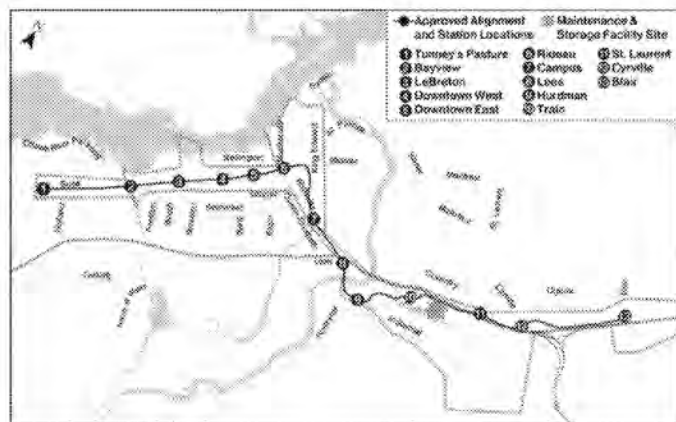


**Deloitte.**

**Ottawa**

# Ottawa Light Rail Transit Project



## Project Delivery and Procurement Options Report

Final Version: February 28, 2011



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# Glossary of Terms

<b>Term</b>	<b>Definition</b>
B(f)	Means a Build-Finance project delivery methodology, as defined in Section 4.3.4
BOO	Means a Build-Own-Operate project delivery methodology, as defined in Section 4.3.10
BOOT	Means a Build-Own-Operate-Transfer project delivery methodology, as defined in Section 4.3.10
City	The City of Ottawa
Costing Model	Means the financial model developed by Deloitte, for the purposes of this Report, based on construction, operating, maintenance and lifecycle cost estimates provided by the City, which estimates the total cost of the project to the City under a variety of scenarios. The outputs of the Costing Model are summarized in Appendix A.
DB	Means a Design-Build project delivery methodology, as defined in Section 4.3.2
DBB	Means a Design-Bid-Build project delivery methodology, as defined in Section 4.3.1
DB(f)	Means a Design-Build-Finance project delivery methodology, as defined in Section 4.3.3
DBFM	Means a Design-Build-Finance-Maintain project delivery methodology, as defined in Section 4.3.8
DBFOM	Means a Design-Build-Finance-Operate-Maintain project delivery methodology, as defined in Section 4.3.9
DBOM(f)	Means a Design-Build-Operate-Maintain project delivery methodology, as defined in Section 4.3.7
DBOM	Means a Design-Build-Operate-Maintain project delivery methodology utilizing public sector financing, as defined in Section 4.3.6
DBM(f)	Means a Design-Build-Maintain project delivery methodology, as defined in Section 4.3.5
Deloitte	Deloitte & Touche LLP
EPC	Means Engineering-Procurement-Construction
Evaluation Category	Means any one of the four broad categories of Evaluation Criteria used to evaluate each of the Project Delivery Options
Evaluation Criteria	Means the set of detailed criteria used to evaluate each of the Project Delivery Options, as set out in Section 4.6
Functional Design and EA Study	Means the Downtown Ottawa Transit Tunnel Planning Functional Design and Environmental Assessment study undertaken to assess the technical

<b>Term</b>	<b>Definition</b>
	feasibility of the LRT Project as part of the TMP update approval process in November, 2008
LRT	Means Light Rail Transit
LRT Project	Means the proposed light rail transit system between Tunney's Pasture Station and Blair Transit Station on the existing Transitway corridor with a tunnel section through the downtown core
MSP	Means a milestone payment during construction
NPV	Means net present value
O&M	Operations and maintenance
Project Delivery Options	Means the eleven Project Delivery Options defined by Figure 5, each of which embody a given allocation of roles and responsibilities between the public and private sectors for the delivery of the Project
Project Delivery and Procurement Options Report	Means this Report, which consists of a review of Project Delivery Options to determine the most appropriate procurement and project delivery model to be used to design, construct, commission, maintain and operate the LRT Project, from a range of models inclusive of traditional, Alternative Financing and Procurement, and public-private-partnership options
RIO	Means the City's Rail Implementation Office
SCP	Means a substantial completion payment following the completion of the asset
TMP	The City's Transportation Master Plan as updated and approved by City Council on November 28, 2008
VFM or Value for Money	Means an assessment of the risk adjusted costs of a particular Project Delivery Option as compared to the risk adjusted costs of a traditional City-led Design-Bid-Build contract

# 1 Executive Summary

## 1.1 Background

In November 2008, as part of its 20/20 initiative to manage growth, the City of Ottawa (the City) updated its Transportation Master Plan (TMP) with a target to increase transit usage by 2031 to a level that would be similar to many European cities. A key feature of the TMP is a light rail transit system between Tunney's Pasture Station and Blair Transit Station on the existing Transitway corridor with a tunnel section through the downtown core (the LRT Project).

The City has engaged Deloitte to work with the City to determine the most appropriate procurement and project delivery model to be used to design, construct, commission, maintain and operate the LRT Project. Since January 2010, Deloitte has been working with the City's Rail Implementation Office (RIO) to develop this study, titled "Project Delivery and Procurement Options Report." Deloitte's work has included the following steps:

- Meetings with the City to ascertain the City's objectives for the LRT Project
- Definition of the full range of Project Delivery Options to be considered
- In collaboration with the City, development of a set of evaluation criteria by which to evaluate the Project Delivery Options (the Evaluation Criteria)
- Development of a Costing Model, in order to estimate the capital and operating costs of the LRT Project under several different financing and funding scenarios
- Preparation of several case studies of other successful public transit rail projects in order to draw out lessons learned and best practices

This Report ties together the Project Delivery Options, the Evaluation Criteria, and the Costing Model in order to provide a comprehensive assessment of the Project Delivery Options and a recommendation on which Project Delivery Options are best positioned to achieve the City's objectives.

## 1.2 The City's Objectives

The City's objectives for the LRT Project are set out below. The Evaluation Criteria have been developed with these objectives in mind.

**Table 1 – City Objectives**

Objective	Description
• <b>Cost and Schedule Certainty</b>	<ul style="list-style-type: none"> <li>– Construction of the asset should be completed on time and on budget.</li> <li>– There should be strong incentives in place for the completion of construction on time and on budget, and the party responsible for construction should bear the consequences of delay and/or cost overruns.</li> </ul>
• <b>Service Quality</b>	<ul style="list-style-type: none"> <li>– The City desires a high level of service quality, including on-time service, appropriate levels of service to match demand, and vehicle and station cleanliness.</li> </ul>
• <b>Asset Residual Condition</b>	<ul style="list-style-type: none"> <li>– The system and civil works should be maintained in good working condition throughout the lifecycle of the project.</li> </ul>
• <b>Risk Transfer</b>	<ul style="list-style-type: none"> <li>– The City wishes to transfer appropriate risks to the private sector.</li> </ul>
• <b>Performance Security</b>	<ul style="list-style-type: none"> <li>– The private sector's performance should be assured through a liquid form of performance security which can easily be leveraged by the City if need be.</li> </ul>



### 1.3 Methodology and Approach

#### 1.3.1 Identification of Project Delivery Options

Project Delivery Options refer to the range of contractual terms and allocation of roles and responsibilities between the public and private sectors for delivery of an infrastructure project. The Project Delivery Options evaluated in this Report differ from one another primarily in terms of:

- Allocation of responsibility for design, EPC, maintenance, system operations, and vehicle procurement
- The timing and method of paying the private sector partner, and whether the selected timing and method of payment is deferred thereby requiring the private sector to obtain financing

Deloitte has identified a long-list of Project Delivery Options. These Project Delivery Options are based on background material provided by the City (listed in Appendix B); case studies of transit projects from other jurisdictions; and market knowledge and experience. The long-list of Project Delivery Options is set out below, along with a high-level description of the roles and responsibilities allocated to the private sector under each option. A comprehensive description of each of the Project Delivery Options is provided in Section 4.3.

The DBB, DB, and DBOM options do not require any significant financing from a private sector partner. The options which include an "(f)" in their abbreviation require short-term private financing, while options which include an "F" in their abbreviation require both short and long-term private financing.

**Figure 1 - Identification and Summary of Project Delivery Options to be Evaluated**

Project Delivery Option	Design Bid Build	Design Build	Build Finance	Design Build Finance	Design Build Maintain	Design Build Operate Maintain (Public Financing)	Design Build Operate Maintain	Design Build Finance Maintain	Design Build Finance Operate Maintain	Build Own Operate Transfer	Build Own Operate
Abbreviation	DBB	DB	B(f)	DB(f)	DBM(f)	DBOM	DBOM(f)	DBFM	DBFOM	BOOT	BOO
Roles Allocated to Private Sector		Design		Design	Design	Design	Design	Design	Design	Design	Design
	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction
						Operations	Operations		Operations	Operations	Operations
					Maintenance	Maintenance	Maintenance	Maintenance	Maintenance	Maintenance	Maintenance
			Short Finance	Short Finance	Short Finance		Short Finance	Short Finance	Short Finance	Short Finance	Short Finance
							Long Finance	Long Finance	Long Finance	Long Finance	Long Finance
									Ridership Risk	Ridership Risk	Ridership Risk

#### 1.3.2 Screening Factors

The case studies developed for this Report indicate that transferring significant revenue and ridership volume risk to the private sector is not representative of commercial best practices for a public transit system. Therefore, the Build-Own-Operate-Transfer and Build-Own-Operate options, which as defined by this Report transfer revenue and ridership risk transfer to the private sector, were screened out and not considered further. Please refer to Section 4.5.1.1 for more detail.

#### 1.3.3 Evaluation Criteria

In collaboration with the City, a set of detailed Evaluation Criteria have been developed in order to assess and rank each of the Project Delivery Options which have passed the initial screen. The broad Evaluation Categories, which are each composed of multiple different Evaluation Criteria, include:

**Table 2 – Evaluation Categories**

Evaluation Category	Description
1. Cost to the City	Evaluation of the costs to the City under the various Project Delivery Options, including the net present value (NPV) of the City's capital outlays in connection with the Project, and the NPV of the City's operating costs for the Project

Evaluation Category	Description
<b>2.Alignment of City's Role with Core Business and Objectives</b>	Assessment of how well the division of roles and responsibilities between the public and private sector under each of the Project Delivery Options meshes with the City's experience and qualifications in managing construction, vehicle procurement, vehicle operations and maintenance, and setting/meeting service quality standards, in relation to a project of the size and complexity of the LRT Project
<b>3.Commercial and Contractual Structure</b>	Assessment of the strength of the commercial and contractual structures of each Project Delivery Option, and the extent to which they provide appropriate incentives for performance, mitigate risk, secure fixed prices, and provide performance security  Each Project Delivery Option has been evaluated based on a view of best practices for commercial and contractual structuring of major infrastructure projects.
<b>4.Value from Risk Transfer</b>	Assessment of the extent to which each Project Delivery Option transfers appropriate risks from the City to the private sector

### 1.3.3.1 Value from Risk Transfer

With respect to the fourth Evaluation Category (Value from Risk Transfer), this Report defines appropriate risks for transfer to the private sector as those risks which the private sector is equally or better able to bear than the public sector. These risks are typically risks which the private sector can understand, measure, and properly price; and are also typically risks which the private sector can control by taking steps to mitigate or manage the risk. An example of an appropriate risk to transfer to the private sector would be construction cost overruns, while an example of an inappropriate risk would be risks associated with property acquisition.

The City obtains value from transferring appropriate risks to the private sector. This is because when a risk is transferred to the private sector, the financial consequences of the risk, should it transpire, are also shifted to the private sector. Therefore, any additional or unexpected costs associated with a fully transferred risk will be borne by the private sector and not the City. The City would not obtain value from transferring inappropriate risks to the private sector, since the result would be large pricing contingencies which are in excess of the costs the City would incur through managing the risk by itself.

### 1.3.4 Weighting Factors

In collaboration with the City, weighting factors have been developed to assign relative priority to each Evaluation Category. The weighting factors for each category are set out below. Detailed weighting factors for the individual Evaluation Criteria are set out in Section 4.7 (Figure 13).

**Table 3 – Weighting Factors**

Evaluation Category	Weighting
<b>Cost to the City</b>	40%
<b>Alignment of City's Role with Core Business and Policy Objectives</b>	10%
<b>Commercial and Contractual Structure</b>	30%
<b>Value from Risk Transfer</b>	20%
	<b>100%</b>

## 1.4 Analysis of Project Delivery Options

This section of the Executive Summary summarizes the evaluation of the Project Delivery Options for each Evaluation Category. The evaluation is set out in detail for each of the Evaluation Criteria in Section 5 of the Report.

### 1.4.1 Cost to the City

The key difference among the Project Delivery Options with respect to capital costs is the amount and type of private sector financing required for construction. The Project Delivery Options which include no private financing



are the least expensive, since the public sector can generally borrow at lower rates than the private sector. The Project Delivery Options which include short-term private sector borrowing are more expensive, since the private sector must finance construction and typically borrows at higher rates than the City, resulting in increased capital costs. Finally, the Project Delivery Options which include long-term private financing are the most expensive, since long-term private sector debt generally includes higher credit spreads than short-term debt, requires equity investment, and accrues more interest payments over the term of the debt.

The Costing Model assumes that costs for operation and maintenance of the system will be the same under each of the Project Delivery Options. Although an argument could be made that under a Project Delivery Option where the private sector provides operations and/or maintenance services, private sector efficiencies and competitive tension during the procurement process could result in lower prices for operating and/or maintenance services, a conservative assumption has been made that operating and maintenance costs would be the same across all Project Delivery Options for the purposes of this analysis.

The table below sets out the scores for this Evaluation Category, which includes individual Evaluation Criteria examining both capital and O&M costs. Please refer to Section 4.9 for details on the scoring methodology. The Project Delivery Options with no private financing have the highest scores, due to having the lowest capital costs. The Project Delivery Options with short and/or long term private financing have lower scores due to higher costs.

**Table 4 – Cost to the City Evaluation Category**

**1. Cost to the City**

	Design Bid Build	Design Build	Design Build Finance	Build Finance	Design Build Maintain	Design Build Operate Maintain (Public Financing)	Design Build Operate Maintain	Design Build Finance Maintain	Design Build Finance Operate Maintain
	DBB	DB	DB(F)	B(F)	DBM(F)	DBOM	DBOM(F)	DBFM	DBFOM
Score (Percentage of Total Available Points)	100%	100%	98%	98%	98%	100%	98%	87%	87%

### 1.4.2 Alignment of City's Role with Core Business and Public Policy Objectives

Project Delivery Options which involve the private sector taking on responsibility for design, EPC, vehicle procurement, vehicle operations, vehicle maintenance, and service quality scored highly under this Evaluation Category. This is because a well-qualified private sector partner should be better positioned to carry out these roles due to significantly greater levels of experience and expertise in projects of the scale and complexity of the LRT Project.

With respect to service quality, Project Delivery Options which scored well were those which appeared likely to be compatible with development of clear service quality standards for items such as on-time arrivals, vehicle throughput, and vehicle/station cleanliness, as well as performance-based payment mechanisms to enforce service quality standards through financial incentives. Project Delivery Options which included City vehicle operation scored less favorably under this criteria, since the City's operation of municipal services does not typically include performance standards with financial or other penalties for non-performance. Therefore, Project Delivery Options which include private sector operation and/or maintenance of the system scored more favorably, since contracts with the private sector can include performance-based payment and monitoring regimes which will provide strong incentives to meet customer service standards.

The table below summarizes the scoring for this Evaluation Category.

Table 5 - Alignment of City's Role with Core Business and Public Policy Objectives Evaluation Category

## 2. Alignment of City's Role with Core Business and Public Policy Objectives

	Design Bid Build	Design Build	Design Build Finance	Build Finance	Design Build Maintain	Design Build Operate Maintain (Public Financing)	Design Build Operate Maintain	Design Build Finance Maintain	Design Build Finance Operate Maintain
	DBB	DB	DB(f)	B(f)	DBM(f)	DBOM	DBOM(f)	DBFM	DBFOM
Score (Percentage of Total Available Points)	48%	64%	64%	60%	76%	96%	100%	76%	100%

## 1.4.3 Commercial and Contractual Structure

Project Delivery Options which scored well under this Evaluation Category featured some or all of the following commercial best practices:

- Deferred Payment Mechanism.** Certain Project Delivery Options include payment mechanisms which delay payment for construction until following the completion of construction. These Project Delivery Options include DB(f), B(f), DBM(f), DBOM(f), DBFM, and DBFOM. This form of payment mechanism requires the private sector to obtain private financing for construction, and consequently private capital is at risk during the construction period in the sense that the private sector must perform by completing construction in order to repay its funders. The advantages to this approach include:
  - Strong incentives for on-time delivery, since late delivery results in higher financing costs and erodes the private sector partner's returns. The private sector is incented to complete the project on time, and may also be incented to minimize time-consuming construction claims during the construction period.
  - Liquid form of performance security (deferred payment for construction)
  - Likelihood of enhanced due diligence and monitoring of construction plans, timeline, and execution by lenders who have an interest in on-time and on-budget completion of the project so that they can be repaid
- Bundling of Design and EPC Role with Operations and/or Maintenance Role:** Project Delivery Options which bundle design, construction, and long term operations and/or maintenance are rated highly since this integration provides incentives to consider long term lifecycle and operational performance during the design and construction phase. These options included DBM(f), DBOM, DBOM(f), DBFM, and DBFOM. These models typically include contractually defined long-term capital asset maintenance plans, as well as performance-based payment mechanisms that may financially penalize the private sector if assets are not maintained according to specification.
- Long-Term Private Capital at Risk:** Where payment to the private sector partner for construction is deferred and is paid in installments over a 15 to 30 year operations/maintenance term, the private sector partner must obtain long term financing. Project Delivery Options which include long-term private capital at risk during both the construction and operations/maintenance period (DBFM and DBFOM) scored more favorably than Project Delivery Options with no private capital or only short-term private capital, since providers of long-term private capital will exercise an important oversight role during the maintenance term. Poor lifecycle performance can erode returns to debt and equity funders, through financial penalties imposed under the contract for poor maintenance practices, higher maintenance and operating costs if the asset's condition deteriorates, and/or penalties at the time of hand-back if the asset does not meet the required standard. Therefore, lenders and equity investors seek to protect their investment by developing comprehensive long-term capital budgets, regularly funding maintenance reserve accounts, and ensuring that maintenance and lifecycle replacement is carried out as scheduled. This should result in optimal lifecycle maintenance commitments, in contrast to a public sector-led process which may include a shorter budgetary horizon and may be more vulnerable to planned maintenance being deferred, often due to budgetary pressures.

The table below summarizes the scoring for this Evaluation Category.

