoria* consider the financial consequences of risk as being influenced by the following factors:

- **Effect** - the risk may be expected to either increase costs or reduce revenue;
- **Time** - the financial consequence of risk may change over time, as the ability to forecast costs accurately decreases over time. In addition, the expected timing of the consequence will have an impact on the NPV cash flow of the PSC; and
- **Severity of risk consequence** - The cost of additional repairs to a building will be less than if the same building collapses due to a major structural flaw.

It is certainly common to start by having some risks that are easily subject to quantification and others which are not. But it is a dangerous distinction to draw, because it suggests that there are risks which, because they have not been quantified in the past, can never be quantified and which may therefore be ignored. Such risks are as pertinent as the more easily quantified risks to the overall judgement of whether a P3 bid is likely to represent value for money. "The value given to a risk in a PSC measures the expected cost of that risk to government if the project were delivered under a public procurement. This also represents an estimate of what government would be willing to pay to transfer a risk to the bidders in a *Partnerships Victoria* arrangement."[3] Thus, the *Partnerships Victoria* approach classifies risk between those which would be transferred to a bidder and those which the government would "take back" or retain.

1.3.2 The best methods for quantifying or valuing the impact of identified risk will depend upon the information sources available. As a general rule, the best approach should be to use empirical evidence whenever it is available; otherwise, common sense approximations should be used. What this means in practice, depends on the nature of the risk. The objective is always to obtain an unbiased estimate of the cost for the public procurement plans (i.e., an estimate where the chance of the cost outcome being too optimistic is the same as the chance of it being too pessimistic). Care should be taken to distinguish between planned costs (which assume everything goes well) and expected costs (which include an allowance for problems such as costs and time over-runs on the basis of past experience). The PSC must be based on expected costs.

1.3.3 Typically, arriving at expected costs will involve adding on a percentage of the original estimate to take account of an optimism bias in estimating costs. Moreover, this percentage should not be arbitrary in nature; rather, the adjustments should be based on experience and relevant data.

[3] Ibid, P.32, Sec 5.2, 1st paragraph.

1.3.4 Quantifying the impact of project risks can be made easier by banding the risks into a smaller number of categories according to their impact. For example, the categories of: catastrophic, critical, serious, marginal and negligible. The amount of time and resources that are devoted to quantifying risks should relate to their likely materiality.

1.3.5 Even when it appears that costing a risk is impossible at first, it should be listed in the matrix, to return to later and to refine when information becomes available. Ignoring difficult risks is not an option, as such risks ultimately affect the prices charged to the public sector or the service being procured. Therefore, even though these risks may not be specifically costed at first, it will benefit the public sector to identify the risks and to be sensitive to factors affecting these risks. Greater understanding of all project risks will assist the public sector to compare private sector bids with the PSC.

1.3.6 When assessing the consequences of any risk, thinking should be as broad as possible to ensure that all follow-on effects, not just the immediate, direct effects are considered. This is particularly relevant where the event causes delay and is on a critical path. This requires a little care, as there will be interaction between different risk events. For example, if a property-based service is not available on time, the possible repercussions may include:

- The cost of renting alternative premises or continuing to use existing premises;
- The costs of servicing this property;
- Lost management time as a result of litigation;
- If appropriate, increased insurance premiums, or, alternatively, self-insurance; and
- An inability to meet contract commitments.

1.3.8 The ultimate objective is to be able to add up the consequences of all risk elements to obtain the net present expected value of the costs and benefits in the project. Care must be taken to avoid double counting the same risk, e.g., incorrectly counting the cost of insurance products available to cover a particular risk (whether taken up or not) and, in addition, adding in the impact of the risk covered by such insurance. It is also important to make a sensible assessment of when the consequence of each risk will arise as this will affect the NPV of that consequence.

1.3.9 Generally, risk can be included in the PSC through one of the following methods:

- Including the costs of project specific risk in the cash flow numerator; or
- Adjusting the discount rate (cost of capital) to reflect the specific level of risk for each project.

The Australian PSC Technical Note advocates valuing risk in the cash flow numerator of the PSC. This is seen as offering the following advantages:

- By valuing risk as a separate cash flow item, government is better able to focus on the key factors influencing the optimal level of risk allocation;
- Cash flow valuation takes better account of the timing of risk by analysing the risk profile of each risk. For example, construction risk arises early in the project, while upgrade and residual value risks arise towards the end; and
- The value and impact of a particular risk may vary over time; and cash flow valuation provides a transparent methodology by using a consistent government discount rate across projects.

1.4 Estimation of Probability of Risks

1.4.1 After identifying the risks and assessing the potential consequences, it is then necessary to assess the likelihood or probability of each of the possible consequences occurring.

1.4.2 A key practical issue is how to arrive at the relevant probabilities, in a manner that is reasonable, consistent and transparent. A database of costs captured for previous similar procurements is an ideal source of information. However, in most cases, this type of high quality information is likely not available and an approach which is as close to the ideal as possible must be devised.

1.4.3 Box 1.4.3. shows how probabilities can be used to derive the expected value/cost of a risk.

Box 1.4.3. - Likelihood of Risks and Expected Costs

Imagine a PSC or a Reference Project where the basic procurement cost has been estimated to be $385M in NPV terms. The total cost initially includes $10M for the IT system - as this is considered to be the most likely outcome. However, risk analysis identifies a technology risk relating to the IT system. The PSC should therefore be adjusted to include the expected cost of the IT system rather than the most likely cost outcome.

What do we mean by expected costs? How does it vary from most likely cost?

The risk evaluation exercise has indicated that the probability of everything going to plan, is only 60 per cent. There is a significant chance (40 per cent) that the IT system, which is original and untested in practice, will be difficult to implement which will require a period of parallel running with the old system. This will lead to total costs escalating to $48M to achieve reliability consistent with the overall output specification.

Overall, expected costs of the IT system can be obtained by multiplying the costs by the respective probabilities and summing:

Outcome		Probability		Total
$M				$M
10	X	0.6	=	6.0
48	X	0.4	=	19.2
		Expected Cost	=	25.2

The PSC should be increased by $15M to reflect the difference between the original cost estimate ($10M) and the expected cost ($25M).

1.4.4 Even if no formal database is available internally, the estimation of probability should be based on experience rather than arbitrary estimates. All internal sources of Departmental/organizational data should be exploited as fully as possible. Cost outcome data should be the most recent and relevant available. Possible sources of information include:

- Industry wide information on outcome costs - such as the Quarterly Building Price and Cost Indices;
- Sector specific surveys;
- Departmental case studies; and,
- Data on the cost and time overruns of construction projects,

1.4.5 Another possible source of information is the use of external consultants. If consultants are used, their predictions should be based on the experience of past events together with any foreseeable changes or developments which would deliver improvement. It is important often to distinguish between cost overruns for smaller projects or those let as a succession of small contracts and major single contracts where the risks of time and cost overrun are greater.

1.4.6 Estimating probabilities is not an exact science and inevitably assumptions - sometimes quite bold ones - have to be made. While there is nothing wrong with this, it is important to ensure that the assumptions are reasonable and fully documented, as they may be open to challenge later on in the procurement process.

1.4.7 There are some risks where the probability of the event occurring is low but the risk cannot be dismissed as negligible because the economic impact is high, e.g., the collapse of a bridge. In this case, a small change in the assumed probability can have a major effect on the expected value of the risks. If there is doubt about the ability to make meaningful estimates of probability, it is best practice to itemize the risk and use a subjective probability, rather than simply ignoring the risk altogether. Clients should also be prepared to revisit initial estimates as the negotiations develop, if they consider that they have learned something new that materially affects the initial estimate.

1.4.8 A useful approach might be to classify the likelihood of risks into broad categories (e.g., frequent, probable, occasional, remote or improbable), with each category being ten times more likely than the next.

1.4.9 The objective is to follow reasonable procedures at all times, to be as systematic as possible and to record the decision making process to facilitate subsequent audit. Exploring difficult issues with private sector suppliers may be another means of enhancing understanding of the risks involved. An approach which is as open and flexible as possible without compromising the ability to negotiate the best possible deal for the public sector should be employed.

1.4.10 Ultimately, the test of the accuracy of estimates of probability will be actual outcome figures. The client team responsible for contract maintenance should always fully record such figures and compare them to the original PSC estimates. The building and maintaining of databases will be an important development in the public sector's knowledge base and critical to its success in negotiating P3 deals in the future. Clients should be prepared to share knowledge if approached by other public sector purchasing teams, as this will help to disseminate best practice throughout the public sector.

1.4.11 Box 1.4.11 which follows, illustrates the results that sensitivity analysis can yield for the Reference Project. Sensitivity analysis can be used to identify the point at which changes in the assumptions are sufficiently significant as to change the conclusions drawn from the net present value (i.e., the "switching point"). Where practical, (after final bids have been received) the analyses should be used to identify the changes in assumptions which would result in bids exceeding the PSC.

Box 1.4.11. - Exploring the Sensitivity of Assumptions on the Probability of a Risk

Continuing the example in Box 1.4.3, assume that the aggregate of all risk adjustments is $10M (including the IT adjustment of $15M). The risk adjusted PSC is therefore $495M. An independent report about an IT innovation has been discovered, suggesting that there might be a greatly reduced chance of parallel running being required. Note that the report did not say that the innovation is definite and tested, in which case the PSC should be altered as a result of new information becoming available, but that the innovation is only in its initial development stages. Nevertheless, it looks sufficiently plausible to require an exploration of the sensitivity of expected costs to its successful development.

What would happen to the expected IT technology risk adjustment if the projections in this industry report were correct?

Professional risk analysts now suggest that the probability of the worst-case risk occurring is 20%. The revised calculation of the expected IT cost is therefore:

Outcome		Probability		Total	
$M				$M	
10	X	0.8	=	8.0	
48	X	0.2	=	9.6	
				17.6	Rounded to $18M

There has been a significant impact on the expected cost of the IT system - it has fallen by $7M from $25M to $18M.

What is the overall significance of this reduction? The PSC's costs are once again compared with the private sector bid. The further reduction of $7M to the PSC costs must be compared with the best P3 bid to determine if there is still a cost advantage.

1.5 Risk and Insurance

1.5.1 Insurance can be a help when costing and allocating risk. Much of the public sector historically does not use commercial insurers (except for some special cases, such as vehicles) nor do they self-insure because commercial insurance would not provide value for money for the government. Moreover, because the size and range of its business is so large the public sector does not need to spread its risk, while the value of claims is unlikely to exceed its premium payments. Notwithstanding, the government still bears the costs arising from uninsured risks and there are many examples of projects where the public sector has been poor at managing insurable but uninsured risk

1.5.2 The PSC should include an estimate of the value of such uninsured risks, taking into account the likelihood of such costs arising. A notional insurance premium could be estimated on the basis of past losses or the costs of commercial insurance could be taken as a first approximation to the value of the risk borne by government. In the exceptional cases where the government uses commercial insurance, the cost of premiums should be included in PSCs but care should be taken not to double count the risk insured.

1.5.3 Many risks which are transferred from the public sector to the private sector under P3 deals are potentially insurable. The availability of insurance should be a consideration when risk allocation is being negotiated. Private sector arguments that they cannot accept risk may not apply when the capacity of the insurance market is considered.

2. THE ALLOCATION OF RISKS

Following the identification and valuation of risks, each risk should be identified as Transferable Risk or Retained Risk, depending on whether it should be transferred to the bidder or retained by government. The objective is to obtain an optimal balance of risk by transferring risk, whenever the benefit to government is greater than the cost of transfer to the private sector. It is only following detailed negotiations between the parties that the final balance is achieved. However, an early, if preliminary assignment of risks to the parties (government or bidder) is desirable and useful to discuss. Since different private sector bids may propose the transfer of different combinations of risks, the making of a valid comparison among bids (and later making a valid comparison between the best private sector bid and the PSC) is critically dependent on sound risk allocation accounting.

2.1 Transferable Risk

The decision to allocate a risk to the bidder depends on whether the bidder is best able to manage the risk at least cost. The type and number of risks, which are classified as Transferable Risks, need to be assessed on a project by project basis and over time as parties develop more effective risk management and mitigation skills. The value of Transferable Risk in a PSC measures the cost government would expect to pay for that risk over the term of the project in a public procurement scenario.

The steps involved in valuing transferable risk are the following:

Step 1 - Analyse all material and quantifiable risks (see Section 3)
Step 2 - Identify optimal risk allocation
Step 3- Calculate Transferable Risk

2.1.1 Identifying the optimal Level of Risk Transfer

The principle governing risk transfer is that each risk should be allocated to whoever is best able to manage it at least cost, taking into account public interest considerations. It is determined by assessing the ability of each party to reduce the probability of a risk occurring, and to minimize the consequences if that risk eventuates.

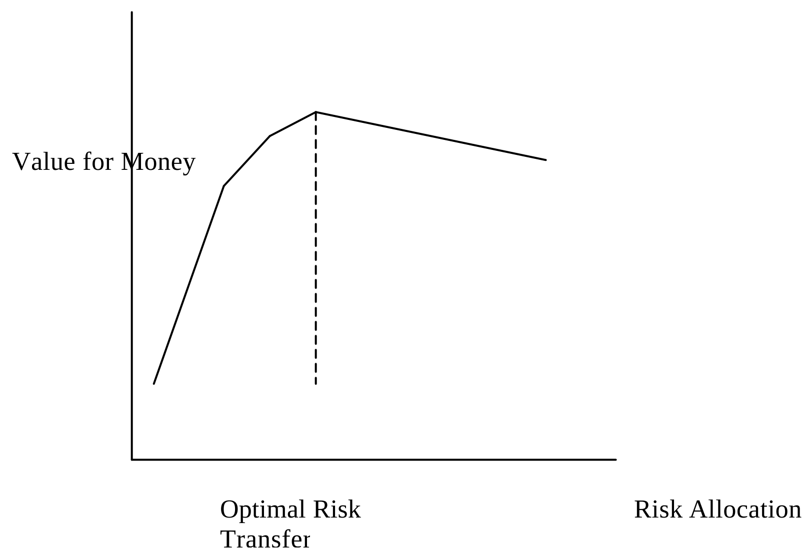
It is unlikely that either government or bidders will be best suited to manage all the risks of a project.

Risk allocation should be determined separately for each project to deliver the best outcomes for government. Factors to be considered include:

- The nature of the project;
- The respective strengths and ability of each party to manage a risk (this may change over time as each party's risk mitigation skills improve);
- Flexibility of the output specification (whether any constraints exist which influence the method for managing risk);
- Previous levels of risk transfer (this indicates the historical success of each party in managing particular risks and the potential ability to manage risk in the future);
- Prevailing market attitudes towards risk; and
- Public interest factors and other policy considerations.

Figure 2.1 illustrates the principle of optimal risk transfer. An efficient allocation of risks allows government to obtain greatest value for money by harnessing the respective skills of all parties. However, if too much risk or the wrong risks are transferred to the bidder, government may pay more than if they were retained. For example, government is often in a better position to manage part of regulation risk while the bidder may be better suited to hold construction and operations risk where it has generated considerable expertise providing similar services in the past.

Figure 2.1 – Principles of Optimal Risk Transfer



Risks are then classified as either Transferable Risk (those that government seeks to allocate to bidders) or Retained Risk (those that government is willing to accept). However, there may be situations where specific components of a particular risk are allocated between parties, or where an overall risk is shared. Risk sharing may occur in accordance with an agreed formula contained in a negotiated contract. For example, where a department or agency is not expected to be the only end-user of an asset or service, government may specify a base level of demand it will support. Bidders may be required to take demand risk above this base level.

Where a risk is classified as a Transferable Risk, bidders should be given a substantial degree of flexibility to determine the best method of controlling the costs associated with that risk. This creates a powerful incentive for bidders to manage the risk in the overall interests of the project, while delivering greater value for money to government. This is further enhanced through the use of a performance-based payment mechanism. Achieving an optimal risk allocation can have a substantial impact on value for money considerations. This was highlighted in the U.K.'s survey of project managers across a number of sectors, indicating that risk transfer is considered a primary value for money driver in partnership projects. The U.K.'s Treasury Taskforce report found that partnership projects delivered an average cost saving of approximately 17 per cent compared to public procurement methods. Efficient risk transfer in turn, provided approximately 60 per cent of these cost savings.

Before seeking formal Expressions of Interest, government departments and agencies may seek to engage the market to assess the level of likely market interest in accepting risk in a proposed project. This can be done by various means, including holding preliminary discussions with an appropriate sample of industry practitioners. In undertaking such discussions, the government department or agency needs to ensure that such discussions will not restrict or distort competition, or give any bidder an unfair advantage

However, government should also be satisfied that bidders are able to manage allocated risks effectively at the bid price specified. Although this does not directly affect the construction of a PSC, the reasonableness of risk valuation should be included in the qualitative assessment of each bid. If it becomes clear that government is better placed to take a risk, it should become a Retained Risk rather than a Transferable Risk.

2.1.2 Valuing Transferable Risk

Once all the Transferable Risks have been identified, the size and timing of the expected cash flows associated with each risk needs to be aggregated to determine the NPV of the Transferable Risk component of the PSC. Each of the risks should be included as a separate cash flow item and then added to form the Transferable Risk component, to allow for a detailed analysis of the key risks and their sensitivity to the overall PSC.

Example - Valuing Transferable Risk

Consider a project for the provision of a new educational facility and related ancillary services. The material and quantifiable risks associated with the project, which have been summarized and simplified in this example, are then allocated as shown in Table 2.1.2.

Table 2.1.2. - Simplified Risk Allocation

Risk	**Transferable Risk**	**Retained Risk**
Design and construction risk	X	
Change in law risk		X
Operating Risk	X	
Demand Risk		
• base level demand		X
• additional usage	X	
Maintenance Risk	X	
Security risk (e.g. vandalism)		
• during school hours		X
• after school hours	X	

The costs and revenues associated with each of the Transferable Risks are then specified in the PSC model as a periodic cash flow based on the expected timing of their financial impact. Table 2.1.2. is an example of the Transferable Risk section of the PSC model for the first five years of a project.

Table 2.1.2. - Transferable Risk cash flow valuation - real flows

Cost	**Year 0 ($M)**	**Year 1 ($M)**	**Year 2 ($M)**	**Year 3 ($M)**	**Year 4 ($M)**	**Year 5 ($M)**
Design and construction risk	10.0	20.0	2.5			
Operating Risk		5.0	5.0	5.0	5.0	5.0
Demand Risk		0.5	0.5	0.5	0.5	0.5
• Additional usage		2.0	2.0	2.0	2.0	2.0
Security Risk (e.g. Vandalism)						
• After School Hours			1.0	1.0	1.0	1.0
Technology Risk		1.0	2.1	3.8	5.0	2.3

Note that there is a small design and construction risk cost remaining in Year 2, due to the low probability of a delay greater than one year. Technology risk is assumed to increase prior to replacement, due to the increased risk of technological obsolescence over time. The effects of expected inflation (or appropriate cost index) are now included to give the appropriate periodic cash flows, and are then discounted to give the present value of Retained Risk for the project. In this example, all costs are assumed to increase by inflation at 2.5 per cent per year.

Cost	**Year 0 ($M)**	**Year 1 ($M)**	**Year 2 ($M)**	**Year 3 ($M)**	**Year 4 ($M)**	**Year 5 ($M)**
Design and construction risk	10.0	20.5	2.6			
Operating Risk		5.1	5.3	5.4	5.5	5.7
Demand Risk						
• Additional usage		0.5	0.5	0.5	0.6	0.6
Security Risk (e.g. Vandalism)						
• After School Hours			1.1	1.1	1.1	1.1
Technology Risk		1.0	2.1	3.8	5.0	2.3
Total Transferable Risk	10.0	29.2	13.7	12.9	14.3	11.9
Discount factor (assume discount rate @ 8.65% p.a.)	1.00	1.09	1.18	1.28	1.39	1.51
Discounted Cash Flows	10.0	26.9	11.6	10.1	10.3	7.8
Present Value	**76.7**					

In this hypothetical example, the present value of Transferable Risk for the project is $76.7 million. This demonstrates the importance of accurately assessing the expected timing as well as the size of the costs of risk.

2.2 Retained Risk

Retained Risks are those risks or parts of a risk that government proposes to bear itself.

The scope of Retained Risk reflects the nature of the project and the output specifications. Where government retains responsibility for the provision of core services, these should not be considered in the intended risk allocation, as they are not part of the project. For example, in a project for the provision of educational facilities, government maintains the responsibility of providing teachers and developing the curriculum outside the project. This risk does not form part of the project's Retained Risk.

Although both Transferable and Retained Risks are calculated from the same standpoint in a PSC (as the cost to government of holding the risk), they are treated as separate components for the following reasons:

- Retained Risk needs to be added to the private bids to determine the true cost to government under a proposed partnership model; and
- Maintaining a clear distinction between Transferable and Retained Risks focuses attention on the factors influencing risk transfer and the proposed level of that transfer.

2.2.1 Valuing Retained Risk

There are three steps involved with valuing Retained Risk:

Step 1 - Analyse all material and quantifiable risks
Step 2 - Identify optimal risk allocation
Step 3 - Calculate Retained Risk

Although the types of risk that should be borne by government need to be assessed individually for each project, Retained Risk may typically include:

- Provincial/federal change in law risk;
- The portion of commissioning or defect risks that may be caused by flaws in the output specifications; and
- The portion of demand risk which government may assume, for example if the output specifications contain a base level of demand

Government may generally be suited to managing parts of change in law risk due to its unique understanding and role in the regulatory process. Valuing change in law risk first requires an assessment of the impact of the key regulations/legislation influencing a project, and the likely impact of changes to the current regulatory framework.

Often where government assumes a portion of demand risk, the base level of government or community usage specified may be quite conservative (i.e., all government or community demand will be satisfied). In these cases, the associated cost to government of the Retained Risk component of demand risk may be fairly low or immaterial. There may also be additional risks that government agrees to take for policy or other reasons.

This recognizes the particular responsibilities and accountabilities of government with respect to the delivery of services to the community.

Once all the Retained Risks have been identified, the size and timing of the expected cash flows associated with each of these risks needs to be aggregated to determine the NPV of the Retained Risk component of the PSC. Each of the risks should be included as a separate cash flow item and then added to form the Retained Risk component to allow for a detailed analysis of the key risks and their sensitivity to the overall PSC.

Example - Valuing Retained Risk

Table 2.2.1.a.- Simplified Risk Allocation

Risk	**Transferable Risk**	**Retained Risk**
Design and construction risk	X	
Change in law risk		X
Operating Risk	X	
Demand Risk		
• base level demand		X
• additional usage	X	
Maintenance Risk	X	
Security risk (e.g. vandalism)		
• during school hours		X
• after school hours	X	
Technology Risk	X	

For the first five years of the project, the real periodic cash flows for the Retained Risk component of the PSC may look something like Table 2.2.1.b.

Table 2.2.1.b - Retained Risk cash flow valuation - real flows

Cost	**Year 0 ($M)**	**Year 1 ($M)**	**Year 2 ($M)**	**Year 3 ($M)**	**Year 4 ($M)**	**Year 5 ($M)**
Change in law risk		0.5	1.0	2.0	3.0	3.0
Demand Risk						
• base level demand		0.5	0.5	0.5	0.5	0.5
Security Risk (e.g. Vandalism)						
• During School Hours		1.0	1.0	1.0	1.0	1.0

Note that the financial impact of change in law risk increases over time due to increasing uncertainty in the future (e.g. changes to wheelchair or other access requirements, or an increase in safety regulations which may require alterations to the facilities).

Consider the project for the provision of a new educational facility and related ancillary services discussed in the previous example in Section 2.1. Again, the project risks have been allocated as shown in Table 2.2.1.a

The effects of expected inflation are added to give the appropriate periodic cash flows, and are then discounted

Table 2.2.1.c - Retained Risk cash flow valuation - nominal flows

Cost	**Year 0 ($M)**	**Year 1 ($M)**	**Year 2 ($M)**	**Year 3 ($M)**	**Year 4 ($M)**	**Year 5 ($M)**
Change in law risk		0.5	1.1	2.2	3.3	3.4
Demand Risk						
• base level demand		0.5	0.5	0.5	0.6	0.6
Security Risk (e.g. Vandalism)						
• during school hours		1.1	1.1	1.1	1.1	1.1
Total Retained Risk	0.0	2.1	2.7	3.8	5.0	5.1
Discount factor@8.65%	1.00	1.09	1.18	1.28	1.39	1.51
Discounted Cash Flows	0.0	2.0	2.3	3.0	3.6	3.4
Present Value	**14.3**					

In the preceding example, the value of retained risk is $14.3 million. Thus, the total value of risk in the PSC is therefore $91.0 million (including the $76.7 million for Transferable Risk.

2.2.2 Risk Mitigation

When evaluating Retained Risk (for the purpose of constructing the PSC), specific consideration should be given to the ability of government to mitigate risks in practice. Risk mitigation is all about minimizing and controlling either or both the consequences and the probability of a risk materializing. Factors that may help mitigate Retained Risks include:

- Ability to influence directly the probability of a risk materializing;
- Utilizing proven technology and reputable contractors;
- Developing effective monitoring and risk management practices; and
- Maintaining appropriate insurance coverage.

Third-party insurance should be considered for economically insurable Retained Risks. As mentioned previously in Section 1.5, self-insurance, which has been traditionally used by government, is the preferred approach where the cost of it is less than commercial insurance. Ideally, self-insurance should involve setting aside the premiums in a fund or dedicated reserve. However, where government uses commercial insurance (e.g. construction or contractor insurance), the cost of the insured risk to government is no longer included as a Retained Risk, since it has been passed at a cost to a third party. Instead, the cost of premiums should be included in the Raw PSC.

For projects where Retained Risk is included in the PSC, it should also be added to each of the private bids to allow a meaningful comparison with the PSC. However, the level of Retained Risk may need to be adjusted between bids to reflect the same level of risk transfer proposed by government.

Appendix B

Description of Scope of Work, from Section 2.3 of Volume One, Main Document (source: current RFP documents)

2.3 Alignment and Segments

The Facility includes approximately 13 kilometers of new and upgraded roads and structures, including the new bridge and approach structures crossing the Fraser River. The Facility extends from its southwestern limit in the vicinity of 173A Street and 96th Avenue in Surrey northeastward under Highway 1 and Barnston Drive East and parallel to the CN rail right-of-way to the 201st corridor in Langley. The alignment then follows the 201st Street corridor northward across the river and continues through Pitt Meadows and Maple Ridge crossing over the CP railway tracks and Lougheed Highway where it becomes the Abernethy Connector and continues to its northeastern limit at 128th Avenue and 210th Street in Maple Ridge.

For convenience, the RFP describes the Facility using six Segments as outlined below and as shown in Exhibit 2-1. The right-of-way requirements and road cross-sections vary within and across Segments to accommodate the different requirements for traffic lanes, pedestrian, cyclist and other facilities.

- Western Connector (approximately 5.6 kilometres in length). Extends from 173A Street and 96th Avenue eastward adjacent to the BC Hydro line, under Highway 1 and Barnston Drive East and then eastward parallel to the CN rail line to the start of the south approach structure in the vicinity of 199A Street.

- Southern Connector. A one-way couplet at the southern end of the Bridge Crossing, which will provide access to and from the GEB and the 200th Street corridor. The couplet comprises southbound lanes on 199A Street and northbound lanes on 201st Street. The northern limits of the Southern Connector will be the start of the south approach structure elevated ramps on 199A Street and 201 Street.

- Bridge Crossing (approximately 2.2 kilometres in length). Comprises the south and north approach structures and the bridge over the Fraser River.

- Northern Connector (approximately 2.8 kilometres in length). Extends north from the end of the north approach structure approximately at 113B Avenue along the Pitt Meadows-Maple Ridge boundary over the CP railway tracks and Lougheed Highway to the north end of the the Lougheed Overpass structure and to Maple Meadows Way / Dewdney Trunk Road / Lougheed Highway intersection.

- Abernethy Connector (approximately 2.5 kilometres in length). Roughly follows the Maple Ridge-Pitt Meadows boundary north from Lougheed Highway and then eastward across 203rd Street traversing farm properties before joining 128 Avenue at 210th Street.

- 200th St. Upgrades to 200th St extend from the junction of 201st Street & 200th Street South to 88th Avenue West.

2.4 Working with Government and Other Agencies

The Facility contains or is traversed by highways, roads, railways and utility infrastructure owned by parties other than TransLink. The Facility also impacts properties over which various government and other agencies have jurisdiction and specific requirements. The DBFO Contractor will be responsible for working with these external parties and reaching agreements regarding the implementation of the Work.

The DBFO Contractor is to plan, coordinate and implement its activities so as to comply with all governmental and other agency requirements relevant to the Work. Costs associated with these activities and with the accommodation, relocation or adjustment of third party infrastructure will be to the DBFO Contractor's account as specified in the DBFO Agreements.

Contacts

TransLink will organize a series of briefings for Proponents with representatives of the key governments, agencies and utility companies with whom the GEB project team has met during the development of the GEB Project. The RFP Data provides a list of contacts should Proponents wish to consult further when preparing their Proposals (see RFP Volume Five).

TransLink anticipates that it will take an active role in supporting the DBFO Contractor, including discussions with key governments, agencies and utility companies during the Work.

Municipalities

The Facility is located within four municipalities: Langley, Maple Ridge, Pitt Meadows and Surrey. In each municipality, the DBFO Contractor is to obtain all permits required to implement the Work and obtain all municipal approvals required to ensure that the design and construction of Municipal Handover Facilities complies with the applicable municipal standards.

Appendix C

Reference Case Delivery Model Comparison for Facility Construction

B.C. - Awarded Road Projects as of 08 August 2005

>10M
>road or bridge+road

Roads Contractor	**Project Name and Description**	**Date**	**Procurement Method**
Walter and SCI Construction	**Westview Interchange Design/Build Project** Freeway construction through North Vancouver. The first MoT design-build project. http://www.nsnews.com/oldnews/11179503.html http://www.ae.ca/aetoday/000201.html#story2 **$25 million** contract, includes $6-million bridge	Contract award-1994 Completion-1997	Design-Build
Peter Kiewit and Sons	Johnson-Mariner Way project, Coquitlam, B.C. A four-lane arterial road and a bridge over a railway crossing and creek. The second MoT design-build project. http://www.ae.ca/aetoday/000201.html#story2 **$14 million** contract	1994	Design-Build
Emil Anderson Construction Inc. Hope, BC	**Highway 1, Yoho Bridge and Approaches Contract #3: Construction** **$17.2 Million** Awarded to Emil Anderson Construction Ltd., to undertake significant improvements in the Kicking Horse Canyon section of the Trans-Canada Highway	completion fall of 2006	Design-Bid-Build
	Highway 97C/5A, Garcia Lake to Courtney Lake: Construction **$12.9-million contract**	completion fall of 2006.	Design-Bid-Build

JJM Construction	**Sea to Sky Highway Improvements – $600 M capital cost shared by:** Peter Kiewett **JJM Construction – highways contractor** Hatch Mott Macdonald ND Lea, McElhaney Miller Paving Capilano Highway Services (OM&R)	completion by 2009	DBFO Design-Build (Sunset Beach to Lions Bay)
	Highway 10 and Highway 15: Preload A **$10.7-million** contract has been awarded to JJM Construction of Delta to place a preload of granular material to solidify soft soils, allowing for the subsequent widening of Highway 10 to four lanes from 122nd Street to Highway 15 and widening of Highway 15 to four lanes from 32nd Avenue to 96th Avenue.	Preload work will be completed in September 2005.	Design-Bid-Build
B. Cusano Contracting Inc. of Surrey	**8th Avenue, Highway 99A to Highway 15 (176th Street) and Highway 99, Nexus Lane Extension: Construction** **$11.8-million contract**	completion by September 2005	Design-Bid-Build
B&B Contracting Ltd. of Surrey	**Highway 15, 57th Avenue to 68A Avenue: Construction** **$12.2-million contract**	completion in June 2006	Design-Bid-Build
Sharp Construction and CTL Logging Joint Adventure of Prince George	**Highway 97, Fort St. John Phase 2: Construction** **$12.7-million contract**	completion fall of 2005.	Design-Bid-Build
Interoute Construction Ltd. of Crescent Valley	**Highway 37, Hodder Lake to Bob Quinn: Resurfacing** **$9.8-million contract**	completion Aug. 31, 2005	Design-Bid-Build
Ledcor Industrial Limited	A major upgrade of the Sierra Yoyo Desan (SYD) Road through a Design-Build-Finance-Operate-Maintain arrangement. (Ministry of Energy & Mines). http://www.em.gov.bc.ca/subwebs/Oilandgas /infrastructure/syd/syd.htm Bridge and Road Upgrade, shared between: Ledcor Highways Maintenance Ltd. (Fort Nelson) McElhanney Consulting Services Ltd. (Fort St. John) Trow Associates (Vancouver) Triton Environmental Consultants (Vancouver) Buckland & Taylor Ltd. (Vancouver) Peter Kiewit Sons Co. (Vancouver) Doug Gordon Contracting (Fort Nelson) Kledo Construction (Fort Nelson). **$40 - million (upgrade)** **$2.5-million per year (14 year O&M period)**	Awarded June 2004, expected completion December 2005	DBFO Design-Build sub-contracts?

Canada (non-BC) - Awarded Road Projects as of 08 August 2005

Brun-Way Highway Operations Inc	Fredericton - Moncton Toll Road http://www.brunway.com/English/gettingyouthere/index.cfm Partners: SNC-Lavalin Group Inc. Atcon Construction Inc. Team Members: A.D. Fiander & Associates Aspen Environmental Inc Caldwell & Ross Limited Dunbar Construction Limited Eastern Designers & Company Limited Eastern Fence Limited Gemtec Limited Hillside Engineering K-Line Construction Limited R.A. Currie Ltd. Ralph Smith Engineering Inc. Restigouche Construction Co. Limited Springhill Construction Limited	Contract awarded Feb 2005 Completion November 2007	DBFO Design-Build sub-contracts?
	Highway 104 "Western Alignment" Nova Scotia		
	Airport Infield Development - Site Works Lester B. Pearson International Airport		
	Jacque Cartier Bridge, Montreal Redecking Design-Build		
	Reconstruction of the Q.E.W. Stoney Creek, Ontario		

Golden Ears Bridge – Reference Case
Delivery Model Comparison

Option	Delivery Model	Description	Construction Duration	Advantages	Disadvantages
1	**Design-Build**	Single Contract for Entire Facility TL - Outline Design	3.5 years approx.	Costs to owner are better controlled; cost risk priced in by contractor	More difficult to make design changes
				Cost efficiencies gained by having a team which include designers and builders	
				Design/scope change costs – equal to or less than Option 3	
				Better end product because: - More intensive quality control, - independent QA audit - motivation (if owner finds a problem there are significant consequences) - designed to suit construction	
				Potential cost savings due to economies of scale	
				Entire site needs preloading but to varying degrees; single contract facilitates reuse of materials and potential time/cost efficiency	
				Single contractor would deal with utility companies across entire facility; more efficient than Option 2	
				Contract not subject to change by way of political influence; political buy-in required before contract signed	
2	**Design-Build**	Multiple Sections TL - Outline Design	4.0 years approx.	Costs to owners are better controlled; cost risk priced in by contractor	More difficult to make design changes
				Cost efficiencies gained by having teams which include designers and builders	More GVTA-administered meetings required than for Option 1 re. tie-ins therefore higher project cost
				Design/scope change costs – equal to or less than for Option 3	Potentially higher cost per lane-km due to smaller sized contracts

Golden Ears Bridge – Reference Case
Delivery Model Comparison

Option	Delivery Model	Description	Construction Duration	Advantages	Disadvantages
				Better end product because: - More intensive quality control, - independent QA audit - motivation (if owner finds a problem there are significant consequences) - designed to suit construction	Multiple contractors would deal with utility companies; less efficient that Options 1 and 2
				Contracts not subject to change by way of political influence; political buy-in required before contracts signed	More potential for variation in quality than Option 1 due to multiple contractors.
3	**Design-Build** (bridge and road sections with significant structural and utility works) **Design-Bid-Build** (road sections with mainly traditional civil infrastructure content)	<u>DB Portion</u>: Multiple Sections TL-Outline Design <u>DBB Portion</u> Multiple Sections TL – Detailed Design	4.0 years approx.	Bridge Crossing: Advantages as for Option 1 Connector Roads: Advantages as for Option 4	Bridge Crossing: Disadvantages as for Option 1 Connector Roads: Disadvantages as for Option 4
					The schedule and cost advantages of using a DB contract for the bridge construction potentially threatened by scope or contract changes to connector road construction.
4	**Design-Bid-Build**	Multiple Sections TL - Detailed Design	4.0 years approx.	Since detailed design complete at contract award, potential to start earlier	More scope creep potential
				GVTA are in complete control of scope and budget throughout, so design changes easily implemented	Historically cost over-runs of 30% typical
				Design/scope changes easy to implement	Historical schedule over-runs of 0.5 years on 3-year B.C. road project (Alex Fraser Bridge and approach roads)
				Political Sensitivity; GVTA better able to respond to cultural/ethnic/ALR/community issues	Design and construction contracts separate - less efficient than Option s 1 or 2
					Design/scope change costs – equal to or greater than for Options 1 or 2
					GVTA would interface with utility companies, added GVTA cost

Golden Ears Bridge – Reference Case
Delivery Model Comparison

Option	Delivery Model	Description	Construction Duration	Advantages	Disadvantages
					Capital costs based on unit prices; these could fluctuate – due to inflation/demand
					Contractors not as motivated to work efficiently or create a quality product
					More potential for variation in quality than Option 1 due to multiple contractors.
					More administrative effort by GVTA, running multiple contracts over time and at any one time
					Contract subject to change by way of political influence
5	**Design-Bid-Build**	Single Section TL - Detailed Design	4.0 years approx.	Since detailed design complete at contract award, potential to start earlier	Do local contractors carry sufficient bonding for a project this size? DBB contracts so far in BC are under $20 million.
				GVTA are in complete control of scope and budget throughout, so design changes easily implemented	Would a DBB project this size attract interest from outside the province/country?
				Design/scope changes easy to implement	More scope creep potential
				Political Sensitivity; GVTA better able to respond to cultural/ethnic/ALR/community issues	Historically cost over-runs of 30% typical
				Single contractor would deal with utility companies across entire facility; more efficient than Option 4	Historical schedule over-runs of 0.5 years on 3-year B.C. road project (Alex Fraser Bridge and approach roads)
				Entire site needs preloading but to varying degrees; single contract facilitates reuse of materials and potential time/cost efficiency	Design and construction contracts separate - less efficient than Option 4
					Design/scope change costs – equal to or greater than for Option 4
					GVTA would interface with utility companies, added GVTA cost

Golden Ears Bridge – Reference Case
Delivery Model Comparison

Option	Delivery Model	Description	Construction Duration	Advantages	Disadvantages
					Capital costs based on unit prices; these could fluctuate – due to inflation/demand
					Contractors not as motivated to work efficiently or create a quality product
					Contract subject to change by way of political influence

Appendix D

Basis of Estimate – Reference Case Total Contracts

Technical Memorandum No. 6

The Golden Ears Bridge

Greater Vancouver Transportation Authority

Reference Case Estimate Assumptions

OCTOBER 2005

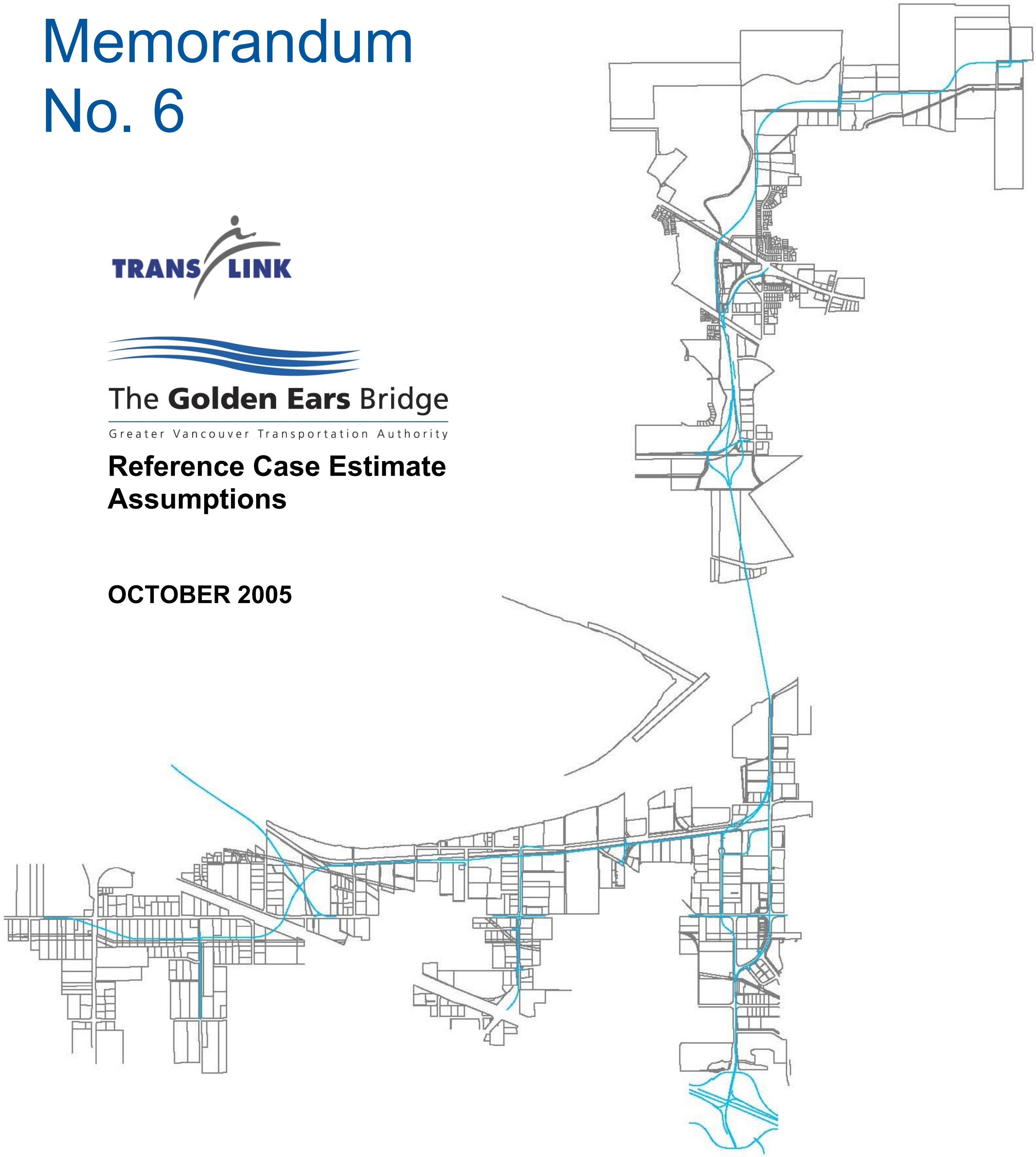


Table of Contents

TECHNICAL MEMORANDUM NO. 6

TransLink
Golden Ears Bridge

Reference Case Estimate – Assumptions

Issued: October 31, 2005
Previous Issue: --

1 PROJECT DELIVERY LOGISTICS

1.1 Composition of Contracts

For the Reference Case Estimate, the Project has been divided into three Design-Build (DB) and 2 Design-Bid-Build (DBB) contracts.

The type of contract by section is based on complexity and type of construction work, and potential opportunities for innovation and scheduling improvements. Sections dominated by or with significant structural and utility works have been designated for design-build. Sections with traditional civil infrastructure content, similar to a municipal road projects, have been designed for design-build-bid.

Project components have been assigned to contracts after consideration of work type, construction scheduling, coordination between contracts, impact on adjacent work, and impact on traffic management. Using these basic considerations, the following decisions were made:

- Although 180th Street is a municipal road, and would, accordingly, be included in Contract 1 – South Shore Municipal Facilities, it has been included in Contract 2 – 176th Street to Telegraph Trail for traffic management and community access reasons. The GEB Mainline under Contract 2 will sever 182nd Street, which provides access to the area known as the South Port Kells triangle. The construction of 180th Street prior to the severing of 182nd Street is necessary for maintenance of community access.

- The realignment of 98th Avenue between 189th and 190th Streets has been included in Contract 2 for similar reasons.

- The 96th Avenue Connector construction must be coordinated with the Barnston Drive overpass construction and the GEB Mainline between the connector and 176th Street to maintain traffic continuity to 96th Avenue, and is, therefore, included in Contract 2.

- The upgrading of the 192nd Street crossing of CN Rail and the tie-in to 98A Avenue is controlled by the GEB Mainline construction through 192nd Street, and, therefore, is included in Contract 2.

- The location of the boundary between Contract 2 and Contract 3 is based on utility impacts. There is a definite break in the utility systems at Telegraph Trail. The proximity of the Mutual Materials overpass to the bridge structures to the east is another factor.

- The construction of new Telegraph Trail and the closure of old Telegraph Trail are dependent on the Mutual Materials overpass construction and, therefore, included in Contract 3 – Fraser River Crossing. The remainder of improvements to old Telegraph Trail south of the CN spur line can logically remain in Contract 1.

- Near the CN Rail at 199A and 201st Streets, coordination of the works between Contracts 1 and 3 is necessary. To limit the overlap between the contracts, grade and utility works on 201st Street adjacent and under the 201st Street entrance ramp and the south approach viaduct to the main river crossing have been included in Contract 3. As the implementation of the conversion of 199A and 201st Streets to a one-way couplet is dependent on the east-west connecting road between those streets, it has to be included in Contract 1.

- The location of the boundary between Contract 3 – Fraser River Crossing and Contract 4 – 113B Avenue to Lougheed Highway has been placed at grade just north of the start of the north-facing ramps of the 113B Avenue Interchange. Thus, the entire interchange is within Contract 3. This eliminates coordination issues related to the tie-in of the south-facing ramps to the north approach structure to the main river crossing and provides an opportunity for the exploration of interchange configurations options.

- The location of the boundary between Contract 4 and Contract 5 – Abernethy Connector has been placed on the north-south tangent of the connector within the District of Maple Ridge. Thus all works impacting the Maple Meadows Golf Course are contained within Contract 4.

The physical components of each contract, as illustrated on the attached Figure 1-1, are as follows:

- Contract 1 – South Shore Facilities (DBB)
    - 201st Street from 200th Street to start of the bridge ramp structure
    - 199A Street from the end of the bridge ramp structure to 96th Avenue
    - The new east-west connecting road between 201st and 199A Streets
    - 96th Avenue from Telegraph Trail to 201st Street
    - Telegraph Trail from 98A Avenue to 96th Avenue
    - 200th Street from 86th Avenue to 201st Street
    - Realigned 200th Street from 96th Avenue to 201st Street
    - 192nd Street from just south of the GEB Mainline to north of the Harvie Road Overpass at Highway 1
    - 96th Avenue approaches to 192nd Street

- Contract 2 – 176th Street to Telegraph Trail (DB)
  - GEB Mainline from west of 176th Street to just west of the old Telegraph Trail
  - The intersection at 176th Street and necessary improvements north and south of the intersection on 176th Street
  - 180th Street from just north of the GEB Mainline to 92nd Avenue
  - Highway 1 overpass structures
  - Barnston Drive overpass structure
  - 96th Avenue Connector and intersection from GEB Mainline to 96th Avenue
  - Connector from the 96th Avenue Connector to Barnston Drive
  - Unnamed Creek Bridge
  - 98th Avenue between 189th Street and 190th Street
  - 192nd Street north from the GEB Mainline to tie to 98A Avenue north of the tracks
  - Cul-de-sacs within the Contract limits

- Contract 3 – Fraser River Crossing (DB)
  - GEB Mainline from just west of old Telegraph Trail to just north of the north-facing ramps of the 113B Avenue Interchange
  - GEB Mainline structures include the Mutual Materials overpass, the south approach to the main river crossing, the main river crossing, the north approach to the main river crossing, the 201st Street entrance ramp, and the 199A Street exit ramp
  - 201st Street beneath the south approach structure from the start of the 201st Street structure to 102B Avenue
  - 113B Avenue Interchange
  - Pitt Meadows shared path

- Contract 4 – 113B Avenue to Lougheed Highway (DB)
  - GEB Mainline from just north of the north-facing ramps of the 113B Avenue Interchange to north of the Lougheed Highway Interchange
  - GEB Mainline structures include the CP overpass, the ONNI viaduct, and the Lougheed Highway overpass
  - Lougheed Highway Interchange including ramp structures
  - Maple Meadows Way exit ramp and structures
  - Maple Meadows Way upgrading
  - Dunn Avenue improvements including the realignment at West Street
  - Maple Meadows Way/Dewdney Trunk Road/Lougheed Highway intersection
  - Lougheed Highway eastbound acceleration lane from Maple Meadows Way
  - West Coast Express access to the GEB Mainline
  - Golf course underpasses

- Contract 5 – Abernethy Connector (DBB)

- GEB Mainline from north of the Lougheed Highway Interchange to 128th Avenue
- 203rd, 209th, and 210th Street tie-ins to the GEB Mainline

1.2 Contract Scheduling

To determine the schedule for the five construction contracts, the key steps in the procurement and execution of DB and DBB contracts were established. These steps are summarized in Table 1-1.

Table 1-1
The Design – Build and Design – Bid – Build Processes

Design–Build (Contracts 2, 3, 4)		**Design-Bid-Build (Contracts 1,5)**	
DB Contract	Prepare and issue EOI; receive and evaluate responses	Design Contract	Prepare RFP
	Prepare shortlist of proponents		Issue RFP
	Prepare and issue RFP; receive proposals		Evaluate proposals
	Evaluate proposals		Design contract execution
	Contract execution		
		Construction Contract	Prepare, issue and receive bids from tender documents
			Bid evaluation
			Construction contract execution

Subsequently, through project team discussions the time required for each of the steps listed above was considered for each of Contracts 1 to 5. The conclusions are summarized in Tables 1-2 and 1-3.

Table 1-2
Design – Build Contract Durations

	Contract 2 176 to Telegraph	Contract 3 Fraser River Crossing	Contract 4 113B to Lougheed
Prepare, issue and receive responses from EOI	2 months	2 months	2 months
Prepare shortlist	1 month	1 month	1 month
Prepare, issue and receive responses from RFP	6 months	6 months	6 months
Evaluate proposals	2 months	2 months	2 months
Contract execution	2.5 years	3.5 years (with possible DFO fisheries window schedule constraints)[1]	2.5 years
Total Duration	3. 5 years	4.5 years	3.5 years

Table 1-3
Design – Bid – Build Contract Durations

		Contract 1 South Shore Municipal Facilities	Contract 5 Abernethy Connector
Design Contract	Prepare RFP	4 weeks	4 weeks
	Issue RFP and receive proposals	6 weeks	6 weeks
	Evaluate proposals	2 weeks	2 weeks
	Design contract execution and duration	1 year	1 year
Construction Contract	Prepare, Issue and receive bids from tender documents	2 months	
	Bid evaluation	1 month	1 month
	Construction contract execution and duration	2 years	14 months
Total Duration		3.5 years	2.5 years

[1] The Department of Fisheries and Oceans fisheries window schedule constraints refers to a time window during which no river-related (pile) foundation construction may occur due to seasonal fish movement. Typical window period is March – May. Were Contract 3 to be awarded in December through May, the construction schedule could be constrained due to this provision.

The critical timeline governing the completion of the project is the duration of Contract 3, the Fraser River Crossing. This task is expected to take a total of 4.5 years. Assuming procurement begins in January 2006, Contract 3 is expected to be complete by the end of June 2010.

Since the duration of Contracts 1, 2, 4 and 5 is shorter than Contract 3, consideration was given to the relative scheduling of the contracts and potential benefits that could result. Completion of all contracts consistent with the river crossing would result in a single commissioning of the entire project with no significant interim benefits to vehicle users. Alternatively early completion of certain contracts could provide local benefits prior to completion of the river crossing. A summary of the adopted start and completion dates of all five contracts is shown in Table 1-4.

Table 1-4
Contracts Schedule Summary

Contract	Start Date	End Date
Contract 1 South Shore Municipal Facilities	November 2006	June 2010
Contract 2 176 to Telegraph	January 2007	June 2010
Contract 3 Fraser River Crossing	January 2006	June 2010
Contract 4 113B to Lougheed	March 2006	October 2009
Contract 5 Abernethy Connector	July 2007	December 2009

The reasons for staging the completion of the contracts are:

- If completed on time, the 113B to Lougheed (Contract 4) and Abernethy Connector (Contract 5) sections of the Facility may be opened for public use prior to June 30, 2010. They provide an improved road connection to the Lougheed Highway from other parts of Maple Ridge and Pitt Meadows

- Staging reduces the risk of the June 30, 2010 opening of the overall GEB Facility from being delayed.

Insert Figure 1-1 Here

2 ESCALATION

To complete the Reference Case Estimate, two specific cost escalation issues required review, namely adjustment of the current unit rate data to reflect anticipated pricing for 2005 and development of inflation rates for estimation of bid prices for the relevant contracts.

2.1 Adjustment of Unit Rate Data

The current project capital cost estimate is based on 2004 dollars. To update the estimate, and specifically the various unit construction rates, prices from recent 2005 contracts were reviewed. The prices were also considered relative to scale of work, type of construction, and duration of contract to assess the applicability of the rates to the GEB work. Based on the available data, the following price escalation assumptions have been made:

- For road works and civil infrastructure works, unit rate increases range between 5% and 10%. Some construction items, specifically gravels, have increased dramatically, and accordingly, increases of to 40% result. No specific adjustment was made for contract duration, as the original rates had been developed from construction cost data that typically reflects multi-year road works contracts. **Assumption Adopted: 5% to 10% increase for civil infrastructure works.**

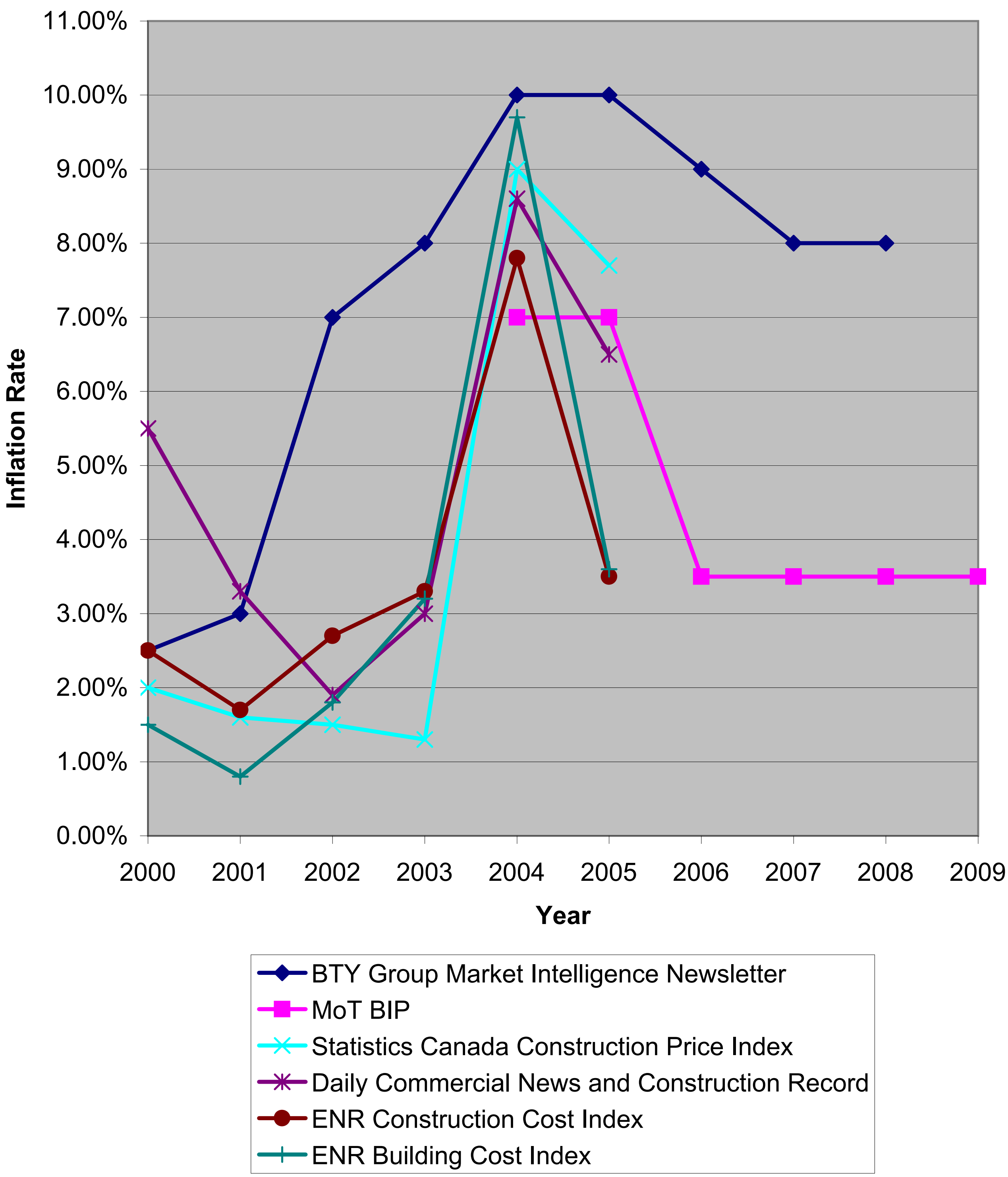
- For bridges and structures, rates were reviewed based on the size of the structure, namely conventional highway bridges versus long span river crossing bridges and approaches. The available data suggested that a 10% increase for conventional bridges and an 8% increase for long span bridges is reasonable. In addition, as the available data was based on short duration contracts, typically 1 to 1.5 years, a further adjustment was made to the rates to reflect the anticipated multi-year duration of the contracts. This increase was developed based on the inflationary rates discussed below, and the estimated value of structural work in each construction year. **Assumption Adopted: 10% increase for conventional bridges, 8% increase for river bridge and approaches.**

2.2 Inflation Rates

Various sources were reviewed to establish pricing trends within the infrastructure construction industry. A subjective review of the likely market place in future years was also undertaken. Within this analysis and review, engineering judgment has been utilized to inflate the 2005 estimated construction capital cost to reflect anticipated construction cost for the year in which the contract will be bid.

Our research efforts provided little information on future trends in inflation. Historical data is available, although not typically focused on the infrastructure construction sector. Figure 2-1 provides a graphical presentation of the data assembled.

Figure 2-1
Construction Cost Inflation Rates



The following provides additional background information:

- BTY Group Market Intelligence Newsletter - 4th Quarter Indices Report - BTY Group is a cost management and project management consultant.

- Ministry of Transportation Border Infrastructure Program.

- Statistics Canada - Non-residential Building Construction Price index for Vancouver, Years 2000 to 2004.

- Daily Commercial News and Construction Record, 08/03/05, Vol. 78, Iss. 148, pg. 2, article by: John Clinkard "The rate of increase of non-residential construction costs for the seven largest census metropolitan areas in Canada appears to have peaked in the fourth quarter of 2004, when a fourteen-year high was recorded. This observation is based on the year-over-year increase in the composite price index for non-residential building construction, which slowed from + 8.6% in the fourth quarter of 2004 to +6.5% in the first quarter of 2005. ...Looking forward, it appears that the rate of increase in non-residential construction costs will slow further over the remainder of 2005 and into 2006 for two reasons. First, the rate of growth of world commodity prices, principle contributor to last year's acceleration in non-residential construction costs, has slowed sharply over the past several months. It is likely that this moderating trend will continue. Second, although non-residential building will pick up steam in the coming months (leading to stronger demand for materials and labour), much of this increase will be offset by an expected slowing in residential construction. A final point: given the very strong pace of non-residential construction activity in B.C. and Alberta, cost increases in those two provinces will continue to outpace the rest of the country over the next several quarters." (Canadian National data)

- Engineering News Record - 12/20/04 issue, article by: Tim Grogan "ENR's Building Cost Index [BCI] was affected the most by the spike in prices, ending the year 9.7% higher than 2003. The Construction Cost Index [CCI] posted a 7.8% annual increase. ENR believes the impact from higher material prices on industry inflation has played out and by December of next year inflation will ease back to its former pace. ENR is forecasting a 3.6% increase for the BCI and a 3.5% increase in the CCI in 2005."

