




To: General Purposes Committee **Date:** September 28, 2016
From: Victor Wei, P. Eng.
Director, Transportation **File:** 01-0150-20-
THIG1/2016-Vol 01
Re: **George Massey Tunnel Replacement Project – Key Highway Infrastructure Features**

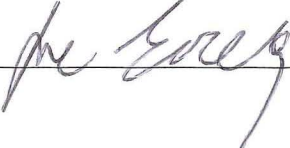
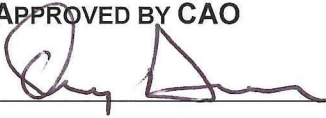
Staff Recommendation

1. That a letter be sent to the Ministry of Transportation and Infrastructure requesting that:
 - (a) measures be incorporated into the design of the Steveston Highway Interchange ramps to mitigate the noise, lighting and visual impacts of the ramps such as the installation of a green wall/vertical garden or other decorative concrete forms on the vertical walls;
 - (b) principles to ensure the security of transit passengers (i.e., Crime Prevention Through Environmental Design) and mitigation measures to address the noise, visual and air quality impacts be incorporated into the design of the transit exchange located within the Steveston Highway Interchange; and
 - (c) the design for the widening of Highway 99 near the Steveston Highway Interchange be re-examined with a view to minimizing the extent of widening while not comprising safety and its functions;
2. That a follow-up letter be sent to the Provincial Agricultural Land Commission reiterating the City's concerns regarding the Ministry's application for Transportation, Utility and Recreational Trail Use along the Highway 99 corridor to allow for the widening of Highway 99 as part of the Project; and
3. That the report titled "George Massey Tunnel Replacement Project – Highway Infrastructure Features" dated September 28, 2016 be forwarded to the British Columbia Environmental Assessment Office for consideration as part of the City's second round of comments further to the initial 30-day Working Group review period on the Provincial Environmental Assessment Application for the George Massey Tunnel Replacement Project.



Victor Wei, P. Eng.
Director, Transportation
(604-276-4131)

Att. 9

REPORT CONCURRENCE		
ROUTED TO:	CONCURRENCE	CONCURRENCE OF GENERAL MANAGER
Parks Services Engineering Sustainability Policy Planning Development Applications	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	
REVIEWED BY STAFF REPORT / AGENDA REVIEW SUBCOMMITTEE	INITIALS: DW	APPROVED BY CAO 

Staff Report

Origin

At the September 13, 2016 public open house in the City of Richmond as part of the 60-day public comment period (August 3 to October 3, 2016) for the Environmental Assessment Application for the George Massey Tunnel Replacement Project (the Project), new three-dimensional scaled models of elements of the Project between the Steveston Highway Interchange and Highway 17A Interchange were available for viewing. This report provides the key features with respect to the size and scope of the proposed new infrastructure (i.e., bridge, interchanges, overpasses, and BC Hydro transmission towers) in Richmond.

Analysis

Renderings and Three Dimensional Models of Infrastructure Elements

In September 2013, Premier Clark announced that the George Massey Tunnel would be replaced with a new bridge in the same corridor. As part of the announcement, a short video was released depicting what the Project could look like. The video is primarily from the perspective of a motorist and shows a 10-lane cable stay bridge but no details on the interchanges at either end of the bridge (i.e., Steveston Highway and Highway 17A) as this design work had likely not yet progressed.

In December 2015, the Project Definition Report was released that contained conceptual drawings of the Project, which included greater detail of the proposed interchanges (e.g., number of ramps) but in plan view only. Limited information was shown regarding vertical profiles.

Beginning in late June 2016, scaled model displays of the proposed new bridge and the two interchanges at Steveston Highway and Highway 17A have been available for public viewing at the Ministry of Transportation and Infrastructure's (the Ministry) Project office in Ironwood Plaza.¹ The models were also available for viewing at the public open houses held in Delta (August 17 and September 14, 2016) and Richmond (September 13, 2016) as part of the 60-day public comment period for the Environmental Assessment Application for the Project. The models reveal new information in terms of the vertical profiles of the structures and their relation to adjacent existing structures and buildings.

Proposed New Bridge

The key physical features of the proposed new bridge (Attachment 1) include:

- A length of three kilometres, which is 65 percent longer than the Port Mann Bridge and 32 percent longer than the Alex Fraser Bridge.
- 10 vehicle lanes (eight for general traffic plus two dedicated transit/high occupancy vehicle).
- Multi-use path for cyclists and pedestrians on each side of the bridge.

¹ The models were installed for viewing on June 28, 2016 (new bridge), July 15, 2016 (Steveston Highway Interchange) and August 5, 2016 (Highway 17A Interchange).

- Proposed height of the bridge deck is 57 m above the high water mark (similar to Alex Fraser Bridge) based on two ships passing together underneath the bridge (i.e., 200 m wide navigational envelope).
- The deck will be suspended from two towers – one on each side of the Fraser River – that will each be about 210 m high, which is equivalent to a 60-storey building.
- Maximum grade of five percent per national industry standards (confirmed verbally by Project team).

