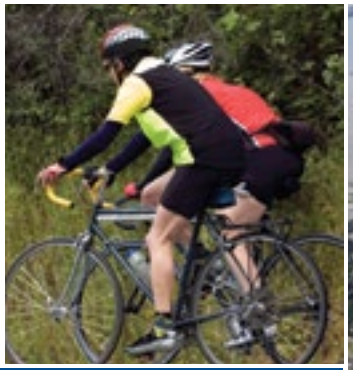

George Massey Tunnel Replacement Project

Project Definition Report

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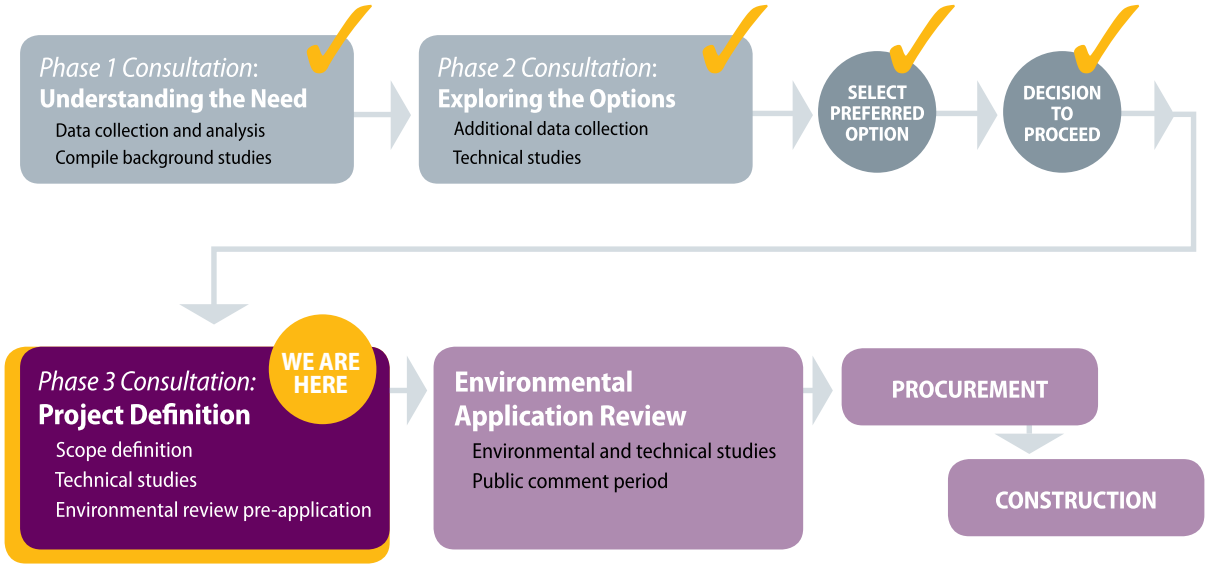
This Project Definition Report for the George Massey Tunnel Replacement Project presents the Ministry of Transportation and Infrastructure's vision, rationale and plans for improving a key section of the Highway 99 corridor and replacing the Tunnel with a new bridge to serve current and future transportation needs. Final decisions will be made based on feedback received during Phase 3 consultation, along with remaining technical studies and the environmental review.

The Ministry has a mandate to develop transportation strategies that move people and goods safely and grow our provincial economy. In developing this report, the Ministry consulted widely, gaining insight from municipalities, First Nations, Metro Vancouver, TransLink, the agricultural community, environmental groups, first responders, recreational groups, local businesses, local residents, marine users, cyclists, other stakeholders and the general public. The Ministry also conducted planning, engineering, geotechnical and environmental analyses; worked with engineering, environmental and other subject-matter experts; and collected data on historic, current and forecast population and economic growth, and on traffic patterns. Supporting plans, consultation and analyses are outlined in Appendix A.

The Ministry acknowledges the efforts of many stakeholders and partners, including First Nations, and municipal and TransLink staff members, who met regularly with the Project Team to discuss respective plans and provide insight into Project development. The Ministry also thanks all who have taken the time to share their views on this Project to date, and invites everyone to offer comments on this Project Definition Report. Please see below for information about how to share your feedback.



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Rendering of the potential new bridge configuration

1 PROJECT OVERVIEW

The George Massey Tunnel is an important link in the regional and provincial transportation system, carrying an average of 80,000 vehicles each day.[1] It connects to key gateways such as Vancouver International Airport (YVR), the Peace Arch and Pacific Canada-U.S. border crossings, BC Ferries' Tsawwassen terminal, Deltaport and the Boundary Bay Airport. It is a vital goods movement route that fuels our local, regional, provincial and national economies, and a key access point for businesses in Delta, Surrey, Richmond, and Tsawwassen First Nation.

Since the Tunnel opened in 1959, Metro Vancouver's population and economy have grown, and its population is forecast to continue to grow by more than one million people over the next 30 years.[2] Without improvements to this crossing, economic growth and regional livability will be constrained by congestion and increasing travel times for commuters, goods movers, commercial traffic and other traffic.

With growing concerns about public safety and congestion in and near the Tunnel, in 2012, the government of B.C. commenced a study of options to address the Highway 99 corridor. After analysis and consultation, a new bridge to replace the Tunnel emerged as the most appropriate and supported solution. Construction is anticipated to begin in 2017.

Need for a Replacement Crossing

Reduce Congestion The Tunnel has been congested during weekday morning and afternoon rush hours for decades, with combined queues from all directions now regularly as long as five kilometres.[1] When there is a crash or vehicle breakdown, these queues can be much longer. The volume of traffic at other times of the day has also grown to the point that the Tunnel is operating close to capacity throughout most of the day. Traffic studies indicate that if this crossing remains unchanged, then by 2045, peak-period queues will be three to five times longer than they are today. There will be more than a threefold increase in travel delays and a rush "hour" lasting at least four to six hours.

The Alex Fraser Bridge, which opened in 1986 on Highway 91, has absorbed much of the growth in rush-hour traffic south of the Fraser River. However, traffic has increased to the point where both the Tunnel and the Alex Fraser Bridge face significant peak-direction congestion and delays during rush hours.

With economic development south and north of the Fraser River continuing, and population and employment forecast to rise in the communities of Delta, Richmond, Surrey and Tsawwassen First Nation, TransLink's *Regional Transportation Model* forecasts that traffic volumes through the Tunnel will grow over time. This includes significant growth in truck traffic, which is expected to double in the next thirty years.[3] With no room at the Tunnel to accommodate this additional traffic during rush hour, new trips will have to be made before or after the rush hour at the Tunnel and the Alex Fraser Bridge, creating heavy congestion in all directions and constraining economic growth.

Improve Safety The Tunnel was built to the engineering standards of the 1950s and, while operationally safe, it does not meet modern highway and seismic standards. With narrow lanes and multiple merge points, crashes in and around the Tunnel happen with higher frequency than on other parts of the Highway 99 corridor.[4]

Support Goods Movement The Tunnel and the Highway 99 corridor are an important component of Canada's Pacific Gateway, supporting the movement of domestic and international trade goods. The Tunnel is a critical link on Highway 99, connecting key gateway access points. A new bridge would facilitate shorter and more predictable trip times throughout the day and help businesses to schedule goods movement more efficiently.

Support Transit

The Tunnel cannot accommodate dedicated transit lanes. A new bridge would support additional transit by providing continuous dedicated transit and high occupancy vehicle (HOV) lanes in the medium term, and space for potential rapid transit in the longer term.

Accommodate Cyclists and Pedestrians

For safety reasons, pedestrians and cyclists are prohibited from using the Tunnel. Cyclists use the shuttle service, which has limited hours of operation. The new bridge will include a multi-use pathway.

The Proposed Solution

Two phases of public consultation for the Project were held between November 2012 and April 2013, with more than 2,000 participants. Results indicate strong public support for additional capacity at this crossing, and a clear preference for a new bridge to replace the Tunnel.[5] As a result of this consultation, and in recognition of the age and condition of the Tunnel and the importance of the Highway 99 corridor as a public and economic asset, the Ministry will:

- Replace the Tunnel with a new 10-lane bridge (eight lanes plus two dedicated transit/HOV lanes), with construction to begin in 2017.
- Replace the Westminster Highway, Steveston Highway and Highway 17A interchanges, providing better access to and across Highway 99, with improved on- and off-ramps and additional lanes.
- Improve transit and HOV infrastructure, providing a continuous dedicated transit/HOV lane between Highway 91 in Delta and Bridgeport Road in Richmond, which will also support potential future rapid transit expansion.
- Provide access and connections for cyclists and pedestrians with a multi-use pathway on the new bridge.
- Decommission the Tunnel once the new bridge opens.

The new bridge will be built at the same location as the Tunnel. Traffic through the Tunnel will be maintained while the new bridge is under construction. The Ministry is reviewing options for removing sections of the Tunnel from the Fraser River once it is decommissioned. The Province intends to fund the Project through user tolls and is also working with the federal government to determine potential funding partnerships.

Other opportunities for potential future Highway 99 improvements between the Canada-U.S. border and Bridgeport Road have also been identified. This work is not included in the current Project scope but in future could potentially be undertaken by the Ministry in partnership with municipalities and/or other agencies, in consideration of TransLink's Transportation Vision as approved by the Mayors' Council on Regional Transportation.

Project Goals

Based on the Ministry's mandate and results of consultation to date, six primary goals have been identified for the Project:

1. **Reduce congestion.** Improve travel times and reliability for all users.

2. **Improve safety.** This includes improving traffic and seismic safety, as well as emergency response capabilities.

3. **Support trade and commerce.** Improve access to local businesses and gateway facilities, and improve travel time reliability for goods movers and service providers.

4. **Support increased transit on the Highway 99 corridor.** Provide dedicated transit/HOV lanes on the new bridge to improve travel time reliability and add capacity for long-term transit improvements.

5. **Support options for pedestrians and cyclists.** Provide a multi-use pathway on the new bridge to connect cycling and pedestrian corridors in Richmond and Delta.

6. **Enhance the environment.** Enhance the environment under the new bridge and in the Project right-of-way on Deas Island.

Business Case

Based on an estimated capital cost of $3.5 billion, the user benefits plus long-term economic effects result in a favourable benefit-cost ratio of 2.1 to 1.[6] Key Project benefits are:

Reduced congestion. The new bridge will meet current and forecast travel demand with no significant congestion to at least 2045; the average commuter will save about 25 to 35 minutes a day when the bridge is complete in 2022. This includes consideration of traffic that currently uses the Tunnel, forecast traffic growth at this crossing, and the potential for some travellers who avoid the Tunnel today to switch to the new bridge. Dedicated transit/HOV lanes will encourage transit and carpooling, to help manage growth in auto traffic. Travel time savings and reliability benefits are expected to be more than $70 million in the first full year of operation, increasing over time.[7]

Improved safety. The Project is expected to provide more than a 35 per cent decrease in the frequency of collisions.[8] The new bridge will have more lanes and wider shoulders than the Tunnel. This will make it easier for traffic to continue moving in the event of an incident and will facilitate first responder access. Additional lanes will also make it safer to merge onto Highway 99 from the Steveston Highway and Highway 17A interchanges and make it easier to avoid slower-moving trucks. The seismic safety of this river crossing will also be significantly improved.

Improved trade and commerce. Growth in international trade through Greater Vancouver has contributed significantly to the economy of B.C. and has increased traffic along major trade routes such as Highway 99, which is also a popular commuter and tourist route. Addressing traffic congestion will benefit goods movers and trade in B.C. and Canada by improving travel times, reliability and agricultural access. It will also improve access within and between municipalities. This will provide greater flexibility in scheduling service and deliveries, and support overall growth in truck traffic, which is expected to double by 2045.[3]

Improved transit. Dedicated transit/HOV lanes will ensure more reliable, free-flowing transit trips across the river, and a dedicated Highway 99 transit-only ramp will connect to Bridgeport Road. The new bridge will also be built to accommodate future rapid transit.

Improved cyclist/pedestrian access. Cyclists and pedestrians will be able to cross at all times of the day using the new multi-use pathway.

Enhanced environment. Potential environmental improvements include connecting portions of Deas Island Regional Park that are currently separated by the Tunnel infrastructure, lower per-trip fuel consumption, lower idling-related greenhouse gas emissions, and improved local trail access.

Project Schedule

Planning and delivery for a project of this scale includes project development, environmental review, contractor selection and construction. The environmental review is expected to be complete in 2016. Moving forward now ensures construction can begin in 2017 to ensure the bridge is completed in 2022 (*see Figure 1*). The Tunnel will be decommissioned after the new bridge opens to traffic.

Figure 1: Project Timeline

Next Steps

The Ministry welcomes feedback on this Project Definition Report (*see inside front cover for details on how to participate*), and will continue to work with stakeholders and the public to plan and implement this Project.

The Project is preparing its submission to the B.C. Environmental Assessment Office for an environmental review, which will include public consultation. Pre-application discussions commenced in 2014, with plans to submit an Environmental Assessment Application for review in early 2016. Environmental baseline studies have been underway since early 2014. This work will also support the development of conceptual designs for procurement and applications for future permits.

Following completion of Phase 3 consultation, the Ministry will finalize the Project scope and cost estimate and submit the Project application for environmental review.