Assumption Adopted: Based on the available information and discussions with the Project Team, we have assumed a yearly construction cost inflation rate of 6% for the Years 2005 to 2010, compounded to the year of bid for each contract.

3 DB RATES VERSUS DBB RATES

3.1 Construction

Definitive data is not readily available to ascertain the costing differential between these two delivery methods.

Generally DBB contracts tend to yield higher costs than DB contracts for the following reasons:

- more onerous specifications
- less opportunity for innovation by the contractor
- less opportunity for the contractor to utilize alternative materials and material sources
- more contractor claims for changed conditions or design.

As data is not available for DB work, the construction costs for DBB and DB contracts have been estimated based on DBB pricing data.

If reliable DB cost data had been available, the total cost of the Reference Case estimate (assuming the same years of construction) would have been higher than the DBFO estimate due to its DBB components. However, as the value of the DBB work is small relative to the DB work (less than 5% of the total construction cost), the impact is insignificant and has been ignored. As the majority of the work is DB, and has been estimated based on DBB, the construction cost likely includes some additional, yet not quantifiable contingency.

3.2 Soft Costs

Soft costs generally include preliminary and detailed design, project management, and resident engineering during construction. These costs have been developed as a percentage of construction cost, which is a methodology that is consistent with industry practice. DBB soft costs generally are higher than DB soft costs as the DB process provides opportunities for design efficiencies resulting from direct interaction between the designer and the contractor.

Under DB, the contractor is typically responsible for preliminary design, detailed design, resident engineering, and project management of the design and construction process. TransLink, as the owner, also has a project management role through the DB delivery phase. Rates used for contractor and owner costs under DB are based on typical costs experienced on other large projects delivered using an alternative delivery process, such as the Fredericton-Moncton Highway in New Brunswick.

DBB rates are average rates based on historical data compiled by the Ministry of Transportation for use with their elemental parametric cost estimating methodology, which is the base methodology used for the Golden Ears Bridge Project. The preliminary design rate, normally 3%, has been reduced to 0.5% in recognition of the substantial preliminary design work completed to date.

Management Reserve is an allocation of funds to manage scope changes and cost pressures beyond the estimated scope of a project. It is not construction contingency. On DB projects, typically no management reserve is provided. By the nature of the DB delivery process, the scope of work must be well defined and inclusive of third party requirements. On DBB projects, changes to the project scope for elements that may arise through third parties are more prevalent. Any potential changes to the project scope have been identified under risk assessment, and accordingly, no direct allowance for management reserve under DBB has been made.

The following table provides assumed rates as a percentage of construction cost:

Table 3-1
Soft Cost Rates

SOFT COST	DB RATE (% of Construction)	DBB RATE (% of Construction)
Preliminary Design	2.0%	0.5%
Detailed Design	3.75%	5.5%
Project Management		
- TransLink	2.0%	1.5%
- Contractor	3.5%	Included in construction costs
Resident Engineering	3.0%	6.0%

3.3 Construction Contingency

The purpose of construction contingency is to provide an allowance for variations in estimated construction quantities and unit rates. Based on historical data compiled by the Ministry of Transportation, for the current level of design, a rate of 15% of construction cost is typical for DBB. Experience from other DB contracts indicates that a 12% rate is realistic.

3.4 Property Costs

The delivery of Facility Lands through the property acquisition process is now progressing, with many properties under negotiation. Although the Reference Case contract delivery would start one year later than the DBFO contract, it would not be practical to stop and re-start the acquisition process due to its advanced stage. Accordingly, property acquisition costs for the Reference Case are assumed to be the same as the DBFO.

Prepared by:

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Project Manager
NDA/cb

Appendix E

Tolling Revenue and Tolling Infrastructure – DBFO and Reference Case Comparison

1 Toll Revenue

	Item	Assumptions: Current	Assumptions: Reference	Notes
1.1	*SDG Final report*	Opening in 2008 6 GP lane on main crossing car toll rate of $2.50 (2003 $) small trucks= 1.5* car tolls large trucks= 2* car tolls No variable toll rates tolling both directions no additional video toll revenue No charges for transponders	Opening in 2009 6 GP lane on main crossing car toll rate of $2.50 (2003 $) small trucks= 1.5 car tolls large trucks= 2* car tolls No variable toll rates tolling both directions no additional video toll revenue No charges for transponders	Refer to February 2005 Board report for classifications and rates Refer to February 2005 Board report for classifications and rates
1.2	*Additional Video Revenue*	Applied	Applied	See KPMG memo dated May 19, 2005
1.3	*Transponder maintenance fees ($1 monthly fee in 2003$)*	NA	NA	Revenue has been builtinto the back office operating cost model to offset transponder capital cost of $10.
1.4	*Transponder security deposit ($10 in 2003$)*	NA	NA	Financial gain based on an interest rate of 4% have been built into the back office operating cost model to offset transponder capital cost
	Future Toll adjustments, I.e. maximum annual escalation of tolls	Base rate applied to cars adjusted by the reported CPI rate in Canada, rounded to the nearest nickel		

2 Tolling Infrastructure

	Item	Assumptions: Current	Assumptions: Reference	Notes
2.1	*Tolling civil infrastructure, gantries, conduits, etc..*	Part of Civil DBFO Contractor Work	Part of Civil DBFO Contractor Work	
2.2	*Tolling System*	Design, Build, Operate and Maintain	Design, Build, Operate and Maintain	
		RFP to be issued in August 2005 Contract term of 5+3 years Capital cost paid off in 2009 Semi annual OM payments (includes inflation)	One year delay Contract term of 5+3 years Capital cost paid off in 2010 Semi annual OM payments (includes inflation)	If the busienss model changes in October, the impacts will be: Cancelling the current RFP process, possible delay of about a year, competing with more tolling projects in the following year

Appendix F

OMR Delivery Model Options Summary Table

Golden Ears Bridge – Reference Case
OMR Model Options

Option	OMR Model	Description	Contract Duration	Advantages	Disadvantages
1 (A)	TL – Bridge & Roads	TL engages in private OMR contracts for entire Facility. This includes the following aspects of work: Periodic Inspections, Operations and Maintenance, and Rehabilitation for each of the following components of the Facility: 1. Roads, 2. Structures and 3. Electrical BC road/highway standards adopted	5 years	TL has direct control over OMR activities, more influence if traffic flow over bridge affected (i.e. than if municipalities given responsibility as in Options 2 and 3)	Higher legal and specialist consultant fees incurred in administering private contract than if municipalities took on all or some OMR responsibility (as for Options 2 and 3)
				Efficiencies with creating and engaging in only one contract for each component of the entire Facility	More cost to TL to set up contract than if municipalities took over responsibility for OMR of some or all of Facility (Options 2 and 3) or if MOT took over responsibility for O&M of roads (Option 1B)
1(B)	TL/MOT – Bridge And Roads	As for Option 1(A) but no RFQ or competitive tender, but instead extend existing arrangement with MOT for their administration of O&M work for Pattullo, Knight St and Westham Island bridges to include GEB Facility (including bridges and roads): All Road O&M (including inspections) - MOT administered All Road Rehabilitation – TL administered All Structure OMR – TL administered All Structure Inspections – TL administered All Electrical OMR (including inspections) – TL administered BC road/highway standards adopted	5 years	Slightly less TL effort to set up contract with MOT than if OMR were contracted privately.	TL would still have full responsibility for all electrical OMR work and OMR and rehabilitation for major structures and rehabilitation for roads.
				Less TL effort to administer contract, as direct interfacing with contractor done by MOT	Starting Jan 2005 MOT's OMR work has been carried out by private contractors. Consequently, TL has no valid OMR contract with MOT for past year for three TransLink – owned bridges. TL's bridges are a small part of MOT's OMR budget – therefore TL has less influence than if the contract is a large part of a private contractor's client base. Such a situation is particularly undesirable/risky with a tolled facility.

Golden Ears Bridge – Reference Case
OMR Model Options

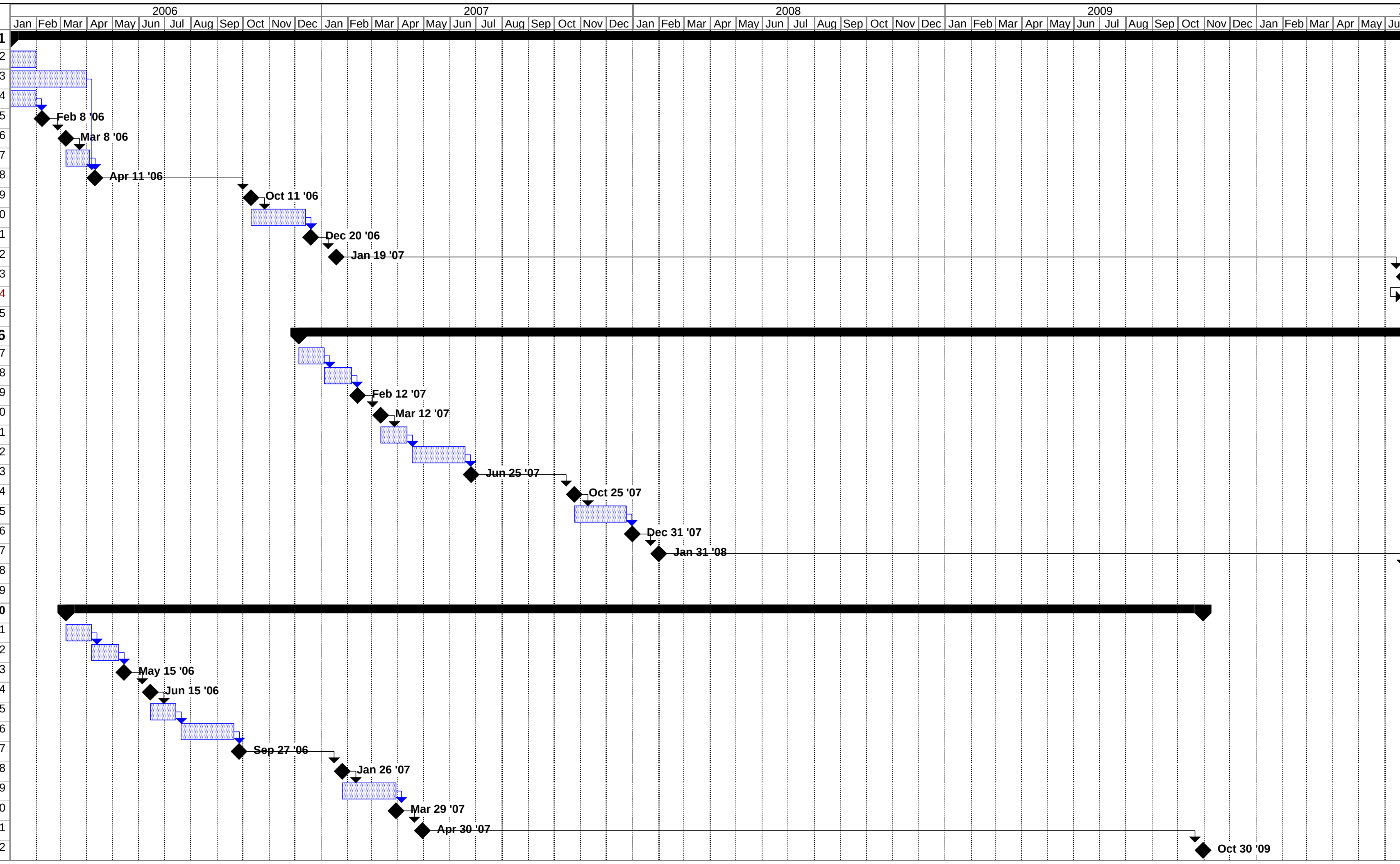
Option	OMR Model	Description	Contract Duration	Advantages	Disadvantages
2	TL – Bridge Municipalities - Roads	TL engages in private contract(s) for the OMR of the GEB (including road surface on bridge), including the following aspects of work: Periodic Inspections, Operations and Maintenance, and Rehabilitation. BC road/highway standards adopted for the bridge. Municipalities responsible for non-bridge roads/structures/electrical OMR (Multiple OMR Sections, divided by municipality boundaries) Road standards to be as presently exist for the MRN roads.	Bridge – 5 years Roads – long-term partnership with municipalities through the MRN OMR Program	For Bridge – TL has direct control over OMR activities, more influence if traffic flow over bridge affected.	For Bridge - higher legal and specialist consultant fees incurred in administering private contract than if MOT took on OMR responsibility (as in Option 3)
				For roads – reduced legal and specialist consultant fees associated with municipalities administering the work	Roads - TL has less control over OMR activities, and as a result: • TL has potentially less influence if traffic flow over bridge affected, and • more difficult for TL to deal with complaints.
				Less TL efforts and less cost to TL to administer roads contract, since the roads would be maintained in the same way as current MRN roads.	Roads – TL would have to enter into contract and deal with 4 different agencies for the roads OMR.
					Roads - ownership of the roads will be topic for discussion. The municipalities own MRN roads but TransLink pays for their OMR, at rates that municipalities claim are too low. If TransLink pays more for GEB roads than for MRN roads, municipalities will complain about unequal pay for equal work. The municipalities will want to maintain roads to their own standard. However, the municipalities have standards that are different from each other and different from MRN-TL standards.
3	Municipalities – all	Multiple OMR Sections, divided by municipality boundaries. This is the same as for Option 2 but one municipality would take on bridge OMR. (It is not considered feasible for bridge OMR to be shared by more than one agency.) Standards to be as presently exist for the MRN roads.	Bridge and Roads – long-term partnership with municipalities through the MRN OMR Program	Reduced legal costs/specialist consultant fees associated with municipalities administering the work	TL would have to interact with four different agencies
				Setting up contract would involve establishing boundaries and deciding on which agencies carry out bridge OMR. Overall effort less than setting up single OMR contract with private contractor (Option 1)	TL has less control over OMR activities, potentially less influence if traffic flow over bridge affected
					This option is not feasible as it is not reasonable to hand over the operations and maintenance of a major bridge to a municipality.

Appendix G

Reference Case Project Schedule

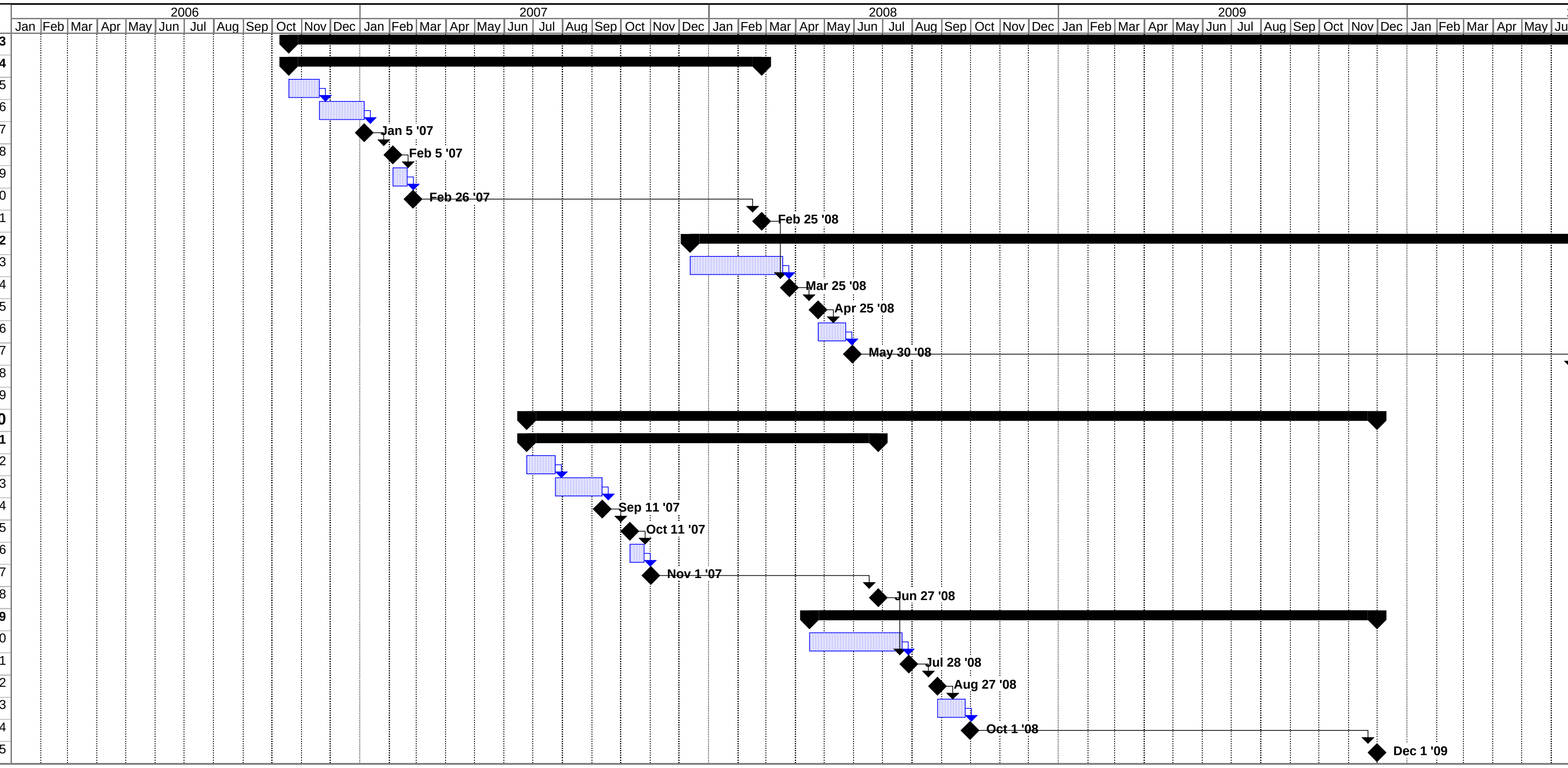
TransLink - Engineering & Project Services
Golden Ears Bridge
Reference Case Schedule

Act.ID	Task Name	Duration	Start	End
1	**DB - Section 3 (Fraser River Crossing)**	**1172 days**	**Mon 1/2/06**	**1**
2	Hire additional consultants	22 days	Mon 1/2/06	2
3	Prepare RFP	65 days	Mon 1/2/06	3
4	Prepare Request for EOI	22 days	Mon 1/2/06	4
5	Issue Request for EOI	0 days	Wed 2/8/06	5
6	Receive EOI Responses	0 days	Wed 3/8/06	6
7	Prepare Shortlist	20 days	Wed 3/8/06	7
8	Issue RFP to Shortlist	0 days	Tue 4/11/06	8
9	Proposals Received	0 days	Wed 10/11/06	9
10	Proposal Evaluation Period	46 days	Wed 10/11/06	10
11	Award of Contract	0 days	Wed 12/20/06	11
12	Construction Start	0 days	Fri 1/19/07	12
13	Construction Complete	0 days	Wed 6/23/10	13
14	Traffic begins across Golden Ears Bridge	0 days	Wed 6/30/10	14
15				15
16	**DB - Section 2 (176 to Telegraph)**	**931 days**	**Wed 12/6/06**	**16**
17	Hire additional consultants	22 days	Wed 12/6/06	17
18	Prepare Request for EOI	22 days	Fri 1/5/07	18
19	Issue Request for EOI	0 days	Mon 2/12/07	19
20	Receive EOI Responses	0 days	Mon 3/12/07	20
21	Prepare Shortlist	23 days	Mon 3/12/07	21
22	Prepare RFP	44 days	Wed 4/18/07	22
23	Issue RFP to Shortlist	0 days	Mon 6/25/07	23
24	Proposals Received	0 days	Thu 10/25/07	24
25	Proposal Evaluation Period	43 days	Thu 10/25/07	25
26	Award of Contract	0 days	Mon 12/31/07	26
27	Construction Start	0 days	Thu 1/31/08	27
28	Construction Complete	0 days	Wed 6/30/10	28
29				29
30	**DB - Section 4 (113B to Lougheed)**	**953 days**	**Wed 3/8/06**	**30**
31	Hire additional consultants	22 days	Wed 3/8/06	31
32	Prepare Request for EOI	22 days	Fri 4/7/06	32
33	Issue Request for EOI	0 days	Mon 5/15/06	33
34	Receive EOI Responses	0 days	Thu 6/15/06	34
35	Prepare Shortlist	22 days	Thu 6/15/06	35
36	Prepare RFP	44 days	Fri 7/21/06	36
37	Issue RFP to Shortlist	0 days	Wed 9/27/06	37
38	Proposals Received	0 days	Fri 1/26/07	38
39	Proposal Evaluation Period	45 days	Fri 1/26/07	39
40	Award of Contract	0 days	Thu 3/29/07	40
41	Construction Start	0 days	Mon 4/30/07	41
42	Construction Complete	0 days	Fri 10/30/09	42



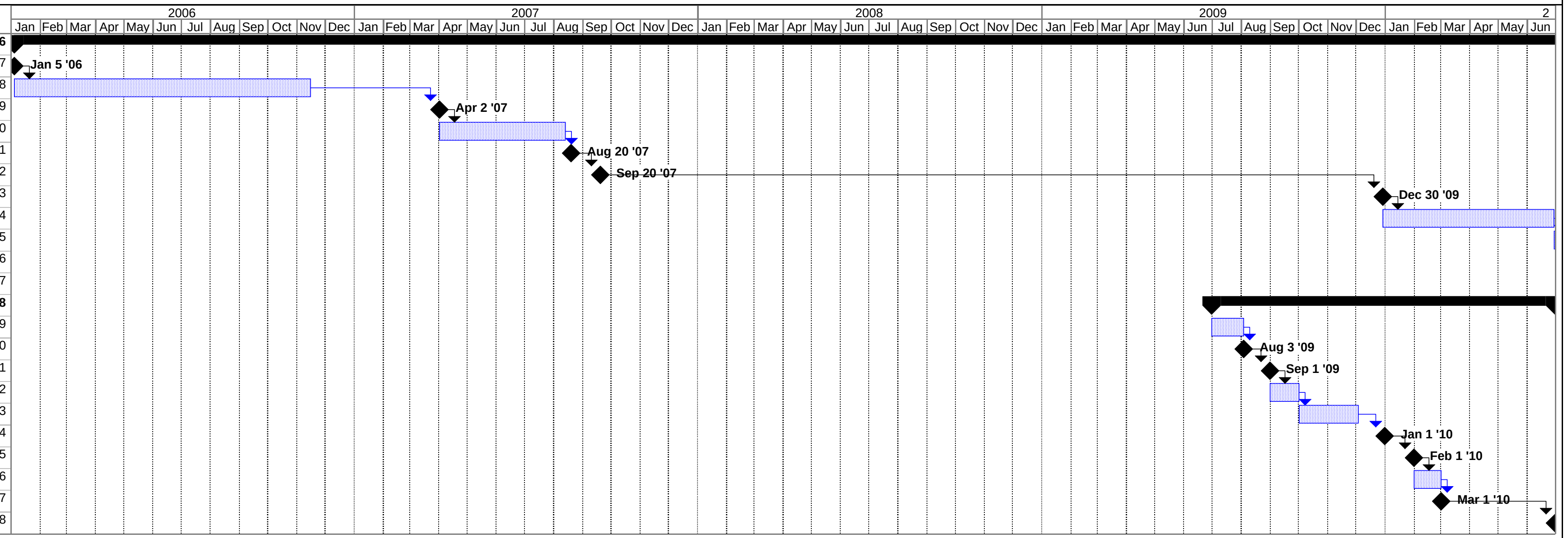
TransLink - Engineering & Project Services
Golden Ears Bridge
Reference Case Schedule

Act.ID	Task Name	Duration	Start	End
43	**DBB - South Shore Municipal Facilities**	**965 days**	**Thu 10/19/06**	**43**
44	**Design Contract**	**353 days**	**Thu 10/19/06**	**44**
45	**Hire additional consultants**	22 days	Thu 10/19/06	45
46	**Prepare RFP**	35 days	Mon 11/20/06	46
47	Issue RFP to Shortlist	0 days	Fri 1/5/07	47
48	Proposals Received	0 days	Mon 2/5/07	48
49	**Proposal Evaluation Period**	11 days	Mon 2/5/07	49
50	Award of Contract	0 days	Mon 2/26/07	50
51	Design Complete	0 days	Mon 2/25/08	51
52	**Construction Contract**	**665 days**	**Thu 12/13/07**	**52**
53	**Prepare Tender Documents**	69 days	Thu 12/13/07	53
54	Issue Tender Documents to Shortlist	0 days	Tue 3/25/08	54
55	Bids Submitted	0 days	Fri 4/25/08	55
56	**Bid Evaluation Period**	21 days	Fri 4/25/08	56
57	Award of Contract	0 days	Fri 5/30/08	57
58	Construction Complete	0 days	Wed 6/30/10	58
59				59
60	**DBB - Section 5 (Abernathy Connector)**	**636 days**	**Mon 6/25/07**	**60**
61	**Design Contract**	**264 days**	**Mon 6/25/07**	**61**
62	**Hire additional consultants**	22 days	Mon 6/25/07	62
63	**Prepare RFP**	35 days	Wed 7/25/07	63
64	Issue RFP to Shortlist	0 days	Tue 9/11/07	64
65	Proposals Received	0 days	Thu 10/11/07	65
66	**Proposal Evaluation Period**	11 days	Thu 10/11/07	66
67	Award of Contract	0 days	Thu 11/1/07	67
68	**Design Complete**	0 days	Fri 6/27/08	68
69	**Construction Contract**	**424 days**	**Wed 4/16/08**	**69**
70	**Prepare Tender Documents**	69 days	Wed 4/16/08	70
71	Issue Tender Documents to Shortlist	0 days	Mon 7/28/08	71
72	Bids Submitted	0 days	Wed 8/27/08	72
73	**Bid Evaluation Period**	21 days	Thu 8/28/08	73
74	Award of Contract	0 days	Wed 10/1/08	74
75	Construction Complete	0 days	Tue 12/1/09	75



TransLink - Engineering & Project Services
Golden Ears Bridge
Reference Case Schedule

Act.ID	Task Name	Duration	Start	End
76	**DBOM - Tolling Contract**	**1192 days**	**Thu 1/5/06**	**76**
77	**Prepare RFP (already done)**	0 days	Thu 1/5/06	77
78	Issue RFP to Bidders	225 days	Thu 1/5/06	78
79	Proposals Received	0 days	Mon 4/2/07	79
80	**Proposal Evaluation Period**	96 days	Mon 4/2/07	80
81	Award of Contract	0 days	Mon 8/20/07	81
82	Construction Start	0 days	Thu 9/20/07	82
83	Construction Complete	0 days	Wed 12/30/09	83
84	**6 month Testing Period**	130 days	Wed 12/30/09	84
85	**Bridge Open to Traffic, 1 month toll-free period**	23 days	Wed 6/30/10	85
86	Construction Complete, Tolling Begins	0 days	Mon 8/2/10	86
87				87
88	**Operations & Maintenance Contract**	**261 days**	**Wed 7/1/09**	**88**
89	**Prepare RFQ**	24 days	Wed 7/1/09	89
90	Issue RFQ	0 days	Mon 8/3/09	90
91	RFQ Responses received	0 days	Tue 9/1/09	91
92	**Prepare Shortlist**	23 days	Tue 9/1/09	92
93	**Prepare Tender Documents**	45 days	Fri 10/2/09	93
94	Issue Tender Documents to Shortlist	0 days	Fri 1/1/10	94
95	Bids Submitted	0 days	Mon 2/1/10	95
96	**Bid Evaluation Period**	21 days	Mon 2/1/10	96
97	Award of Contract	0 days	Mon 3/1/10	97
98	Operations & Maintenance Period	0 days	Wed 6/30/10	98



Appendix H

Operations, Maintenance and Rehabilitation Costs

GEB Project
Operation, Maintenance & Rehabilitation Reference Bid

Detailed Cost Estimate

Detail	Life Cycle	Inventory		%	Unit Cost														
		Qty	Unit			2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
								1	2	3	4	5	6	7	8	9	10	11	12
Annual Inflation Factor						1.075	1.075	1.060	1.060	1.060	1.060	1.060	1.025	1.025	1.025	1.025	1.025	1.025	1.025
Inflation Factor from $2003 to year x						1.075	1.156	1.225	1.298	1.376	1.459	1.546	1.585	1.625	1.665	1.707	1.750	1.793	1.838
A.1 Routine Maintenance																			
											0	0	0	0	0	0	0	0	0
Year - round O&M (roads and bridge pavement)		58.58	lane km		12,000							351,480	702,960	702,960	702,960	702,960	702,960	702,960	702,960
Sub-total											0	351,480	702,960	702,960	702,960	702,960	702,960	702,960	702,960
B. Overhead																			
RWIS		0	number		0							0	0	0	0	0	0	0	0
Electric Power		1	service		25,000							12,500	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Electrical Maintenance		1	service		30,000							15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Line Repainting		1	service		40,000							20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
1 FTE, Contract Administrator		1	service		100,000							50,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
1 FTE, Analyst/Planner/Contract Monitoring role		1	service		80,000							40,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
Legal & Specialist Consultant (Quality and Environmental and		1	service		100,000							50,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Operating Insurance (not part of VFM)		1	service		0							0	0	0	0	0	0	0	0
Radio and Telecommunications System		1	service		25,000							12,500	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Sub-total											0	200,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
C. Rehabilitation																			
Pavement/Shoulder (not bridge)	14	39.7	lane km	100%	135,000														
Railroad Crossing	50	0	count	50%	50,000														
Ditches	75	0	km	75%	1,000														
Culvert Entrance	50	0	count	50%	3,000														
Culvert Roadway	50	0	count	50%	10,000														
Culvert Fume	50	0	count	50%	1,000														
Culvert Down Drain	50	0	count	50%	5,000														
Culvert Other	50	0	count	50%	1,000														
Curb & Gutter Asphalt	50	0	km	50%	10,000														
Curb & Gutter concrete	50	0	km	50%	10,000														
Drainage Appliance Catch Basin	50	0	count	50%	500														
Drainage Appliance Manhole	50	0	count	50%	500														
Sub-drains	30		m	1005%															
Sedimentation ponds	20		count	100%															
Sidewalks	50		m	100%															
Bicycle paths	14		m asphalt	100%															
Traffic Island	20	0	count	100%	500														
Fence Other	20	0	km	100%	1,000														
Structures	75	151,960	m2	100%	120						0	0	0	0	0	0	0	0	0
Structures-Culverts-multi plate	50	0	m	100%	1,000														
Structures-Retaining Walls	75	0	m	50%	1,000														
Noise Barriers	40		m	1005%															
Illumination	30		count	100%															
Power Services	30		count	100%															
Signs	10	0	count	100%	10														
Sign Posts	10	0	count	100%	5														
Structures-Signs	50	0	m	100%	1,000														
Guardrail Concrete	40	0	km	50%	50,000														
Steel Beam Guide Rail	20		m	100%															
Inertia/crash Attenuation Barriers	30		count	100%															
Traffic Signals - poles	40		count	100%															
Traffic Signal - signal heads	15		count	100%															
Traffic Signals - controllers	15		count	100%															
Traffic Signals - power supply	30		count	100%															
Toll Gantry	50		count	100%															
Camera	6		count	100%												x			
TV	10		count	100%															
Traffic Volume Counters	15	0	count	100%															
Control Computers	6		count	100%												x			
Corridor Control Hub Building	40		count	100%															
Misc																20,000			
Sub-total							0	0	0	0	0	0	0	0	0	20,000	0	0	0
D. Risk																			
Rock Stabilization				0	0						0	0	0	0	0	0	0	0	0
Floods				2	0											0			
Mud, Earth and Rock Slide				0	0									0				0	
Earthquake				2	100,000														
Relevant Change In law				50%	0														
Non-Availability				32	20,000							10,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Non-Conformance					0						0	0	0	0	0	0	0	0	0
Sub-total							0	0	0	0	0	10,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
E. Contingency																			
0%							0	0	0	0	0	0	0	0	0	0	0	0	0
Total (uninflated,in $2003)											0	561,480	1,122,960	1,122,960	1,122,960	1,142,960	1,122,960	1,122,960	1,122,960
Total (inflated)												868,321	1,780,059	1,824,561	1,870,175	1,951,070	1,964,852	2,013,973	2,064,323

GEB Project
Operation, Maintenance & Rehal

Detailed Cost Estimate

Detail	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Annual Inflation Factor	1.025	1.025	1.025	1.025	1.025	1.025	1.025	1.025	1.025	1.025	1.025	1.025	1.025	1.025
Inflation Factor from $2003 to year x	1.884	1.931	1.980	2.029	2.080	2.132	2.185	2.240	2.296	2.353	2.412	2.472	2.534	2.597
A.1 Routine Maintenance														
	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Year - round O&M (roads and bridge pavement)	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960
Sub-total	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**
B. Overhead														
RWIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electric Power	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Electrical Maintenance	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Line Repainting	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
1 FTE, Contract Administrator	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
1 FTE, Analyst/Planner/Contract Monitoring role	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
Legal & Specialist Consultant (Quality and Environmental and	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Operating Insurance (not part of VFM)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Radio and Telecommunications System	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Sub-total	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**
C. Rehabilitation														
Pavement/Shoulder (not bridge)				5,359,500										
Railroad Crossing														
Ditches														
Culvert Entrance														
Culvert Roadway														
Culvert Fume														
Culvert Down Drain														
Culvert Other														
Curb & Gutter Asphalt														
Curb & Gutter concrete														
Drainage Appliance Catch Basin														
Drainage Appliance Manhole														
Sub-drains														
Sedimentation ponds														
Sidewalks														
Bicycle paths				x										
Traffic Island											x			
Fence Other														
Structures	0	0		0	0	18,235,164	0	0	0	0	0	0	0	0
Structures-Culverts-multi plate														
Structures-Retaining Walls														
Noise Barriers														
Illumination														
Power Services														
Signs	x										x			
Sign Posts	x										x			
Structures-Signs														
Guardrail Concrete														
Steel Beam Guide Rail											x			
Inertia/crash Attenuation Barriers														
Traffic Signals - poles														
Traffic Signal - signal heads						x								
Traffic Signals - controllers						x								
Traffic Signals - power supply														
Toll Gantry														
Camera			x						x					
TV		x										x		
Traffic Volume Counters				x										
Control Computers			x						x					
Corridor Control Hub Building														
Misc	20,000	10,000	20,000	50,000		50,000			20,000		20,000	10,000		
Sub-total	**20,000**	**10,000**	**20,000**	**5,409,500**	**0**	**18,285,164**	**0**	**0**	**20,000**	**0**	**20,000**	**10,000**	**0**	**0**
D. Risk														
Rock Stabilization	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Floods												0		
Mud, Earth and Rock Slide			0				0				0			
Earthquake						100,000								
Relevant Change In law						0								
Non-Availability	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Non-Conformance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub-total	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**120,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**
E. Contingency														
0%	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total (uninflated,in $2003)	**1,142,960**	**1,132,960**	**1,142,960**	**6,532,460**	**1,122,960**	**19,508,124**	**1,122,960**	**1,122,960**	**1,142,960**	**1,122,960**	**1,142,960**	**1,132,960**	**1,122,960**	**1,122,960**
Total (inflated)	**2,153,616**	**2,188,143**	**2,262,643**	**13,255,177**	**2,335,592**	**41,588,381**	**2,453,831**	**2,515,177**	**2,623,972**	**2,642,508**	**2,756,810**	**2,801,008**	**2,845,692**	**2,916,834**

GEB Project
Operation, Maintenance & Rehal

Detailed Cost Estimate

Detail	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total
	27	28	29	30	31	32	33	34	35	
Annual Inflation Factor	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	
Inflation Factor from $2003 to year x	**2.662**	**2.729**	**2.797**	**2.867**	**2.939**	**3.012**	**3.088**	**3.165**	**3.244**	
A.1 Routine Maintenance										
	0	0	0	0	0	0				
Year - round O&M (roads and bridge pavement)	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	21,440,280
Sub-total	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**21,440,280**
B. Overhead										
RWIS	0	0	0	0	0	0	0	0	0	0
Electric Power	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	762,500
Electrical Maintenance	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	915,000
Line Repainting	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	1,220,000
1 FTE, Contract Administrator	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	3,050,000
1 FTE, Analyst/Planner/Contract Monitoring role	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	2,440,000
Legal & Specialist Consultant (Quality and Environmental and	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	3,050,000
Operating Insurance (not part of VFM)	0	0	0	0	0	0	0	0	0	0
Radio and Telecommunications System	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	762,500
Sub-total	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**12,200,000**
C. Rehabilitation										
Pavement/Shoulder (not bridge)				5,359,500						10,719,000
Railroad Crossing										0
Ditches										0
Culvert Entrance										0
Culvert Roadway										0
Culvert Fume										0
Culvert Down Drain										0
Culvert Other										0
Curb & Gutter Asphalt										0
Curb & Gutter concrete										0
Drainage Appliance Catch Basin										0
Drainage Appliance Manhole										0
Sub-drains								x		0
Sedimentation ponds										0
Sidewalks										0
Bicycle paths				x						0
Traffic Island										0
Fence Other										0
Structures	0	0	0	0	0	0	18,235,164	0	0	36,470,328
Structures-Culverts-multi plate										0
Structures-Retaining Walls										0
Noise Barriers										0
Illumination							x			0
Power Services							x			0
Signs							x			0
Sign Posts							x			0
Structures-Signs										0
Guardrail Concrete										0
Steel Beam Guide Rail										0
Inertia/crash Attenuation Barriers							x			0
Traffic Signals - poles										0
Traffic Signal - signal heads							x			0
Traffic Signals - controllers							x			0
Traffic Signals - power supply							x			0
Toll Gantry										0
Camera	x								x	0
TV									x	0
Traffic Volume Counters				x						0
Control Computers	x								x	0
Corridor Control Hub Building										0
Misc	20,000			50,000			100,000		50,000	440,000
Sub-total	**20,000**	**0**	**0**	**5,409,500**	**0**	**0**	**18,335,164**	**0**	**50,000**	**47,629,328**
D. Risk										
Rock Stabilization	0	0								0
Floods										0
Mud, Earth and Rock Slide	0									0
Earthquake	100,000									200,000
Relevant Change In law										0
Non-Availability	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	610,000
Non-Conformance	0	0	0	0	0	0	0	0	0	0
Sub-total	**120,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**810,000**
E. Contingency										
0%	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
										0
Total (uninflated,in $2003)	**1,242,960**	**1,122,960**	**1,122,960**	**6,532,460**	**1,122,960**	**1,122,960**	**19,458,124**	**1,122,960**	**1,172,960**	**82,079,608**
Total (inflated)	**3,309,241**	**3,064,499**	**3,141,111**	**18,729,218**	**3,300,130**	**3,382,633**	**60,077,998**	**3,553,879**	**3,804,919**	

Appendix I

Traffic and Revenue Forecasts

A1. CENTRAL CASE TRAFFIC AND REVENUE FORECASTS FOR THE FRC AT $2.50 CAR TOLL (EXCLUDING RAMP - UP)

FRC TRAFFIC AND REVENUE
SCENARIO 2
TITLE: FRC Tolled @ 2.5 $
TEST: -

DAILY TRAFFIC - AADT		Year													
Vehicle Class	Traffic Type	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Car	Current and Growth	11,542	12,438	13,464	14,446	15,567	16,775	18,078	19,481	20,994	22,105	23,186	24,382	25,629	26,940
	Redistribution	24,214	24,704	25,131	25,686	26,008	26,467	26,916	27,380	27,854	28,498	29,157	29,831	30,521	31,227
Light Truck	Current and Growth	1,089	1,115	1,142	1,169	1,197	1,225	1,256	1,286	1,315	1,360	1,406	1,453	1,602	1,653
	Redistribution	609	621	633	646	658	671	683	696	708	718	728	737	747	756
Heavy Truck	Current and Growth	1,752	1,824	1,899	1,977	2,058	2,142	2,230	2,322	[illegible]	2,520	2,627	2,740	2,886	2,976
	Redistribution	288	278	292	306	321	338	353	369	[illegible]	391	398	405	413	420

Vehicle Class	Traffic Type	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026					
Car	Current and Growth	28,317	29,768	31,287	32,887	[illegible]	35,672	36,911	37,986	39,198	40,449	41,740	43,072	44,447	45,865	[illegible]
	Redistribution	31,940	32,698	33,444	34,217	[illegible]	35,336	35,687	36,991	38,838	36,678	37,021	37,366	37,718	38,071	[illegible]
Light Truck	Current and Growth	1,606	1,660	1,716	1,774	[illegible]	1,857	1,880	1,903	1,927	1,951	1,975	1,999	2,024	2,049	[illegible]
	Redistribution	768	776	786	795	[illegible]	809	814	818	822	827	831	836	840	845	[illegible]
Heavy Truck	Current and Growth	3,106	3,238	3,376	3,520	[illegible]	3,756	3,849	3,941	4,036	4,133	4,232	4,334	4,438	4,545	[illegible]
	Redistribution	427	434	441	449	[illegible]	457	459	461	462	464	466	467	469	470	[illegible]

TOLLS - $		Year													
Vehicle Class	Traffic Type	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Car	Current and Growth	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
	Redistribution	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Light Truck	Current and Growth	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
	Redistribution	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Heavy Truck	Current and Growth	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
	Redistribution	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

Vehicle Class	Traffic Type	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2	2031
Car	Current and Growth	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
	Redistribution	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Light Truck	Current and Growth	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3
	Redistribution	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.
Heavy Truck	Current and Growth	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
	Redistribution	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

ANNUAL REVENUE - Millions $		Year													
Vehicle Class	Traffic Type	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Car	Current and Growth	10.5	11.3	12.2	13.2	14.2	15.3	16.5	17.8	19.2	20.1	21.2	22.2	23.4	24.6
	Redistribution	22.2	22.5	22.9	23.3	23.7	24.1	24.6	25.0	25.4	26.0	26.6	27.2	27.9	28.5
Light Truck	Current and Growth	1.5	1.5	1.6	1.6	1.6	1.7	1.7	1.8	1.8	1.9	1.9	2.0	2.1	2.1
	Redistribution	0.8	0.8	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Heavy Truck	Current and Growth	3.2	3.3	3.5	3.6	3.8	3.9	4.1	4.2	4.4	4.6	4.8	5.0	5.2	5.4
	Redistribution	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	[illegible]	0.8
CAR	A$		33.8	35.2	36.5	37.9	38.4	41.1	42.8	44.6	46.1	47.8	49.5	51.2	53.1
LIGHT TRUCK			2.4	2.4	2.5	2.5	2.6	2.7	2.7	2.8	2.8	2.9	3.0	3.1	3.2
HEAVY TRUCK			3.8	4.0	4.2	4.3	4.5	4.7	4.9	5.1	5.3	5.5	5.7	6.0	6.2
TOTAL	A$		40.1	41.6	43.2	44.8	46.6	48.4	50.4	52.6	54.3	56.2	58.2	60.3	62.4

Vehicle Class	Traffic Type	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Car	Current and Growth	25.8	27.2	28.5	30.0	31.5	32.6	33.6	34.7	35.8	36.9	38.1	39.3	40.6	41.9	43.2
	Redistribution	29.2	29.8	30.5	31.2	31.9	32.2	32.5	32.9	33.2	33.5	33.8	34.1	34.4	34.7	35.1
Light Truck	Current and Growth	2.2	2.3	2.3	2.4	2.5	2.5	2.6	2.6	2.6	2.7	2.7	2.7	2.8	2.8	2.8
	Redistribution	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2
Heavy Truck	Current and Growth	5.7	5.9	6.2	6.4	6.7	6.9	7.0	7.2	7.4	7.5	7.7	7.9	8.1	8.3	8.5
	Redistribution	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9
CAR	A$	55.0	57.0	59.1	61.2	63.5	64.8	66.1								
LIGHT TRUCK		3.2	3.3	3.4	3.5	3.6	3.6	3.7								
HEAVY TRUCK		6.4	6.7	7.0	7.2	7.5	7.7	7.9								
TOTAL	A$	64.7	67.0	69.5	72.0	74.6	76.1	77.7								

UNITS Daily Traffic is an AADT value (ie to obtain annual traffic you multiply the AADT by 365)
Tolls are in real 2003 $
Annual Revenue is in real 2003 Millions of $

RAMP UP/BUILD UP		Year after opening									
Vehicle Class	Traffic Type	0	1	2	3	4	5	6	7	8	9
Car	Current and Growth	0.85	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Redistribution	0.40	0.76	0.96	0.98	0.99	1.00	1.00	1.00	1.00	1.00
Light Truck	Current and Growth	0.85	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Redistribution	0.40	0.76	0.96	0.98	0.99	1.00	1.00	1.00	1.00	1.00
Heavy Truck	Current and Growth	0.85	0.90	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Redistribution	0.40	0.76	0.96	0.98	0.99	1.00	1.00	1.00	1.00	1.00

A2. BASE CASE TRAFFIC AND REVENUE FORECASTS FOR THE FRC AT $2.50 CAR TOLL INCLUDING RAMP – UP (OPENING YEAR 2008)

FRC TRAFFIC AND REVENUE
SCENARIO 2
TITLE: FRC Tolled @ 2.5 $
TEST: Base Case

DAILY TRAFFIC - AADT		Year																												
Vehicle Class	Traffic Type	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Car	Current and Growth						18,048	17,641	19,456	20,960	22,354	23,815	24,877	26,257	27,625	29,111	30,695	32,226	33,891	35,042	36,460	37,960	39,549	40,960	42,440	43,694	44,686	45,707	46,757	47,529
	Redistribution						9,539	16,751	21,889	23,172	24,420	25,716	27,024	28,377	29,355	30,050	30,655	31,221	31,781	32,347	32,067	32,989	33,315	33,644	33,977	34,313	34,652	34,995	35,341	35,691
Light Truck	Current and Growth						1,070	1,149	1,250	1,293	1,363	1,409	1,456	1,506	1,556	1,610	1,665	1,719	1,769	1,817	1,843	1,870	1,898	1,924	1,951	1,975	1,994	2,014	2,036	2,051
	Redistribution						243	426	556	589	621	654	687	721	746	764	779	794	808	822	831	839	847	855	864	872	881	890	899	907
Heavy Truck	Current and Growth						1,923	2,081	2,276	2,381	2,530	2,641	2,754	2,876	2,997	3,129	3,267	3,400	3,526	3,645	3,743	3,847	3,957	4,055	4,158	4,245	4,316	4,388	4,463	4,519
	Redistribution						231	302	320	337	355	373	391	405	414	423	431	438	446	450	455	459	464	469	473	478	483	487	492	495

TOLLS - $		Year																												
Vehicle Class	Traffic Type	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Car	Current and Growth	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
	Redistribution	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Light Truck	Current and Growth	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
	Redistribution	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Heavy Truck	Current and Growth	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
	Redistribution	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00

ANNUAL REVENUE - Millions $		Year																												
Vehicle Class	Traffic Type	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Car	Current and Growth						14.6	16.1	17.8	19.0	20.4	21.5	22.7	24.0	25.2	26.3	28.0	29.4	30.7	32.0	33.3	34.6	36.1	37.4	38.7	39.9	40.8	41.7	42.7	43.4
	Redistribution						8.7	15.3	20.0	21.1	22.3	23.5	24.7	25.9	26.9	27.4	28.0	28.5	29.0	29.5	29.9	30.1	30.4	30.7	31.0	31.3	31.6	31.9	32.2	32.6
Light Truck	Current and Growth						1.5	1.6	1.7	1.8	1.9	1.9	2.0	2.1	2.1	2.2	2.2	2.4	2.4	2.5	2.5	2.6	2.6	2.6	2.7	2.7	2.7	2.8	2.8	2.8
	Redistribution						0.3	0.6	0.8	0.8	0.9	0.9	0.9	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Heavy Truck	Current and Growth						3.5	3.8	4.2	4.3	4.6	4.8	5.0	5.2	5.5	5.7	6.0	6.2	6.4	6.7	6.8	7.0	7.2	7.4	7.6	7.7	7.9	8.0	8.1	8.2
	Redistribution						0.4	0.5	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9
CAR	All						23.3	31.4	37.7	40.2	42.7	45.0	47.4	49.8	52.0	54.0	56.4	57.9	59.7	61.5	63.1	64.7	66.5	68.1	69.7	71.2	72.4	73.5	74.9	75.9
LIGHT TRUCK	All						1.8	2.2	2.5	2.6	2.7	2.8	2.9	3.0	3.2	3.2	3.3	3.4	3.5	3.6	3.7	3.7	3.8	3.8	3.8	3.9	3.9	4.0	4.0	4.0
HEAVY TRUCK	All						3.9	4.3	4.7	5.0	5.3	5.5	5.7	6.0	6.2	6.5	6.7	7.0	7.2	7.5	7.7	7.9	8.1	8.3	8.5	8.6	8.8	8.9	9.0	9.1
TOTAL	All						29.1	37.9	44.9	47.7	50.7	53.3	56.0	58.9	61.4	63.7	66.1	68.3	70.5	72.8	74.4	76.3	78.3	80.1	82.0	83.7	85.1	86.5	88.0	89.1

UNITS

Daily Traffic is an AADT value (ie to obtain annual traffic you multiply the AADT by 36
Tolls are in real 2003 $
Annual Revenue is in real 2003 Millions of $

RAMP-UP/ BUILD-UP HAVE BEEN APPLIED!

Appendix J

GEB Reference Case Financing Plan

GEB Reference Case – Financing Plan

This Financing Plan assumes that, given its strategic importance to the region, the GEB Reference Case Project will proceed if the TransLink Board rejects both DBFO proposals.

We have divided the project into a number of financing periods as follows:

A. **TransLink "Owners Costs" incurred up to December 2005**
Up to this point TransLink would be financing these expenditures out of short-term working capital. Therefore we would want to refinance ASAP, likely at the 2006 Spring Issue (assume December 31, 2005 for modeling purposes) as follows:
- Conventional Bond – with Sinking Fund (MFA)
- Amortization Period: 30 Years
- Repayments: No principle for 5 years – then annual; and semi-annual interest payments
- Hedging: Yes, using an interest rate swap (assumed trade date Oct 28, 2005; assumed effective date Dec 31, 2005)

B. New RFP Process & Construction Period – January 2006 to June 2010
Using a combination of short-term and long-term financing. Short-term financing would be via the MFA's Commercial Paper Program (possibly supplemented by MFA's BMO demand line). Maximum short-term funding over this period would be $220 million with six monthly refinancing with long-term funding as follows:
- Conventional Bond – with Sinking Fund (MFA)
- Amortization Period: 30 Years
- Repayments: No principle for 5 years – then annual; and semi-annual interest payments
- Hedging: Yes, using interest rate swaps (assumed trade date Oct 28, 2005; assumed effective dates every 6 months starting June 30, 2006 and ending June 30, 2010)

C. Operation Period – July 2010 to December 2040
Preliminary modeling shows that with the principal payments on the long term borrowings and some projected rehab payments the project does not breakeven from a cash flow point of view until the end of 2019 (9 years into operations) and will therefore require a short-term funding facility of up to $105 million which will then be fully repaid by 2026.

Risks in Financing Plan

These are some of the main risks identified around the above Financing Plan:

1. The Reference Case model assumes that interest rates are hedged from October 28, 2005 (the Base Date). There is a risk that interest rates move unfavourably from October 28, 2005 until such time that TransLink actually goes out and purchases the hedge. This hedge purchase date is assumed to be in early 2006 (January or February), following the Dec. 7 Board decision to proceed with the Reference Case, and the following Board meeting decision to approve the Reference Case Financing Plan. Under the DBFO model, the interest rates are set at the Base Date but TransLink incurs the risk of interest rate fluctuations between the Base Date and the date of Commercial Close (February xx 2006). Therefore, TransLink faces an equivalent un-hedged risk under the DBFO model as under the Reference Case, so no adjustments have been made to the Reference Case model for this risk.
2. The risk of a downgrading of MFA's credit rating. MFA's credit rating could also be affected by a downgrading of the Province of BC's credit rating. Based on the current economic outlook this risk is minimal.
3. The risk of implementing an ineffective interest rate hedging strategy. Setting up a hedging strategy involves a projection of the amount and timing of future borrowings and if these projections end up being materially too high or too low it would be costly to make adjustments to the hedge if interest rates have changed significantly.
4. The risk of a change in the capital market's capacity to handle the projected amount of borrowing. This risk is considered to be minimal.
5. The risk that there would be a delay in MFA accessing markets due to internal approvals or problems in the accessing the market. Risk is considered minimal.
6. Hedging the interest rate risk for borrowings during the operation period is not considered feasible. This risk will be fully mitigated by the fact that toll revenues will be indexed to inflation, which will mirror the movement in interest rates.
7. There is the risk that the actual investment returns on the sinking funds placed with the MFA to ultimately repay the debenture debt may be lower than the 4% estimate that the MFA is using to determine the annual sinking fund payments. If this were to occur it would mean that the project would be obligated to make higher sinking fund payments (than what is currently assumed in the model) or a top-up payment closer to maturity of the debentures. Due to the long term involved over which the sinking funds are invested, the 4% is a conservative estimate and so the chances of there needing to be higher sinking fund payments or a top-up payments are considered very small. Historically it has been the experience of TransLink that the returns on it's sinking funds have exceeded the estimated returns and have been able to cease making sinking funds payments a year or so ahead of the repayment schedule.

Appendix K

Summary Analysis of Project Risks, GEB Reference Case

KPMG

Golden Ears Bridge

Summary Analysis of Project Risks

GEB Reference Case

November 2, 2005

KPMG

Table of Contents

Executive Summary

Introduction and Background

In September and October 2005 KPMG LLP (KPMG) facilitated an analysis of the risks of the reference case for the Golden Ears Bridge Project (the Project). The risk analysis involved a series of workshops attended by representatives of Translink, Golden Ears Bridge Project, Associated Engineering and KPMG.

Risk Analysis Process

The individual risks that could affect capital or operations, maintenance and rehabilitation costs were developed through group discussion. The steps involved in the analysis of risks involved included:

1. Defining the project scope by identifying the likely procurement strategy for the project if it was not delivered as a design-build-finance and operate contract
2. Developing the baseline costs and the risks that could affect these costs
3. Determining the potential range of impacts for each risk
4. Determining the distribution of outcomes within that range
5. Conducting a Monte Carlo evaluation of the impacts of the risk
6. Assigning the risks to the relevant cash flows for both capital and OMR.

Findings of Risk Analysis

Exhibit ES-1 contains a summary of the analysis of the capital cost risks. This exhibit also shows the non risk-adjusted capital cost of the project. As indicated in this exhibit, the mean cost estimate is $1,058 million (50 percent probability of achieving) and the project has a 90 percent probability of achieving a cost of less than $1,108 million.

Exhibit ES-1
Assessment of Capital Cost – Risk Adjusted ($ million)

	Delivery Mode	Total Capital Cost - Risk Adjusted: Minimum	Mean	Maximum	70th Percentile	90th Percentile	Non-Risk Adjusted Capital Cost
Contract 1	**DBB**	$22.5	$25.7	$29.9	$26.3	$27.4	$21.3
Contract 2	**DB**	$63.1	$69.3	$78.4	$70.6	$73.1	$60.0
Contract 3	**DB**	$565.2	$605.3	$666.2	$614.9	$634.0	$547.2
Contract 4	**DB**	$141.1	$152.9	$169.2	$155.4	$159.9	$135.7
Contract 5	**DBB**	$9.7	$12.2	$15.6	$12.6	$13.3	$9.3
Global Risks	**n/a**	$0.4	$7.6	$414.5	$7.3	$15.5	$0.0
Sub-Total		$802.0	$873.0	$1,373.8	$887.1	$923.2	$773.5
Fixed Costs		$177.8	$177.8	$177.8	$177.8	$177.8	$177.8
Tolling Capital		$7.3	$7.3	$7.3	$7.3	$7.3	$7.3
Grand Total		**$987.1**	**$1,058.1**	**$1,558.9**	**$1,072.2**	**$1,108.3**	**$958.6**

The principal risks relating to the differential between risk adjusted and non-risk adjusted capital cost estimates include:

- The potential for significant construction cost inflation between 2005 and 2010
- Uncertainties around GVTA project management costs
- Uncertainties around the cost of bonding and construction insurance
- Uncertainties around GVTA design costs
- The potential for further delays (with the attendant loss of toll revenue and increased construction costs).

Exhibit ES-2 contains a summary of the results of the analysis of capital cost risk in terms of its net present value (at a discount rate of 6 percent). As indicated in this exhibit the net present value of the capital cost (adjusted for risks) has a mean of $866 million and $905 million at the 90th percentile.

Exhibit ES-2
Assessment of NPV of Capital Cost – Risk Adjusted ($ million)

		NPV of Capital Cost - Risk Adjusted				
	Delivery Mode	**Minimum**	**Mean**	**Maximum**	**70th Percentile**	**90th Percentile**
Contract 1	**DBB**	$17.0	$19.3	$22.5	$19.8	$20.6
Contract 2	**DB**	$47.8	$52.5	$59.4	$53.5	$55.4
Contract 3	**DB**	$444.1	$475.3	$522.5	$482.7	$497.5
Contract 4	**DB**	$111.9	$121.2	$134.0	$123.2	$126.7
Contract 5	**DBB**	$7.4	$9.2	$11.8	$9.6	$10.1
Global Risks	**n/a**	$0.3	$5.9	$319.2	$5.6	$11.9
Sub-Total		$628.5	$683.4	$1,069.4	$694.4	$722.2
Fixed Costs		$176.8	$176.8	$176.8	$176.8	$176.8
Tolling Capital		$6.0	$6.0	$6.0	$6.0	$6.0
Grand Total		**$811.3**	**$866.2**	**$1,252.2**	**$877.2**	**$905.0**

Exhibit ES-3 contains a summary of the results of the analysis of OMR cost risk in terms of both its absolute and net present value (at a discount rate of 6 percent). As indicated in this exhibit the net present value of OMR costs has a mean of $83.7 million and 92.1 million at the 90th percentile.

The risks associated with OMR costs include:

- Latent defects in material and workmanship
- Delayed rehabilitation
- Higher volumes of trucks than expected (thus resulting in higher maintenance costs).

Exhibit ES-3
Assessment of OMR Cost – Risk Adjusted ($ million)

	NPV of OMR Cost - Risk Adjusted				
	Minimum	Mean	Maximum	70th Percentile	90th Percentile
Total OMR Costs	$67.7	$83.7	$105.0	$86.7	$92.1

1 Introduction

This chapter provides an overview of the risk management process applied to the Golden Ears Bridge Reference Case Risk Assessment.

1.1 Project Objectives

The objective of the risk assessment process was to identify the differential risks associated with delivering the Golden Ears Bridge Project (the "Project") as a series of design-build and design-bid-build contracts (the "Reference Case") as opposed to a design-build-finance and operate contract.

1.2 Risk Management Process

A Risk Management Committee was convened to deal with risk management on the STS Project, the members of which included:

Fred Cummings, GEB
Robin Johnston, GEB
Paul Levelton, KPMG
Norm D'Andrea, Associated Engineering
Sandra Oh, Translink
Lisa Brown, Translink
Lester Marr, Associated Engineering.

A series of meetings were held during September and October 2005 to identify and quantify the risks and assess the impacts of the risks on the project.