**Table 6 – Commercial and Contractual Structure Evaluation Category****3. Commercial and Contractual Structure**

	Design Bid Build	Design Build	Design Build Finance	Build Finance	Design Build Maintain	Design Build Operate Maintain (Public Financing)	Design Build Operate Maintain	Design Build Finance Maintain	Design Build Finance Operate Maintain
	DBB	DB	DB(f)	B(f)	DBM(f)	DBOM	DBOM(f)	DBFM	DBFOM
Score (Percentage of Total Available Points)	21%	36%	53%	43%	62%	60%	82%	69%	100%

**1.4.4 Value from Risk Transfer**

Project Delivery Options which transferred the most roles and responsibilities to the private sector were rated the highest, since this implies greater transfer of risk to the private sector. None of the Project Delivery Options transferred inappropriate risks which could reduce value for the City. In addition to the transfer of design, construction, operations and maintenance risks, the evaluation also took into account the transfer of financing risks to the private sector, and the role of long-term private financing in securing risk transfer by making it difficult for the private sector partner to walk away from contractual obligations. Accordingly, Project Delivery Options which include long-term private financing (DBFM and DBFOM) scored higher than other options without long term private financing.

**Table 7 – Value from Risk Transfer Evaluation Category****4. Value from Risk Transfer**

	Design Bid Build	Design Build	Design Build Finance	Build Finance	Design Build Maintain	Design Build Operate Maintain (Public Financing)	Design Build Operate Maintain	Design Build Finance Maintain	Design Build Finance Operate Maintain
	DBB	DB	DB(f)	B(f)	DBM(f)	DBOM	DBOM(f)	DBFM	DBFOM
Score (Percentage of Total Available Points)	0%	10%	30%	20%	30%	30%	40%	60%	100%

**1.5 Results**

The results were tabulated by applying the weighting factors to the scores under each Evaluation Criteria. A full description of the scoring “mechanics” is provided in Section 4.9.

Based on the evaluation of the Project Delivery Options, the highest rated Project Delivery Options include four short-listed Project Delivery Options identified as Short Listed Project Delivery Options. Each of these options bundles design, construction, and maintenance responsibility with a private sector partner. Each of these options also defers payment to the private sector for construction until following the commissioning of the system.

- Design-Build-Maintain – DBM(f)
- Design-Build-Operate-Maintain – DBOM(f)
- Design-Build-Finance-Maintain - DBFM
- Design-Build-Finance-Operate-Maintain - DBFOM

The Design-Build-Operate-Maintain (Public Financing) option also scored well, but is not one of the recommended options due to the lack of a competitive procurement process for the final design, construction, operations and maintenance works. The benefits of the Design-Build-Operate-Maintain (Public Financing) option include bundled



design, construction, operations and maintenance coupled with improved affordability due to the lack of private finance. These benefits can be captured by the City, if desired, through the Design-Build-Operate-Maintain (DBOM(f)) option by minimizing private capital requirements through providing milestone payments during construction.

**Table 8 – Evaluation Results**

**TOTAL SCORE – EVALUATION OF PROJECT DELIVERY OPTIONS**

	Design Bid Build	Design Build	Design Build Finance	Build Finance	Design Build Maintain	Design Build Operate Maintain (Public Financing)	Design Build Operate Maintain	Design Build Finance Maintain	Design Build Finance Operate Maintain
	DBB	DB	DBF	BF	DBM(f)	DBOM	DBOM(f)	DBFM	DBFOM
Score (Percentage of Total Available Points)	51%	59%	68%	62%	71%	73%	82%	75%	95%

Table 9 on the following page summarizes the alignment between the City's objectives and the Short Listed Project Delivery Options.

Table 9 – Alignment between City objectives and Short Listed Project Delivery Options

City Objective	DBM(f)	DBOM(f)	DBFM	DBFOM
<b>Cost and Schedule Certainty</b>	<ul style="list-style-type: none"> <li>Defers the majority of payment for construction until following the completion of construction. This provides strong incentives for the private sector partner to complete construction on time.</li> <li>Fixed <b>maintenance</b> prices for the entire term of the project, with little scope for cost escalation except in narrowly defined circumstances.</li> </ul>	<ul style="list-style-type: none"> <li>Defers the majority of payment for construction until following the completion of construction. This provides strong incentives for the private sector partner to complete construction on time.</li> <li>Fixed <b>operations and maintenance</b> prices for the entire term of the project, with little scope for cost escalation except in narrowly defined circumstances.</li> </ul>	<ul style="list-style-type: none"> <li>Defers the majority of payment for construction until following the completion of construction. This provides strong incentives for the private sector partner to complete construction on time.</li> <li>Fixed <b>maintenance</b> prices for the entire term of the project, with little scope for cost escalation except in narrowly defined circumstances.</li> </ul>	<ul style="list-style-type: none"> <li>Defers the majority of payment for construction until following the completion of construction. This provides strong incentives for the private sector partner to complete construction on time.</li> <li>Fixed <b>operations and maintenance</b> prices for the entire term of the project, with little scope for cost escalation except in narrowly defined circumstances.</li> </ul>
<b>Service Quality</b>	<ul style="list-style-type: none"> <li>Leverages the private sector's greater <b>maintenance</b> experience with the scale and type of system envisioned for the LRT Project.</li> <li>Performance-based payment mechanism under this option will incentivize meeting <b>maintenance</b> service quality standards.</li> </ul>	<ul style="list-style-type: none"> <li>Leverages the private sector's greater <b>operations and maintenance</b> experience with the scale and type of system envisioned for the LRT Project.</li> <li>Performance-based payment mechanism under this option will incentivize meeting <b>operations and maintenance</b> service quality standards.</li> </ul>	<ul style="list-style-type: none"> <li>Leverages the private sector's greater <b>maintenance</b> experience with the scale and type of system envisioned for the LRT Project.</li> <li>Performance-based payment mechanism under this option will incentivize meeting <b>maintenance</b> service quality standards.</li> </ul>	<ul style="list-style-type: none"> <li>Leverages the private sector's greater <b>operations and maintenance</b> experience with the scale and type of system envisioned for the LRT Project.</li> <li>Performance-based payment mechanism under this option will incentivize meeting <b>operations and maintenance</b> service quality standards.</li> </ul>
<b>Asset Residual Condition</b>	<ul style="list-style-type: none"> <li>Bundles design, construction, and long-term maintenance of all system assets, providing clear lines of accountability and risk transfer.</li> <li>Performance-based payment mechanism will penalize inadequate maintenance of the assets. In contrast to traditional methods, the long-term contract can commit the private partner up-front to a capital maintenance program which is optimal for mitigating the risk of deferred maintenance.</li> </ul>	<ul style="list-style-type: none"> <li>Bundles design, construction, and long-term maintenance of all system assets, providing clear lines of accountability and risk transfer.</li> <li>Performance-based payment mechanism will penalize inadequate maintenance of the assets. In contrast to traditional methods, the long-term contract can commit the private partner up-front to a capital maintenance program which is optimal for mitigating the risk of deferred maintenance.</li> </ul>	<ul style="list-style-type: none"> <li>Bundles design, construction, and long-term maintenance of all system assets, providing clear lines of accountability and risk transfer.</li> <li>Performance-based payment mechanism will penalize inadequate maintenance of the assets. In contrast to traditional methods, the long-term contract can commit the private partner up-front to a capital maintenance program which is optimal for mitigating the risk of deferred maintenance.</li> <li>Long-term private capital providers will oversee appropriate maintenance practices since they could face losses if the asset is not properly maintained.</li> </ul>	<ul style="list-style-type: none"> <li>Bundles design, construction, and long-term maintenance of all system assets, providing clear lines of accountability and risk transfer.</li> <li>Performance-based payment mechanism will penalize inadequate maintenance of the assets. In contrast to traditional methods, the long-term contract can commit the private partner up-front to a capital maintenance program which is optimal for mitigating the risk of deferred maintenance.</li> <li>Long-term private capital providers will oversee appropriate maintenance practices since they could face losses if the asset is not properly maintained.</li> </ul>
<b>Risk Transfer</b>	<ul style="list-style-type: none"> <li>Transfers significant <b>design, construction, and maintenance</b> risks to the private sector, reducing the risks borne by the City with respect to the project.</li> <li>During the construction period, private capital is at risk and ultimately bears performance risks.</li> </ul>	<ul style="list-style-type: none"> <li>Transfers significant <b>design, construction, operations, and maintenance</b> risks to the private sector, reducing the risks borne by the City with respect to the project.</li> <li>During the construction period, private capital is at risk and ultimately bears performance risks.</li> </ul>	<ul style="list-style-type: none"> <li>Transfers significant <b>design, construction, and maintenance</b> risks to the private sector, reducing the risks borne by the City with respect to the project.</li> <li>During the construction period, private capital is at risk and ultimately bears performance risks.</li> </ul>	<ul style="list-style-type: none"> <li>Transfers significant <b>design, construction, operations, and maintenance</b> risks to the private sector, reducing the risks borne by the City with respect to the project.</li> <li>During the construction period, private capital is at risk and ultimately bears performance risks.</li> </ul>



City Objective	DBM(f)	DBOM(f)	DBFM	DBFOM
<b>Performance Security</b>	<ul style="list-style-type: none"> <li>Performance is secured during the construction phase by very liquid forms of security.</li> </ul>	<ul style="list-style-type: none"> <li>Performance is secured during the construction phase by very liquid forms of security.</li> </ul>	<ul style="list-style-type: none"> <li>During the operations period, private capital is at risk and ultimately bears performance risks.</li> <li>Performance is secured during the construction phase by very liquid forms of security.</li> <li>Performance is secured during the operations period by very liquid forms of security.</li> </ul>	<ul style="list-style-type: none"> <li>During the operations period, private capital is at risk and ultimately bears performance risks.</li> <li>Performance is secured during the construction phase by very liquid forms of security.</li> <li>Performance is secured during the operations period by very liquid forms of security.</li> </ul>

## 1.6 Recommendations

The evaluation of the Project Delivery Options has identified four Short-Listed Project Delivery Options which feature bundled design, construction, and maintenance contracts and deferred payment for construction.

- Design-Build-Maintain – DBM(f)
- Design-Build-Operate-Maintain – DBOM(f)
- Design-Build-Finance-Maintain - DBFM
- Design-Build-Finance-Operate-Maintain - DBFOM

Each of these Short-Listed Project Delivery Options meets the City's core objectives and is a suitable option for undertaking the LRT Project. However, of the Short-Listed Project Delivery Options, the DBFM and DBFOM are preferred options since they include long-term private capital to fund deferred construction payments, which this Report identifies as the most effective mechanism for securing long-term performance.

In determining the single Project Delivery Option that will be utilized, the City should consider how each of the Short-Listed Project Delivery Options fulfills the following objectives:

- Financial and/or budgetary considerations
- The extent to which each Short-Listed Project Delivery maximizes the City's operational flexibility for long-term operations of the transit system, including system expansion
- Maximizing value to the City, based on an updated Value for Money assessment which quantifies the estimated risk-adjusted value for the City of each of the Short-Listed Project Delivery Options



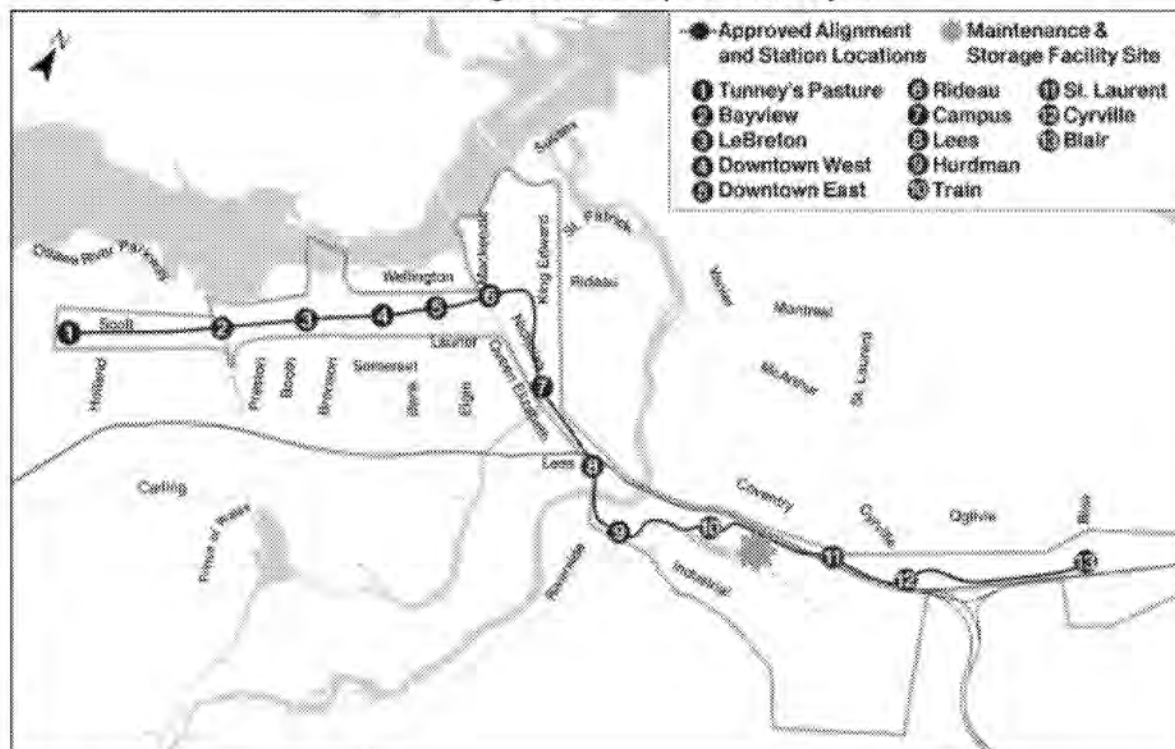
## 2 Background

### 2.1 An Overview of the LRT Project

In November 2008, as part of its 20/20 initiative to manage growth, the City updated its Transportation Master Plan (TMP) with a target to increase transit usage by 2031 to a level that would be similar to many European cities. The TMP presented strategies to improve the integration of transit with other modes through policy initiatives on development, parking and public awareness which will result in increased transit use, ultimately contributing to sustainable development, a strong economy and improved quality of life. The TMP also set priorities for new infrastructure to improve the level of transit service through a variety of initiatives related to route network structure and service standards, rapid transit and transit priority networks, fleet expansion and maintenance, and safety and security.

From a broad perspective, the TMP envisions a long-run expansion of the transit network and the electrification of light rail corridors to encourage intensification of land uses around rapid transit stations. It also proposed the implementation of a network of transit priority corridors to reduce travel times and improve the reliability of transit service in mixed traffic conditions. A key feature of the TMP is a light rail transit system between Tunney's Pasture Station and Blair Transit Station on the existing Transitway corridor with a tunnel section through the downtown core (the LRT Project).

Figure 2: The Proposed LRT Project



#### 2.1.1 Functional Design Study

As part of the TMP update approval in November, 2008, City Council initiated the Downtown Ottawa Transit Tunnel Planning Functional Design and Environmental Assessment study (Functional Design and EA Study) to

assess the technical feasibility of the LRT Project. The objective of the Functional Design and EA Study was to determine how to build the LRT between Tunney's Pasture Station and Blair Transit Station on the existing Transitway and to identify the routing of the tunnel section through the downtown core. In addition, the Study included recommendations for station locations, transit riders' access to the tunnel from the street, the look of the stations from an urban design perspective, and how the stations will be integrated with existing buildings.

The Functional Design and EA Study was completed in June 2010, with a Notice to Proceed from the Ontario Minister of the Environment received dated August 14, 2010.

### **2.1.2 Other Studies**

The City has also initiated a series of other studies to assess the feasibility of the LRT project. These studies include:

1. Operational planning and technology reviews
2. A business development strategy framework
3. A project communications strategic plan
4. A preliminary VFM analysis completed by Infrastructure Ontario on Alternative Financing and Procurement options

## **2.2 The Project Delivery and Procurement Options Report**

Almost all large public infrastructure projects involve contracting with the private sector to deliver at least some portion of the required works and/or services. The City is considering which aspects of the Project should be procured from the private sector, as well as the appropriate procurement methodology. Accordingly, the City has engaged Deloitte to work with the City to determine the most appropriate procurement and project delivery models which could be used to design, construct, commission, maintain and operate the LRT Project. This report (the Project Delivery and Procurement Options Report) contains Deloitte's recommendations to the City.

### **2.2.1 Status of Deloitte Work**

Since January 2010, Deloitte has been working with the City's Rail Implementation Office (RIO) to develop the Project Delivery and Procurement Options Report. Deloitte's work to date has included the following steps which have helped to develop this document:

- Study of background material provided by the City, including reports prepared by other consultants on potential procurement options for the LRT Project
- Meetings with the City to ascertain the City's objectives for the LRT Project
- Definition of eleven Project Delivery Options
- In collaboration with the City, development of a set of evaluation criteria by which to evaluate Project Delivery Options (the Evaluation Criteria)
- Preparation of several case studies of other successful public transit rail projects in order to draw out lessons learned and best practices
- Development of the Costing Model which estimates the capital and operating costs of the LRT Project under several different financing scenarios
- Interim presentation to the City of a preliminary assessment of the Project Delivery Options
- Presentation to the City of a draft final version of this Report including recommendations

### **2.2.2 Purpose of This Report**

This Report ties together the Project Delivery Options, the Evaluation Criteria, and the Costing Model in order to provide a comprehensive assessment of the Project Delivery Options and a recommendation on which Project Delivery Options are best positioned to achieve the City's objectives.



## 2.3 The City's Objectives

The City has identified several key objectives for the procurement and delivery of the LRT Project. The optimal Project Delivery Options will be the options which best position the City to achieve these objectives. Accordingly, the evaluation criteria by which the Project Delivery Options have been analyzed are focused on the City's objectives, which are as follows:

- **Cost and Schedule Certainty.** The City desires that the construction of the asset be completed on time and on budget, that there be strong incentives in place for the completion of construction on time and on budget, and that the party responsible for construction should bear the consequences of delay and/or cost overruns.
- **Service Quality.** The City desires a high level of service quality, including on-time service, appropriate levels of service to match demand, and vehicle and station cleanliness.
- **Asset Residual Condition.** The system and civil works should be maintained in good working condition such that the residual value of the assets in the medium to long-term (15 to 30 years) is optimized.
- **Risk Transfer.** The City wishes to transfer appropriate risks to the private sector, based on the relative capabilities of the public and private sector.
- **Performance Security.** The private sector's performance should be backed by a liquid form of performance security which can easily be leveraged by the City if necessary.

## 3 Summary of Key Themes

During discussions and workshops with the City, as well as in interim reports prepared for the City, a number of key themes have emerged. These principles underlie much of the analysis of the Project Delivery Options which appears in subsequent sections of the Report and are repeated through the analytical sections of the Report. Therefore, a summary of key themes is presented upfront in this section, in order to help inform an understanding of the analysis in Sections 4 and 5 of this Report.

### 3.1 Bundling of Roles

The City can benefit from efficiencies under Project Delivery Options which bundle together the design, construction, operations and/or maintenance roles into one contract with one private sector partner. These efficiencies include a reduction in design coordination issues, strong incentives to design a system which can be constructed efficiently, as well as strong incentives to design and construct a system which will have optimal lifecycle performance. The integration of design, construction, and long-term maintenance (lifecycle) with one private sector entity helps to transfer long-term maintenance risks to the private sector, as there is clear accountability for the long-term condition of the assets. This tends to result in better long-term asset quality.

