Independent Technical Review of the George Massey Crossing

December, 2018

WESTMAR ADVISORS

The Independent Technical Review (ITR)

The Review will focus on what level of improvement is needed in the context of regional and provincial planning, growth and vision, as well as which option would be best for the corridor, be it the proposed 10-lane bridge, a smaller bridge or tunnel.

The Review was supported by subject matter experts in:

- Bridge engineering
- Highway engineering
- Engineering economics
- Aquatic Environment
- Geotechnical engineering
- Traffic forecasting
- Tunnel engineering

ITR Approach

1 . Understanding the Project needs, goals and objectives
i.e., why is the Project being contemplated?

2. Assessing the solutions planned to meet the needs, goals and objectives
i.e., what functions is the Project planned to provide?

3. Providing findings and recommendations for improvements to the Project

The Review did not speak to Proponents about proposed designs and was not provided with commercial offers.

Components of the ITR

Project Needs, Objectives and Functional Criteria

Traffic

Highway and Bridge

HOV and Transit

Business Case

Tunnel

ITR Findings > *Needs & Goals*

Project Needs, Objectives and Functional Criteria

Findings Summary 1 of 3

- There is an obvious need to increase capacity to improve travel time reliability in the non-peak direction during peak hours.
- Goals of the Mayor's Council on Transportation, TransLink, Metro Vancouver, and local governments are closely aligned on the need to improve Crossing.

Traffic is exceeding the George Massey Tunnel's capacity, resulting in excessive travel times, delays, and poor service reliability, particularly in the non-counterflow direction during peak hours.

ITR Findings > *Needs & Goals*

George Massey Tunnel Replacement Project Goals

Each Project Goal is supported by a number of Functional Criteria.

1. **Reduce congestion –** e.g., improve travel times and reliability for all users.
2. **Improve safety -** e.g., traffic and seismic safety as well as emergency response capabilities.
3. **Support trade and commerce -** e.g., improve access to businesses and gateways.
4. **Support increased transit on the Highway 99 Corridor -** e.g., provide dedicated HOV/transit lanes.
5. **Support options for pedestrians and cyclists -** e.g., provide a multi-use pathway on the new bridge.
6. **Enhance the environment -** e.g., under the new bridge and in the Project right-of-way on Deas Island.

ITR Findings > *Needs & Goals*

Project Needs, Objectives and Functional Criteria

Findings Summary 2 of 3

- Absence of community alignment, community livability, and cost from the Project Goals contributed to stakeholder concerns.

- **Alignment with Community, Regional and National Objectives**
- **Community Livability**
- **Cost**

These key design considerations were identified in 2012 and considered during early project planning.

Their lack of formal inclusion in the Project Goals is seen as a significant factor in the resulting stakeholder concerns.

ITR Findings > *Needs & Goals*

Project Needs, Objectives and Functional Criteria

Findings Summary 3 of 3

- Functional Criteria developed for Goals 1, 4, and 6 were principal factors in defining Project scope.

- **Goal 1 - Reduce Congestion**
  (i) Eliminate queuing at any time to 2045.
- **Goal 4 - Support Increased Transit on the Hwy 99 Corridor**
  (i) Provide convenience of transit by improving infrastructure.; (e.g., integrated bus stops similar to SkyTrain stations).
- **Goal 6 - Enhance the Environment**
  (i) Provide a clear span structure with no piers in the Fraser River.
  (ii) Construct project within existing corridor and reduce footprint of project infrastructure.

These functional criteria were specific and effectively determined the 10 Lane Reference Concept bridge.

ITR Findings > *Traffic*

Traffic

Findings Summary 1 of 2

- Reference Concept highway improvements achieve 45% of total Project user benefits and are equally important to the Crossing solution.
- TransLink Regional Transportation Model (RTM3) model is appropriate for future traffic forecasting on the Highway 99 Corridor.

- Alex Fraser Bridge and George Massey Crossing act as a “couplet”.
- The Project forecast, with a tolled bridge:
  - First-year daily traffic to decrease to 71,000
  - Traffic to increase 84,000 in 2045, similar to what the tunnel is handling today
  - First year traffic to increase 17% increase on the Alex Fraser Bridge
- The Review’s traffic modelling was based on no tolls and analyzed 8 and 6 lane alternatives as well as the 10 Lane Reference Concept.