1.3 Scope of the Risk Analysis

The scope of the risk analysis related to the Project was subject to certain limitations, as follows:

- The analyses were conducted using cost information derived from feasibility studies, not detailed engineering estimates. Associated Engineering developed the cost information used in the analysis.

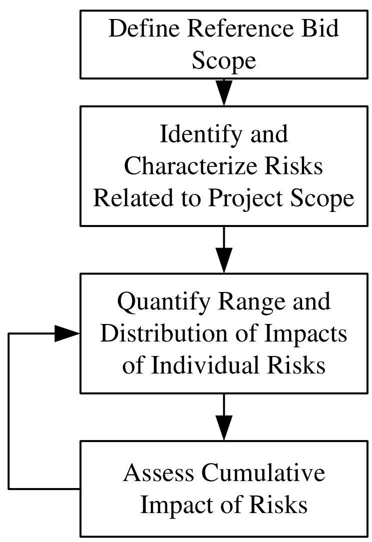
- As more detailed work on design and construction is undertaken, the nature and magnitude of risks could change significantly due to improved information.

- The assessment of risks was conducted using expert opinion on the nature and potential magnitude of risks. Detailed studies of risks were not undertaken.

2 Process of Risk Analysis

This chapter provides a description of the process used in undertaking the risk analysis. The basic methodology is depicted in Exhibit 2-1 below.

Exhibit 2-1
Risk Analysis Methodology Summary



As noted in this exhibit, the last two steps, the quantification of the impacts of individual risks and the assessment of the cumulative impact of risks is an iterative process. As better information on costs, schedule or particular risks becomes available or as means of mitigating risks are identified, the analyses are re-done.

The individual risks that could affect capital or operations, maintenance and rehabilitation costs were developed through group discussion. The steps involved in the analysis of risks included:

1. Defining the project scope by identifying the likely procurement strategy for the project if it was not delivered as a design-build-finance and operate contract
2. Developing the baseline costs and the risks that could affect these costs
3. Determining the potential range of impacts for each risk
4. Determining the distribution of outcomes within that range
5. Conducting a Monte Carlo evaluation of the impacts of the risk

6. Assigning the risks to the relevant cash flows for both capital and OMR.

This study is based on the preliminary risk analysis performed in 2003 and more recent information regarding costs and risks developed since the completion of the previous analysis.

2.1 Project Scope

The scope of the project was defined by identifying:

- The number of separate contract packages that Translink would likely use to deliver the project under an alternate procurement process
- The nature of each of these contract packages (design-build or design-bid-build).

2.2 Identification of Risks

The individual risks that could affect the initial capital costs or the ongoing operating, maintenance and rehabilitation (”OMR”) costs were developed through group discussion.

Risks were identified in four general areas:

- Risks to construction costs that would form part of the contractors' bids
- Risks to GVTA with respect to owner's costs associated with design, project management and resident engineering
- Global risks that could affect all of the construction contracts (e.g., schedule delays caused by GVTA)
- Risks to the OMR contractor.

2.3 Quantification of Risks

The quantification of risks involved three steps:

1. Developing the baseline cost
2. Determining the potential range of impacts (relative to the baseline costs) for each risk
3. Determining the distribution of outcomes within that range.

2.3.1 Baseline Cost

Associated Engineering developed the estimates of baseline costs based on the assumed contract type for each project segment.

2.3.2 Range of Impacts

If significant data is available about the range of potential outcomes of a particular risk element, that information can be used in the risk analysis. For example, if there is a good history of cost data relevant to key components of the construction work, that data can be used to construct very sophisticated risk analysis. For many construction projects such detailed information is not available. In such cases, expert opinion is used to provide the key descriptors of the potential range of impacts (low, probable and high).

For this work we have used the methodology developed by Dr. Francis Hartman of the University of Calgary. Dr Hartman's methodology is based on using expert opinion to estimate the three parameters noted above by answering the following questions:

- Under perfect conditions, what impact would this risk have on project schedule or cost (**P – Perfect Outcome**)?
- Under likely conditions, what impact would this risk have on project schedule or cost (**L – Likely Outcome**)?
- Under outrageous conditions, what impact would this risk have on project schedule or cost (**O – Outrageous Outcome**)?

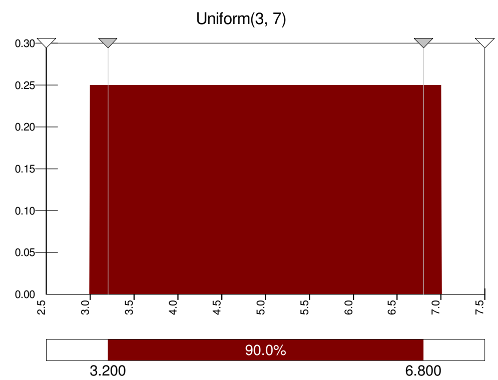
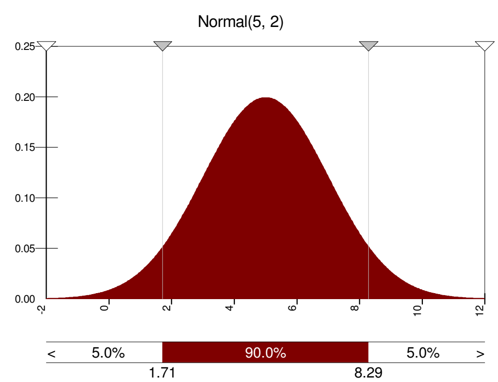
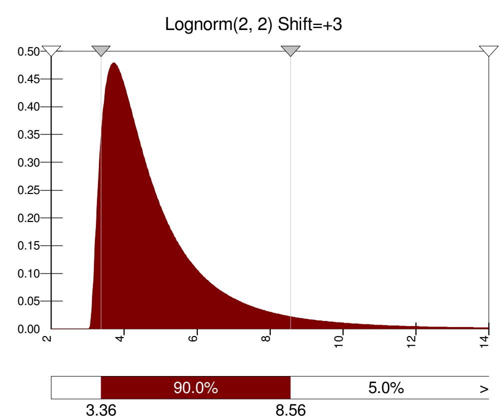
The estimates of the perfect, likely and outrageous outcomes for each risk were developed by the Committee as order-of-magnitude estimates, based primarily on collective experience. Detailed study of the impact of a potential risk was not undertaken.

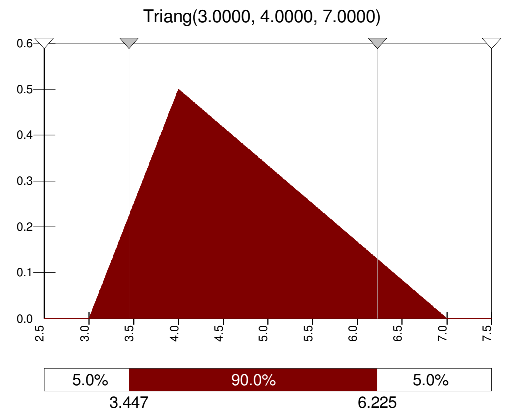
2.3.3 Distribution of Impacts

Once the range of the potential impact of each risk has been identified, it is necessary to assign a probability distribution to that range. While there are a large number of potential distributions that could be used, the most commonly used ones are those shown in Exhibit 2-2. These are appropriate for most circumstances.

In the analyses contained in this report, most of the risks were assigned triangular distributions due to the lack of good historical information on the probable distribution of outcomes of the specific risk elements. In cases where a risk was identified but the probability of the risk occurring was very low, a log normal (skewed) distribution was used.

Exhibit 2-2
Types of Distributions

<table>
<tr><th>Type of Distribution</th><th>Example</th></tr>
<tr><td>Rectangular – The chances are the same that the deliverable will cost any amount within the range.</td><td>
</td></tr>
<tr><td>Normal – The distribution of potential outcomes is symmetrical and more likely to be closer to the mean (likely) estimate.</td><td>
</td></tr>
<tr><td>Skewed – The distribution is one-tailed, typically with a substantially lesser chance of being on the high (outrageous) end of the scale. A log normal distribution is often used in this circumstance.</td><td>
</td></tr>
</table>

Type of Distribution	Example
Triangular – This is the distribution most commonly used when there is insufficient information about the actual distribution of outcomes.	

2.4 Analysis of Risks

The analysis of risks was undertaken through a process of simulation of potential outcomes involving the baseline cost or schedule and the associated risks. The software used in the analysis is **@Risk** from Pallisade Corporation.

The simulation process involves Monte Carlo sampling of potential outcomes for each risk variable. A total of 10,000 iterations of the sampling were undertaken, which is sufficient for the purposes of this analysis. For each iteration, random numbers were used to generate values for each risk variable, based on the PLO estimates and the defined distribution (e.g., triangular, log normal) of the PLO estimates.

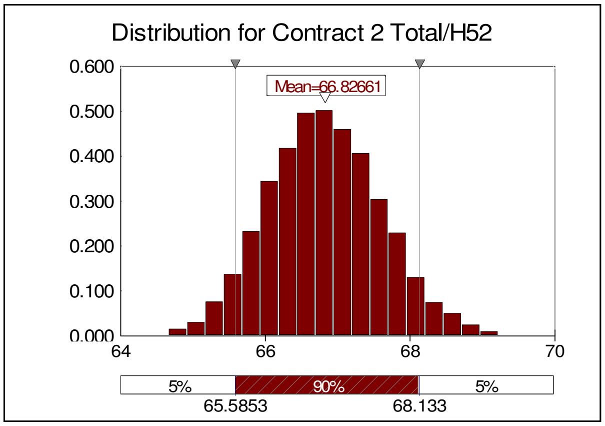
The results of the analysis are summarized in cumulative probability charts and associated statistics. Exhibit 2-3 illustrates typical outputs from the analysis model.

As shown in Exhibit 2-3, the typical output of the risk analysis includes a cumulative probability chart, a tornado chart showing summarizing the sensitivity of the analysis to the individual risk factors and a number of statistics. This information provides the user with the ability to determine the level of risk of exceeding a budget that they are comfortable with and an indication of the specific risk elements that may require further evaluation and/or the development of a mitigation strategy.

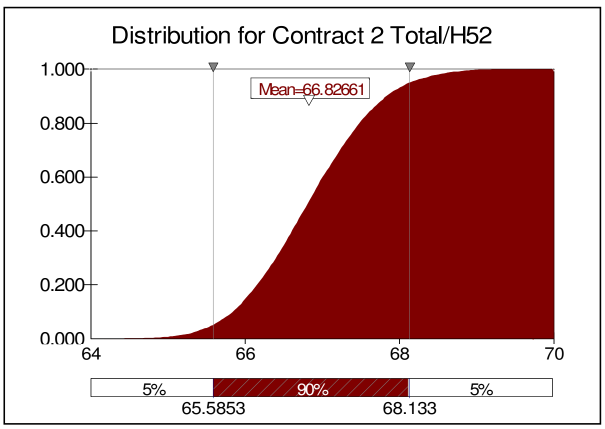
This report has used the mean, 70^{th} percentile and 90^{th} percentile as being relevant levels of confidence in the results. Translink may wish to use a different level of confidence in its planning. Expected values from the 5^{th} percentile to the 95^{th} percentile have been calculated (at 5 percent intervals) and are included in the tables in Appendix A.

The choice of the appropriate level of confidence is a management decision.

Exhibit 2-3
Typical Output from Risk Analysis Model

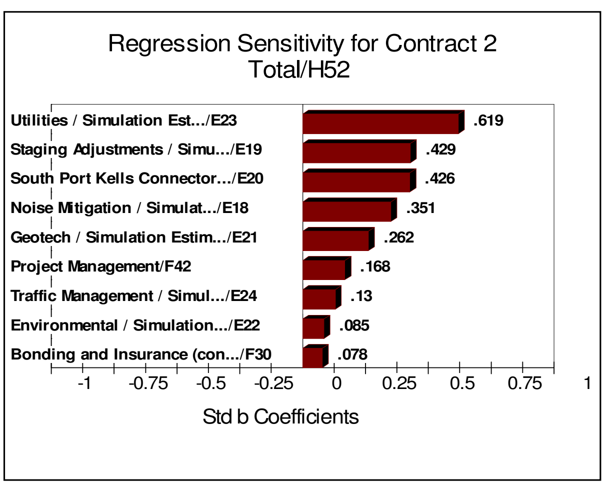


Summary Information	
Workbook Name	EB Ref Bid Risk Analysis.x
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	87
Number of Outputs	14
Sampling Type	Monte Carlo
Simulation Start Time	10/21/2005 7:41
Simulation Stop Time	10/21/2005 7:43
Simulation Duration	00:01:42
Random Seed	417300399



Summary Statistics

Statistic	Value	%tile	Value
Minimum	$ 64.17	5%	$ 65.59
Maximum	$ 69.73	10%	$ 65.84
Mean	$ 66.83	15%	$ 66.01
Std Dev	$ 0.78	20%	$ 66.15
Variance	0.607119488	25%	$ 66.28
Skewness	0.130313498	30%	$ 66.40
Kurtosis	2.912345076	35%	$ 66.51
Median	$ 66.81	40%	$ 66.61
Mode	$ 66.45	45%	$ 66.71
Left X	$ 65.59	50%	$ 66.81
Left P	5%	55%	$ 66.91
Right X	$ 68.13	60%	$ 67.00
Right P	95%	65%	$ 67.12
Diff X	$ 2.55	70%	$ 67.23
Diff P	90%	75%	$ 67.35
#Errors	0	80%	$ 67.48
Filter Min		85%	$ 67.64
Filter Max		90%	$ 67.83
#Filtered	0	95%	$ 68.13



Sensitivity

Rank	Name	Regr	Corr
#1	Utilities / Simulati	0.619	0.597
#2	Staging Adjustme	0.429	0.412
#3	South Port Kells (	0.426	0.409
#4	Noise Mitigation /	0.351	0.347
#5	Geotech / Simula	0.262	0.248
#6	Project Managem	0.168	0.164
#7	Traffic Manageme	0.130	0.130
#8	Environmental / S	0.085	0.106
#9	Bonding and Insu	0.078	0.079
#10	Golf Course Take	0.000	0.028
#11	Archaeological Fi	0.000	0.007
#12	Suicide Preventio	0.000	-0.007
#13	Noise Mitigation /	0.000	0.012
#14	Water Line / Simu	0.000	0.009
#15	Municipal Extras /	0.000	-0.019
#16	Construction Cos	0.000	-0.006

3 Findings

This chapter contains a summary of the findings of the risk analysis on the capital and operating, maintenance and rehabilitation costs for the GEB Project. The detailed inputs and outputs of the risk analysis are contained in Appendix 1.

3.1 Reference Case Scope

The reference case was constructed after an analysis that indicated that if the Project did not proceed as a design-build-finance and operate contract, it would proceed through several separate contracts as follows:

- Contract 1 – Southshore Municipal Handover Facilities – Design-Bid-Build
- Contract 2 – 176th Street to Telegraph Trail – Design-Build
- Contract 3 – Telegraph Trail to 113B Street – Design-Build
- Contract 4 – 113B Street to Lougheed Highway – Design-Build
- Contract 5 – Abernathy Connector – Design-Bid-Build
- OMR Contract.

3.2 Capital Cost Risk Analysis

The analysis of cost risks was undertaken by examining the risks associated with each segment of the overall project. Exhibit 3-1 provides a summary of the findings of the capital cost risk assessment. This exhibit also shows the non-risk adjusted capital cost for comparison purposes.

In reading Exhibit 3-1, the following points should be noted:

- The baseline costs shown for individual contracts include engineering, project management, design and other soft costs. The total cost estimate includes the project fixed costs and tolling costs as well.
- Each contract was first assessed as a stand-alone project. All risks specific to each segment are included in this analysis.
- The total cost estimate assumes five separate contracts. The potential portfolio effect of pooling risks is thus lost.

Exhibit 3-1
Assessment of Capital Cost – Risk Adjusted ($ Million)

		Total Capital Cost - Risk Adjusted					Non-Risk Adjusted Capital Cost
	Delivery Mode	Minimum	Mean	Maximum	70th Percentile	90th Percentile	
Contract 1	**DBB**	$22.5	$25.7	$29.9	$26.3	$27.4	$21.3
Contract 2	**DB**	$63.1	$69.3	$78.4	$70.6	$73.1	$60.0
Contract 3	**DB**	$565.2	$605.3	$666.2	$614.9	$634.0	$547.2
Contract 4	**DB**	$141.1	$152.9	$169.2	$155.4	$159.9	$135.7
Contract 5	**DBB**	$9.7	$12.2	$15.6	$12.6	$13.3	$9.3
Global Risks	**n/a**	$0.4	$7.6	$414.5	$7.3	$15.5	$0.0
Sub-Total		$802.0	$873.0	$1,373.8	$887.1	$923.2	$773.5
Fixed Costs		$177.8	$177.8	$177.8	$177.8	$177.8	$177.8
Tolling Capital		$7.3	$7.3	$7.3	$7.3	$7.3	$7.3
Grand Total		**$987.1**	**$1,058.1**	**$1,558.9**	**$1,072.2**	**$1,108.3**	**$958.6**

As indicated in Exhibit 3-1, the project has a 50 percent probability of meeting a $1,058 million cost limit. If GVTA desires a 90 percent level of confidence of achieving its cost, the required cost rises to $1,108 million. These estimates are significantly higher than the non-risk adjusted capital cost estimate of $959 million, shown in the right-hand column of Exhibit 3-1.

The principal risks relating to the differential between risk adjusted and non-risk adjusted capital cost estimates include:

- The potential for significant construction cost inflation between 2005 and 2010
- Uncertainties around GVTA project management costs
- Uncertainties around the cost of bonding and construction insurance
- Uncertainties around GVTA design costs

- The potential for further delays (with the attendant loss of toll revenue and increased construction costs)

Exhibit 2-2 contains a summary of the results of the analysis of capital cost risk in terms of its net present value (at a discount rate of 6 percent). As indicated in this exhibit the net present value of the capital cost (adjusted for risks) has a mean of $866 million and $905 million at the 90th percentile.

Exhibit 2-2
Assessment of NPV of Capital Cost – Risk Adjusted ($ million)

		NPV of Capital Cost - Risk Adjusted				
	Delivery Mode	Minimum	Mean	Maximum	70th Percentile	90th Percentile
Contract 1	**DBB**	$17.0	$19.3	$22.5	$19.8	$20.6
Contract 2	**DB**	$47.8	$52.5	$59.4	$53.5	$55.4
Contract 3	**DB**	$444.1	$475.3	$522.5	$482.7	$497.5
Contract 4	**DB**	$111.9	$121.2	$134.0	$123.2	$126.7
Contract 5	**DBB**	$7.4	$9.2	$11.8	$9.6	$10.1
Global Risks	**n/a**	$0.3	$5.9	$319.2	$5.6	$11.9
Sub-Total		$628.5	$683.4	$1,069.4	$694.4	$722.2
Fixed Costs		$176.8	$176.8	$176.8	$176.8	$176.8
Tolling Capital		$6.0	$6.0	$6.0	$6.0	$6.0
Grand Total		**$811.3**	**$866.2**	**$1,252.2**	**$877.2**	**$905.0**

3.3 OMR Cost Risk Assessment

Exhibit 3-3 contains a summary of the results of the analysis of OMR cost risk in terms of both its absolute and net present value (at a discount rate of 6 percent). As indicated in this exhibit the net present value of OMR costs has a mean of $83.7 million and 92.1 million at the 90th percentile.

Exhibit 3-3
Assessment of OMR Cost – Risk Adjusted ($ million)

	NPV of OMR Cost - Risk Adjusted				
	Minimum	**Mean**	**Maximum**	**70th Percentile**	**90th Percentile**
Total OMR Costs	$67.7	$83.7	$105.0	$86.7	$92.1

The risks associated with OMR costs were all significant and include:

- Latent defects in material and workmanship
- Delayed rehabilitation
- Higher volumes of trucks than expected (thus resulting in higher maintenance costs).

Appendix 1 – Inputs and Outputs for Risk Analysis

Golden Ears Bridge - Risk Assessment of Reference Case

Summary of Risk Analysis - Capital Costs ($ million)

	Delivery Mode	Total Capital Cost - Risk Adjusted					Non-Risk Adjusted Capital Cost (Note 1)	NPV of Capital Cost - Risk Adjusted				
		Minimum	Mean	Maximum	70th Percentile	90th Percentile		Minimum	Mean	Maximum	70th Percentile	90th Percentile
Contract 1	**DBB**	$22.5	$25.7	$29.9	$26.3	$27.4	$21.3	$17.0	$19.3	$22.5	$19.8	$20.6
Contract 2	**DB**	$63.1	$69.3	$78.4	$70.6	$73.1	$60.0	$47.8	$52.5	$59.4	$53.5	$55.4
Contract 3	**DB**	$565.2	$605.3	$666.2	$614.9	$634.0	$547.2	$444.1	$475.3	$522.5	$482.7	$497.5
Contract 4	**DB**	$141.1	$152.9	$169.2	$155.4	$159.9	$135.7	$111.9	$121.2	$134.0	$123.2	$126.7
Contract 5	**DBB**	$9.7	$12.2	$15.6	$12.6	$13.3	$9.3	$7.4	$9.2	$11.8	$9.6	$10.1
Global Risks	**n/a**	$0.4	$7.6	$414.5	$7.3	$15.5	$0.0	$0.3	$5.9	$319.2	$5.6	$11.9
Sub-total (Note 2)		**$802.0**	**$873.0**	**$1,373.8**	**$887.1**	**$923.2**	**$773.5**	**$628.5**	**$683.4**	**$1,069.4**	**$694.4**	**$722.2**
Fixed Costs		**$177.8**	**$177.8**	**$177.8**	**$177.8**	**$177.8**	**$177.8**	**$176.8**	**$176.8**	**$176.8**	**$176.8**	**$176.8**
Tolling Capital		**$7.3**	**$7.3**	**$7.3**	**$7.3**	**$7.3**	**$7.3**	**$6.0**	**$6.0**	**$6.0**	**$6.0**	**$6.0**
Total with Fixed Costs		**$987.1**	**$1,058.1**	**$1,558.9**	**$1,072.2**	**$1,108.3**	**$958.6**	**$811.3**	**$866.2**	**$1,252.2**	**$877.2**	**$905.0**

Notes:
(1) Based on Reference Case Cost Analysis dated 9/12/2005
(2) Assumes projects proceed independently of each other (no portfolio effect)

	NPV of OMR Cost - Risk Adjusted				
	Minimum	Mean	Maximum	70th Percentile	90th Percentile
Total OMR Costs	$67.7	$83.7	$105.0	$86.7	$92.1

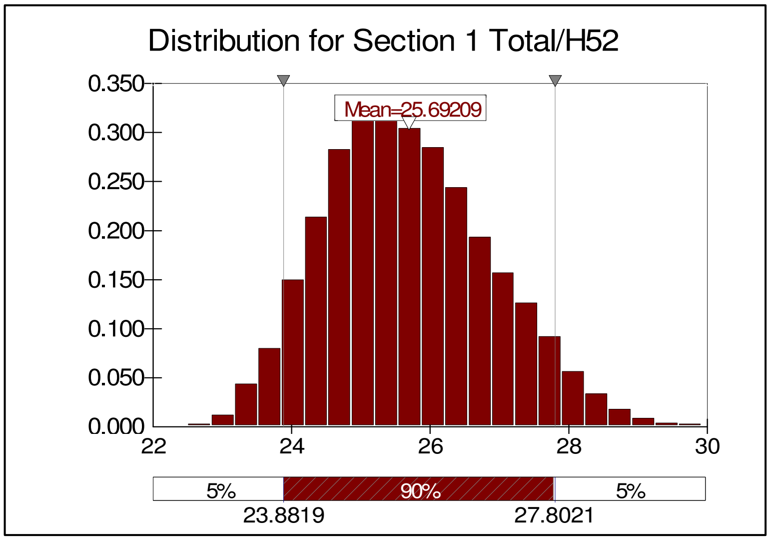
Golden Ears Bridge - Risk Assessment of Reference Case

Contract 1 - Southshore Municipal Handover Facilities

	Risk Distribution			Simulation Estimate											
Cash Flow Distribution	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Contractor Construction, PM & RE						100%					28%	48%	24%		
Contractor Bonding and Insurance						0%									
Contractor Design						0%									
GVTA Project Management						100%			7%	27%	27%	27%	13%		
GVTA Design						100%				69%	31%				
GVTA Resident Engineering						100%					28%	48%	24%		
Contractor Costs	**P**	**L**	**O**	**$**	**%**	**Total %**		**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Construction Costs							$ 13.68	$ -	$ -	$ -	$ 3.83	$ 6.57	$ 3.28	$ -	$ -
Risks															
Municipal Extras	$ -	$ 1.0	$ 2.0	1.00			$ 1.00	$ -	$ -	$ -	$ 0.28	$ 0.48	$ 0.24	$ -	$ -
Utility Unknowns	$ -	$ 0.2	$ 0.4	0.20			$ 0.20	$ -	$ -	$ -	$ 0.06	$ 0.10	$ 0.05	$ -	$ -
Traffic Management	$ (0.1)	$ 0.1	$ 0.4	0.13			$ 0.13	$ -	$ -	$ -	$ 0.04	$ 0.06	$ 0.03	$ -	$ -
Risk 4	$ -	$ -	$ -	0.00			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Risk 5	$ -	$ -	$ -	0.00			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Risk 6	$ -	$ -	$ -	0.00			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Risk 7	$ -	$ -	$ -	0.00			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Project Management	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Resident Engineering	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Bonding and Insurance (const., risks & design)	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Design	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contingency (on const. and risks)						15.0%	$ 2.25	$ -	$ -	$ -	$ 0.63	$ 1.08	$ 0.54	$ -	$ -
Inflation on Contractor Costs	5.0%	6.0%	10.0%		7.00%		$ 5.33	$ -	$ -	$ -	$ 1.09	$ 2.58	$ 1.67	$ -	$ -
Total Contractor Costs							**$ 22.60**	**$ -**	**$ -**	**$ -**	**$ 5.92**	**$ 10.86**	**$ 5.81**	**$ -**	**$ -**
GVTA Costs	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Project Management	1.5%	1.5%	3.0%		2.00%		$ 0.35	$ -	$ 0.02	$ 0.09	$ 0.09	$ 0.09	$ 0.05	$ -	$ -
Design	6.0%	6.0%	7.5%		6.50%		$ 1.12	$ -	$ -	$ 0.77	$ 0.35	$ -	$ -	$ -	$ -
Resident Engineering	6.0%	6.0%	6.0%		6.00%		$ 1.04	$ -	$ -	$ -	$ 0.29	$ 0.50	$ 0.25	$ -	$ -
Inflation on GVTA Costs	5.0%	6.0%	10.0%		7.00%		$ 0.59	$ -	$ 0.00	$ 0.13	$ 0.16	$ 0.18	$ 0.12	$ -	$ -
Total GVTA Costs							**$ 3.10**	**$ -**	**$ 0.02**	**$ 0.99**	**$ 0.89**	**$ 0.77**	**$ 0.41**	**$ -**	**$ -**
Total Contractor and GVTA Costs							**$ 25.69**	**$ -**	**$ 0.025**	**$ 0.992**	**$ 6.817**	**$ 11.636**	**$ 6.225**	**$ -**	**$ -**
Net Present Value of Cash Flow							**$19.34**								

These two cells are the outputs of the analysis and will be shown with the cumulative probability distributions

Simulation Results for
Section 1 Total / H52



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Number of Iterations	10000
Number of Inputs	87
Number of Outputs	14
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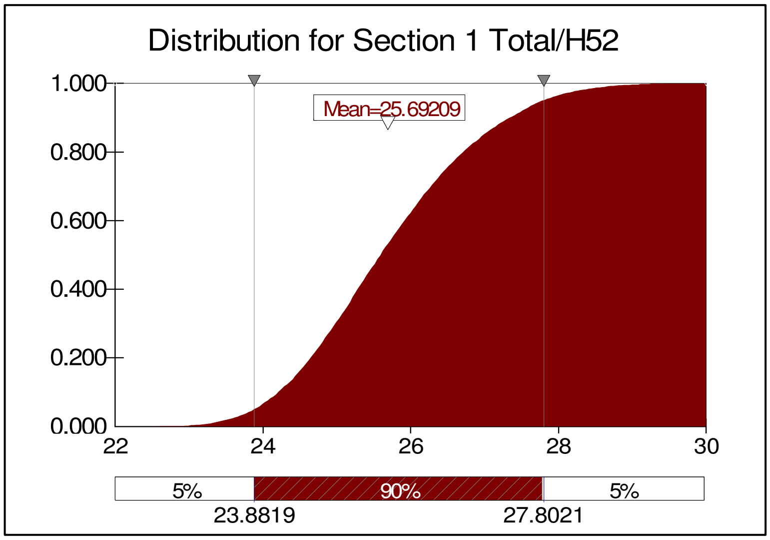
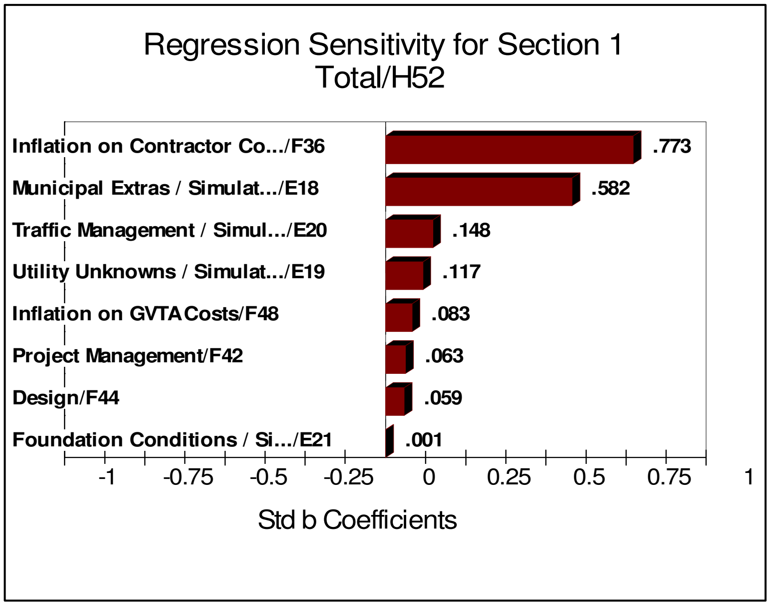
Simulation Stop Time	11/1/2005 16:12
Simulation Duration	00:01:44
Random Seed	162425227

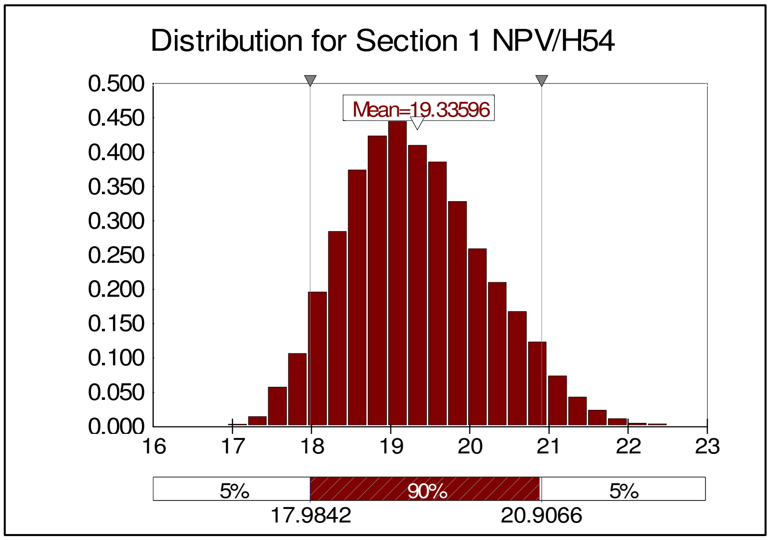


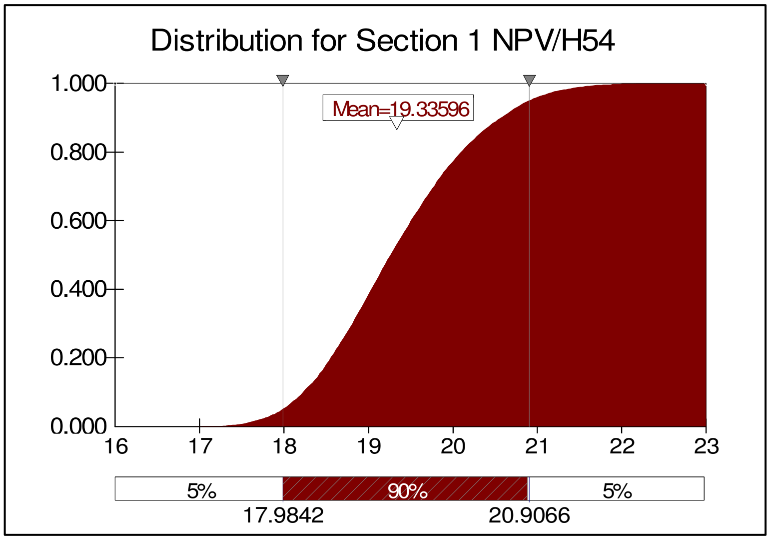
Summary Statistics					
Statistic	Value		%tile	Value	
Minimum	$	22.51	5%	$	23.88
Maximum	$	29.93	10%	$	24.21
Mean	$	25.69	15%	$	24.45
Std Dev	$	1.19	20%	$	24.65
Variance		1.425171586	25%	$	24.82
Skewness		0.343052725	30%	$	24.99
Kurtosis		2.792135536	35%	$	25.14
Median	$	25.60	40%	$	25.29
Mode	$	23.72	45%	$	25.44
Left X	$	23.88	50%	$	25.60
Left P		5%	55%	$	25.75
Right X	$	27.80	60%	$	25.91
Right P		95%	65%	$	26.10
Diff X	$	3.92	70%	$	26.28
Diff P		90%	75%	$	26.48
#Errors		0	80%	$	26.71
Filter Min			85%	$	26.99
Filter Max			90%	$	27.35
#Filtered		0	95%	$	27.80

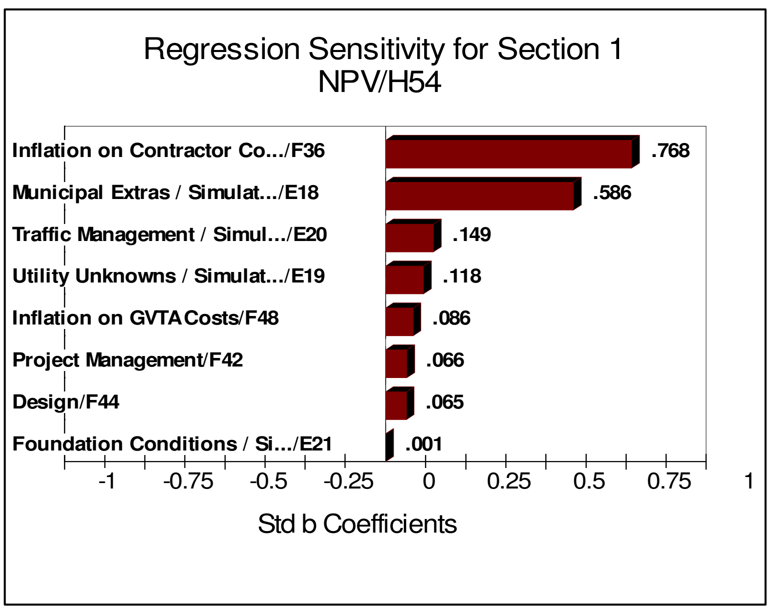


Sensitivity			
Rank	Name	Regr	Corr
#1	Inflation on Contra	0.773	0.764
#2	Municipal Extras /	0.582	0.580
#3	Traffic Manageme	0.148	0.149
#4	Utility Unknowns /	0.117	0.130
#5	Inflation on GVTA	0.083	0.080
#6	Project Managem	0.063	0.061
#7	Design / F44	0.059	0.062
#8	Foundation Condi	0.001	-0.001
#9	Risk 4 / Simulatio	0.000	0.000
#10	Risk 5 / Simulatio	0.000	0.000
#11	Risk 6 / Simulatio	0.000	0.000
#12	Risk 7 / Simulatio	0.000	0.000
#13	Project Managem	0.000	0.000
#14	Resident Enginee	0.000	0.000
#15	Bonding and Insu	0.000	0.000
#16	Design / F32	0.000	0.000

Simulation Results for
Section 1 NPV / H54







Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 2.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	87
Number of Outputs	14
Sampling Type	Monte Carlo
Simulation Start Time	11/1/2005 16:10
Simulation Stop Time	11/1/2005 16:12
Simulation Duration	00:01:44
Random Seed	162425227

Summary Statistics			
Statistic	**Value**	**%tile**	**Value**
Minimum	$16.95	5%	$17.98
Maximum	$22.51	10%	$18.23
Mean	$19.34	15%	$18.41
Std Dev	$0.89	20%	$18.55
Variance	0.795172663	25%	$18.68
Skewness	0.337396062	30%	$18.81
Kurtosis	2.792829371	35%	$18.93
Median	$19.26	40%	$19.03
Mode	$17.95	45%	$19.15
Left X	$17.98	50%	$19.26
Left P	5%	55%	$19.38
Right X	$20.91	60%	$19.51
Right P	95%	65%	$19.64
Diff X	$2.92	70%	$19.78
Diff P	90%	75%	$19.92
#Errors	0	80%	$20.10
Filter Min		85%	$20.30
Filter Max		90%	$20.58
#Filtered	0	95%	$20.91

Sensitivity			
Rank	**Name**	**Regr**	**Corr**
#1	Inflation on Contra	0.768	0.759
#2	Municipal Extras /	0.586	0.585
#3	Traffic Manageme	0.149	0.150
#4	Utility Unknowns /	0.118	0.130
#5	Inflation on GVTA	0.086	0.082
#6	Project Managem	0.066	0.064
#7	Design / F44	0.065	0.068
#8	Foundation Condi	0.001	-0.001
#9	Risk 4 / Simulatio	0.000	0.000
#10	Risk 5 / Simulatio	0.000	0.000
#11	Risk 6 / Simulatio	0.000	0.000
#12	Risk 7 / Simulatio	0.000	0.000
#13	Project Managem	0.000	0.000
#14	Resident Enginee	0.000	0.000
#15	Bonding and Insu	0.000	0.000
#16	Design / F32	0.000	0.000

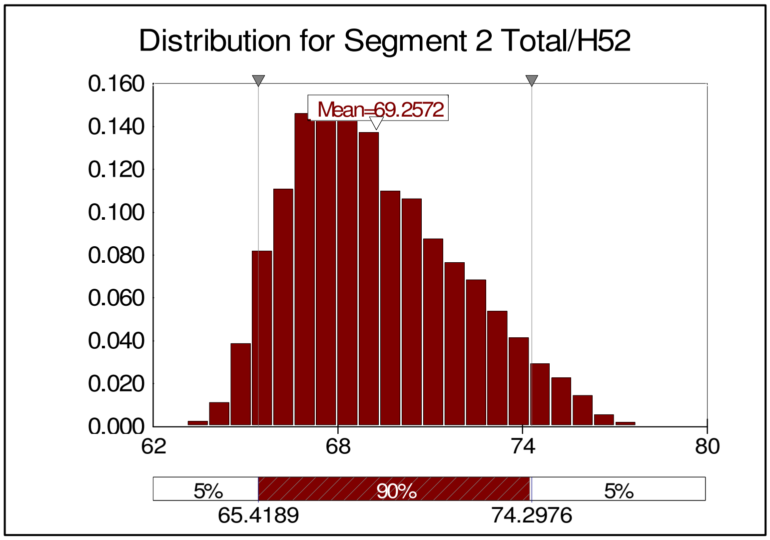
Golden Ears Bridge - Risk Assessment of Reference Case

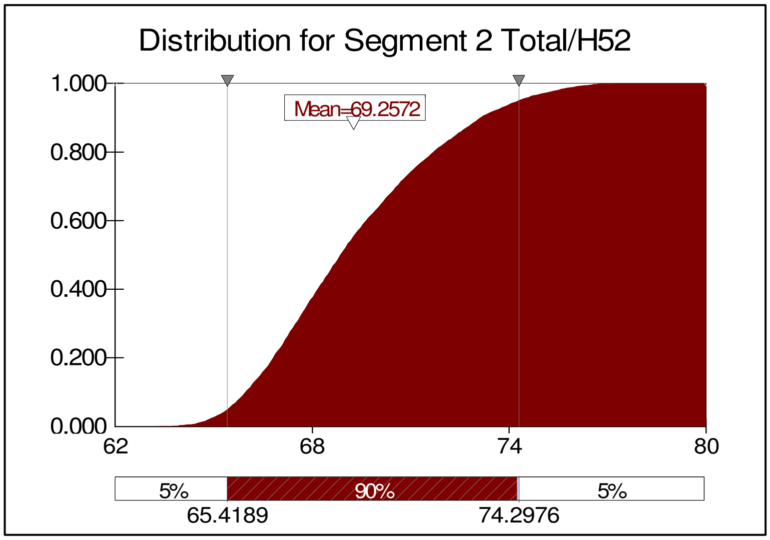
Contract 2 - 176 Street to Telegraph Trail

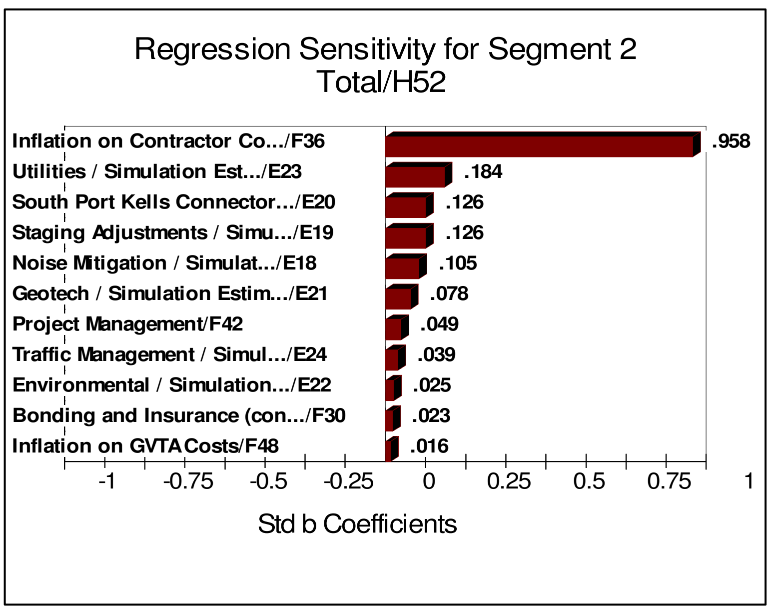
	Risk Distribution			Simulation Estimate											
Cash Flow Distribution	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Contractor Construction, PM & RE						100%					38%	41%	21%		
Contractor Bonding and Insurance						100%					100%				
Contractor Design						100%				35%	65%				
GVTA Project Management						100%			2%	28%	28%	28%	14%		
GVTA Design						0%									
GVTA Resident Engineering						0%									
Contractor Costs	**P**	**L**	**O**	**$**	**%**	**Total %**		**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Construction Costs							$ 38.69	$ -	$ -	$ -	$ 14.68	$ 16.01	$ 8.00	$ -	$ -
Risks															
Noise Mitigation	$ -	$ 0.6	$ 0.8	$ 0.47			$ 0.47	$ -	$ -	$ -	$ 0.18	$ 0.19	$ 0.10	$ -	$ -
Staging Adjustments	$ -	$ 0.5	$ 1.0	$ 0.50			$ 0.50	$ -	$ -	$ -	$ 0.19	$ 0.21	$ 0.10	$ -	$ -
South Port Kells Connector	$ -	$ 0.5	$ 1.0	$ 0.50			$ 0.50	$ -	$ -	$ -	$ 0.19	$ 0.21	$ 0.10	$ -	$ -
Geotech	$ -	$ 0.2	$ 0.6	$ 0.27			$ 0.27	$ -	$ -	$ -	$ 0.10	$ 0.11	$ 0.06	$ -	$ -
Environmental	$ -	$ 0.1	$ 0.2	$ 0.10			$ 0.10	$ -	$ -	$ -	$ 0.04	$ 0.04	$ 0.02	$ -	$ -
Utilities	$ -	$ 0.1	$ 1.3	$ 0.47			$ 0.47	$ -	$ -	$ -	$ 0.18	$ 0.19	$ 0.10	$ -	$ -
Traffic Management	$ (0.1)	$ -	$ 0.2	$ 0.03			$ 0.03	$ -	$ -	$ -	$ 0.01	$ 0.01	$ 0.01	$ -	$ -
Project Management	3.5%	3.5%	3.5%		3.50%		$ 1.44	$ -	$ -	$ -	$ 0.54	$ 0.59	$ 0.30	$ -	$ -
Resident Engineering	3.0%	3.0%	3.0%		3.00%		$ 1.23	$ -	$ -	$ -	$ 0.47	$ 0.51	$ 0.25	$ -	$ -
Bonding and Insurance (const., risks & design)	3.6%	3.6%	4.1%		3.77%		$ 1.63	$ -	$ -	$ -	$ 1.63	$ -	$ -	$ -	$ -
Design	5.8%	5.8%	5.8%		5.75%		$ 2.36	$ -	$ -	$ 0.83	$ 1.53	$ -	$ -	$ -	$ -
Contingency (on const. and risks)						12.0%	$ 4.92	$ -	$ -	$ -	$ 1.87	$ 2.04	$ 1.02	$ -	$ -
Inflation on Contractor Costs	5.0%	6.0%	10.0%		7.00%		$ 15.28	$ -	$ -	$ 0.12	$ 4.86	$ 6.25	$ 4.05	$ -	$ -
Total Contractor Costs							**$ 67.89**	**$ -**	**$ -**	**$ 0.95**	**$ 26.47**	**$ 26.37**	**$ 14.11**	**$ -**	**$ -**
GVTA Costs	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Project Management	2.0%	2.0%	3.0%		2.33%		$ 1.07	$ -	$ 0.02	$ 0.30	$ 0.30	$ 0.30	$ 0.15	$ -	$ -
Design	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Resident Engineering	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Inflation on GVTA Costs	5.0%	6.0%	10.0%		7.00%		$ 0.27	$ -	$ 0.00	$ 0.04	$ 0.07	$ 0.09	$ 0.06	$ -	$ -
Total GVTA Costs							**$ 1.34**	**$ -**	**$ 0.03**	**$ 0.34**	**$ 0.37**	**$ 0.39**	**$ 0.21**	**$ -**	**$ -**
Total Contractor and GVTA Costs							**$ 69.23**	**$ -**	**$ 0.027**	**$ 1.288**	**$ 26.836**	**$ 26.760**	**$ 14.316**	**$ -**	**$ -**
Net Present Value of Cash Flow							**$52.45**								

These two cells are the outputs of the analysis and will be shown with the cumulative probability distributions

Simulation Results for
Segment 2 Total / H52





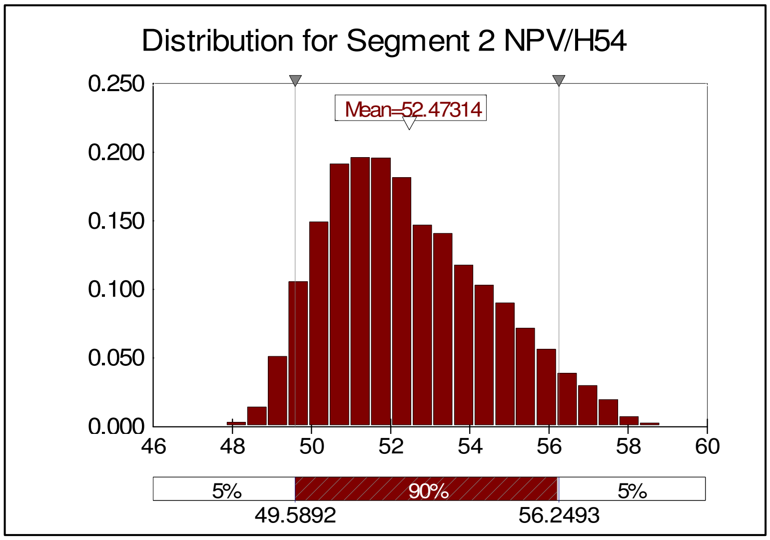


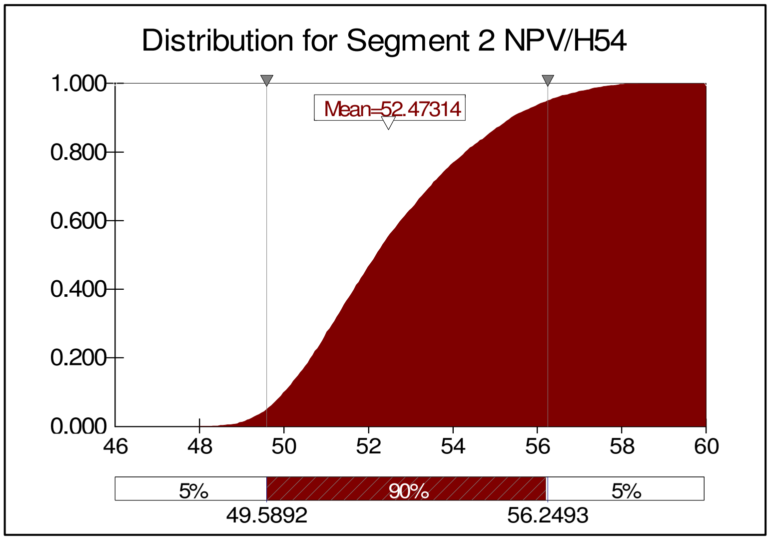
Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 2.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	87
Number of Outputs	14
Sampling Type	Monte Carlo
Simulation Start Time	11/1/2005 16:10
Simulation Stop Time	11/1/2005 16:12
Simulation Duration	00:01:44
Random Seed	162425227

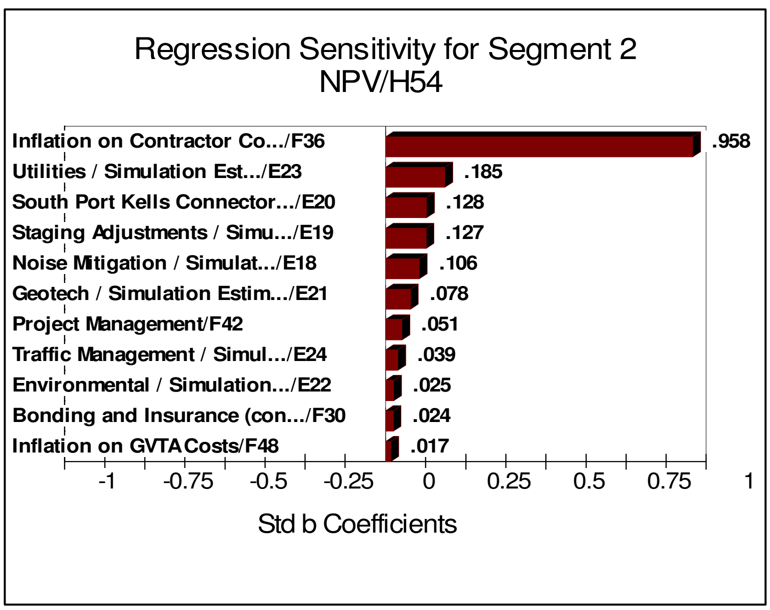
Summary Statistics			
Statistic	**Value**	**%tile**	**Value**
Minimum	$ 63.13	5%	$ 65.42
Maximum	$ 78.42	10%	$ 65.96
Mean	$ 69.26	15%	$ 66.43
Std Dev	$ 2.73	20%	$ 66.81
Variance	7.43298674	25%	$ 67.17
Skewness	0.49465253	30%	$ 67.50
Kurtosis	2.626625784	35%	$ 67.83
Median	$ 68.86	40%	$ 68.17
Mode	$ 67.53	45%	$ 68.52
Left X	$ 65.42	50%	$ 68.86
Left P	5%	55%	$ 69.22
Right X	$ 74.30	60%	$ 69.64
Right P	95%	65%	$ 70.11
Diff X	$ 8.88	70%	$ 70.58
Diff P	90%	75%	$ 71.09
#Errors	0	80%	$ 71.69
Filter Min		85%	$ 72.39
Filter Max		90%	$ 73.13
#Filtered	0	95%	$ 74.30

Sensitivity			
Rank	**Name**	**Regr**	**Corr**
#1	Inflation on Contra	0.958	0.952
#2	Utilities / Simulati	0.184	0.158
#3	South Port Kells C	0.126	0.123
#4	Staging Adjustme	0.126	0.102
#5	Noise Mitigation /	0.105	0.116
#6	Geotech / Simula	0.078	0.072
#7	Project Managem	0.049	0.031
#8	Traffic Manageme	0.039	0.050
#9	Environmental / S	0.025	0.041
#10	Bonding and Insu	0.023	0.008
#11	Inflation on GVTA	0.016	0.023
#12	Material (Latent) I	0.000	0.000
#13	Project Managem	0.000	0.015
#14	Municipal Extras /	0.000	0.015
#15	Utility Unknowns /	0.000	-0.004
#16	Traffic Manageme	0.000	-0.003

Simulation Results for
Segment 2 NPV / H54







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Number of Simulations	1
Number of Iterations	10000
Number of Inputs	87
Number of Outputs	14
Sampling Type	Monte Carlo
Simulation Start Time	11/1/2005 16:10
Simulation Stop Time	11/1/2005 16:12
Simulation Duration	00:01:44
Random Seed	162425227

Summary Statistics			
Statistic	**Value**	**%tile**	**Value**
Minimum	$47.86	5%	$49.59
Maximum	$59.35	10%	$50.00
Mean	$52.47	15%	$50.35
Std Dev	$2.05	20%	$50.64
Variance	4.189836663	25%	$50.90
Skewness	0.492899106	30%	$51.16
Kurtosis	2.627767401	35%	$51.40
Median	$52.18	40%	$51.66
Mode	$50.26	45%	$51.92
Left X	$49.59	50%	$52.18
Left P	5%	55%	$52.45
Right X	$56.25	60%	$52.76
Right P	95%	65%	$53.11
Diff X	$6.66	70%	$53.47
Diff P	90%	75%	$53.84
#Errors	0	80%	$54.30
Filter Min		85%	$54.82
Filter Max		90%	$55.38
#Filtered	0	95%	$56.25

Sensitivity			
Rank	**Name**	**Regr**	**Corr**
#1	Inflation on Contra	0.958	0.951
#2	Utilities / Simulati	0.185	0.160
#3	South Port Kells C	0.128	0.124
#4	Staging Adjustme	0.127	0.103
#5	Noise Mitigation /	0.106	0.117
#6	Geotech / Simula	0.078	0.073
#7	Project Managem	0.051	0.033
#8	Traffic Manageme	0.039	0.050
#9	Environmental / S	0.025	0.041
#10	Bonding and Insu	0.024	0.009
#11	Inflation on GVTA	0.017	0.024
#12	Material (Latent) I	0.000	0.000
#13	Project Managem	0.000	0.015
#14	Municipal Extras /	0.000	0.015
#15	Utility Unknowns /	0.000	-0.004
#16	Traffic Manageme	0.000	-0.003

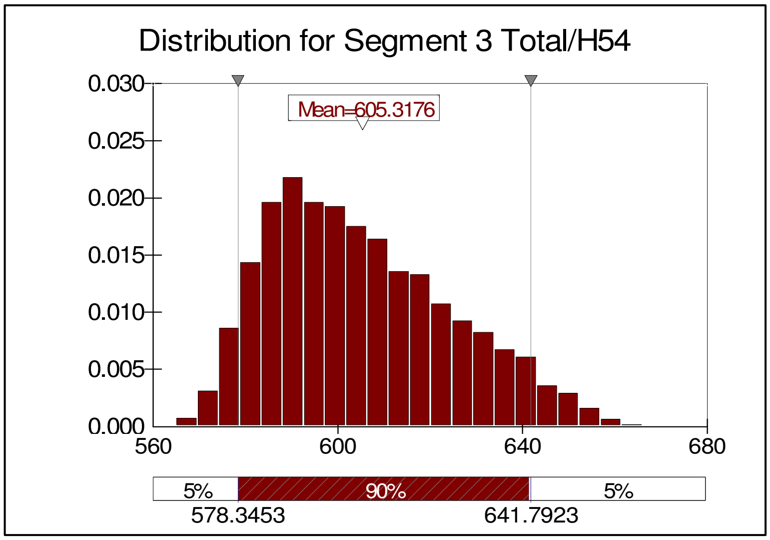
Golden Ears Bridge - Risk Assessment of Reference Case

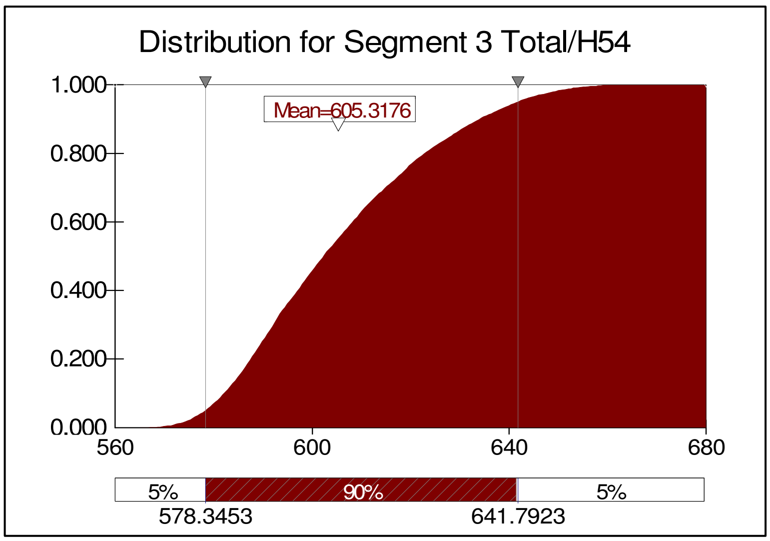
Contract 3 - Fraser River Crossing

Cash Flow Distribution	Risk Distribution P	L	O	Simulation Estimate $	%	Total %	Total $	2005	2006	2007	2008	2009	2010	2011	2012
Contractor Construction, PM & RE						100%				17%	51%	26%	6%		
Contractor Bonding and Insurance						100%				100%					
Contractor Design						100%			35%	11%	33%	17%	4%		
GVTA Project Management						100%			22%	22%	22%	22%	11%		
GVTA Design						0%									
GVTA Resident Engineering						0%									
Contractor Costs	**P**	**L**	**O**	**$**	**%**	**Total %**		**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Construction Costs							$ 372.30	$ -	$ -	$ 63.29	$ 189.87	$ 96.80	$ 22.34	$ -	$ -
Risks															
Emergency Service Requirements	$ -	$ 1.6	$ 5.0	$ 2.20			$ 2.20	$ -	$ -	$ 0.37	$ 1.12	$ 0.57	$ 0.13	$ -	$ -
Suicide Prevention	$ -	$ -	$ 0.5	$ 0.17			$ 0.17	$ -	$ -	$ 0.03	$ 0.09	$ 0.04	$ 0.01	$ -	$ -
Noise Attentuation	$ -	$ -	$ 0.3	$ 0.10			$ 0.10	$ -	$ -	$ 0.02	$ 0.05	$ 0.03	$ 0.01	$ -	$ -
Foundation Conditions	$ (7.5)	$ (4.0)	$ 4.0	$ (2.50)			$ (2.50)	$ -	$ -	$ (0.43)	$ (1.28)	$ (0.65)	$ (0.15)	$ -	$ -
Risk 5	$ -	$ -	$ -	$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Risk 6	$ -	$ -	$ -	$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Risk 7	$ -	$ -	$ -	$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Project Management	3.5%	3.5%	3.5%		3.50%		$ 13.03	$ -	$ -	$ 2.21	$ 6.64	$ 3.39	$ 0.78	$ -	$ -
Resident Engineering	3.0%	3.0%	3.0%		3.00%		$ 11.17	$ -	$ -	$ 1.90	$ 5.70	$ 2.90	$ 0.67	$ -	$ -
Bonding and Insurance (const., risks & design)	3.6%	3.6%	4.1%		3.77%		$ 14.83	$ -	$ -	$ 14.83	$ -	$ -	$ -	$ -	$ -
Design	5.8%	5.8%	5.8%		5.75%		$ 21.41	$ -	$ 7.49	$ 2.35	$ 7.06	$ 3.64	$ 0.86	$ -	$ -
Contingency (on const. and risks)						12.0%	$ 44.67	$ -	$ -	$ 7.59	$ 22.78	$ 11.61	$ 2.68	$ -	$ -
Inflation on Contractor Costs	5.0%	6.0%	10.0%		7.00%		$ 113.88	$ -	$ 0.52	$ 13.36	$ 52.22	$ 36.78	$ 11.00	$ -	$ -
Total Contractor Costs							**$ 591.25**	**$ -**	**$ 8.02**	**$ 105.53**	**$ 284.26**	**$ 155.11**	**$ 38.32**	**$ -**	**$ -**
GVTA Costs	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Honorarium							$ 2.40	$ -	$ 2.40	$ -	$ -	$ -	$ -	$ -	$ -
Project Management	2.0%	2.0%	3.0%		2.33%		$ 9.73	$ -	$ 2.16	$ 2.16	$ 2.16	$ 2.16	$ 1.08	$ -	$ -
Design	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Resident Engineering	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Inflation on GVTA Costs	5.0%	6.0%	10.0%		7.00%		$ 2.06	$ -	$ 0.15	$ 0.31	$ 0.49	$ 0.67	$ 0.44	$ -	$ -
Total GVTA Costs							**$ 14.19**	**$ -**	**$ 4.71**	**$ 2.48**	**$ 2.65**	**$ 2.83**	**$ 1.52**	**$ -**	**$ -**
Total Contractor and GVTA Costs							**$ 605.43**	**$ -**	**$ 12.730**	**$ 108.007**	**$ 286.911**	**$ 157.946**	**$ 39.840**	**$ -**	**$ -**
Net Present Value of Cash Flow							**$475.39**								