Steveston Highway Interchange

The proposed three-level configuration of the Steveston Highway Interchange was developed by the Project team to minimize its footprint and achieve no net loss of farmlands for the overall Project. Based on verbal communications from the Project team and the model, key features (Attachment 2) include:

- Free-flow ramps for all movements with each ramp being approximately 2.0 m in height and having a maximum grade of five percent (same as the new bridge).
- Minimum vertical clearance of 5.0 m between Highway 99 and the first level of ramp, and between each additional level of ramp.
- The minimum vertical clearance of 5.0 m is slightly higher than the current clearance of 4.5 m for the existing Steveston Highway overpass above Highway 99 in order to meet new national road design standards.
- The highest ramps are proposed for the eastbound-to-northbound and westbound-to-southbound movements.
- The elevation of the highest ramp is anticipated to be 14.0 m (Attachment 3, top photograph).
- The section of Steveston Highway just west of the proposed interchange is at different elevations between the two directions of traffic (eastbound and westbound) with the south portion for eastbound traffic lanes at a higher elevation (Attachment 3, bottom photograph).
- Connections to Rice Mill Road to and from the north.

Compared to a traditional cloverleaf interchange, this design reduces the footprint needed and thus reduces the impact on adjacent farmlands in the immediate vicinity of the interchange. Conversely, the design is likely to have potential noise and visual impacts on adjacent land use, including the Gardens site (comprised of residential and commercial uses as well as a daycare to be in operation in 2017) and the City's Gardens Agricultural Park.

The Gardens development is a three-phase project located at the northeast corner of Steveston Highway and No. 5 Road (see Attachment 4 for site plan) and comprised of:

- Phase 1: Approved in 2011 prior to announcement of the Project, two commercial and residential mixed use buildings facing Steveston Highway that have been constructed and became occupied in July 2014. The heights (as indicated in the Development Permit plans submitted to the City) are 19.0 m for one building and 19.5 m for the other; both buildings are four storeys high.
- Phase 2: Approved in 2013, one commercial and residential mixed use building facing No. 5 Road that is now constructed with occupancy pending. The heights are 17.31 m to the top storey and 18.69 m to the rooftop structures (elevator shaft and mechanical room).

- Phase 3: Approved on June 13, 2016, one apartment building facing Highway 99 and two apartment buildings internal to the site that face the Gardens Agricultural Park. The height of the building facing Highway 99 is 14.9 m (four storeys) while that of the other buildings is 25 m to the top storey (26.9 m to the top of the rooftop structures – mechanical/electrical units) or eight storeys. The approval pre-dates confirmation of the dimensions of the Ministry's property take along the eastern edge of the site for the widening of Highway 99, which did not become known until the Ministry submitted its application to the Provincial Agricultural Land Commission on June 23, 2016. The site design includes measures to address the anticipated widening of Highway 99 (e.g., the location of public open space amenities along the eastern edge of site next to Highway 99 rather than a residential building).

Subsequently, Townline Gardens Inc. submitted a new Development Permit application (DP 16-741981) for Phase 3 in August 2016. Key changes from the Development Permit Application (DP 15-708397) that was approved in June 2016 that would further mitigate impacts of the Project on the development include the reallocation of some of the available density farther away from Highway 99. Staff will continue to work with the applicant to minimize the impacts of the Project including any additional sound attenuation measures that may be appropriate.

Recommendation: Given that the height of the highest ramp of the new Steveston Highway Interchange (14.0 m) would be approximately the same height as the apartment building to be built in Phase 3 facing Highway 99 (14.9 m), staff recommend that the Ministry be requested to apply measures to mitigate the noise, lighting and visual impacts of the ramps on adjacent land uses, especially the residents of the Gardens as well as park users. Such measures could include a "green" treatment similar to the "green walls" installed at the Vancouver International Airport on the front wall of the Canada Line Station and at Guildford Town Centre shopping mall, or other similar visually pleasing effects such as textured/formed surfaces (see Attachment 5 for examples).

Transit Exchange at Steveston Highway Interchange

A transit exchange serviced by regional bus routes operating between Bridgeport Exchange and south of the Fraser River will be located in a widened centre median area of Highway 99 as part of the Steveston Highway Interchange (Attachment 6). Though not shown in the model, the Project team has verbally advised that bus bays for local bus routes (e.g., 403 service to/from Riverport) will be incorporated into the first level of the proposed elevated ramps across Highway 99 while the express buses from south of the Fraser River would stop at the grade level of the main highway lanes.

From these local bus bays, transit passengers would access the at-grade transit exchange within Highway 99 via stairs or elevator. Passengers accessing the transit exchange from beyond the local bus bays (e.g., from Ironwood Plaza or the Gardens) would utilize multi-use pathways to be constructed on either side of the interchange that would tie-in to existing City pedestrian and cycling networks. In order to provide grade separation of the pathways from the vehicle ramps (i.e., so that pedestrian and cyclists do not have to cross a free flow ramp), some pathways may need to incorporate an underpass/tunnel.

The design of the regional transit exchange at-grade within Highway 99 with the local bus bays above would consolidate the existing spatially dispersed bus stops in the vicinity of the Steveston Highway Interchange, which is intended to improve passenger convenience for bus transfers and enhance safety by minimizing the crossing of roadways and ramps. Conversely, as the regional and local bus stops are located within the centre of the interchange surrounded by multiple vehicle lanes and ramps, the transit facilities may be relatively noisy, less visible and more isolated particularly at night, more circuitous to access for passengers coming from beyond the local bus bays, and have reduced air quality due to vehicle emissions.

Recommendation: To maximize the safety, passenger comfort and attractiveness of the transit facilities, staff recommend that the Ministry be requested to incorporate design principles to ensure the security of transit passengers (i.e., Crime Prevention Through Environmental Design) and mitigation measures to address the noise, visual and air quality impacts.