2 RATIONALE

Improving Safety

The Tunnel was built to the engineering standards of the 1950s. While operationally safe, it does not meet today's engineering standards, though some deficiencies have been addressed through lighting, ventilation and structural upgrades.

The Tunnel's design constraints make it difficult for first responders to reach and clear emergencies. Some cargoes are not permitted in the Tunnel, and neither are cyclists. The new bridge will be a lifeline structure in a significant seismic event, and will also have a multi-use pathway for cyclists and pedestrians.

The Tunnel has been consistently voted as one of the worst roads in B.C. in BCAA's "Worst Roads" survey because of congestion.[9] The Tunnel also does not meet current roadway and seismic design standards.

High Crash Rates

An analysis of traffic collision patterns along the Highway 99 corridor shows that crashes are highest at merge points leading to the Tunnel entrances, and at the Highway 17A and Steveston Highway interchanges. According to ICBC records, the Steveston Highway interchange is by far the worst crash site in Richmond, and in Delta, the Highway 17A interchange is the third-worst crash site.[10] Northbound crash rates are approximately 50 per cent higher than southbound rates, particularly with respect to rear-end collisions. This is due in part to the large volume of vehicles making multiple merges as Highway 17A connects with Highway 99, combined with congestion and the related queues during the morning rush. In addition to safety and damage concerns, these crashes affect travel times and corridor reliability.

The Project is forecast to reduce crashes by more than 35 per cent.[8]

Earthquake Risk

Built in the 1950s, the Tunnel does not meet modern seismic standards. A new bridge would provide seismic performance in accordance with current engineering standards.

Addressing Traffic Congestion

The Tunnel on Highway 99 and the Alex Fraser Bridge on Highway 91 are key components of a regional, provincial and national transportation network that links communities south of the Fraser River with their neighbours to the north. As the two crossings are not far from each other, travellers have a choice, and congestion at one crossing significantly affects traffic movements on the other.

Because of the counterflow system, the four-lane Tunnel is the only Fraser River crossing with a single lane of traffic in the off-peak direction during rush hour. In the past 10 years, congestion in the off-peak direction (southbound in the morning and northbound in the afternoon) has become worse than in the peak direction. During the same period, midday traffic increased by 20 per cent in the northbound direction and 30 per cent in the southbound direction.[1]

The counterflow system, which was first introduced in 1982 and automated in 1990, works like this:

- Three northbound lanes and one southbound lane in the morning rush (5:45–9:15 a.m.).
- Three southbound lanes and one northbound lane in the evening rush (3:00–6:15 p.m.).
- Two lanes in each direction at all other times.

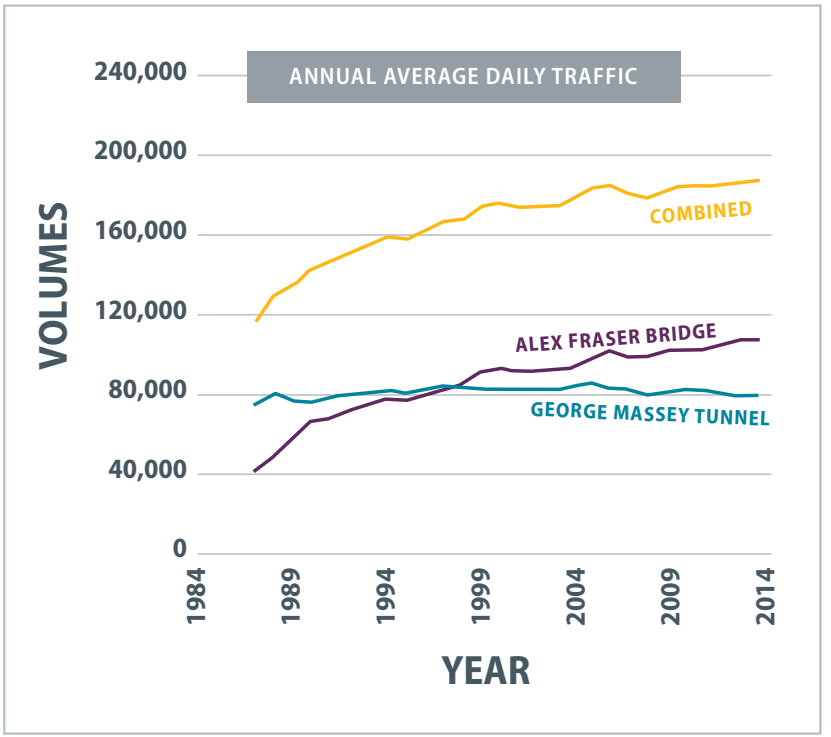


Figure 2: Annual Average Daily Traffic

By comparison, the Alex Fraser Bridge, which opened in 1986 on Highway 91, has six lanes, three in each direction at all times.

The Alex Fraser Bridge has absorbed much of the growth in traffic demand, as Figure 2 illustrates. Between 1994 and 2014, annual average daily traffic (AADT) on the Alex Fraser Bridge grew by an average of 1.7 per cent annually, while combined traffic across the Alex Fraser Bridge and through the Tunnel grew at an average rate of 0.8 per cent.[1]

While both the Alex Fraser Bridge and the Tunnel are significantly congested during the morning and afternoon rush hours,[11] a comparison of the two crossings (*see Figures 3 and 4*) shows that the Alex Fraser Bridge has free-flowing traffic in the middle of the day, while the Tunnel is at or near capacity for much of the day. This is due to:

- The Tunnel counterflow lane system limits off-peak direction traffic to one lane, causing people to shift their travel time.
- Steady Tunnel use throughout the week at all times of the day for local business use, and significant demand in the summer months for tourism travel.

The Tunnel has been at capacity during the morning and afternoon rush hours for decades, and traffic queues have continued to grow. Midday traffic has also grown, so the Tunnel is often congested during the day.

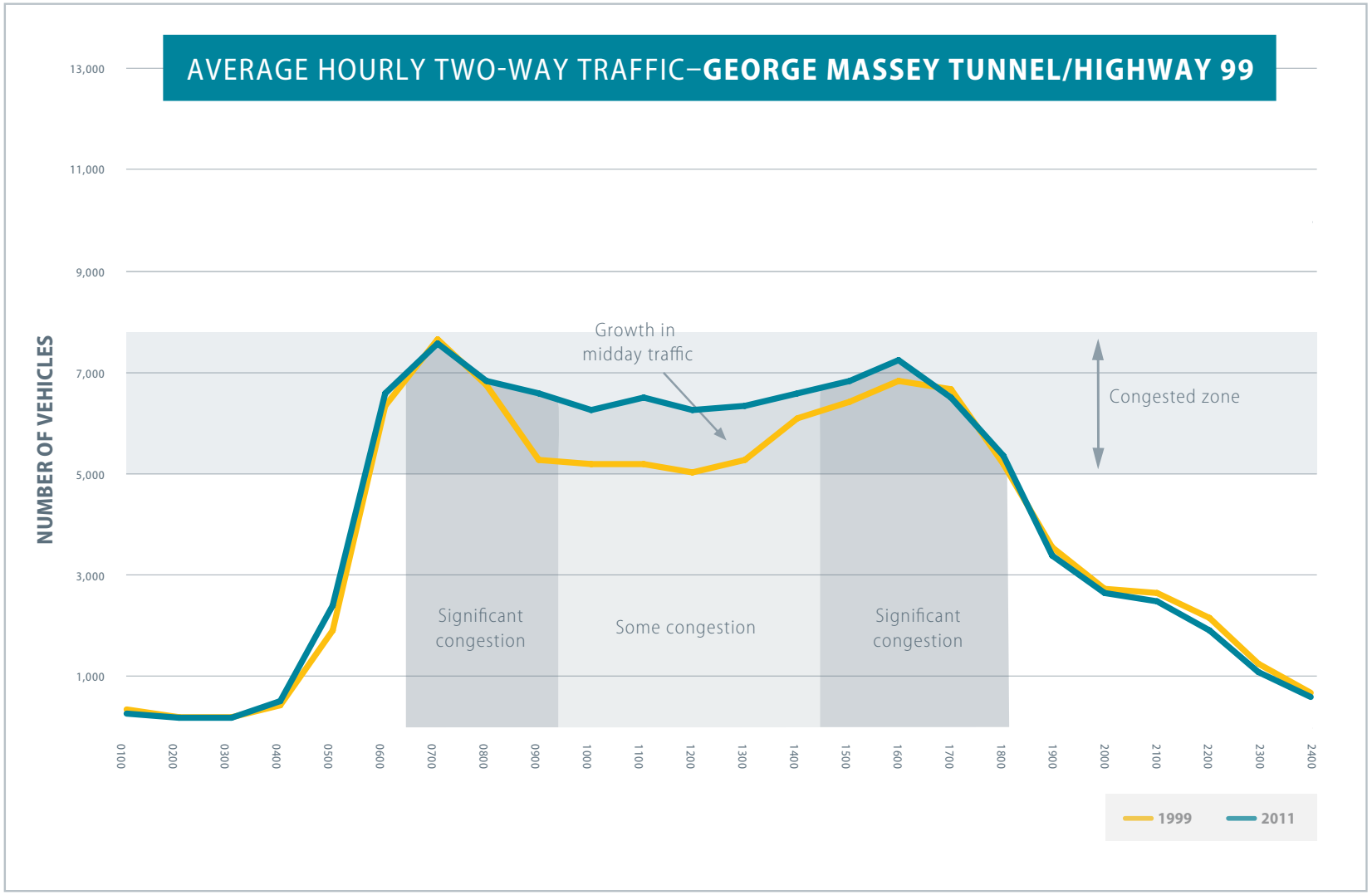


Figure 3: Average Hourly Traffic at the Tunnel

With traffic growing year over year since it opened in 1986, the Alex Fraser Bridge and Highway 91 no longer have room to accommodate more northbound traffic in the morning rush or southbound traffic in the evening rush because they are at capacity during these times. Queues at the bridge are getting longer and rush "hour" now lasts between two and three hours each day in each direction.

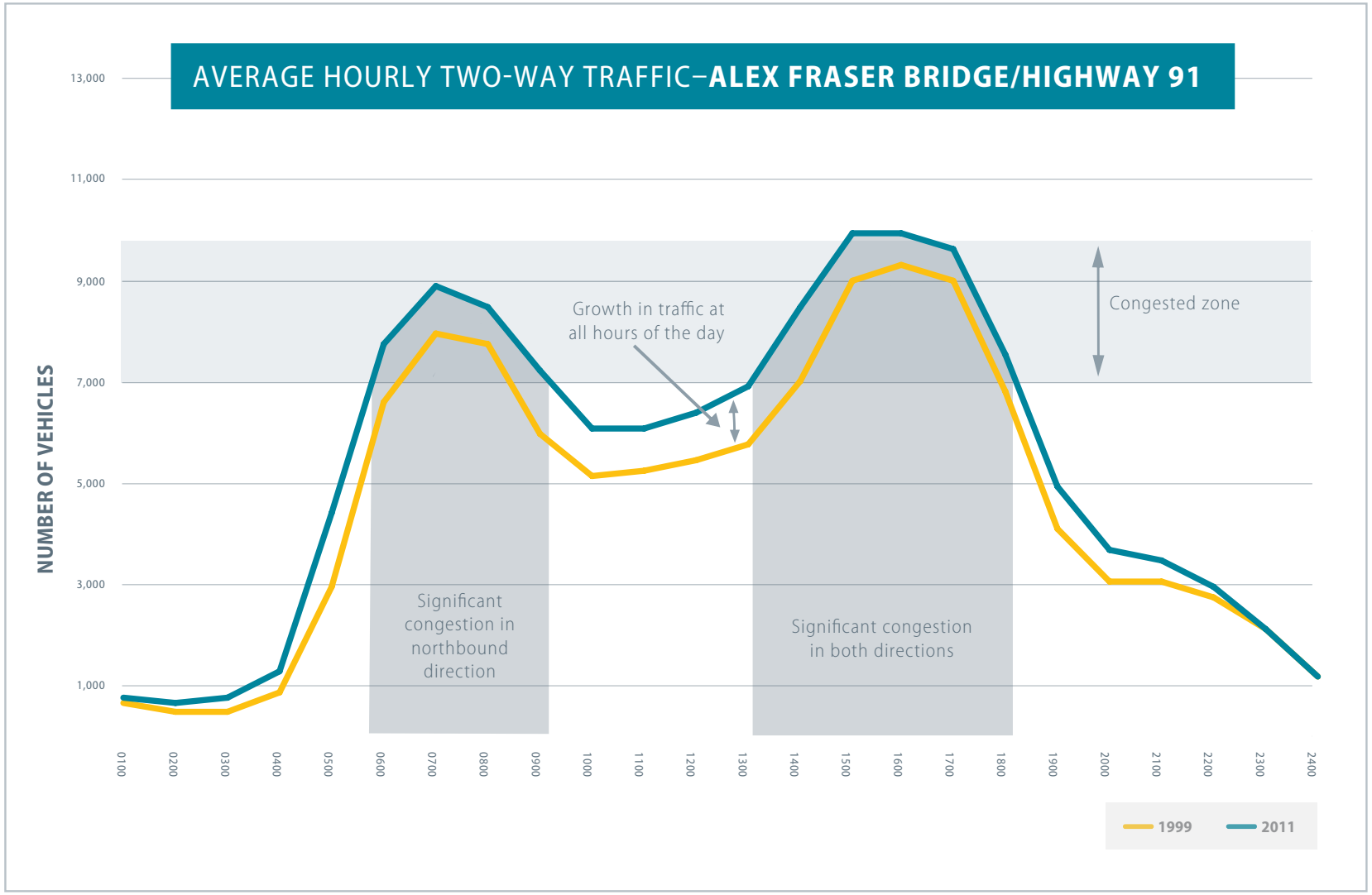


Figure 4: Average Hourly Traffic at the Alex Fraser Bridge

Current Traffic Patterns

Origins and Destinations

After the Tunnel opened in 1959, it rapidly became a key commuter route to downtown Vancouver for residents south of the Fraser River. Today, commuter traffic to downtown Vancouver accounts for less than half the total traffic through the Tunnel. Almost 60 per cent of daily vehicle trips through the Tunnel are between Richmond and communities south of the Fraser River.[12] Figures 5 and 6 illustrate daily origins and destinations for vehicles passing through the Tunnel on a typical weekday. A breakdown of these numbers is available in Appendix B.