### 3.2 Deferred Payment for Construction

Under certain Project Delivery Options, the City does not pay the private sector for construction until the system has been substantially completed and commissioned into service<sup>1</sup>. This requires the private sector to obtain short term construction financing. Other Project Delivery Options allow the City to pay the private sector partner for construction in installments over a 15-30 year period following completion. This requires the private sector partner to obtain long-term financing. Methods of payment which defer payment for construction until completion result in strong incentives for the private sector to overcome delays during construction and complete the works on schedule, since they are not paid until completion. In addition, the private sector partner's repayment obligations to lenders are typically triggered on a date which is on or close to the scheduled completion date, providing further incentive to complete construction on time in order to meet debt repayment obligations coming due.

### 3.3 Performance-based Payment

Contracts with the private sector which include operations and/or maintenance roles allow the City to define detailed performance standards for the services provided by the private sector partner. If these service standards are not met, the City could be entitled to deduct amounts from the scheduled service payments to the private sector as a penalty for not meeting service specifications. Performance-based payment in the transit context is well established and is currently in use on several transit systems in North America including the Canada Line in British Columbia as well as the Hudson Bergen system in New Jersey. Performance-based payment provides the private sector partner with strong incentives to meet service standards.

### 3.4 Wheel-Rail Interface

There is significant co-dependence between vehicle operations, vehicle maintenance and track maintenance. The manner of vehicle operations (speed, frequency, and braking) may impact upon vehicle and track maintenance requirements. It is optimal for vehicle operations and vehicle and track maintenance to be bundled with one responsible party. If these functions are unbundled, careful attention must be paid to the contractual interfaces

<sup>1</sup> In the context of this report, "substantial completion" refers to the completion of the construction works (subject to minor outstanding works) and delivery of vehicles to the site, and "commissioning" refers to the contractor demonstrating compliance with specified requirements through system performance tests. Specific projects may define these milestones in a slightly different manner or using different terminology.

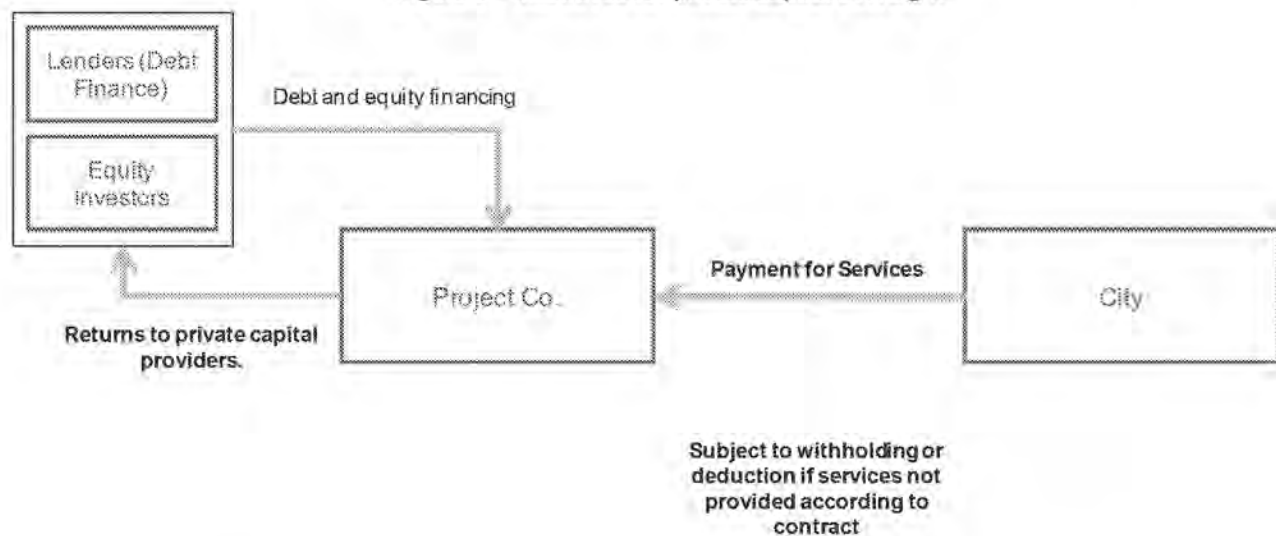
between the party responsible for vehicle operations and the party responsible for vehicle and/or track maintenance.

### 3.5 Oversight Role of Private Capital

This theme is relevant for Project Delivery Options which include short-term or long-term private financing. Providers of private capital for large infrastructure projects typically perform extensive up-front due diligence on the achievability of construction and operation of the asset, and typically also thoroughly check the accuracy and reasonableness of construction schedules and budgets as well as lifecycle replacement budgeting.

Private capital providers should play this role because their funds are at risk if construction, maintenance, or operation of the asset does not go according to plan or does not meet service standards. Under typical infrastructure project financing arrangements, investment returns to private capital providers are sourced only from the cash flows to the project. In turn, the project's only source of cash flow is payment by the public sector for contracted services, which can be withheld until construction is complete or subject to deductions if services are not provided according to contractual specifications. Therefore, private sector capital providers' investment returns are at risk based on the performance of the project. This is set out in the diagram below, which illustrates the point that if the private sector partner receives less payment due to failure to meet services specifications, this can impact the investment returns to private capital. Private capital providers are incented to provide strong third-party oversight.

**Figure 3 – Incentives for private capital oversight**



In the event of a default or poor performance which could lead to a default, private capital providers should be incented to step in since they bear ultimate financial responsibility and all or part of their investment could be at risk.<sup>2</sup>

### 3.6 Fixed Prices

Fixed price contracts for construction transfer the risks associated with cost overruns and schedule delays to the private sector, and provide the public sector with cost certainty. Although almost all forms of construction contract will provide for some degree of additional compensation to the contractor in defined circumstances, contracts which transfer greater construction risk to the private sector will provide more cost certainty.

Long-term operations and/or maintenance contracts with the private sector can also provide fixed prices and cost certainty for most operations and/or maintenance services, based on a 15-30 year time horizon. This can provide

<sup>2</sup> Depending upon type of funding provided (debt or equity) and contractual termination provisions.

the City with greater cost certainty than if the City carries out these services itself and budgets based on shorter time horizons.

### 3.7 Deferred Maintenance

Project Delivery Options which include maintenance services, particularly those which involve long-term lender oversight (such as DBFM or DBFOM), will require the private sector partner to develop a long term maintenance budget (15-30 years, to match the contractual term), to regularly fund the budget from project revenues, and to carry out the maintenance plan according to schedule. The conditions will be contained in the contract between the private sector and the City, or (in the case of DBFM and DBFOM) in the terms of lending agreements between the private sector and its funders.

This can be contrasted with a public sector process which may budget over a shorter time horizon and could be vulnerable to deferred maintenance in the case of other pressing budgetary priorities.

In this sense, Project Delivery Options which include a long-term maintenance role for the private sector, and in particular those which include long term lender oversight, can be seen as the optimal method by which to “lock in” a 15-30 year maintenance plan and mitigate the risk of deferred maintenance.

### 3.8 Methods of Securing Performance

A key consideration in the evaluation of various Project Delivery Options is the extent to which the public sector can secure the performance of private sector partners by enforcing financial consequences for failure to perform in accordance with contractual arrangements via a form of performance security. This may take the form of obtaining funds from the private sector partner in order to rectify deficient work, obtaining funds from the private sector as a form of damages, withholding payments otherwise due to the private sector, or deducting amounts from payments due to the private sector.

Methods of securing performance can be ranked in order of their liquidity; that is, how easily the public sector can realize, withhold, or deduct funds if performance is not in accordance with contractual standards. Generally speaking, the more liquid a form of performance security, the better it is for the public sector, since the public sector can more easily impose financial consequences for failure to perform and the “threat” to the private sector is more credible. Project Delivery Options which withhold payment until performance is assured (thus requiring private financing) by definition have more liquid forms of performance security.

Common forms of performance security in the Project Delivery Options reviewed by this Report include, in order of liquidity:

#### 3.8.1 Traditional Forms of Performance Security (Less Liquid)

Traditional forms of performance security include parent company guarantees, performance bonds, and liquidated damages for late completion. These forms of security can be used to secure performance during either the construction or maintenance period. These traditional forms of performance security are very well established in the infrastructure industry, but do have some features which make them less liquid than other forms of performance security:

- They may require “extracting” funds from a counterparty (as opposed to simple withholding of payment), and therefore include the risk of dispute by the counterparty and consequent delay in realizing payment. For example, a claim for liquidated damages may be disputed by the private sector on the grounds that delays in completion were caused by other contractors or by the actions of the public sector, and a dispute such as this could reach an arbitration panel or even the courts. In addition, a performance bond is typically provided by a third party surety (analogous to an insurer) and the third party may contest whether the conditions for payment of the bond have been triggered or not.
- Specific legal conditions must be met in order to realize these forms of security – either the conditions of the form of parent company guarantee, the conditions of the performance bond, or the contractual conditions governing liquidated damages.
- In the case of parent company guarantees and performance bonds, the funds obtained by the public sector from this form of performance security are typically used to rectify non-performance that has already occurred.



- Cashing a performance bond affects the reputation and performance history of a contractor and typically marks the end of the contractual relationship.

### 3.8.2 Other Traditional Forms of Performance Security (Liquid)

Other traditional forms of performance security include irrevocable letters of credit payable on demand. A letter of credit can be used to secure performance during the construction period as well as during the maintenance period:

- A letter of credit can typically be presented by the public sector to a third party financial institution for payment on demand, and therefore is more liquid than parent company guarantees, performance bonds and liquidated damages since there is no need to "extract" payment from the counterparty.
- Specific legal conditions (typically contained in the form of letter of credit) may have to be met in order for the public sector to draw on this security, but in the majority of cases the conditions are not onerous for the beneficiary to meet.
- A letter of credit is typically secured by funds deposited with the bank which underwrites the letter of credit. Therefore, the maximum amount of a letter of credit is limited by the amount of cash that a private sector partner is willing to put on deposit with a bank. Letters of credit are often used to provide performance security to a maximum of 5-10% of construction cost.

### 3.8.3 Deferred Payment for Construction (More Liquid)

Deferred payment for construction is applied when the private sector partner is not paid for the construction works until the substantial completion and/or commissioning of the asset. For example under the B(f), DB(f), DBM(f), and DBOM(f) options, payment occurs by way of lump sum payment upon substantial completion or commissioning of the asset. To a lesser extent, this method of securing performance may also be utilized in the DBB, DB, or DBOM option if sufficiently large final milestone or progress payments are held back until commissioning of the asset<sup>3</sup>. This form of performance security has the following characteristics:

- This is a more liquid form of security since payment does not have to be "extracted" from a counterparty, rather payment is simply withheld until performance is assured.
- This form of performance security can be triggered by a more objective set of criteria – payment is only provided when an independent certifier certifies that the asset is substantially complete or has been commissioned into service in accordance with technical criteria which should be clearly defined by the contract.
- This form of performance security requires performance by the private sector, rather than obtaining funds from the private sector to compensate the public sector for rectification work or other losses.

### 3.8.4 Long-Term Capital Repayment (Most Liquid)

This form of performance security is similar to the deferred payment for construction set out above, in that payment to the private sector is not triggered until following commissioning/substantial completion of the asset. However, in this case instead of payment being provided as a lump sum payment following commissioning/substantial completion, payment is provided in installments over a long-term operations period, which requires the private sector to obtain financing for construction which is repaid over a long term (typically roughly the same length as the operations period). Therefore, this method can be used to secure performance during not only the construction period but also during the operations period. Performance is secured since payments are withheld until the delivery of the service, and deductions may be applied to the private sector partner's installment payments (monthly service payments) if performance falls short of the standards.

- This is also a more liquid form of security since payment does not have to be "extracted" from a counterparty, rather payment is simply withheld until performance is assessed against the performance standards during each month of the operating period.
- As with the deferred payment for construction method outlined above, payment does not begin until construction performance has been assured and the asset is commissioned and in service.

<sup>3</sup> For example, the Houston Metro project included withholding of the final \$75 Million in construction payments until commissioning was achieved.



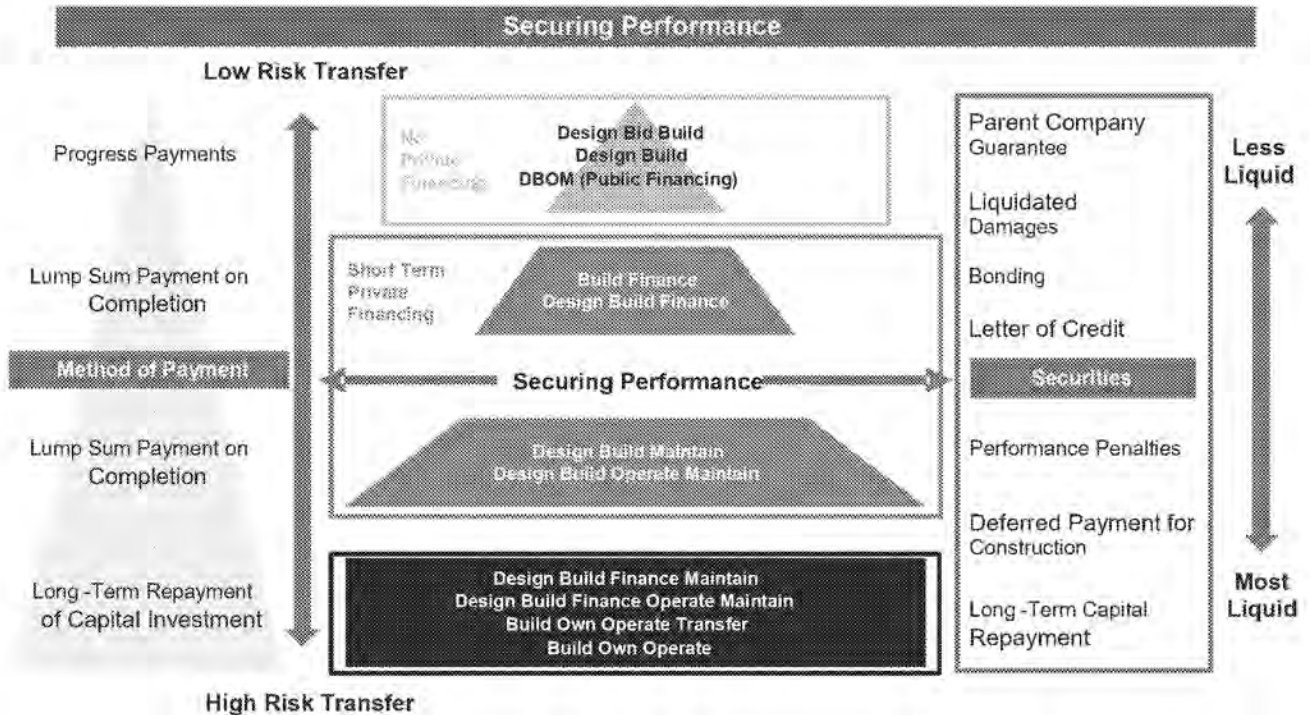
- This form of performance security will cause lenders to closely scrutinize the ability of the private sector partner to both successfully construct and maintain the asset, since withholding of payment or excessive payment deduction by the public sector due to non-performance could make the private sector partner unable to meet its debt service obligations. This point is also illustrated in Section 3.5, above.

### 3.8.5 Performance Penalties

Under Project Delivery Options such as DBM(f), DBOM, and DBOM(f) it is also possible to secure operations and maintenance performance through performance penalties during the operations term. Similar to the payment mechanism outlined above for DBFM and/or DBFOM delivery options, the contract can provide for deductions to be applied to the private sector partner's regular service payments if performance falls short of specified standards. Again, this is a very liquid form of security since payment is simply withheld until performance is assessed against the required standards.

However, in contrast to the long-term capital repayment under a DBFM and/or DBFOM option, the service payments under a DBM(f), DBOM and DBOM(f) option include only payment for operations and maintenance services, since under all these options no private capital is required beyond the construction period. Unlike long-term capital repayment then, performance penalties under the DBM(f), DBOM and DBOM(f) options do not have the potential to erode returns to private capital. Therefore, while performance penalties serve as a very powerful incentive to the private sector service operator to maintain service standards, unlike long-term capital repayment they do not incent third party capital providers to monitor the service provider's performance.

Figure 4: Methods of Securing Performance



# 4 Overview of Deloitte Methodology and Approach

This section of the Report will identify and describe the long-list of Project Delivery Options to be analyzed. This section will also set out the methodology utilized to evaluate the Project Delivery Options, including Evaluation Criteria, scoring and weighting system.

## 4.1 Identification of Project Delivery Options to Be Analyzed

Project Delivery Options refer to the range of contractual terms and allocation of roles and responsibilities between the public and private sector for delivery of an infrastructure project. At a high level, delivery of an infrastructure project includes preliminary engineering work, design, construction, maintenance and/or operation of the asset, vehicle procurement and supply (in the case of transit projects), as well as financing of construction. The Project Delivery Options evaluated in this Report differ from one another in terms of:

- Allocation of responsibility for design, EPC (engineering-procurement-construction) coordination role during construction, maintenance, system operations, and vehicle procurement
- The timing and method of paying the private sector partner(s), and whether the selected timing and method of payment is deferred thereby requiring the private sector to obtain financing
- Risks associated with ridership and revenue

Deloitte has identified a long-list of Project Delivery Options. These Project Delivery Options are based on background material provided by the City (listed in Appendix B); case studies of transit projects from other jurisdictions; and market knowledge and experience. The long-list of Project Delivery Options is set out below in Figure 5.

**Figure 5 - Identification of Project Delivery Options to be Evaluated**

Design Bid Build	Design Build	Build Finance	Design Build Finance	Design Build Maintain	Design Build Operate Maintain (Public Financing)	Design Build Operate Maintain	Design Build Finance Maintain	Design Build Finance Operate Maintain	Build Own Operate Transfer	Build Own Operate
DBB	DB	B(f)	DB(f)	DBM(f)	DSOM	DSOM(f)	DSFM	DEFOM	BOOT	BOO

## 4.2 Sources of Financing

A key variable among the Project Delivery Options set out in Figure 2 is the method of payment for construction. Project Delivery Options which withhold payment for a significant portion of construction costs will require the private sector partner to obtain financing, in order to bridge the gap between construction expenditure and receipt of payment. Table 10 below summarizes the method of payment and type of financing associated with the Project Delivery Options.

The reader will note that options which are abbreviated with an "(f)" require short-term private financing, while options which are abbreviated with an "F" require both short and long-term private financing. The BOT and BOOT options also require both short and long-term private financing.