Highway 99 North of Steveston Highway Interchange

Based on the Steveston Highway Interchange model and the Project Definition Report conceptual drawings, the width of the widened Highway 99 and the adjacent on-/off-ramps immediately north of the Steveston Highway Interchange is estimated at over 100 m and thus equivalent to approximately 25 traffic lanes based on a typical highway lane width of 3.7 m (Attachment 2, bottom photograph). This width is proposed to accommodate the Project elements of a 10-lane bridge, a centre median transit exchange, southbound off-ramps to Steveston Highway, northbound on-ramps from Steveston Highway, southbound off-ramp to Rice Mill Road, and northbound on-ramp from Rice Mill Road as well as the associated roadway shoulders and placement of the required roadside barriers.

Recommendation: Staff recommend that the Ministry be requested to re-examine the design for the widening of Highway 99 north of Steveston Highway Interchange with a view to minimizing the extent of widening while not comprising safety nor its intended functions. Staff further recommend that a follow-up letter be sent to the Provincial Agricultural Land Commission reiterating the City's concerns regarding the Ministry's application for Transportation, Utility and Recreational Trail Use along the Highway 99 corridor to allow for the widening of Highway 99 as part of the Project particularly with respect to the impacts to adjacent agricultural land, the City's riparian management areas and environmentally sensitive areas, and the City's Gardens Agricultural Park.

Replacement of Existing Overpasses North of Steveston Highway

The Project includes replacement of the existing overpasses at Blundell Road, Westminster Highway, Cambie Road, and Shell Road. While these locations are not included in the recent project models, based on conceptual drawings included in the Project Definition Report, the new Blundell Road overpass will be located just south of the existing overpass within the existing Ministry right-of-way (Attachment 6). Based on information contained in the Ministry's application to the Agricultural Land Commission, there is no additional property required to accommodate the replacement of the existing overpass (i.e., the property required in the vicinity of Blundell Road is to accommodate the widening of Highway 99 not the new relocated overpass). Based on verbal communications from the Project team, all the new overpasses will

be slightly higher than the existing overpasses in order to accommodate a minimum vertical clearance of 5.0 m versus the current clearance of 4.5 m.

BC Hydro Transmission Line Relocation

On August 12, 2016, the City received a letter from BC Hydro advising that the agency has confirmed an overhead crossing of the Fraser River as the preferred alternative. Key features of the overhead crossing include:

- Two lattice transmission towers each 122 m (equivalent to a 35-storey building) in height placed in line with and approximately 70 m from the proposed new bridge towers (Attachment 8).
- The lowest sag of the transmission line would be 2.0 m above the bottom of the bridge deck based on the current design.
- Installation of four new transmission poles (two each on either side of Steveston Highway) each at a height of 75 m and the removal of two existing poles each at a height of 60 m (both north of Steveston Highway) to accommodate the higher level of the new Steveston Highway Interchange (Attachment 9).
- The new poles will be in a similar alignment to existing poles and within existing Ministry or BC Hydro rights-of-way.

Staff are working with the Ministry and BC Hydro to identify how drainage and diking issues arising from the installation of the new towers and poles will be addressed and will update Council on this topic in a future report.

Financial Impact

None.

Conclusion

The physical size of the major elements of the George Massey Tunnel Replacement Project and the proximity of some of these structures to existing adjacent properties (e.g., residential developments, parks) in Richmond are anticipated to have potential noise, visual and other impacts.

In order to minimize the potential negative impacts from the proposed highway infrastructure on the existing and planned land use in close proximity of this project, staff recommend that a letter be sent to the Ministry of Transportation and Infrastructure requesting mitigation measures, discussed in this report, be incorporated into the design of infrastructure to address these impacts.

Staff also recommend that a follow-up letter be sent to the Provincial Agricultural Land Commission reiterating the City's concerns regarding the Ministry's application for Transportation, Utility and Recreational Trail Use along the Highway 99 corridor to allow for the widening of Highway 99 as part of the Project.