ITR Findings > *Traffic*

Traffic

Findings Summary 2 of 2

- Reducing the number of lanes from 10 to 8 or 6 will accommodate majority of the 2045 predicted traffic but with delays in the peak direction in 2045, similar to today.

An 8 lane crossing with the Reference Concept highway improvements accommodates 99% of the 2045 predicted traffic and achieves 95% of the travel time and operating cost benefits and 98% of the reliability benefits of the 10 Lane Reference Concept.

ITR Findings > *Traffic*

Project Option	Lane Configuration	Future Traffic Volume (2045 AADT)	2045 PM Peak Travel Times (mm:ss)		Travel Time and Operating Cost Benefits (NPV $ 2018)	Reliability Benefits (NPV $ 2018)
			North- bound	South- bound		
4 Lane Do Nothing	2/2 General Purpose Off Peak 3/1 General Purpose Peak Counter Flow	74%	31:30	35:00	0%	0%
6 Lane Do Minimum	3/3 General Purpose	87%	16:10	33:50	42%	36%
8 Lane Do Minimum	4/4 General Purpose	91%	15:10	32:30	50%	46%
8 Lane Reference Concept	4/4 General Purpose	99%	13:25	17:30	95%	98%
10 Lane Reference Concept	4/4 General Purpose + 1/1 HOV/Bus	100%	13:20	17:00	100%	100%
Summary Metric		**128,400**	**-**	**-**	**$1,734 million**	**$509 million**