Richmond has become an important trip generator in Metro Vancouver. Depending on the time of day, traffic originating in or destined for Richmond now represents approximately 60 per cent of total daily trips through the Tunnel.

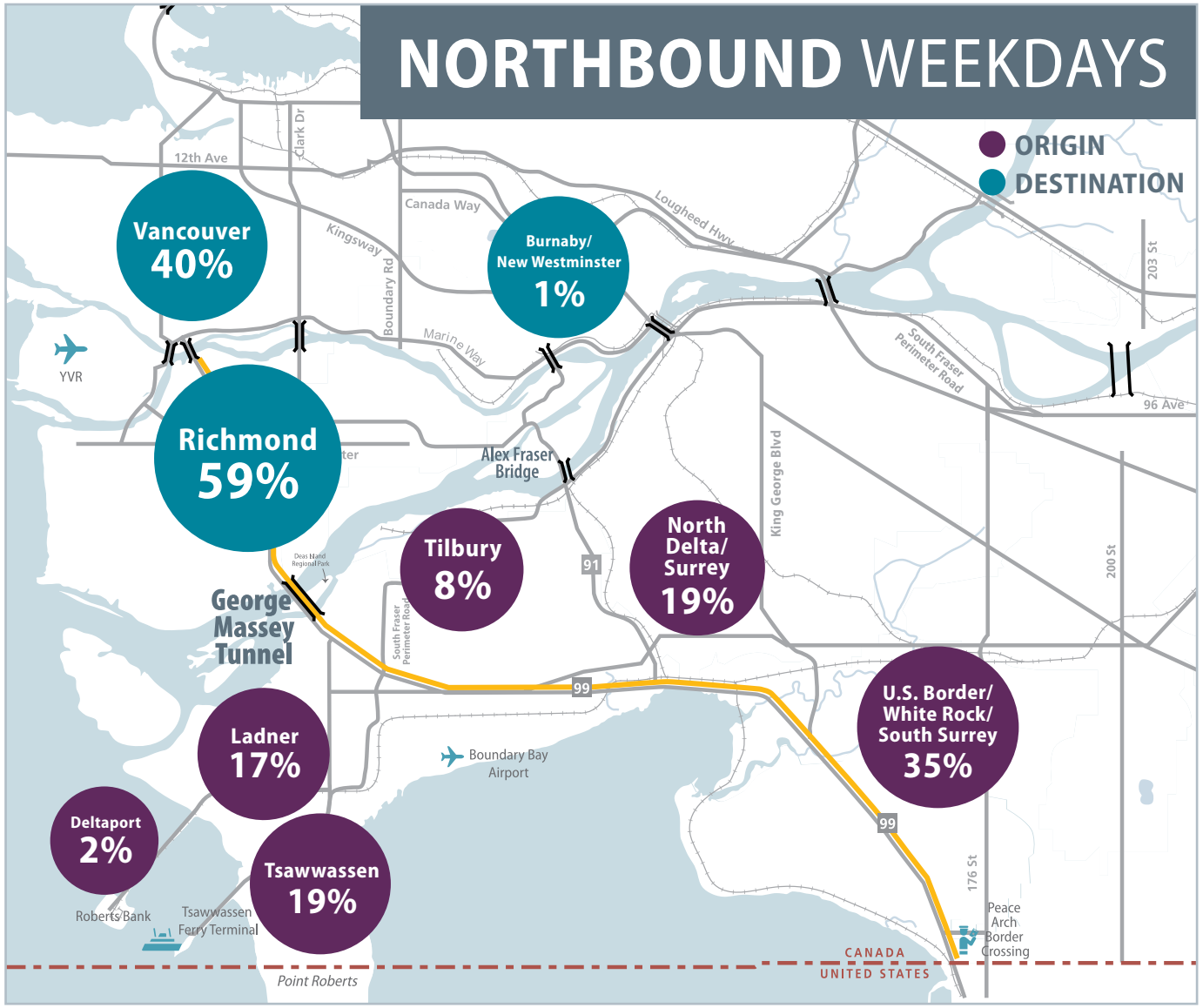


Figure 5: Northbound Weekday Vehicle Travel Patterns (October 2014)

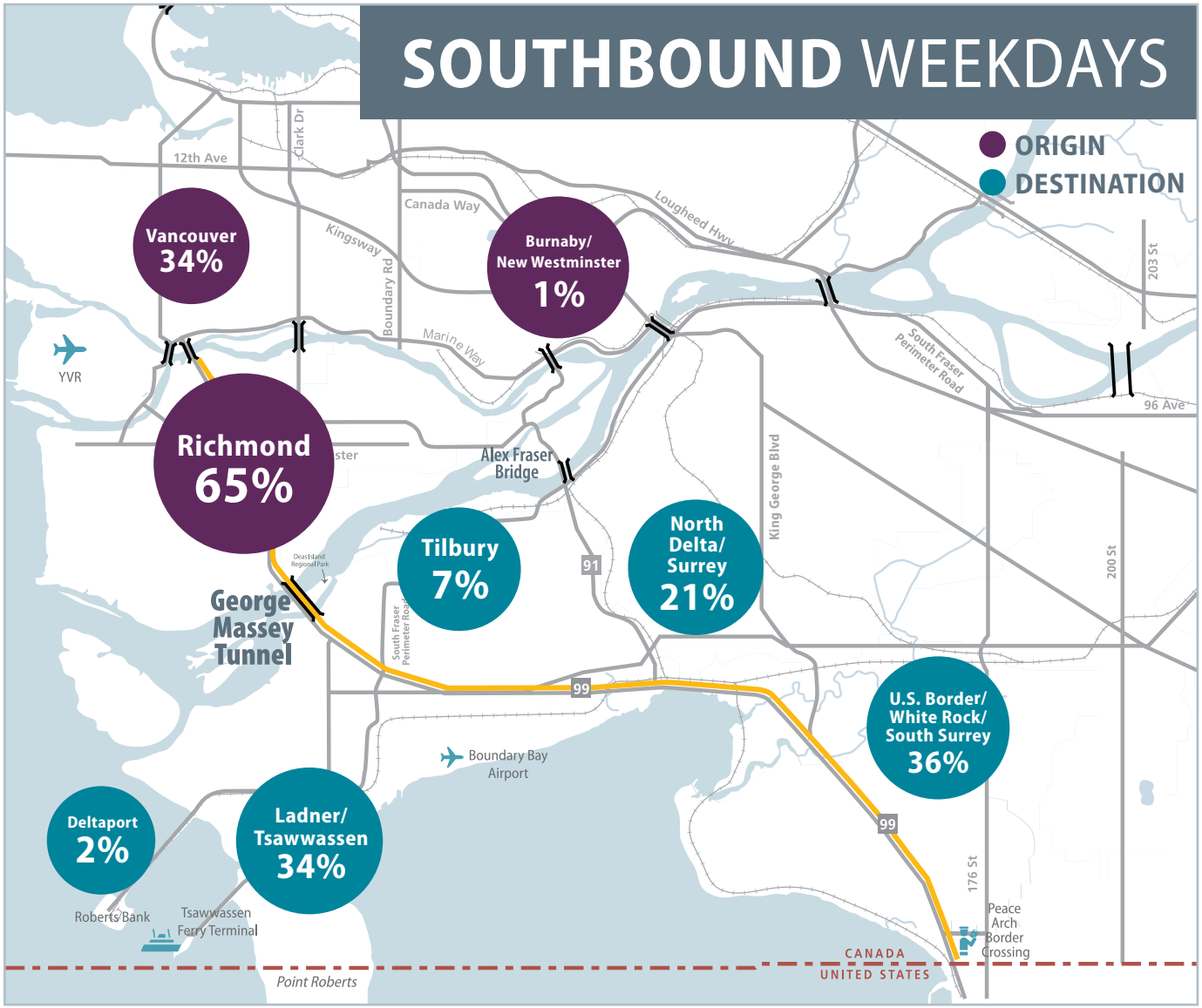


Figure 6: Southbound Weekday Vehicle Travel Patterns (October 2014)

Travel Delays

Congestion-related travel delays were identified as the number one concern during public consultation in 2012 and 2013. Delays can be well over an hour in the event of traffic accidents or vehicle breakdowns.[13] This unpredictability leads to travel time uncertainty and traveller frustration, and hurts the economy.

An important additional consideration is that Highway 99 carries a significant amount of B.C.'s tourism traffic, accessing destinations such as BC Ferries, YVR, Whistler, the Canada-U.S. border, and Port Metro Vancouver's cruise ship terminals. For northbound afternoon traffic, delays are highest in July and August – the season of greatest tourist and vacation traffic demand. For example, in recent years, August peak hour delays have ranged from 30 to 45 minutes.[13]

More People, More Trips

Population and Employment Growth

Since the Tunnel opened in 1959, population and employment in Richmond and south of the Fraser River have grown considerably. The Agricultural Land Reserve and Metro Vancouver's *Regional Growth Strategy* have helped to shape this growth. New Metro Vancouver *Regional Growth Strategy* targets call for population and employment in Richmond and south of the Fraser River to grow by more than 50 per cent between 2011 and 2041 (*see Table 1*).[2]

	Population Projections				Percentage Increase 2011–2041
	2011	2021	2031	2041	
Delta, Richmond, Tsawwassen	296,900	344,000	380,000	409,500	38%
Surrey, White Rock	497,500	614,500	707,000	793,500	59%
Total Population	**794,400**	**958,500**	**1,087,000**	**1,203,000**	**51%**

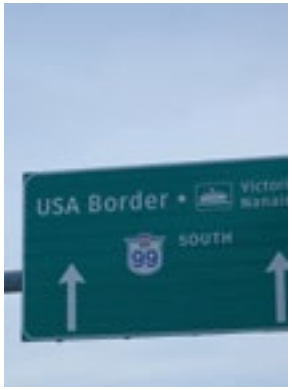
	Employment Projections				Percentage Increase 2011–2041
	2011	2021	2031	2041	
Delta, Richmond, Tsawwassen	178,750	210,200	233,400	252,500	41%
Surrey, White Rock	175,200	221,800	266,400	306,300	75%
Total Employment	**353,950**	**432,000**	**499,800**	**558,800**	**58%**

Table 1: Metro Vancouver Projections for Population and Employment Growth

Municipalities and other economic generators south of the Fraser River also have numerous planned developments that are expected to increase traffic volume on Highway 99 in the Project area (*see Appendix C*).

As a result of this planned population growth and future economic development, the following travel pattern changes are expected south of the Fraser River:

- Proportionately more commercial trips to Deltaport, Richmond, Tilbury, South Surrey, YVR, Boundary Bay Airport and the Canada-U.S. border.
- Steady growth in commuting trips from South Surrey to Richmond as the population and employment density in Surrey and Richmond continue to increase.
- Increased use of transit.
- Modest growth in tourism-related travel, including discretionary trips to and from the Canada-U.S. border, YVR and BC Ferries' Tsawwassen terminal.
- Increased employment and discretionary trips to new developments in Surrey and Delta, and on Tsawwassen First Nation lands.



Forecast Traffic Growth

Local municipalities are working with TransLink to reduce growth in single-occupancy traffic within and across communities. Municipalities adjacent to the Highway 99 corridor have also planned local upgrades to their traffic network to address increased demand. TransLink's recently approved Transportation Vision includes plans for a new Pattullo Bridge and long-term transit and other transportation improvements designed to increase transit's share of traffic relative to passenger vehicles. These plans are not expected to significantly reduce demand for travel on Highway 99 or through the Tunnel.

Based on forecast population and employment growth, and considering the planned regional road and transit improvements noted above, TransLink's *Regional Transportation Model* predicts that the volume of traffic through the four-lane Tunnel will grow by about 20 per cent to just under 100,000 vehicles per day by the year 2045.[14] Also, as a result of economic growth, truck traffic is expected to double over today's levels within the same period.[3]

Since the Tunnel is already over capacity at rush hour, some people will switch to transit, but not enough to offset the forecast growth in new traffic. With no room at the Tunnel to accommodate more traffic during the morning and afternoon rush hours, travel patterns would shift to before or after the rush hours, including in the middle of the day. Queues at the Tunnel and the Alex Fraser Bridge would grow, and the current three-hour rush period would grow to between four and six hours (*see Figures 7 and 8*) in both the morning and afternoon. Congested conditions would occur in all directions of travel on Highway 99 and Highway 91 throughout the day, hindering traffic movement and economic growth. Tunnel users would routinely experience weekday delays in both directions in the range of 45 minutes to over an hour during the busiest times and significantly longer delays in the event of a traffic incident.