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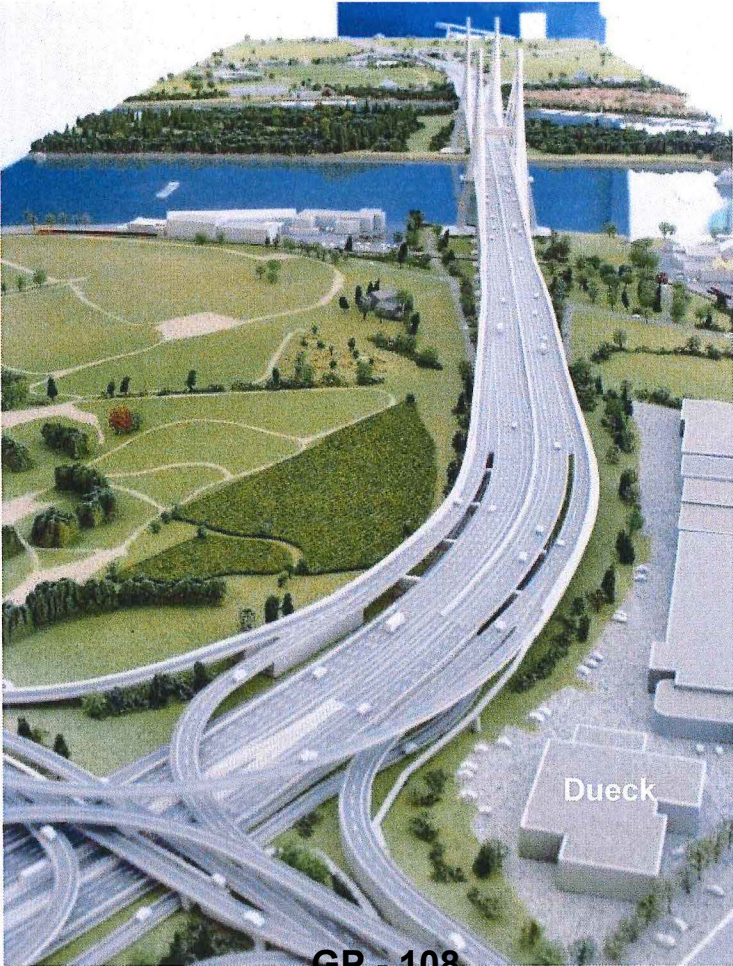
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- Att. 1: Model of New Bridge
- 2: Model of Steveston Highway Interchange
 - 3: Model of Steveston Highway Interchange: Comparison of Height of Highest Ramp and Residential Buildings on Gardens Site and Elevation of Steveston Highway Westbound and Eastbound Lanes West of Interchange
 - 4: Site Plan for the Gardens
 - 5: Local Examples of Green Walls
 - 6: Model of Steveston Highway Interchange: Transit Exchange
 - 7: Blundell Road Overpass
 - 8: BC Hydro Transmission Line Relocation: Location of New Lattice Towers
 - 9: BC Hydro Transmission Line Relocation: Installation of New and Removal of Existing Transmission Poles