Table 10 – Sources of Financing

Project Delivery Options	Payment Mechanism	Type of Private Financing Required
<ul style="list-style-type: none"> <li>• DBB</li> <li>• DB</li> <li>• DBOM</li> </ul>	<ul style="list-style-type: none"> <li>• Progress or milestone payments during construction based on value of work in place</li> </ul>	<ul style="list-style-type: none"> <li>• Little or no private financing</li> </ul>
<ul style="list-style-type: none"> <li>• B(f)</li> <li>• DB(f)</li> <li>• DBM(f)</li> <li>• DBOM(f)</li> </ul>	<ul style="list-style-type: none"> <li>• Significant portion of payment withheld and paid following substantial completion or commissioning of system</li> </ul>	<ul style="list-style-type: none"> <li>• Short-term construction financing</li> </ul>
<ul style="list-style-type: none"> <li>• DBFM</li> <li>• DBFOM</li> <li>• BOT</li> <li>• BOOT</li> </ul>	<ul style="list-style-type: none"> <li>• Significant portion of payment withheld and paid following substantial completion or commissioning of system</li> <li>• Significant portion of payment withheld and paid in installments over 15 – 30 year operations or maintenance term</li> </ul>	<ul style="list-style-type: none"> <li>• Short term construction financing</li> <li>• Long-term debt and equity financing</li> </ul>

### 4.3 Description of Project Delivery Options

The following section summarizes the roles and responsibilities, payment structure, and other features associated with each of the long-list of Project Delivery Options. The roles and responsibilities for each Project Delivery Option are set out in their entirety in the chart attached as Figure 6.

It is important to note that many variations on each project delivery option are possible and it may be desirable to address specific situations on a project-by-project basis. However, the Project Delivery Options described in Figure 6 represent the most typical allocations of roles and responsibilities between the public and private sector for delivery of transit infrastructure.

In the description of Project Delivery Options set out below, the term “public sector” refers to the government and/or government agency charged with delivering and managing the transit project – in this case, the City of Ottawa. The term “private sector” may refer to either: a private sector design, construction, or asset maintenance firm, or to a special purpose corporate vehicle established specifically to carry out an infrastructure project, which is owned by and contracts with various private sector service providers.

#### 4.3.1 Design – Bid – Build (DBB)

Under this option, the public sector leads the design and construction of the asset in a sequential manner. The public sector will first procure the design of the asset, either through its own public works department or from a private sector design firm. Following the completion of the design documents, the public sector will then tender the construction works based on the completed design, usually on a low-bid basis. The public sector must assume all risks associated with the design, to the extent that it cannot recover from the design firm. In particular, design coordination issues that increase construction costs typically fall to the public sector under this delivery option. During construction, the public sector must manage and oversee the general contractor. If the construction works have been contracted out to more than one general contractor, the public sector must also coordinate the contractors. In addition, under this model the public sector will typically procure all transit vehicles.

The public sector pays for the asset through progress or milestone payments to construction contractors during the construction period, based on work in place. Due to this method of payment, construction contractors do not have to obtain significant amounts of private financing in order to carry out construction. Performance is secured through less liquid methods including performance bonding and limited construction warranties. At completion, the public sector leads the testing and commissioning process.

Following completion, the asset is turned over to the public sector which then assumes full responsibility for operations and maintenance (O&M). The method of budgeting and payment for O&M is carried out according to the public sector's established practices.

Under this Project Delivery Option, the public sector maintains ownership of system assets at all times.



### 4.3.2 Design Build (DB)

Under this option, the public sector contracts with a single private sector design-builder which carries out the final design and EPC role for constructing the asset. This option integrates the final design and construction roles with one private sector firm, transferring design coordination risks to the private sector partner as well as compressing the schedule to the extent that design and construction can proceed contemporaneously. Under this model the private sector typically leads the procurement of vehicles, based on specifications provided by the public sector.

Similar to the DBB model, the public sector pays for the asset through progress or milestone payments to the design-build contractor during the construction period based on the value of work in place. Due to this method of payment, the design-builder does not have to source significant amounts of private financing. Performance security is also limited to less liquid methods including performance bonding and construction warranties.

Also similar to the DBB model, following completion, the asset is turned over to the public sector which then assumes full responsibility for funding and implementing O&M.

Under this Project Delivery Option, the public sector maintains ownership of system assets at all times.

### 4.3.3 Design Build Finance (DB(f))

As with the DB delivery option, this model integrates final design and the EPC role with one private sector design-build contractor, which is also typically charged with vehicle procurement based on specifications developed by the public sector. However, a key point of difference is the payment mechanism, as the DB(f) model does not provide any payment to the private sector partner until substantial completion is achieved. Therefore, the private sector partner must obtain construction financing from private sector lenders. This payment mechanism provides a more liquid form of security for the public sector, since the public sector does not pay until the asset is substantially completed and commissioned. Therefore, payment for construction is performance-based in the sense that the contractor is not paid until it demonstrates compliance with the public sector's technical specifications for construction of the system.

As with the DBB and DB model, the asset is turned over to the public sector following completion, and the public sector assumes full responsibility for funding and implementing O&M.

Under this Project Delivery Option, the public sector maintains ownership of system assets at all times.

### 4.3.4 Build Finance (B(f))

This delivery option is a variation of a DB(f) model, and is typically employed when the public sector has already developed a final or close to final design for the asset at the time of procuring the project. The private sector may perform some due diligence and value engineering on the design, but constructs the asset based on this design. Under this model, the project agreement will typically lay out intricate provisions which share the risk of design deficiencies and design coordination issues between the public and private sector.

Similar to the DB(f) model, the B(f) model does not provide any payment to the private sector partner until substantial completion is achieved. Therefore, the private sector partner must obtain construction financing from private sector lenders.

Under this Project Delivery Option, the public sector maintains ownership of system assets at all times.

### 4.3.5 Design Build Maintain (DBM(f))

Under the DBM(f) model, the private sector has final design and construction responsibilities, is not paid for construction until substantial completion (resulting in a requirement to source private construction financing), and assumes responsibility for vehicle procurement based on specifications laid out by the public sector. A key distinction however is that the private sector would continue to be involved in the project following substantial completion, providing maintenance services for a long-term period typically 15-30 years in length.

As noted above, the private sector partner will have to source private construction financing since it does not receive payment for construction until substantial completion is certified. This financing requirement is however only short-term in nature – spanning the length of the construction period – and following receipt of payment for construction, the private sector partner is typically able to repay its funders at the close of the construction period. Therefore, there is no long-term financing outstanding during the 15-30 year maintenance period. The private sector may be paid using a performance-based method during the term of the maintenance period for its maintenance services. This payment is in respect of the maintenance services only and does not represent private capital at risk.

The scope of maintenance services will generally include regular and rehabilitative maintenance for civil works such as stations, tunnels, maintenance centers and grade separations, as well as vehicle and station custodial duties. The scope of maintenance services may also include track, vehicle and train control system maintenance. Since under the DBM(f) model the public sector retains responsibility for vehicle operations, including these components in the private sector's scope of work would involve "unbundling" vehicle operations from track, vehicle, and systems maintenance. This creates some risks associated with overlapping responsibility for vehicle and track conditions. As but one example, the manner of vehicle operations (speed, frequency, and braking) can affect the requirements for vehicle maintenance. Therefore, the contract with the private sector partner must mitigate these risks by setting out clear terms governing this interface. This Report assumes that the private sector is responsible for track, vehicle, and train control system maintenance.

Under this Project Delivery Option, the public sector maintains ownership of system assets at all times.

#### **4.3.6 Design Build Operate Maintain - Public Financing (DBOM)**

This delivery option is based on the "Houston model" precedent utilized for the Houston Metro project. There are also additional projects which have been executed based on DBOM models similar (but not identical) to this model, such as the Hudson-Bergen light rail project.<sup>4</sup>

Under this model, the public and private sectors work collaboratively during an initial preliminary engineering phase of the project, governed by a development agreement. The scope of works which may be the subject of public and private sector collaboration include preliminary design, pricing for Design-Build and O&M work, development of procurement documents for vehicle procurement, assisting the public sector in developing a financing solution, and other preliminary works such as subsurface utility works. These initial phase works are paid on a monthly progress basis according to work completed up to a maximum total amount. During the later stages of the developmental phase, the public sector and private sector partner must negotiate pricing for design, construction, and O&M works. Provided that the parties can agree on pricing, the project moves to an execution stage where the private sector partner takes responsibility for the final design and construction roles. The private sector partner is typically paid during construction primarily on a progress payment basis, meaning that there are minimal requirements for private sector financing of construction.

Following completion of construction, the private sector takes responsibility for operation and maintenance of the transit system, including vehicle operations. The private sector is paid monthly for its operations and maintenance services, and payments may be adjusted upward or downward based on adherence to contractually defined service standard – in other words, payment is performance-based. Roles such as fare setting, fare collection, and customer service interface are still carried out by the public sector. In addition, the private sector's payment for O&M services is not affected by the transit system's levels of ridership – the public sector retains all ridership risk.

Under this Project Delivery Option, the public sector maintains ownership of system assets at all times.

#### **4.3.7 Design Build Operate Maintain (DBOM(f))**

This model differs from the DBOM (Public Financing) option in three principal ways. First, construction and O&M pricing is set based on a competitive procurement process. Second, private sector construction financing is required since the private sector is not paid for construction until substantial completion. Third, the public and

<sup>4</sup> Unlike the DBOM (Public Financing) model presented in this Report, the Hudson Bergen project had a competitive procurement process for construction and O&M services, and did not involve private sector participation in preliminary engineering activities.



private sectors do not collaborate during the preliminary engineering phase of the project, and therefore preliminary design as well as technology and vehicle specification is entirely the role of the public sector.

Under this delivery option, the private sector has final design and construction responsibilities, and assumes responsibility for vehicle procurement based on specifications laid out by the public sector. The private sector also takes responsibility for operation and maintenance of the transit system, including vehicle operations. The private sector is paid on a monthly basis for its operations and maintenance services, and payment is performance-based. Since all private capital is repaid at the end of the construction period, there is no requirement for long-term financing and performance security during the operations period is limited to less liquid methods such as performance bonds and/or letters of credit. Roles such as fare setting, fare collection, and customer service interface are still assumed by the public sector. In addition, the private sector's payment for O&M services is not affected by the transit system's levels of ridership – the public sector retains all ridership risk.

As noted in the preamble to this Section 4.2, variations on each of these Project Delivery Options exist. In particular, the requirement for private sector construction financing under the DBOM(f) may be reduced or eliminated by providing milestone payments during the construction period. This would result in a Project Delivery Option similar to the Hudson Bergen project, which is summarized as a case study in Appendix C.

Under this Project Delivery Option, the public sector maintains ownership of system assets at all times.

#### 4.3.8 Design Build Finance Maintain (DBFM)

This option is similar to the DBM(f) option, in that final design, construction, and long-term maintenance responsibilities are all integrated with the private sector partner. However, a key distinction under this model is that the private sector partner is not fully paid for construction of the asset following completion of construction, but is paid in installments over the length of the maintenance term (typically 15-30 years). Alternatively, the private sector partner may be partially paid for construction during construction and/or at substantial completion, with the remaining portion being paid in installments over the term of the agreement.<sup>3</sup>

The private sector's scope of work during the maintenance term is similar to that under the DBM(f) model, discussed above, including regular and rehabilitative maintenance for civil works as well as vehicle and station custodial duties. As with the DBM(f) model, the scope of maintenance services may also include track, vehicle and train control system maintenance. If this is the case, the contract with the private sector partner must mitigate the risks associated with unbundling these functions from vehicle operations by providing clear terms governing the interface between vehicle operations and track, vehicle and systems maintenance. This Report assumes that the private sector is responsible for track, vehicle, and train control system maintenance.

As noted above, the private sector partner will receive at least a portion of its payment via monthly payments throughout the length of the maintenance term. The monthly payments include:

- A fixed capital repayment component, which effectively repays the private sector's long-term debt and equity investors for their financing of the construction works
- An additional maintenance component to compensate the private sector partner for its ongoing maintenance work. The payment for maintenance services is typically performance-based and is subject to deductions for failing to meet contractually specified performance standards. If deductions are quite severe, they may reduce the capital repayment component as well.

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<sup>3</sup> In most cases, the public sector provides partial payment for construction during the construction period via public capital contributions consisting of milestone payments and/or a lump sum payment on substantial completion, in order to reduce the long-term financing requirements. In this scenario, the private sector partner will utilize a combination of public financing (milestone payments), short-term private financing and long-term private financing in order to finance construction. Therefore, the private sector partner will be partially paid for construction of the asset during and/or immediately following the construction period, and will be paid for the remainder of the capitalized cost of construction through instalments over the length of the maintenance term. Public sector capital contributions of this nature are relatively common in the North American P3 market, particularly on projects with high capital costs, and have been utilized on a number of recent comparable projects such as the Canada Line project in British Columbia and the Denver Eagle project in Colorado.

Therefore, the private sector has long-term debt and equity capital at risk throughout the term of the project<sup>6</sup>. This results in enhanced oversight and due diligence from third party private capital providers.

Under this Project Delivery Option, the public sector maintains ownership of system assets at all times.

#### 4.3.9 Design Build Finance Operate Maintain (DBFOM)

This option is similar to the DBFM option, in that the private sector takes on final design and construction responsibilities and is paid for the construction works in installment payments over a long-term period, resulting in a requirement to obtain long-term private financing. As with DBFM, the private sector may be partially paid for construction on an upfront basis through milestone and/or substantial completion payments, and therefore in many cases only needs to source long-term financing for a portion of the capital costs.

Under the DBFOM option, the private sector takes on not only a long-term maintenance role but also a long-term operations role, usually for a 15-30 year period. The private sector's scope of operations and maintenance roles include maintenance of civil works, vehicle and station custodial, vehicle operations, system dispatch and control, as well as maintenance of track, signals, train control systems and vehicles. The public sector retains responsibility for fare setting, fare collection, customer service interface, and ridership volume risk.

Similar to the DBFM option, the private sector is paid on a monthly basis during the operations term, via blended payments which include fixed a capital repayment component in consideration of the unpaid portion of the capital cost of the construction works, as well as a performance-based maintenance component. The private sector has debt and equity capital at risk throughout the length of the operations term, and there should be enhanced oversight and due diligence from third party private capital providers.

Under this Project Delivery Option, the public sector typically maintains ownership of system assets at all times.<sup>7</sup>

#### 4.3.10 Build Own Operate Transfer (BOOT) and Build Own Operate (BOO)

Under each of these options, the private sector is fully responsible for final design, construction, financing, operation, and maintenance of the system.

Under a BOOT or BOO project delivery option, the private sector typically receives payment in one of two ways:

- a) The private sector partner obtains all or a portion of its revenue through a payment from the public sector which is based on ridership levels, thus assuming revenue and ridership risk
- b) The private sector partner obtains its revenue through a fixed availability payment from the public sector which is not dependant on ridership levels

It is important to note that although there are examples of BOOT and BOO projects being delivered under type (a) (ridership risk transfer) as well as type (b) (no ridership risk transfer), this Report has evaluated BOO and BOOT projects assuming a payment mechanism similar to type (a) including transfer of revenue and ridership risks to the private sector. This is because the Report already considers a delivery option under which the private sector design, build, finances, maintains and operates the system in return for availability-based payments (no ridership risk transfer). This is the DBFOM option discussed above in Section 4.3.9.

Another distinctive feature of BOOT and BOO delivery options is the issue of ownership of the assets. Under the BOOT option, the private sector owns the asset during the operational period, and transfers the asset back to the public sector following the expiry of a defined operational period. By contrast, under a BOO option, the private sector owns the asset at all times and does not transfer it back to the public sector.

<sup>6</sup> Note that "equity capital" does not refer to ownership of the system assets themselves. Equity capital, in this context, refers to the capital contributed by equity investors in the project company required by lenders to secure the debt financing.

<sup>7</sup> In certain cases, such as the Canada Line project, certain system assets such as vehicles are owned by the private sector.

#### 4.4 Detailed Summary of Project Delivery Options

The typical allocation of roles and responsibilities for each Project Delivery Option is set out in detail in the chart on the following page.





## 4.5 Evaluation Framework to Analyze Each Project Delivery Option

The diagram below sets out the process that has been undertaken by Deloitte in analyzing the Project Delivery Options identified in Section 4.3.

Figure 7: Evaluation Framework to Analyze Each Project Delivery Option



### 4.5.1 Develop Screening Factors

The analysis of Project Delivery Options has included a “screening” factor which has been used to eliminate Project Delivery Options which do not meet certain first level evaluation criteria dealing with ridership risks.

#### 4.5.1.1 Commercial Best Practices on Ridership Risk

The case studies carried out as a part of this Report have determined that commercial best practices, particularly in the North American context, indicate that ridership revenue risks should generally be retained by the public sector, with the exception of a “weak” link that may provide some reward for customer service performance as well as compensate the private sector for increased operating costs if ridership is higher than projected<sup>8</sup>. A “weak” link must not put debt repayment at risk. The Project Delivery Options will be screened to set aside those options which do not meet this criteria.

### 4.5.2 Developing the Detailed Evaluation Criteria

In collaboration with the City, a set of broad Evaluation Categories, composed of detailed Evaluation Criteria, have been developed in order to assess and rank each of the Project Delivery Options which have passed the initial screen. The broad Evaluation Categories include:

#### 4.5.2.1 Cost to the City

The cost to the City includes an evaluation of the costs to the City under the various Project Delivery Options, including:

- NPV of the City's capital outlays in connection with the Project
- NPV of the City's operating costs for the Project

#### 4.5.2.2 Alignment of City's Role with Core Business and Objectives

This Evaluation Category assesses how well the division of roles and responsibilities between the public and private sector under each of the Project Delivery Options meshes with the City's core competencies. The City's core competencies are determined with reference to the City's experience and qualifications in an EPC role; the City's experience and qualifications in vehicle procurement; the City's capabilities and objectives relating to vehicle operations and maintenance; and the City's experience and qualifications in setting and/or meeting service quality standards.

#### 4.5.2.3 Commercial and Contractual Structure

This Evaluation Category assesses the strength of the commercial and contractual structures of each Project Delivery Option, and the extent to which they provide appropriate incentives for performance, mitigate risk, secure

<sup>8</sup> The Canada Line project developed in British Columbia included such a linkage.



fixed prices, and provide performance security. Each Project Delivery Option has been evaluated based on a view of best practices<sup>9</sup> for commercial and contractual structure in the following key areas:

- Risk mitigation during construction, including competitive procurement and method of securing performance
- Risk mitigation during operations, including cost certainty during the project lifecycle and extent to which project delivery option encourages consideration of long-term lifecycle considerations
- Maximization of long-term life of assets, including extent to which the delivery option secures commitments for regular maintenance and enforces performance standards that reward maintenance of assets
- Vehicle operations and maintenance, including the extent to which the maintenance and operations responsibility are allocated in an optimal fashion between the public and private sectors
- Fare setting and ridership volume risk, including the degree to which ridership and volume risk can be partially assumed by a third party. For this criteria, consistent with the screening factors, Deloitte has assumed that full ridership volume risk is sub-optimal and would result in the option being screened out at an earlier stage; however, an option which allows the project operator to have some exposure to this risk in order to incentivize maximization of ridership is optimal, provided that only equity returns and not debt repayment is at risk.