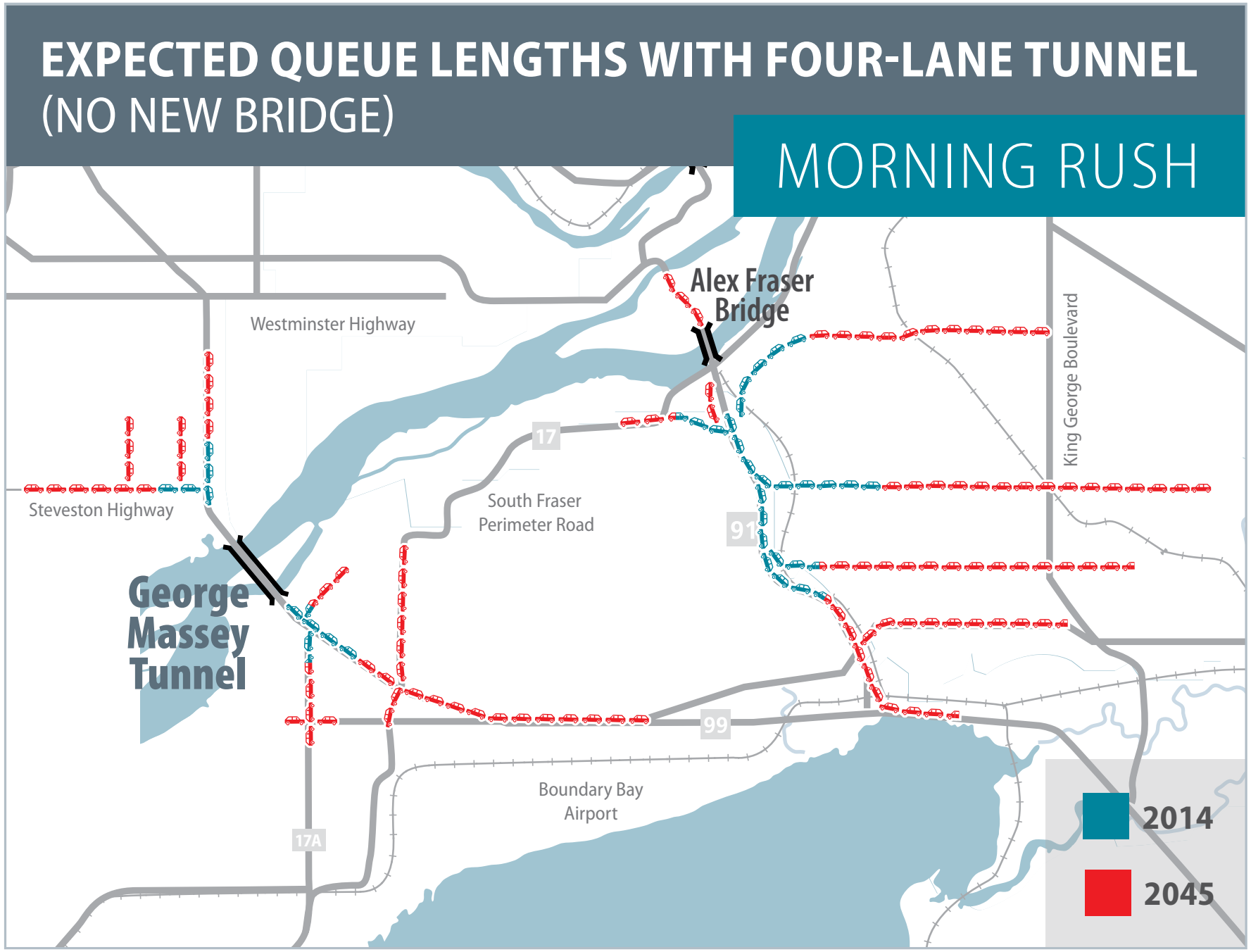


Figure 7: Morning Rush Queues for Traffic Headed to the Tunnel and the Alex Fraser Bridge

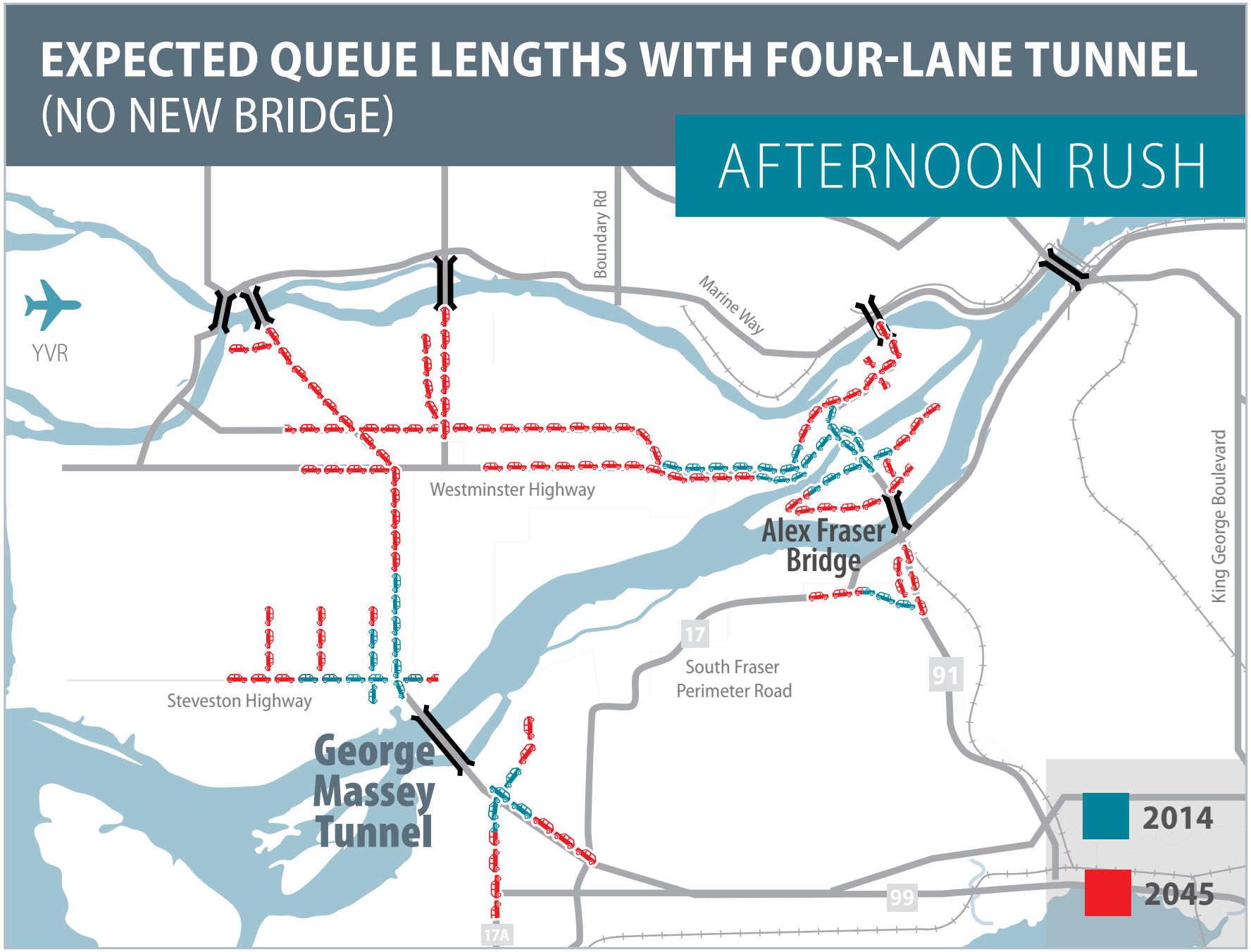


Figure 8: Afternoon Rush Queues for Traffic Headed to the Tunnel and the Alex Fraser Bridge

Supporting Growth

With or without a new crossing to replace the Tunnel, travel demand is forecast to increase over the next 30 years as the population and the economy grow and generate more traffic.[14] With no room for additional traffic at the Tunnel, travellers will experience severe congestion.

A new tolled bridge would result in lower growth in traffic over time, as compared with an untolled crossing. The new crossing would provide significant travel time savings and reliability benefits while also helping to relieve rush-hour traffic congestion at the Alex Fraser Bridge and ensuring that the new bridge continues to serve national, provincial, regional and local trips well beyond the 30-year planning horizon.

A new bridge will help keep all traffic moving. Figure 9 illustrates the mix of combined daily rush-hour traffic in the future as compared with today, as well as the growth rates for different types of traffic, with trucks and transit growing at faster rates than cars.[3] "Trucks" includes heavy trucks such as container trucks serving port and industrial facilities, as well as light trucks such as cube vans serving local commercial needs.

FORECAST RUSH-HOUR TRAFFIC GROWTH,
MORNING AND AFTERNOON COMBINED

(2014–2045)

	TODAY (with Tunnel)	**2045** (with new bridge)	
CARS	12,000	18,500	↑ **55%**
TRUCKS	600	1,600	↑ **170%**
BUSES	85	190	↑ **125%**

Figure 9: Forecast Growth in Rush-Hour Traffic

Supporting Goods Movement

Moving Goods by Road

Highway 99 is part of a transportation network that supports local commerce, and provincial and international trade. Replacing the Tunnel with a new bridge will not only benefit commuters, but also strengthen the local, regional, provincial and national economies.

With economic development south of the Fraser River continuing to grow, total daily truck trips through the Tunnel are predicted to double by 2045.[3] Without new capacity, these trucks will face significant delays in delivery time as they compete with other vehicles for access across the river.

	Tunnel	Alex Fraser Bridge
Number of trucks per day	7,000	9,000
Percentage of peak-hour traffic that is trucks	5%	6%
Percentage of midday traffic that is trucks	15%	11%
Number of trucks in rush hour	600	1,100

Table 2: Truck Traffic

Some of these trips will come from Port Metro Vancouver's Deltaport terminal. Others will be in support of growing inland container depots and other industrial growth in areas such as the Fraser Richmond lands and Tilbury Island, while still others will support retail goods and services. Port Metro Vancouver's Deltaport terminal represents about 2 per cent of all Tunnel trips each day and about 50 to 70 trucks per hour in the northbound direction during the morning and evening rush.[15] There are more than 80,000 light and heavy commercial vehicles in Greater Vancouver and the Fraser Valley,[16] of which about 2,000 are registered to access Port Metro Vancouver.[17]

Trucks tend to avoid rush-hour traffic and, as such, truck travel increases during the midday (*see Table 2*).[1]

Moving Goods by Water

A number of industries – including container import/export and auto import/export and breakbulk exports – use the Fraser River as a marine highway for goods movement. In 2012, port and shipping facilities and related activities for the Lower Fraser River contributed 41,500 jobs and $4 billion to Canada's gross domestic product (GDP).[18] For B.C. alone, the Fraser River ports generated some 32,000 jobs and $3 billion in GDP.[18] Consistent with Port Metro Vancouver's *Land Use Plan*, more intensive use of Port Metro Vancouver sites on the South Arm of the Fraser River can be anticipated to support continued growth in Canada's trade.[19]

The new bridge will have vertical clearance similar to that of the Alex Fraser Bridge, to ensure that current shipping requirements continue to be addressed. Once the new bridge is operational, the Tunnel will be decommissioned. Removing portions of the Tunnel as part of decommissioning would increase the water draft at this location by less than 2 metres. This would not appreciably change the mix of vessels using the Fraser River because of other constraints in the shipping channel.

The Tunnel carries more transit passengers than any other major Fraser River crossing except SkyTrain's SkyBridge.

Supporting Transit

Transit use in the Project catchment area is high today. For example, during the morning rush hour, approximately 60 per cent of trips to downtown Vancouver by residents of South Delta and South Surrey are made by transit. In comparison, 44 per cent of downtown trips by residents of the North Shore, which has a similar population and better transit access, are made by transit.[20]

Nine northbound TransLink bus routes use the Tunnel during the morning rush. While these buses comprise only 1 per cent of the rush-hour traffic, they carry about 17 per cent of all Tunnel travellers. However, transit is not practical for approximately 70 per cent of northbound weekday drivers through the Tunnel.[21] This includes commercial vehicles, tourists, and commuters travelling to or from areas with limited or no transit service.

Peak-hour transit volume is expected to almost double through to 2045 (*see Figure 10*). The new bridge will have dedicated transit/HOV lanes and will be built to accommodate future rapid transit service, consistent with the results of public consultation in 2012 and 2013.