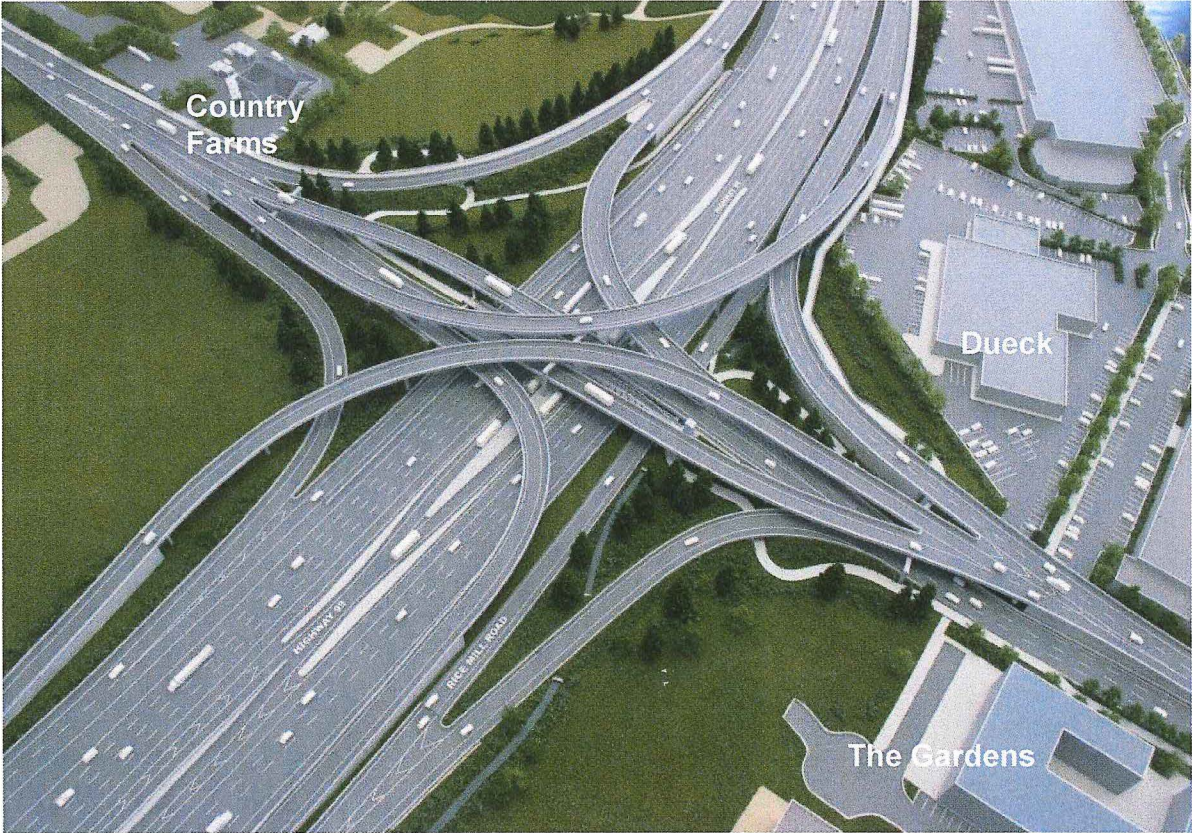
Model of New Bridge



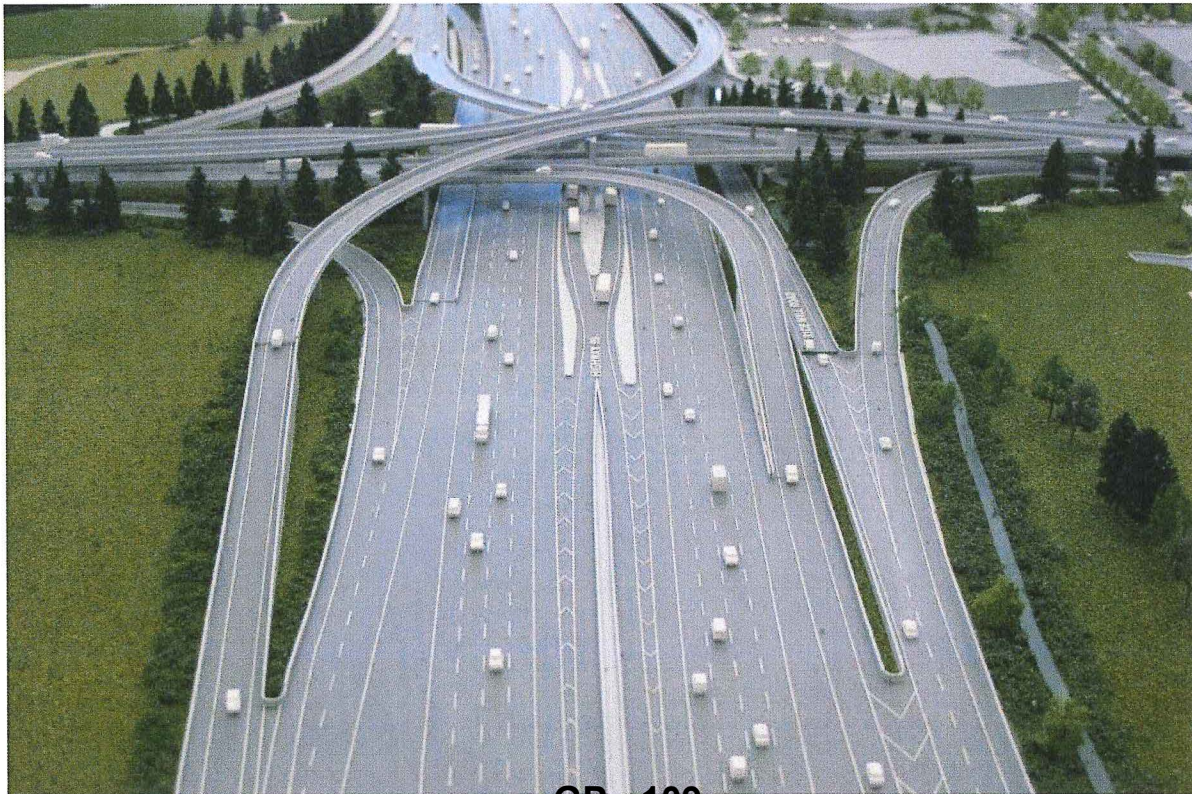
Looking from south in Richmond



Model of Steveston Highway Interchange



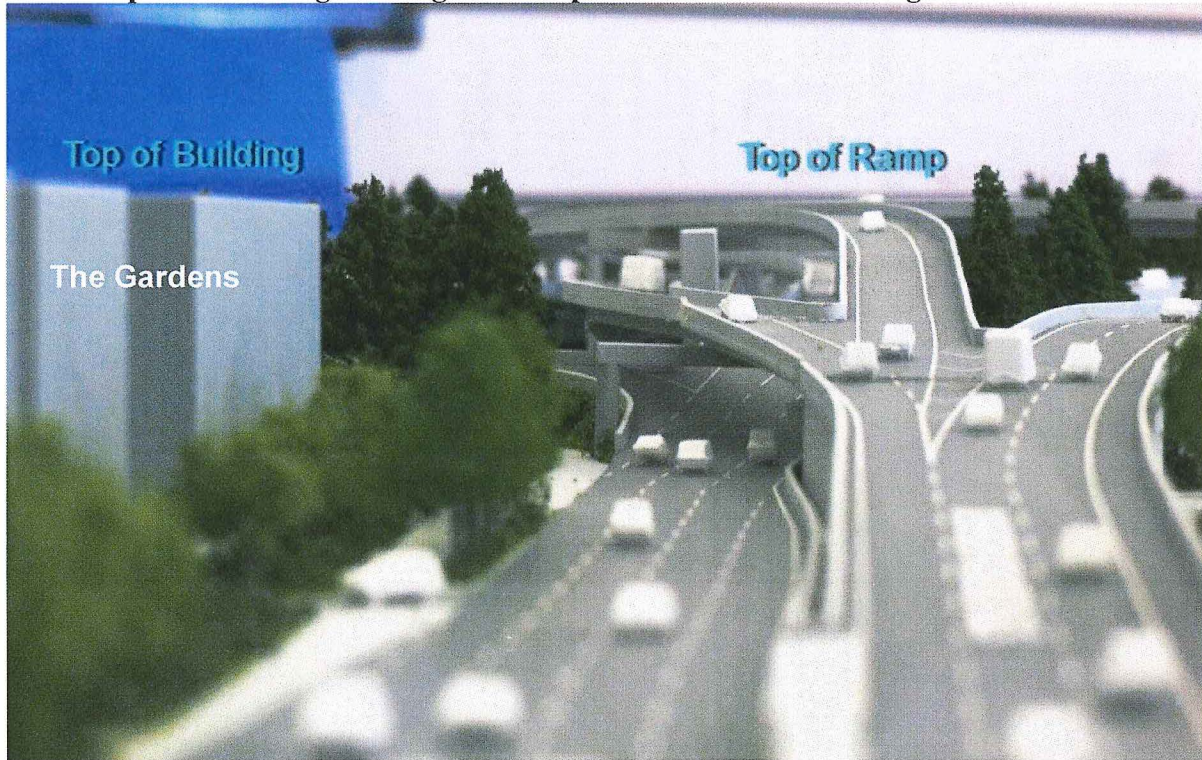
Looking from northwest (Gardens site) to southeast (Country Farms site)