These two cells are the outputs of the analysis and will be shown with the cumulative probability distributions

Simulation Results for
Segment 3 Total / H54





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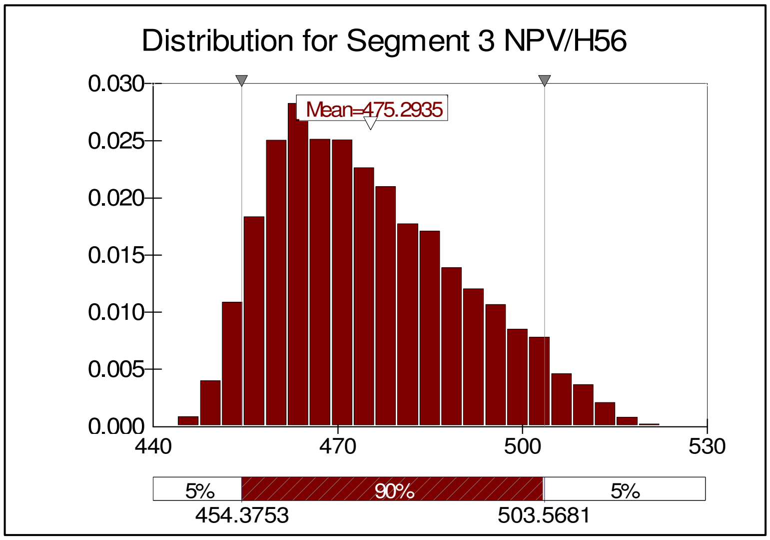
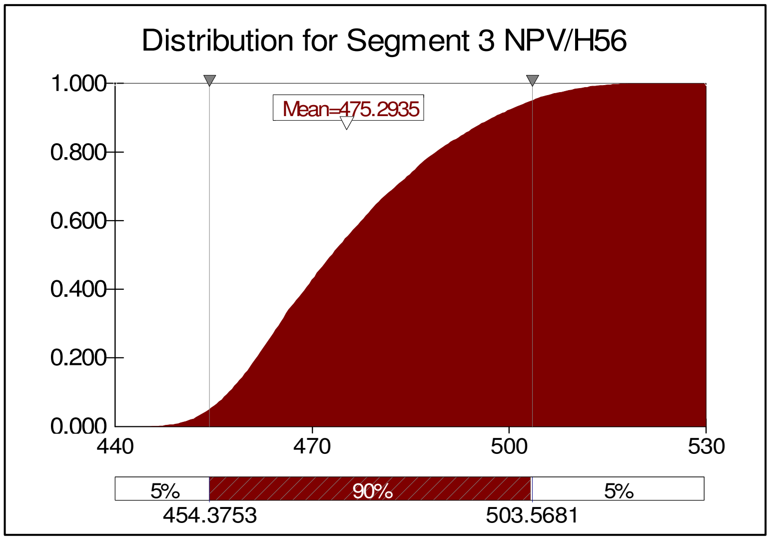
Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 2.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	0
Number of Outputs	14
Sampling Type	Monte Carlo
Simulation Start Time	11/2/2005 15:56
Simulation Stop Time	11/2/2005 15:58
Simulation Duration	00:02:20
Random Seed	232071117

Summary Statistics			
Statistic	**Value**	**%tile**	**Value**
Minimum	$ 565.16	5%	$ 578.35
Maximum	$ 666.15	10%	$ 582.15
Mean	$ 605.32	15%	$ 585.08
Std Dev	$ 19.56	20%	$ 587.55
Variance	382.5853049	25%	$ 589.84
Skewness	0.515678878	30%	$ 592.11
Kurtosis	2.537448634	35%	$ 594.41
Median	$ 602.29	40%	$ 597.14
Mode	$ 574.37	45%	$ 599.59
Left X	$ 578.35	50%	$ 602.29
Left P	5%	55%	$ 605.18
Right X	$ 641.79	60%	$ 608.20
Right P	95%	65%	$ 611.21
Diff X	$ 63.45	70%	$ 614.88
Diff P	90%	75%	$ 618.78
#Errors	0	80%	$ 622.85
Filter Min		85%	$ 628.08
Filter Max		90%	$ 633.96
#Filtered	0	95%	$ 641.79

Sensitivity			
Rank	**Name**	**Regr**	**Corr**
#1			
#2			
#3			
#4			
#5			
#6			
#7			
#8			
#9			
#10			
#11			
#12			
#13			
#14			
#15			
#16			

Simulation Results for
Segment 3 NPV / H56





(graph unavailable for this simulation and output)

Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 2.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	0
Number of Outputs	14
Sampling Type	Monte Carlo
Simulation Start Time	11/2/2005 15:56
Simulation Stop Time	11/2/2005 15:58
Simulation Duration	00:02:20
Random Seed	232071117

Summary Statistics			
Statistic	**Value**	**%tile**	**Value**
Minimum	$444.08	5%	$454.38
Maximum	$522.47	10%	$457.35
Mean	$475.29	15%	$459.62
Std Dev	$15.15	20%	$461.55
Variance	229.6388973	25%	$463.29
Skewness	0.513897026	30%	$465.06
Kurtosis	2.537622696	35%	$466.85
Median	$472.99	40%	$468.97
Mode	$453.55	45%	$470.85
Left X	$454.38	50%	$472.99
Left P	5%	55%	$475.20
Right X	$503.57	60%	$477.54
Right P	95%	65%	$479.87
Diff X	$49.19	70%	$482.71
Diff P	90%	75%	$485.72
#Errors	0	80%	$488.90
Filter Min		85%	$492.94
Filter Max		90%	$497.45
#Filtered	0	95%	$503.57

Sensitivity			
Rank	**Name**	**Regr**	**Corr**
#1			
#2			
#3			
#4			
#5			
#6			
#7			
#8			
#9			
#10			
#11			
#12			
#13			
#14			
#15			
#16			

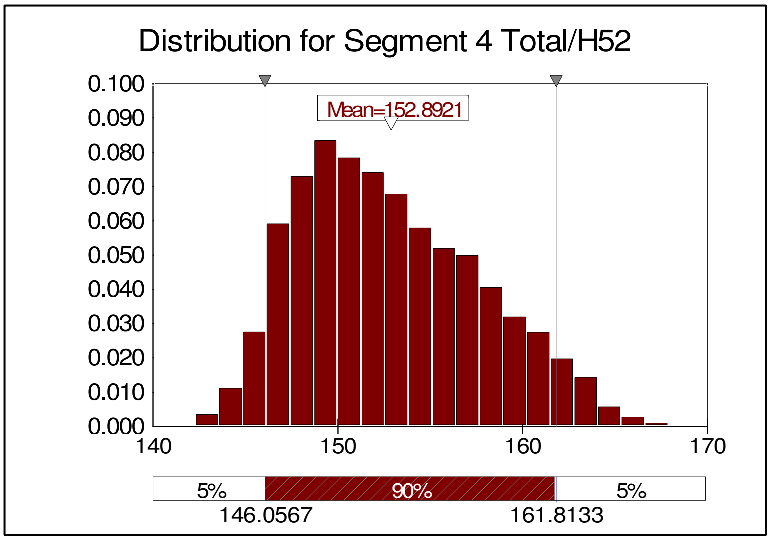
Golden Ears Bridge - Risk Assessment of Reference Case

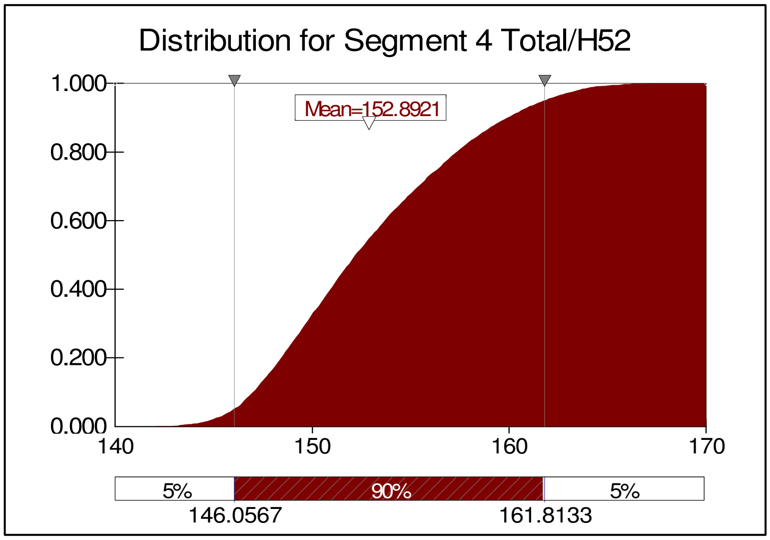
Contract 4 - 113B Avenue to Lougheed Highway

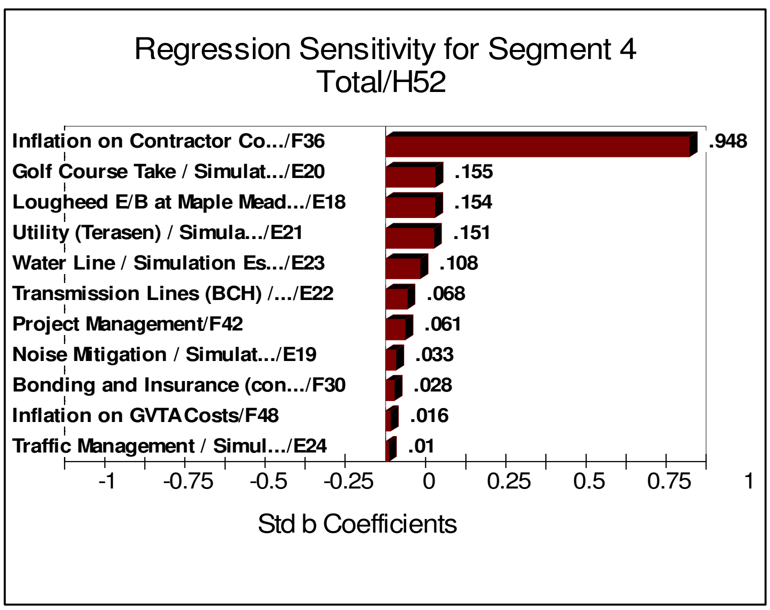
	Risk Distribution			Simulation Estimate											
Cash Flow Distribution	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Contractor Construction, PM & RE						100%				27%	40%	33%			
Contractor Bonding and Insurance						100%				100%					
Contractor Design						100%			26%	74%					
GVTA Project Management						100%			23%	27%	27%	23%			
GVTA Design						0%									
GVTA Resident Engineering						0%									
Contractor Costs	**P**	**L**	**O**	**$**	**%**	**Total %**		**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Construction Costs							$ 92.74	$ -	$ -	$ 24.73	$ 37.10	$ 30.91	$ -	$ -	$ -
Risks															
Lougheed E/B at Maple Meadows	$ -	$ -	$ 2.0	$ 0.67			$ 0.67	$ -	$ -	$ 0.18	$ 0.27	$ 0.22	$ -	$ -	$ -
Noise Mitigation	$ -	$ 0.3	$ 0.5	$ 0.25			$ 0.25	$ -	$ -	$ 0.07	$ 0.10	$ 0.08	$ -	$ -	$ -
Golf Course Take	$ (1.0)	$ 1.0	$ 1.0	$ 0.33			$ 0.33	$ -	$ -	$ 0.09	$ 0.13	$ 0.11	$ -	$ -	$ -
Utility (Terasen)	$ (0.2)	$ 0.5	$ 2.0	$ 0.77			$ 0.77	$ -	$ -	$ 0.20	$ 0.31	$ 0.26	$ -	$ -	$ -
Transmission Lines (BCH)	$ (0.5)	$ -	$ 0.5	$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Water Line	$ -	$ 0.3	$ 1.5	$ 0.58			$ 0.58	$ -	$ -	$ 0.16	$ 0.23	$ 0.19	$ -	$ -	$ -
Traffic Management	$ -	$ 0.1	$ 0.2	$ 0.07			$ 0.07	$ -	$ -	$ 0.02	$ 0.03	$ 0.02	$ -	$ -	$ -
Project Management	3.5%	3.5%	3.5%		3.50%		$ 3.34	$ -	$ -	$ 0.89	$ 1.34	$ 1.11	$ -	$ -	$ -
Resident Engineering	3.0%	3.0%	3.0%		3.00%		$ 2.86	$ -	$ -	$ 0.76	$ 1.14	$ 0.95	$ -	$ -	$ -
Bonding and Insurance (const., risks & design)	3.6%	3.6%	4.1%		3.77%		$ 3.80	$ -	$ -	$ 3.80	$ -	$ -	$ -	$ -	$ -
Design	5.8%	5.8%	5.8%		5.75%		$ 5.49	$ -	$ 1.44	$ 4.05	$ -	$ -	$ -	$ -	$ -
Contingency (on const. and risks)						12.0%	$ 11.45	$ -	$ -	$ 3.05	$ 4.58	$ 3.82	$ -	$ -	$ -
Inflation on Contractor Costs	5.0%	6.0%	10.0%		7.00%		$ 27.50	$ -	$ 0.10	$ 5.51	$ 10.18	$ 11.71	$ -	$ -	$ -
Total Contractor Costs							**$ 149.84**	**$ -**	**$ 1.54**	**$ 43.50**	**$ 55.40**	**$ 49.40**	**$ -**	**$ -**	**$ -**
GVTA Costs	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Project Management	2.0%	2.0%	3.0%		2.33%		$ 2.49	$ -	$ 0.57	$ 0.68	$ 0.68	$ 0.57	$ -	$ -	$ -
Design	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Resident Engineering	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Inflation on GVTA Costs	5.0%	6.0%	10.0%		7.00%		$ 0.47	$ -	$ 0.04	$ 0.10	$ 0.15	$ 0.18	$ -	$ -	$ -
Total GVTA Costs							**$ 2.96**	**$ -**	**$ 0.61**	**$ 0.78**	**$ 0.83**	**$ 0.74**	**$ -**	**$ -**	**$ -**
Total Contractor and GVTA Costs							**$ 152.80**	**$ -**	**$ 2.147**	**$ 44.279**	**$ 56.233**	**$ 50.141**	**$ -**	**$ -**	**$ -**
Net Present Value of Cash Flow							**$121.10**								

These two cells are the outputs of the analysis and will be shown with the cumulative probability distributions

Simulation Results for
Segment 4 Total / H52







Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 2.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	87
Number of Outputs	14
Sampling Type	Monte Carlo
Simulation Start Time	11/1/2005 16:10
Simulation Stop Time	11/1/2005 16:12
Simulation Duration	00:01:44
Random Seed	162425227

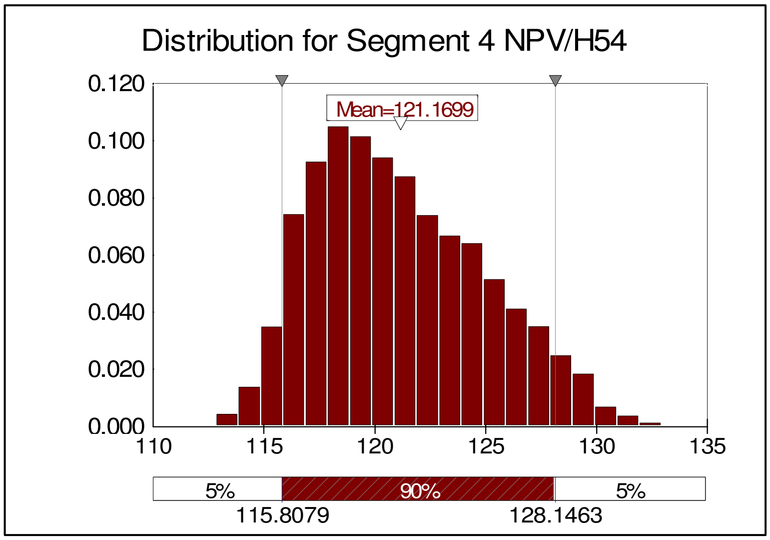
Summary Statistics

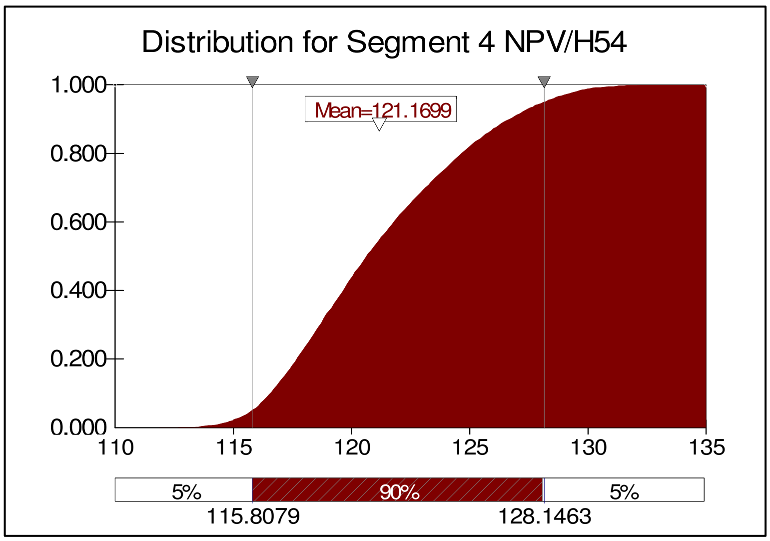
Statistic	Value	%tile	Value
Minimum	$ 141.05	5%	$ 146.06
Maximum	$ 169.21	10%	$ 147.01
Mean	$ 152.89	15%	$ 147.76
Std Dev	$ 4.88	20%	$ 148.43
Variance	23.78695298	25%	$ 149.07
Skewness	0.436537079	30%	$ 149.69
Kurtosis	2.498146224	35%	$ 150.32
Median	$ 152.20	40%	$ 150.94
Mode	$ 146.51	45%	$ 151.53
Left X	$ 146.06	50%	$ 152.20
Left P	5%	55%	$ 152.92
Right X	$ 161.81	60%	$ 153.68
Right P	95%	65%	$ 154.50
Diff X	$ 15.76	70%	$ 155.39
Diff P	90%	75%	$ 156.38
#Errors	0	80%	$ 157.35
Filter Min		85%	$ 158.51
Filter Max		90%	$ 159.92
#Filtered	0	95%	$ 161.81

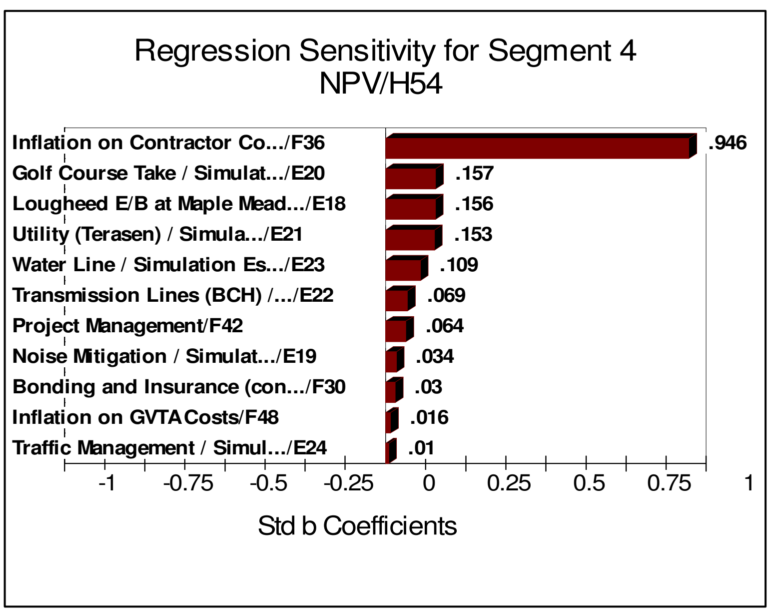
Sensitivity

Rank	Name	Regr	Corr
#1	Inflation on Contra	0.948	0.949
#2	Golf Course Take	0.155	0.161
#3	Lougheed E/B at	0.154	0.171
#4	Utility (Terasen) /	0.151	0.143
#5	Water Line / Simu	0.108	0.111
#6	Transmission Line	0.068	0.070
#7	Project Managem	0.061	0.036
#8	Noise Mitigation /	0.033	0.050
#9	Bonding and Insu	0.028	0.013
#10	Inflation on GVTA	0.016	0.026
#11	Traffic Manageme	0.010	0.013
#12	Project Managem	0.000	-0.015
#13	Design / F44	0.000	-0.009
#14	Traffic Manageme	0.000	-0.008
#15	Inflation on Contra	0.000	0.007
#16	Increased Heavy	0.000	0.007

Simulation Results for
Segment 4 NPV / H54







Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 2.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	87
Number of Outputs	14
Sampling Type	Monte Carlo
Simulation Start Time	11/1/2005 16:10
Simulation Stop Time	11/1/2005 16:12
Simulation Duration	00:01:44
Random Seed	162425227

Summary Statistics			
Statistic	**Value**	**%tile**	**Value**
Minimum	$111.86	5%	$115.81
Maximum	$133.96	10%	$116.56
Mean	$121.17	15%	$117.15
Std Dev	$3.82	20%	$117.67
Variance	14.58419988	25%	$118.18
Skewness	0.43417738	30%	$118.67
Kurtosis	2.500082046	35%	$119.17
Median	$120.63	40%	$119.64
Mode	$115.72	45%	$120.11
Left X	$115.81	50%	$120.63
Left P	5%	55%	$121.19
Right X	$128.15	60%	$121.78
Right P	95%	65%	$122.43
Diff X	$12.34	70%	$123.13
Diff P	90%	75%	$123.89
#Errors	0	80%	$124.66
Filter Min		85%	$125.56
Filter Max		90%	$126.67
#Filtered	0	95%	$128.15

Sensitivity			
Rank	**Name**	**Regr**	**Corr**
#1	Inflation on Contra	0.946	0.948
#2	Golf Course Take	0.157	0.163
#3	Lougheed E/B at	0.156	0.173
#4	Utility (Terasen) /	0.153	0.145
#5	Water Line / Simu	0.109	0.113
#6	Transmission Line	0.069	0.071
#7	Project Managem	0.064	0.039
#8	Noise Mitigation /	0.034	0.050
#9	Bonding and Insu	0.030	0.015
#10	Inflation on GVTA	0.016	0.026
#11	Traffic Manageme	0.010	0.013
#12	Project Managem	0.000	-0.015
#13	Design / F44	0.000	-0.009
#14	Traffic Manageme	0.000	-0.008
#15	Inflation on Contra	0.000	0.007
#16	Increased Heavy	0.000	0.007

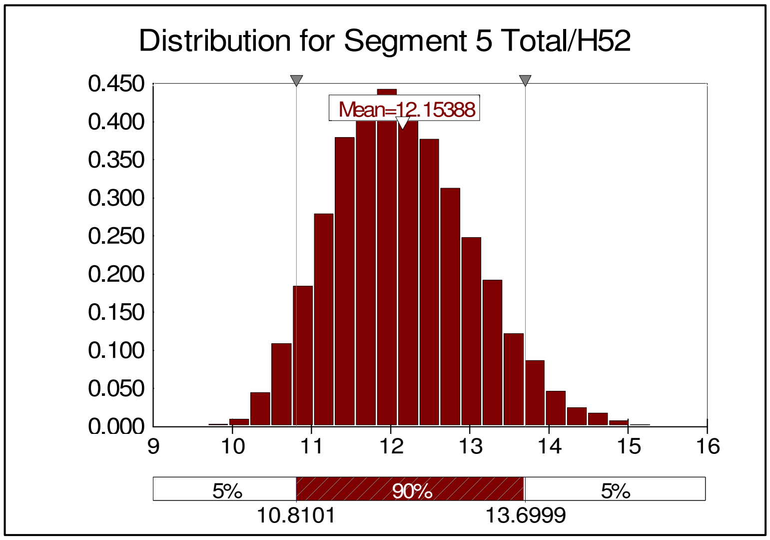
Golden Ears Bridge - Risk Assessment of Reference Case

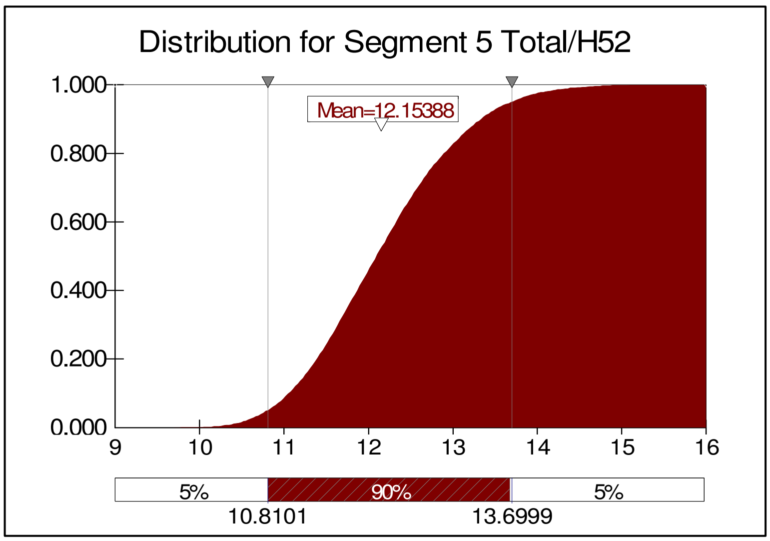
Contract 5 - Abernathy Connector

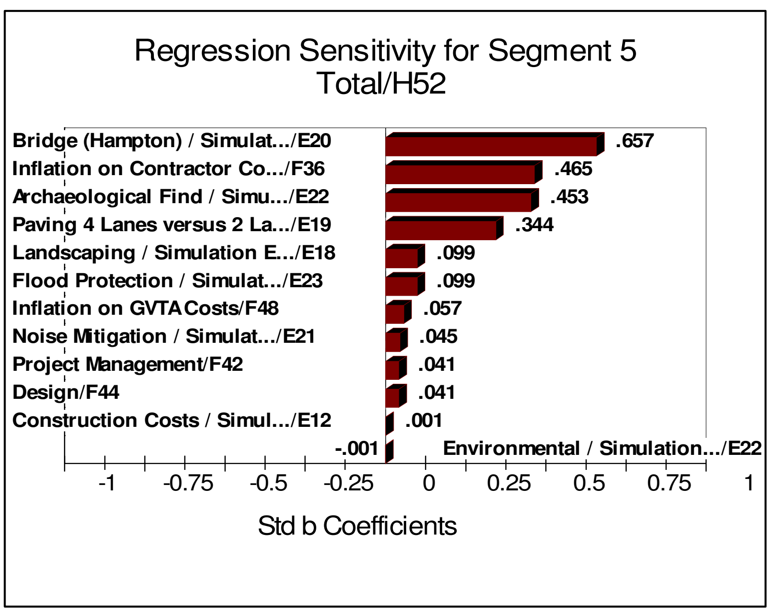
	Risk Distribution			Simulation Estimate											
Cash Flow Distribution	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Contractor Construction, PM & RE						100%					21%	79%			
Contractor Bonding and Insurance						0%									
Contractor Design						0%									
GVTA Project Management						100%				23%	40%	37%			
GVTA Design						100%				4%	96%				
GVTA Resident Engineering						100%					21%	79%			
Contractor Costs	**P**	**L**	**O**	**$**	**%**	**Total %**		**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Construction Costs							$ 6.01	$ -	$ -	$ -	$ 1.29	$ 4.72	$ -	$ -	$ -
Risks															
Landscaping	$ -	$ 0.1	$ 0.3	$ 0.12			$ 0.12	$ -	$ -	$ -	$ 0.03	$ 0.09	$ -	$ -	$ -
Paving 4 Lanes versus 2 Lanes	$ -	$ -	$ 0.8	$ 0.25			$ 0.25	$ -	$ -	$ -	$ 0.05	$ 0.20	$ -	$ -	$ -
Bridge (Hampton)	$ (0.4)	$ -	$ 1.3	$ 0.30			$ 0.30	$ -	$ -	$ -	$ 0.06	$ 0.24	$ -	$ -	$ -
Noise Mitigation	$ -	$ -	$ 0.1	$ 0.03			$ 0.03	$ -	$ -	$ -	$ 0.01	$ 0.03	$ -	$ -	$ -
Archaeological Find	$ -	$ -	$ 1.0	$ 0.33			$ 0.33	$ -	$ -	$ -	$ 0.07	$ 0.26	$ -	$ -	$ -
Flood Protection	$ -	$ 0.1	$ 0.3	$ 0.12			$ 0.12	$ -	$ -	$ -	$ 0.03	$ 0.09	$ -	$ -	$ -
Risk 7	$ -	$ -	$ -	$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Project Management	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Resident Engineering	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Bonding and Insurance (const., risks & design)	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Design	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contingency (on const. and risks)						15.0%	$ 1.07	$ -	$ -	$ -	$ 0.23	$ 0.84	$ -	$ -	$ -
Inflation on Contractor Costs	5.0%	6.0%	10.0%		7.00%		$ 2.41	$ -	$ -	$ -	$ 0.40	$ 2.01	$ -	$ -	$ -
Total Contractor Costs							**$ 10.64**	**$ -**	**$ -**	**$ -**	**$ 2.16**	**$ 8.48**	**$ -**	**$ -**	**$ -**
GVTA Costs	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Project Management	1.5%	1.5%	3.0%		2.00%		$ 0.16	$ -	$ -	$ 0.04	$ 0.07	$ 0.06	$ -	$ -	$ -
Design	6.0%	6.0%	7.5%		6.50%		$ 0.54	$ -	$ -	$ 0.02	$ 0.51	$ -	$ -	$ -	$ -
Resident Engineering	6.0%	6.0%	6.0%		6.00%		$ 0.49	$ -	$ -	$ -	$ 0.11	$ 0.39	$ -	$ -	$ -
Inflation on GVTA Costs	5.0%	6.0%	10.0%		7.00%		$ 0.30	$ -	$ -	$ 0.01	$ 0.15	$ 0.14	$ -	$ -	$ -
Total GVTA Costs							**$ 1.50**	**$ -**	**$ -**	**$ 0.07**	**$ 0.84**	**$ 0.59**	**$ -**	**$ -**	**$ -**
Total Contractor and GVTA Costs							**$ 12.14**	**$ -**	**$ -**	**$ 0.069**	**$ 3.001**	**$ 9.068**	**$ -**	**$ -**	**$ -**
Net Present Value of Cash Flow							**$9.21**								

These two cells are the outputs of the analysis and will be shown with the cumulative probability distributions

Simulation Results for
Segment 5 Total / H52





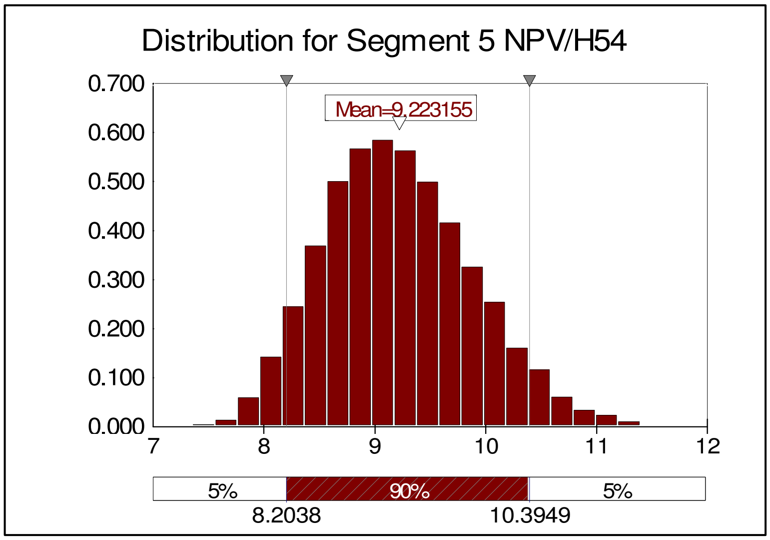


Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 2.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	87
Number of Outputs	14
Sampling Type	Monte Carlo
Simulation Start Time	11/1/2005 16:10
Simulation Stop Time	11/1/2005 16:12
Simulation Duration	00:01:44
Random Seed	162425227

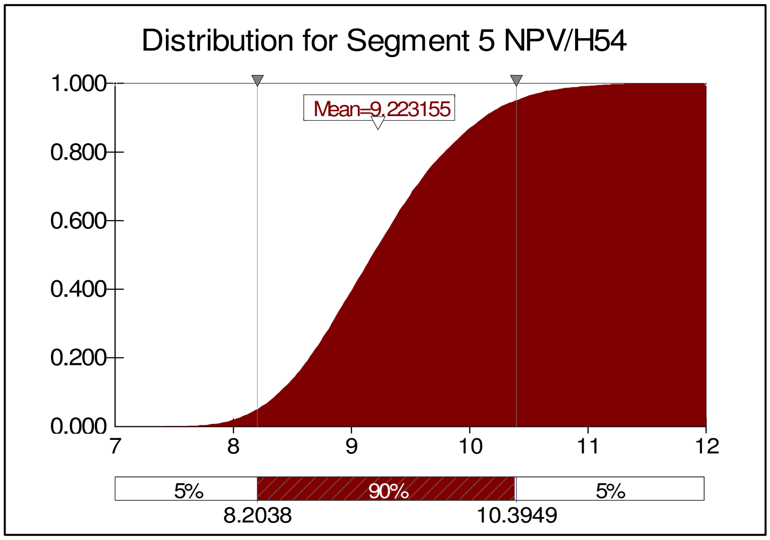
Summary Statistics			
Statistic	**Value**	**%tile**	**Value**
Minimum	$ 9.70	5%	$ 10.81
Maximum	$ 15.56	10%	$ 11.06
Mean	$ 12.15	15%	$ 11.25
Std Dev	$ 0.88	20%	$ 11.39
Variance	0.773397985	25%	$ 11.52
Skewness	0.348009025	30%	$ 11.64
Kurtosis	2.938270131	35%	$ 11.75
Median	$ 12.09	40%	$ 11.87
Mode	$ 11.22	45%	$ 11.98
Left X	$ 10.81	50%	$ 12.09
Left P	5%	55%	$ 12.21
Right X	$ 13.70	60%	$ 12.33
Right P	95%	65%	$ 12.45
Diff X	$ 2.89	70%	$ 12.58
Diff P	90%	75%	$ 12.72
#Errors	0	80%	$ 12.90
Filter Min		85%	$ 13.09
Filter Max		90%	$ 13.34
#Filtered	0	95%	$ 13.70

Sensitivity			
Rank	**Name**	**Regr**	**Corr**
#1	Bridge (Hampton)	0.657	0.645
#2	Inflation on Contra	0.465	0.444
#3	Archaeological Fi	0.453	0.441
#4	Paving 4 Lanes ve	0.344	0.334
#5	Landscaping / Sir	0.099	0.088
#6	Flood Protection /	0.099	0.099
#7	Inflation on GVTA	0.057	0.045
#8	Noise Mitigation /	0.045	0.035
#9	Project Managem	0.041	0.039
#10	Design / F44	0.041	0.035
#11	Construction Cost	0.001	0.002
#12	Environmental / S	-0.001	0.015
#13	Municipal Extras /	0.000	0.012
#14	Utility Unknowns /	0.000	-0.009
#15	Traffic Manageme	0.000	0.017
#16	Risk 4 / Simulatio	0.000	0.000

Simulation Results for
Segment 5 NPV / H54

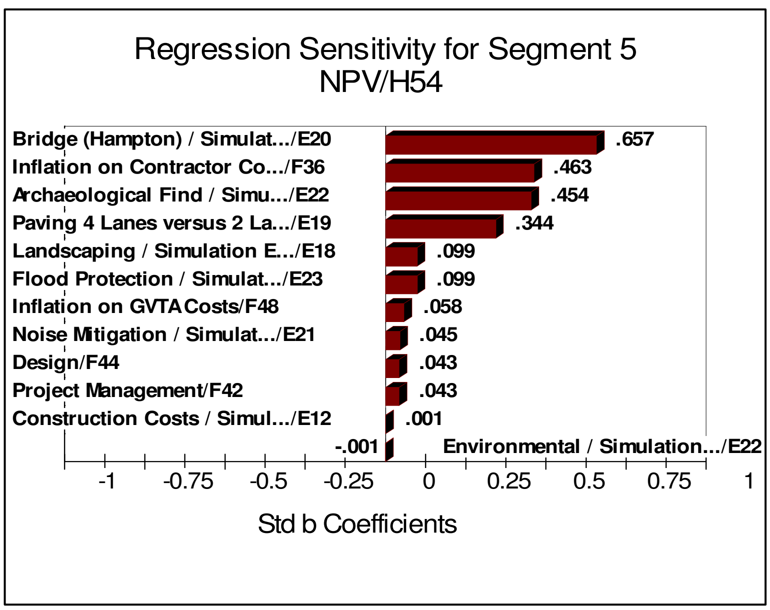


Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 2.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	87
Number of Outputs	14
Sampling Type	Monte Carlo
Simulation Start Time	11/1/2005 16:10
Simulation Stop Time	11/1/2005 16:12
Simulation Duration	00:01:44
Random Seed	162425227



Summary Statistics

Statistic	Value	%tile	Value
Minimum	$7.36	5%	$8.20
Maximum	$11.81	10%	$8.39
Mean	$9.22	15%	$8.53
Std Dev	$0.67	20%	$8.65
Variance	0.444427807	25%	$8.74
Skewness	0.347596977	30%	$8.83
Kurtosis	2.937861016	35%	$8.92
Median	$9.18	40%	$9.01
Mode	$8.31	45%	$9.09
Left X	$8.20	50%	$9.18
Left P	5%	55%	$9.27
Right X	$10.39	60%	$9.36
Right P	95%	65%	$9.45
Diff X	$2.19	70%	$9.55
Diff P	90%	75%	$9.65
#Errors	0	80%	$9.79
Filter Min		85%	$9.94
Filter Max		90%	$10.12
#Filtered	0	95%	$10.39



Sensitivity

Rank	Name	Regr	Corr
#1	Bridge (Hampton)	0.657	0.646
#2	Inflation on Contra	0.463	0.442
#3	Archaeological Fi	0.454	0.442
#4	Paving 4 Lanes v	0.344	0.335
#5	Landscaping / Sir	0.099	0.088
#6	Flood Protection /	0.099	0.099
#7	Inflation on GVTA	0.058	0.046
#8	Noise Mitigation /	0.045	0.035
#9	Design / F44	0.043	0.036
#10	Project Managem	0.043	0.040
#11	Construction Cost	0.001	0.003
#12	Environmental / S	-0.001	0.015
#13	Municipal Extras /	0.000	0.012
#14	Utility Unknowns /	0.000	-0.009
#15	Traffic Manageme	0.000	0.017
#16	Risk 4 / Simulatio	0.000	0.000

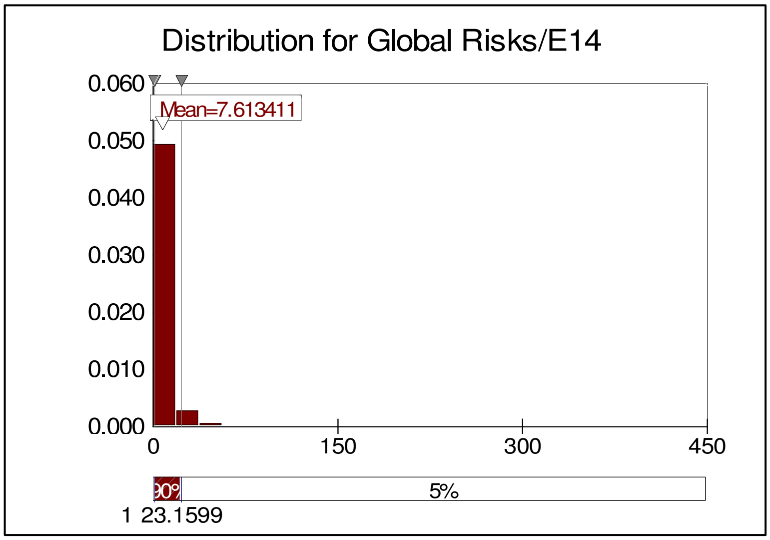
Golden Ears Bridge - Risk Assessment of Reference Case

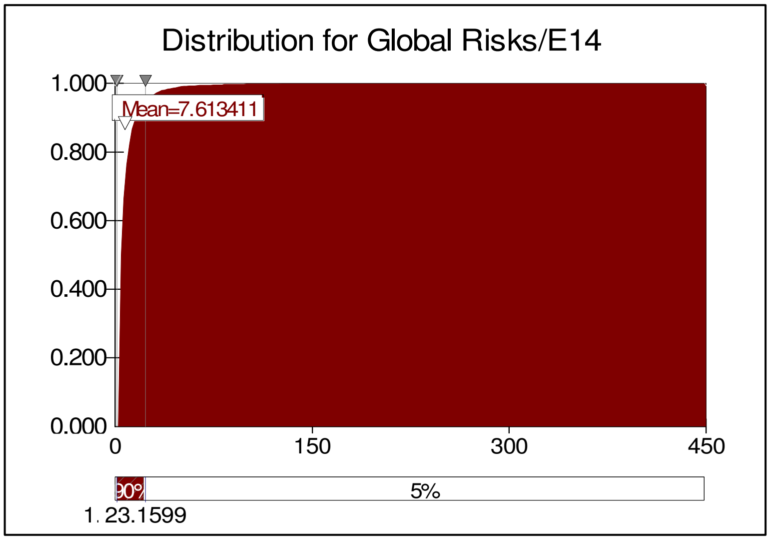
Global Risks

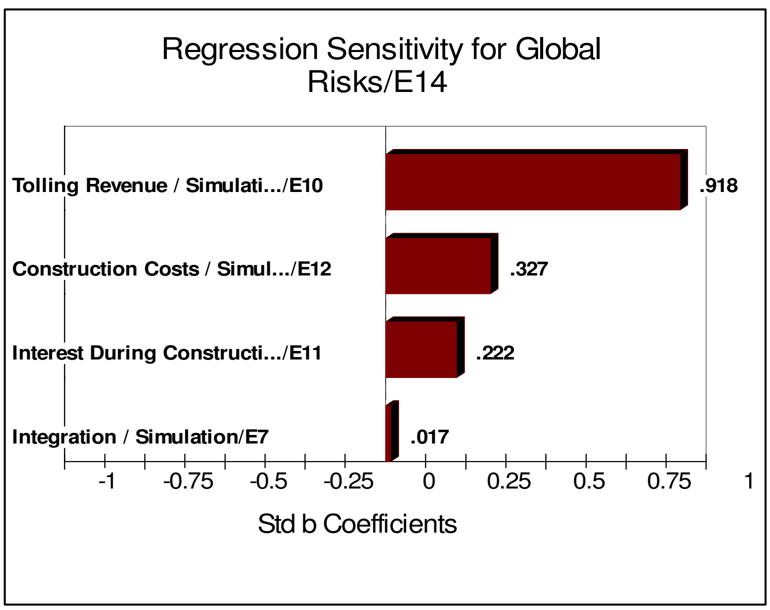
Risk Description	P	L	O	Simulation	Comments
Integration	$0.00	$0.50	$1.00	$0.50	
Schedule Delay	0 yr	0 yr	1.0 yr	-	GVTA Fault
Tolling Revenue	$0.00	$0.00	$80.00	$5.00	
Interest During Construction	$0.00	$0.00	$14.00	$1.00	4% (GVTA borrowing rate) on half of contractors' costs
Construction Costs	$0.00	$0.00	$17.00	$1.00	5% (inflation) on half of contractors' costs (including GVTA costs)
Totals	**$0.00**	**$0.50**	**$112.00**	**$7.50**	

Schedule Delay Risks are Lognormal Functions (see cells for mean and standard deviation)

Simulation Results for Global Risks / E14







Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 2.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	87
Number of Outputs	14
Sampling Type	Monte Carlo
Simulation Start Time	11/1/2005 16:10
Simulation Stop Time	11/1/2005 16:12
Simulation Duration	00:01:44
Random Seed	162425227

Summary Statistics			
Statistic	**Value**	**%tile**	**Value**
Minimum	$0.40	5%	$1.31
Maximum	$414.49	10%	$1.67
Mean	$7.61	15%	$2.00
Std Dev	$11.97	20%	$2.31
Variance	143.1769884	25%	$2.62
Skewness	11.53371034	30%	$2.94
Kurtosis	269.0683755	35%	$3.27
Median	$4.55	40%	$3.65
Mode	$4.59	45%	$4.06
Left X	$1.31	50%	$4.55
Left P	5%	55%	$5.05
Right X	$23.16	60%	$5.66
Right P	95%	65%	$6.35
Diff X	$21.85	70%	$7.29
Diff P	90%	75%	$8.36
#Errors	0	80%	$9.87
Filter Min		85%	$11.90
Filter Max		90%	$15.52
#Filtered	0	95%	$23.16

Sensitivity			
Rank	**Name**	**Regr**	**Corr**
#1	Tolling Revenue /	0.918	0.811
#2	Construction Cost	0.327	0.241
#3	Interest During Co	0.222	0.263
#4	Integration / Simu	0.017	0.065
#5	Lougheed E/B at	0.000	0.008
#6	Archaeological Fi	0.000	-0.004
#7	Flood Protection /	0.000	0.004
#8	Project Managem	0.000	0.020
#9	Golf Course Take	0.000	0.022
#10	Bonding and Insu	0.000	0.017
#11	Municipal Extras /	0.000	-0.008
#12	Traffic Manageme	0.000	-0.009
#13	Project Managem	0.000	-0.003
#14	Staging Adjustme	0.000	-0.001
#15	Emergency Servic	0.000	-0.002
#16	Noise Mitigation /	0.000	0.005

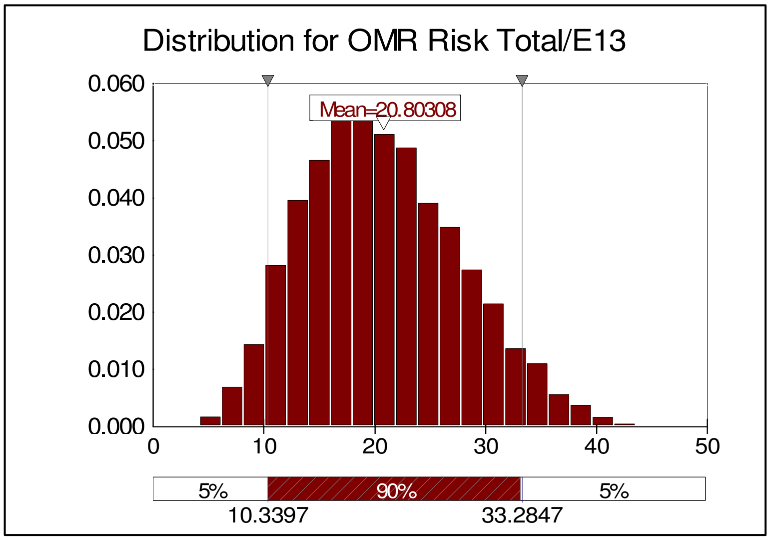
Golden Ears Bridge - Risk Assessment of Reference Case

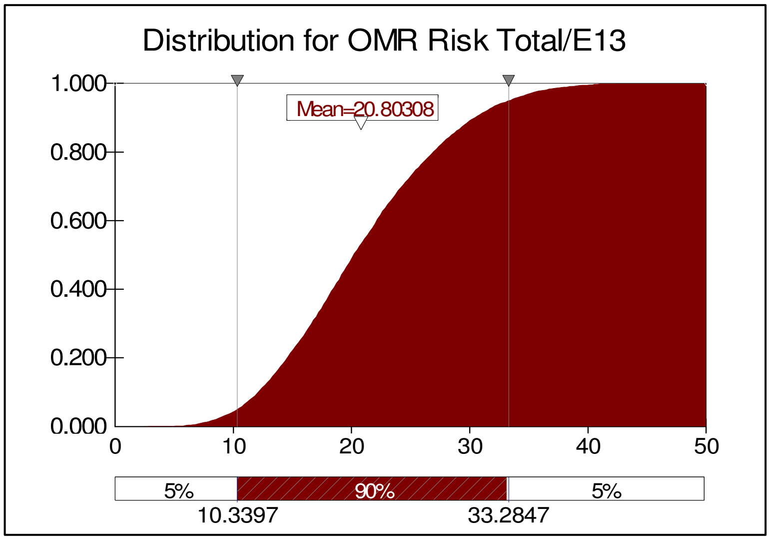
Operations, Maintenance and Rehabilitation

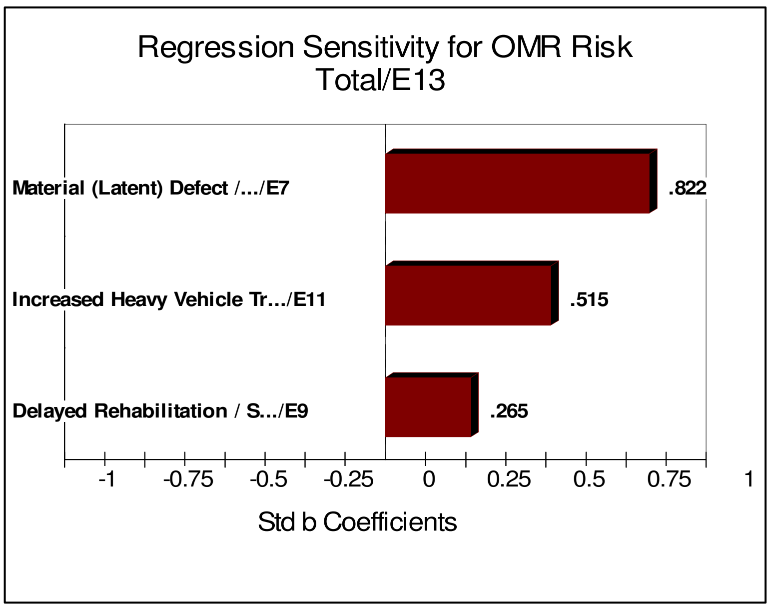
Risk Description	P	L	O	Simulation	Comments
Material (Latent) Defect	$0.00	$0.50	$25.00	$8.50	Occurs Mid-Term in the Contract
Delayed Rehabilitation	$0.00	$3.60	$9.00	$4.20	L=20%, O=50% more than in budget - Assumes Delay of 2 years
Increased Heavy Vehicle Traffic	$0.00	$7.00	$17.50	$8.17	L=10% Higher Traffic, O=25% Higher Traffic- Prorated by Year by Maintenance
Totals	**$0.00**	**$11.10**	**$51.50**	**$20.87**	

Schedule Delay Risks are Lognormal Functions (see cells for mean and standard deviation)

Simulation Results for
OMR Risk Total / E13







Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 2.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	87
Number of Outputs	14
Sampling Type	Monte Carlo
Simulation Start Time	11/1/2005 16:10
Simulation Stop Time	11/1/2005 16:12
Simulation Duration	00:01:44
Random Seed	162425227

Summary Statistics			
Statistic	**Value**	**%tile**	**Value**
Minimum	$2.29	5%	$10.34
Maximum	$45.55	10%	$12.10
Mean	$20.80	15%	$13.42
Std Dev	$7.00	20%	$14.55
Variance	48.95325973	25%	$15.60
Skewness	0.361367725	30%	$16.61
Kurtosis	2.730009376	35%	$17.55
Median	$20.18	40%	$18.41
Mode	$21.82	45%	$19.29
Left X	$10.34	50%	$20.18
Left P	5%	55%	$21.17
Right X	$33.28	60%	$22.12
Right P	95%	65%	$23.11
Diff X	$22.94	70%	$24.23
Diff P	90%	75%	$25.48
#Errors	0	80%	$26.92
Filter Min		85%	$28.46
Filter Max		90%	$30.43
#Filtered	0	95%	$33.28

Sensitivity			
Rank	**Name**	**Regr**	**Corr**
#1	Material (Latent) D	0.822	0.799
#2	Increased Heavy	0.515	0.492
#3	Delayed Rehabilit	0.265	0.261
#4	Geotech / Simula	0.000	0.000
#5	Inflation on Contra	0.000	-0.006
#6	Noise Mitigation /	0.000	-0.008
#7	Project Managem	0.000	0.008
#8	Inflation on GVTA	0.000	0.018
#9	Suicide Preventio	0.000	0.018
#10	Noise Mitigation /	0.000	0.002
#11	Interest During Co	0.000	-0.012
#12	Inflation on Contra	0.000	0.007
#13	Water Line / Simu	0.000	0.019
#14	Traffic Manageme	0.000	-0.002
#15	Project Managem	0.000	-0.007
#16	Integration / Simu	0.000	0.000

Detailed Cost Estimate Risk Adjusted

No.	Detail	Life Cycle	Inventory Qty	Inventory Unit	%	Unit Cost	2004	2005	2006	2007	2008	2009	2010	2011
									1	2	3	4	5	6
	Annual Inflation Factor						**1.075**	**1.075**	**1.060**	**1.060**	**1.060**	**1.060**	**1.060**	**1.025**
	Inflation Factor from $2003 to year x						**1.075**	**1.156**	**1.225**	**1.298**	**1.376**	**1.459**	**1.546**	**1.585**
	A.1 Routine Maintenance													
												0	0	0
	Year - round O&M (roads and bridge pavement)		58.58	lane km		12,000							351,480	702,960
	Sub-total											**0**	**351,480**	**702,960**
	B. Overhead													
	RWIS		0	number		0							0	0
	Electric Power		1	service		25,000							12,500	25,000
	Electrical Maintenance		1	service		30,000							15,000	30,000
	Line Repainting		1	service		40,000							20,000	40,000
	1 FTE, Contract Administrator		1	service		100,000							50,000	100,000
	1 FTE, Analyst/Planner/Contract Monitoring role		1	service		80,000							40,000	80,000
	Legal & Specialist Consultant (Quality and Environmental and Inspecti		1	service		100,000							50,000	100,000
	Operating Insurance (not part of VFM)		1	service		0							0	0
	Radio and Telecommunications System		1	service		25,000							12,500	25,000
	Sub-total											**0**	**200,000**	**400,000**
	C. Rehabilitation													
1	Pavement/Shoulder (not bridge)	14	39.7	lane km	100%	135,000								
2	Railroad Crossing	50	0	count	50%	50,000								
3	Ditches	75	0	km	75%	1,000								
4	Culvert Entrance	50	0	count	50%	3,000								
5	Culvert Roadway	50	0	count	50%	10,000								
6	Culvert Fume	50	0	count	50%	1,000								
7	Culvert Down Drain	50	0	count	50%	5,000								
8	Culvert Other	50	0	count	50%	1,000								
9	Curb & Gutter Asphalt	50	0	km	50%	10,000								
10	Curb & Gutter concrete	50	0	km	50%	10,000								
11	Drainage Appliance Catch Basin	50	0	count	50%	500								
12	Drainage Appliance Manhole	50	0	count	50%	500								
13	Sub-drains	30		m	1005%									
14	Sedimentation ponds	20		count	100%									
15	Sidewalks	50		m	100%									
16	Bicycle paths	14		m asphalt	100%									
17	Traffic Island	20	0	count	100%	500								
18	Fence Other	20	0	km	100%	1,000								
19	Structures	75	151,960	m2	100%	120								0
20	Structures-Culverts-multi plate	50	0	m	100%	1,000								
21	Structures-Retaining Walls	75	0	m	50%	1,000								
21	Noise Barriers	40		m	1005%									
22	Illumination	30		count	100%									
23	Power Services	30		count	100%									
24	Signs	10	0	count	100%	10								
25	Sign Posts	10	0	count	100%	5								
26	Structures-Signs	50	0	m	100%	1,000								
27	Guardrail Concrete	40	0	km	50%	50,000								
	Steel Beam Guide Rail	20		m	100%									
28	Inertia/crash Attenuation Barriers	30		count	100%									
	Traffic Signals - poles	40		count	100%									
	Traffic Signal - signal heads	15		count	100%									
29	Traffic Signals - controllers	15		count	100%									
	Traffic Signals - power supply	30		count	100%									
30	Toll Gantry	50		count	100%									
31	Camera	6		count	100%									
32	TV	10		count	100%									
33	Traffic Volume Counters	15	0	count	100%									
34	Control Computers	6		count	100%									
35	Corridor Control Hub Building	40		count	100%									
	Misc													
	Sub-total						**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	D-1. Risk													
	Rock Stabilization				0	0						0	0	0
	Floods				2	0								
	Mud, Earth and Rock Slide				0	0								
	Earthquake				2	100,000								
	Relevant Change In law				50%	0								
	Non-Availability				32	20,000							10,000	20,000
	Non-Conformance					0						0	0	0
	D-2. Risk Assessment for Reference Bid													
	Material Defect													
	Delayed Rehabilitation						0	0	0	0	0	0	0	0
	Increased Heavy Vehicle Traffic						0	0	0	0	0	0	133,880	267,760
	Sub-Total Reference Bid Risks						0	0	0	0	0	0	133,880	267,760
	Subtotal Inflated						0	0	0	0	0	0	207,043	424,439
	Sub-total						**0**	**0**	**0**	**0**	**0**	**0**	**143,880**	**287,760**
	E. Contingency													
	0%						**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Total (uninflated,in $2003)											**0**	**695,360**	**1,390,720**
	Total (inflated)												**1,075,365**	**2,204,498**

Net Present Value (2005 $)

Total OMR Plus Reference Bid Risks	**$83,725,434.91**
Total Reference Bid Risks	**$13,435,764.10**
Total OMR Less Reference Bid Risks	**$70,289,670.82**