TRANSIT VOLUMES, MORNING RUSH HOURS	NUMBER OF BUSES	TRAVEL TIMES (MINUTES)*
2014 CURRENT CONDITIONS	50	30
2045 WITH NO IMPROVEMENTS	95	45
2045 WITH NEW BRIDGE	95	25

*KING GEORGE BOULEVARD TO BRIDGEPORT ROAD

Figure 10: Transit Volumes in the Morning Peak

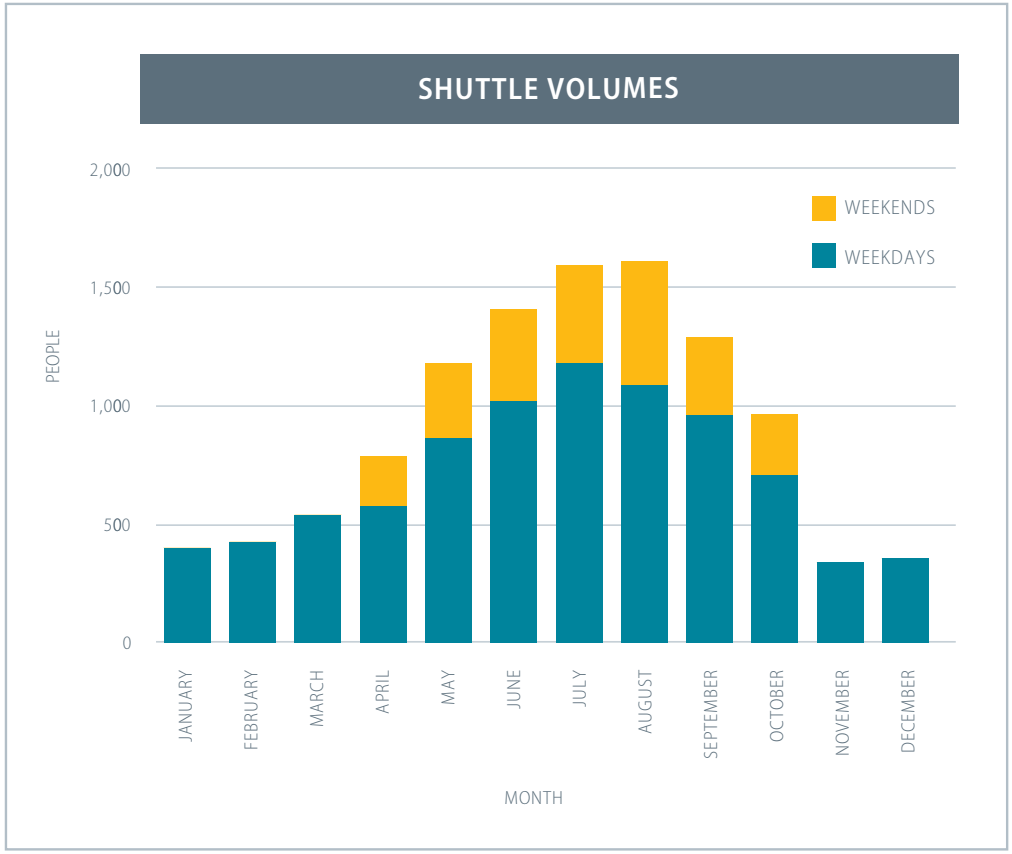


Figure 11: Number of People Transported by Shuttle in 2014

With no shoulders and narrow lanes, the Tunnel cannot safely accommodate cyclists or pedestrians. The new bridge will include a multi-use pathway that will connect to walking/cycling routes on either side of the Fraser River.

Creating Opportunities for Cyclists and Pedestrians

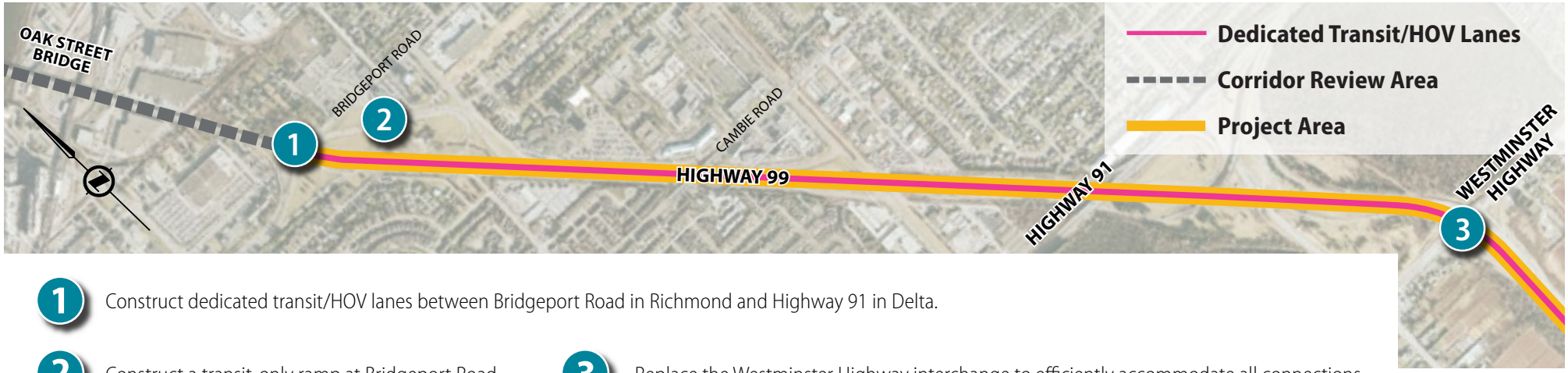
Public consultation undertaken in 2012 and 2013 highlighted a strong desire for the new bridge to provide access for cyclists and pedestrians. According to TransLink's 2011 *Regional Trip Diary Survey*, cycling mode share in Delta/Richmond (1.2 per cent) is second only to Vancouver (4.1 per cent).[22] Both municipalities have an extensive network of well-used cycling and pedestrian trails, such as the Millennium Trail and the Dyke Trails.

In the absence of a safe route for cyclists, the Ministry operates a year-round free shuttle service through the Tunnel. In 2014 the shuttle transported an average of 910 people per month (an average of 30 people per day – this number varies by season; *see Figure 11*).[23] The shuttle service does not operate on weekends during the winter months. The number of bikes on the shuttle is highest in the summer. When the new bridge opens, the shuttle service will no longer be required.

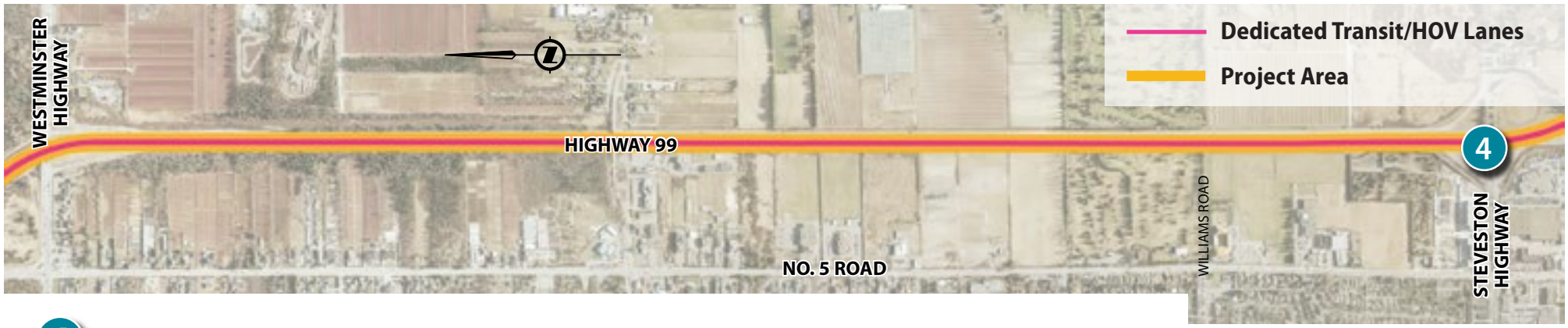
The new bridge will include a multi-use pathway connecting to walking/cycling routes on either side of the Fraser River, improving the potential for cycling and walking as an option for the many people who travel back and forth between Delta and Richmond. The new bridge will also encourage cycle tourism and recreation, providing improved access to and from BC Ferries' Tsawwassen terminal, to and from cycling trails on both sides of the Fraser River, and within Deas Island Regional Park.

3 PROJECT SCOPE

In developing the Project scope, the Ministry reviewed the Highway 99 corridor between the Oak Street Bridge and the Canada-U.S. border, considering current and forecast traffic volumes, existing roadway and structural conditions, and potential improvements by others over the next 30 years. This included technical requirements and input from municipalities, First Nations, TransLink, Metro Vancouver, marine users, the farming community, cycling groups, adjacent resident and business groups and the public. The analysis confirmed the need for a new bridge and related Highway 99 improvements from Bridgeport Road in Richmond to Highway 91 in Delta.



1. Construct dedicated transit/HOV lanes between Bridgeport Road in Richmond and Highway 91 in Delta.
2. Construct a transit-only ramp at Bridgeport Road.
3. Replace the Westminster Highway interchange to efficiently accommodate all connections.



4. Replace the Steveston Highway interchange to improve traffic flow into and out of Richmond, as well as along Steveston Highway. New, integrated transit stops will be constructed within the interchange, with safe and convenient walkways to access them.

5 Build a new bridge that will have four lanes in each direction, plus a dedicated transit/HOV lane in each direction. The new bridge will be built to accommodate potential future rapid transit and will provide navigational clearances similar to those at the Alex Fraser Bridge.

6 Construct a multi-use pathway for cyclists and pedestrians on the west side of the bridge, connecting to Steveston Highway and River Road South.

7 Decommission the Tunnel.

8 Replace the Deas Slough Bridge with the Delta approach to the new bridge. The Delta approach will be significantly higher than the Deas Slough Bridge, allowing a wider range of boats to pass underneath.

9 The new bridge will include a southbound ramp exit connecting to River Road South. This will allow the Corporation of Delta to extend River Road South eastward under the Delta approach ramp, improving connectivity between Ladner and North Delta.

10 Replace the Highway 17A interchange to efficiently accommodate all connections. New, integrated transit stops will be constructed within the interchange, with safe and convenient walkways to access them.

11 Construct dedicated transit/HOV lanes between Bridgeport Road in Richmond and Highway 91 in Delta.

Options Analysis

The Province held two rounds of public consultation in November 2012 and April 2013, with more than 2,000 participants to gather input and explore options for Tunnel replacement.

Phase 1 consultation sought feedback to gain a better understanding of current travel needs and community considerations for developing replacement options. Phase 1 consultation centred on community and provincial interests; crossing design elements; benefits and opportunities of a new crossing; and the connection to local, regional, provincial and national growth and transportation plans.

Phase 2 consultation sought feedback on five potential replacement scenarios that were developed in consideration of Phase 1 feedback. Results clearly indicated public preference for a new bridge to replace the Tunnel within the existing corridor.

The four-lane Tunnel serves an average of 80,000 vehicles each day.[1] During rush hour, the counterflow system provides three lanes of travel in the peak direction and one lane in the non-peak direction. Traffic demand in both directions during rush hour greatly exceeds the capacity of the available lanes, resulting in long queues on Highway 99, major delays at the Steveston Highway and Highway 17A interchanges, and congestion on municipal roads in Richmond and Delta.

Given the congestion and safety issues today and the outlook for future population and employment growth, two short-listed options were considered for the new bridge:

- A 10-lane bridge, with one transit/HOV lane and four lanes for general traffic in each direction.
- An eight-lane bridge, with one transit/HOV lane and three lanes for general traffic in each direction.

Option 1: A 10-lane bridge with one dedicated transit/HOV lane in each direction and four lanes for trucks and cars in each direction (a total of five lanes in each direction) would:

- Significantly reduce traffic collisions due to improvements in merging and reduced weaving.
- Eliminate congestion from opening day and accommodate future traffic growth, with no significant congestion to at least 2045.
- Eliminate the need for a counterflow operation.
- Provide a separate lane for trucks and other slower-moving traffic as they navigate the grade of the new bridge (similar to the Alex Fraser Bridge), without compromising travel times for faster-moving traffic.
- Potential to convert the transit/HOV lanes to rail rapid transit at some future point while retaining four lanes of capacity in each direction.
- Have a more favourable benefit-cost ratio, despite having a higher cost than an eight-lane crossing.

Option 2: An eight-lane bridge with one dedicated transit/HOV lane and three lanes for trucks and cars in each direction (a total of four lanes in each direction) would:

- Reduce collisions, due to improvements in merging.
- Result in congestion on opening day and constrain future economic growth.
- Not provide a separate lane for trucks and other slower-moving traffic as they navigate the grade of the new bridge.

Comparing Lane Configurations

The benefits and costs of the two options were compared by considering their ability to achieve the Project goals *(see Table 3)*. Congestion relief and safety were considered quantitatively, and other key criteria were considered qualitatively.

Considering the substantial benefits of a 10-lane bridge relative to those of an eight-lane bridge, a 10-lane bridge provides better overall value for British Columbians.