Facing south toward Steveston Highway Interchange

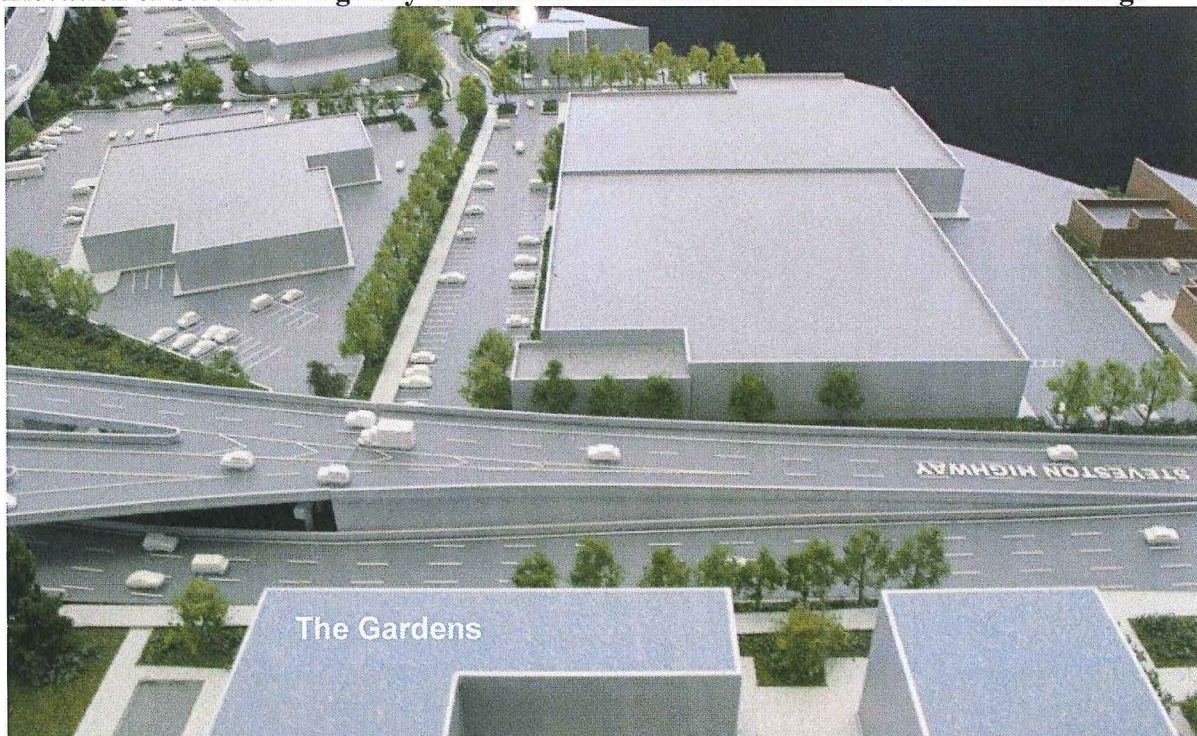
Model of Steveston Highway Interchange: Ramp Elevations

Comparison of Height of Highest Ramp and Residential Buildings on Gardens Site



Looking east on Steveston Highway toward Steveston Highway Interchange

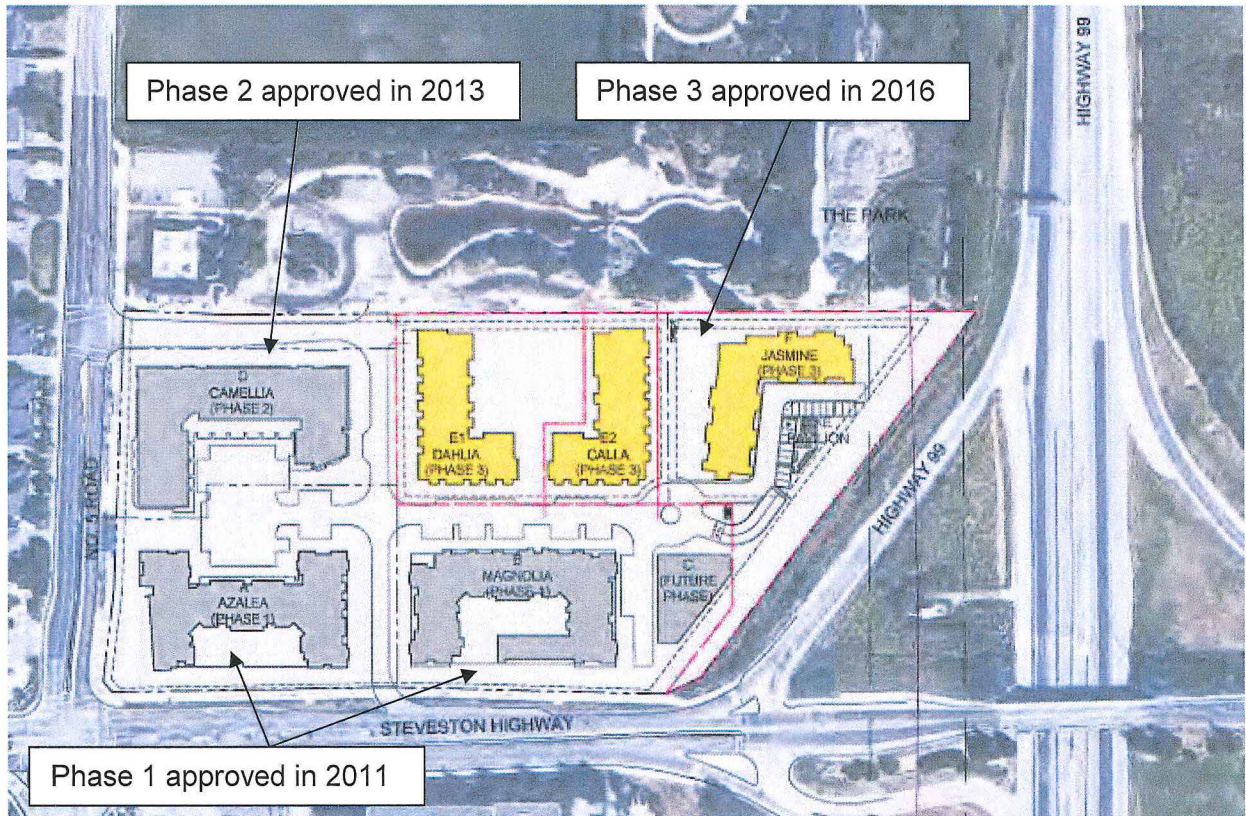
Elevation of Steveston Highway Westbound and Eastbound Lanes West of Interchange