Comparison: Base Case to Reference Case	**Base Case**	**Ref. Case**	**Difference**	**Description**	
A.1 Routine Maintenance ($per year, $2003)	702,960	702,960	0	annual	no difference
B. Overhead ($per year, $2003)	1,470,000	1,550,000	80,000	annual	Yard and SPV costs removed, 2 FTE and Legal and specialist consulting costs added
C. Rehabilitation (entire contract, $2003)	47,629,328	47,629,328	0	contract term	3 rehabilitation works carried out over contract term rather than 2
D. Risk ($2003)	840,000	810,000	-30,000	contract term	difference due to changed start date
E. Contingency	0	0	0		
Inflation	none applied	see inflation factors above			
Schedule	start Jan 2009	start July 2010		1.5 years' delay of start of operations term	

2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**
7	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**
1.025	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**
1.625	**1.665**	**1.707**	**1.750**	**1.793**	**1.838**	**1.884**	**1.931**	**1.980**	**2.029**	**2.080**	**2.132**	**2.185**	**2.240**	**2.296**	**2.353**	**2.412**	**2.472**	**2.534**	**2.597**	**2.662**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960
702,960	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
400,000	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**
											5,359,500									
											x									
																		x		
0	0	0	0	0	0	0	0	0	0		0	0	18,235,164	0	0	0	0	0	0	0
								x										x		
								x										x		
																		x		
													x							
													x							
				x						x						x				
									x										x	
											x									
				x						x						x				
				20,000				20,000	10,000	20,000	50,000		50,000			20,000		20,000	10,000	
0	**0**	**0**	**0**	**20,000**	**0**	**0**	**0**	**20,000**	**10,000**	**20,000**	**5,409,500**	**0**	**18,285,164**	**0**	**0**	**20,000**	**0**	**20,000**	**10,000**	**0**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		0															0			
0				0				0				0				0				0
											100,000									100,000
											0									
20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
													8,500,000							
0	0	0	0	1,765	0	0	0	1,765	883	1,765	477,516	0	1,614,098	0	0	1,765	0	1,765	883	0
267,760	267,760	267,760	267,760	267,760	267,760	267,760	267,760	267,760	267,760	267,760	267,760	267,760	267,760	267,760	267,760	267,760	267,760	267,760	267,760	267,760
267,760	267,760	267,760	267,760	269,525	267,760	267,760	267,760	269,525	268,642	269,525	745,276	267,760	10,381,857	267,760	267,760	269,525	267,760	269,525	268,642	267,760
435,050	445,926	457,074	468,501	483,380	492,219	504,524	517,138	533,561	545,109	560,572	1,588,816	585,094	23,253,016	614,714	630,082	650,092	661,980	683,003	697,785	712,880
287,760	**287,760**	**287,760**	**287,760**	**289,525**	**287,760**	**287,760**	**287,760**	**289,525**	**288,642**	**289,525**	**865,276**	**287,760**	**10,401,857**	**287,760**	**287,760**	**289,525**	**287,760**	**289,525**	**288,642**	**387,760**
0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
1,390,720	**1,390,720**	**1,390,720**	**1,390,720**	**1,412,485**	**1,390,720**	**1,390,720**	**1,390,720**	**1,412,485**	**1,401,602**	**1,412,485**	**7,377,736**	**1,390,720**	**29,789,981**	**1,390,720**	**1,390,720**	**1,412,485**	**1,390,720**	**1,412,485**	**1,401,602**	**1,490,720**
2,259,610	**2,316,101**	**2,374,003**	**2,433,353**	**2,533,222**	**2,556,542**	**2,620,455**	**2,685,967**	**2,796,203**	**2,844,026**	**2,937,761**	**15,728,221**	**3,038,925**	**66,722,831**	**3,192,770**	**3,272,589**	**3,406,902**	**3,438,264**	**3,579,377**	**3,640,594**	**3,968,873**

2033	2034	2035	2036	2037	2038	2039	2040	Total	
28	**29**	**30**	**31**	**32**	**33**	**34**	**35**		
1.025	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**	**1.025**		
2.729	**2.797**	**2.867**	**2.939**	**3.012**	**3.088**	**3.165**	**3.244**		
0	0	0	0	0					
702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	21,440,280	
702,960	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**702,960**	**21,440,280**	
									21,440,280
0	0	0	0	0	0	0	0	0	
25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	762,500	
30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	915,000	
40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	1,220,000	
100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	3,050,000	
80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	2,440,000	
100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	3,050,000	
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25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	762,500	
400,000	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**12,200,000**	12,200,000
				5,359,500				10,719,000	
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				x				0	
								0	
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0	0	0	0	0	0	0	18,235,164	36,470,328	
								0	
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							x	0	
							x	0	
							x	0	
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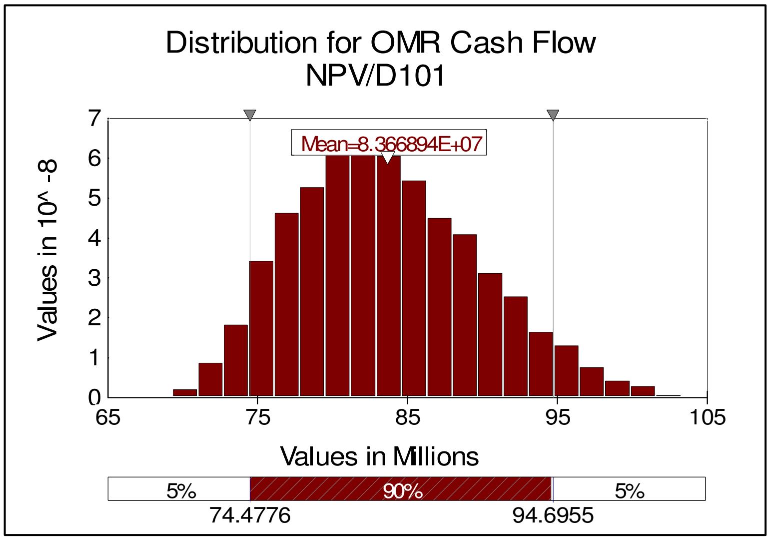
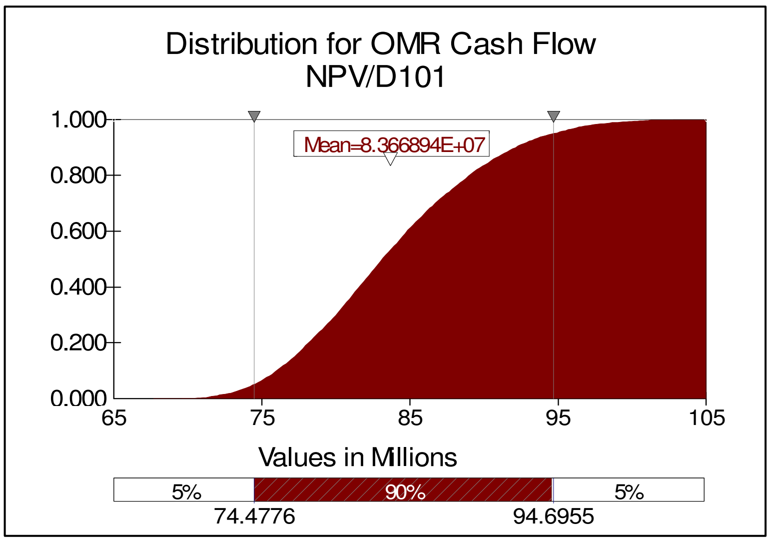
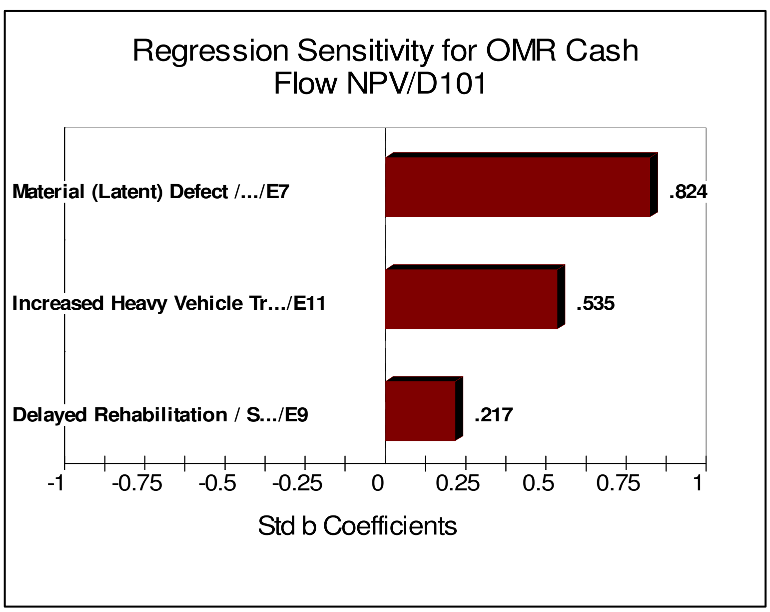
							x	0	
							x	0	
							x	0	
								0	
	x							0	
								0	
				x				0	
	x							0	
								0	
	20,000			50,000			100,000	390,000	
0	**20,000**	**0**	**0**	**5,409,500**	**0**	**0**	**18,335,164**	**47,579,328**	47,579,328
0								0	
								0	
								0	
								200,000	
								0	
20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	610,000	
0	0	0	0	0	0	0	0	0	
								8,500,000	
0	1,765	0	0	477,516	0	0	1,618,511	4,200,000	
267,760	267,760	267,760	267,760	267,760	267,760	267,760	267,760	8,166,667	
267,760	269,525	267,760	267,760	745,276	267,760	267,760	1,886,271	20,866,667	
730,702	753,908	767,694	786,886	2,244,955	826,722	847,390	6,118,801	49,229,054	
287,760	**289,525**	**287,760**	**287,760**	**765,276**	**287,760**	**287,760**	**1,906,271**	**21,676,667**	21,676,667
0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
								0	
1,390,720	**1,412,485**	**1,390,720**	**1,390,720**	**7,277,736**	**1,390,720**	**1,390,720**	**21,344,395**	**102,896,275**	102,896,275
3,795,200	**3,950,962**	**3,987,333**	**4,087,016**	**21,922,340**	**4,293,921**	**4,401,269**	**69,238,248**	**257,302,742**	

Simulation Results for
OMR Cash Flow NPV / D101





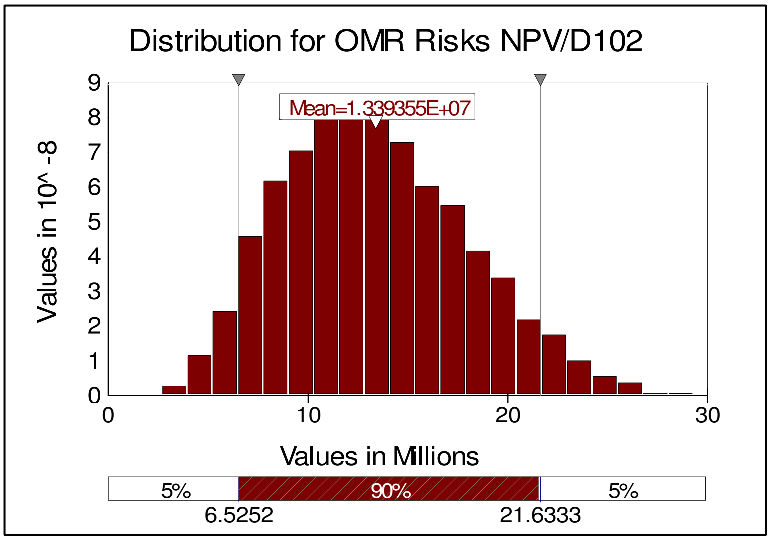


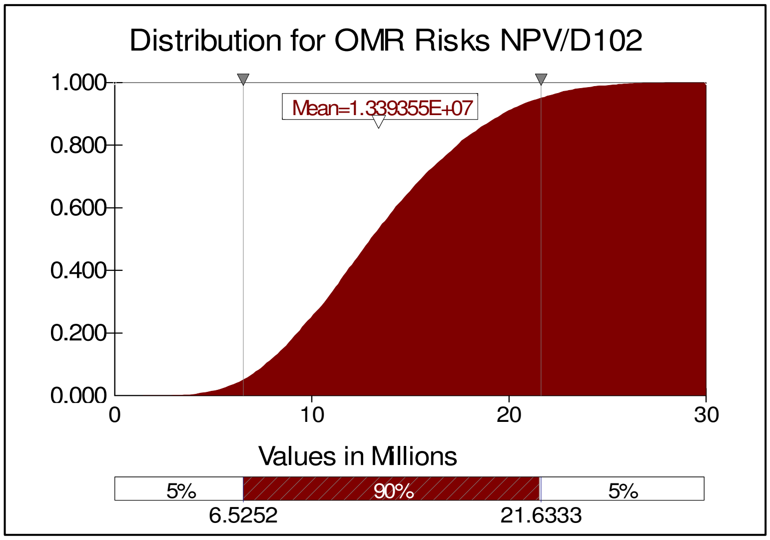
Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 2.x
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	87
Number of Outputs	14
Sampling Type	Monte Carlo
Simulation Start Time	11/1/2005 16:10
Simulation Stop Time	11/1/2005 16:12
Simulation Duration	00:01:44
Random Seed	162425227

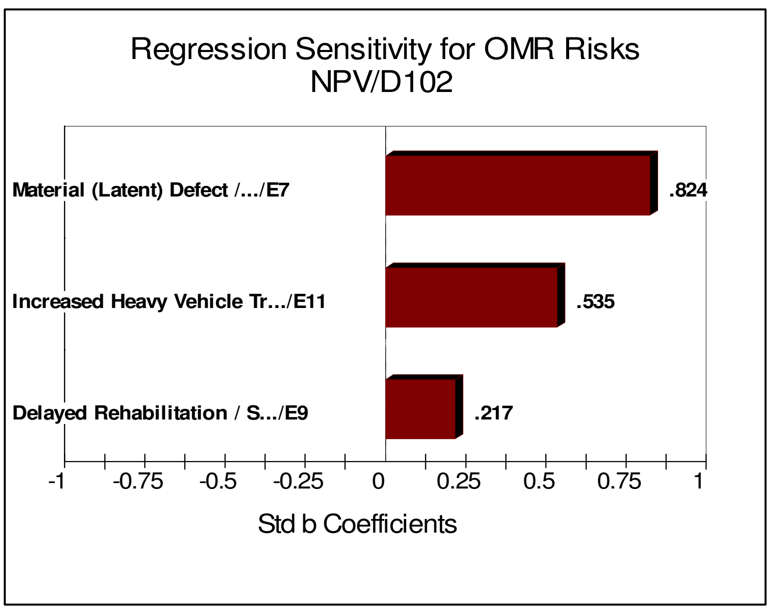
Summary Statistics			
Statistic	**Value**	**%tile**	**Value**
Minimum	$67,677,824.00	5%	$74,477,552.00
Maximum	$104,997,360.00	10%	$75,973,080.00
Mean	$83,668,945.24	15%	$77,168,432.00
Std Dev	$6,154,319.65	20%	$78,136,744.00
Variance	3.78757E+13	25%	$79,099,064.00
Skewness	0.364720788	30%	$80,021,560.00
Kurtosis	2.727241744	35%	$80,790,976.00
Median	$83,115,280.00	40%	$81,551,680.00
Mode	$74,502,936.00	45%	$82,364,856.00
Left X	$74,477,552.00	50%	$83,115,280.00
Left P	5%	55%	$83,946,224.00
Right X	$94,695,520.00	60%	$84,799,328.00
Right P	95%	65%	$85,740,816.00
Diff X	$20,217,968.00	70%	$86,701,352.00
Diff P	90%	75%	$87,828,360.00
#Errors	0	80%	$89,001,000.00
Filter Min		85%	$90,390,408.00
Filter Max		90%	$92,128,024.00
#Filtered	0	95%	$94,695,520.00

Sensitivity			
Rank	**Name**	**Regr**	**Corr**
#1	Material (Latent) De	0.824	0.800
#2	Increased Heavy Ve	0.535	0.512
#3	Delayed Rehabilitati	0.217	0.215
#4	Design / F44	0.000	-0.003
#5	Geotech / Simulatio	0.000	0.001
#6	Bonding and Insurai	0.000	0.007
#7	Project Managemen	0.000	-0.015
#8	Utility Unknowns / S	0.000	-0.003
#9	Paving 4 Lanes vers	0.000	-0.016
#10	Noise Mitigation / Si	0.000	-0.009
#11	Landscaping / Simu	0.000	-0.006
#12	Municipal Extras / S	0.000	-0.006
#13	Lougheed E/B at Ma	0.000	0.004
#14	Inflation on GVTA C	0.000	0.018
#15	Environmental / Sim	0.000	-0.006
#16	Noise Attentuation /	0.000	0.003

Simulation Results for
OMR Risks NPV / D102







Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 2.x
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	87
Number of Outputs	14
Sampling Type	Monte Carlo
Simulation Start Time	11/1/2005 16:10
Simulation Stop Time	11/1/2005 16:12
Simulation Duration	00:01:44
Random Seed	162425227

Summary Statistics

Statistic	Value	%tile	Value
Minimum	$1,444,056.00	5%	$6,525,209.00
Maximum	$29,331,382.00	10%	$7,642,754.00
Mean	$13,393,551.73	15%	$8,535,989.00
Std Dev	$4,598,865.65	20%	$9,259,566.00
Variance	2.11496E+13	25%	$9,978,668.00
Skewness	0.364720807	30%	$10,668,015.00
Kurtosis	2.727241788	35%	$11,242,966.00
Median	$12,979,820.00	40%	$11,811,406.00
Mode	$6,544,179.00	45%	$12,419,059.00
Left X	$6,525,209.00	50%	$12,979,820.00
Left P	5%	55%	$13,600,753.00
Right X	$21,633,250.00	60%	$14,238,238.00
Right P	95%	65%	$14,941,773.00
Diff X	$15,108,041.00	70%	$15,659,542.00
Diff P	90%	75%	$16,501,706.00
#Errors	0	80%	$17,377,974.00
Filter Min		85%	$18,416,220.00
Filter Max		90%	$19,714,670.00
#Filtered	0	95%	$21,633,250.00

Sensitivity

Rank	Name	Regr	Corr
#1	Material (Latent) D	0.824	0.800
#2	Increased Heavy V	0.535	0.512
#3	Delayed Rehabilita	0.217	0.215
#4	Inflation on Contra	0.000	0.017
#5	Integration / Simula	0.000	0.000
#6	Staging Adjustmen	0.000	0.003
#7	Bonding and Insura	0.000	0.007
#8	Environmental / Si	0.000	-0.006
#9	Archaeological Fin	0.000	-0.006
#10	Inflation on Contra	0.000	-0.006
#11	Inflation on Contra	0.000	0.002
#12	Suicide Prevention	0.000	0.019
#13	Lougheed E/B at M	0.000	0.004
#14	Traffic Managemen	0.000	-0.002
#15	Project Manageme	0.000	-0.007
#16	Noise Mitigation / S	0.000	-0.009

Golden Ears Bridge - Risk Assessment of Reference Case

Fixed Costs - Cash Flow and NPV ($ million)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Fixed Costs	$2.57	$6.18	$6.18	$90.96	$73.30	$1.57	$5.69	$1.97	($2.19)	($8.43)	$177.80
PV (2005)	$3.06	$6.94	$6.55	$90.96	$69.15	$1.40	$4.78	$1.56	($1.64)	($5.94)	$176.82

Tolling Capital - Cash Flow and NPV ($ million)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Tolling Capital	$0.00	$0.00	$0.00	$0.00	$0.00	$0.81	$3.26	$3.26	$0.00	$0.00	$7.33
PV (2005)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.72	$2.74	$2.58	$0.00	$0.00	$6.04

Appendix L

Financial Model Output

Assumptions

in C$ thousands at Base Date

Source | Date

General

Inflation	2.50%	compounded annually	
RFP / Construction Start Date	31-Dec-05		
# of Construction Years	4.5		
Operation Start Date	30-Jun-10		
# of Operating Years	30.5		
Operation End Date	30-Dec-40		

Revenue

				Source	Date
Toll & Video				Brian Ast Revenue Model	5-May-05
Albion Ferry Subsidy (2003$)	5,091	(2004 equivilant = 5218)		Email sent from Fred Cummings	19-May-05
Transponder Revenue	Include Transponder Rev in Model? 1=yes, 2=no		2	Beth Cassells' memo	20-May-05
Payments to Tolling Concessionaire		Year One Capital Costs	7,326	Lester's Capital Cost Model, Version C	9-Sep-05
		Fixed O&M Costs Grown at Inflation (2003$)	700	Mahrokh's email	25-May-05
		Variable O&M Costs Grown at Overall Traffic Growth & Inflation	6,137	Mahrokh's email	25-May-05

CONCESSIONAIRE	Development Period Ending	RFP & Construction Costs For DBFO										Source	Date
		30-Jun-06	30-Dec-06	30-Jun-07	30-Dec-07	30-Jun-08	30-Dec-08	30-Jun-09	30-Dec-09	30-Jun-10			
	2002-2005	1	1	2	2	3	3	4	4	5			
Translink Costs	105,883	54,557	23,801	2,919	2,565	4,070	5,984	3,122	2,976	-9,301	196,575	Lester's Capital Cost Model, Version D	12-Sep-05
Capital Costs Of Construction	0	4,183	5,746	48,650	111,143	142,313	191,513	132,731	76,070	42,331	754,681	Lester's Capital Cost Model, Version D	12-Sep-05
Risk Cost	31	1,395	1,395	17,221	17,221	34,189	34,189	19,475	19,475	7,568	152,160	Paul Levelton's Risk Model (saved under TD Models)	2-Nov-05
(Translink Costs and Capital Costs assumed to be already inflated)	105,914	60,136	30,942	68,790	130,929	180,572	231,686	155,328	98,522	40,598			

Risk Construction Costs	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**Percentile Scenario #**	**Scenario Being Run: 90th Percentile**	Source	Date
5th Percentile	11	988	12,339	24,440	14,215	2,777	1	**Scenario Switch: 6**	Paul Levelton's Risk Model (saved under TD Models)	2-Nov-05
10th Percentile	12	1,100	13,711	27,225	15,857	3,096	2	***(note this switch changes both***	Paul Levelton's Risk Model (saved under TD Models)	2-Nov-05
30th Percentile	15	1,390	17,310	34,618	20,232	3,975	3	***the construction risk and the***	Paul Levelton's Risk Model (saved under TD Models)	2-Nov-05
50th Percentile	19	1,714	21,270	42,342	24,512	4,772	4	***OMR risk percentile)***	Paul Levelton's Risk Model (saved under TD Models)	2-Nov-05
70th Percentile	23	2,111	26,148	51,972	29,878	5,807	5		Paul Levelton's Risk Model (saved under TD Models)	2-Nov-05
90th Percentile	31	2,790	34,442	68,379	38,950	7,568	6		Paul Levelton's Risk Model (saved under TD Models)	2-Nov-05
95th Percentile	35	3,152	38,868	77,138	43,798	8,509	7		Paul Levelton's Risk Model (saved under TD Models)	2-Nov-05

OMR Costs

			Source	Date
Operations & Maintenance	Annual Cost in 2003 Dollars			
Routine Maintenance	703.0		Lisa Brown's emailed file, version 4	24-Oct-05
Overhead	400.0		Lisa Brown's emailed file, version 4	24-Oct-05
Risk	20.0	Except in year 2023 and 2032, where the cost is $120	Lisa Brown's emailed file, version 4	24-Oct-05
Contingency	0.0		Lisa Brown's emailed file, version 4	24-Oct-05
Rehabilitation	*NOTE: Rehab Costs have been moved over 2 years to reflect risk (per Paul Levelton and Sandra), so a cost targeted for 2023 in Lisa Brown's file shows up in 2025*		Lisa Brown's emailed file, version 4	24-Oct-05

Capital Structure

		Source	Date
Equity	0%		
Interest Rate Charged on Construction Costs Between Bond Take-outs	4.29%	Derek Bacchioni - Scotiabank's T. MacKenzie-Armes	28-Oct-05
TransLink Revolver Interest Rate for Balance Owing	6.00%	Derek Bacchioni's Conservative Assumption	11-Oct-05
TransLink Revolver Interest Rate Earned on Credit Balance	2.50%	Derek Bacchioni's Conservative Assumption	11-Oct-05
Finance Fee (% of Total Bond Issue)	0.68%	Derek Bacchioni - MFA's Letter	7-Oct-05

Investing

		Source	Date
MFA Debt Reserve (Percent of Isssue)	2.00%	Derek Bacchioni's MFO Financing Model	10-Aug-05
MFA Debt Reserve Interest Rate	3.50%	Derek Bacchioni's MFO Financing Model	10-Aug-05
Sinking fund yield	4.00%	Derek Bacchioni's MFO Financing Model	10-Aug-05

Debt Amortization Rates

											Source	Date
Bond Number	1	2	3	4	5	6	7	8	9	10		
Issue Date	31-Dec-05	30-Jun-06	31-Dec-06	30-Jun-07	31-Dec-07	30-Jun-08	31-Dec-08	30-Jun-09	31-Dec-09	30-Jun-10		
Amortization (Years)	30	30	30	30	30	30	30	30	30	30		
Principal Deferred (Years)	5	5	5	5	5	5	5	5	5	5	Derek Bacchioni - MFA's Letter	7-Oct-05
Sinking Fund Yield	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%	4.00%		
Annual Principal Pmnt	2.4012%	2.4012%	2.4012%	2.4012%	2.4012%	2.4012%	2.4012%	2.4012%	2.4012%	2.4012%		
Interest Rate	4.78%	4.78%	4.78%	4.78%	4.78%	4.78%	4.78%	4.78%	4.78%	4.78%	Derek Bacchioni - MFA's Graham Egan	28-Oct-05
Hedge Premium	0.02%	0.06%	0.09%	0.12%	0.15%	0.18%	0.20%	0.23%	0.25%	0.26%	Derek Bacchioni - Scotiabank's T. MacKenzie-Armes	28-Oct-05
Coupon	4.80%	4.84%	4.87%	4.90%	4.93%	4.96%	4.98%	5.01%	5.03%	5.04%		

Additional Cash Balance to Fund Ramp-up Period	-	**Operating Year**	**1**	**3**	**6**	**9**	**12**	**15**
		Revolver Draw	44,055	84,593	164,448	240,373	281,757	329,083

NPV Calculations

Translink NPV Discount Rate 6.00%

#		30-Jun-10	31-Dec-10	1-Jul-11	31-Dec-11	1-Jul-12	31-Dec-12	1-Jul-13	31-Dec-13	1-Jul-14	31-Dec-14	1-Jul-15	31-Dec-15
	Cummulative Traffic Growth Rate		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.7%	4.7%	8.9%	8.9%	13.4%
3	*in C$ thousands* **General Inflation**	1.19	1.19	1.22	1.22	1.25	1.25	1.28	1.28	1.31	1.31	1.34	1.34
	OMR Inflation Factor	1.55	1.55	1.59	1.59	1.62	1.62	1.67	1.67	1.71	1.71	1.75	1.75
	OMR Inflation Rate	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%

#		Construction Period									
4	**Implied Dates** (for XNPV and XIRR calc.)	31-Dec-05	30-Jun-06	30-Dec-06	30-Jun-07	30-Dec-07	30-Jun-08	30-Dec-08	30-Jun-09	30-Dec-09	30-Jun-10
5	**Semi-Annual Period**	0	1	2	1	2	1	2	1	2	1
6	**Cumulative Semi-Annual Period**	0	1	2	3	4	5	6	7	8	9
	Year										
7	**Annual Period**	0	1	1	2	2	3	3	4	4	5

#		Operations Period											
4	**Implied Dates**	30-Jun-10	31-Dec-10	1-Jul-11	31-Dec-11	1-Jul-12	31-Dec-12	1-Jul-13	31-Dec-13	1-Jul-14	31-Dec-14	1-Jul-15	31-Dec-15
5	**Semi-Annual Period**	0	1	2	1	2	1	2	1	2	1	2	1
6	**Cumulative Semi-Annual Period**	0	1	2	3	4	5	6	7	8	9	10	11
	Year	2010	2010	2011	2011	2012	2012	2013	2013	2014	2014	2015	2015
7	**Annual Period**	0	1	1	2	2	3	3	4	4	5	5	6

TRANSLINK

#		30-Jun-10	31-Dec-10	1-Jul-11	31-Dec-11	1-Jul-12	31-Dec-12	1-Jul-13	31-Dec-13	1-Jul-14	31-Dec-14	1-Jul-15	31-Dec-15
8	Revenue												
9	Toll & Video		14,153	16,984	24,926	24,926	31,368	31,368	33,831	33,831	36,265	36,265	38,369
10	Albion Ferry Subsidy		3,026	3,101	3,101	3,179	3,179	3,258	3,258	3,340	3,340	3,423	3,423
11	Transponder Revenue		0	0	0	0	0	0	0	0	0	0	0
12	Total Revenue	0	17,179	20,085	28,027	28,104	34,547	34,626	37,090	37,171	39,604	39,688	41,792
13	Payments to Tolling Concessionaire		11,323	4,089	4,089	4,182	4,182	4,278	4,461	4,564	4,736	4,846	5,029
14	Net Revenue	0	5,855	15,996	23,938	23,922	30,364	30,348	32,629	32,607	34,868	34,842	36,763
15	Operating Expenses												
16	Routine Maintenance		544	557	557	571	571	585	585	600	600	615	615
17	Overhead		309	317	317	325	325	333	333	341	341	350	350
18	Risk		15	16	16	16	16	17	17	17	17	17	17
19	Contingency		0	0	0	0	0	0	0	0	0	0	0
20	Total O&M Expenses		868	890	890	912	912	935	935	958	958	982	982
21	O&M Risk Cost		138	282	282	289	289	296	296	304	304	311	311
22	Rehabilitation Expenses		0	0	0	0	0	0	0	0	0	0	0
23	Rehab Risk Cost		0	0	0	0	0	0	0	0	0	0	0
24	EBITDA	0	4,849	14,824	22,766	22,721	29,163	29,117	31,397	31,345	33,606	33,549	35,469
25	Less: Debt Service Pmt (P+I+Financing Fee + Reserve Recovery)		31,465	31,465	34,077	33,028	34,952	34,868	38,387	39,628	44,542	44,037	47,648
26	Less: Interest Payments on Revolver		0	798	1,322	1,701	2,061	2,296	2,538	2,824	3,157	3,580	4,002
27	Ending Cash		(26,616)	(17,439)	(12,633)	(12,008)	(7,849)	(8,048)	(9,527)	(11,106)	(14,092)	(14,068)	(16,180)
28	Cash from Revolver		26,616	17,439	12,633	12,008	7,849	8,048	9,527	11,106	14,092	14,068	16,180
29	Revolver Repayment		-	-	-	-	-	-	-	-	-	-	-
30	**Free Cash Flow**	-	-	-	-	-	-	-	-	-	-	-	-

#	**Revolver**	30-Jun-10	31-Dec-10	1-Jul-11	31-Dec-11	1-Jul-12	31-Dec-12	1-Jul-13	31-Dec-13	1-Jul-14	31-Dec-14	1-Jul-15	31-Dec-15
32	Opening Balance		0	26,616	44,055	56,687	68,696	76,545	84,593	94,120	105,226	119,318	133,386
33	Drawdown		26,616	17,439	12,633	12,008	7,849	8,048	9,527	11,106	14,092	14,068	16,180
34	Annual Interest		0	798	1,322	1,701	2,061	2,296	2,538	2,824	3,157	3,580	4,002
35	Revolver Repayment		0	0	0	0	0	0	0	0	0	0	0
36	Ending Balance	-	26,616	44,055	56,687	68,696	76,545	84,593	94,120	105,226	119,318	133,386	149,566

31 **Revolver**

37 **NPV and IRR**

38 Discount Rate 6.00%

39 NPV to Jan 06 142,709

40 Number of Days Prior to End of Period that Cash Flow is Received: 90 days (assumes all periods still discounted back to Jan 06)

TRANSLINK NPV & IRR Calc. →

	31-Dec-05	1-Apr-06	1-Oct-06	1-Apr-07	1-Oct-07	1-Apr-08	1-Oct-08	1-Apr-09	1-Oct-09	1-Apr-10	2-Oct-10	2-Apr-11	2-Oct-11	2-Apr-12	2-Oct-12	2-Apr-13	2-Oct-13	2-Apr-14	2-Oct-14	2-Apr-15	2-Oct-15
Free Cash Flow	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

DEBT CALCULATIONS

41 **DEBT - Annual Sinking Fund Bonds**

#		31-Dec-05	30-Jun-06	30-Dec-06	30-Jun-07	30-Dec-07	30-Jun-08	30-Dec-08	30-Jun-09	30-Dec-09	30-Jun-10
42	Opening Balance		0	0	0	0	0	0	0	0	0
43	Capital Additions	105,914	60,136	30,942	68,790	130,929	180,572	231,686	155,328	98,522	40,598
44	Accrued Interest Between Bond Take Outs	0	645	332	738	1,404	1,937	2,485	1,666	1,057	435
45	Debt Service Payments (accrued)	734	3,052	4,433	5,592	7,919	11,820	17,126	23,021	27,253	30,125
46	Financing Shortfall In Initial Operating Period										0
47	Equity	0	0	0	0	0	0	0	0	0	0
48	Bond #1	106,648	0	0	0	0	0	0	0	0	0
49	Bond #2	0	63,832	0	0	0	0	0	0	0	0
50	Bond #3	0	0	35,707	0	0	0	0	0	0	0
51	Bond #4	0	0	0	75,119	0	0	0	0	0	0
52	Bond #5	0	0	0	0	140,252	0	0	0	0	0
53	Bond #6	0	0	0	0	0	194,328	0	0	0	0
54	Bond #7	0	0	0	0	0	0	251,296	0	0	0
55	Bond #8	0	0	0	0	0	0	0	180,015	0	0
56	Bond #9	0	0	0	0	0	0	0	0	126,831	0
57	Bond #10	0	0	0	0	0	0	0	0	0	71,158
58	Closing Balance	0	0	0	0	0	0	0	0	0	0

O&M RISK CALCULATIONS - per Paul Levelton's model sent November 2nd, uninflated

5th Percentile	$45	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90
10th Percentile	$50	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101
30th Percentile	$61	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121
50th Percentile	$67	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135
70th Percentile	$75	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
90th Percentile	$89	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178
95th Percentile	$96	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191

Rehab RISK CALCULATIONS - per Paul Levelton's model sent November 2nd, uninflated

5th Percentile	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10th Percentile	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
30th Percentile	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
50th Percentile	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
70th Percentile	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
90th Percentile	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
95th Percentile	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

#		1-Jul-16	31-Dec-16	1-Jul-17	31-Dec-17	1-Jul-18	31-Dec-18	1-Jul-19	31-Dec-19	1-Jul-20	31-Dec-20	1-Jul-21	31-Dec-21	1-Jul-22	31-Dec-22	1-Jul-23	31-Dec-23	1-Jul-24	31-Dec-24	1-Jul-25	31-Dec-25	1-Jul-26	31-Dec-26	1-Jul-27	31-Dec-27	1-Jul-28	31-Dec-28
	Cummulative Traffic Growth Rate	13.4%	17.4%	17.4%	21.6%	21.6%	26.0%	26.0%	30.6%	30.6%	35.3%	35.3%	40.2%	40.2%	45.4%	45.4%	48.3%	48.3%	51.3%	51.3%	54.5%	54.5%	57.6%	57.6%	60.9%	60.9%	64.3%
3	*in C$ thousands* **General Inflation**	1.38	1.38	1.41	1.41	1.45	1.45	1.48	1.48	1.52	1.52	1.56	1.56	1.60	1.60	1.64	1.64	1.68	1.68	1.72	1.72	1.76	1.76	1.81	1.81	1.85	1.85
	OMR Inflation Factor	1.79	1.79	1.84	1.84	1.88	1.88	1.93	1.93	1.98	1.98	2.03	2.03	2.08	2.08	2.13	2.13	2.19	2.19	2.24	2.24	2.30	2.30	2.35	2.35	2.41	2.41
	OMR Inflation Rate	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%
4	**Implied Dates** (for XNPV and XIRR calc.)	1-Jul-16	31-Dec-16	1-Jul-17	31-Dec-17	1-Jul-18	31-Dec-18	1-Jul-19	31-Dec-19	1-Jul-20	31-Dec-20	1-Jul-21	31-Dec-21	1-Jul-22	31-Dec-22	1-Jul-23	31-Dec-23	1-Jul-24	31-Dec-24	1-Jul-25	31-Dec-25	1-Jul-26	31-Dec-26	1-Jul-27	31-Dec-27	1-Jul-28	31-Dec-28
5	**Semi-Annual Period**	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1
6	**Cumulative Semi-Annual Period**	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
	Year	2016	2016	2017	2017	2018	2018	2019	2019	2020	2020	2021	2021	2022	2022	2023	2023	2024	2024	2025	2025	2026	2026	2027	2027	2028	2028
7	**Annual Period**	6	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19

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#		1-Jul-16	31-Dec-16	1-Jul-17	31-Dec-17	1-Jul-18	31-Dec-18	1-Jul-19	31-Dec-19	1-Jul-20	31-Dec-20	1-Jul-21	31-Dec-21	1-Jul-22	31-Dec-22	1-Jul-23	31-Dec-23	1-Jul-24	31-Dec-24	1-Jul-25	31-Dec-25	1-Jul-26	31-Dec-26	1-Jul-27	31-Dec-27	1-Jul-28	31-Dec-28
8	Revenue																										
9	Toll & Video	38,369	40,903	40,903	43,567	43,567	45,862	45,862	48,786	48,786	51,926	51,926	55,238	55,238	58,733	58,733	61,418	61,418	64,194	64,194	67,066	67,066	70,036	70,036	73,172	73,172	77,064
10	Albion Ferry Subsidy	3,509	3,509	3,597	3,597	3,686	3,686	3,779	3,779	3,873	3,873	3,970	3,970	4,069	4,069	4,171	4,171	4,275	4,275	4,382	4,382	4,492	4,492	4,604	4,604	4,719	4,719
11	Transponder Revenue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Total Revenue	41,878	44,412	44,499	47,163	47,253	49,548	49,640	52,565	52,659	55,799	55,895	59,208	59,307	62,802	62,904	65,589	65,693	68,470	68,576	71,448	71,558	74,528	74,640	77,776	77,891	81,783
13	Payments to Tolling Concessionaire	5,146	5,317	5,441	5,623	5,755	5,950	6,090	6,297	6,446	6,667	6,825	7,061	7,229	7,481	7,660	7,808	7,994	8,150	8,345	8,509	8,713	8,886	9,099	9,281	9,504	9,695
14	Net Revenue	36,732	39,095	39,058	41,540	41,498	43,599	43,551	46,268	46,214	49,132	49,071	52,147	52,078	55,321	55,244	57,781	57,699	60,319	60,231	62,939	62,845	65,642	65,541	68,495	68,387	72,088
15	Operating Expenses																										
16	Routine Maintenance	630	630	646	646	662	662	679	679	696	696	713	713	731	731	749	749	768	768	787	787	807	807	827	827	848	848
17	Overhead	359	359	368	368	377	377	386	386	396	396	406	406	416	416	426	426	437	437	448	448	459	459	471	471	482	482
18	Risk	18	18	18	18	19	19	19	19	20	20	20	20	21	21	128	128	22	22	22	22	23	23	24	24	24	24
19	Contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	Total O&M Expenses	1,007	1,007	1,032	1,032	1,058	1,058	1,084	1,084	1,112	1,112	1,139	1,139	1,168	1,168	1,304	1,304	1,227	1,227	1,258	1,258	1,289	1,289	1,321	1,321	1,354	1,354
21	O&M Risk Cost	319	319	327	327	335	335	344	344	352	352	361	361	370	370	379	379	389	389	399	399	408	408	419	419	429	429
22	Rehabilitation Expenses	18	18	0	0	0	0	0	0	20	20	10	10	21	21	5,766	5,766	0	0	20,477	20,477	0	0	0	0	24	24
23	Rehab Risk Cost	2	2	0	0	0	0	0	0	2	2	1	1	2	2	677	677	0	0	18,074	18,074	0	0	0	0	3	3
24	EBITDA	35,386	37,748	37,699	40,181	40,105	42,205	42,123	44,840	44,728	47,646	47,559	50,635	50,517	53,760	47,119	49,656	56,083	58,704	20,024	22,732	61,147	63,945	63,801	66,755	66,576	70,277
25	Less: Debt Service Pmt (P+I+Financing Fee + R	45,780	47,648	45,780	47,648	45,780	47,648	45,780	47,648	45,780	47,648	45,780	47,648	45,780	47,648	45,780	47,648	45,780	47,648	45,780	47,648	45,780	47,648	45,780	47,648	45,780	47,648
26	Less: Interest Payments on Revolver	4,487	4,933	5,378	5,782	6,180	6,535	6,895	7,211	7,512	7,769	8,002	8,188	8,345	8,453	8,523	8,738	8,940	8,899	8,835	9,872	10,916	10,783	10,617	10,395	10,134	9,814
27	Ending Cash	(14,881)	(14,833)	(13,459)	(13,249)	(11,855)	(11,978)	(10,552)	(10,019)	(8,564)	(7,771)	(6,223)	(5,201)	(3,607)	(2,341)	(7,183)	(6,730)	1,363	2,156	(34,590)	(34,789)	4,451	5,514	7,404	8,712	10,663	12,815
28	Cash from Revolver	14,881	14,833	13,459	13,249	11,855	11,978	10,552	10,019	8,564	7,771	6,223	5,201	3,607	2,341	7,183	6,730	-	-	34,590	34,789	-	-	-	-	-	-
29	Revolver Repayment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,363	2,156	-	-	4,451	5,514	7,404	8,712	10,663	12,815
30	**Free Cash Flow**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

#	**Revolver**	1-Jul-16	31-Dec-16	1-Jul-17	31-Dec-17	1-Jul-18	31-Dec-18	1-Jul-19	31-Dec-19	1-Jul-20	31-Dec-20	1-Jul-21	31-Dec-21	1-Jul-22	31-Dec-22	1-Jul-23	31-Dec-23	1-Jul-24	31-Dec-24	1-Jul-25	31-Dec-25	1-Jul-26	31-Dec-26	1-Jul-27	31-Dec-27	1-Jul-28	31-Dec-28
31	**Revolver**																										
32	Opening Balance	149,566	164,448	179,280	192,740	205,989	217,843	229,821	240,373	250,392	258,956	266,726	272,949	278,150	281,757	284,098	291,282	298,012	296,649	294,493	329,083	363,871	359,420	353,906	346,502	337,789	327,126
33	Drawdown	14,881	14,833	13,459	13,249	11,855	11,978	10,552	10,019	8,564	7,771	6,223	5,201	3,607	2,341	7,183	6,730	0	0	34,590	34,789	0	0	0	0	0	0
34	Annual Interest	4,487	4,933	5,378	5,782	6,180	6,535	6,895	7,211	7,512	7,769	8,002	8,188	8,345	8,453	8,523	8,738	8,940	8,899	8,835	9,872	10,916	10,783	10,617	10,395	10,134	9,814
35	Revolver Repayment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,363	2,156	0	0	4,451	5,514	7,404	8,712	10,663	12,815
36	Ending Balance	164,448	179,280	192,740	205,989	217,843	229,821	240,373	250,392	258,956	266,726	272,949	278,150	281,757	284,098	291,282	298,012	296,649	294,493	329,083	363,871	359,420	353,906	346,502	337,789	327,126	314,311

37 **NPV and IRR**

38 Discount Rate 6.00%

39 NPV to Jan 06 142,709

40

	2-Apr-16	2-Oct-16	2-Apr-17	2-Oct-17	2-Apr-18	2-Oct-18	2-Apr-19	2-Oct-19	2-Apr-20	2-Oct-20	2-Apr-21	2-Oct-21	2-Apr-22	2-Oct-22	2-Apr-23	2-Oct-23	2-Apr-24	2-Oct-24	2-Apr-25	2-Oct-25	2-Apr-26	2-Oct-26	2-Apr-27	2-Oct-27	2-Apr-28	2-Oct-28
NI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

DEBT CALCULATIONS

#																											
		$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90
41	**DEBT - Annual Sinking Fund Bonds**	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101
42	Opening Balance	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121
43	Capital Additions	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135
44	Accrued Interest Between Bond Take Outs	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
45	Debt Service Payments (accrued)	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178
46	Financing Shortfall In Initial Operating Period	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191
47	Equity																										
48	Bond #1																										
49	Bond #2																										
50	Bond #3	$1	$1	$0	$0	$0	$0	$0	$0	$1	$1	$0	$0	$1	$1	$161	$161	$0	$0	$1,545	$1,545	$0	$0	$0	$0	$1	$1
51	Bond #4	$1	$1	$0	$0	$0	$0	$0	$0	$1	$1	$0	$0	$1	$1	$181	$181	$0	$0	$1,998	$1,998	$0	$0	$0	$0	$1	$1
52	Bond #5	$1	$1	$0	$0	$0	$0	$0	$0	$1	$1	$0	$0	$1	$1	$218	$218	$0	$0	$3,422	$3,422	$0	$0	$0	$0	$1	$1
53	Bond #6	$1	$1	$0	$0	$0	$0	$0	$0	$1	$1	$0	$0	$1	$1	$241	$241	$0	$0	$4,683	$4,683	$0	$0	$0	$0	$1	$1
54	Bond #7	$1	$1	$0	$0	$0	$0	$0	$0	$1	$1	$0	$0	$1	$1	$269	$269	$0	$0	$6,076	$6,076	$0	$0	$0	$0	$1	$1
55	Bond #8	$1	$1	$0	$0	$0	$0	$0	$0	$1	$1	$1	$1	$1	$1	$317	$317	$0	$0	$8,070	$8,070	$0	$0	$0	$0	$1	$1
56	Bond #9	$1	$1	$0	$0	$0	$0	$0	$0	$1	$1	$1	$1	$1	$1	$342	$342	$0	$0	$8,954	$8,954	$0	$0	$0	$0	$1	$1
57	Bond #10																										
58	Closing Balance																										

#		1-Jul-29	31-Dec-29	1-Jul-30	31-Dec-30	1-Jul-31	31-Dec-31	1-Jul-32	31-Dec-32	1-Jul-33	31-Dec-33	1-Jul-34	31-Dec-34	1-Jul-35	31-Dec-35
	Cummulative Traffic Growth Rate	64.3%	67.7%	67.7%	71.3%	71.3%	74.9%	74.9%	78.6%	78.6%	82.5%	82.5%	86.4%	86.4%	90.5%
3	*in C$ thousands* **General Inflation**	1.90	1.90	1.95	1.95	2.00	2.00	2.05	2.05	2.10	2.10	2.15	2.15	2.20	2.20
	OMR Inflation Factor	2.47	2.47	2.53	2.53	2.60	2.60	2.66	2.66	2.73	2.73	2.80	2.80	2.87	2.87
	OMR Inflation Rate	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%
4	**Implied Dates** (for XNPV and XIRR calc.)	1-Jul-29	31-Dec-29	1-Jul-30	31-Dec-30	1-Jul-31	31-Dec-31	1-Jul-32	31-Dec-32	1-Jul-33	31-Dec-33	1-Jul-34	31-Dec-34	1-Jul-35	31-Dec-35
5	**Semi-Annual Period**	2	1	2	1	2	1	2	1	2	1	2	1	2	1
6	**Cumulative Semi-Annual Period**	38	39	40	41	42	43	44	45	46	47	48	49	50	51
	Year	2029	2029	2030	2030	2031	2031	2032	2032	2033	2033	2034	2034	2035	2035
7	**Annual Period**	19	20	20	21	21	22	22	23	23	24	24	25	25	26
	TRANSLINK														
8	Revenue														
9	Toll & Video	77,064	80,433	80,433	83,894	83,894	88,259	88,259	91,981	91,981	96,651	96,651	101,489	101,489	105,675
10	Albion Ferry Subsidy	4,837	4,837	4,958	4,958	5,082	5,082	5,209	5,209	5,339	5,339	5,473	5,473	5,609	5,609
11	Transponder Revenue	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Total Revenue	81,901	85,270	85,391	88,852	88,976	93,341	93,468	97,190	97,321	101,990	102,123	106,962	107,099	111,285
13	Payments to Tolling Concessionaire	9,929	10,130	10,374	10,586	10,842	11,065	11,332	11,567	11,847	12,094	12,388	12,648	12,955	13,229
14	Net Revenue	71,972	75,140	75,017	78,266	78,134	82,277	82,136	85,623	85,473	89,896	89,736	94,314	94,144	98,056
15	Operating Expenses														
16	Routine Maintenance	869	869	891	891	913	913	936	936	959	959	983	983	1,008	1,008
17	Overhead	494	494	507	507	519	519	532	532	546	546	559	559	573	573
18	Risk	25	25	25	25	26	26	160	160	27	27	28	28	29	29
19	Contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	Total O&M Expenses	1,388	1,388	1,423	1,423	1,458	1,458	1,628	1,628	1,532	1,532	1,571	1,571	1,610	1,610
21	O&M Risk Cost	440	440	451	451	462	462	474	474	486	486	498	498	510	510
22	Rehabilitation Expenses	0	0	25	25	13	13	0	0	0	0	28	28	0	0
23	Rehab Risk Cost	0	0	3	3	2	2	0	0	0	0	3	3	0	0
24	EBITDA	70,144	73,312	73,115	76,364	76,199	80,342	80,034	83,522	83,455	87,878	87,636	92,215	92,024	95,936
25	Less: Debt Service Pmt (P+I+Financing Fee + R	45,780	47,648	45,780	47,648	45,780	47,648	45,780	47,648	45,780	47,648	45,780	47,648	45,780	41,661
26	Less: Interest Payments on Revolver	9,429	8,981	8,481	7,915	7,291	6,597	5,814	4,961	4,034	3,025	1,908	710	0	0
27	Ending Cash	14,935	16,683	18,854	20,801	23,128	26,096	28,440	30,913	33,642	37,205	39,948	43,857	46,244	54,275
28	Cash from Revolver	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	Revolver Repayment	14,935	16,683	18,854	20,801	23,128	26,096	28,440	30,913	33,642	37,205	39,948	23,665	-	-
30	**Free Cash Flow**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**20,192**	**46,244**	**54,275**
31	**Revolver**														
32	Opening Balance	314,311	299,376	282,693	263,839	243,038	219,909	193,813	165,373	134,460	100,818	63,613	23,665	0	0
33	Drawdown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	Annual Interest	9,429	8,981	8,481	7,915	7,291	6,597	5,814	4,961	4,034	3,025	1,908	710	0	0
35	Revolver Repayment	14,935	16,683	18,854	20,801	23,128	26,096	28,440	30,913	33,642	37,205	39,948	23,665	0	0
36	Ending Balance	299,376	282,693	263,839	243,038	219,909	193,813	165,373	134,460	100,818	63,613	23,665	0	0	0

#		1-Jul-36	31-Dec-36	1-Jul-37	31-Dec-37	1-Jul-38	31-Dec-38	1-Jul-39	31-Dec-39	1-Jul-40	31-Dec-40	1-Jul-41	31-Dec-41	1-Jul-42	31-Dec-42
	Cummulative Traffic Growth Rate	90.5%	94.6%	94.6%	98.9%	98.9%	103.3%	103.3%	107.8%	107.8%	112.4%	112.4%	117.2%	117.2%	122.1%
3	*in C$ thousands* **General Inflation**	2.26	2.26	2.32	2.32	2.37	2.37	2.43	2.43	2.49	2.49	2.56	2.56	2.62	2.62
	OMR Inflation Factor	2.94	2.94	3.01	3.01	3.09	3.09	3.16	3.16	3.24	3.24	3.32	3.32	3.41	3.41
	OMR Inflation Rate	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%	0.00%	2.50%
4	**Implied Dates** (for XNPV and XIRR calc.)	1-Jul-36	31-Dec-36	1-Jul-37	31-Dec-37	1-Jul-38	31-Dec-38	1-Jul-39	31-Dec-39	1-Jul-40	31-Dec-40	1-Jul-41	31-Dec-41	1-Jul-42	31-Dec-42
5	**Semi-Annual Period**	2	1	2	1	2	1	2	1	2	1	2	1	2	1
6	**Cumulative Semi-Annual Period**	52	53	54	55	56	57	58	59	60	61	62	63	64	65
	Year	2036	2036	2037	2037	2038	2038	2039	2039	2040	2040	2041	2041	2042	2042
7	**Annual Period**	26	27	27	28	28	29	29	30	30	31	31	32	32	33
	TRANSLINK														
8	Revenue														
9	Toll & Video	105,675	110,901	110,901	116,343	116,343	121,907	121,907	127,724	127,724	133,781	0	0	0	
10	Albion Ferry Subsidy	5,750	5,750	5,893	5,893	6,041	6,041	6,192	6,192	6,346	6,346	0	0	0	
11	Transponder Revenue	0	0	0	0	0	0	0	0	0	0	0	0	0	
12	Total Revenue	111,425	116,651	116,794	122,237	122,384	127,948	128,099	133,916	134,071	140,128	0	0	0	
13	Payments to Tolling Concessionaire	13,551	13,839	14,176	14,479	14,833	15,152	15,522	15,859	16,246	16,601	0	0	0	
14	Net Revenue	97,874	102,812	102,618	107,757	107,551	112,795	112,576	118,057	117,824	123,527	0	0	0	
15	Operating Expenses														
16	Routine Maintenance	1,033	1,033	1,059	1,059	1,085	1,085	1,112	1,112	1,140	1,140	0	0	0	
17	Overhead	588	588	602	602	618	618	633	633	649	649	0	0	0	
18	Risk	29	29	30	30	31	31	32	32	32	32	0	0	0	
19	Contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	
20	Total O&M Expenses	1,650	1,650	1,691	1,691	1,734	1,734	1,777	1,777	1,821	1,821	0	0	0	
21	O&M Risk Cost	523	523	536	536	549	549	563	563	577	577				
22	Rehabilitation Expenses	0	0	8,147	8,147	0	0	0	0	29,738	29,738				
23	Rehab Risk Cost	0	0	956	956	0	0	0	0	3,489	3,489				
24	EBITDA	95,701	100,639	91,288	96,427	105,268	110,512	110,236	115,717	82,198	87,901	0	0	0	
25	Less: Debt Service Pmt (P+I+Financing Fee + R	39,584	38,844	34,925	29,335	20,986	11,224	5,730	1,072	-422	0	0	0	0	0
26	Less: Interest Payments on Revolver	0	0	0	0	0	0	0	0	0	0	0	0	0	
27	Ending Cash	56,117	61,795	56,364	67,092	84,282	99,288	104,507	114,645	82,620	87,901	0	(0)	(0)	0
28	Cash from Revolver	-	-	-	-	-	-	-	-	-	-	-	0	0	-
29	Revolver Repayment	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	**Free Cash Flow**	**56,117**	**61,795**	**56,364**	**67,092**	**84,282**	**99,288**	**104,507**	**114,645**	**82,620**	**87,901**	**-**	**0**	**0**	**-**
31	**Revolver**														
32	Opening Balance	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	Drawdown	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	Annual Interest	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	Revolver Repayment	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	Ending Balance	0	0	0	0	0	0	0	0	0	0	0	0	0	0

37 **NPV and IRR**

38 Discount Rate 6.00%

39 NPV to Jan 06 142,709

40

	2-Apr-29	2-Oct-29	2-Apr-30	2-Oct-30	2-Apr-31	2-Oct-31	2-Apr-32	2-Oct-32	2-Apr-33	2-Oct-33	2-Apr-34	2-Oct-34	2-Apr-35	2-Oct-35
NI	-	-	-	-	-	-	-	-	-	-	-	20,192	46,244	54,275

	2-Apr-36	2-Oct-36	2-Apr-37	2-Oct-37	2-Apr-38	2-Oct-38	2-Apr-39	2-Oct-39	2-Apr-40	2-Oct-40	2-Apr-41	2-Oct-41	2-Apr-42	2-Oct-42
NI	56,117	61,795	56,364	67,092	84,282	99,288	104,507	114,645	82,620	87,901	-	-	-	-

DEBT CALCULATIONS

#															
		$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90	$90
41	**DEBT - Annual Sinking Fund Bonds**	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101
42	Opening Balance	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121
43	Capital Additions	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135
44	Accrued Interest Between Bond Take Outs	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
45	Debt Service Payments (accrued)	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178
46	Financing Shortfall In Initial Operating Period	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191
47	Equity														
48	Bond #1														
49	Bond #2														
50	Bond #3	$0	$0	$1	$1	$0	$0	$0	$0	$0	$0	$1	$1	$0	$0
51	Bond #4	$0	$0	$1	$1	$0	$0	$0	$0	$0	$0	$1	$1	$0	$0
52	Bond #5	$0	$0	$1	$1	$0	$0	$0	$0	$0	$0	$1	$1	$0	$0
53	Bond #6	$0	$0	$1	$1	$0	$0	$0	$0	$0	$0	$1	$1	$0	$0
54	Bond #7	$0	$0	$1	$1	$0	$0	$0	$0	$0	$0	$1	$1	$0	$0
55	Bond #8	$0	$0	$1	$1	$1	$1	$0	$0	$0	$0	$1	$1	$0	$0
56	Bond #9	$0	$0	$1	$1	$1	$1	$0	$0	$0	$0	$1	$1	$0	$0
57	Bond #10														
58	Closing Balance														

#											
		$90	$90	$90	$90	$90	$90	$90	$90	$90	$90
41	**DEBT - Annual Sinking Fund Bonds**	$101	$101	$101	$101	$101	$101	$101	$101	$101	$101
42	Opening Balance	$121	$121	$121	$121	$121	$121	$121	$121	$121	$121
43	Capital Additions	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135
44	Accrued Interest Between Bond Take Outs	$150	$150	$150	$150	$150	$150	$150	$150	$150	$150
45	Debt Service Payments (accrued)	$178	$178	$178	$178	$178	$178	$178	$178	$178	$178
46	Financing Shortfall In Initial Operating Period	$191	$191	$191	$191	$191	$191	$191	$191	$191	$191
47	Equity										
48	Bond #1										
49	Bond #2										
50	Bond #3	$0	$0	$161	$161	$0	$0	$0	$0	$546	$546
51	Bond #4	$0	$0	$181	$181	$0	$0	$0	$0	$615	$615
52	Bond #5	$0	$0	$218	$218	$0	$0	$0	$0	$739	$739
53	Bond #6	$0	$0	$241	$241	$0	$0	$0	$0	$816	$816
54	Bond #7	$0	$0	$269	$269	$0	$0	$0	$0	$912	$912
55	Bond #8	$0	$0	$317	$317	$0	$0	$0	$0	$1,076	$1,076
56	Bond #9	$0	$0	$342	$342	$0	$0	$0	$0	$1,158	$1,158
57	Bond #10										
58	Closing Balance										

Appendix M

Reference Case Development Team

Appendix M

Reference Case Development Team

Reference Case Development Team

The Golden Ears Bridge Reference Case Development Team was led by TransLink staff, with support and involvement from consultants with technical and specialized expertise in a number of areas, as well as other TransLink staff members as listed below.