#### 4.5.2.4 Value from Risk Transfer

This Evaluation Category assesses the extent to which each Project Delivery Option transfers appropriate risks from the City to the private sector.

Appropriate risks for transfer to the private sector are those risks which the private sector is equally or better able to bear than the public sector. These risks are typically risks which the private sector can understand and measure, and are also risks which the private sector can control by taking steps to mitigate or manage the risk. An example of an appropriate risk to transfer to the private sector would be construction cost overruns, while an example of an inappropriate risk would be risks associated with property acquisition.

The City obtains value from transferring appropriate risks to the private sector. This is because when a risk is transferred to the private sector, the financial consequences of the risk, should it transpire, are also shifted to the private sector. Therefore, any additional or unexpected costs associated with a transferred risk will be borne by the private sector and not the City. The City would not obtain value from transferring inappropriate risks to the private sector, since the result would be large pricing contingencies which are in excess of the costs the City would incur through managing the risk by itself.

The chart below provides some illustrative examples of how transferring roles and responsibilities results in transferring risks and their financial consequences to the private sector:

**Table 11 – Risk Transfer Examples**

Project Delivery Option	Roles and Responsibilities Transferred to Private Sector (High-Level)	Examples of Associated Risks Transferred to Private Sector
Design-Build (DB)	<ul style="list-style-type: none"> <li>• Final Design</li> <li>• Construction (EPC Role)</li> </ul>	<ul style="list-style-type: none"> <li>– Risk that design coordination errors will result in change orders during construction</li> <li>– Risk of construction cost overruns due to delays</li> </ul>
Design-Build-Maintain (DBM(f))	<ul style="list-style-type: none"> <li>• Final Design</li> <li>• Construction (EPC Role)</li> <li>• Maintenance (Civil Works and Custodial)</li> </ul>	<ul style="list-style-type: none"> <li>– Risk that design coordination errors will result in change orders during construction</li> <li>– Risk of construction cost overruns due to delays</li> <li>– Risk that capital replacement will be required earlier than expected</li> </ul>

<sup>9</sup> Deloitte's view of commercial and contractual best practices is set out in Appendix D. This view of commercial and contractual best practices is based on Deloitte knowledge and experience in transportation, transit, and social infrastructure projects, as well as case studies of Canadian and International transit projects.

Project Delivery Option	Roles and Responsibilities Transferred to Private Sector (High-Level)	Examples of Associated Risks Transferred to Private Sector
Design-Build-Operate-Maintain (DBOM(f))	<ul style="list-style-type: none"> <li>• Final Design</li> <li>• Construction (EPC Role)</li> <li>• Maintenance</li> <li>• Operations</li> </ul>	<ul style="list-style-type: none"> <li>- Risk that design coordination errors will result in change orders during construction</li> <li>- Risk of construction cost overruns due to delays</li> <li>- Risk that capital replacement will be required earlier than expected</li> <li>- Risk that operating costs will be higher than expected</li> <li>- Risk of failure to meet operating service and quality standards</li> </ul>

#### 4.5.2.5 Distinction between Commercial and Contractual Structure and Value from Risk Transfer

It is important to distinguish the "Commercial and Contractual Structure" Evaluation Category from the "Value from Risk Transfer" Evaluation Category. The former examines the extent to which the alignment of roles and responsibilities under each Project Delivery Option incents and secures project performance. The latter examines the extent to which the alignment of roles and responsibilities under each Project Delivery Option reduces project-related risks to the City.

#### 4.5.2.6 Value for Money

There is a close relationship between risk transfer to the private sector, private financing, and cost to the City. Project Delivery Options which transfer a large amount of roles and responsibilities to the private sector and which require long-term financing are, all other things being equal, likely to be the most costly due to premiums charged by the private sector for bearing risk and for long-term private financing. Best practices in Canadian procurement include carrying out a quantitative analysis of the net benefits obtained by the City through transferring risk to the private sector, weighed against additional costs due to private sector premiums for bearing risk and providing financing. This is termed a "Value for Money" or "VfM" analysis. A VfM analysis is outside the scope of this Report. However, the City should carry out a VfM analysis on the Project Delivery Options recommended by this Report in order to determine which one of the Short-Listed Project Delivery Options provides the City with the best trade-off between cost and risk transfer.

## 4.6 Evaluation Criteria

Each Evaluation Category is composed of detailed Evaluation Criteria, which are set out in full in Table 12 below:

**Table 12 - Summary of the Detailed Evaluation Criteria**

Criteria	Evaluation Factors
<b>1. Cost to the City</b>	
1.1. The total capital costs minimize impacts to the city's capital funding plan	The extent to which the capital payment profile and financing requirements are to be borne by the City
1.2. The net annual operating and maintenance costs minimize the city's operating affordability plan	The extent to which net annual operating and maintenance costs related to the Project Delivery Option are to be borne by the City
<b>2. Alignment of City's Role with Core Business and Objectives</b>	
2.1. Alignment with city's expertise on engineering- procurement-construction	The extent to which the alignment of roles and responsibilities associated with each Project Delivery Option is consistent with the City's experience and qualifications in: <ul style="list-style-type: none"> <li>• Setting technical specifications</li> <li>• Managing, procuring and administering engineering and construction contracts</li> <li>• Designing and constructing projects of the scope, scale, complexity and magnitude of the LRT Project</li> </ul>

Criteria	Evaluation Factors
2.2. Alignment with city's expertise on vehicle procurement	The extent to which the alignment of roles and responsibilities associated with each Project Delivery Option is consistent with the City's experience and qualifications in coordinating, negotiating and procuring the vehicles required for the LRT.
2.3. Alignment with city's expertise and objectives related to vehicle operations	The extent to which the alignment of roles and responsibilities associated with each Project Delivery Option is consistent with the City's core capabilities, strengths, and overall objectives on public policy as identified and confirmed with City management. Evaluation factors include: <ul style="list-style-type: none"> <li>• Experience and qualifications in operating the rail vehicles contemplated for use on the LRT, and dispatching the train sets and crews</li> <li>• Experience in coordinating and/or undertaking maintenance of the vehicles</li> </ul>
2.4. Alignment with the public's expectations on service quality	The extent to which the alignment of roles and responsibilities associated with each Project Delivery Option is consistent with the City's experience and qualifications on: <ul style="list-style-type: none"> <li>• Setting service quality standards</li> <li>• Managing and coordinating key operational components to consistently meet performance standards on customer services, cleanliness and schedule compliance</li> </ul>
<b>3. Commercial and Contractual Structure</b>	
3.1. Consistency with industry best practices for risk mitigation during engineering-procurement-construction phase	The extent to which the Project Delivery Option is consistent with best practices. Evaluation factors include: <ul style="list-style-type: none"> <li>• The degree to which the project procurement results in competitive tension and securing fixed prices</li> <li>• The coordination of key components, such as engineering (design), construction, procurement of materials and sub-trades, quality control / assurance, and the extent to which responsibilities of these key components are clearly delineated</li> <li>• The timing and form of payments during construction and the extent to which payment mechanisms are applied to secure and enforce specifications and on-time completion</li> <li>• The method and form of acceptance at substantial completion and the measures applied to ensure compliance with specifications</li> </ul>
3.2. Consistency with industry best practices for risk mitigation during operations	The extent to which the Project Delivery Option is consistent with best practices. Evaluation factors include: <ul style="list-style-type: none"> <li>• The degree to which the payment mechanism provides cost certainty during the operational life-cycle</li> <li>• The extent to which the procurement process encourages or provides incentives for the consideration of life-cycle performance during the EPC phase, and the extent to which responsibilities of these key components are clearly delineated</li> </ul>
3.3. Consistency with industry best practices to maximize useful life of assets	The extent to which the Project Delivery Option is consistent with best practices. Evaluation factors include: <ul style="list-style-type: none"> <li>• The method used to secure commitments for annual preventative maintenance and scheduled periodic major maintenance</li> <li>• The timing and form of payments during operations and the extent to which payment mechanisms are applied to secure and enforce performance specifications that maximize the useful life of all assets</li> </ul>
3.4. Consistency with industry best practices on vehicle operations and maintenance	The extent to which the Project Delivery Option is consistent with best practices. Evaluation factors include: <ul style="list-style-type: none"> <li>• The extent to which vehicle operations is interdependent with dispatching train sets and crews, and the coordination and/or execution of vehicle maintenance, and can ensure a clear delineation of costs and responsibilities</li> <li>• The extent to which track and system maintenance is interdependent with vehicle operations and can demonstrate a clear delineation of costs and responsibilities</li> </ul>
3.5. Consistency with industry best practices on fare setting and ridership volume risk	The extent to which the Project Delivery Option is consistent with best practices. Evaluation factors include: <ul style="list-style-type: none"> <li>• The alignment of responsibility for setting fares with best practices</li> <li>• The extent to which ridership volume is linked to broader transit policy and integration, and the corresponding degree to which ridership volume risk can be fully or partially assumed by a 3<sup>rd</sup> party</li> </ul>
<b>4. Value from Risk Transfer</b>	
4.1. Level and appropriateness of risk allocation to the private sector	The extent to which the Project Delivery Option transfers appropriate risks to the private sector, through the commercial, contractual, and financial structure.



Criteria	Evaluation Factors
	<ul style="list-style-type: none"> <li>• Appropriate risks are those which can be assessed, managed and mitigated by the private sector and may include: <ul style="list-style-type: none"> <li>- Design risks</li> <li>- Construction risks</li> <li>- Operations risks</li> <li>- Maintenance and lifecycle risks</li> <li>- Financial risks</li> </ul> </li> </ul>

#### 4.7 Evaluation Weighting Factors

In collaboration with the City, weighting factors have been developed to assign relative priority to each of the broad Evaluation Categories and detailed Criteria mentioned above. The weighting factors for each Category and Criteria are set out below:

**Table 13 - Evaluation Weighting Factors**

Criteria	Sub Totals			Totals	
	Maximum Raw Score	Sub-Weight	Sub-Weighted Score	Category Weight	Category Score
<b>1. Cost to the City</b>					
1.1 The total capital costs minimize impacts to the City's capital funding plan.	10.0	60%	6.0		
1.2 The net annual operating and maintenance costs minimize the City's operating affordability plan.	10.0	40%	4.0		
<b>Category Total</b>			<b>10.0</b>	<b>40%</b>	<b>4.0</b>
<b>2. Alignment of City's Role with Core Business and Objectives</b>					
2.1 Alignment with city's expertise on engineering-procurement-construction	10.0	20%	2.0		
2.2 Alignment with city's expertise on vehicle procurement	10.0	20%	2.0		
2.3 Alignment with city's expertise and objectives related to vehicle operations	10.0	20%	2.0		
2.4 Alignment with the public's expectations on service quality	10.0	40%	4.0		
<b>Category Total</b>			<b>10.0</b>	<b>10%</b>	<b>1.0</b>
<b>3. Commercial and Contractual Structure</b>					
3.1 Consistency with industry best practices for risk mitigation during engineering-procurement-construction	10.0	35%	3.5		
3.2 Consistency with industry best practices for risk mitigation during operations	10.0	20%	2.0		
3.3 Consistency with industry best practices to maximize useful life of assets	10.0	20%	2.0		
3.4 Consistency with industry best practices on vehicle operations and maintenance	10.0	20%	2.0		
3.5 Consistency with industry best practices on fare setting and ridership risk	10.0	5%	0.5		
<b>Category Total</b>			<b>10.0</b>	<b>30%</b>	<b>3.0</b>

4. Value from Risk Transfer						
4.1	Level and appropriateness of risk allocation to the private sector	10.0	100%	10.0		
<b>Category Total</b>				<b>10.0</b>	<b>20%</b>	<b>2.0</b>
<b>Total Evaluation Score</b>				<b>100%</b>	<b>10.0</b>	

## 4.8 Applying the Screening Factors and the Detailed Evaluation Criteria

### 4.8.1 Applying the Screening Factors

#### 4.8.1.1 Commercial Best Practices on Ridership Risk

As noted above, the Project Delivery Options will be screened to exclude those options which substantially transfer revenue and ridership risk to the private sector. This would include any Project Delivery Options where the private sector derived all or a significant part of its revenue directly from the fare box, as well as Project Delivery Options where the private sector's payments are not taken from the fare box but are closely tied to ridership.

### 4.8.2 Applying the Detailed Evaluation Criteria

Section 5 of this Report will proceed to apply the screening and evaluation criteria to each of the project delivery models. The application of the screening and evaluation criteria will take into consideration the following sources:

#### 4.8.2.1 Costing Model

The Costing Model will be used to support the assessment of capital and operating costs for the evaluation under Criteria 1 (Costs to the City). Please refer to Appendix A.

#### 4.8.2.2 Background Reports by City

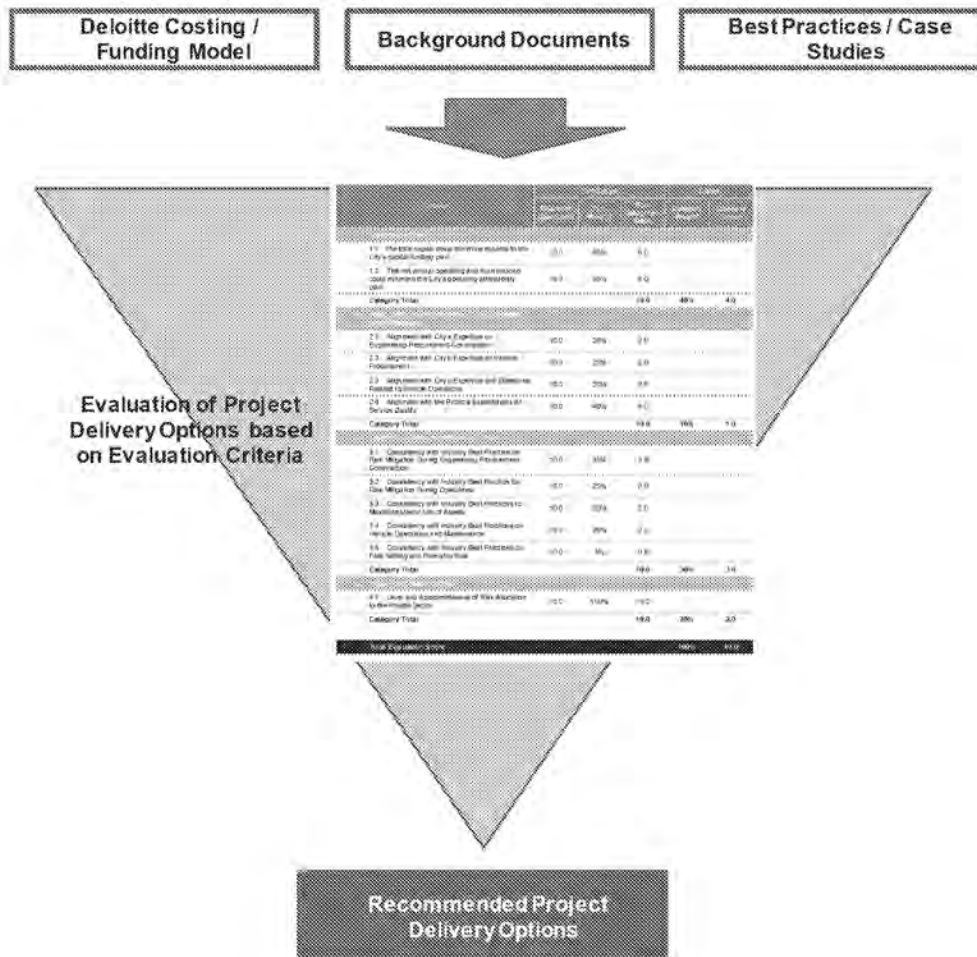
The City has provided various background documents, which are listed in Appendix B. These background documents provided by the City have been used to develop a full understanding of certain project delivery models and support the application of the evaluation criteria to these project delivery models.

#### 4.8.2.3 Deloitte Best Practices

This Report has assessed each of Project Delivery Options against Deloitte's view of best practices, which are summarized in Appendix D. This view is based on market knowledge and experience in transit, transportation, and social infrastructure projects, as well as case studies of similar projects set out in Appendix C.



Figure 8: Inputs to the Application and Analysis of the Evaluation Criteria



#### 4.9 Scoring Methodology

The evaluation of the Project Delivery Options has required consideration of a wide range of Evaluation Criteria. It is necessary to reflect the relative importance of each of the Evaluation Criteria. Therefore, scores have been weighted to account for the relative importance of various Evaluation Criteria. The diagram and narrative on the following page provide a brief explanation of the scoring methodology.

Figure 9 – Scoring Methodology

Criteria	Weighting	Design-Bid-Build	Traditional Design-Build	Design-Build-Finance
<b>1. Cost to the City</b> <sup>1</sup>				
1.1. The total capital costs minimize impacts to the City's capital funding plan <sup>2</sup>	60% <sup>4</sup>	10.0 <sup>3</sup>	10.0	9.7
		6.0 <sup>5</sup>	6.0	5.8
1.2. The net annual operating and maintenance costs minimize the City's operating affordability plan	40%	10.0	10.0	10.0
		4.0	4.0	4.0
<b>Unweighted Score</b>	<b>100%</b>	<b>10.0</b> <sup>6</sup>	<b>10.0</b>	<b>9.8</b>
<b>Total Weighted Score</b>	<b>40%</b>	<b>4.0</b>	<b>4.0</b>	<b>3.9</b>

- Evaluation Category** – The term “Evaluation Category” refers to a group of Evaluation Criteria. In this example, “Cost to the City” is the Evaluation Category.
- Evaluation Criteria** – The term Evaluation Criteria refers to each individual evaluation factor. In this example, the evaluation factors numbered 1.1 and 1.2 are referred to as Evaluation Criteria.
- Raw Criteria Score** – Each Project Delivery Option is assigned a score from 0 to 10, based on how well that Project Delivery Option satisfies each Evaluation Criteria. The raw Criteria scores are set out in Section 5.3 of this Report.
- Sub-Criteria Weighting Factor** – Each Evaluation Criteria has been assigned a weighting factor from 0% to 100%, in consultation with the City. The weighting factor accounts for the City's view of the relative importance of each particular Evaluation Criteria.
- Weighted Criteria Score** – The raw Criteria score is multiplied by the weighting factor, to yield the Weighted Criteria Score.
- Sum of Criteria Scores** – The Weighted Criteria Scores for each Evaluation Criteria are summed. This yields the “Unweighted Score” for the Evaluation Category as a whole. The term “Unweighted Score” is used because an additional weighting factor is yet to be applied.