Elevated southern half of Steveston Highway between Highway 99 and No. 5 Road

GP - 110

The Gardens: Site Plan for Phases 1 to 3



Gardens Site Plan with Existing Steveston Highway Interchange



Gardens Site Plan with Proposed New Steveston Highway Interchange

Examples of Green Walls and Decorative Concrete

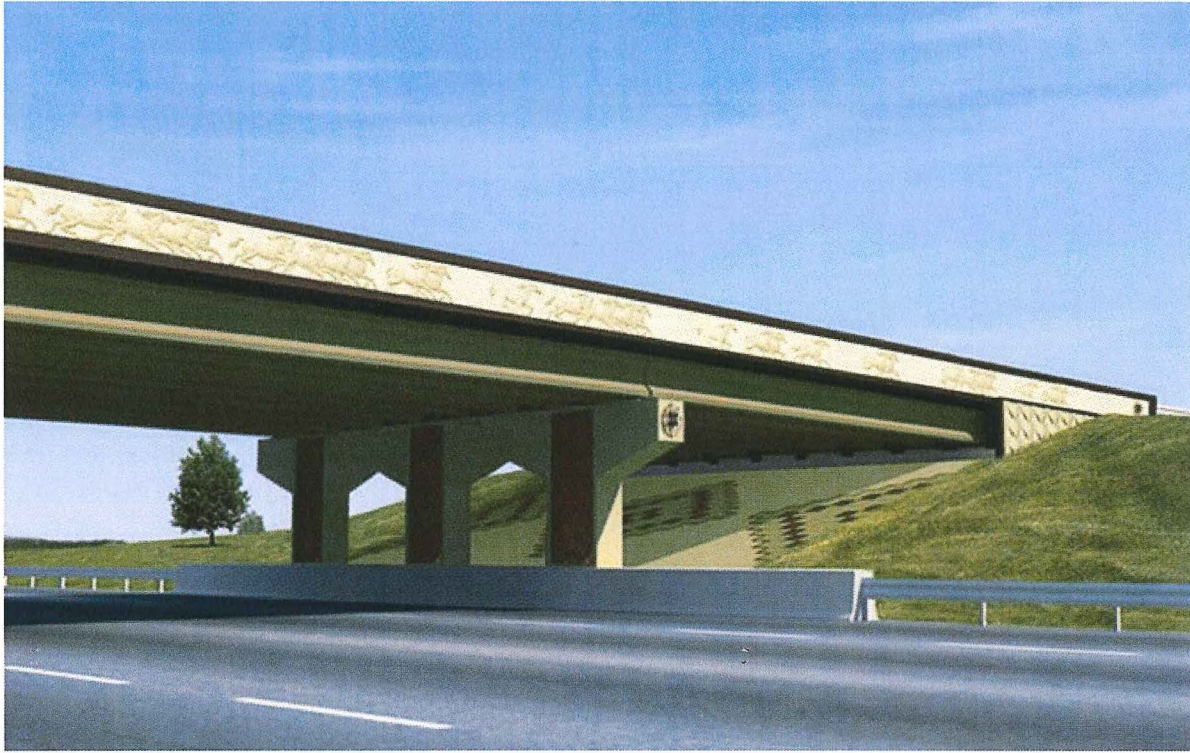


Green Wall at Vancouver International Airport
[Source: Connect Landscape Architecture Inc., Vancouver, BC]