	10 Lanes	8 Lanes
Relieve congestion	✓✓✓	✓
Improve safety	✓✓✓	✓✓
Support trade and commerce	✓✓✓	✓
Support increased transit	✓✓✓	✓✓✓
Support pedestrians and cyclists	✓✓✓	✓✓✓
Enhance the environment	✓✓	✓✓

Table 3: Ten vs. Eight Lanes

4 BUSINESS CASE

The business case for the Project has been developed based on the Province's Capital Asset Management Framework (CAMF) guidelines. The following pages summarize the key benefits – specifically, the quantitative congestion-reduction and safety benefits – and the additional qualitative user, economic and community benefits.[6]

User Benefits

Quantified user benefits include:

- Congestion-reduction benefits for traffic on Highway 99, specifically:
  - Travel time savings – the average commuter will save about 25 to 35 minutes per day when the bridge is complete in 2022.
  - Improved reliability of travel times.
  - Safe and efficient merging for the large volume of vehicles entering and exiting at the Steveston Highway and Highway 17A interchanges at either end of the new bridge.
  - Reduced vehicle operating costs.
  - Travel time and reliability benefits are forecast to be more than $70 million in the first full year of operation, increasing over time.
- Traffic safety benefits, with a forecast decrease in the frequency of crashes of more than 35 per cent.
- Seismic safety improvements to meet present-day seismic standards.

Non-quantified user benefits include:

- Dedicated transit/HOV lanes in both directions, supporting provincial and regional strategies to encourage transit and carpooling to help manage traffic growth.
- Improved transit scheduling because of increased travel time reliability.
- Increased capacity for additional bus service and potential future rapid transit.
- New pedestrian and cycling opportunities in and between Richmond and Delta.
- Accommodation of slower-moving traffic, such as trucks, climbing the new bridge's grade (similar to the grade of the Alex Fraser Bridge).
- Commercial vehicle operators able to schedule their operations more efficiently, without needing to avoid congested times of the day.
- Improved air quality relative to the Tunnel.

Economic Development, Social and Community Benefits

Emergency Response: The Project will improve emergency response times and capabilities, particularly during congested times, and especially for across-the-river responses.

Project-Related Employment: The planning and construction program is forecast to generate more than 9,000 direct jobs, plus more than 8,000 indirect jobs for businesses that support and supply construction activities.

Long-Term Economic Growth: The Project will also provide a stimulus to long-term economic growth, in terms of annual GDP and permanent jobs created. By 2045, the incremental effects of the Project – including direct, indirect and induced effects – are projected to increase GDP by about $325 million annually.

Recreational: The Project will result in enhancements to Deas Island Regional Park by allowing people to use the land that is currently occupied by Highway 99 and the Tunnel portal.

Agriculture: The Project will improve reliability for the agricultural community in getting goods to market, and will improve local community connectivity on both sides of the crossing.

Environmental: The Project will provide environmental restoration opportunities, especially along river shorelines and at Deas Slough within the current right-of-way.

Project Costs

The Project cost is estimated at approximately $3.5 billion.

Benefit-Cost Analysis

The benefit-cost analysis compares quantified congestion-relief, safety and long-term economic benefits with Project costs, using the standard annual discount rate of 6 per cent. Considering quantified user and economic benefits, the Project has a positive benefit-cost ratio of 2.1 to 1.

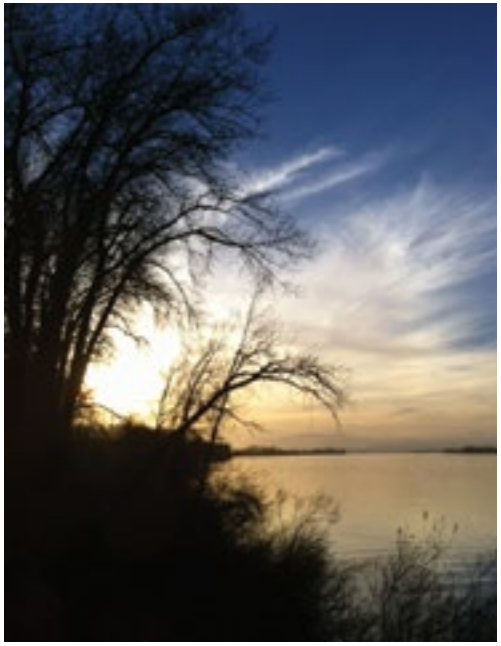
Sensitivity analysis was also undertaken to consider the effects of alternate discount rates and traffic growth, as discussed below.

Alternate Discount Rates: The benefit-cost ratio is positive for a range of alternate discount rates. Considering user and economic benefits, an annual discount rate of 7.5 per cent decreases the benefit-cost ratio to 1.5 to 1, while a 4.5 per cent discount rate increases the ratio to 2.8 to 1.

Alternate Traffic Growth Assumptions: Benefit-cost results are also positive for a range of alternate assumptions regarding future traffic levels. For example, if these growth rates are reduced or increased by 20 per cent, the ratio of user and economic benefits ranges from 1.7 to 1 up to 2.5 to 1, respectively.

Project Funding

The Province intends to fund the Project through user tolls, and is working with the federal government to determine potential funding partnerships.



5 ENVIRONMENT

As required by the *Environmental Assessment Act*, the Project will undergo a provincial environmental assessment coordinated by the B.C. Environmental Assessment Office (EAO). This will include assessment of potential environmental, economic, heritage, health and social effects that may occur during construction and operations, with opportunities for comments from the public, permitting agencies, other levels of government and other interested stakeholders.

The Highway 99 corridor includes areas of agricultural land and the foreshore of the Fraser River, which provides habitat for fish, wildlife and migratory birds. The corridor is also an important link between the communities of White Rock, Delta, Surrey, Richmond, Vancouver and Tsawwassen First Nation. As such, it supports recreation and conservation activities and influences socio-economic conditions such as air quality, noise, visual impact and community connectivity.

The Ministry is committed to environmental best practices, and work is ongoing to collect baseline data for the environmental assessment. Studies informing the Project include First Nations' interests, as well as studies on vegetation, birds and other wildlife, river hydraulics, hydrogeology, fish and fish habitat, marine mammals, water quality and sedimentation, atmospheric and underwater noise, air quality, agriculture, contaminated sites, social and economic considerations, archaeology, and visual effects.

Opportunities to Enhance the Environment

The project provides an opportunity to address past development effects and to avoid new effects by considering the environment as part of project planning. Key features that have been incorporated into the project design include:

- Transit enhancements to increase ridership
- Multi-use pathway to encourage cycling/walking
- Less idling; reduced greenhouse gas emissions
- Restoring Green Slough to historic alignment
- Bio-filtration marshes for stormwater management
- Environmental enhancements in Deas Slough
- Improvements to Millennium Trail

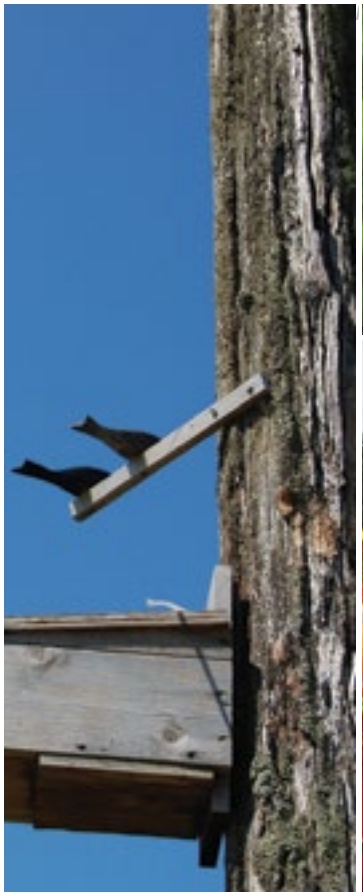
Additionally, noise walls will be installed at key locations along the highway. Some surplus land that is created by developing more efficient interchanges can be returned to agricultural use.

6 MEASURING SUCCESS

Baselines and performance measures are fundamental to the accountability and monitoring of the Project, and in assessing whether goals are being achieved. The Ministry has developed a framework for evaluation that includes specific performance measures for each Project goal (*see Table 4*). This will guide decision-making and ensure that reporting is done in a measurable and understandable way.

Goals	Objectives/Targets	Performance Measures
Reduce congestion. Improve travel times and reliability for all users.	• Eliminate queues at the crossing on opening day and achieve reduced travel times, compared with today, for 20 years after opening.	• Analysis of travel times and variances by time of day, week and season.
Improve safety. This includes improving traffic and seismic safety, as well as emergency response capabilities.	• Reduce crashes by more than 35 per cent over current levels.	• Analysis of ICBC incident records.
	• Build infrastructure to current seismic standards.	• Post-construction verification.
Support trade and commerce. Improve access to local businesses and gateway facilities, and improve travel time reliability for goods movers and service providers.	• Increase efficiency of goods movement.	• Travel time studies. • Survey of local and regional businesses.
Support increased transit on the Highway 99 corridor. Provide dedicated transit/HOV lanes on the new bridge to improve travel time reliability and add capacity for long-term transit improvements.	• Provide dedicated transit/HOV lanes.	• Post-construction verification.
	• Allow for potential future rapid transit on the new bridge.	• Post-construction verification.
	• Improve transit travel times and reliability.	• Travel time studies.
Provide options for pedestrians and cyclists. Provide a multi-use pathway on the new bridge to connect cycling and pedestrian corridors in Richmond and Delta.	• Increase cyclist and pedestrian traffic on the crossing.	• Traffic counts.
	• Improve Millennium Trail underneath the new bridge.	• User surveys.
Enhance the environment. Enhance the environment under the new bridge and in the Project right-of-way on Deas Island.	• Restore the area under the new bridge on Deas Island that is bisected by Highway 99.	• Post-construction verification.
	• Reconstruct marsh habitat in the area occupied by the abutments of the Deas Slough Bridge.	• Post-construction verification.
	• Meet commitments and obligations prescribed in the environmental assessment approvals.	• Inspection and reporting during construction. • Post-construction verification.

Table 4: Performance Targets and Measures



7 NEXT STEPS

Technical Work

Technical studies continue, including updating traffic modelling and forecasting on a regular basis as new regional and municipal development information becomes available. Results will be used to support the environmental assessment and Project construction.

Environmental Review

The Ministry is preparing its submission to the B.C. Environmental Assessment Office for an environmental review. There will be opportunities for public comment in early 2016.

Procurement

Following completion of Phase 3 consultation, the Ministry will finalize the Project scope and cost estimate, and develop the contract requirements for construction and ongoing operations in accordance with the performance measurement framework as described in Section 6. A competitive procurement process will commence in 2016.

Construction and Tunnel Decommissioning

The Ministry is doing technical work to prepare for construction, which will begin in 2017. Traffic through the Tunnel will be maintained during bridge construction. The Tunnel will be decommissioned after the bridge is complete in 2022.

Ongoing Dialogue and Consultation

Consultation and engagement with local government, TransLink, Metro Vancouver, Port Metro Vancouver, First Nations and others has been underway since fall 2012 and will continue throughout the Project's development and implementation.

8 FREQUENTLY ASKED QUESTIONS

Why not restrict truck traffic in the Tunnel?

Commercial traffic is important to the economic health of the region and local businesses. It has been suggested that banning trucks from entering the Tunnel during rush hour would relieve traffic congestion. However, since trucks represent less than 5 per cent of rush-hour traffic, congestion-reduction benefits would be limited. It would also shift truck traffic to the Alex Fraser Bridge, which is also congested during rush hour, resulting in longer travel distances for trucks and additional delays for Alex Fraser Bridge traffic.

Another suggestion is to restrict truck traffic through the Tunnel to nighttime only. Deltaport has recently extended its hours of operation to allow night access to better manage the flow of traffic at the terminal. Restricting non-port truck traffic through the Tunnel to nighttime only would require current daytime commercial vehicle traffic to use other river crossings during the day, or to work only at night. This would affect local municipalities, including creating nighttime noise on local streets and affecting employee hours of work to accommodate nighttime truck deliveries.

How will the new bridge affect the Oak Street Bridge?

It's important to note that 60 per cent of vehicles using the Tunnel are travelling to or from Richmond. We expect this pattern to continue in the future, and our traffic forecasts indicate that there won't be additional cars crossing the Oak Street Bridge because of the new bridge.

While Oak Street is likely to remain congested due to signal lights at Oak and 70th Street in Vancouver we're not expecting any more traffic to drive over the Oak Street Bridge each day.

In fact, since the Canada Line was built, we're seeing no traffic growth on the Oak Street Bridge.

What we may see, and what we saw on the Port Mann Bridge, is that because people know that they're no longer going to be stuck in traffic at the George Massey crossing – saving up to 30 minutes a day – they may change their preferred travel time. This could make queue lengths at Oak Street a little longer during the busiest part of rush hours.

Are you building a new bridge so bigger ships can navigate the Fraser River?

The project is intended to improve safety and congestion on Highway 99 – congestion that affects people who commute every day, as well as local businesses, tourists and goods movers.

The new bridge will be the same height above the water as the Alex Fraser Bridge.

Removing the Tunnel would increase the water draft by less than two metres. This would assist marine traffic in dealing with tide-related loading/schedule restrictions, but will not significantly change the size of vessels using the Fraser River because of other navigational constraints.

It is worth noting that the tunnel is not the shallowest point within the main shipping channel; the Steveston Cut at the mouth of the river is shallower. In addition, Metro Vancouver has a large water pipeline across the river just downstream of the tunnel.

Why not just add more buses?