Figure 10 – Scoring Methodology (Continued)

Criteria	Weighting	Design-Bid-Build	Traditional Design-Build	Design-Build-Finance
<b>1. Cost to the City</b>				
1.1. The total capital costs minimize impacts to the City's capital funding plan	60%	10.0	10.0	9.7
		6.0	6.0	5.8
1.2. The net annual operating and maintenance costs minimize the City's operating affordability plan	40%	10.0	10.0	10.0
		4.0	4.0	4.0
<b>Unweighted Score</b>	<b>100%</b>	<b>10.0</b>	<b>10.0</b>	<b>9.8</b>
<b>Total Weighted Score</b>	<b>60%</b>	<b>4.0</b>	<b>4.0</b>	<b>3.9</b>
<b>2. Alignment of City's Role...</b>				
.....				
<b>Total Weighted Score</b>	<b>10%</b>	<b>0.5</b>	<b>0.6</b>	<b>0.8</b>
<b>3. Commercial and Contractual Structure</b>				
.....				
<b>Total Weighted Score</b>	<b>30%</b>	<b>0.6</b>	<b>1.1</b>	<b>1.6</b>
<b>4. Value from Risk Transfer</b>				
.....				
<b>Total Weighted Score</b>	<b>20%</b>	<b>0.0</b>	<b>0.2</b>	<b>0.5</b>
<b>Total Score</b>		<b>5.1</b>	<b>5.9</b>	<b>6.8</b>
<b>Percentage of Available Points</b>		<b>51%</b>	<b>59%</b>	<b>68%</b>

7. **Evaluation Category Weighting Factor** – An additional weighting factor is applied for the Evaluation Category as a whole. This weighting factor accounts for the City's view of the relative importance of the Evaluation Category as a whole.
8. **Total Weighted Score** – The Evaluation Category Weighting Factor is multiplied by the Criteria Unweighted Score (Item 6 from the previous page), to yield the Total Weighted Score for the Evaluation Category.
9. **Summation and Total Score** – The Total Weighted Scores for each Evaluation Category are summed to yield the Total Score for the Project Delivery Option. The Total Score may be expressed as a score out of 10, or as a percentage of the maximum Total Score.

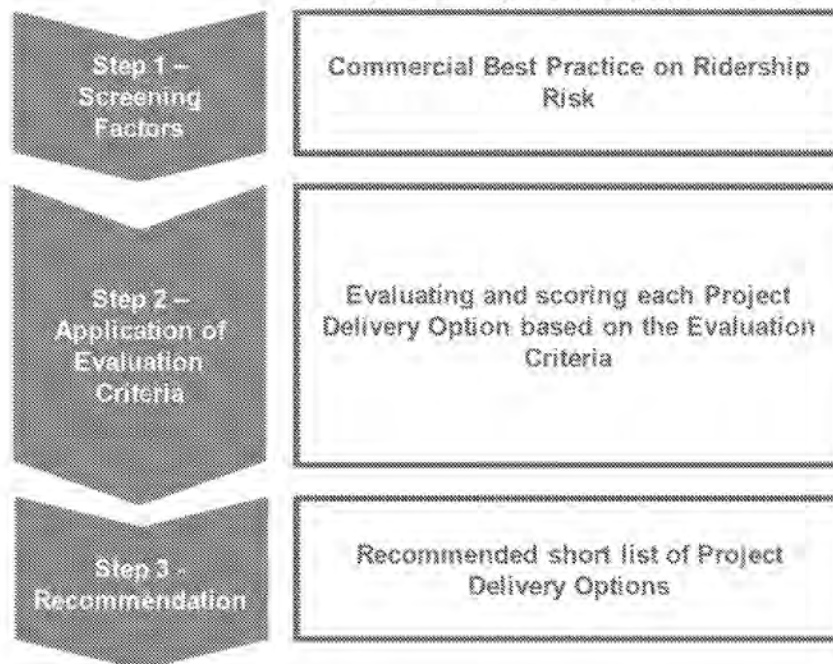
# 5 Analysis of Project Delivery Options

## 5.1 Overview

This section will analyze the various Project Delivery Options according to the Evaluation Criteria. The analysis will include:

- Application of screening criteria based on commercial best practices for allocation of ridership and revenue risk, and screening out delivery options which do not meet this criteria
- Evaluation of each option according to the Evaluation Criteria and scoring of each option
- Final analysis and recommendation of a short list of preferred Project Delivery Options

**Figure 11: Project Delivery Options Analysis Methodology**



## 5.2 Step 1: Analysis of Screening Factors

### 5.2.1 Commercial Best Practices on Ridership Risk

As noted in Section 4.2.10, the BOOT and BOO project delivery models typically involve the transfer of ridership revenue risk to the private sector. The private sector partner's revenue is dependent on the level of ridership.

Based on current project finance capital markets, it would be extremely difficult for a project delivered according to this method to attract competitive debt financing. If debt funders were to provide capital to a project of this size based on a ridership revenue risk model, the terms and conditions of this financing would likely be very costly and would not result in an economical solution for the City. Accordingly, this Report has determined that the BOOT and BOO project delivery methods do not represent current commercial best practices and should not be considered further in the analysis.

We would also note the following with regard to the BOOT and BOO Project Delivery Options:

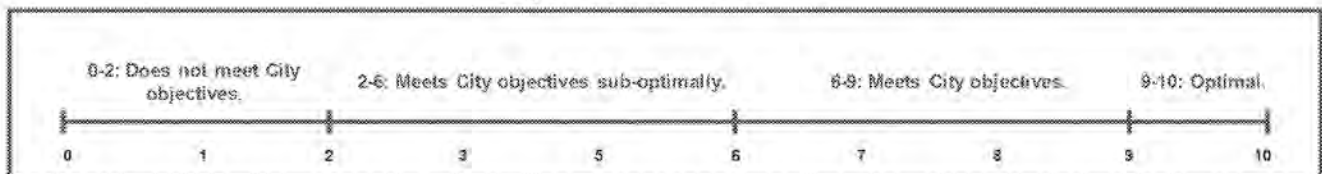
- As noted in Section 2.2.10, in some cases project finance professionals will use the term "BOOT" or "BOO" to refer to projects which involve availability payments which are not tied to ridership revenue. However, in this case the BOOT and/or BOO options would be functionally similar in most respects to the DBFOM option, which has not been excluded and will be considered.
- The BOOT and BOO options involve ownership of the system assets by the private sector partner. Although this issue has not been extensively considered, private ownership of the system assets may not be desirable to the City from a public policy perspective. All other Project Delivery Options considered in this Report include public ownership of the system assets at all times.
- The City plans to retain control over route planning, station location, and fares. The City will also control bus system scheduling which will provide most of the LRT system's traffic. Accordingly, a revenue risk model would not likely be acceptable to a private sector partner.

### 5.3 Step 2: Analysis of Detailed Evaluation Criteria

Each of the Project Delivery Options were evaluated and scored based on the Evaluation Criteria and assigned a score. The scoring reflects the extent to which each Project Delivery Option should achieve the City's objectives.

The Project Delivery Options were scored on a relative basis. For each Evaluation Criteria, a score of 10 was assigned to the Option(s) which should optimally achieve the City's objectives. This does not signify that the "optimal" Project Delivery Option(s) are necessarily perfect options or without any risks; rather it signifies that the "optimal" Project Delivery Option(s) best addresses the City's objectives relative to all other Options. For each Evaluation Sub-Criteria, other Options which were not identified as "optimal" were assigned scores based on how well they should achieve identified City objectives, relative to the "optimal" Option.

Figure 12 – Evaluation Scale



The scoring for each project delivery option is set out below, along with a summary of each Evaluation Criteria, key considerations for each evaluation criteria (Evaluation Factors), and a summary of the rationale for the scoring assigned to Project Delivery Options.

#### 5.3.1 Cost to the City

##### 5.3.1.1 The total capital costs minimize impacts to the City's capital funding plan.

The Costing Model developed by Deloitte (refer to Appendix A) examines the City's total capital outlays under the various Project Delivery Options, on a net present value basis. This includes the City's debt servicing for required City borrowing, and for Project Delivery Options which involve long-term private sector borrowing, City payments to the private sector in consideration of the private sector's capital expenditures, and debt servicing costs.

Deloitte's costing model examines three different financing scenarios. A variety of senior government funding scenarios are possible and are examined in detail in Appendix A; for the purposes of the evaluation the government funding scenario considered to be the most likely scenario is utilized. Table 14 below sets out the financing scenarios and the related Project Delivery Options covered by each scenario:

Table 14 – Financing Scenarios

Scenario	Relevant Project Delivery Options
• No private financing	DBB, DB, DBOM



Scenario	Relevant Project Delivery Options
• Short-term private financing	DB(f), B(f), DBM(f), DBOM(f)
• Short-term and long-term private financing	DBFM, DBFOM

The net present value of the City's capital outlay under each of the Project Delivery Options has been estimated by the costing model. For the purposes of scoring the Project Delivery Options, the relative net present values have been normalized and converted into a score based on the least expensive Project Delivery Options receiving the maximum score and the other Project Delivery Options receiving lesser scores, on a relative basis to the least expensive option.

Please note that base construction costs have been assumed to be the same for all Project Delivery Options. The main difference among options is the amount and type of private sector financing required for construction. The Project Delivery Options which include no private financing are the least expensive, since the public sector can generally borrow at lower rates than the private sector on the strength of its general revenues. The Project Delivery Options which include short-term private sector borrowing are more expensive, since the private sector must finance construction and typically borrows at higher rates than the City, resulting in increased capital costs. Finally, the Project Delivery Options which include long-term private financing are the most expensive, since long-term private sector debt generally includes higher credit margins than short-term debt, requires equity investment, and accrues more interest payments over the term of the debt.

#### Scoring

Design Bid Build	Design Build	Design Build Finance	Build Finance	Design Build Maintain	Design Build Operate Maintain (Public Financing)	Design Build Operate Maintain	Design Build Finance Maintain	Design Build Finance Operate Maintain
DBB	DB	DB(f)	B(f)	DBM(f)	DBOM	DBOM(f)	DBFM	DBFOM
10	10	9.7	9.7	9.7	10	9.7	7.9	7.9

#### 5.3.1.2 The net annual operating and maintenance costs minimize the City's operating affordability plan.

The Costing Model developed by Deloitte with the City's input assumes that the City's operating costs will be the same under each of the Project Delivery Options. Typically, even where the private sector provides operations and maintenance services, these expenses are a "flow-through" cost to the City. Although an argument could be made that under a Project Delivery Option where the private sector provides operations and/or maintenance services, private sector efficiencies, competitive tension during the procurement process, and benchmarking/market testing provisions could result in lower operating costs, a conservative assumption has been made for the purposes of this analysis that operating and maintenance costs would be the same across all Project Delivery Options.

#### Scoring

Design Bid Build	Design Build	Design Build Finance	Build Finance	Design Build Maintain	Design Build Operate Maintain (Public Financing)	Design Build Operate Maintain	Design Build Finance Maintain	Design Build Finance Operate Maintain
DBB	DB	DB(f)	B(f)	DBM(f)	DBOM	DBOM(f)	DBFM	DBFOM
10	10	10	10	10	10	10	10	10

### 5.3.2 Alignment of City's Role with Core Business and Public Policy Objectives

This Evaluation Category evaluates each of the remaining nine Project Delivery Options with respect to how well they are aligned with the City's core business competencies and public policy objectives.

#### 5.3.2.1 Alignment with City's Expertise on Engineering-Procurement-Construction

This evaluation criteria examines the extent to which the alignment of roles and responsibilities associated with each Project Delivery Option is consistent with the City's experience and qualifications in:

- Setting technical specifications
- Managing, procuring and administering engineering and construction contracts
- Designing and constructing projects of the scope, scale, complexity and magnitude of the LRT project

#### Considerations

Key considerations when evaluating each of the Project Delivery Options included:

- City's experience with EPC on projects of scope and magnitude of the LRT Project
- The degree of design and/or EPC responsibility assumed by the City and the extent of the City's experience in carrying out this role for a project similar to the LRT Project
- The extent to which the project delivery model requires the City to work alongside the private sector during preliminary engineering and development phases
- Experience of private sector with EPC roles

#### Scoring

Design Bld Bldg	Design Bldg	Design Bldg Finance	Bldg Finance	Design Bldg Maintain	Design Bldg Operate Maintain (Public Financing)	Design Bldg Operate Maintain	Design Bldg Finance Maintain	Design Bldg Finance Operate Maintain
DBB	DB	DB(F)	B(F)	DBM(F)	DBOM	DBOM(F)	DBFM	DBFOM
6	10	10	8	10	8	10	10	10

Project Delivery Options which involve the private sector taking on responsibility for managing, procuring, and administering engineering and construction contracts (EPC role) scored optimally under these evaluation criteria. This is because a well-qualified private sector partner is typically better positioned to take on the EPC role due to significantly greater levels of experience and expertise in carrying out this role on a project of the scope, scale, complexity and magnitude of the LRT Project. The DBB option had a lower score since it would require the City to carry out the EPC role.

As well, Project Delivery Options which require the private sector partner to design (final design) and construct the system scored optimally under these criteria. This is due not only to the private sector's relative expertise in final design and construction of projects of this scope, scale, complexity and magnitude, but also to the advantages inherent in bundling these two roles with one entity, which allows the City to transfer the risks associated with design coordination issues to the private sector.<sup>10</sup> Accordingly, the DBB and Build-Finance options received lower scores since they do not bundle final design and construction with one entity and therefore the City would bear design coordination risks.

The Design-Build-Operate-Maintain (Public Financing) model requires the City and the private sector to work collaboratively during the preliminary engineering phase of the project, including development of final design and design approvals as well as pricing. This option received a lower score since it requires the City to play a more demanding role - at a minimum, the City must be able to ensure that the design is appropriate and economical from a construction and lifecycle cost perspective, and that construction pricing is competitive. In particular, the skill and time investment required from the City to ensure the best possible construction price in the absence of a

<sup>10</sup> Design coordination generally refers to risks associated with change orders being issued during construction due to inconsistencies, gaps, or incompleteness in the design.

competitive procurement process is not a core capability of the City and results in a lower score than other comparable options such as DBOM(f).

### 5.3.2.2 Alignment with City's Expertise on Vehicle Procurement

This evaluation criteria considers the extent to which the alignment of roles and responsibilities associated with each project delivery option is consistent with the City's experience and qualifications in procuring the vehicles required for the LRT Project.

#### Considerations

Key considerations when evaluating each of the Project Delivery Options included:

- The City's experience with LRT vehicle procurement
- The private sector's relative experience with LRT vehicle procurement
- The extent to which any of the Project Delivery Options include a sharing of this role

#### Scoring

Design Bid Build	Design Build	Design Build Finance	Build Finance	Design Build (Maintain)	Design Build Operate Maintain (Public Financing)	Design Build Operate Maintain	Design Build Finance Maintain	Design Build Finance Operate Maintain
DBB	DB	DB(f)	B(f)	DBM(f)	DBOM	DBOM(f)	DBFM	DBFOM
6	10	10	10	10	10	10	10	10

Vehicle procurement typically includes two distinct phases of work: development of detailed functional specifications and technology selection, followed by the supplier selection process and negotiations of terms and conditions. Project Delivery Options which allow the public sector to carry out the first phase of this process by developing the functional specifications and selecting vehicle technology, and then assign the subsequent selection process (including coordination and negotiation) to the private sector, scored optimally under this evaluation criteria. Although the City has some expertise in procuring transit vehicles, a well-qualified private sector partner (e.g., consortia that submitted bids for comparable projects such as the Canada Line and Denver Eagle projects) will likely have significantly more experience and expertise than the City in the selection of a vehicle supplier and the negotiation of detailed terms and conditions for a project of the scale, scope, complexity and technological sophistication of the LRT Project. Based on case studies, the private sector typically carries out its vehicle procurement role by partnering with a vehicle supplier as part of its bidding consortium, with terms of vehicle acquisition agreed between the consortium members and based on functional specifications issued by the public sector as part of the overall procurement process.

The DBB option would require the City to lead all phases of the vehicle procurement process, and accordingly has been evaluated less favorably.

The DBOM (Public Financing) model typically requires the public sector to select vehicle technology and develop vehicle requirements. The private sector partner is engaged during the preliminary engineering stage to develop detailed specifications, and the private sector partner also carries out the supplier selection and negotiation functions. Therefore, this option was also scored highly since the City would be able to carry out its comparative strength – providing overall direction as to functional requirements and technology selection – while relying on the private partner's expertise in supplier selection and negotiation.

### 5.3.2.3 Alignment with City's Expertise and Public Policy Objectives Related to Vehicle Operations

This evaluation criteria examines the degree to which roles and responsibilities associated with vehicle operations under each Project Delivery Option is consistent with the City's core capabilities, strengths, and overall objectives as identified and confirmed with City management. Evaluation factors include:

- Experience and qualifications in operating the rail vehicles contemplated for use on the LRT, and dispatching the train sets and crews



- Experience and qualifications in coordinating and/or undertaking maintenance of the vehicles

### Considerations

Key considerations when evaluating each of the Project Delivery Options included:

- City's experience with LRT vehicle operations
- Experience of private sector with LRT vehicle operations

### Scoring

Design Bid Build	Design Build	Design Build Finance	Build Finance	Design Build/ Maintain	Design/Build/ Operate/ Maintain (Public Financing)	Design/ Build/ Operate/ Maintain	Design/ Build/ Finance/ Maintain	Design/ Build/ Operate/ Maintain
DBB	DB	DBF	B(f)	DBM(f)	DBOM	DBOM(f)	DBFM	DBFM
4	4	4	4	6	10	10	6	10

Project Delivery Options which require the private sector partner to operate, dispatch, maintain and crew the rail vehicles scored optimally under this Evaluation Criteria. A well-qualified private sector partner is likely better positioned to carry out this role as they should have significantly more experience and expertise than the City in carrying out this role on a project of the scope, scale, complexity and magnitude of the LRT Project. In particular, the private sector partner's experience is more likely to be relevant to the type of technology expected for this LRT Project.

Project Delivery Options which do not require the private sector to operate the vehicles but do require the private sector to maintain track, vehicles, and systems scored less favorably, since the private sector's anticipated greater experience and expertise with LRT will be utilized to a lesser extent. As well, the interface between public sector vehicle operations and private sector vehicle and track maintenance will add complexity to the project.

Project Delivery Options under which the private sector carried out design and/or construction roles but did not take any role in the project following commissioning were evaluated least favorably, since this would involve the City, which has less relative experience than a well-qualified private sector entity in operating and maintaining LRT vehicles using the type of technology expected for this LRT project.