ITR Findings > *Highway and Bridge*

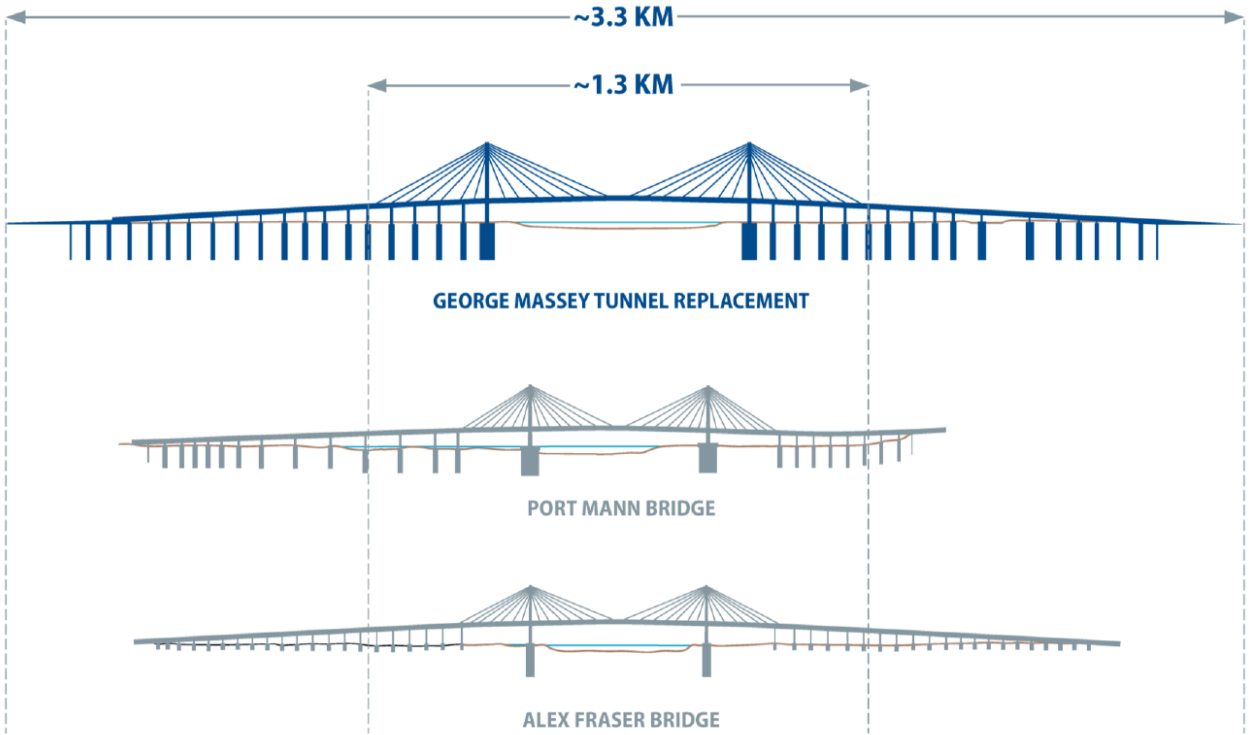
Highway and Bridge

Findings Summary

- Scale, complexity, and cost of the bridge can be reduced by changing the functional criteria to allow an alignment that is offset from the existing highway.
- Scale, complexity, and cost of the bridge can be reduced by changing the functional criteria to allow construction to occur in, or adjacent to, the Fraser River.

- Proposed Interchanges are imposing structures; dictated by the constraints to minimize the footprint and to include HOV/transit stations in median of the highway.
- Allowing construction in or adjacent to the Fraser River and on an offset alignment would simplify the bridge design and construction, reducing capital costs in the order of $500 million.

ITR Findings > *Highway and Bridge*



ITR Findings > *HOV and Transit*

HOV and Transit

Findings Summary

- Eliminating median transit provisions and corresponding lane reductions will significantly reduce complexity of Steveston Highway and Highway 17A interchanges.
- The 10 Lane Reference Concept HOV/transit provisions do not provide value for money.

- The HOV/transit provisions are estimated to cost approximately $500 million.
- The HOV/transit provisions achieve only 5% of Project benefits and have a 0.31 benefit cost ratio.
- TransLink noted no future plans to extend LRT south of the Fraser River and that the existing shoulder bus lane is functioning well with capability for expansion.

ITR Findings > *Business Case*

Business Case

Findings Summary

- Major components were not tested individually through trade-off studies and independent value for money analysis, consistent with normal MoTI practice.
- Estimated user benefits are reasonable and the 10 Lane Reference Concept has a benefit/cost ratio greater than 1.0.

User benefits estimated by the Project were comparable to the Review's RTM3 estimate, if not conservative.

ITR Findings > *Tunnel*

Tunnel

Findings Summary

- Retrofitting the Tunnel to modern seismic standards is technically feasible.
- Utilizing a new Immersed Tube Tunnel (ITT) for the new crossing, either on its own or in conjunction with retrofit of the existing Tunnel, is feasible.

- The conditions of the Project site and the needs of the Project are similar to crossings that have been successfully addressed with ITTs internationally.
- Both a new tunnel or a new bridge designed to modern standards can achieve the same level of safety.
- The cost of an ITT is expected to be competitive with a bridge.

Recommendations of the ITR

Summary of Concluding Recommendations

- **The 10 Lane Reference Concept achieves functional requirements and maximizes user benefits but with an all encompassing solution, avoiding impacts that could be mitigated.**
- **Revised functional criteria can reduce the Project scope and provide cost savings while still providing increased capacity and reliability.**
- **A reduced Project scope would better align with regional transportation and community planning goals and would likely result in broader Project acceptance.**

Recommendations of the ITR

Recommended Path Forward *(1 of 2)*

Province should re-examine Project needs and functional criteria to facilitate a Project that:

- provides capacity to improve current reliability and reduce future congestion to levels consistent with other crossings,
- provides transit infrastructure that is appropriate based on regional transportation planning,
- respects environment with mitigation and compensation measures to allow for alternative designs,
- accepts impacts to agricultural and park lands that can be mitigated.

Recommendations of the ITR

Recommended Path Forward *(2 of 2)*

Complete a new comprehensive feasibility study to re-visit Project Goals and functional criteria to allow:

- for congestion to be reduced, but not eliminated,
- a new tunnel or bridge to be offset from the existing highway alignment,
- further detailed consideration of adding new capacity in the form of a tunnel,
- reuse of the existing Tunnel,
- maintaining and improving existing shoulder bus transit system,
- construction in the Fraser River with suitable mitigation and compensation measures,
- some encroachment on agricultural and park lands with suitable mitigation and compensation measures.