Input	Organization	Team Member	Report Section
• Overall Reference Case Development and Coordination	GEB Project TransLink Engineering and Project Services KPMG – Toronto	Fred Cummings Sandra Oh Lisa Brown Will Lipson	All
• Facility Construction Delivery Model & Costs	Collings Johnston Inc. Associated Engineering (B.C.) Ltd.	Robin Johnston Norm D'Andrea Lester Marr	4,5
• Tolling Infrastructure and Operations Delivery Model & Costs	TransLink Strategic Planning and Policy GEB Consultant	Jim Wang Mahrokh Arefi	4,5,6
• Facility Operating Period Delivery Model & Costs	Collings Johnston Inc. Associated Engineering (B.C.) Ltd TransLink Roads and Bridges	Richard Ciceri Norm D'Andrea Lester Marr Susan Hollingshead Brock Radloff	4,6
• Project Financing	TransLink Finance Infrastructure Financial Advisory Services Ltd.	Derek Bacchioni Robin Stringer Neil Alexander	7
• Financial Model	Toronto Dominion Securities (TDSI)	Jill Leversage Jordan Anderson	8,9
• Risk Valuation & Sensitivity	KPMG - Vancouver	Paul Levelton	9,10

The Golden Ears Bridge

Greater Vancouver Transportation Authority

Golden Ears Bridge
Reference Case Report
Supplementary Information

Note: This information must be read in conjunction with the Reference Case as provided in the previous section

The Golden Ears Bridge
Greater Vancouver Transportation Authority

TransLink

Adjustments to the Golden Ears Bridge Reference Case Report

November 25, 2005

The Golden Ears Bridge
Greater Vancouver Transportation Authority

Table of Contents

1. Introduction

A reference case, estimating the hypothetical, risk-adjusted costs of procuring the Golden Ears Bridge (GEB) Project using traditional approaches, has been prepared to provide TransLink with a tool for determining whether the DBFO proposals from the Proponents represent value-for-money to TransLink. In addition, the information developed in the reference case was used in the conduct of due diligence on, and test for reasonableness of, the financial offers and financial models submitted by Proponents.

The reference case was developed under the management of the GEB Project Team, which included TransLink staff, consultants, and technical and management accountant advisors. The Reference Case Report was developed during the months leading up to the receipt of financial submissions and a report documenting the development of the Reference Case NPV was issued on November 4, 2005. In keeping with accepted industry practice, the Reference Case Report was reviewed following receipt of the financial submissions from Proponents to update for appropriate changes. Conditions for adjustments to the Reference Case Report were agreed to and documented in Section 11 (page 48) of the November 4, 2005 report. Changes to the reference case may be made:

- "If the scope of the project changes.
- If it becomes apparent that a significant component has been mispriced or omitted.
- To update financing rates in order to be comparable to proponent proposals.
- To correct errors of fact including omissions.
- To update for market information that is discovered upon review of proposals."

This document presents the adjustments made to the Reference Case Report to arrive at the Adjusted Reference Case NPV. All of the changes relate to mispricing or to errors of fact, including omissions.

This document does not repeat the information provided in the Reference Case Report, and should be read in conjunction with that document.

2 Adjustments to the Reference Case NPV

This section describes each of the adjustments made to the Reference Case Report to arrive at an adjusted Reference Case NPV.

2.1 Capital Costs

This section documents capital cost changes between the Reference Case Report and the adjusted Reference Case NPV using the following categories:

- Capital estimates.
- Soft costs.
- Insurance and bonding.
- Katzie training.
- Communications during the construction period.

2.1.1 Construction Cost Estimates

As noted in Section 3.1 (see Appendix D, Technical Memorandum No.6, Section 1 of the Reference Case Report), definitive data are not available to estimate construction costs for design build (DB) contracts. Accordingly, design bid build (DBB) construction cost data have been utilized to estimate the construction cost for the GEB Project in the Reference Case NPV even though the GEB Project was divided into three DB and two DBB contracts.

Experience in other jurisdictions with projects of similar type and size as the GEB Project indicates when the work is undertaken under a single contract there is a significant opportunity for greater flexibility in design, construction management and innovation across the whole project as opposed to multiple contracts as in the reference case.

In the United Kingdom, under the Highway Agency's Design Build Finance and Operate (DBFO) program, completed highway improvement procurements have demonstrated cost savings of up to 30% of construction cost for single contracts with a significant DB component. Average savings have amounted to approximately 15% of DB costs. The Highways Agency's documents 'Efficiency Gains from Collaborative Roads Procurement' and 'Procurement Strategy Review 2005', both promote framework contracts, where a long term program of work is let as a single contract rather than individual contracts in order to benefit from the resulting cost savings.

In a case study for the retrofit of the San Francisco-Oakland Bay Bridge in California, one of the reasons given for the large growth in costs was the method used for procurement delivery. Six projects were tendered for the seismic safety work rather than a single contract. This was deemed as a contributing factor for the increase in costs. (Expert Technical Committee, Bay Bridge Project Assessment Meeting, January 6-8, 2005.)

Recent analysis of the UK data for application to other major projects in British Columbia concluded that savings of up to 10% on the capital construction cost provided appropriate recognition of this potential for efficiencies of a single DB contract over a multi-contract delivery approach.

Although the GEB Project differs from the other major BC projects, similar efficiency opportunities are likely when a single contract delivery is used instead of multiple contract delivery. For the GEB Project, single contract efficiencies would primarily relate to design, material usage and handling, traffic management, utility coordination and project management. While the Fraser River is a barrier to fully integrating construction activities on the north and south shores, the civil work on both sides of the river would benefit from a single contract, especially in the areas of utility coordination, traffic management during construction, materials and manpower management, integration at the major tie-in locations with structures, and overall coordination between the various stakeholders. Depending on scheduling, opportunities may exist for some cross-river efficiency by utilizing the main river crossing bridge prior to its total completion. These efficiencies would be reduced were the same work completed using multiple contracts.

The main river crossing bridge and approach structures are unique construction challenges in their own right, whether delivered as part of a large single contract or as their own single contract within a multiple contract program such as the reference case model. Opportunities for efficiencies, while reduced due to this uniqueness within the GEB project scope, still remain. On the south shore, utility coordination, integration of construction at the major tie-in locations with structures, and overall coordination between the various stakeholders would be more efficient under a single contract including the river bridge and approaches. On the north shore, significant benefits would be achieved under one contract for the river bridge / approach structure and the viaduct structure between CP Rail and the Lougheed Highway through a common approach to design elements and the resulting simplified procurement of components.

The construction cost estimates in the Reference Case Report are based on prices derived from a single DB contract delivery approach. Accordingly, in order to more accurately reflect the cost of a multiple contract approach, the following factors have been applied to recognize the loss of potential single contract efficiencies:

- A 10% increase in raw construction cost for Contracts 1, 2, 4, and 5;
- A 5% increase in raw construction cost for Contract 3 (the main river crossing bridge and approach structures).

Table 1 below summarizes the change by contract.

Table 1
Raw Construction Costs
Reference Case and Adjusted Reference Case
($ M Nominal)

	Reference Case Report	Adjusted Reference Case	Difference
Contract 1	13.68	15.05	1.57
Contract 2	38.69	42.56	3.87
Contract 3	372.30	390.92	18.62
Contract 4	92.74	102.01	9.27
Contract 5	6.01	6.61	0.60
Total	523.42	557.15	33.93

These changes represent a $28.9M addition to the raw construction costs in NPV, based on 2005 dollars and a 6% discount rate.

2.1.2 Soft Costs

For the purpose of this discussion, soft costs are project management, preliminary design, detailed design and residential engineering. Certain soft cost rates used in preparing the reference case cost estimates, (namely, preliminary and detailed design, project management, and resident engineering during construction) were developed for DB and DBB contracts from historical data compiled by the British Columbia Ministry of Transportation (BC MoT). Although the data are based on a significant number of projects, the vast majority of these projects are relatively small in comparison to the estimated value of the five contracts proposed in the reference case. Table 2 below is Table 3-1 from Technical Memorandum No. 6.

Table 2
Soft Cost Rates
Technical Memorandum No. 6 (Table 3-1)
Percent of Raw Construction Costs

SOFT COST	DB RATE	DBB RATE
Preliminary Design	2.0%	0.5%
Detailed Design	3.75%	5.5%
Project Management		
TransLink	2.0%	1.5%
Contractor	3.5%	N/A*
Resident Engineering	3.0%	6.0%

** included in construction costs.*

In 2003, BC MoT commenced the $210M Border Infrastructure Program (BIP). BIP is being delivered under a traditional DBB approach with the overall project management of the Program's three major component highways assigned to consultants who also have responsibility for the design and tendering of the work. As the overall size of BIP is significant, and therefore more in line with the anticipated size of contracts for the GEB Project, a review of soft costs from one of the BIP component highways was undertaken.

Table 3 provides soft cost rates derived from the BIP component highway.

Table 3
Soft Cost Rates
BIP Component Highway
Percent of Raw Construction Costs

SOFT COST	DB RATE	DBB RATE
Preliminary Design	2.0%	4.5%
Detailed Design	3.75%	5.5%
Project Management		
TransLink	2.0%	3.7%
Contractor	3.5%	N/A
Resident Engineering	6.0%	9.0%

** included in construction costs.*

As the Table 3 rates reflect a large project with similar work and a comparable delivery approach to the reference case, the soft costs of the Adjusted Reference Case NPV have been adjusted to reflect the Table 3 rates. Specifically, the following rates were used in the Adjusted Reference Case NPV:

- TransLink project management costs for DBB contracts were increased from 1.5% to 3.7%.
- TransLink resident engineering costs for DBB contracts were increased from 6.0% to 9.0%.
- TransLink design costs for DBB contracts were increased from 6.0% to 10.0%.
- Contractor resident engineering costs for DB contracts were increased from 3.0% to 6.0%.

Additionally, soft costs have changed slightly to reflect the higher hard construction costs described in Section 2.1.

Together, these changes in soft costs represent a $3.4M NPV addition to TransLink costs and a $19.3M NPV addition to contract soft costs, based on 2005 dollars and a 6% discount rate.

2.1.3 Bonding and Insurance

The Reference Case Report identifies bonding and insurance costs as a separate account for each of the DB and DBB contracts. In typical DBB contracts, the contractor's prices include bonding and insurance. As the DB construction costs were developed based on DBB build rates, bonding and insurance costs for Contracts 2, 3, and 4 have been double counted in the Reference Case Report.

The estimated change to correct for double counting of bonding and insurance costs is a reduction in the nominal cost of bonding by $2.9M and a reduction in the nominal cost of insurance by 18.3M. Together these changes reduce the NPV of costs in the Adjusted Reference Case NPV by approximately $17.9M in 2005 dollars, based on a discount rate of 6%.

2.1.4 Katzie First Nation Training

The Reference Case Report does not include a cost for providing training opportunities for the Katzie First Nation. If the GEB Project were to proceed using a traditional delivery model, the Katzie Benefiting Agreement would obligate TransLink to establish a program for training and to provide opportunities for KFN businesses, similar to the support that would be provided to the Katzie by the DBFO Contractor.

The estimated cost of providing such programs is approximately $2M ($1M 2007 and $0.5M in 2008 and 2009) – an increase in the NPV of construction period costs of about $1.7M in 2005 dollars, based on a discount rate of 6%.

2.1.5 Communications During the Construction Phase

The Reference Case Report anticipates that TransLink's communications costs during the construction phase would be the same under the two delivery models. The RFP places substantial responsibility for communications on the DBFO Contractor. With a traditional delivery model some of these responsibilities might be taken on by the DB contractors for Contract 2, 3 and 4, but not all of these services, particularly for segments that would be delivered using a DBB approach (i.e., Contract 1 and Contract 5). Accordingly, TransLink's responsibilities for communications would be greater than the original Reference Case cost estimate provides.

The estimated cost of increased communications responsibilities during construction would be $150 thousand annually for 2007 to 2010. The estimated NPV of this in 2005 dollars, based on a 6% discount rate, would be $0.4 M.

2.2 OMR Costs

This section documents OMR cost adjustments to the Reference Case Report using the following categories:

- Schedule.
- Albion Ferry.
- Contingencies.

2.2.1 Schedule

The Reference Case Report assumes a contracting term beginning January 2006 and ending December 2040. Based on a 35-year term starting in January 2006, the scenario for the DBFO Contractor assumed a 31.5 year operating period and the scenario for a traditional procurement approach assumed a 30.5 year operating term due to a one year delay in the commencement of construction. In fact the project term extends for a fixed 32 years from Substantial Completion (which is documented in the Reference Case Report, Section 2B). This suggests an inconsistency in the Reference Case Report.

To correct this inconsistency in the DBFO scenario, the operations period should be extended from June 30, 2009 to June 30, 2041 (i.e. 32 years) and from June 30, 2010 to June 30, 2041 in the scenario based on a traditional procurement. The following costs should be added to the Reference Case NPV to present a fair comparison between the delivery options:

- An additional 0.5 years of operations and maintenance costs.
- An additional 0.5 years of payments to the tolling operator.
- An additional 0.5 years of Albion Ferry subsidy revenue.
- An additional 0.5 years of toll revenue.

These changes represent $2.41M in additional costs to the raw NPV based on 2005 dollars and a 6% discount rate and addition toll revenues of $$17.96M.

2.2.2 Albion Ferry Operating Costs

The Reference Case Report assumes that TransLink incurs no cost due to the additional year of operating the ferry service. As the project will begin one year later if a traditional procurement approach were used, this additional cost should be considered.

The additional cost would be equal in magnitude to the Albion Ferry Subsidy over the period June 2009 to June 2010 (that is, $5.218M in $2004). The estimated NPV of the additional year of Albion Ferry operations in 2005 dollars, based on a 6% discount rate, would be $4.7 M.

2.2.3 Contingency on Operations, Maintenance and Rehabilitation Costs

If a traditional procurement approach were used to develop the GEB Project, TransLink would inherit the long term risks of rehabilitation of the Facility as the DB contractors would have no long term requirement to warranty construction. TransLink would be responsible for any undetected material defect work in the future, which would include such items as scouring, earthquake damage, premature deterioration of an asset, etc. Operation and maintenance contracts would likely follow BC MoT contract standards that require contractors to meet minimum performance specifications, including quality management, but do not include any rehabilitation requirements. Accordingly, TransLink would have to engage firms to monitor the assets in accordance with the asset performance standards designed for the GEB and come up with a five year rehabilitation plan. Tender documents would have to be prepared for the rehabilitation work and tendered to the lowest bidder. This could result in some costly contracts compared to the DBFO alternative.

Accordingly a contingency of 10% is added as an adjustment to the Reference Case OMR costs, to reflect the short term nature of the operations and maintenance contracts and the proposed rehabilitation strategy.

The proposed cost contingency for OMR work would increase the NPV of OMR costs by about $8.0 M, in 2005 dollars based on a 6% discount rate.

2.3 Risk Valuation

Based on the changes to the raw capital cost and OMR costs, and a further review of the underlying risk assumptions reported in the Reference Case Report, several adjustments have been made to the risk valuation, which are documented in Appendix A (which updates the information provided in Appendix K of the Reference Case Report), Summary Analysis of Project Risks, GEB Reference Case.

2.3.1 Construction Cost Risk Valuation

The construction cost risk valuation has been adjusted to reflect:

- TransLink project management costs for DBB contracts were increased from a risk range of 1.5%/1.5%/3.0% to 3.7%/3.7%/7.0%[1].
- TransLink design costs for DBB contracts were increased from a risk range of 6.0%/6.0%/7.5% to 10.0%/10.0%/12.5%.
- The global risk regarding the impact of schedule delay on toll revenue was reduced from a risk range of $0.0/$0.0/$80.0 million to $0.0/$0.0/$40.0 million.
- A global risk was added relating to having to subsidize the operation of the Albion Ferry for a further year if the project was delayed - risk range of $0.0/$0.0/$6.0 million.
- A new risk was identified for Contract 3 – environmental compensation/ mitigation with a risk range of $0.0/$0.0/$1.0 million.
- A new risk was identified for Contract 5 – flood protection with a risk range of $0.0/$0.3/$1.5 million.

Table 4 summarizes the changes in risk adjusted capital costs at the 90th percentile confidence level.

[1] *The distribution of risks was set as a triangular distribution, with the values for the three points (i.e., Perfect/ Likely/Outrageous).*

Table 4
Capital Cost Risk Adjustments
Reference Case NPV and Adjusted Reference Case NPV
(NPV in 2005 @ 6% Discount Rate)

	Reference Case	Adjusted Reference Case	Difference
Contract 1	20.6	25.8	5.2
Contract 2	55.4	63.9	8.5
Contract 3	497.5	551.8	54,3
Contract 4	126.7	146.2	19.5
Contract 5	10.1	13.5	3.4
Global risks	11.9	14.4	2.5
Sub-Total	**722.2**	**815.6**	**93.4**
Fixed Costs	176.8	180.0	3.2
Tolling Capital	6.0	6.0	0.0
Total	**905.0**	**1,001.6**	**96.6**

** at the 90th percentile*

This represents all the changes to the raw costs, soft costs, bonding and insurance and to the valuation of risk for the capital cost of construction. The risk valuation included in these costs went from 131.0M to 142.9M, a change of about $12M to the NPV of the risks associated with capital costs at the 90th percentile, in 2005 dollars based on a 6% discount rate.

2.3.2 OMR Cost Risk Valuation

The sensitivity of OMR costs to assumptions about inflation was tested through a risk analysis. The analysis used the previous risk analysis of OMR costs with an additional risk element added – inflation risk. All other OMR risks remain in the analysis at their reported values.

Table 5
Operational Risks
Reference Case NPV* and Adjusted Reference Case NPV
(NPV in 2005 @ 6% Discount Rate)

	NPV – 70%	NPV – 90%	NPV – 95%
Reference Case NPV*	$68.9 M	$73.1 M	$75.0
Adjusted Reference Case NPV*	$79.9 M	$86.7 M	$90.0
% Decrease	16%	19%	20%

* *Based on a triangular distribution of 2.5% for all three point (restated to correct for error in original reporting).*

** *Based on a triangular distribution of 2.0%/2.5%/4.0% for the perfect/likely and outrageous values.*

At the 90% confidence level, the risk valuation for OMR inflation would increase the NPV of the Reference Case NPV by about $13.6M, including a $7.3 M adjustment due to uncertainty around inflation, in 2005 dollars based on a 6% discount rate.

2.4 Revenues

The Reference Case Report assumes that the initial toll rates would be inflated from the 2003 base rates ($2.50 for cars, $3.75 for light trucks and $5.00 for heavy trucks) by an annual rate of 2.5% to January 2009 in the P3 scenario and to January 2010 in the Reference Case. As the estimated date of substantial completion is June 30th 2009 in the P3 scenario and June 30th 2010 in the Reference Case, the initial toll rates should include an additional half-year of inflation.

This adjustment in initial toll rates to correctly reflect the date of Substantial Completion would increase the NPV of revenues by about $17.6M in the Reference Case and about $16.6M in the case with P3 delivery, a net impact of $1M when compared to the Reference Case.

2.5 Summary of Adjustments

Table 6 summarizes the changes made from the Reference Case NPV to the Adjusted Reference Case NPV.

Table 6
Summary of Adjustments
Reference Case NPV and Adjusted Reference Case NPV
(NPV in $M 2005 @ 6% Discount Rate)

Item	Reference Case	Adjusted Reference Case	Difference
Capital Costs			
Raw construction cost estimates	448.8	477.8	28.9
Soft Costs – GVTA	14.0	17.4	3.4
Soft Costs – Contracts	59.7	79.0	19.3
Bonding and insurance	17.9	0	(17.9)
Katzie First Nation training	0	1.7	1.7
Communications	0	0.4	0.4
OMR Costs			
Schedule – additional toll revenue	0	(18.0)	(18.0)
Schedule – incremental operating costs (Payment to tolling operator and OMR costs)	0	2.4	2.4
Incremental Albion Ferry operating costs	0	4.7	4.7
Contingency	0	8.0	8.0
Risk Valuation			
Risk adjusted capital cost	131.0	142.9	12.0
OMR inflation risk valuation	73.1	86.7	13.6
Toll rate change to initial rates*	0	(17.6)	(17.6)

* *Toll revenue also increased by $16.6M in the DBFO scenario– for a net change between the two of $1.0M.*

3 Summary of Reference Case

Table 7 summarizes the Reference Case NPV and the Adjusted Reference Case NPV based on the changes documented in this document. The changes in revenues and costs identified in Chapter 2, together with the resulting changes in financing costs, result in a $50.5M decrease in the NPV of the reference case.

Table 7
Overall Project
Reference Case NPV and Adjusted Reference Case NPV
(NPV in $thousands 2005 @ 6% Discount Rate)

Cost Item	Reference Case	Adjusted Reference Case
Costs to 2005, New RFP Process and Construction		
TransLink Retained Costs up to 2005	(105,883)	(106,830)
TransLink Retained Costs 2006-2010	(87,963)	(98,390)
Retained Costs – Risks	(31)	(34)
Capital Costs – Civil Works and Tolling	(647,145)	(683,463)
Capital Costs – Risks	(131,049)	(142,932)
Sub-Total without Financing Costs	972,071	1,031,649
Financing		
Debt Service Payments	(109,708)	(120,947)
Accrued interest between bond takeouts	(8,878)	(9,918)
Bond Takeouts	1,090,657	1,162,514
Operations Period – Costs		
Payments to Tolling Concessionaire	(165,649)	(167,826)
OMR - Routine Maintenance	(15,949)	(17,708)
OMR – TransLink Retained (Overhead)	(9,075)	(9,160)
OMR – Risk	(587)	(635)
OMR – Rehabilitation	(27,946)	(30,740)
O&M Risk Costs	(7,970)	(9,666)
Rehabilitation Risk Costs	(13,332)	(17,333)
Incremental Albion Ferry operating costs		(4,734)
Financing		
Debt Servicing	(912,300)	(980,088)
Revolver Interest Payments	(109,999)	(190,747)
Revolver Draws	191,152	294,301
Revolver Repayment	(82,679)	(106,201)
Total Operating Period	1,154,334	1,240,537
Revenues		
Toll & Video	1,208,653	1,243,508
Albion Ferry Subsidy	88,776	89,609

Cost Item	Reference Case	Adjusted Reference Case
Total Revenues	1,297,429	1,333,117
Total Raw NPV	143,096	92,580

* * *

Please note that Appendix B provides a summary of changes to the text that should be made to the Reference Case Report.

Appendix A

Risk Valuation Report with Adjustments

Risk Valuation Report

Appendix B

Text Changes to the Reference Case Report

Text Changes to the Reference Case Report

a. List of Appendices – Appendices A to L are listed. The following is recommended for addition to the list:

Appendix M: Reference Case Development Team

b. Executive Summary – the last paragraph reads:

"The following table shows the Raw NPV and the risk-adjusted NPV values expressed at the 50th, 70th and the 90th Percentile confidence levels."

This should be replaced by:

"**The confidence level is chosen a scale of 1 to 100 percentile and is based on the level of risk tolerance acceptable to TransLink. For example, a choice of the 90th Percentile confidence level can be interpreted as an acceptance that, on a balance of probabilities, the actual cost will not exceed the calculated value more than once out of 10 times.** The following table shows the Raw NPV and the risk-adjusted NPV values expressed at the 50th, 70th and the 90th Percentile confidence levels"

c. Section 3(C) under heading "Retained Costs" reads:

"The (TransLink) retained costs are for work paid and directly administered by TransLink, not through the services of a contractor. These costs can be divided into fixed costs and contract-related costs."

This should be replaced by:

"The (TransLink) retained costs are for work paid and directly administered by TransLink. These costs can be divided into fixed costs and contract-related costs. **Examples of fixed costs are:**

- ***Project Development costs to date***
- ***Property acquisition, property contingency and any other property related costs***
- ***DBFO Honorarium***

Examples of contract-related costs are:

- ***Project Management***
- *Preliminary Design*
- *Resident Engineering"*

d. Section 3(C) under heading "Base Costs" reads:

"The Project Base Costs are all the costs that can be reasonably quantified and that are likely to be materially different between the Reference Case and the DBFO proposals"

This should be replaced by:

"The Project Base Costs **include** all the costs that can be reasonably quantified and that are likely to be materially different between the Reference Case and the DBFO proposals. **Some, but not all base costs common to both the Reference Case and the DBFO proposals are also included in the Reference Case (see Note 1 of Table 3.1)**"

e. Section 4A, under heading "Translink Retained Obligations" reads:

"Under the current RFP process, the DBFO contractor would need to obtain All Risks Property Insurance (insurable value capped at $300 Million) insurance coverage during the Operating Period of the GEB project. Under a Reference Case Scenario, TransLink would likely not obtain a separate All Risks Property Insurance for GEB to the full insurable value. Instead, TransLink would add the GEB asset to its insurance for existing assets, and which are not insured individually. As the DBFO proposals will not include costs for OMR insurance, the Reference Case will likewise exclude any costs for insurance coverages during the operating period."

This should be replaced by:

"**As the DBFO proposals will not include costs for OMR insurance, the Reference Case will likewise exclude any costs for insurance coverages during the operating period. (**Under the current RFP process, the DBFO contractor would need to obtain All Risks Property Insurance coverage during the Operating Period of the GEB project. Under a Reference Case Scenario, TransLink would likely not obtain a separate All Risks Property Insurance for GEB to the full insurable value. Instead, TransLink would add the GEB asset to its insurance for existing assets, and which are not insured individually**)**."

f. Section 4C, first paragraph reads:

"The Reference Case timing is developed based upon a December 2005 Board decision not to proceed with a DBFO procurement model."

This should be replaced by:

"The Reference Case timing is developed based **upon the assumption that in December 2005 the Board decides** not to proceed with a DBFO procurement model."

g. Section 4C, under heading "Schedule Impacts", last paragraph reads:

"The following Sections 4 through 9 develop the Reference Case Costs assuming the schedule as outlined in Appendix G."

This should be replaced by:

"The following Sections 5 through 10 develop the Reference Case Costs assuming the schedule as outlined in Appendix G."

h. Section 5, Table 5.1, second column heading reads:

"Cost (2005, millions)"

Should be replaced by:

"*Nominal cost, (millions, inflated at 6% to year incurred)"*

i. Section 6, under Heading "4. Administration of O&M and rehabilitation contracts" reads:

"- efforts would be required from July 2009 to begin the procurement of the first O&M contract."

Should be replaced by:

"…efforts would be required from July 2009 to begin the procurement of the first O&M contract ***and subsequent O&M and rehabilitation contracts"***

j. Section 7C, under heading "3. Operations Period – July 2010 to December 2040", second bullet reads:

"Drawdowns under this facility will likely begin in the June-December 2010 period, and all interest will be capitalized (added to the amount owing) as the facility is rolled-over (anywhere from monthly to every twelve months).

This should be replaced by:

"Drawdowns under this facility will likely begin in the June-December 2010 period, and all interest will be ***compounded*** *(added to the amount owing) as the facility is rolled-over (anywhere from monthly to every twelve months).*

Footnote to Table 7.1 reads:

"…and improvements in the province a tax sufficient to restore the fund. It is mandatory"

This should be replaced by:

"…and improvements in the province a tax sufficient to restore the fund. It is mandatory ***for the Trustees to levy such a tax when the balance in the debt***

reserve fund is less than 50 percent of what the balance would have been had no such payments been made. The defaulting Client is not relieved of its unpaid balance owing and is obligated to reimburse the other MFA Clients that covered the default*.”*

k. Section 8, first paragraph states

"…A full printout of the Financial Model is contained in Appendix L.

The base costs reported in Sections 5-7 are summarized below in NPV terms where the sum of the itemized NPV values represents a "raw"(unadjusted for risk) NPV."

This should be replaced by:

"A full printout of the Financial Model ***showing the risk-adjusted NPV at the 90% confidence level*** *is contained in Appendix L.*

The base costs and revenues reported in Sections 5-7 are summarized below in NPV terms where the sum of the itemized NPV values represents a "raw"(unadjusted for risk) NPV. It should be noted that all NPV values in this report represent cashflows discounted to 1st January 2006."

l. Discrepancy between Table 10.2 (90th Percentile NPV= $143M) and chart 10.1(90% percentile NPV = $142M. Both numbers should be $143M.

m. Section 11, second paragraph states:

"All adjustments made to the Reference Case will be fully documented and defended via the financial evaluation supported by the Reference Case Development Team, to the due Diligence Committee"

This should be replaced by:

"All adjustments made to the Reference Case will be fully documented and defended via the ***Financial Evaluation Team*** *supported by the Reference Case Development Team, to the* ***Steering Committee****"*

n. Appendix Sheet Replacements

- Last sheet of construction contracts costs – was copied at an angle and some information is missing. To be replaced one-to-one by correctly oriented sheets.
- Traffic and revenue forecast sheets – were not scaled down correctly, but no key information missing. Three sheets to be replaced with two sheets.

KPMG

Golden Ears Bridge

Summary Analysis of Project Risks

GEB Reference Case (Revised)

November 27, 2005

Table of Contents

Executive Summary

Introduction and Background

In September and October 2005 KPMG LLP (KPMG) facilitated an analysis of the risks of the reference case for the Golden Ears Bridge Project (the Project). The risk analysis involved a series of workshops attended by representatives of Translink, Golden Ears Bridge Project, Associated Engineering and KPMG.

Risk Analysis Process

The individual risks that could affect capital or operations, maintenance and rehabilitation costs were developed through group discussion. The steps involved in the analysis of risks involved included:

1. Defining the project scope by identifying the likely procurement strategy for the project if it was not delivered as a design-build-finance and operate contract
2. Developing the baseline costs and the risks that could affect these costs
3. Determining the potential range of impacts for each risk
4. Determining the distribution of outcomes within that range
5. Conducting a Monte Carlo evaluation of the impacts of the risk
6. Assigning the risks to the relevant cash flows for both capital and OMR.

Findings of Risk Analysis

Exhibit ES-1 contains a summary of the analysis of the capital cost risks. This exhibit also shows the non risk-adjusted capital cost of the project. As indicated in this exhibit, the mean cost estimate is $1,122 million (50 percent probability of achieving) and the project has a 90 percent probability of achieving a cost of less than $1,174 million.

Exhibit ES-1
Assessment of Capital Cost – Risk Adjusted ($ million)

		Total Capital Cost - Risk Adjusted					Non-Risk Adjusted Capital Cost
	Delivery Mode	Minimum	Mean	Maximum	70th Percentile	90th Percentile	
Contract 1	**DBB**	$26.9	$30.5	$35.3	$31.1	$32.3	$25.3
Contract 2	**DB**	$68.2	$75.4	$85.0	$76.8	$79.7	$65.6
Contract 3	**DB**	$591.3	$634.9	$705.2	$645.4	$664.9	$568.8
Contract 4	**DB**	$154.9	$166.8	$183.3	$169.4	$174.5	$148.4
Contract 5	**DBB**	$12.0	$15.2	$19.4	$15.7	$16.7	$11.1
Global Risks	**n/a**	$1.8	$10.6	$87.1	$11.8	$17.4	$0.0
Sub-Total		**$855.1**	**$933.4**	**$1,115.3**	**$950.2**	**$985.5**	**$819.2**
Fixed Costs		$181.4	$181.4	$181.4	$181.4	$181.4	$182.3
Tolling Capital		$7.3	$7.3	$7.3	$7.3	$7.3	$7.3
Grand Total		**$1,043.8**	**$1,122.1**	**$1,304.0**	**$1,138.9**	**$1,174.2**	**$1,008.8**

The principal risks relating to the differential between risk adjusted and non-risk adjusted capital cost estimates include:

- The potential for significant construction cost inflation between 2005 and 2010
- Uncertainties around GVTA project management costs
- Uncertainties around GVTA design costs
- The potential for further delays (with the attendant loss of toll revenue and increased construction costs).

Exhibit ES-2 contains a summary of the results of the analysis of capital cost risk in terms of its net present value (at a discount rate of 6 percent). As indicated in this exhibit the net present value of the capital cost (adjusted for risks) has a mean of $959 million and $1,002 million at the 90th percentile.

Exhibit ES-2
Assessment of NPV of Capital Cost – Risk Adjusted ($ million)

	Delivery Mode	NPV of Capital Cost - Risk Adjusted Minimum	Mean	Maximum	70th Percentile	90th Percentile
Contract 1	**DBB**	$21.6	$24.4	$28.3	$24.9	$25.8
Contract 2	**DB**	$54.7	$60.4	$68.1	$61.6	$63.9
Contract 3	**DB**	$491.5	$527.4	$585.1	$535.9	$551.8
Contract 4	**DB**	$130.0	$139.9	$153.6	$142.0	$146.2
Contract 5	**DBB**	$9.6	$12.2	$15.7	$12.7	$13.5
Global Risks	**n/a**	$1.5	$8.8	$72.1	$9.8	$14.4
Sub-Total		**$708.9**	**$773.1**	**$922.9**	**$786.9**	**$815.6**
Fixed Costs		$180.0	$180.0	$180.0	$180.0	$180.0
Tolling Capital		$6.0	$6.0	$6.0	$6.0	$6.0
Grand Total		**$894.9**	**$959.1**	**$1,108.9**	**$972.9**	**$1,001.6**

Exhibit ES-3 contains a summary of the results of the analysis of OMR cost risk in terms of both its absolute and net present value (at a discount rate of 6 percent). As indicated in this exhibit the net present value of OMR costs has a mean of $76.1 million and $86.7 million at the 90th percentile.

The risks associated with OMR costs include:

- Latent defects in material and workmanship
- Delayed rehabilitation
- Higher volumes of trucks than expected (thus resulting in higher maintenance costs).

Exhibit ES-3
Assessment of OMR Cost – Risk Adjusted ($ million)

	NPV of OMR Cost - Risk Adjusted				
	Minimum	Mean	Maximum	70th Percentile	90th Percentile
Total OMR Costs	$57.7	$76.1	$108.1	$79.9	$86.7

1 Introduction

This chapter provides an overview of the risk management process applied to the Golden Ears Bridge Reference Case Risk Assessment.

1.1 Project Objectives

The objective of the risk assessment process was to identify the differential risks associated with delivering the Golden Ears Bridge Project (the "Project") as a series of design-build and design-bid-build contracts (the "Reference Case") as opposed to a design-build-finance and operate contract.

1.2 Risk Management Process

A Risk Management Committee was convened to deal with risk management on the STS Project, the members of which included:

Fred Cummings, GEB	Sandra Oh, Translink
Robin Johnston, GEB	Lisa Brown, Translink
Paul Levelton, KPMG	Lester Marr, Associated Engineering.
Norm D'Andrea, Associated Engineering	

A series of meetings were held during September and October 2005 to identify and quantify the risks and assess the impacts of the risks on the project.

1.3 Scope of the Risk Analysis

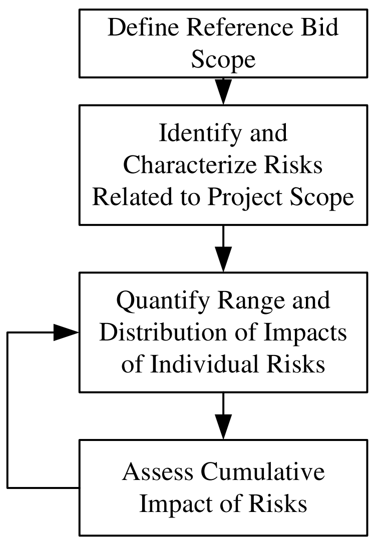
The scope of the risk analysis related to the Project was subject to certain limitations, as follows:

- The analyses were conducted using cost information derived from feasibility studies, not detailed engineering estimates. Associated Engineering developed the cost information used in the analysis.
- As more detailed work on design and construction is undertaken, the nature and magnitude of risks could change significantly due to improved information.
- The assessment of risks was conducted using expert opinion on the nature and potential magnitude of risks. Detailed studies of risks were not undertaken.

2 Process of Risk Analysis

This chapter provides a description of the process used in undertaking the risk analysis. The basic methodology is depicted in Exhibit 2-1 below.

Exhibit 2-1
Risk Analysis Methodology Summary



As noted in this exhibit, the last two steps, the quantification of the impacts of individual risks and the assessment of the cumulative impact of risks is an iterative process. As better information on costs, schedule or particular risks becomes available or as means of mitigating risks are identified, the analyses are re-done.

The individual risks that could affect capital or operations, maintenance and rehabilitation costs were developed through group discussion. The steps involved in the analysis of risks included:

1. Defining the project scope by identifying the likely procurement strategy for the project if it was not delivered as a design-build-finance and operate contract

2. Developing the baseline costs and the risks that could affect these costs

3. Determining the potential range of impacts for each risk

4. Determining the distribution of outcomes within that range

5. Conducting a Monte Carlo evaluation of the impacts of the risk

6. Assigning the risks to the relevant cash flows for both capital and OMR.

This study is based on the preliminary risk analysis performed in 2003 and more recent information regarding costs and risks developed since the completion of the previous analysis.

2.1 Project Scope

The scope of the project was defined by identifying:

- The number of separate contract packages that Translink would likely use to deliver the project under an alternate procurement process
- The nature of each of these contract packages (design-build or design-bid-build).

2.2 Identification of Risks

The individual risks that could affect the initial capital costs or the ongoing operating, maintenance and rehabilitation ("OMR") costs were developed through group discussion.

Risks were identified in four general areas:

- Risks to construction costs that would form part of the contractors' bids
- Risks to GVTA with respect to owner's costs associated with design, project management and resident engineering
- Global risks that could affect all of the construction contracts (e.g., schedule delays caused by GVTA)
- Risks to the OMR contractor.

2.3 Quantification of Risks

The quantification of risks involved three steps:

1. Developing the baseline cost
2. Determining the potential range of impacts (relative to the baseline costs) for each risk
3. Determining the distribution of outcomes within that range.

2.3.1 Baseline Cost

Associated Engineering developed the estimates of baseline costs based on the assumed contract type for each project segment.

2.3.2 Range of Impacts

If significant data is available about the range of potential outcomes of a particular risk element, that information can be used in the risk analysis. For example, if there is a good history of cost data relevant to key components of the construction work, that data can be used to construct very sophisticated risk analysis. For many construction projects such detailed information is not available. In such cases, expert opinion is used to provide the key descriptors of the potential range of impacts (low, probable and high).

For this work we have used the methodology developed by Dr. Francis Hartman of the University of Calgary. Dr Hartman's methodology is based on using expert opinion to estimate the three parameters noted above by answering the following questions:

- Under perfect conditions, what impact would this risk have on project schedule or cost (**P – Perfect Outcome**)?
- Under likely conditions, what impact would this risk have on project schedule or cost (**L – Likely Outcome**)?
- Under outrageous conditions, what impact would this risk have on project schedule or cost (**O – Outrageous Outcome**)?

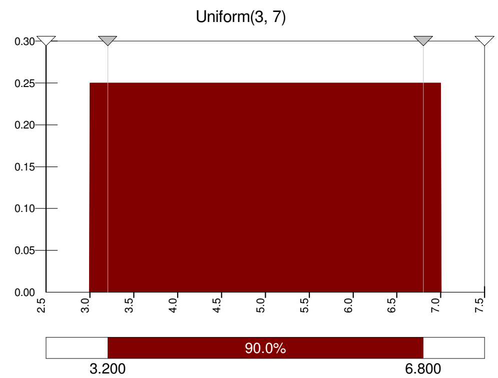
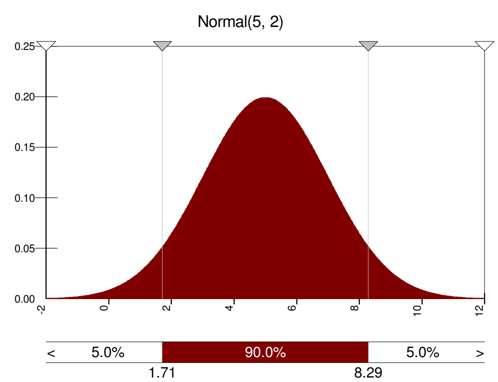
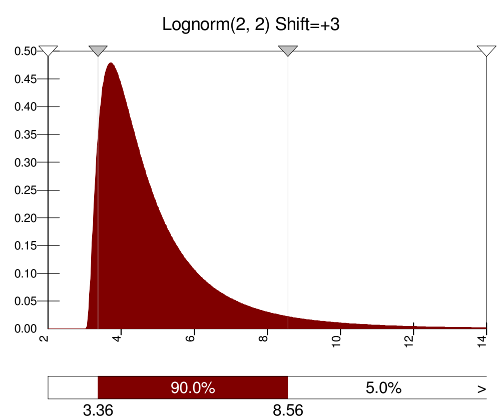
The estimates of the perfect, likely and outrageous outcomes for each risk were developed by the Committee as order-of-magnitude estimates, based primarily on collective experience. Detailed study of the impact of a potential risk was not undertaken.

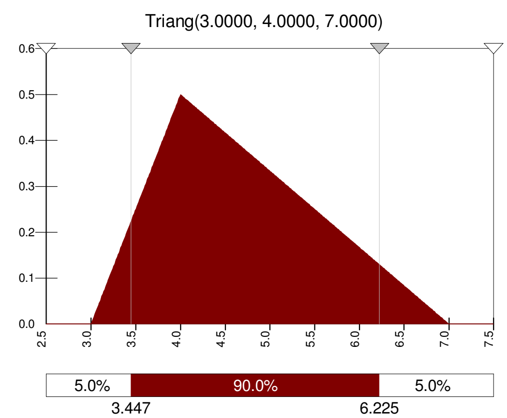
2.3.3 Distribution of Impacts

Once the range of the potential impact of each risk has been identified, it is necessary to assign a probability distribution to that range. While there are a large number of potential distributions that could be used, the most commonly used ones are those shown in Exhibit 2-2. These are appropriate for most circumstances.

In the analyses contained in this report, most of the risks were assigned triangular distributions due to the lack of good historical information on the probable distribution of outcomes of the specific risk elements. In cases where a risk was identified but the probability of the risk occurring was very low, a log normal (skewed) distribution was used.

Exhibit 2-2
Types of Distributions

Type of Distribution	Example
Rectangular – The chances are the same that the deliverable will cost any amount within the range.	
Normal – The distribution of potential outcomes is symmetrical and more likely to be closer to the mean (likely) estimate.	
Skewed – The distribution is one-tailed, typically with a substantially lesser chance of being on the high (outrageous) end of the scale. A log normal distribution is often used in this circumstance.	

Type of Distribution	Example
Triangular – This is the distribution most commonly used when there is insufficient information about the actual distribution of outcomes.	

2.4 Analysis of Risks

The analysis of risks was undertaken through a process of simulation of potential outcomes involving the baseline cost or schedule and the associated risks. The software used in the analysis is **@Risk** from Pallisade Corporation.

The simulation process involves Monte Carlo sampling of potential outcomes for each risk variable. A total of 10,000 iterations of the sampling were undertaken, which is sufficient for the purposes of this analysis. For each iteration, random numbers were used to generate values for each risk variable, based on the PLO estimates and the defined distribution (e.g., triangular, log normal) of the PLO estimates.

The results of the analysis are summarized in cumulative probability charts and associated statistics. Exhibit 2-3 illustrates typical outputs from the analysis model.

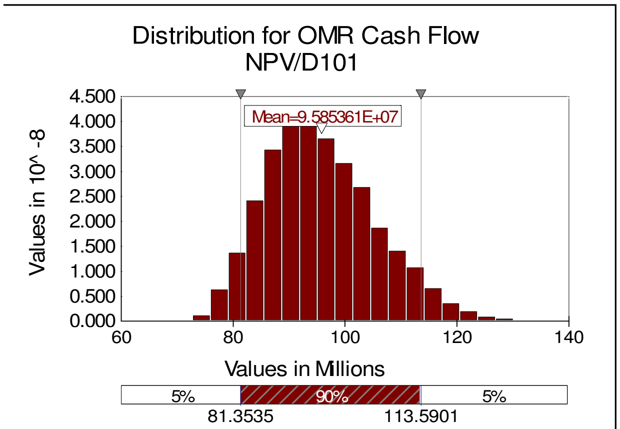
As shown in Exhibit 2-3, the typical output of the risk analysis includes a cumulative probability chart, a tornado chart showing summarizing the sensitivity of the analysis to the individual risk factors and a number of statistics. This information provides the user with the ability to determine the level of risk of exceeding a budget that they are comfortable with and an indication of the specific risk elements that may require further evaluation and/or the development of a mitigation strategy.

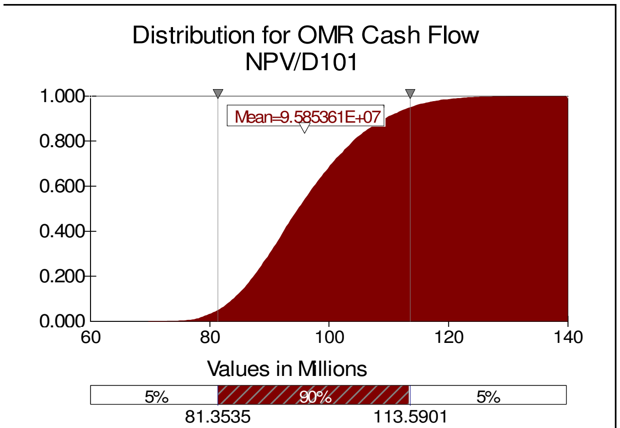
This report has used the mean, 70th percentile and 90th percentile as being relevant levels of confidence in the results. Translink may wish to use a different level of confidence in its planning. Expected values from the 5th percentile to the 95th percentile have been calculated (at 5 percent intervals) and are included in the tables in Appendix A.

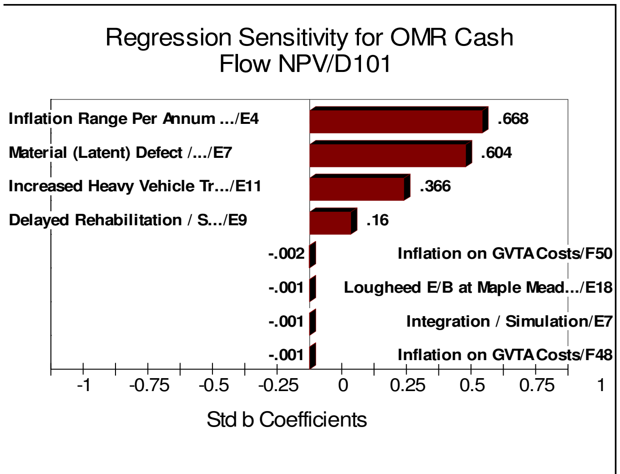
The choice of the appropriate level of confidence is a management decision.

Exhibit 2-3
Typical Output from Risk Analysis Model

Simulation Results for
OMR Cash Flow NPV / D101







Summary Information	
Workbook Name	GEB Ref Bid Risk Analysis 4.xl
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	89
Number of Outputs	15
Sampling Type	Monte Carlo
Simulation Start Time	11/21/2005 13:04
Simulation Stop Time	11/21/2005 13:05
Simulation Duration	00:01:22
Random Seed	1326620301

Summary Statistics

Statistic	Value	%tile	Value
Minimum	$69,701,328.00	5%	$81,353,472.00
Maximum	$139,762,480.00	10%	$83,920,328.00
Mean	$95,853,605.08	15%	$85,829,080.00
Std Dev	$9,826,239.78	20%	$87,308,832.00
Variance	9.6555E+13	25%	$88,674,952.00
Skewness	0.480834465	30%	$89,953,984.00
Kurtosis	3.020067119	35%	$91,204,784.00
Median	$94,804,128.00	40%	$92,357,536.00
Mode	$84,407,104.00	45%	$93,525,256.00
Left X	$81,353,472.00	50%	$94,804,128.00
Left P	5%	55%	$96,120,968.00
Right X	$113,590,144.00	60%	$97,421,696.00
Right P	95%	65%	$98,912,200.00
Diff X	$32,236,672.00	70%	$100,487,584.00
Diff P	90%	75%	$102,239,632.00
#Errors	0	80%	$103,987,960.00
Filter Min		85%	$106,346,016.00
Filter Max		90%	$109,342,528.00
#Filtered	0	95%	$113,590,144.00

Sensitivity

Rank	Name	Regr	Corr
#1	Inflation Range Per	0.668	0.664
#2	Material (Latent) De	0.604	0.609
#3	Increased Heavy V	0.366	0.367
#4	Delayed Rehabilitat	0.160	0.175
#5	Inflation on GVTA C	-0.002	0.002
#6	Lougheed E/B at M	-0.001	-0.021
#7	Integration / Simula	-0.001	-0.001
#8	Inflation on GVTA C	-0.001	0.013
#9	Municipal Extras / S	0.000	-0.003
#10	Utility Unknowns / S	0.000	0.009
#11	Traffic Managemen	0.000	-0.009
#12	Risk 4 / Simulation	0.000	0.000
#13	Risk 5 / Simulation	0.000	0.000
#14	Risk 6 / Simulation	0.000	0.000
#15	Risk 7 / Simulation	0.000	0.000
#16	Project Manageme	0.000	0.000

3 Findings

This chapter contains a summary of the findings of the risk analysis on the capital and operating, maintenance and rehabilitation costs for the GEB Project. The detailed inputs and outputs of the risk analysis are contained in Appendix 1.

3.1 Reference Case Scope

The reference case was constructed after an analysis that indicated that if the Project did not proceed as a design-build-finance and operate contract, it would proceed through several separate contracts as follows:

- Contract 1 – Southshore Municipal Handover Facilities – Design-Bid-Build
- Contract 2 – 176th Street to Telegraph Trail – Design-Build
- Contract 3 – Telegraph Trail to 113B Street – Design-Build
- Contract 4 – 113B Street to Lougheed Highway – Design-Build
- Contract 5 – Abernathy Connector – Design-Bid-Build
- OMR Contract.

3.2 Capital Cost Risk Analysis

The analysis of cost risks was undertaken by examining the risks associated with each segment of the overall project. Exhibit 3-1 provides a summary of the findings of the capital cost risk assessment. This exhibit also shows the non-risk adjusted capital cost for comparison purposes.

In reading Exhibit 3-1, the following points should be noted:

- The baseline costs shown for individual contracts include engineering, project management, design and other soft costs. The total cost estimate includes the project fixed costs and tolling costs as well.
- Each contract was first assessed as a stand-alone project. All risks specific to each segment are included in this analysis.
- The total cost estimate assumes five separate contracts. The potential portfolio effect of pooling risks is thus lost.

Exhibit 3-1
Assessment of Capital Cost – Risk Adjusted ($ Million)

		Total Capital Cost - Risk Adjusted					Non-Risk Adjusted Capital Cost
	Delivery Mode	Minimum	Mean	Maximum	70th Percentile	90th Percentile	
Contract 1	**DBB**	$26.9	$30.5	$35.3	$31.1	$32.3	$25.3
Contract 2	**DB**	$68.2	$75.4	$85.0	$76.8	$79.7	$65.6
Contract 3	**DB**	$591.3	$634.9	$705.2	$645.4	$664.9	$568.8
Contract 4	**DB**	$154.9	$166.8	$183.3	$169.4	$174.5	$148.4
Contract 5	**DBB**	$12.0	$15.2	$19.4	$15.7	$16.7	$11.1
Global Risks	**n/a**	$1.8	$10.6	$87.1	$11.8	$17.4	$0.0
Sub-Total		**$855.1**	**$933.4**	**$1,115.3**	**$950.2**	**$985.5**	**$819.2**
Fixed Costs		$181.4	$181.4	$181.4	$181.4	$181.4	$182.3
Tolling Capital		$7.3	$7.3	$7.3	$7.3	$7.3	$7.3
Grand Total		**$1,043.8**	**$1,122.1**	**$1,304.0**	**$1,138.9**	**$1,174.2**	**$1,008.8**

As indicated in Exhibit 3-1, the project has a 50 percent probability of meeting a $1,122 million cost limit. If GVTA desires a 90 percent level of confidence of achieving its cost, the required cost rises to $1,174 million. These estimates are significantly higher than the non-risk adjusted capital cost estimate of $1,009 million, shown in the right-hand column of Exhibit 3-1.

The principal risks relating to the differential between risk adjusted and non-risk adjusted capital cost estimates include:

- The potential for significant construction cost inflation between 2005 and 2010
- Uncertainties around GVTA project management costs
- Uncertainties around GVTA design costs
- The potential for further delays (with the attendant loss of toll revenue and increased construction costs)

Exhibit 2-2 contains a summary of the results of the analysis of capital cost risk in terms of its net present value (at a discount rate of 6 percent). As indicated in this exhibit the net present value of the capital cost (adjusted for risks) has a mean of $959 million and $1,002 million at the 90th percentile.

Exhibit 2-2
Assessment of NPV of Capital Cost – Risk Adjusted ($ million)

		NPV of Capital Cost - Risk Adjusted				
	Delivery Mode	**Minimum**	**Mean**	**Maximum**	**70th Percentile**	**90th Percentile**
Contract 1	**DBB**	$21.6	$24.4	$28.3	$24.9	$25.8
Contract 2	**DB**	$54.7	$60.4	$68.1	$61.6	$63.9
Contract 3	**DB**	$491.5	$527.4	$585.1	$535.9	$551.8
Contract 4	**DB**	$130.0	$139.9	$153.6	$142.0	$146.2
Contract 5	**DBB**	$9.6	$12.2	$15.7	$12.7	$13.5
Global Risks	**n/a**	$1.5	$8.8	$72.1	$9.8	$14.4
Sub-Total		**$708.9**	**$773.1**	**$922.9**	**$786.9**	**$815.6**
Fixed Costs		$180.0	$180.0	$180.0	$180.0	$180.0
Tolling Capital		$6.0	$6.0	$6.0	$6.0	$6.0
Grand Total		**$894.9**	**$959.1**	**$1,108.9**	**$972.9**	**$1,001.6**

3.3 OMR Cost Risk Assessment

Exhibit 3-3 contains a summary of the results of the analysis of OMR cost risk in terms of both its absolute and net present value (at a discount rate of 6 percent). As indicated in this exhibit the net present value of OMR costs has a mean of $76.1 million and $86.7 million at the 90th percentile.

Exhibit 3-3
Assessment of NPV of OMR Cost – Risk Adjusted ($ million)

	NPV of OMR Cost - Risk Adjusted				
	Minimum	Mean	Maximum	70th Percentile	90th Percentile
Total OMR Costs	$57.7	$76.1	$108.1	$79.9	$86.7

The risks associated with OMR costs were all significant and include:

- Inflation
- Latent defects in material and workmanship
- Delayed rehabilitation
- Higher volumes of trucks than expected (thus resulting in higher maintenance costs).

KPMG

Appendix 1 – Inputs and Outputs for Risk Analysis

Golden Ears Bridge - Risk Assessment of Reference Case

Summary of Risk Analysis - Capital Costs ($ million)

		Total Capital Cost - Risk Adjusted					Non-Risk Adjusted Capital Cost (Note 1)	NPV of Capital Cost - Risk Adjusted				
	Delivery Mode	Minimum	Mean	Maximum	70th Percentile	90th Percentile		Minimum	Mean	Maximum	70th Percentile	90th Percentile
Contract 1	**DBB**	$26.9	$30.5	$35.3	$31.1	$32.3	$25.3	$21.6	$24.4	$28.3	$24.9	$25.8
Contract 2	**DB**	$68.2	$75.4	$85.0	$76.8	$79.7	$65.6	$54.7	$60.4	$68.1	$61.6	$63.9
Contract 3	**DB**	$591.3	$634.9	$705.2	$645.4	$664.9	$568.8	$491.5	$527.4	$585.1	$535.9	$551.8
Contract 4	**DB**	$154.9	$166.8	$183.3	$169.4	$174.5	$148.4	$130.0	$139.9	$153.6	$142.0	$146.2
Contract 5	**DBB**	$12.0	$15.2	$19.4	$15.7	$16.7	$11.1	$9.6	$12.2	$15.7	$12.7	$13.5
Global Risks	**n/a**	$1.8	$10.6	$87.1	$11.8	$17.4	$0.0	$1.5	$8.8	$72.1	$9.8	$14.4
Sub-total (Note 2)		**$855.1**	**$933.4**	**$1,115.3**	**$950.2**	**$985.5**	**$819.2**	**$708.9**	**$773.1**	**$922.9**	**$786.9**	**$815.6**
Fixed Costs		**$181.4**	**$181.4**	**$181.4**	**$181.4**	**$181.4**	**$182.3**	**$180.0**	**$180.0**	**$180.0**	**$180.0**	**$180.0**
Tolling Capital		**$7.3**	**$7.3**	**$7.3**	**$7.3**	**$7.3**	**$7.3**	**$6.0**	**$6.0**	**$6.0**	**$6.0**	**$6.0**
Total with Fixed Costs		**$1,043.8**	**$1,122.1**	**$1,304.0**	**$1,138.9**	**$1,174.2**	**$1,008.8**	**$894.9**	**$959.1**	**$1,108.9**	**$972.9**	**$1,001.6**

Note: These are NPV numbers. Do not compare to the middle column.