#### 5.3.2.4 Alignment with the Public's Expectations on Service Quality

This evaluation criteria examines the degree to which the alignment of roles and responsibilities associated with each project delivery option is consistent with the City's experience and qualifications in:

- Setting service quality standards
- Managing and coordinating key operational components to consistently meet performance standards on customer service, cleanliness and schedule compliance

### Considerations

Key considerations when evaluating each of the Project Delivery Options included:

- The City's experience with LRT vehicle operations
- Experience of the private sector with LRT vehicle operations and track-record in meeting performance standards that maximize quality and ridership
- Extent to which City operation of system is compatible with performance-based payment that rewards meeting customer service standards vs. extent to which private sector operation of system is compatible with same



### Scoring

Design Build Build	Design Build	Design Build Finance	Build Finance	Design Build Operate	Design Build Operate Maintain (Public Financing)	Design Build Operate Maintain	Design Build Finance Maintain	Design Build Finance Operate Maintain
DBB	DB	DB(f)	B(f)	DBM(f)	DBOM	DBOM(f)	DBFM	DBFOM
4	4	4	4	6	10	10	6	10

Under this criteria, the highest scoring Project Delivery Options were those which appeared likely to be compatible with development of clear service quality standards governing items such as on-time arrivals, vehicle throughput, and vehicle/station cleanliness, as well as performance-based payment mechanisms to enforce service quality standards through financial incentives.

Project Delivery Options which included the City leading the operation and maintenance of the system scored less favorably under this criteria. Typically, the City's operation of municipal services does not include performance standards which include financial or other penalties for non-performance. Under City-led operation and maintenance of the system, it is less likely that these types of performance standards would be put into place.

By contrast, Project Delivery Options which include private sector operation and maintenance of the system (such as DBOM, DBOM(f) and DBFOM) scored optimally, since contracts with the private sector can include performance-based payment and monitoring regimes which will provide strong incentives to meet customer service standards. This may include detailed performance standards for both operations of the system (wait times, travel times) as well as maintenance (vehicle and station cleanliness, etc.) which should help to ensure appropriate customer service and will result in penalties to the private sector if standards are not met. The private sector partner will have strong financial incentives to meet customer service standards. Case studies included in the appendices of this Report have demonstrated the effectiveness of performance-based payment mechanisms in incenting high quality operational performance from a private sector partner.

Finally, Project Delivery Options which included private sector maintenance of the system only, with City-led operations, received less optimal scores since they would realize some of the benefits of private sector expertise.

### 5.3.3 Commercial and Contractual Structure

This Evaluation Category examines the extent to which the commercial and contractual structure of each Project Delivery Option incents a high level of project performance during the construction and operations phases of the project. This includes an assessment of the method of payment, type of performance security, bundling of key components and third party oversight, based on a view of industry best practices.<sup>11</sup>

#### 5.3.3.1 Consistency with Industry Best Practices for Risk Mitigation during Engineering-Procurement-Construction

This evaluation criteria examines the extent to which each Project Delivery Option is consistent with identified best practices in this area. Evaluation factors include:

- The degree to which the project procurement results in competitive tension and securing fixed prices
- The coordination of key components, such as engineering (design), construction, procurement of materials and sub-trades, quality control/assurance, and the extent to which responsibilities of these key components are clearly delineated
- The timing and form of payments during construction and the extent to which payment mechanisms are applied to secure and enforce specifications and on-time completion

<sup>11</sup> Deloitte's view of commercial and contractual best practices is set out in Appendix D. This view of commercial and contractual best practices is based on Deloitte knowledge and experience in transportation, transit, and social infrastructure projects, as well as case studies of Canadian and international transit projects.

- The method and form of acceptance at substantial completion and the measures applied to ensure compliance with specifications

### Considerations

Key considerations when evaluating each of the Project Delivery Options included:

- Extent to which private capital is at risk during construction period
- Degree to which the option is compatible with a competitive procurement process
- Whether there is integration of design and construction responsibility
- Definition of output-based standards to clarify responsibilities and risk transfer
- Performance-based payments and acceptance procedures that secure risk transfer and cost certainty
- Form of security

### Scoring

Design Bid Build	Design Build	Design Build Finance	Build Finance	Design Build Maintain	Design Build Operate Maintain (Public Financing)	Design Build Operate Maintain	Design Build Finance Maintain	Design Build Finance Operate Maintain
DBB	DB	DB(f)	B(f)	DBM(f)	DBOM(f)	DBOM(f)	DBFM	DBFOM
2	5	10	7	10	4	10	10	10

Under this evaluation criteria, Project Delivery Options which scored highly typically included payment mechanisms which delayed payment for construction until following the completion of construction, including DB(f), B(f), DBM(f), DBOM(f), DBFM, and DBFOM models. This form of payment mechanism requires the private sector to obtain private financing for construction, and consequently private capital is at risk during the construction period in the sense that the private sector must perform by completing construction in order to repay its funders. This is in accordance with identified best practices. The advantages to this approach include:

- Strong incentives for on-time delivery, since late delivery results in higher financing costs and erodes the private sector partner's returns. The private sector is incented to commission the project on time.
- Liquid form of performance security (deferred payment for construction)
- Likely to be enhanced due diligence and monitoring of construction plans, timeline, and execution by lenders who have an interest in on-time and on-budget completion of the project so that they can be repaid

This evaluation criteria also rated highly those Project Delivery Options which tend to have clear and comprehensive commissioning processes based on well-defined contractual standards, in accordance with identified best practices. Although every individual project will vary in terms of the thoroughness of its commissioning process, typically projects which include private capital at risk during construction, as well as deferred payment until completion of construction, tend to have more robust commissioning processes. This is because these contractual provisions receive heightened third party scrutiny from lenders' technical advisors during the procurement process, as these provisions are the ones which will trigger the flow of project revenues. Accordingly, on balance the commissioning provisions associated with DB(f), B(f), DBM(f), DBOM, DBFM, and DBFOM delivery models will be more well-developed and are likely to utilize an independent engineer jointly appointed by the parties to oversee the commissioning process.

Best practices dictate that responsibility for design, construction, testing and commissioning should be bundled with one party to minimize design coordination risks borne by the public sector. The DBB and B(f) models split design and construction roles between two or more entities, and thus design coordination issues encountered during construction may result in change orders for which the public sector is liable. Therefore, these options were rated less favorably in this regard.

Best practices also favor Project Delivery Options which include fixed pricing for procurement, based on pricing submitted during a competitive procurement process. Based on case studies, the DBOM (Public Financing) option is often (although not always) associated with a procurement process that includes competitive pricing for pre-development work only, and relies on negotiated pricing for the construction and operation works. Accordingly, this option was not rated as highly in this regard as all other options which typically include competitive pricing.

### 5.3.3.2 Consistency with Industry Best Practices for Risk Mitigation during Operations

This evaluation criteria examines the consistency of each Project Delivery Option with regard to identified best practices for risk mitigation during operations. Evaluation factors include:

- The degree to which the payment mechanism provides cost certainty during the operational life-cycle
- The extent to which the procurement process encourages or provides incentives for the consideration of life-cycle performance during the EPC phase, and the extent to which responsibilities of these key components are clearly delineated

#### Considerations

Key considerations when evaluating each of the Project Delivery Options included:

- Coordination of EPC and operations to clarify responsibilities/risk transfer and provide cost certainty
- Performance-based payments that secure risk transfer and cost certainty
- Form of security
- Degree to which performance is secured by private capital being at risk during operations phase

#### Scoring

Design Bid Build	Design Build	Design Build Finance	Build Finance	Design Build Maintain	Design Build Operate Maintain (Public Financing)	Design Build Operate Maintain	Design Build Finance Maintain	Design Build Finance Operate Maintain
DBB	DB	DB(f)	B(f)	DBM(f)	DBOM	DBOM(f)	DBFM	DBFOM
0	1	1	1	3.5	5.5	6	4	10

Generally speaking, under this evaluation criteria Project Delivery Options which transferred significant operations and maintenance roles to the private sector (such as DBFOM, DBOM(f), and DBOM (Public Financing)) scored the highest, followed by Project Delivery Options which transferred only maintenance roles to the private sector (such as DBM(f) and DBFM). Project Delivery Options which did not transfer operations or maintenance to the private sector scored the lowest.

Best practices for risk mitigation during operations include fixed pricing for operations, based on pricing submitted during a competitive procurement process. Therefore, Project Delivery Options which include a long-term operations and a long-term maintenance component were scored most favorably, since under these models pricing for operations and maintenance services are typically defined by the private sector partner's successful bid, subject only to changes for inflation and extraordinary events – providing a significant degree of cost certainty. These delivery options included DBOM (Public Financing), DBOM(f), and DBFOM. The DBM(f) and DBFM options only include a long-term maintenance component and not an operations component, and so were scored less favorably. Note that the scoring for DBOM (Public Financing) was slightly lower than DBOM(f) since, based on case studies, operations and maintenance fees for the private sector may be negotiated rather than procured under competitive tension.

In contrast, delivery options which included operations and/or maintenance services provided by the public sector were rated less favorably, since the City will have less cost certainty with regard to operations and maintenance costs. Any cost overruns or unexpected costs must be borne by the City under these options. These options included DBB, DB, DB(f), and B(f).

Another key best practice is the bundling of EPC with operations and/or maintenance responsibility, since this strengthens incentives to develop the project in a way which considers not only the costs of construction but also the costs of operating and maintaining the asset. Therefore, Project Delivery Options which integrate design, construction, and long-term operations and/or maintenance are rated highly since this integration should provide incentives to consider long-term lifecycle and operational performance during the design and construction phase.

Finally, best practices include the private sector partner having private capital at risk during the operations period, which can only be repaid through operation of the project in accordance with specifications in exchange for service payments. This is the most liquid form of performance security. As well, the involvement of long-term



private capital will result in substantial due diligence on design and construction plans and should help ensure that the design is optimized for lifecycle performance, since poor lifecycle performance will cause cost overruns over the life of the project that would erode private capital returns. Project Delivery Options with these characteristics include DBFOM and to a lesser extent DBFM (no operations component).

### 5.3.3.3 Consistency with Industry Best Practices to Maximize Useful Life of Assets

This evaluation criteria examines the extent to which each project delivery option is consistent with relevant best practices for maximizing the useful life of assets. Evaluation factors include:

- The method used to secure commitments for annual preventative maintenance and scheduled periodic major maintenance
- The timing and form of payments during operations and the extent to which payment mechanisms are applied to secure and enforce performance specifications that maximize the useful life of all assets

#### Considerations

Key considerations when evaluating each of the Project Delivery Options included:

- Integration of EPC and maintenance responsibility
- Degree to which private capital is at risk during later stages of the project and at hand-back of the asset;
- Performance-based payment which penalizes poor maintenance practices
- Ability of party responsible for maintaining the asset to defer lifecycle maintenance

#### Scoring

Design Bid Build	Design Build	Design Build Finance	Build Finance	Design Build Maintain	Design Build Operate Maintain (Public Financing)	Design Build Operate Maintain	Design Build Finance Maintain	Design Build Finance Operate Maintain
DBB	DB	DB(f)	B(f)	DBM(f)	DBOM	DBOM(f)	DBFM	DBFOM
0	1	1	1	5	7	7	8	10

Under this evaluation criteria, Project Delivery Options which included integration between design, construction, and long-term maintenance scored well. Integration between some or all of these roles is identified as a best practice as it strengthens incentives to design an asset which can be well constructed, and may also strengthen incentives to develop an asset which can be best maintained over a long-term period – a “whole-life” solution. Therefore, DB scored higher than DBB, due to integration of design and construction; whereas DBOM(f) scored even higher due to integration of design, construction, and long-term operations and maintenance.

Project Delivery Options which included a long-term maintenance role for the private sector were also scored more favorably, including DBM(f), DBOM (Public Financing), DBOM(f), DBFM, and DBFOM. These models typically include contractually defined long-term capital asset maintenance plans, as well as performance-based payment mechanisms that may financially penalize the private sector if assets are not maintained according to specification. Long-term capital asset maintenance plans typically contractually require the private sector partner to set aside funds to a maintenance reserve account on a regular basis and to utilize these funds at pre-determined times to make capital repairs and replace components that have reached the end of their useful lives. Deloitte takes the view that this is an optimal mechanism to secure long-term asset quality and mitigate the risks of deferred maintenance. Project Delivery Options which include public sector maintenance do not include this contractual mechanism.

Examples of these plans are illustrated in the Case Studies. In contrast, where the public sector is responsible for maintenance, budgets for preventative and periodic major maintenance are typically determined on a year-to-year basis through the regular budgeting process. There is the potential for maintenance to be deferred due to budgetary pressures, impacting on the condition and ultimately the useful life of the asset.

Best practices also include a clearly defined set of contractual hand-back provisions, which specify the condition in which assets must be turned over to the public sector at the end of the operations term, and financially



penalizes the private sector partner if these conditions are not met. This in effect provides a guarantee to the public sector that the assets will be in the defined condition at the end of the project term, or that the private sector will provide the funds to restore the assets to the defined condition. This type of arrangement is generally only seen under Project Delivery Options where the private sector is responsible for long-term maintenance; accordingly, these options have been scored more favorably.

Finally, Project Delivery Options which include long-term private capital at risk (DBFM and DBFOM) have been scored most favorably, for two reasons:

- Lenders of long-term private capital will exercise an important oversight role during the maintenance term. Lending agreements typically provide for regular inspections by a technical advisor and penalize the project company if maintenance reserve accounts are not properly funded through project revenues. This is because poor lifecycle performance can erode returns to debt and equity funders, through financial penalties imposed under the contract for poor maintenance practices, higher maintenance and operating costs if the asset's condition deteriorates, and/or penalties at the time of hand-back if the asset does not meet the required standard. The vigilance that lenders will exercise can be contrasted with the typical public sector process, which does not include this positive tension and oversight.
- As noted in section 2.3, long-term private capital at risk is the most liquid form of performance security. Therefore, if the private sector fails to meet its maintenance obligations, holdback of payment provides considerable leverage and liquidity to ensure that required maintenance can be funded.

Finally, note that DBFOM has been scored as optimal, since the scope of works delegated to the private sector is much broader under DBFOM and includes not only operations but also system maintenance, whereas DBFM does not include these items. Therefore, the positive effect of integration of design, construction, and long-term operations and maintenance, as well as the positive effect of private capital, is most pronounced for the DBFOM option due to the broader scope of works subject to these effects.

#### 5.3.3.4 Consistency with Industry Best Practices on Vehicle Operations and Maintenance

This evaluation criteria considers the degree to which each project delivery option is consistent with identified best practices for vehicle operations and maintenance. Evaluation factors include:

- The extent to which vehicle operations is interdependent with dispatching train sets and crews, and the coordination and/or execution of vehicle maintenance, and can ensure a clear delineation of costs and responsibilities
- The extent to which track and system maintenance is interdependent with vehicle operations and can demonstrate a clear delineation of costs and responsibilities

#### Considerations

Key considerations for this evaluation criteria include:

- Coordination of vehicle and track operations/maintenance to clarify responsibilities/risk transfer and provide cost certainty

#### Scoring

Design Build Build	Design Build	Design Build Finance	Build Finance	Design Build Maintain	Design/Build/ Operate/ Maintain (Public Financing)	Design Build/ Operate/ Maintain	Design Build/ Finance/ Maintain	Design/ Build/ Finance/ Operate/ Maintain
DBB	DB	DBM(f)	DFI	DBM(f)	DBOM	DBOM(f)	DBFM	DBFOM
6	6	6	6	4	8	8	4	10

It is optimal for vehicle operations and dispatch to be bundled as closely as possible with vehicle, track, and systems maintenance due to the interdependence of these components. All of the Project Delivery Options which bundled these components to be carried by either the private sector or the public sector scored highly. The Project Delivery Options which "unbundled" these components – DBM(f) and DBFM - were scored lower, since

the interface between vehicle operations and vehicle, track, and systems maintenance will add complexity to the project.

However, Project Delivery Options which include private sector vehicle operations and maintenance have been scored more favorably since these delivery models are more likely to have a clear delineation of costs and responsibilities within their organizational structure, given that they are typically executed by single-purpose entities. In particular, options such as DBFOM which involve long-term private capital are most likely to have very clear organization structures since project lenders will perform enhanced due diligence on the contractual structure underpinning the project consortium to ensure that costs and responsibilities are clearly defined and there are no "stranded risks" among consortium members.

**5.3.3.5 Consistency with Industry Best Practices on Fare Setting and Ridership Volume Risk**

This evaluation criteria examines the extent to which each project delivery option is consistent with identified best practices on fare setting and ridership volume risk. Evaluation factors include:

- The alignment of responsibility for setting fares with broader transit objectives, including inter-modal integration to maximize public use
- The extent to which ridership volume is linked to broader transit objectives and integration, and the corresponding degree to which ridership volume risk can be fully or partially assumed by a third party

**Considerations**

Key considerations for this criteria include:

- Degree to which the option follows identified best practices for allocation of ridership risk and fare setting responsibility
- Incentives that provide for increased ridership

**Scoring**

Design-Build	Design-Build	Design-Build-Finance	Build-Finance	Design-Build-Maintain	Design-Build-Operate-Maintain (Public Financing)	Design-Build-Operate-Maintain	Design-Build-Finance-Maintain	Design-Build-Finance-Operate-Maintain
DBB	DB	DB(f)	B(f)	DBM(f)	DBOM	DBOM(f)	DBFM	DBFOM
4	4	4	4	4	9	9	4	10

Identified best practices for fare setting and ridership volume risk include:

- The public sector retaining all responsibility for fare policy
- Where the private sector is responsible for vehicle operations, a weak linkage between ridership volume and payments during the operations period in order to reward the system operator for high ridership volume resulting from good service as well as to compensate for increased wear and tear on vehicles. A "weak linkage" means that debt service is not put at risk from ridership levels.

All of the options are consistent with best practices for the public sector retaining responsibility for fare policy.

Project Delivery Options which include public sector operation of the system typically would not be compatible with incentives rewarding increased ridership, since there are no investors in the asset. However, the options which include private sector operation of the system (DBOM, DBOM(f), and DBFOM options) could potentially include incentives rewarding increased ridership (as it is presumably at least in part a function of effective operation of the system) and providing for automatic escalations in operations and maintenance payments if the system is utilized by more riders than expected. As well, recent comparable projects (the Canada Line project) have included incentives during the procurement process for the private sector to maximize projected ridership through system layout and service plan, by making projected ridership (third-party independent ridership forecast) an evaluated criteria during the procurement process. Therefore, these options involving private sector operation of the system have been scored more favorably. In particular, the DBFOM option involves long-term private capital providers (such as equity providers), who will likely perform independent due diligence on any such

ridership-based incentive structure in order to ensure that it is reasonable and properly calibrated, and does not unduly expose the project consortium to ridership risk. This should help ensure that the “weak linkage” identified as a best practice is properly implemented. Accordingly, the DBFOM option has been scored as optimal.

### 5.3.4 Value from Risk Transfer

This section evaluates each of the remaining nine Project Delivery Options based on the extent to which they provide the City with value by transferring appropriate risks to the private sector. The City obtains value through risk transfer since it does not have to bear the financial consequences of a transferred risk if it materializes. As well, an experienced private sector partner may be able to manage certain project-related risks in a more cost-effective manner than the City could, due to experience, resources, and expertise. These risks include risks which can be measured, controlled and mitigated by the private sector such as design, construction, operations, maintenance, and financial risks.