Adding more buses would not result in better reliability or travel time; only improving the capacity of the crossing can do this. During the morning rush, transit use is already high at this crossing, with a bus travelling through the Tunnel every three to four minutes. Although they benefit from a queue-jumper lane, buses must still merge with the general traffic through the Tunnel since there is not enough space in the Tunnel to support dedicated transit/HOV lanes. When there is a traffic incident that causes congestion and delays for travellers, it also affects the reliability of transit schedules.

The Project includes a dedicated transit/HOV lane in each direction between Bridgeport Road in Richmond and Highway 91 in Delta, which will reduce travel times for buses and provide the capacity needed to add buses.

Will a tolled new bridge divert traffic to other routes?

The new bridge is expected to provide an attractive alternative to the congested Alex Fraser Bridge, particularly during peak periods. Outside of peak periods, some people may divert to the Alex Fraser Bridge to avoid paying the toll. This could result in a reduction in total volumes on the new bridge on evenings and weekends. That's the experience from other tolled crossings, and it's what happened on the Port Mann Bridge as well.

On the new Port Mann crossing overall traffic volumes initially dropped with the introduction of tolls, but rush-hour traffic volumes increased by more than 15 per cent.

It took two years for traffic to stabilize and for drivers to return to Port Mann, and now traffic volumes are growing steadily.

Why not keep the Tunnel for transit or local traffic use?

Keeping the Tunnel would require significant rehabilitation and ongoing operating costs, and the Tunnel would still not meet current seismic standards. Neither the existing Steveston Highway and Highway 17A interchanges nor the local road networks in Richmond and Delta have room to accommodate the local traffic lanes and the additional entry and exit points that would be required.

The new bridge will accommodate all forecast traffic, with no significant congestion to at least 2045, and will provide new opportunities for cyclists and pedestrians. The new bridge will also improve travel times and schedule reliability for transit users and will be constructed to accommodate potential future rapid transit.

Why not build a new tunnel?

During consultation in 2013, many people expressed concerns about the safety of tunnels for all users, but specifically for pedestrians and cyclists. More than half of consultation respondents disagreed with a tunnel option.

Additionally, technical analysis confirmed that a new bridge will improve safety and security for traffic, pedestrians and cyclists; fewer effects on agricultural land; and fewer disturbances on the Fraser River.

Building a new bridge creates opportunities for environmental and community improvements to the Fraser River, and at Deas Island Regional Park and Deas Slough.

APPENDIX A: SUPPORTING PLANS, CONSULTATION AND ANALYSES

For decades, the need for added capacity at the Tunnel crossing has been clear. As early as 1989, the *Freedom to Move* plan developed by the Greater Vancouver Transportation Task Force recommended that the Tunnel be expanded by 2001. This was reinforced in *Transport 2021* (1993), the long-range transportation plan in support of developing the *Livable Region Strategic Plan* (1999). In 2006, the Gateway Program Definition Report identified additional capacity at the Tunnel as a potential longer-term priority to meet transportation goals, while identifying potential concerns regarding increased traffic on the Oak Street Bridge. Since then, the Canada Line has been implemented and Richmond has become a major population and employment centre, which has changed traffic patterns significantly. Today, approximately 60 per cent of the daily traffic through the Tunnel is headed to or from Richmond.

Supporting Plans

The Ministry has considered national, provincial and regional plans and legislation that influence the Project, as shown in Tables A1 and A2.

National Plans	Provincial Plans	Regional Plans
Asia-Pacific Gateway and Corridor Initiative[24] (2006)	*Pacific Gateway Transportation Strategy*[25] (2012–2020)	Metro Vancouver's *Regional Growth Strategy* (2011)
Building Canada plan[26] (2007)	*BC Jobs Plan*[27] (2011)	TransLink's *Regional Transportation Strategy* (2013)
Economic Action Plan[28] (2014)	*B.C. on the Move: A 10-Year Transportation Plan, Government of British Columbia* [29], 2015	Corporation of Delta's Official Community Plan (2012)
Port 2050[30] (2010)	Port Metro Vancouver's *Land Use Plan Update* [19] (2014)	City of Richmond's Official Community Plan (2012)
	B.C. on the Move: A 10-Year Transportation Plan (2015)	
		City of Surrey's Official Community Plan (2013)
		City of White Rock's Official Community Plan (2008)
		Tsawwassen First Nation's Land Use Plan (2009)

The Project has been developed in consideration of national, provincial, regional and local economic, transportation and land use plans. Specific studies to expand or replace the Tunnel date back to 1989.

Table A1: Plans that Influence the Project

National Legislation	Provincial Legislation
Canada Marine Act (S.C. 1998, c. 10)	*Agricultural Land Commission* Act, S.B.C. 2002, C. 36
Navigation Protection Act (R.S.C., 1985, c. N-22)	British Columbia *Environmental Assessment Act* (2002)
Canadian Environmental Assessment Act, 2012 (S.C. 2012, c. 19, s. 52)	

Table A2: Legislation that Influences the Project

Consultation

Also informing Project development is consultation with First Nations, municipalities, stakeholders and the public. Results of consultation and engagement to date are summarized below.

Public Consultation (2012–2013)

Initial consultation for the Project was held in two phases between November 2012 and April 2013. There were more than 2,000 participants in the online engagement and at open houses in Delta, Richmond and Surrey. The Consultation Summary Reports for both phases are available at masseytunnel.ca. Key findings from these consultations are:

- Strong support for additional capacity.
- Clear preference for a new bridge to replace the Tunnel and to construct the improvements along the existing Highway 99 corridor, citing various reasons including safety and attractiveness for pedestrians and cyclists, and environmental effects.
- Desire for transit, cycling and pedestrian improvements, including protecting the Highway 99 corridor for future rapid transit.
- Questions about potential changes in the locations of population and employment growth.
- Questions about potential view and noise effects.
- Questions about Project cost and funding, with some preferring a tolled bridge and others preferring no tolls.

Ongoing Consultation (2014/2015)

- Adjacent property owners
- BC Hydro
- City of Richmond
- City of Surrey
- City of Vancouver
- City of White Rock
- Corporation of Delta
- First Nations
- Cycling groups
- Delta Farmers' Institute
- Marine users
- Metro Vancouver
- First Nations
- Port Metro Vancouver
- Richmond Farmers' Institute
- TransLink
- Vancouver International Airport (YVR)
- More than 3,000 individuals who visited the Project Office

Key Findings (2014/2015)

- Continued support for Project development and for short-term improvements while Project development continues.
- Desire for additional infrastructure improvements along the Highway 99 corridor.
- Requests for River Road to be connected under the new bridge.
- Questions about potential changes in river hydrology and implications for the river salinity and related effects on irrigation once the Tunnel is decommissioned.
- Requests that cycling infrastructure be built to accommodate all ages and abilities.
- Questions about potential noise and visual effects for residential areas near the new bridge.
- Desire for increased transit service on the Highway 99 corridor.
- Questions about cost and financing, including tolling.
- Questions about the design and aesthetic features of the new bridge.
- Questions about potential property acquisition.

Technical Analyses

To understand the effects of the Project on the provincial and regional transportation network, surrounding environment and local communities, the Ministry is conducting related studies and collecting extensive traffic-related data. The Ministry is also undertaking studies and consulting experts to determine the most appropriate specifications for bridge design and highway upgrades. A summary of work underway is included in Table A3 below.

Environment	Community	Engineering	Transportation
Air quality	Agriculture	Geotechnical analysis	Traffic management
Water quality	Heritage sites	Navigational clearance	Gateway Program Sub-Area Traffic Model (GSAM)[31]
Aquatic species and habitat	Human health	Bridge deck design	TransLink's *Regional Transportation Model* (RTM)[31]
Terrestrial wildlife and vegetation	Noise effects	Bridge foundation design	Traffic count programs
Hydrology	Land use	Lighting	ICBC data analysis
Hydrogeology	Land ownership	Highway lane design	Transit access
Contaminated sites	Community considerations and benefits	Highway structures design	Cyclist/pedestrian access
Archaeological	Economic considerations and benefits	Seismic studies	
Aboriginal traditional and current use (by First Nations)	Visual aspects	Utility relocation	
		Drainage	

Table A3: Project Work Underway

Corridor-wide analysis of current and future conditions has been underway since 2012 to support Project development.

APPENDIX B: TUNNEL TRIP ORIGINS AND DESTINATIONS

There are notable differences in origin and destination patterns by time of day and day of week. Tables B1 and B2[32] provide insight. Notable differences are indicated in a bold, underlined font.

Sub-Area	Weekday NORTHBOUND Trips (%)					Weekends (%)
	Morning	Midday	Afternoon	Evening	Total	
Origins						
Ladner	16	17	17	17	17	18
Tilbury	5	**11**	**15**	5	8	4
Nordel	11	9	6	7	9	6
Deltaport	1	3	3	2	2	1
Tsawwassen, including ferries	**15**	21	24	20	19	23
Rural Delta	2	3	4	4	3	2
North Delta	**15**	9	7	12	10	11
South Surrey	**27**	19	**14**	19	23	22
White Rock	8	8	10	**14**	9	13
Destinations						
Vancouver	43	38	41	35	40	43
YVR	6	5	4	10	6	5
Richmond, West of Highway 99	19	17	15	17	18	17
Richmond, East of Highway 99	14	11	7	6	11	7
Richmond Fraser	2	3	2	3	2	2
Steveston	**15**	25	30	28	22	25
Burnaby/New Westminster	1	1	1	1	1	1

Note: Differences between this table and Figure 5 on page 12 are due to rounding.

Table B1: Origins and Destinations of Northbound Trips Weekdays through the Tunnel

Sub-Area	Weekday SOUTHBOUND Trips (%)					Weekends (%)
	Morning	Midday	Afternoon	Evening	Total	
Origins						
Vancouver	35	33	35	35	34	36
YVR	4	6	7	**11**	7	6
Richmond, West of Highway 99	**10**	17	23	20	19	18
Richmond, East of Highway 99	9	12	12	6	11	9
Richmond Fraser	3	3	1	1	2	1
Steveston	**38**	28	21	26	26	28
Burnaby/New Westminster	1	1	1	1	1	2
Destinations						
Ladner	12	15	16	17	15	16
Tilbury	**17**	9	3	3	7	3
Nordel	7	10	8	6	8	5
Deltaport	**7**	3	1	1	2	2
Tsawwassen, including ferries	20	21	17	19	19	23
Rural Delta	5	4	2	4	3	3
North Delta	10	9	16	14	13	12
South Surrey	**10**	17	**27**	**26**	22	22
White Rock	12	12	10	10	11	14

Note: Differences between this table and Figure 6 on page 13 are due to rounding.

Table B2: Origins and Destinations of Southbound Trips Weekdays through the Tunnel

APPENDIX C: PLANNED ECONOMIC DEVELOPMENT SOUTH OF THE FRASER

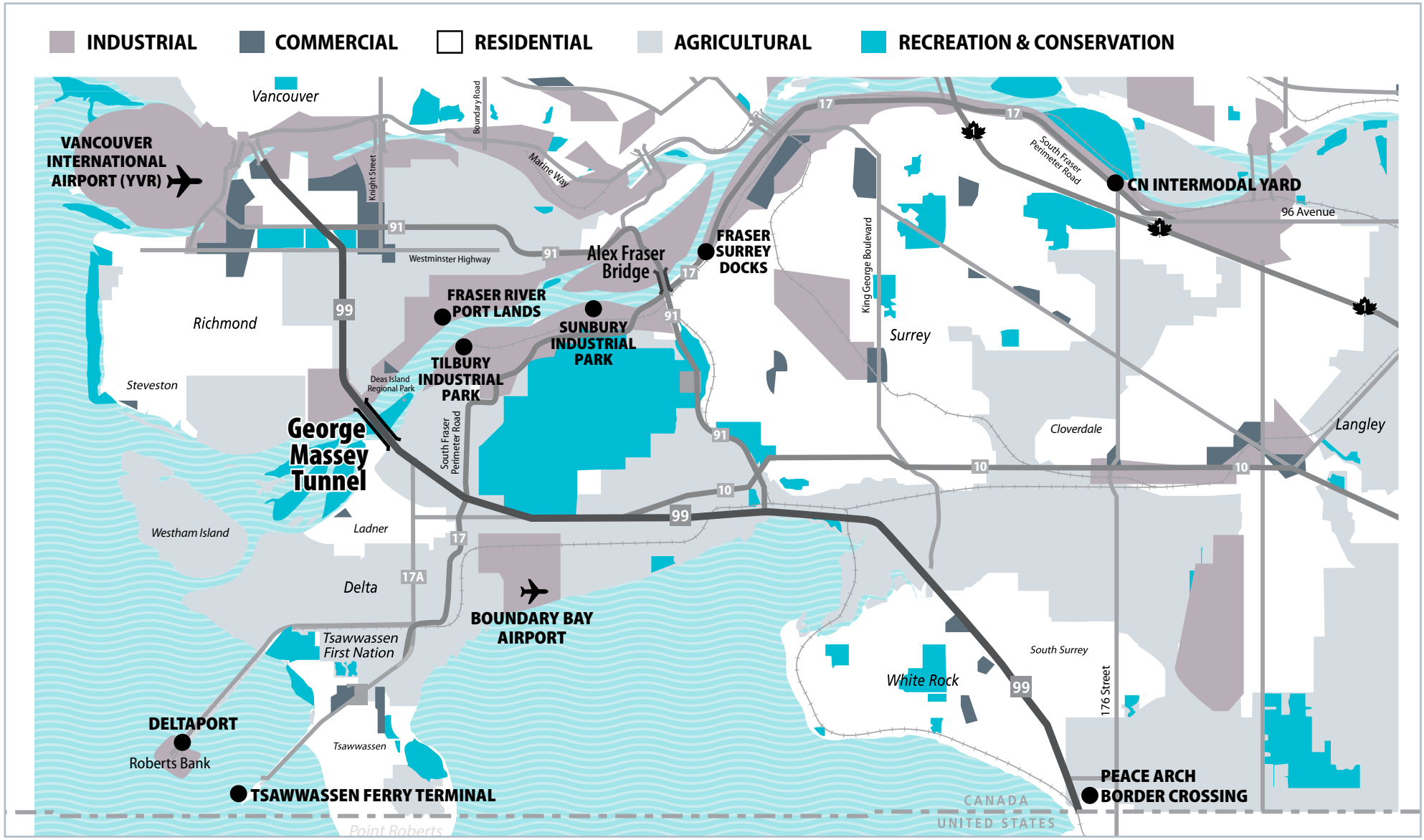


Figure C

Highway 99 connects areas of urban development that are separated by large tracts of farmland, much of which is in the Agricultural Land Reserve (*see Figure C*). Numerous existing and planned developments are expected to increase traffic volume on Highway 99 in the Project area:

- **Corporation of Delta** is home to two of the top four business parks in Greater Vancouver: Annacis Island Industrial Park and Tilbury Industrial Park. Over 10,000 people are employed on Annacis Island by more than 430 companies. Tilbury is a high-growth industrial park with more than 300 businesses employing 8,000 people. Deltaport, Roberts Bank and Boundary Bay Airport are also located in Delta.[33]

- **City of Richmond**'s economy supports more than 135,000 jobs in various sectors, including services, retail, tourism, technology industries, light manufacturing, airport services, aviation, agriculture, fishing and government. Richmond is emerging as a leading centre of high-tech industries.[34] It will continue to have one of the highest job/worker ratios in Metro Vancouver to 2041, with the commercial and industrial sectors continuing to be the dominant employers. The majority (80 per cent) of the employment growth (number of employees) between 2009 and 2041 will be in the city centre, Sea Island (Vancouver International Airport) and North Richmond.[35] Of note are the growing areas of economic development in business parks near Steveston and on the Fraser Richmond industrial lands.

- **City of Surrey** has eight business parks and approximately 46 per cent of Metro Vancouver's total vacant industrial land.[36] South Surrey, with a mix of industrial and commercial uses, is expected to generate $300 to $350 million in new business property assessments and 6,000 jobs along the east side of Highway 99 corridor between 32nd Avenue and 8th Avenue.[37]

- **City of White Rock** is expected to grow because of its proximity to the Canada-U.S. border and neighbouring residential markets. It has a well-known waterfront area and a recently updated tourism strategy.[38]

- **Tsawwassen First Nation** approved a lease for the development of Tsawwassen Mills, a 1.2-million-square-foot commercial and retail facility, which is now under construction. A further 600,000 square feet will be developed as outdoor retail space and mixed use.[39] Tsawwassen Mills is expected to generate 3,000 full- and part-time retail jobs. Tsawwassen First Nation's development plans include a target residential base of more than 4,000 people.[40]

- **Port Metro Vancouver** enables close to 20 per cent of Canada's trade and adds $9.7 billion to the nation's GDP. It generates 57,000 jobs in Metro Vancouver and 38,000 jobs in the rest of B.C.,[41] creating 3,300 jobs and $180 million in wages per year in Delta alone.[42] Container traffic through Canada's Pacific Gateway is expected to more than double over the next 10 to 15 years,[43] leading to an increase in goods movement along the Highway 99 corridor, the Tunnel, Highway 17 and the Alex Fraser Bridge.

- **Boundary Bay Airport** is home to more than 400 airplanes and five flight training schools. It is one of the top 10 busiest airports in Canada, with close to 200,000 takeoffs and landings annually. The Airport plans to become a bigger economic driver for Delta by attracting more commercial tenants, expanding its runway and attracting commercial flights.[44] The Boundary Bay Industrial Park, adjacent to Boundary Bay Airport, is being billed as Metro Vancouver's largest industrial development.[45]

- **Vancouver International Airport** (YVR) has 23,600 employees[46] and creates 2.3 per cent of total employment in Greater Vancouver. It contributes $6.8 billion to B.C.'s economy. YVR is expanding to meet forecasts for a doubling of passenger, aircraft and cargo demands between 2007 and 2027, increasing to an estimated 33.4 million passengers, 484,000 aircraft arrivals and 500,000 tonnes of cargo annually.[47]

- **Goods Movement** Highway 99 is part of a transportation network that supports trade and commerce in Metro Vancouver and throughout B.C., Canada and North America. As a result of population and employment growth and increasing economic development south and north of the Fraser, goods movement along this corridor is expected to increase as goods are moved between local businesses and Pacific Gateway access points.

ENDNOTES

1 Ministry of Transportation and Infrastructure Traffic Data Program.

2 *Regional Growth Strategy*, Metro Vancouver, 2011.

3 Forecast by TransLink's *Regional Transportation Model* and based in part on changes in land use, per Metro Vancouver's *Regional Growth Strategy,* and on projected growth in truck volume at special generators.

4 Analysis of ICBC and Ministry of Transportation and Infrastructure records of collision frequencies by type of collision and by severity, 2014.

5 *George Massey Tunnel Replacement Project Phase 2 – Exploring the Options – Consultation Summary Report*, Ministry of Transportation and Infrastructure, 2013.

6 *George Massey Tunnel Replacement Project Business Case,* October 2015.

7 Based on vehicle demand growth forecasts derived from TransLink's *Regional Transportation Model*, and applying the Ministry of Transportation and Infrastructure's standard values of travel time, plus an allowance for the value of travel time reliability.

8 Forecast crash reduction, based on analysis of ICBC and Ministry of Transportation and Infrastructure records of collision frequencies by type of collision and by severity, 2014.

9 *BCAA unveils 2014 Top 10 "Worst Roads" list*, British Columbia Automobile Association news release dated June 12, 2014, http://www.bcaa.com/learning-centre/bcaa-newsroom/news-releases/06-12-2014-bcaa-2014-worst-roads.

10 *Lower Mainland – Crashes at Intersections 2009 to 2013*, Insurance Corporation of British Columbia. Retrieved May 15, 2014 from ICBC website: http://www.icbc.com/about-icbc/newsroom/Pages/Lower-Mainland-Crash-Map.aspx.

11 TransLink 2011 *Regional Screenline Survey*, TransLink, 1999 and 2011. Vehicle volumes are expressed as passenger car units, which better reflects the volume of transit buses and trucks on this corridor.

12 *Origin-Destination Survey*, B.C. Ministry of Transportation and Infrastructure, fall 2013 and 2014; *Regional Screenline Survey*, TransLink, 2011.

13 Advanced Traveller Information System data, used to estimate travel time and speed over an extended period of time throughout the corridor.

14 Traffic modelling based on population and employment forecasts from Metro Vancouver's *Regional Growth Strategy*, 2011. Note: Population and employment forecasts in this strategy document are for the year 2041.

[15] *Origin-Destination Survey Report*, B.C. Ministry of Transportation and Infrastructure, fall 2013; field observations, fall 2013.

[16] ICBC data, July 2014.

[17] *2013 Sustainability Report*, (page 33), Port Metro Vancouver, 2014.

[18] *The Economic Importance of the Lower Fraser River*, prepared by the Richmond Chamber of Commerce with the assistance of D.E. Park & Associates Ltd., July 2014.

[19] Port Metro Vancouver's *Land Use Plan Update*, Port Metro Vancouver, 2014.

[20] 2011 Metro Vancouver *Regional Trip Diary Survey*, TransLink, 2011.

[21] Estimate based on 2011 Metro Vancouver *Regional Trip Diary Survey* data, looking at what proportion of northbound weekday trips have destinations that are within 1 kilometre of Canada Line stations, and assuming various levels of potential transit use.

[22] 2011 Metro Vancouver *Regional Trip Diary Survey*, *Briefing Paper #2: An Overview of Cycling in Metro Vancouver*, TransLink, 2012.

[23] Highway operations records, 2014.

[24] *Canada's Asia-Pacific Gateway and Corridor Initiative,* Transport Canada, 2006. Retrieved June 17, 2014 from the Asia-Pacific Gateway and Corridor Initiative website: http://www.asiapacificgateway.gc.ca/media/documents/en/APGCI_Launch_Booklet.pdf

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[26] *Building Canada* plan, Infrastructure Canada, October 26, 2011. Retrieved June 17, 2014 from Infrastructure Canada's website: http://www.infrastructure.gc.ca/prog/bcp-pcc-eng.html.

[27] *BC Jobs Plan*, Province of British Columbia, 2011. Retrieved June 6, 2014 from the B.C. provincial government website: http://www.bcjobsplan.ca.

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[31] Note: GSAM and TransLink's RTM are regional transportation demand models. Vehicle and transit trip patterns estimated by these models are a function of forecast land use and reflect the current understanding of how demographic, economic, and development trends and plans will affect the distribution of people and jobs in the future. RTM uses the latest land use forecasts developed by Metro Vancouver, (based on 2011 Census data and the *Regional Growth Strategy*), and GSAM uses earlier draft forecasts.

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[33] *About: Our Communities, Business and Infrastructure,* Delta Chamber of Commerce, 2015. Retrieved December 1, 2015 from Delta Chamber of Commerce's website: http://www.deltachamber.ca/our-communities1.html

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[36] *Industrial Lands & Business Parks*, City of Surrey. Retrieved June 5, 2014, from the City of Surrey's website: http://www.surrey.ca/business-economic-development/3509.aspx.

[37] *2011 Highway 99 Corridor*, City of Surrey's Business and Economic Development Department, 2011.

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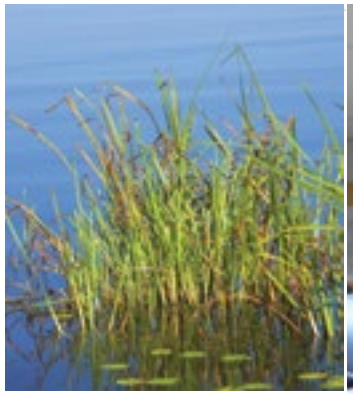
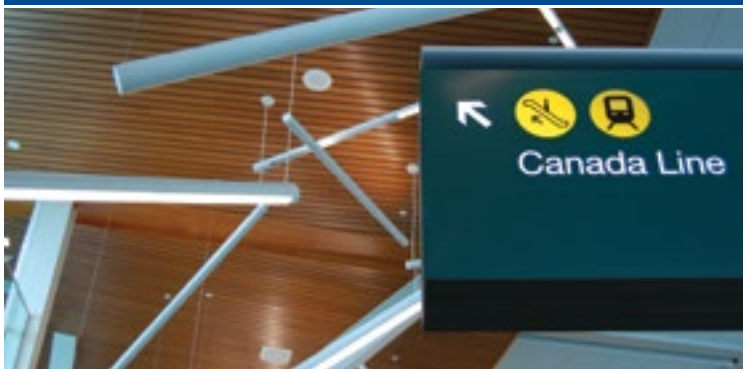
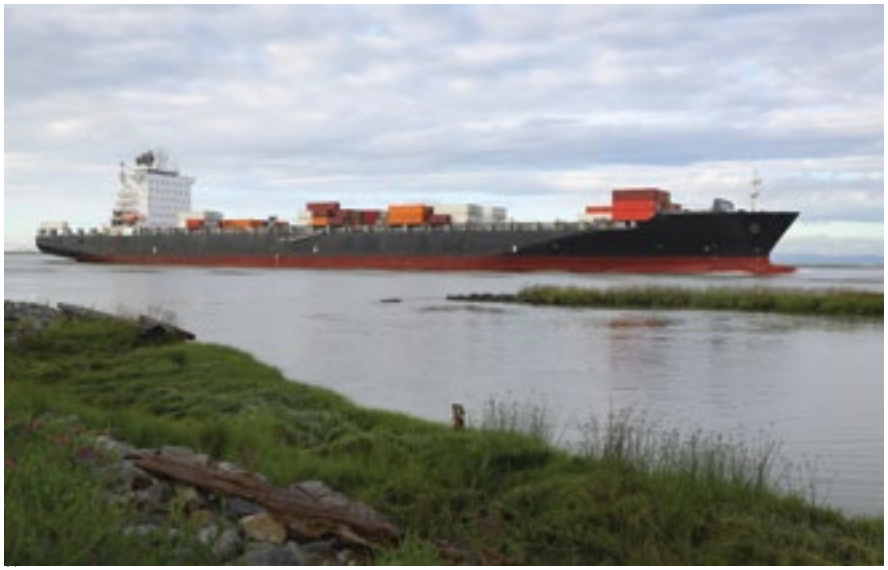
[47] *YVR: Your Airport 2027 – 20-Year Master Plan* (page 4), Vancouver Airport Authority, 2007.







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