Notes:
(1) Based on Reference Case Cost Analysis - Revision J - dated 11/15/2005
(2) Assumes projects proceed independently of each other (no portfolio effect)

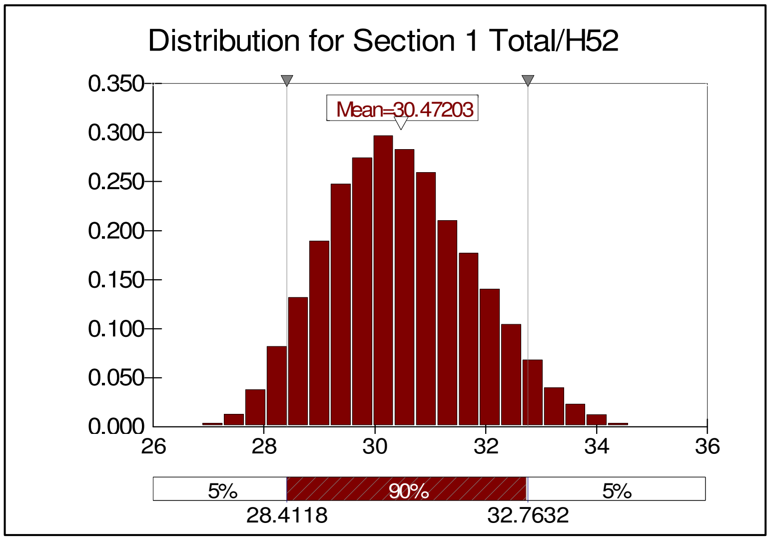
	NPV of OMR Cost - Risk Adjusted				
	Minimum	Mean	Maximum	70th Percentile	90th Percentile
Net Present Value	**$57.7**	**$76.1**	**$108.1**	**$79.9**	**$86.7**

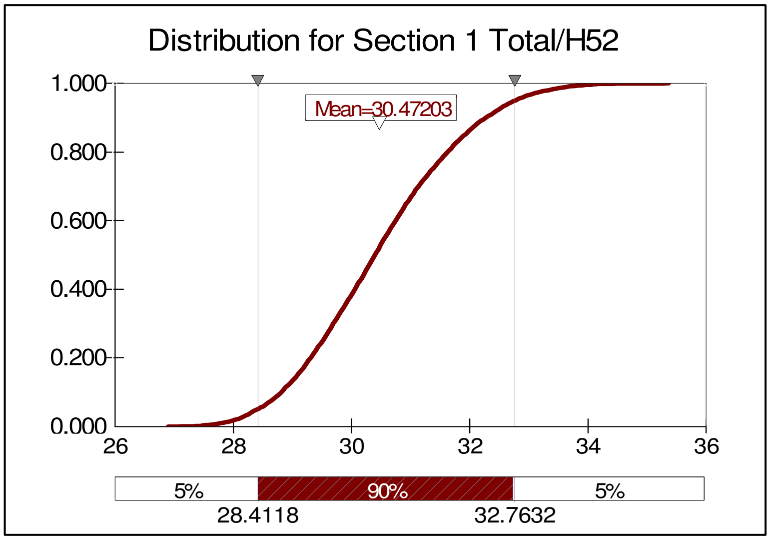
Golden Ears Bridge - Risk Assessment of Reference Case

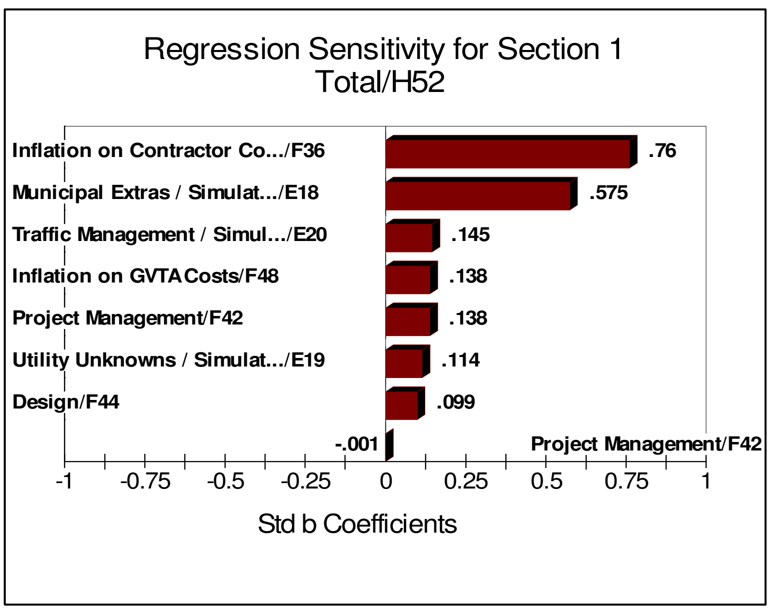
Contract 1 - Southshore Municipal Handover Facilities

	Risk Distribution			Simulation Estimate											
Cash Flow Distribution	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Contractor Construction, PM & RE						100%					28%	48%	24%		
Contractor Bonding and Insurance						0%									
Contractor Design						0%									
GVTA Project Management						100%			7%	27%	27%	27%	13%		
GVTA Design						100%				69%	31%				
GVTA Resident Engineering						100%					28%	48%	24%		
Contractor Costs	**P**	**L**	**O**	**$**	**%**	**Total %**		**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Construction Costs							$ 15.08	$ -	$ -	$ -	$ 4.22	$ 7.24	$ 3.62	$ -	$ -
Risks															
Municipal Extras	$ -	$ 1.0	$ 2.0	1.00			$ 1.00	$ -	$ -	$ -	$ 0.28	$ 0.48	$ 0.24	$ -	$ -
Utility Unknowns	$ -	$ 0.2	$ 0.4	0.20			$ 0.20	$ -	$ -	$ -	$ 0.06	$ 0.10	$ 0.05	$ -	$ -
Traffic Management	$ (0.1)	$ 0.1	$ 0.4	0.13			$ 0.13	$ -	$ -	$ -	$ 0.04	$ 0.06	$ 0.03	$ -	$ -
Risk 4	$ -	$ -	$ -	0.00			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Risk 5	$ -	$ -	$ -	0.00			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Risk 6	$ -	$ -	$ -	0.00			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Risk 7	$ -	$ -	$ -	0.00			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Project Management	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Resident Engineering	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Bonding and Insurance (const., risks & design)	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Design	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contingency (on const. and risks)						15.0%	$ 2.46	$ -	$ -	$ -	$ 0.69	$ 1.18	$ 0.59	$ -	$ -
Inflation on Contractor Costs	5.0%	6.0%	10.0%		7.00%		$ 5.83	$ -	$ -	$ -	$ 1.19	$ 2.82	$ 1.82	$ -	$ -
Total Contractor Costs							**$ 24.70**	**$ -**	**$ -**	**$ -**	**$ 6.47**	**$ 11.88**	**$ 6.35**	**$ -**	**$ -**
GVTA Costs	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Project Management	3.7%	3.7%	7.0%		4.80%		$ 0.91	$ -	$ 0.06	$ 0.24	$ 0.24	$ 0.24	$ 0.12	$ -	$ -
Design	10.0%	10.0%	12.5%		10.83%		$ 2.04	$ -	$ -	$ 1.41	$ 0.63	$ -	$ -	$ -	$ -
Resident Engineering	9.0%	9.0%	9.0%		9.00%		$ 1.70	$ -	$ -	$ -	$ 0.48	$ 0.82	$ 0.41	$ -	$ -
Inflation on GVTA Costs	5.0%	6.0%	10.0%		7.00%		$ 1.09	$ -	$ 0.00	$ 0.24	$ 0.30	$ 0.33	$ 0.21	$ -	$ -
Total GVTA Costs							**$ 5.74**	**$ -**	**$ 0.06**	**$ 1.89**	**$ 1.66**	**$ 1.39**	**$ 0.74**	**$ -**	**$ -**
Total Contractor and GVTA Costs							**$ 30.44**	**$ -**	**$ 0.06**	**$ 1.89**	**$ 8.13**	**$ 13.26**	**$ 7.09**	**$ -**	**$ -**
Net Present Value of Cash Flow							**$ 24.38**	**$ -**	**$ 0.06**	**$ 1.68**	**$ 6.83**	**$ 10.50**	**$ 5.30**	**$ -**	**$ -**

Simulation Results for
Contract 1 Total / H52





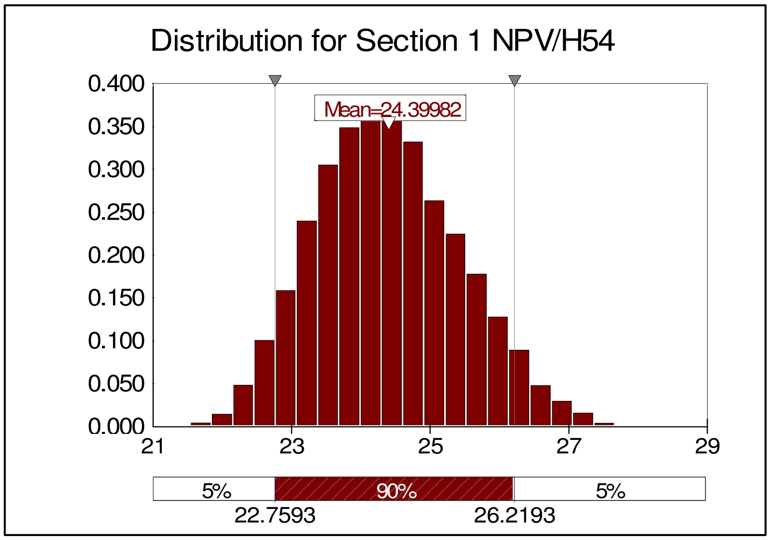


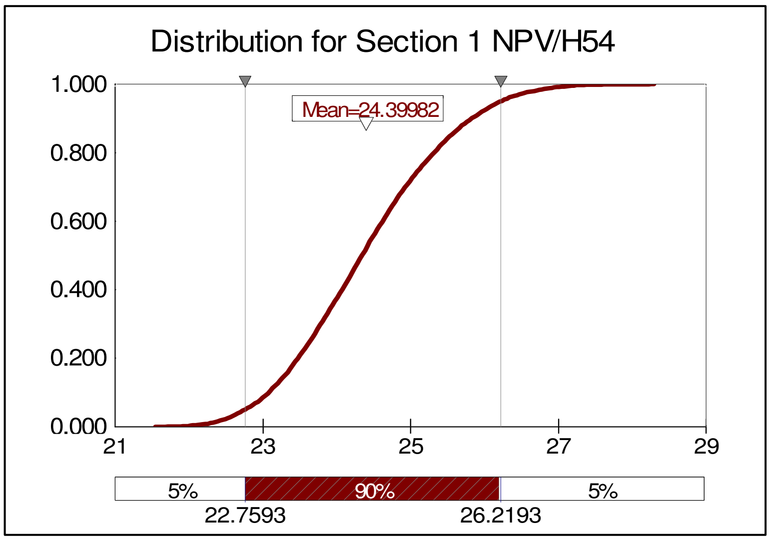
Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 4.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	89
Number of Outputs	15
Sampling Type	Monte Carlo
Simulation Start Time	11/21/2005 9:39
Simulation Stop Time	11/21/2005 9:40
Simulation Duration	00:01:29
Random Seed	185203788

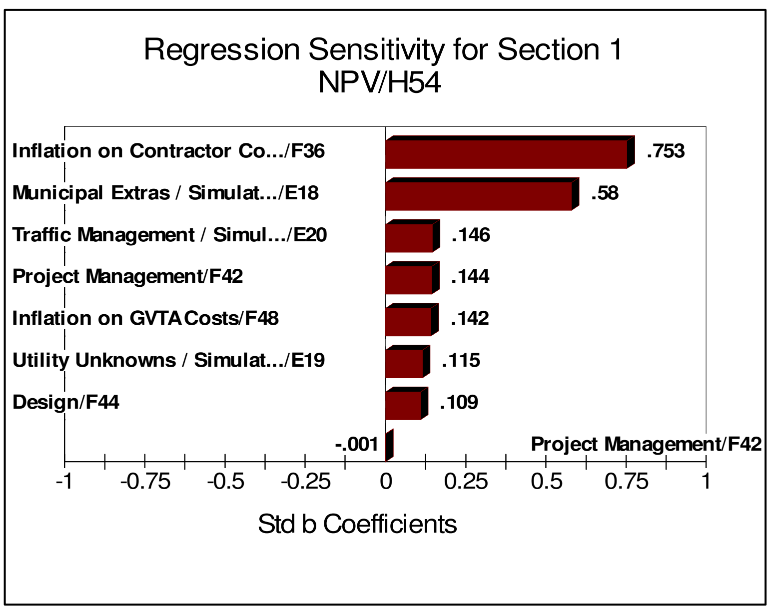
Summary Statistics			
Statistic	**Value**	**%tile**	**Value**
Minimum	$ 26.90	5%	$ 28.41
Maximum	$ 35.37	10%	$ 28.81
Mean	$ 30.47	15%	$ 29.09
Std Dev	$ 1.32	20%	$ 29.31
Variance	1.745069998	25%	$ 29.52
Skewness	0.264112884	30%	$ 29.69
Kurtosis	2.723680376	35%	$ 29.87
Median	$ 30.39	40%	$ 30.05
Mode	$ 28.06	45%	$ 30.23
Left X	$ 28.41	50%	$ 30.39
Left P	5%	55%	$ 30.56
Right X	$ 32.76	60%	$ 30.75
Right P	95%	65%	$ 30.93
Diff X	$ 4.35	70%	$ 31.13
Diff P	90%	75%	$ 31.36
#Errors	0	80%	$ 31.63
Filter Min		85%	$ 31.91
Filter Max		90%	$ 32.27
#Filtered	0	95%	$ 32.76

Sensitivity			
Rank	**Name**	**Regr**	**Corr**
#1	Inflation on Contra	0.760	0.751
#2	Municipal Extras /	0.575	0.573
#3	Traffic Manageme	0.145	0.151
#4	Inflation on GVTA	0.138	0.129
#5	Project Managem	0.138	0.139
#6	Utility Unknowns /	0.114	0.113
#7	Design / F44	0.099	0.096
#8	Project Managem	-0.001	0.005
#9	Risk 4 / Simulatio	0.000	0.000
#10	Risk 5 / Simulatio	0.000	0.000
#11	Risk 6 / Simulatio	0.000	0.000
#12	Risk 7 / Simulatio	0.000	0.000
#13	Project Managem	0.000	0.000
#14	Resident Enginee	0.000	0.000
#15	Bonding and Insu	0.000	0.000
#16	Design / F32	0.000	0.000

Simulation Results for
Contract 1 NPV / H54







Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 4.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	89
Number of Outputs	15
Sampling Type	Monte Carlo
Simulation Start Time	11/21/2005 9:39
Simulation Stop Time	11/21/2005 9:40
Simulation Duration	00:01:29
Random Seed	185203788

Summary Statistics

Statistic	Value	%tile	Value
Minimum	$ 21.55	5%	$ 22.76
Maximum	$ 28.29	10%	$ 23.08
Mean	$ 24.40	15%	$ 23.30
Std Dev	$ 1.05	20%	$ 23.47
Variance	1.101401454	25%	$ 23.64
Skewness	0.258391383	30%	$ 23.78
Kurtosis	2.728192582	35%	$ 23.93
Median	$ 24.34	40%	$ 24.07
Mode	$ 22.94	45%	$ 24.21
Left X	$ 22.76	50%	$ 24.34
Left P	5%	55%	$ 24.47
Right X	$ 26.22	60%	$ 24.62
Right P	95%	65%	$ 24.76
Diff X	$ 3.46	70%	$ 24.92
Diff P	90%	75%	$ 25.11
#Errors	0	80%	$ 25.32
Filter Min		85%	$ 25.54
Filter Max		90%	$ 25.82
#Filtered	0	95%	$ 26.22

Sensitivity

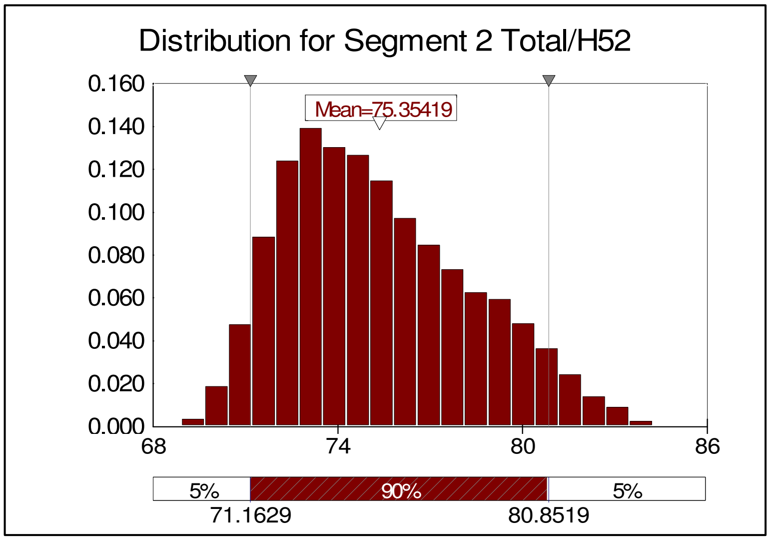
Rank	Name	Regr	Corr
#1	Inflation on Contra	0.753	0.744
#2	Municipal Extras /	0.580	0.577
#3	Traffic Manageme	0.146	0.152
#4	Project Managem	0.144	0.145
#5	Inflation on GVTA	0.142	0.133
#6	Utility Unknowns /	0.115	0.114
#7	Design / F44	0.109	0.106
#8	Project Managem	-0.001	0.005
#9	Risk 4 / Simulatio	0.000	0.000
#10	Risk 5 / Simulatio	0.000	0.000
#11	Risk 6 / Simulatio	0.000	0.000
#12	Risk 7 / Simulatio	0.000	0.000
#13	Project Managem	0.000	0.000
#14	Resident Enginee	0.000	0.000
#15	Bonding and Insu	0.000	0.000
#16	Design / F32	0.000	0.000

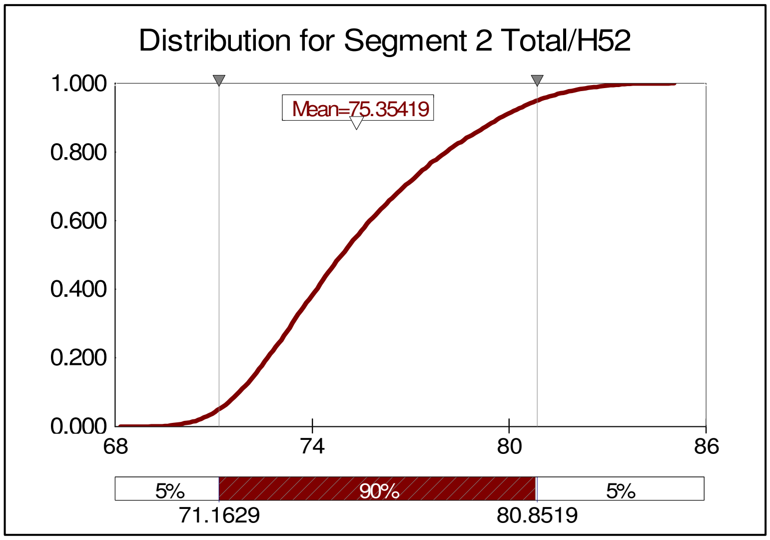
Golden Ears Bridge - Risk Assessment of Reference Case

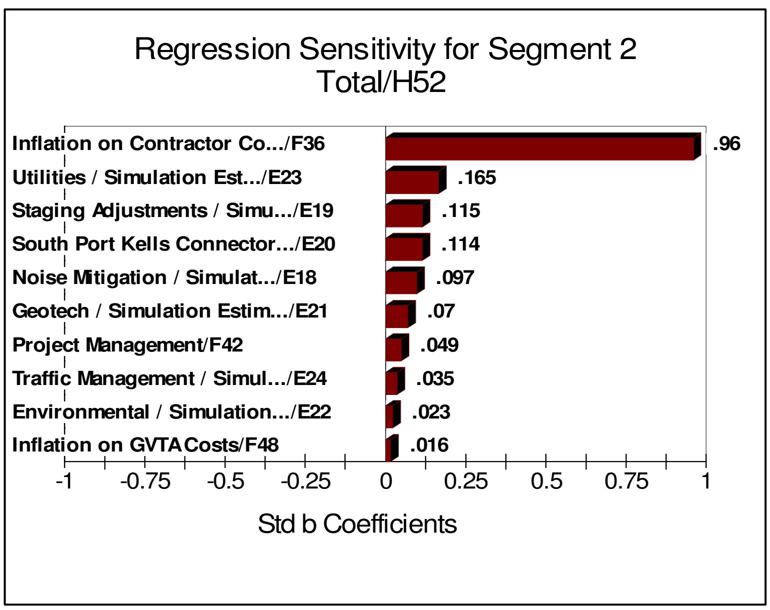
Contract 2 - 176 Street to Telegraph Trail

	Risk Distribution			Simulation Estimate											
Cash Flow Distribution	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Contractor Construction, PM & RE						100%					38%	41%	21%		
Contractor Bonding and Insurance						100%					100%				
Contractor Design						100%				35%	65%				
GVTA Project Management						100%			2%	28%	28%	28%	14%		
GVTA Design						0%									
GVTA Resident Engineering						0%									
Contractor Costs	**P**	**L**	**O**	**$**	**%**	**Total %**		**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Construction Costs							$ 42.56	$ -	$ -	$ -	$ 16.14	$ 17.61	$ 8.81	$ -	$ -
Risks															
Noise Mitigation	$ -	$ 0.6	$ 0.8	$ 0.47			$ 0.47	$ -	$ -	$ -	$ 0.18	$ 0.19	$ 0.10	$ -	$ -
Staging Adjustments	$ -	$ 0.5	$ 1.0	$ 0.50			$ 0.50	$ -	$ -	$ -	$ 0.19	$ 0.21	$ 0.10	$ -	$ -
South Port Kells Connector	$ -	$ 0.5	$ 1.0	$ 0.50			$ 0.50	$ -	$ -	$ -	$ 0.19	$ 0.21	$ 0.10	$ -	$ -
Geotech	$ -	$ 0.2	$ 0.6	$ 0.27			$ 0.27	$ -	$ -	$ -	$ 0.10	$ 0.11	$ 0.06	$ -	$ -
Environmental	$ -	$ 0.1	$ 0.2	$ 0.10			$ 0.10	$ -	$ -	$ -	$ 0.04	$ 0.04	$ 0.02	$ -	$ -
Utilities	$ -	$ 0.1	$ 1.3	$ 0.47			$ 0.47	$ -	$ -	$ -	$ 0.18	$ 0.19	$ 0.10	$ -	$ -
Traffic Management	$ (0.1)	$ -	$ 0.2	$ 0.03			$ 0.03	$ -	$ -	$ -	$ 0.01	$ 0.01	$ 0.01	$ -	$ -
Project Management	3.5%	3.5%	3.5%		3.50%		$ 1.57	$ -	$ -	$ -	$ 0.60	$ 0.65	$ 0.33	$ -	$ -
Resident Engineering	6.0%	6.0%	6.0%		6.00%		$ 2.69	$ -	$ -	$ -	$ 1.02	$ 1.11	$ 0.56	$ -	$ -
Bonding and Insurance (const., risks & design)	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Design	5.8%	5.8%	5.8%		5.75%		$ 2.58	$ -	$ -	$ 0.90	$ 1.68	$ -	$ -	$ -	$ -
Contingency (on const. and risks)						12.0%	$ 5.39	$ -	$ -	$ -	$ 2.04	$ 2.23	$ 1.11	$ -	$ -
Inflation on Contractor Costs	5.0%	6.0%	10.0%		7.00%		$ 16.72	$ -	$ -	$ 0.13	$ 5.03	$ 7.01	$ 4.54	$ -	$ -
Total Contractor Costs							**$ 73.85**	**$ -**	**$ -**	**$ 1.03**	**$ 27.40**	**$ 29.59**	**$ 15.83**	**$ -**	**$ -**
GVTA Costs	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Project Management	2.0%	2.0%	3.0%		2.33%		$ 1.17	$ -	$ 0.03	$ 0.33	$ 0.33	$ 0.33	$ 0.16	$ -	$ -
Design	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Resident Engineering	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Inflation on GVTA Costs	5.0%	6.0%	10.0%		7.00%		$ 0.29	$ -	$ 0.00	$ 0.05	$ 0.07	$ 0.10	$ 0.07	$ -	$ -
Total GVTA Costs							**$ 1.46**	**$ -**	**$ 0.03**	**$ 0.37**	**$ 0.40**	**$ 0.43**	**$ 0.23**	**$ -**	**$ -**
Total Contractor and GVTA Costs							**$ 75.31**	**$ -**	**$ 0.03**	**$ 1.41**	**$ 27.80**	**$ 30.01**	**$ 16.06**	**$ -**	**$ -**
Net Present Value of Cash Flow							**$ 60.40**	**$ -**	**$ 0.03**	**$ 1.25**	**$ 23.34**	**$ 23.77**	**$ 12.00**	**$ -**	**$ -**

Simulation Results for
Contract 2 Total / H52







Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 4.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	89
Number of Outputs	15
Sampling Type	Monte Carlo
Simulation Start Time	11/21/2005 9:39
Simulation Stop Time	11/21/2005 9:40
Simulation Duration	00:01:29
Random Seed	185203788

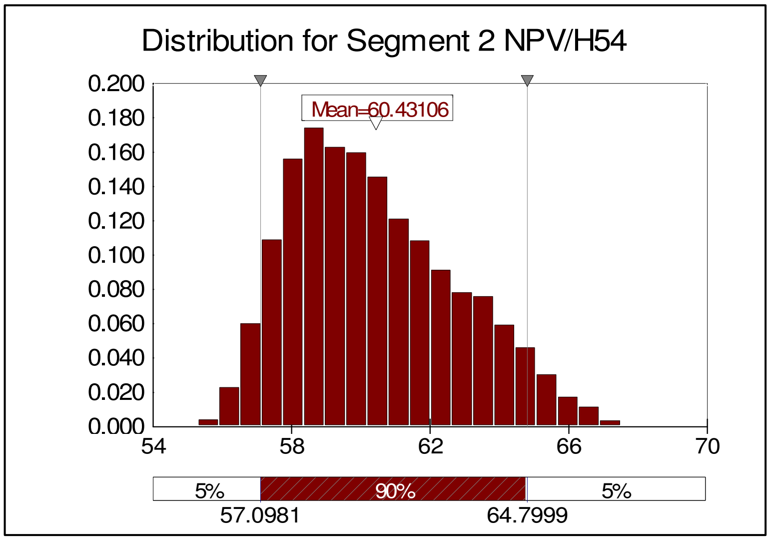
Summary Statistics

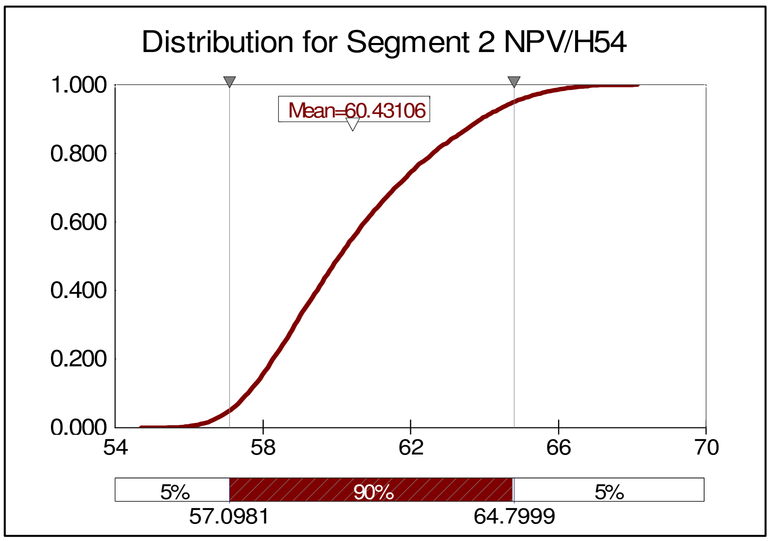
Statistic	Value	%tile	Value
Minimum	$ 68.17	5%	$ 71.16
Maximum	$ 85.02	10%	$ 71.77
Mean	$ 75.35	15%	$ 72.26
Std Dev	$ 3.00	20%	$ 72.64
Variance	8.977347914	25%	$ 73.04
Skewness	0.488166787	30%	$ 73.38
Kurtosis	2.54288334	35%	$ 73.75
Median	$ 74.90	40%	$ 74.13
Mode	$ 69.74	45%	$ 74.51
Left X	$ 71.16	50%	$ 74.90
Left P	5%	55%	$ 75.32
Right X	$ 80.85	60%	$ 75.76
Right P	95%	65%	$ 76.26
Diff X	$ 9.69	70%	$ 76.81
Diff P	90%	75%	$ 77.40
#Errors	0	80%	$ 78.09
Filter Min		85%	$ 78.88
Filter Max		90%	$ 79.74
#Filtered	0	95%	$ 80.85

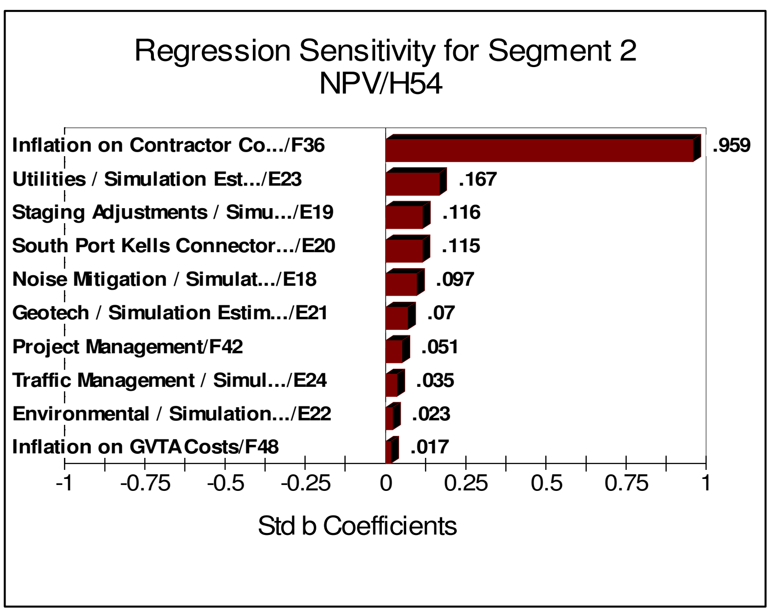
Sensitivity

Rank	Name	Regr	Corr
#1	Inflation on Contra	0.960	0.960
#2	Utilities / Simulati	0.165	0.183
#3	Staging Adjustme	0.115	0.111
#4	South Port Kells C	0.114	0.106
#5	Noise Mitigation /	0.097	0.093
#6	Geotech / Simula	0.070	0.071
#7	Project Managem	0.049	0.058
#8	Traffic Manageme	0.035	0.028
#9	Environmental / S	0.023	0.028
#10	Inflation on GVTA	0.016	0.033
#11	Utility Unknowns /	0.000	0.012
#12	Material (Latent) D	0.000	0.009
#13	Inflation on Contra	0.000	-0.005
#14	Delayed Rehabilit	0.000	0.003
#15	Municipal Extras /	0.000	0.004
#16	Traffic Manageme	0.000	-0.006

Simulation Results for
Contract 2 NPV / H54







Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 4.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	89
Number of Outputs	15
Sampling Type	Monte Carlo
Simulation Start Time	11/21/2005 9:39
Simulation Stop Time	11/21/2005 9:40
Simulation Duration	00:01:29
Random Seed	185203788

Summary Statistics			
Statistic	**Value**	**%tile**	**Value**
Minimum	$ 54.70	5%	$ 57.10
Maximum	$ 68.13	10%	$ 57.58
Mean	$ 60.43	15%	$ 57.97
Std Dev	$ 2.38	20%	$ 58.27
Variance	5.669418514	25%	$ 58.59
Skewness	0.48652014	30%	$ 58.87
Kurtosis	2.543401358	35%	$ 59.15
Median	$ 60.07	40%	$ 59.46
Mode	$ 57.70	45%	$ 59.76
Left X	$ 57.10	50%	$ 60.07
Left P	5%	55%	$ 60.41
Right X	$ 64.80	60%	$ 60.76
Right P	95%	65%	$ 61.16
Diff X	$ 7.70	70%	$ 61.58
Diff P	90%	75%	$ 62.06
#Errors	0	80%	$ 62.60
Filter Min		85%	$ 63.24
Filter Max		90%	$ 63.91
#Filtered	0	95%	$ 64.80

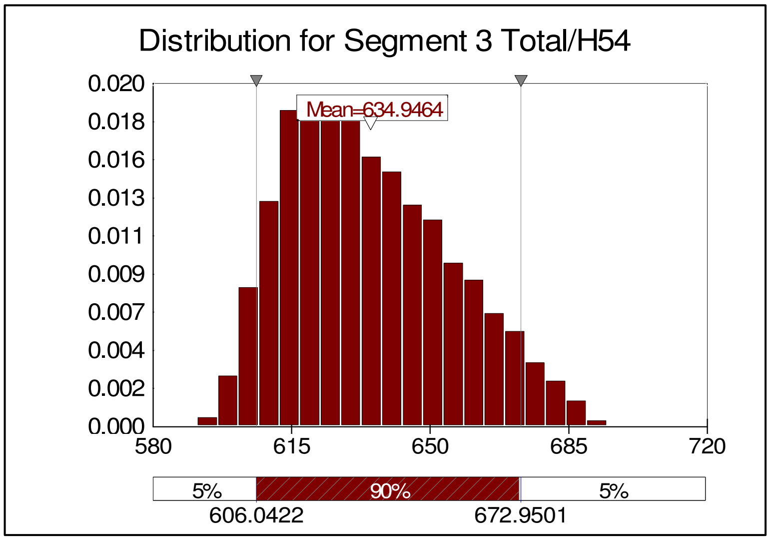
Sensitivity			
Rank	**Name**	**Regr**	**Corr**
#1	Inflation on Contra	0.959	0.959
#2	Utilities / Simulati	0.167	0.184
#3	Staging Adjustme	0.116	0.112
#4	South Port Kells C	0.115	0.107
#5	Noise Mitigation /	0.097	0.093
#6	Geotech / Simula	0.070	0.072
#7	Project Managem	0.051	0.060
#8	Traffic Manageme	0.035	0.029
#9	Environmental / S	0.023	0.028
#10	Inflation on GVTA	0.017	0.034
#11	Utility Unknowns /	0.000	0.012
#12	Material (Latent) I	0.000	0.009
#13	Inflation on Contra	0.000	-0.005
#14	Delayed Rehabilit	0.000	0.003
#15	Municipal Extras /	0.000	0.004
#16	Traffic Manageme	0.000	-0.006

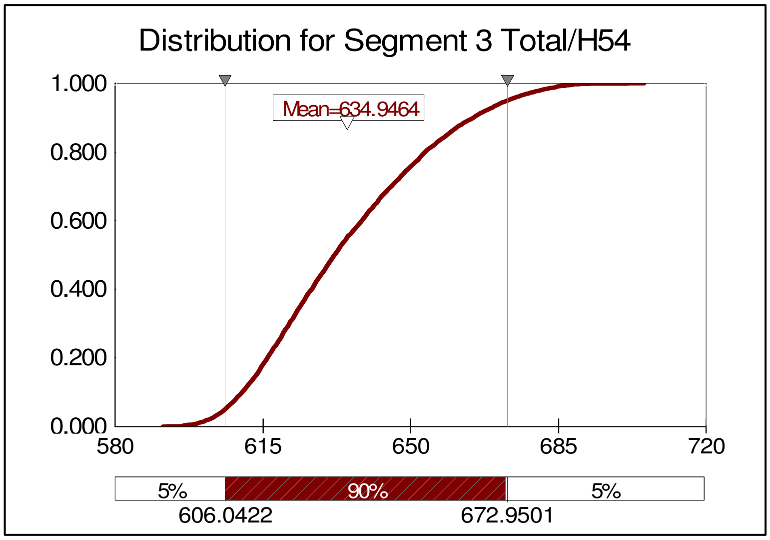
Golden Ears Bridge - Risk Assessment of Reference Case

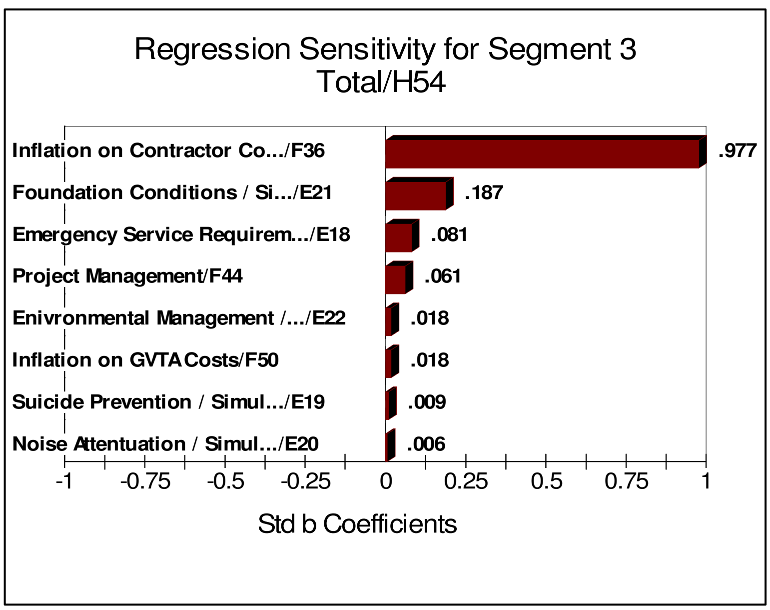
Contract 3 - Fraser River Crossing

	Risk Distribution			Simulation Estimate											
Cash Flow Distribution	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Contractor Construction, PM & RE						100%				17%	51%	26%	6%		
Contractor Bonding and Insurance						100%				100%					
Contractor Design						100%			35%	11%	33%	17%	4%		
GVTA Project Management						100%			22%	22%	22%	22%	11%		
GVTA Design						0%									
GVTA Resident Engineering						0%									
Contractor Costs	**P**	**L**	**O**	**$**	**%**	**Total %**		**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Construction Costs							$ 391.95	$ -	$ -	$ 66.63	$ 199.89	$ 101.91	$ 23.52	$ -	$ -
Risks															
Emergency Service Requirements	$ -	$ 1.6	$ 5.0	$ 2.20			$ 2.20	$ -	$ -	$ 0.37	$ 1.12	$ 0.57	$ 0.13	$ -	$ -
Suicide Prevention	$ -	$ -	$ 0.5	$ 0.17			$ 0.17	$ -	$ -	$ 0.03	$ 0.09	$ 0.04	$ 0.01	$ -	$ -
Noise Attentuation	$ -	$ -	$ 0.3	$ 0.10			$ 0.10	$ -	$ -	$ 0.02	$ 0.05	$ 0.03	$ 0.01	$ -	$ -
Foundation Conditions	$ (7.5)	$ (4.0)	$ 4.0	$ (2.50)			$ (2.50)	$ -	$ -	$ (0.43)	$ (1.28)	$ (0.65)	$ (0.15)	$ -	$ -
Enivronmental Management	$ -	$ -	$ 1.0	$ 0.33			$ 0.33	$ -	$ -	$ 0.06	$ 0.17	$ 0.09	$ 0.02	$ -	$ -
Risk 6	$ -	$ -	$ -	$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Risk 7	$ -	$ -	$ -	$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Project Management	3.5%	3.5%	3.5%		3.50%		$ 13.73	$ -	$ -	$ 2.33	$ 7.00	$ 3.57	$ 0.82	$ -	$ -
Resident Engineering	6.0%	6.0%	6.0%		6.00%		$ 23.54	$ -	$ -	$ 4.00	$ 12.00	$ 6.12	$ 1.41	$ -	$ -
Bonding and Insurance (const., risks & design)	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Design	5.8%	5.8%	5.8%		5.75%		$ 22.55	$ -	$ 7.89	$ 2.48	$ 7.44	$ 3.83	$ 0.90	$ -	$ -
Contingency (on const. and risks)						12.0%	$ 47.07	$ -	$ -	$ 8.00	$ 24.01	$ 12.24	$ 2.82	$ -	$ -
Inflation on Contractor Costs	5.0%	6.0%	10.0%		7.00%		$ 120.60	$ -	$ 0.55	$ 12.10	$ 56.37	$ 39.70	$ 11.87	$ -	$ -
Total Contractor Costs							**$ 619.74**	**$ -**	**$ 8.45**	**$ 95.60**	**$ 306.87**	**$ 167.45**	**$ 41.37**	**$ -**	**$ -**
GVTA Costs	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Honorarium							$ 2.40	$ -	$ 2.40	$ -	$ -	$ -	$ -	$ -	$ -
Project Management	2.0%	2.0%	3.0%		2.33%		$ 10.25	$ -	$ 2.28	$ 2.28	$ 2.28	$ 2.28	$ 1.14	$ -	$ -
Design	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Resident Engineering	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Inflation on GVTA Costs	5.0%	6.0%	10.0%		7.00%		$ 2.17	$ -	$ 0.16	$ 0.33	$ 0.51	$ 0.71	$ 0.46	$ -	$ -
Total GVTA Costs							**$ 14.82**	**$ -**	**$ 4.84**	**$ 2.61**	**$ 2.79**	**$ 2.99**	**$ 1.60**	**$ -**	**$ -**
Total Contractor and GVTA Costs							**$ 634.56**	**$ -**	**$ 13.28**	**$ 98.21**	**$ 309.66**	**$ 170.43**	**$ 42.97**	**$ -**	**$ -**
Net Present Value of Cash Flow							**$ 527.05**	**$ -**	**$ 12.53**	**$ 87.40**	**$ 260.00**	**$ 135.00**	**$ 32.11**	**$ -**	**$ -**

Simulation Results for
Contract 3 Total / H54







Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 4.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	89
Number of Outputs	15
Sampling Type	Monte Carlo
Simulation Start Time	11/21/2005 9:39
Simulation Stop Time	11/21/2005 9:40
Simulation Duration	00:01:29
Random Seed	185203788

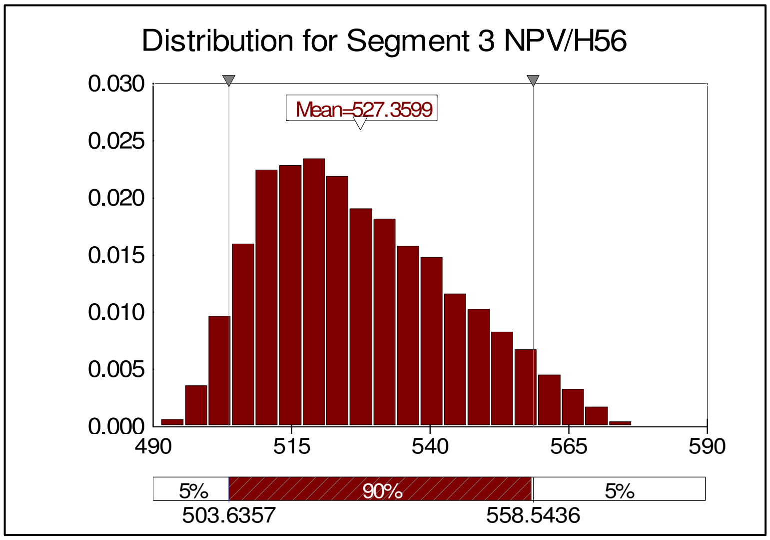
Summary Statistics

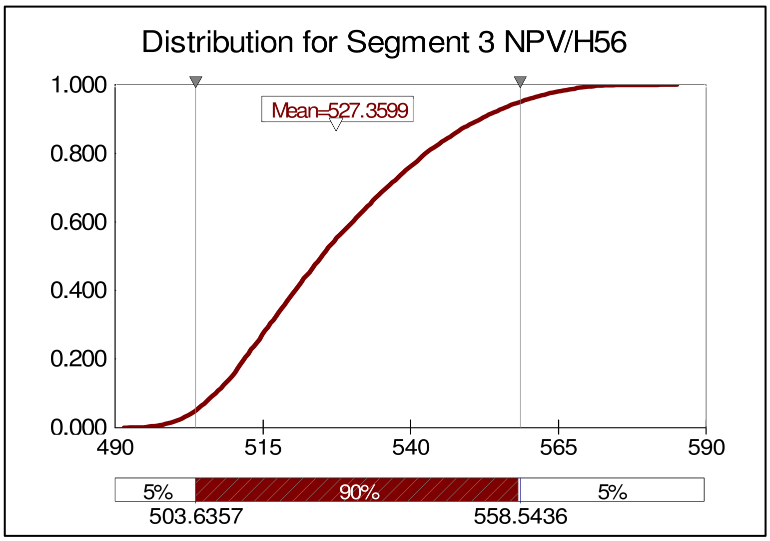
Statistic	Value	%tile	Value
Minimum	$ 591.33	5%	$ 606.04
Maximum	$ 705.23	10%	$ 610.06
Mean	$ 634.95	15%	$ 613.43
Std Dev	$ 20.60	20%	$ 616.10
Variance	424.3792757	25%	$ 618.81
Skewness	0.469544522	30%	$ 621.28
Kurtosis	2.510264344	35%	$ 623.84
Median	$ 631.98	40%	$ 626.52
Mode	$ 602.76	45%	$ 629.29
Left X	$ 606.04	50%	$ 631.98
Left P	5%	55%	$ 634.95
Right X	$ 672.95	60%	$ 638.36
Right P	95%	65%	$ 641.71
Diff X	$ 66.91	70%	$ 645.39
Diff P	90%	75%	$ 649.28
#Errors	0	80%	$ 653.45
Filter Min		85%	$ 658.70
Filter Max		90%	$ 664.86
#Filtered	0	95%	$ 672.95

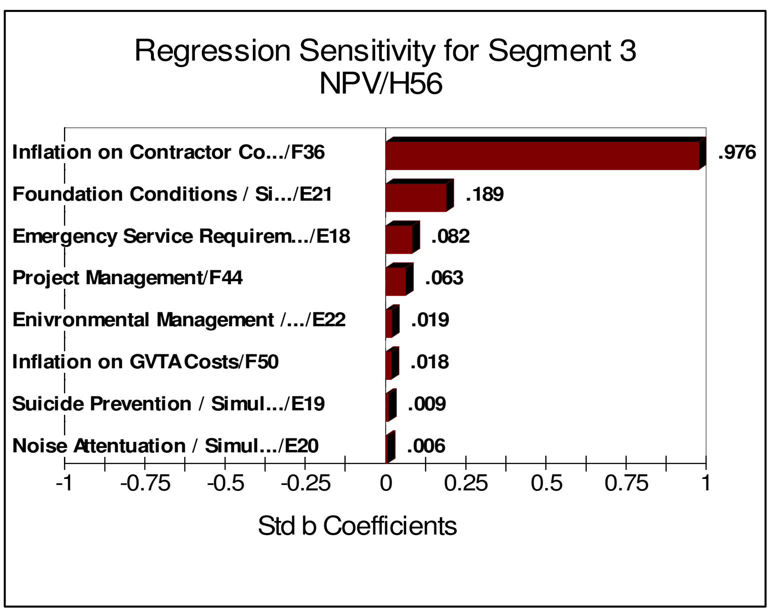
Sensitivity

Rank	Name	Regr	Corr
#1	Inflation on Contra	0.977	0.975
#2	Foundation Condi	0.187	0.168
#3	Emergency Servic	0.081	0.087
#4	Project Managem	0.061	0.080
#5	Enivronmental Ma	0.018	0.007
#6	Inflation on GVTA	0.018	0.029
#7	Suicide Preventio	0.009	0.007
#8	Noise Attentuatio	0.006	-0.022
#9	Archaeological Fi	0.000	0.013
#10	Inflation on GVTA	0.000	0.017
#11	Project Managem	0.000	-0.014
#12	Noise Mitigation /	0.000	0.005
#13	Environmental / S	0.000	0.010
#14	Inflation on GVTA	0.000	-0.001
#15	Inflation on GVTA	0.000	-0.012
#16	Municipal Extras /	0.000	0.009

Simulation Results for
Contract 3 NPV / H56







Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 4.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	89
Number of Outputs	15
Sampling Type	Monte Carlo
Simulation Start Time	11/21/2005 9:39
Simulation Stop Time	11/21/2005 9:40
Simulation Duration	00:01:29
Random Seed	185203788

Summary Statistics

Statistic	Value	%tile	Value
Minimum	$ 491.52	5%	$ 503.64
Maximum	$ 585.05	10%	$ 506.96
Mean	$ 527.36	15%	$ 509.73
Std Dev	$ 16.89	20%	$ 511.89
Variance	285.2634729	25%	$ 514.16
Skewness	0.468225377	30%	$ 516.14
Kurtosis	2.511024215	35%	$ 518.27
Median	$ 524.95	40%	$ 520.44
Mode	$ 506.64	45%	$ 522.71
Left X	$ 503.64	50%	$ 524.95
Left P	5%	55%	$ 527.35
Right X	$ 558.54	60%	$ 530.16
Right P	95%	65%	$ 532.90
Diff X	$ 54.91	70%	$ 535.90
Diff P	90%	75%	$ 539.14
#Errors	0	80%	$ 542.52
Filter Min		85%	$ 546.84
Filter Max		90%	$ 551.82
#Filtered	0	95%	$ 558.54

Sensitivity

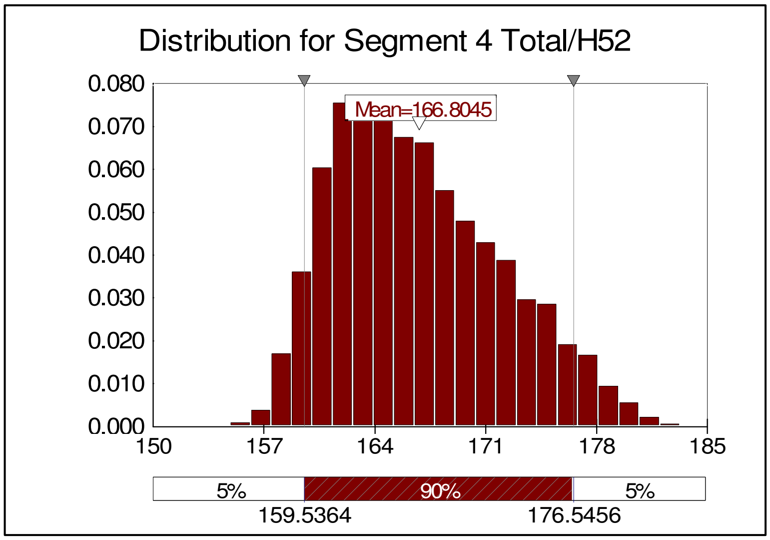
Rank	Name	Regr	Corr
#1	Inflation on Contra	0.976	0.974
#2	Foundation Condi	0.189	0.170
#3	Emergency Servi	0.082	0.088
#4	Project Managem	0.063	0.082
#5	Enivronmental Ma	0.019	0.007
#6	Inflation on GVTA	0.018	0.029
#7	Suicide Preventio	0.009	0.007
#8	Noise Attentuatio	0.006	-0.022
#9	Archaeological Fi	0.000	0.013
#10	Inflation on GVTA	0.000	0.017
#11	Project Managem	0.000	-0.014
#12	Noise Mitigation /	0.000	0.005
#13	Environmental / S	0.000	0.010
#14	Inflation on GVTA	0.000	-0.001
#15	Inflation on GVTA	0.000	-0.012
#16	Municipal Extras /	0.000	0.009

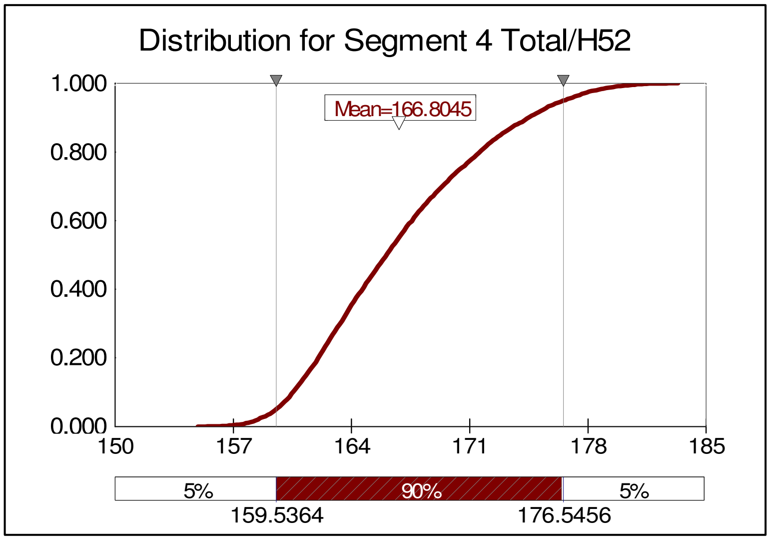
Golden Ears Bridge - Risk Assessment of Reference Case

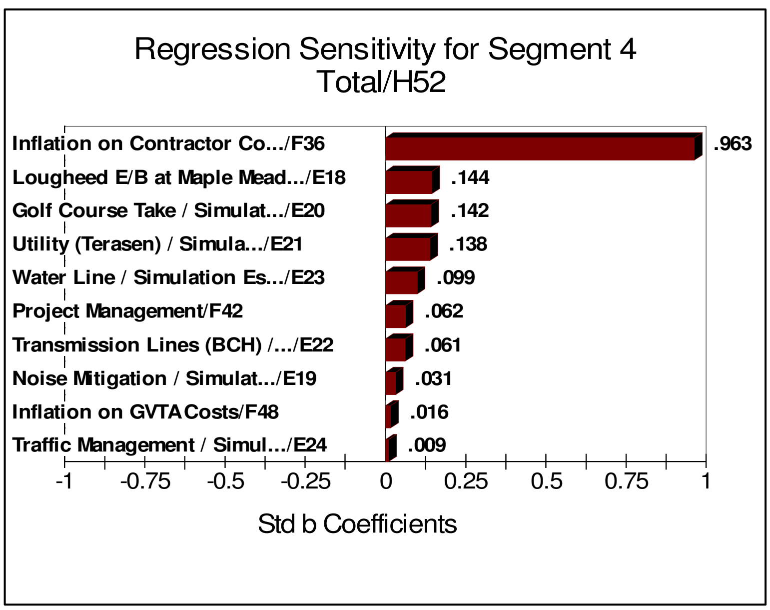
Contract 4 - 113B Avenue to Lougheed Highway

	Risk Distribution			Simulation Estimate											
Cash Flow Distribution	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Contractor Construction, PM & RE						100%				27%	40%	33%			
Contractor Bonding and Insurance						100%				100%					
Contractor Design						100%			26%	74%					
GVTA Project Management						100%			23%	27%	27%	23%			
GVTA Design						0%									
GVTA Resident Engineering						0%									
Contractor Costs	**P**	**L**	**O**	**$**	**%**	**Total %**		**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Construction Costs							$ 102.02	$ -	$ -	$ 27.21	$ 40.81	$ 34.01	$ -	$ -	$ -
Risks															
Lougheed E/B at Maple Meadows	$ -	$ -	$ 2.0	$ 0.67			$ 0.67	$ -	$ -	$ 0.18	$ 0.27	$ 0.22	$ -	$ -	$ -
Noise Mitigation	$ -	$ 0.3	$ 0.5	$ 0.25			$ 0.25	$ -	$ -	$ 0.07	$ 0.10	$ 0.08	$ -	$ -	$ -
Golf Course Take	$ (1.0)	$ 1.0	$ 1.0	$ 0.33			$ 0.33	$ -	$ -	$ 0.09	$ 0.13	$ 0.11	$ -	$ -	$ -
Utility (Terasen)	$ (0.2)	$ 0.5	$ 2.0	$ 0.77			$ 0.77	$ -	$ -	$ 0.20	$ 0.31	$ 0.26	$ -	$ -	$ -
Transmission Lines (BCH)	$ (0.5)	$ -	$ 0.5	$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Water Line	$ -	$ 0.3	$ 1.5	$ 0.58			$ 0.58	$ -	$ -	$ 0.16	$ 0.23	$ 0.19	$ -	$ -	$ -
Traffic Management	$ -	$ 0.1	$ 0.2	$ 0.07			$ 0.07	$ -	$ -	$ 0.02	$ 0.03	$ 0.02	$ -	$ -	$ -
Project Management	3.5%	3.5%	3.5%		3.50%		$ 3.66	$ -	$ -	$ 0.98	$ 1.47	$ 1.22	$ -	$ -	$ -
Resident Engineering	6.0%	6.0%	6.0%		6.00%		$ 6.28	$ -	$ -	$ 1.67	$ 2.51	$ 2.09	$ -	$ -	$ -
Bonding and Insurance (const., risks & design)	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Design	5.8%	5.8%	5.8%		5.75%		$ 6.02	$ -	$ 1.58	$ 4.44	$ -	$ -	$ -	$ -	$ -
Contingency (on const. and risks)						12.0%	$ 12.56	$ -	$ -	$ 3.35	$ 5.02	$ 4.19	$ -	$ -	$ -
Inflation on Contractor Costs	5.0%	6.0%	10.0%		7.00%		$ 30.30	$ -	$ 0.11	$ 5.56	$ 11.45	$ 13.18	$ -	$ -	$ -
Total Contractor Costs							**$ 163.51**	**$ -**	**$ 1.69**	**$ 43.92**	**$ 62.33**	**$ 55.58**	**$ -**	**$ -**	**$ -**
GVTA Costs	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Project Management	2.0%	2.0%	3.0%		2.33%		$ 2.74	$ -	$ 0.62	$ 0.75	$ 0.75	$ 0.62	$ -	$ -	$ -
Design	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Resident Engineering	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Inflation on GVTA Costs	5.0%	6.0%	10.0%		7.00%		$ 0.51	$ -	$ 0.04	$ 0.11	$ 0.17	$ 0.19	$ -	$ -	$ -
Total GVTA Costs							**$ 3.25**	**$ -**	**$ 0.67**	**$ 0.85**	**$ 0.91**	**$ 0.82**	**$ -**	**$ -**	**$ -**
Total Contractor and GVTA Costs							**$ 166.76**	**$ -**	**$ 2.36**	**$ 44.77**	**$ 63.24**	**$ 56.39**	**$ -**	**$ -**	**$ -**
Net Present Value of Cash Flow							**$ 139.83**	**$ -**	**$ 2.22**	**$ 39.85**	**$ 53.10**	**$ 44.67**	**$ -**	**$ -**	**$ -**

Simulation Results for
Contract 4 Total / H52







Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 4.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	89
Number of Outputs	15
Sampling Type	Monte Carlo
Simulation Start Time	11/21/2005 9:39
Simulation Stop Time	11/21/2005 9:40
Simulation Duration	00:01:29
Random Seed	185203788

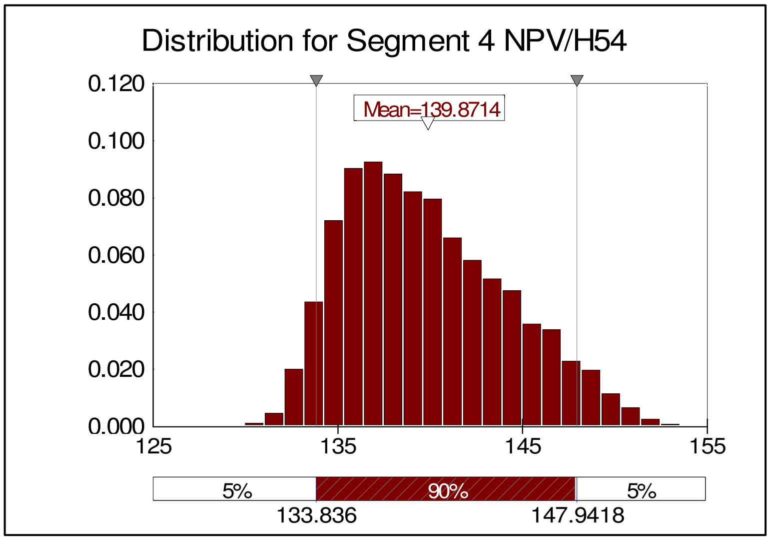
Summary Statistics

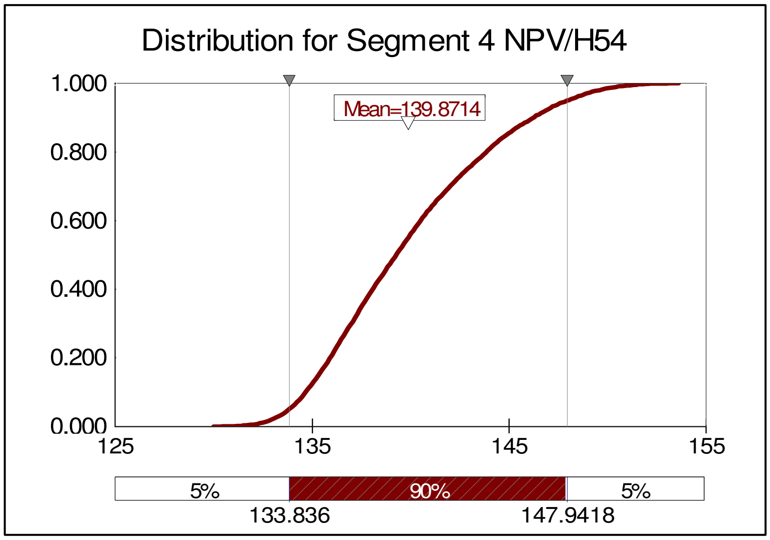
Statistic	Value	%tile	Value
Minimum	$ 154.91	5%	$ 159.54
Maximum	$ 183.33	10%	$ 160.54
Mean	$ 166.80	15%	$ 161.32
Std Dev	$ 5.25	20%	$ 162.02
Variance	27.60577082	25%	$ 162.66
Skewness	0.493552136	30%	$ 163.32
Kurtosis	2.547486844	35%	$ 163.96
Median	$ 166.07	40%	$ 164.65
Mode	$ 158.91	45%	$ 165.33
Left X	$ 159.54	50%	$ 166.07
Left P	5%	55%	$ 166.81
Right X	$ 176.55	60%	$ 167.58
Right P	95%	65%	$ 168.40
Diff X	$ 17.01	70%	$ 169.37
Diff P	90%	75%	$ 170.41
#Errors	0	80%	$ 171.59
Filter Min		85%	$ 172.84
Filter Max		90%	$ 174.48
#Filtered	0	95%	$ 176.55