#### 5.3.4.1 Evaluation - Degree to Which the Project Delivery Option Provides Risk Adjusted Value in Return for the Transferred Roles

Each Project Delivery Option has been evaluated based on the degree to which it allocates appropriate design, construction, operations, maintenance, lifecycle, and/or financial risks to the private sector.

Scoring

Design Bid Build	Design Build	Design Build Finance	Build Finance	Design Build Maintain	Design/Build Operate Maintain (Public Financing)	Design Build Operate Maintain	Design Build Finance Maintain	Design Build Finance Operate Maintain
DBB	DB	DB(f)	B(f)	DBM(f)	DBOM	DBOM(f)	DBFM	DBFOM
0	1	3	2	3	3	4	6	10

Generally, Project Delivery Options which included the most significant transfer of roles and responsibilities to the private sector were scored the most favorably, as this implies greater risk transfer. As well, Project Delivery Options which included private capital at stake during the construction period were scored more favorably since this liquid form of security best secures performance during construction. Project Delivery Options which included private capital at stake during the operations phase were scored even more favorably since performance is secured through liquid security during both construction and operations.

The DBFOM option was scored as the optimal option since it transfers the most risk to the private sector and includes long-term private capital. This option will be among the costliest due to the additional costs associated with long-term private financing, and this has been reflected in the evaluation under Evaluation Criteria 1.1. The DBFM option also includes long-term private capital as well as substantial risk transfer to the private sector, but the public sector retains operations risks, resulting in a lower score than DBFOM. Both DBOM options include risk transfer to the private sector for both operations and maintenance, but do not include long-term private capital and have less liquid forms of security during the operational term. The DBOM (Public Financing) option received a slightly lower score due to the fact that fixed prices are not secured during procurement under competitive tension, which make it more difficult to ensure that best value pricing is being obtained.

## 5.4 Results

The results demonstrate that the DBFOM Project Delivery Option is the highest scoring option. Although it is among the most expensive options based on conservative assumptions of construction cost equivalency across all Project Delivery Options, it is well aligned with the City's core business and public policy objectives as well as with identified best practices, and should also produce value for the City through a high degree of risk transfer. This option includes private capital and bundles design, construction, operations and maintenance.

The DBOM(f) option is the next highest scoring Project Delivery Option. This option is less expensive from a capital cost perspective, and also fits well with the City's core business and public policy objectives. The DBOM(f) option includes short-term private capital and bundles design, construction, operations and maintenance.



The DBFM and DBM(f) options are also among the highest scoring options. These options bundle design, construction, and long-term maintenance and also include either short-term private capital (in the case of DBM(f)) or long-term private capital (in the case of DBFM).

Finally, the DBOM option was also amongst the highest scoring options. This option bundles design, construction, operations and maintenance but does not include significant private capital. As discussed in the Recommendations section, below, this option is not a recommended option due to the lack of a competitive procurement process for the design, construction, operations and maintenance works.

Please note that the Cost to the City has been scored based on certain assumptions regarding the private sector's capacity to provide short and long-term capital to the project. Sensitivity analysis was conducted on these assumptions to test the effect of both increased and decreased capital markets capacity. The scoring of the Project Delivery Options below was not significantly affected under these sensitivity analyses, demonstrating a robust ranking.

**Figure 13 – Summary of Scoring Results**

Criteria	Weighting	Design-Build-Build	Traditional Design-Build	Design-Build-Finance	Build-Finance	Design-Build-Maintain	Design-Build-Operate-Maintain (Public Finance)	Design-Build-Operate-Maintain	Design-Build-Finance-Maintain	Design-Build-Finance-Operate-Maintain
<b>1. Cost to the City</b>										
1.1. The total capital costs minimize impacts to the City's capital funding plan	60%	10.0	10.0	9.7	9.7	9.7	10.0	9.7	7.9	7.9
		6.0	6.0	5.8	5.8	5.8	6.0	5.8	4.7	4.7
1.2. The net annual operating and maintenance costs minimize the City's operating affordability plan	40%	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
<b>Unweighted Score</b>	<b>100%</b>	<b>10.0</b>	<b>10.0</b>	<b>9.8</b>	<b>9.8</b>	<b>9.8</b>	<b>10.0</b>	<b>9.8</b>	<b>8.7</b>	<b>8.7</b>
<b>Total Weighted Score</b>	<b>40%</b>	<b>4.0</b>	<b>4.0</b>	<b>3.9</b>	<b>3.9</b>	<b>3.9</b>	<b>4.0</b>	<b>3.9</b>	<b>3.5</b>	<b>3.5</b>
<b>2. Alignment of City's Role with Core Business and Public Policy Objectives</b>										
2.1. Alignment with City's Expertise on Engineering-Procurement-Construction	20%	6.0	10.0	10.0	6.0	10.0	8.0	10.0	10.0	10.0
		1.2	2.0	2.0	1.6	2.0	1.6	2.0	2.0	2.0
2.2. Alignment with City's Expertise on Vehicle Procurement	20%	6.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
		1.2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
2.3. Alignment with City's Expertise and Objectives Related to Vehicle Operations	20%	4.0	4.0	4.0	4.0	6.0	10.0	10.0	6.0	10.0
		0.8	0.8	0.8	0.8	1.2	2.0	2.0	1.2	2.0
2.4. Alignment with the Public's Expectations on Service Quality	40%	4.0	4.0	4.0	4.0	6.0	10.0	10.0	6.0	10.0
		1.6	1.6	1.6	1.6	2.4	4.0	4.0	2.4	4.0
<b>Unweighted Score</b>	<b>100%</b>	<b>4.8</b>	<b>6.4</b>	<b>6.4</b>	<b>6.0</b>	<b>7.6</b>	<b>9.6</b>	<b>10.0</b>	<b>7.6</b>	<b>10.0</b>
<b>Total Weighted Score</b>	<b>40%</b>	<b>1.9</b>	<b>2.6</b>	<b>2.6</b>	<b>2.4</b>	<b>3.0</b>	<b>3.8</b>	<b>4.0</b>	<b>3.0</b>	<b>4.0</b>
<b>3. Commercial and Contractual Structure</b>										
3.1. Consistency with Industry Best Practice For Risk Mitigation During Engineering-Procurement-Construction	35%	2.0	5.0	10.0	7.0	10.0	4.0	10.0	10.0	10.0
		0.7	1.8	3.5	2.5	3.5	1.4	3.5	3.5	3.5
3.2. Consistency with Industry Best Practice For Risk Mitigation During Operations	20%	0.0	1.0	1.0	1.0	3.5	5.5	6.0	4.0	10.0
		0.0	0.2	0.2	0.2	0.7	1.1	1.2	0.8	2.0
3.3. Consistency with Industry Best Practices To Maximize Useful Life of Assets	20%	0.0	1.0	1.0	1.0	5.0	7.0	7.0	8.0	10.0
		0.0	0.2	0.2	0.2	1.0	1.4	1.4	1.6	2.0
3.4. Consistency with Industry Best Practices on Vehicle Operations and Maintenance	20%	6.0	6.0	6.0	6.0	4.0	8.0	8.0	4.0	10.0
		1.2	1.2	1.2	1.2	0.8	1.6	1.6	0.8	2.0
3.5. Consistency with Industry Best Practices on Fare Setting and Ridership Volume Risk	5%	4.0	4.0	4.0	4.0	4.0	9.0	9.0	4.0	10.0
		0.2	0.2	0.2	0.2	0.2	0.5	0.5	0.2	0.5
<b>Unweighted Score</b>	<b>100%</b>	<b>2.1</b>	<b>3.6</b>	<b>5.3</b>	<b>4.3</b>	<b>6.2</b>	<b>6.0</b>	<b>8.2</b>	<b>6.9</b>	<b>10.0</b>
<b>Total Weighted Score</b>	<b>30%</b>	<b>0.6</b>	<b>1.1</b>	<b>1.6</b>	<b>1.3</b>	<b>1.9</b>	<b>1.8</b>	<b>2.5</b>	<b>2.1</b>	<b>2.0</b>
<b>4. Value from Risk Transfer</b>										
4.1. Level and Appropriateness of Risk Allocation to the Private Sector	100%	0.0	1.0	3.0	2.0	3.0	3.0	4.0	6.0	10.0
		0.0	1.0	3.0	2.0	3.0	3.0	4.0	6.0	10.0
<b>Unweighted Score</b>	<b>100%</b>	<b>0.0</b>	<b>1.0</b>	<b>3.0</b>	<b>2.0</b>	<b>3.0</b>	<b>3.0</b>	<b>4.0</b>	<b>6.0</b>	<b>10.0</b>
<b>Total Weighted Score</b>	<b>20%</b>	<b>0.0</b>	<b>0.2</b>	<b>0.6</b>	<b>0.4</b>	<b>0.6</b>	<b>0.6</b>	<b>0.8</b>	<b>1.2</b>	<b>2.0</b>
<b>Total</b>		<b>5.1</b>	<b>5.9</b>	<b>6.3</b>	<b>6.2</b>	<b>7.1</b>	<b>7.3</b>	<b>6.2</b>	<b>7.0</b>	<b>8.5</b>

Table 15, presented on the following page, demonstrates the alignment between the City's objectives and four of the highest-ranked Project Delivery Options: DBM(f), DBOM(f), DBFM, and DBFOM.



Table 15 – Alignment between City objectives and Short Listed Project Delivery Options

City Objective	DBM(f)	DBOM(f)	DBFM	DBFOM
<b>Cost and Schedule Certainty</b>	<ul style="list-style-type: none"> <li>Defers the majority of payment for construction until following the completion of construction. This provides strong incentives for the private sector partner to complete construction on time.</li> <li>Fixed <b>maintenance</b> prices for the entire term of the project, with little scope for cost escalation except in narrowly defined circumstances</li> </ul>	<ul style="list-style-type: none"> <li>Defers the majority of payment for construction until following the completion of construction. This provides strong incentives for the private sector partner to complete construction on time.</li> <li>Fixed <b>operations and maintenance</b> prices for the entire term of the project, with little scope for cost escalation except in narrowly defined circumstances</li> </ul>	<ul style="list-style-type: none"> <li>Defers the majority of payment for construction until following the completion of construction. This provides strong incentives for the private sector partner to complete construction on time.</li> <li>Fixed <b>maintenance</b> prices for the entire term of the project, with little scope for cost escalation except in narrowly defined circumstances</li> </ul>	<ul style="list-style-type: none"> <li>Defers the majority of payment for construction until following the completion of construction. This provides strong incentives for the private sector partner to complete construction on time.</li> <li>Fixed <b>operations and maintenance</b> prices for the entire term of the project, with little scope for cost escalation except in narrowly defined circumstances</li> </ul>
<b>Service Quality</b>	<ul style="list-style-type: none"> <li>Leverages the private sector's greater <b>maintenance</b> experience with the scale and type of system envisioned for the LRT Project</li> <li>Performance-based payment mechanism under this option will incentivize meeting <b>maintenance</b> service quality standards</li> </ul>	<ul style="list-style-type: none"> <li>Leverages the private sector's greater <b>operations and maintenance</b> experience with the scale and type of system envisioned for the LRT Project</li> <li>Performance-based payment mechanism under this option will incentivize meeting <b>operations and maintenance</b> service quality standards</li> </ul>	<ul style="list-style-type: none"> <li>Leverages the private sector's greater <b>maintenance</b> experience with the scale and type of system envisioned for the LRT Project</li> <li>Performance-based payment mechanism under this option will incentivize meeting <b>maintenance</b> service quality standards</li> </ul>	<ul style="list-style-type: none"> <li>Leverages the private sector's greater <b>operations and maintenance</b> experience with the scale and type of system envisioned for the LRT Project</li> <li>Performance-based payment mechanism under this option will incentivize meeting <b>operations and maintenance</b> service quality standards</li> </ul>
<b>Asset Residual Condition</b>	<ul style="list-style-type: none"> <li>Bundles design, construction, and long-term maintenance of all system assets, providing clear lines of accountability and risk transfer</li> <li>Performance-based payment mechanism will penalize inadequate maintenance of the assets. In contrast to traditional methods, the long-term contract can commit the private partner up-front to a capital maintenance program which is optimal for mitigating the risk of deferred maintenance.</li> </ul>	<ul style="list-style-type: none"> <li>Bundles design, construction, and long-term maintenance of all system assets, providing clear lines of accountability and risk transfer</li> <li>Performance-based payment mechanism will penalize inadequate maintenance of the assets. In contrast to traditional methods, the long-term contract can commit the private partner upfront to a capital maintenance program which is optimal for mitigating the risk of deferred maintenance.</li> </ul>	<ul style="list-style-type: none"> <li>Bundles design, construction, and long-term maintenance of all system assets, providing clear lines of accountability and risk transfer</li> <li>Performance-based payment mechanism will penalize inadequate maintenance of the assets. In contrast to traditional methods, the long-term contract can commit the private partner upfront to a capital maintenance program which is optimal for mitigating the risk of deferred maintenance.</li> <li>Long-term private capital providers will oversee appropriate maintenance practices since they could face losses if the asset is not properly maintained</li> </ul>	<ul style="list-style-type: none"> <li>Bundles design, construction, and long-term maintenance of all system assets, providing clear lines of accountability and risk transfer</li> <li>Performance-based payment mechanism will penalize inadequate maintenance of the assets. In contrast to traditional methods, the long-term contract can commit the private partner upfront to a capital maintenance program which is optimal for mitigating the risk of deferred maintenance.</li> <li>Long-term private capital providers will oversee appropriate maintenance practices since they could face losses if the asset is not properly maintained</li> </ul>
<b>Risk Transfer</b>	<ul style="list-style-type: none"> <li>Transfers significant <b>design, construction, and maintenance</b> risks to the private sector, reducing the risks borne by the City with respect to the project.</li> <li>During the construction period, private capital is at risk and ultimately bears</li> </ul>	<ul style="list-style-type: none"> <li>Transfers significant <b>design, construction, operations, and maintenance</b> risks to the private sector, reducing the risks borne by the City with respect to the project</li> <li>During the construction period, private capital is at risk and ultimately bears</li> </ul>	<ul style="list-style-type: none"> <li>Transfers significant <b>design, construction, and maintenance</b> risks to the private sector, reducing the risks borne by the City with respect to the project</li> <li>During the construction period, private capital is at risk and ultimately bears</li> </ul>	<ul style="list-style-type: none"> <li>Transfers significant <b>design, construction, operations and maintenance</b> risks to the private sector, reducing the risks borne by the City with respect to the project</li> <li>During the construction period, private capital is at risk and ultimately bears</li> </ul>

City Objective	DBM(f)	DBOM(f)	DBFM	DBFOM
	performance risks	performance risks	performance risks • During the operations period, private capital is at risk and ultimately bears performance risks	performance risks • During the operations period, private capital is at risk and ultimately bears performance risks
<b>Performance Security</b>	<ul style="list-style-type: none"> <li>Performance is secured during the construction phase by very liquid forms of security</li> </ul>	<ul style="list-style-type: none"> <li>Performance is secured during the construction phase by very liquid forms of security</li> </ul>	<ul style="list-style-type: none"> <li>Performance is secured during the construction phase by very liquid forms of security</li> <li>Performance is secured during the operations period by very liquid forms of security</li> </ul>	<ul style="list-style-type: none"> <li>Performance is secured during the construction phase by very liquid forms of security</li> <li>Performance is secured during the operations period by very liquid forms of security</li> </ul>

# 6 Recommended Project Delivery Options

## 6.1 Highest Scoring Project Delivery Options

The City's objectives for the LRT Project include: Cost and Schedule Certainty; Service Quality; Asset Residual Condition; Risk Transfer; and Performance Security. The Evaluation Criteria have been designed to select the Project Delivery Options which best meet these objectives. Based on the evaluation of the Project Delivery Options, the highest rated Project Delivery Options include four short-listed Project Delivery Options which feature bundled design, construction, and maintenance contracts ("Short Listed Project Delivery Options"):

- Design-Build-Maintain – DBM(f)
- Design-Build-Operate-Maintain – DBOM(f)
- Design-Build-Finance-Maintain - DBFM
- Design-Build-Finance-Operate-Maintain - DBFOM

The Design-Build-Operate-Maintain (Public Financing) option also scored well, but is not one of the recommended options due to the lack of a competitive procurement process for the design, construction, operations and maintenance works. The benefits of the Design-Build-Operate-Maintain (Public Financing) option include bundled design, construction, operations and maintenance coupled with improved affordability due to the lack of private finance. These benefits can be captured by the City, if desired, through the Design-Build-Operate-Maintain (DBOM(f)) option by minimizing private capital requirements.

**Table 16 – Evaluation of Project Delivery Options**

### TOTAL SCORE – EVALUATION OF PROJECT DELIVERY OPTIONS

	Design Bid Build	Design Build	Design Build Finance	Build Finance	Design Build Maintain	Design Build Operate Maintain (Public Financing)	Design Build Operate Maintain	Design Build Finance Maintain	Design Build Finance Operate Maintain
	DBB	DB	DBF	BF	DBM(f)	DBOM	DBOM(f)	DBFM	DBFOM
Score	5.1	5.9	6.8	6.2	7.1	7.3	8.2	7.5	9.5
Score (Percentage of Total Available Points)	51%	59%	68%	62%	71%	73%	82%	75%	95%

## 6.2 Key Characteristics of Highest Scoring Options

The Short-listed Project Delivery Options share certain key characteristics:

- **Bundled Design, Construction, and Maintenance:** One private sector entity is responsible for design, construction, and long term maintenance of the system. This provides strong incentives for design and construction work which is cost efficient, integrated (reduces design coordination issues), and results in a system which is economical to operate and maintain.

- **Risk Transfer:** Design, construction, maintenance and, in some cases, operations risks are largely transferred to the private sector. The evaluation established that the private sector is generally better equipped and more experienced than the City in carrying out these roles with respect to an LRT system of the scope, scale, and complexity of the Project.
- **Deferred Payment Mechanism:** Each of these options withhold payment until the system is commissioned into service.
- **Private Capital:** Each of these options involves investment of private capital, which should add discipline, third-party oversight, and strong incentives for timely completion during the construction period. The DBFM and DBFOM options include long-term private capital, required to fund the portion of construction payments which have been withheld and are paid out over the operating term, providing the same discipline, oversight, and strong incentives for performance throughout the operations term.

### 6.3 Recommendations

- Each of the Short-listed Project Delivery Options meets the City's core objectives and is a suitable option for undertaking the LRT Project.
- Of the Short-listed Project Delivery Options, the DBFM and DBFOM options are preferred options since they include long-term private capital (to fund deferred construction payments), which this Report has identified as the most effective mechanism for securing long-term performance.
- In deciding on the single Project Delivery Option that will be utilized, the City should consider how each of the Short-listed Project Delivery Options fulfill the following objectives:
  - Financial and/or budgetary considerations
  - The extent to which each Short-listed Project Delivery maximizes the City's operational flexibility for long-term operations of the transit system, including system expansion
  - An updated Value for Money assessment to quantify the expected value for the City of each of the Short-listed Project Delivery Options.



**All Appendices have been redacted as they contain content that is commercially confidential to Deloitte**

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