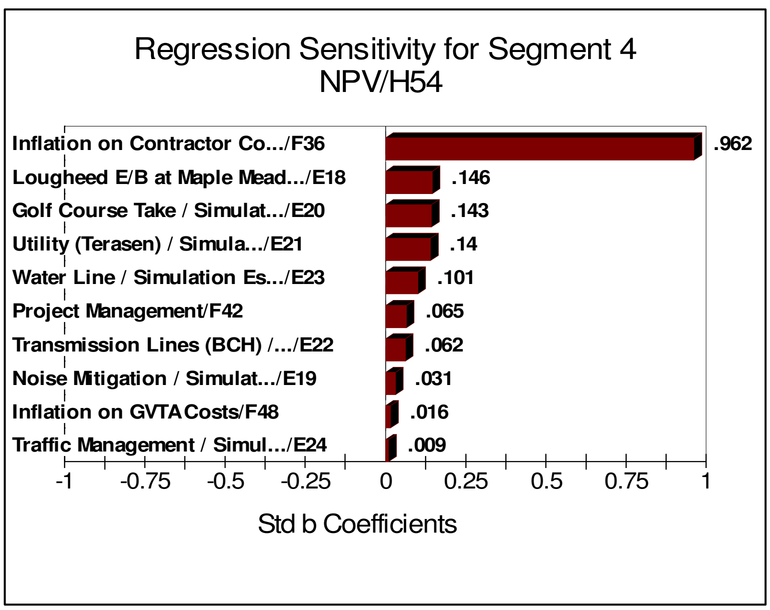
Sensitivity

Rank	Name	Regr	Corr
#1	Inflation on Contra	0.963	0.956
#2	Lougheed E/B at	0.144	0.130
#3	Golf Course Take	0.142	0.125
#4	Utility (Terasen) /	0.138	0.139
#5	Water Line / Simu	0.099	0.089
#6	Project Managem	0.062	0.066
#7	Transmission Line	0.061	0.069
#8	Noise Mitigation /	0.031	0.016
#9	Inflation on GVTA	0.016	0.003
#10	Traffic Manageme	0.009	0.021
#11	Inflation on GVTA	0.000	-0.018
#12	Geotech / Simula	0.000	0.007
#13	Municipal Extras /	0.000	-0.008
#14	Utility Unknowns /	0.000	-0.004
#15	Traffic Manageme	0.000	-0.005
#16	Risk 4 / Simulatio	0.000	0.000

Simulation Results for
Contract 4 NPV / H54







Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 4.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	89
Number of Outputs	15
Sampling Type	Monte Carlo
Simulation Start Time	11/21/2005 9:39
Simulation Stop Time	11/21/2005 9:40
Simulation Duration	00:01:29
Random Seed	185203788

Summary Statistics

Statistic	Value	%tile	Value
Minimum	$ 129.99	5%	$ 133.84
Maximum	$ 153.59	10%	$ 134.68
Mean	$ 139.87	15%	$ 135.33
Std Dev	$ 4.35	20%	$ 135.91
Variance	18.9495371	25%	$ 136.43
Skewness	0.491470921	30%	$ 136.99
Kurtosis	2.548832664	35%	$ 137.52
Median	$ 139.27	40%	$ 138.08
Mode	$ 134.16	45%	$ 138.65
Left X	$ 133.84	50%	$ 139.27
Left P	5%	55%	$ 139.88
Right X	$ 147.94	60%	$ 140.52
Right P	95%	65%	$ 141.20
Diff X	$ 14.11	70%	$ 141.99
Diff P	90%	75%	$ 142.87
#Errors	0	80%	$ 143.84
Filter Min		85%	$ 144.88
Filter Max		90%	$ 146.23
#Filtered	0	95%	$ 147.94

Sensitivity

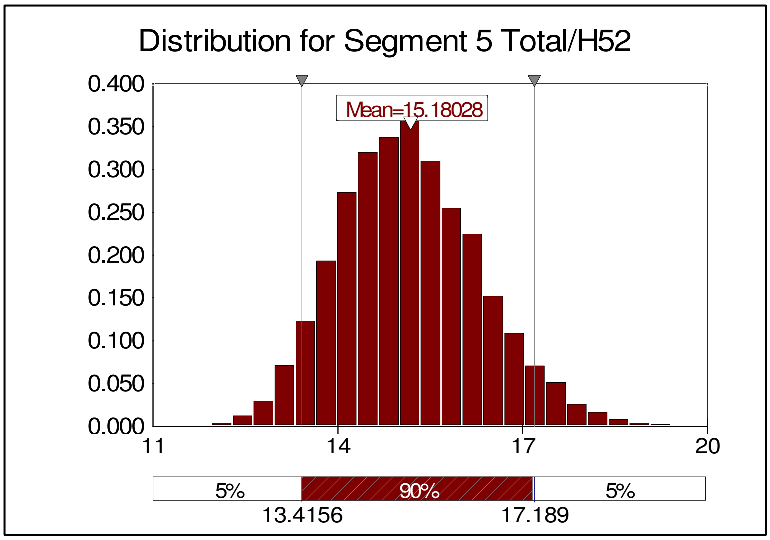
Rank	Name	Regr	Corr
#1	Inflation on Contra	0.962	0.955
#2	Lougheed E/B at	0.146	0.131
#3	Golf Course Take	0.143	0.126
#4	Utility (Terasen) /	0.140	0.141
#5	Water Line / Simu	0.101	0.090
#6	Project Managem	0.065	0.068
#7	Transmission Line	0.062	0.069
#8	Noise Mitigation /	0.031	0.016
#9	Inflation on GVTA	0.016	0.003
#10	Traffic Manageme	0.009	0.021
#11	Inflation on GVTA	0.000	-0.018
#12	Geotech / Simula	0.000	0.007
#13	Municipal Extras /	0.000	-0.008
#14	Utility Unknowns /	0.000	-0.004
#15	Traffic Manageme	0.000	-0.005
#16	Risk 4 / Simulatio	0.000	0.000

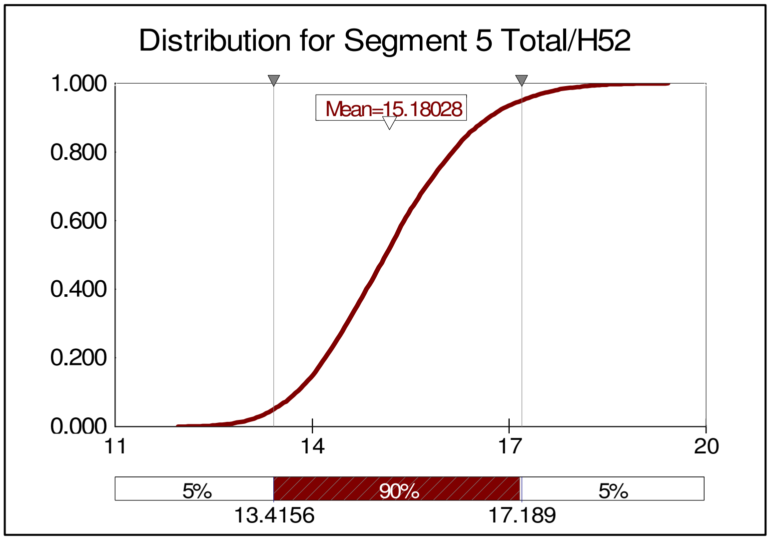
Golden Ears Bridge - Risk Assessment of Reference Case

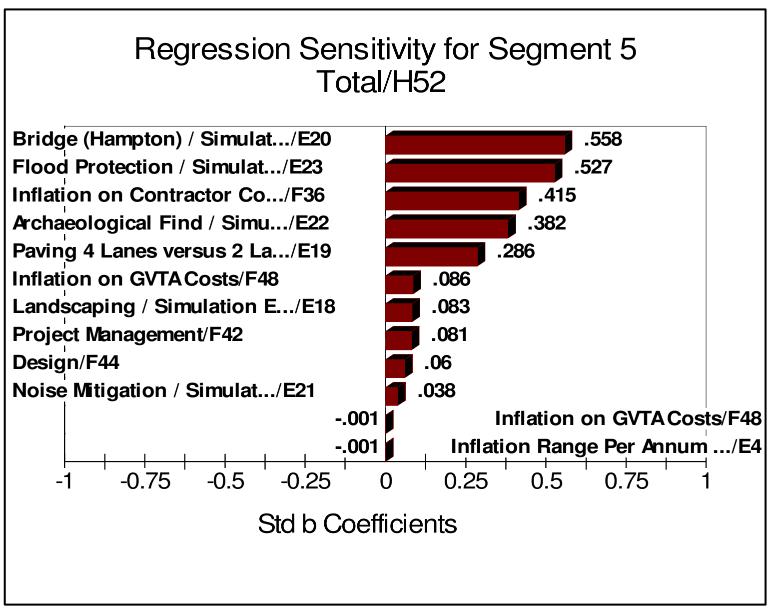
Contract 5 - Abernathy Connector

	Risk Distribution			Simulation Estimate											
Cash Flow Distribution	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Contractor Construction, PM & RE						100%					21%	79%			
Contractor Bonding and Insurance						0%									
Contractor Design						0%									
GVTA Project Management						100%				23%	40%	37%			
GVTA Design						100%				4%	96%				
GVTA Resident Engineering						100%					21%	79%			
Contractor Costs	**P**	**L**	**O**	**$**	**%**	**Total %**		**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Construction Costs							$ 6.61	$ -	$ -	$ -	$ 1.42	$ 5.19	$ -	$ -	$ -
Risks															
Landscaping	$ -	$ 0.1	$ 0.3	$ 0.12			$ 0.12	$ -	$ -	$ -	$ 0.03	$ 0.09	$ -	$ -	$ -
Paving 4 Lanes versus 2 Lanes	$ -	$ -	$ 0.8	$ 0.25			$ 0.25	$ -	$ -	$ -	$ 0.05	$ 0.20	$ -	$ -	$ -
Bridge (Hampton)	$ (0.4)	$ -	$ 1.3	$ 0.30			$ 0.30	$ -	$ -	$ -	$ 0.06	$ 0.24	$ -	$ -	$ -
Noise Mitigation	$ -	$ -	$ 0.1	$ 0.03			$ 0.03	$ -	$ -	$ -	$ 0.01	$ 0.03	$ -	$ -	$ -
Archaeological Find	$ -	$ -	$ 1.0	$ 0.33			$ 0.33	$ -	$ -	$ -	$ 0.07	$ 0.26	$ -	$ -	$ -
Flood Protection	$ -	$ 0.3	$ 1.5	$ 0.60			$ 0.60	$ -	$ -	$ -	$ 0.13	$ 0.47	$ -	$ -	$ -
Risk 7	$ -	$ -	$ -	$ -			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Project Management	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Resident Engineering	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Bonding and Insurance (const., risks & design)	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Design	0.0%	0.0%	0.0%		0.00%		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Contingency (on const. and risks)						15.0%	$ 1.24	$ -	$ -	$ -	$ 0.26	$ 0.97	$ -	$ -	$ -
Inflation on Contractor Costs	5.0%	6.0%	10.0%		7.00%		$ 2.77	$ -	$ -	$ -	$ 0.46	$ 2.31	$ -	$ -	$ -
Total Contractor Costs							**$ 12.25**	**$ -**	**$ -**	**$ -**	**$ 2.49**	**$ 9.76**	**$ -**	**$ -**	**$ -**
GVTA Costs	**P**	**L**	**O**	**$**	**%**	**Total %**	**Total $**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Project Management	3.7%	3.7%	7.0%		4.80%		$ 0.46	$ -	$ -	$ 0.11	$ 0.18	$ 0.17	$ -	$ -	$ -
Design	10.0%	10.0%	12.5%		10.83%		$ 1.03	$ -	$ -	$ 0.04	$ 0.99	$ -	$ -	$ -	$ -
Resident Engineering	9.0%	9.0%	9.0%		9.00%		$ 0.85	$ -	$ -	$ -	$ 0.18	$ 0.67	$ -	$ -	$ -
Inflation on GVTA Costs	5.0%	6.0%	10.0%		7.00%		$ 0.59	$ -	$ -	$ 0.02	$ 0.30	$ 0.26	$ -	$ -	$ -
Total GVTA Costs							**$ 2.92**	**$ -**	**$ -**	**$ 0.17**	**$ 1.65**	**$ 1.10**	**$ -**	**$ -**	**$ -**
Total Contractor and GVTA Costs							**$ 15.17**	**$ -**	**$ -**	**$ 0.169**	**$ 4.143**	**$ 10.861**	**$ -**	**$ -**	**$ -**
Net Present Value of Cash Flow							**$ 12.23**	**$ -**	**$ -**	**$ 0.15**	**$ 3.48**	**$ 8.60**	**$ -**	**$ -**	**$ -**

Simulation Results for
Contract 5 Total / H52





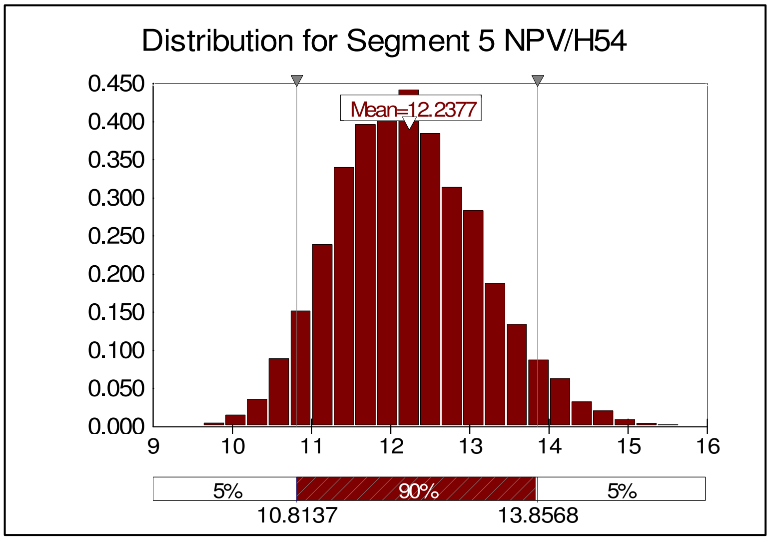


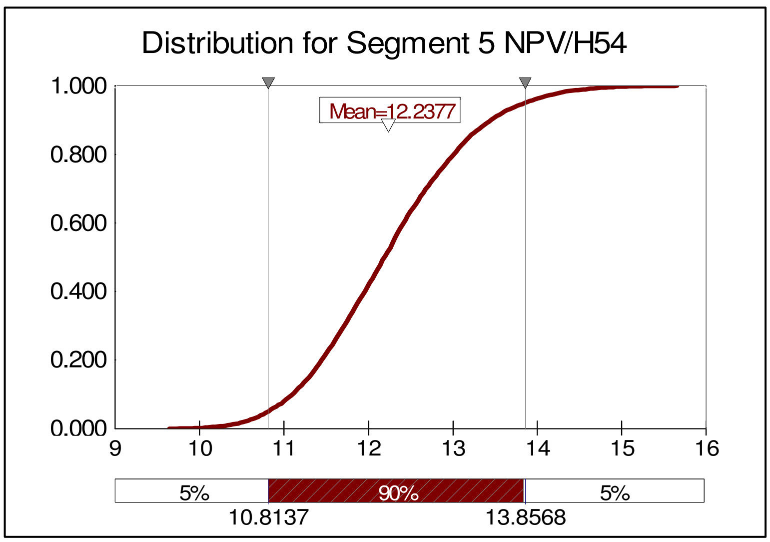
Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 4.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	89
Number of Outputs	15
Sampling Type	Monte Carlo
Simulation Start Time	11/21/2005 9:39
Simulation Stop Time	11/21/2005 9:40
Simulation Duration	00:01:29
Random Seed	185203788

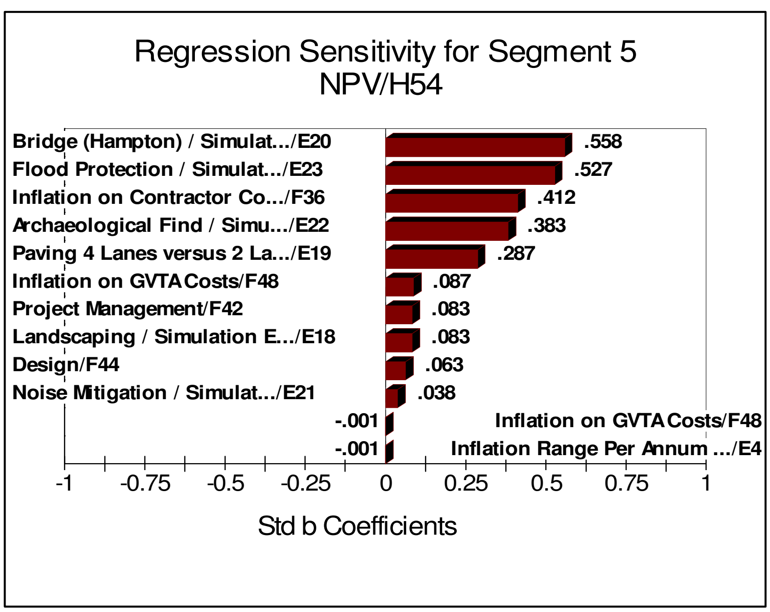
Summary Statistics					
Statistic		Value	%tile		Value
Minimum	$	11.96	5%	$	13.42
Maximum	$	19.42	10%	$	13.77
Mean	$	15.18	15%	$	14.01
Std Dev	$	1.14	20%	$	14.20
Variance		1.296859362	25%	$	14.37
Skewness		0.309086414	30%	$	14.53
Kurtosis		2.981020949	35%	$	14.68
Median	$	15.12	40%	$	14.83
Mode	$	14.06	45%	$	14.98
Left X	$	13.42	50%	$	15.12
Left P		5%	55%	$	15.26
Right X	$	17.19	60%	$	15.40
Right P		95%	65%	$	15.56
Diff X	$	3.77	70%	$	15.73
Diff P		90%	75%	$	15.92
#Errors		0	80%	$	16.14
Filter Min			85%	$	16.36
Filter Max			90%	$	16.69
#Filtered		0	95%	$	17.19

Sensitivity			
Rank	Name	Regr	Corr
#1	Bridge (Hampton)	0.558	0.539
#2	Flood Protection /	0.527	0.506
#3	Inflation on Contra	0.415	0.394
#4	Archaeological Fi	0.382	0.360
#5	Paving 4 Lanes v	0.286	0.266
#6	Inflation on GVTA	0.086	0.074
#7	Landscaping / Sir	0.083	0.082
#8	Project Managem	0.081	0.070
#9	Design / F44	0.060	0.053
#10	Noise Mitigation /	0.038	0.034
#11	Inflation on GVTA	-0.001	-0.027
#12	Inflation Range P	-0.001	-0.005
#13	Municipal Extras /	0.000	0.004
#14	Utility Unknowns /	0.000	0.013
#15	Traffic Manageme	0.000	0.005
#16	Risk 4 / Simulatio	0.000	0.000

Simulation Results for
Contract 5 NPV / H54







Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 4.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	89
Number of Outputs	15
Sampling Type	Monte Carlo
Simulation Start Time	11/21/2005 9:39
Simulation Stop Time	11/21/2005 9:40
Simulation Duration	00:01:29
Random Seed	185203788

Summary Statistics					
Statistic	Value		%tile	Value	
Minimum	$	9.64	5%	$	10.81
Maximum	$	15.65	10%	$	11.10
Mean	$	12.24	15%	$	11.29
Std Dev	$	0.92	20%	$	11.45
Variance		0.841237858	25%	$	11.59
Skewness		0.307879938	30%	$	11.71
Kurtosis		2.979977086	35%	$	11.83
Median	$	12.19	40%	$	11.95
Mode	$	11.11	45%	$	12.07
Left X	$	10.81	50%	$	12.19
Left P		5%	55%	$	12.30
Right X	$	13.86	60%	$	12.41
Right P		95%	65%	$	12.54
Diff X	$	3.04	70%	$	12.68
Diff P		90%	75%	$	12.84
#Errors		0	80%	$	13.01
Filter Min			85%	$	13.19
Filter Max			90%	$	13.45
#Filtered		0	95%	$	13.86

Sensitivity			
Rank	Name	Regr	Corr
#1	Bridge (Hampton)	0.558	0.539
#2	Flood Protection /	0.527	0.507
#3	Inflation on Contra	0.412	0.391
#4	Archaeological Fi	0.383	0.361
#5	Paving 4 Lanes v	0.287	0.266
#6	Inflation on GVTA	0.087	0.076
#7	Project Managem	0.083	0.072
#8	Landscaping / Sir	0.083	0.082
#9	Design / F44	0.063	0.056
#10	Noise Mitigation /	0.038	0.034
#11	Inflation on GVTA	-0.001	-0.026
#12	Inflation Range P	-0.001	-0.005
#13	Municipal Extras /	0.000	0.004
#14	Utility Unknowns /	0.000	0.013
#15	Traffic Manageme	0.000	0.005
#16	Risk 4 / Simulatio	0.000	0.000

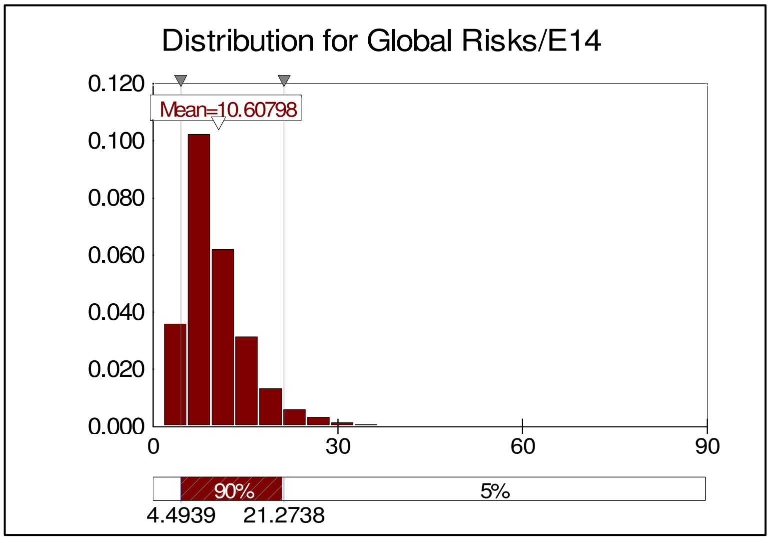
Golden Ears Bridge - Risk Assessment of Reference Case

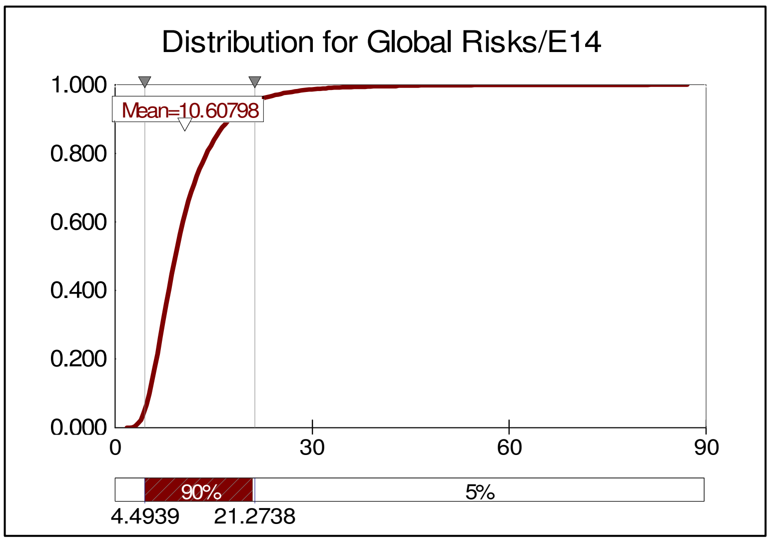
Global Risks

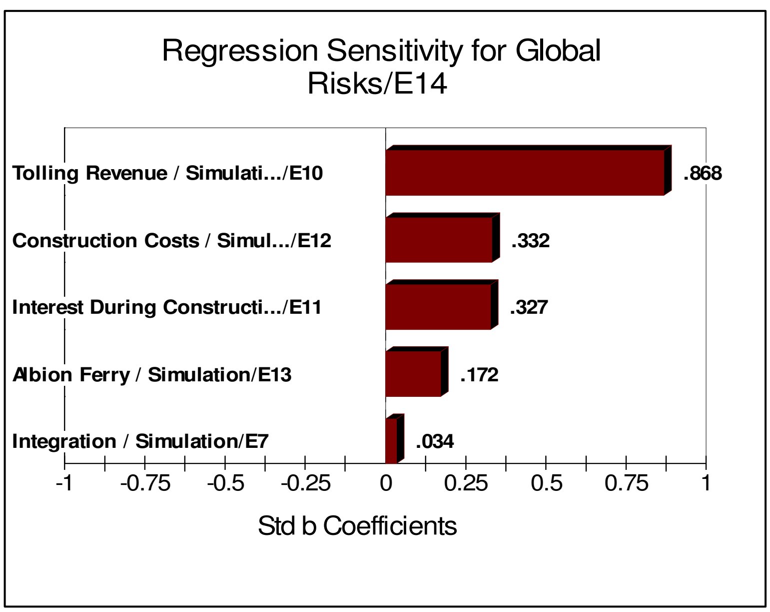
Risk Description	P	L	O	Simulation	Comments
Integration	$0.00	$0.50	$1.00	$0.50	
Schedule Delay	0 yr	0 yr	1.0 yr	-	GVTA Fault
Tolling Revenue	$0.00	$0.00	$40.00	$5.00	
Interest During Construction	$0.00	$0.00	$14.00	$2.00	4% (GVTA borrowing rate) on half of contractors' costs
Construction Costs	$0.00	$0.00	$17.00	$2.00	5% (inflation) on half of contractors' costs (including GVTA costs)
Albion Ferry	$0.00	$0.00	$6.00	$1.00	Subsidy to Albion Ferry
Totals	**$0.00**	**$0.50**	**$78.00**	**$10.50**	

Schedule Delay Risks are Lognormal Functions (see cells for mean and standard deviation)

Simulation Results for
Global Risks / E14







Summary Information	
Workbook Name	EB Ref Bid Risk Analysis 4.
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	89
Number of Outputs	15
Sampling Type	Monte Carlo
Simulation Start Time	11/21/2005 9:39
Simulation Stop Time	11/21/2005 9:40
Simulation Duration	00:01:29
Random Seed	185203788

Summary Statistics

Statistic	Value	%tile	Value
Minimum	$1.78	5%	$4.49
Maximum	$87.11	10%	$5.21
Mean	$10.61	15%	$5.77
Std Dev	$5.99	20%	$6.29
Variance	35.88080675	25%	$6.79
Skewness	2.793017754	30%	$7.24
Kurtosis	19.27363641	35%	$7.66
Median	$9.15	40%	$8.13
Mode	$7.76	45%	$8.63
Left X	$4.49	50%	$9.15
Left P	5%	55%	$9.70
Right X	$21.27	60%	$10.30
Right P	95%	65%	$10.97
Diff X	$16.78	70%	$11.82
Diff P	90%	75%	$12.81
#Errors	0	80%	$13.98
Filter Min		85%	$15.34
Filter Max		90%	$17.39
#Filtered	0	95%	$21.27

Sensitivity

Rank	Name	Regr	Corr
#1	Tolling Revenue /	0.868	0.751
#2	Construction Cost	0.332	0.343
#3	Interest During Co	0.327	0.344
#4	Albion Ferry / Sim	0.172	0.194
#5	Integration / Simu	0.034	0.055
#6	Project Managem	0.000	-0.002
#7	Delayed Rehabilit	0.000	0.017
#8	Inflation on GVTA	0.000	-0.017
#9	Environmental / S	0.000	-0.010
#10	Municipal Extras /	0.000	-0.005
#11	Utility (Terasen) /	0.000	0.013
#12	Archaeological Fi	0.000	0.009
#13	Geotech / Simula	0.000	0.018
#14	Project Managem	0.000	-0.004
#15	Project Managem	0.000	-0.004
#16	Inflation on Contr	0.000	-0.006

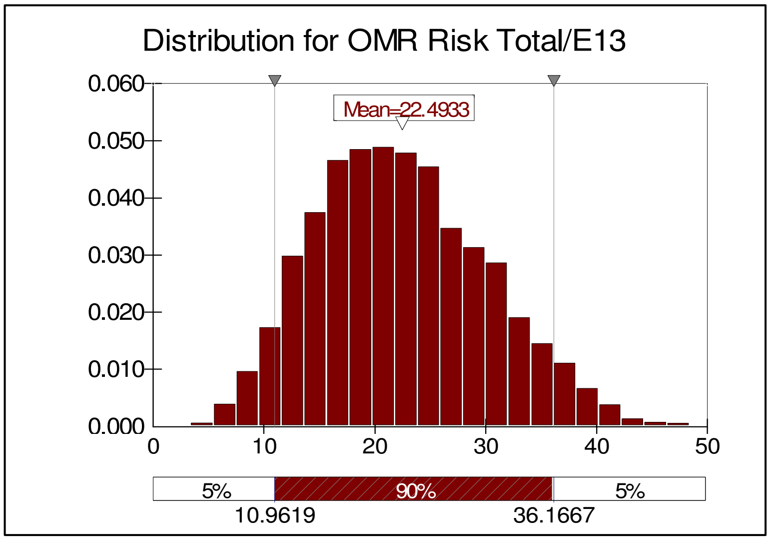
Golden Ears Bridge - Risk Assessment of Reference Case

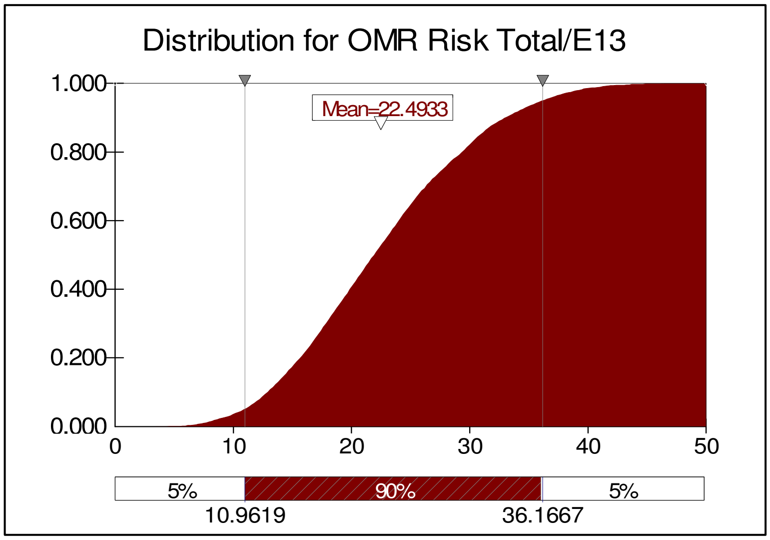
Operations, Maintenance and Rehabilitation

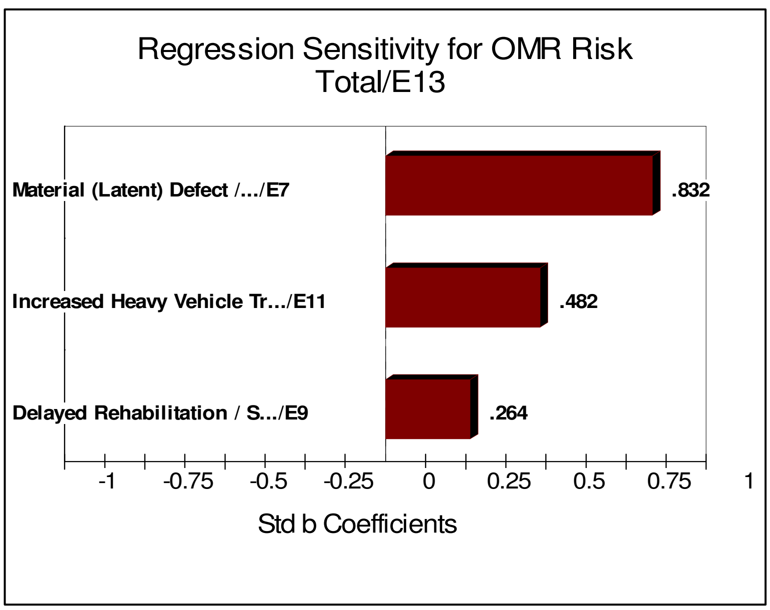
Risk Description	P	L	O	Simulation	Comments
Material (Latent) Defect	$0.00	$0.55	$27.50	$9.35	Occurs Mid-Term in the Contract
Delayed Rehabilitation	$0.00	$3.96	$9.90	$4.62	L=20%, O=50% more than in budget - Assumes Delay of 2 years
Increased Heavy Vehicle Traffic	$0.00	$7.70	$18.25	$8.65	L=10% Higher Traffic, O=25% Higher Traffic- Prorated by Year by Maintenance
Totals	**$0.00**	**$12.21**	**$55.65**	**$22.62**	

Note: All OMR Risks adjusted by 10% to reflect contingency on OMR costs of 10%

Simulation Results for
OMR Risk Total / E13







Summary Information	
Workbook Name	Appendix 1 Final.xls
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	89
Number of Outputs	15
Sampling Type	Monte Carlo
Simulation Start Time	11/25/2005 14:37
Simulation Stop Time	11/25/2005 14:38
Simulation Duration	00:00:54
Random Seed	1114397461

Summary Statistics			
Statistic	**Value**	**%tile**	**Value**
Minimum	$3.45	5%	$10.96
Maximum	$48.45	10%	$12.88
Mean	$22.49	15%	$14.37
Std Dev	$7.68	20%	$15.66
Variance	59.05216029	25%	$16.81
Skewness	0.330425842	30%	$17.82
Kurtosis	2.675611811	35%	$18.86
Median	$21.91	40%	$19.88
Mode	$16.38	45%	$20.87
Left X	$10.96	50%	$21.91
Left P	5%	55%	$22.96
Right X	$36.17	60%	$24.00
Right P	95%	65%	$25.07
Diff X	$25.20	70%	$26.30
Diff P	90%	75%	$27.76
#Errors	0	80%	$29.38
Filter Min		85%	$30.87
Filter Max		90%	$33.03
#Filtered	0	95%	$36.17

Sensitivity			
Rank	**Name**	**Regr**	**Corr**
#1	Material (Latent) [	0.832	0.826
#2	Increased Heavy	0.482	0.471
#3	Delayed Rehabilit	0.264	0.249
#4	Staging Adjustme	0.000	0.006
#5	Interest During Co	0.000	-0.007
#6	Water Line / Simu	0.000	-0.009
#7	Inflation on Contra	0.000	0.000
#8	Design / F44	0.000	0.009
#9	Enivronmental Ma	0.000	-0.021
#10	Inflation on GVTA	0.000	-0.005
#11	Integration / Simu	0.000	-0.001
#12	Noise Mitigation /	0.000	0.009
#13	Albion Ferry / Sim	0.000	0.004
#14	Tolling Revenue /	0.000	0.002
#15	Project Managem	0.000	-0.003
#16	Lougheed E/B at	0.000	-0.002

Detailed Cost Estimate Risk Adjusted

#	Detail	Life Cycle	Inventory Qty	Inventory Unit	%	Unit Cost	2004	2005	2006	2007	2008	2009
									1	2	3	4
	Annual Inflation Factor fo Costs						**1.075**	**1.075**	**1.060**	**1.060**	**1.060**	**1.060**
	Inflation Factor for Costs from 2003 to year x						**1.075**	**1.156**	**1.225**	**1.298**	**1.376**	**1.459**
	Iannual nflation factor for reference bid risks						**1.075**	**1.075**	**1.060**	**1.060**	**1.060**	**1.060**
	Inflation Factor for Risks from 2003 to Year x						**1.075**	**1.156**	**1.225**	**1.298**	**1.376**	**1.459**
	A.1 Routine Maintenance											
												0
	Year - round O&M (roads and bridge pavement)		58.58	lane km		12,000						
	Contingency (10% for contracting method)						0	0	0	0	0	0
	Sub-total						**0**	**0**	**0**	**0**	**0**	**0**
	B. Overhead											
	RWIS		0	number		0						
	Electric Power		1	service		25,000						
	Electrical Maintenance		1	service		30,000						
	Line Repainting		1	service		40,000						
	1 FTE, Contract Administrator		1	service		100,000						
	1 FTE, Analyst/Planner/Contract Monitoring role		1	service		80,000						
	Legal & Specialist Consultant (Quality and Environmental and Inspectio		1	service		100,000						
	Operating Insurance (not part of VFM)		1	service		0						
	Radio and Telecommunications System		1	service		25,000						
	Sub-total											**0**
	C. Rehabilitation											
1	Pavement/Shoulder (not bridge)	14	39.7	lane km	100%	135,000						
2	Railroad Crossing	50	0	count	50%	50,000						
3	Ditches	75	0	km	75%	1,000						
4	Culvert Entrance	50	0	count	50%	3,000						
5	Culvert Roadway	50	0	count	50%	10,000						
6	Culvert Fume	50	0	count	50%	1,000						
7	Culvert Down Drain	50	0	count	50%	5,000						
8	Culvert Other	50	0	count	50%	1,000						
9	Curb & Gutter Asphalt	50	0	km	50%	10,000						
10	Curb & Gutter concrete	50	0	km	50%	10,000						
11	Drainage Appliance Catch Basin	50	0	count	50%	500						
12	Drainage Appliance Manhole	50	0	count	50%	500						
13	Sub-drains	30		m	1005%							
14	Sedimentation ponds	20		count	100%							
15	Sidewalks	50		m	100%							
16	Bicycle paths	14		m asphalt	100%							
17	Traffic Island	20	0	count	100%	500						
18	Fence Other	20	0	km	100%	1,000						
19	Structures	75	151,960	m2	100%	120						
20	Structures-Culverts-multi plate	50	0	m	100%	1,000						
21	Structures-Retaining Walls	75	0	m	50%	1,000						
21	Noise Barriers	40		m	1005%							
22	Illumination	30		count	100%							
23	Power Services	30		count	100%							
24	Signs	10	0	count	100%	10						
25	Sign Posts	10	0	count	100%	5						
26	Structures-Signs	50	0	m	100%	1,000						
27	Guardrail Concrete	40	0	km	50%	50,000						
	Steel Beam Guide Rail	20		m	100%							
28	Inertia/crash Attenuation Barriers	30		count	100%							
	Traffic Signals - poles	40		count	100%							
	Traffic Signal - signal heads	15		count	100%							
29	Traffic Signals - controllers	15		count	100%							
	Traffic Signals - power supply	30		count	100%							
30	Toll Gantry	50		count	100%							
31	Camera	6		count	100%							
32	TV	10		count	100%							
33	Traffic Volume Counters	15	0	count	100%							
34	Control Computers	6		count	100%							
35	Corridor Control Hub Building	40		count	100%							
	Misc											
	Contingency (10% for contracting method)						0	0	0	0	0	0
	Sub-total						**0**	**0**	**0**	**0**	**0**	**0**
	D-1. Risk											
	Rock Stabilization				0	0						0
	Floods				2	0						
	Mud, Earth and Rock Slide				0	0						
	Earthquake				2	100,000						
	Relevant Change In law				50%	0						
	Non-Availability				32	20,000						
	Non-Conformance					0						0
	Subtotal Isks						**0**	**0**	**0**	**0**	**0**	**0**
	D-2. Risk Assessment for Reference Bid											
	Material Defect											
	Delayed Rehabilitation						0	0	0	0	0	0
	Increased Heavy Vehicle Traffic						0	0	0	0	0	0
	Sub-Total Reference Bid Risks						**0**	**0**	**0**	**0**	**0**	**0**
	Subtotal Inflated - Isee OMR Risk Inflation Tab						0	0	0	0	0	0
	Sub-total						**0**	**0**	**0**	**0**	**0**	**0**
	E. Contingency (included in A and C above)											
	0%						**0**	**0**	**0**	**0**	**0**	**0**
	Total (uninflated,in $2003)						**0**	**0**	**0**	**0**	**0**	**0**
	Total (inflated)						**0**	**0**	**0**	**0**	**0**	**0**

Net Present Value (2005 $)	
Total OMR Plus Reference Bid Risks	**$75,687,437.35**
Total Reference Bid Risks	**$16,195,056.59**
Total OMR Less Reference Bid Risks	**$59,492,380.77**

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
5	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**
1.060	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**
1.546	**1.590**	**1.635**	**1.682**	**1.729**	**1.778**	**1.829**	**1.881**	**1.934**	**1.989**	**2.045**	**2.103**	**2.162**	**2.224**	**2.287**	**2.352**	**2.418**	**2.487**	**2.557**
1.060	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**
1.546	**1.590**	**1.635**	**1.682**	**1.729**	**1.778**	**1.829**	**1.881**	**1.934**	**1.989**	**2.045**	**2.103**	**2.162**	**2.224**	**2.287**	**2.352**	**2.418**	**2.487**	**2.557**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
351,480	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960
35,148	70,296	70,296	70,296	70,296	70,296	70,296	70,296	70,296	70,296	70,296	70,296	70,296	70,296	70,296	70,296	70,296	70,296	70,296
386,628	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12,500	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
50,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
40,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
50,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12,500	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
200,000	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**
													5,359,500					
													x					
	0	0	0	0	0	0	0	0	0	0	0		0	0	18,235,164	0	0	0
										x								
										x								
															x			
															x			
						x						x						x
											x							
													x					
						x						x						x
						20,000				20,000	10,000	20,000	50,000		50,000			20,000
0	0	0	0	0	0	2,000	0	0	0	2,000	1,000	2,000	540,950	0	1,828,516	0	0	2,000
0	**0**	**0**	**0**	**0**	**0**	**22,000**	**0**	**0**	**0**	**22,000**	**11,000**	**22,000**	**5,950,450**	**0**	**20,113,680**	**0**	**0**	**22,000**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
				0														
		0				0				0				0				0
													100,000					
													0					
10,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10,000	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**120,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**
															9,350,000			
0	0	0	0	0	0	1,942	0	0	0	1,942	971	1,942	525,268	0	1,775,508	0	0	1,942
141,803	283,607	283,607	283,607	283,607	283,607	283,607	283,607	283,607	283,607	283,607	283,607	283,607	283,607	283,607	283,607	283,607	283,607	283,607
141,803	**283,607**	**283,607**	**283,607**	**283,607**	**283,607**	**285,549**	**283,607**	**283,607**	**283,607**	**285,549**	**284,578**	**285,549**	**808,874**	**283,607**	**11,409,114**	**283,607**	**283,607**	**285,549**
219,297	451,021	463,800	476,941	490,454	504,350	522,191	533,335	548,446	563,985	583,936	598,439	617,495	1,798,739	648,541	26,829,148	685,812	705,243	730,191
151,803	**303,607**	**303,607**	**303,607**	**303,607**	**303,607**	**305,549**	**303,607**	**303,607**	**303,607**	**305,549**	**304,578**	**305,549**	**928,874**	**303,607**	**11,429,114**	**303,607**	**303,607**	**305,549**
0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
738,431	**1,476,863**	**1,476,863**	**1,476,863**	**1,476,863**	**1,476,863**	**1,500,805**	**1,476,863**	**1,476,863**	**1,476,863**	**1,500,805**	**1,488,834**	**1,500,805**	**8,052,580**	**1,476,863**	**32,716,051**	**1,476,863**	**1,476,863**	**1,500,805**
1,141,974	**2,348,661**	**2,415,206**	**2,483,637**	**2,554,006**	**2,626,370**	**2,744,567**	**2,777,306**	**2,855,996**	**2,936,916**	**3,069,089**	**3,130,873**	**3,245,468**	**17,906,974**	**3,377,234**	**76,933,560**	**3,571,322**	**3,672,509**	**3,837,787**

2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	Total	
24	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**		
1.028	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**		
2.630	**2.704**	**2.781**	**2.860**	**2.941**	**3.024**	**3.110**	**3.198**	**3.288**	**3.381**	**3.477**	**3.576**		
1.028	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**	**1.028**		
2.630	**2.704**	**2.781**	**2.860**	**2.941**	**3.024**	**3.110**	**3.198**	**3.288**	**3.381**	**3.477**	**3.576**		
0	0	0	0	0	0	0	0	0					
702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	702,960	21,440,280	
70,296	70,296	70,296	70,296	70,296	70,296	70,296	70,296	70,296	70,296	70,296	70,296	2,144,028	
773,256	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**773,256**	**23,584,308**	
													23,584,308
0	0	0	0	0	0	0	0	0	0	0	0	0	
25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	762,500	
30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	915,000	
40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	1,220,000	
100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	3,050,000	
80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000	2,440,000	
100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	3,050,000	
0	0	0	0	0	0	0	0	0	0	0	0	0	
25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	762,500	
400,000	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**400,000**	**12,200,000**	12,200,000
								5,359,500				10,719,000	
												0	
												0	
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												0	
												0	
								x				0	
	x											0	
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	x										x	0	
	x										x	0	
												0	
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	x											0	
											x	0	
												0	
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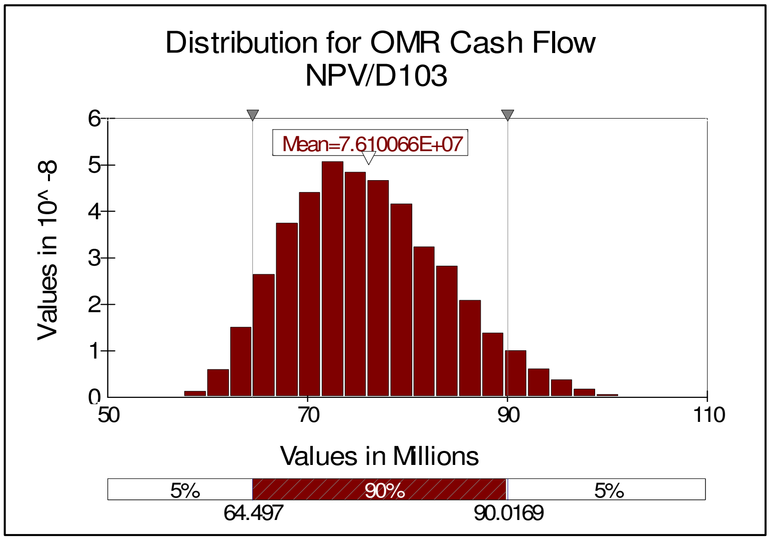
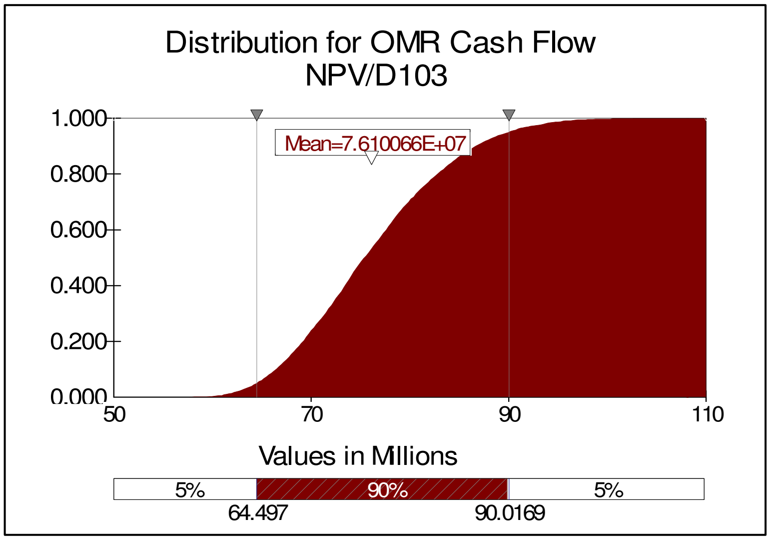
					x							0	
		x										0	
								x				0	
					x							0	
												0	
	20,000	10,000			20,000			50,000			100,000	390,000	
0	2,000	1,000	0	0	2,000	0	0	540,950	0	0	1,833,516	4,757,933	
0	**22,000**	**11,000**	**0**	**0**	**22,000**	**0**	**0**	**5,950,450**	**0**	**0**	**20,168,680**	**52,337,261**	52,337,261
0	0	0	0	0								0	
0												0	
			0									0	
			100,000									200,000	
												0	
20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	610,000	
0	0	0	0	0	0	0	0	0	0	0	0	0	
20,000	**20,000**	**20,000**	**120,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**20,000**	**810,000**	
												9,350,000	
0	1,942	971	0	0	1,942	0	0	525,268	0	0	1,780,363	4,620,000	
283,607	283,607	283,607	283,607	283,607	283,607	283,607	283,607	283,607	283,607	283,607	283,607	8,650,000	
283,607	**285,549**	**284,578**	**283,607**	**283,607**	**285,549**	**283,607**	**283,607**	**808,874**	**283,607**	**283,607**	**2,063,969**	**22,620,000**	
745,773	772,155	791,333	810,977	833,955	863,456	881,882	906,868	2,659,763	958,986	986,157	7,380,179	56,562,848	
303,607	**305,549**	**304,578**	**403,607**	**303,607**	**305,549**	**303,607**	**303,607**	**828,874**	**303,607**	**303,607**	**2,083,969**	**23,430,000**	23,430,000
0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	
												0	
1,476,863	**1,500,805**	**1,488,834**	**1,576,863**	**1,476,863**	**1,500,805**	**1,476,863**	**1,476,863**	**7,952,580**	**1,476,863**	**1,476,863**	**23,425,906**	**111,551,569**	111,551,569
3,883,566	**4,058,342**	**4,140,041**	**4,509,062**	**4,342,765**	**4,538,207**	**4,592,342**	**4,722,458**	**26,149,897**	**4,993,855**	**5,135,347**	**83,764,510**	**298,459,848**	

Simulation Results for
OMR Cash Flow NPV / D103





(graph unavailable for this simulation and output)

Summary Information	
Workbook Name	Appendix 1 Test.xls
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	0
Number of Outputs	15
Sampling Type	Monte Carlo
Simulation Start Time	11/27/2005 20:03
Simulation Stop Time	11/27/2005 20:08
Simulation Duration	00:04:43
Random Seed	2043206501

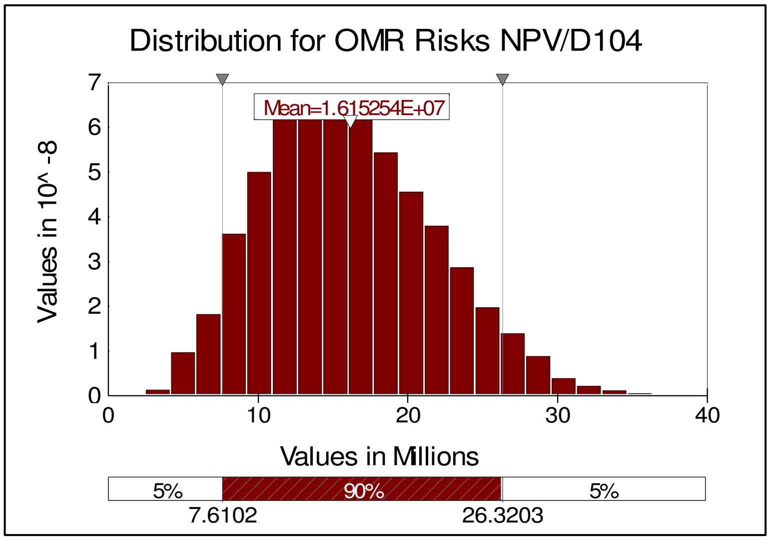
Summary Statistics

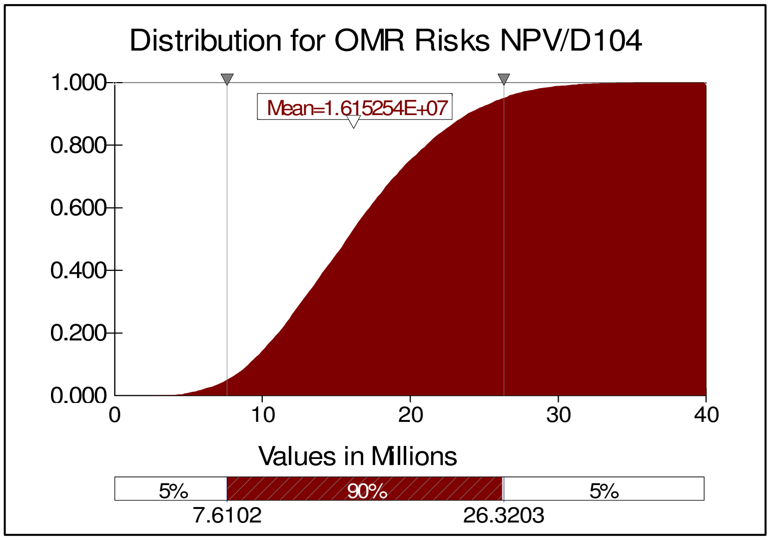
Statistic	Value	%tile	Value
Minimum	$57,666,556.00	5%	$64,497,040.00
Maximum	$108,106,448.00	10%	$66,423,220.00
Mean	$76,100,666.21	15%	$67,904,728.00
Std Dev	$7,788,610.90	20%	$69,181,672.00
Variance	6.06625E+13	25%	$70,287,280.00
Skewness	0.417429188	30%	$71,446,824.00
Kurtosis	2.875491181	35%	$72,449,976.00
Median	$75,396,480.00	40%	$73,440,120.00
Mode	$63,070,612.00	45%	$74,346,992.00
Left X	$64,497,040.00	50%	$75,396,480.00
Left P	5%	55%	$76,517,120.00
Right X	$90,016,896.00	60%	$77,587,248.00
Right P	95%	65%	$78,624,000.00
Diff X	$25,519,856.00	70%	$79,867,032.00
Diff P	90%	75%	$81,235,584.00
#Errors	0	80%	$82,792,736.00
Filter Min		85%	$84,535,976.00
Filter Max		90%	$86,702,800.00
#Filtered	0	95%	$90,016,896.00

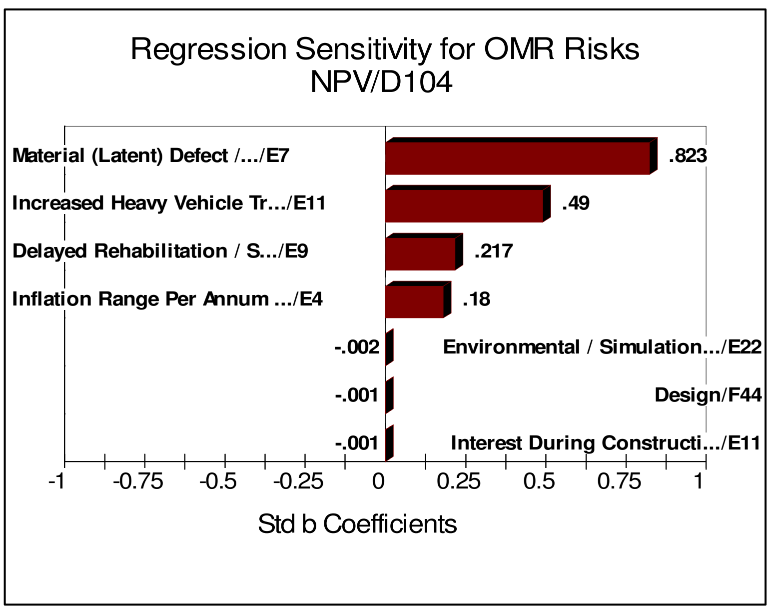
Sensitivity

Rank	Name	Regr	Corr
#1			
#2			
#3			
#4			
#5			
#6			
#7			
#8			
#9			
#10			
#11			
#12			
#13			
#14			
#15			
#16			

Simulation Results for
OMR Risks NPV / D104







Summary Information	
Workbook Name	Appendix 1 Final.xls
Number of Simulations	1
Number of Iterations	10000
Number of Inputs	89
Number of Outputs	15
Sampling Type	Monte Carlo
Simulation Start Time	11/25/2005 14:37
Simulation Stop Time	11/25/2005 14:38
Simulation Duration	00:00:54
Random Seed	1114397461

Summary Statistics

Statistic	Value	%tile	Value
Minimum	$2,508,664.50	5%	$7,610,246.50
Maximum	$39,780,032.00	10%	$9,074,425.00
Mean	$16,152,539.64	15%	$10,135,598.00
Std Dev	$5,712,375.14	20%	$11,075,269.00
Variance	3.26312E+13	25%	$11,894,926.00
Skewness	0.384123814	30%	$12,660,081.00
Kurtosis	2.803609263	35%	$13,457,811.00
Median	$15,719,930.00	40%	$14,197,645.00
Mode	$10,303,887.00	45%	$14,967,077.00
Left X	$7,610,246.50	50%	$15,719,930.00
Left P	5%	55%	$16,443,367.00
Right X	$26,320,264.00	60%	$17,244,706.00
Right P	95%	65%	$18,072,724.00
Diff X	$18,710,017.50	70%	$18,948,276.00
Diff P	90%	75%	$19,947,878.00
#Errors	0	80%	$21,094,174.00
Filter Min		85%	$22,384,034.00
Filter Max		90%	$23,909,250.00
#Filtered	0	95%	$26,320,264.00

Sensitivity

Rank	Name	Regr	Corr
#1	Material (Latent) De	0.823	0.815
#2	Increased Heavy V	0.490	0.483
#3	Delayed Rehabilitat	0.217	0.202
#4	Inflation Range Per	0.180	0.143
#5	Environmental / Sir	-0.002	0.005
#6	Design / F44	-0.001	0.007
#7	Interest During Cor	-0.001	-0.006
#8	Municipal Extras / $	0.000	0.016
#9	Utility Unknowns / $	0.000	-0.001
#10	Traffic Managemen	0.000	0.004
#11	Risk 4 / Simulation	0.000	0.000
#12	Risk 5 / Simulation	0.000	0.000
#13	Risk 6 / Simulation	0.000	0.000
#14	Risk 7 / Simulation	0.000	0.000
#15	Project Manageme	0.000	0.000
#16	Resident Engineeri	0.000	0.000

OMR Inflation Risk

	P	L	O	Estimate
Inflation Range Per Annum	**2.00%**	**2.50%**	**4.00%**	**2.83%**

Summary Statistics			
Statistic	**Value**	**%tile**	**Value**
Minimum	2.01%	5%	2.22%
Maximum	3.99%	10%	2.32%
Mean	2.83%	15%	2.38%
Std Dev	0.42%	20%	2.44%
Variance	1.8042E-05	25%	2.50%
Skewness	0.40761195	30%	2.55%
Kurtosis	2.38773459	35%	2.60%
Median	2.78%	40%	2.66%
Mode	2.35%	45%	2.72%
Left X	2.22%	50%	2.78%
Left P	5%	55%	2.84%
Right X	3.61%	60%	2.91%
Right P	95%	65%	2.98%
Diff X	1.39%	70%	3.05%
Diff P	90%	75%	3.13%
#Errors	0	80%	3.23%
Filter Min		85%	3.33%
Filter Max		90%	3.45%
#Filtered	0	95%	3.61%

Golden Ears Bridge - Risk Assessment of Reference Case

Fixed Costs - Cash Flow and NPV ($ million)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Fixed Costs - Base	$2.57	$6.18	$6.18	$91.90	$73.30	$1.57	$5.69	$2.46	($2.67)	($8.43)	$178.75
Plus KFN Training						$1.00	$0.50	$0.50			
Plus Communications						$0.15	$0.15	$0.15	$0.15		
Total Fixed Costs	$2.57	$6.18	$6.18	$91.90	$73.30	$2.72	$6.34	$3.11	($2.52)	($8.43)	$181.35
PV (2005)	$3.06	$6.94	$6.55	$91.90	$69.15	$2.42	$5.32	$2.46	($1.88)	($5.94)	$179.99

Tolling Capital - Cash Flow and NPV ($ million)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Tolling Capital	$0.00	$0.00	$0.00	$0.00	$0.00	$0.81	$3.26	$3.26	$0.00	$0.00	$7.33
PV (2005)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.72	$2.74	$2.58	$0.00	$0.00	$6.04