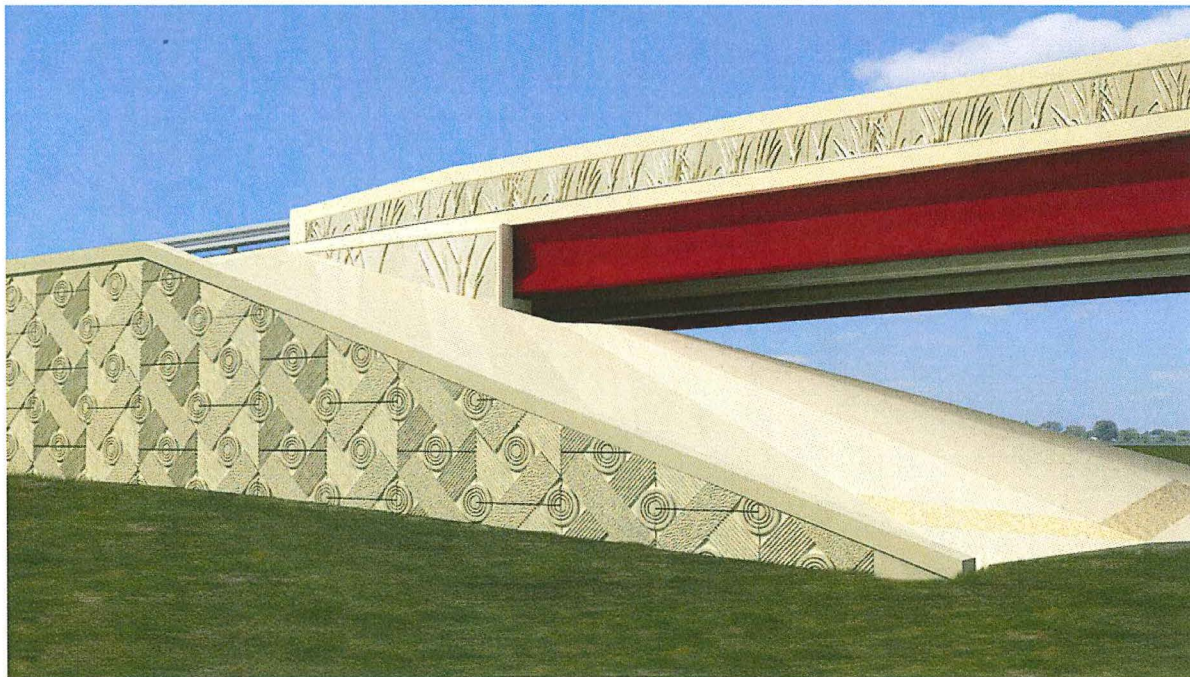


Green Wall at Guildford Town Centre
[Source: Green Over Grey – Living Walls and Design Inc., Vancouver, BC]

Examples of Green Walls and Decorative Concrete



Highway I-35, Norman, OK
[Source: Creative Form Liners Inc., Maryland]

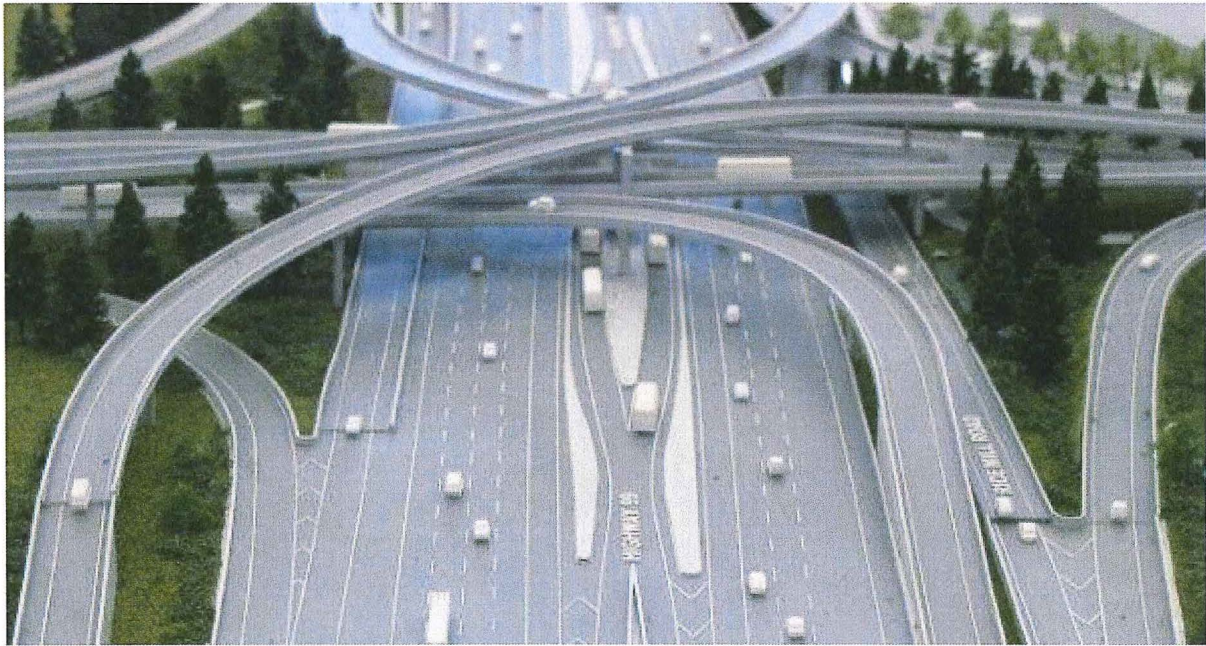


Winstar Boulevard Bridge, Oklahoma
[Source: Creative Form Liners Inc., Maryland]

Model of Steveston Highway Interchange: Transit Exchange

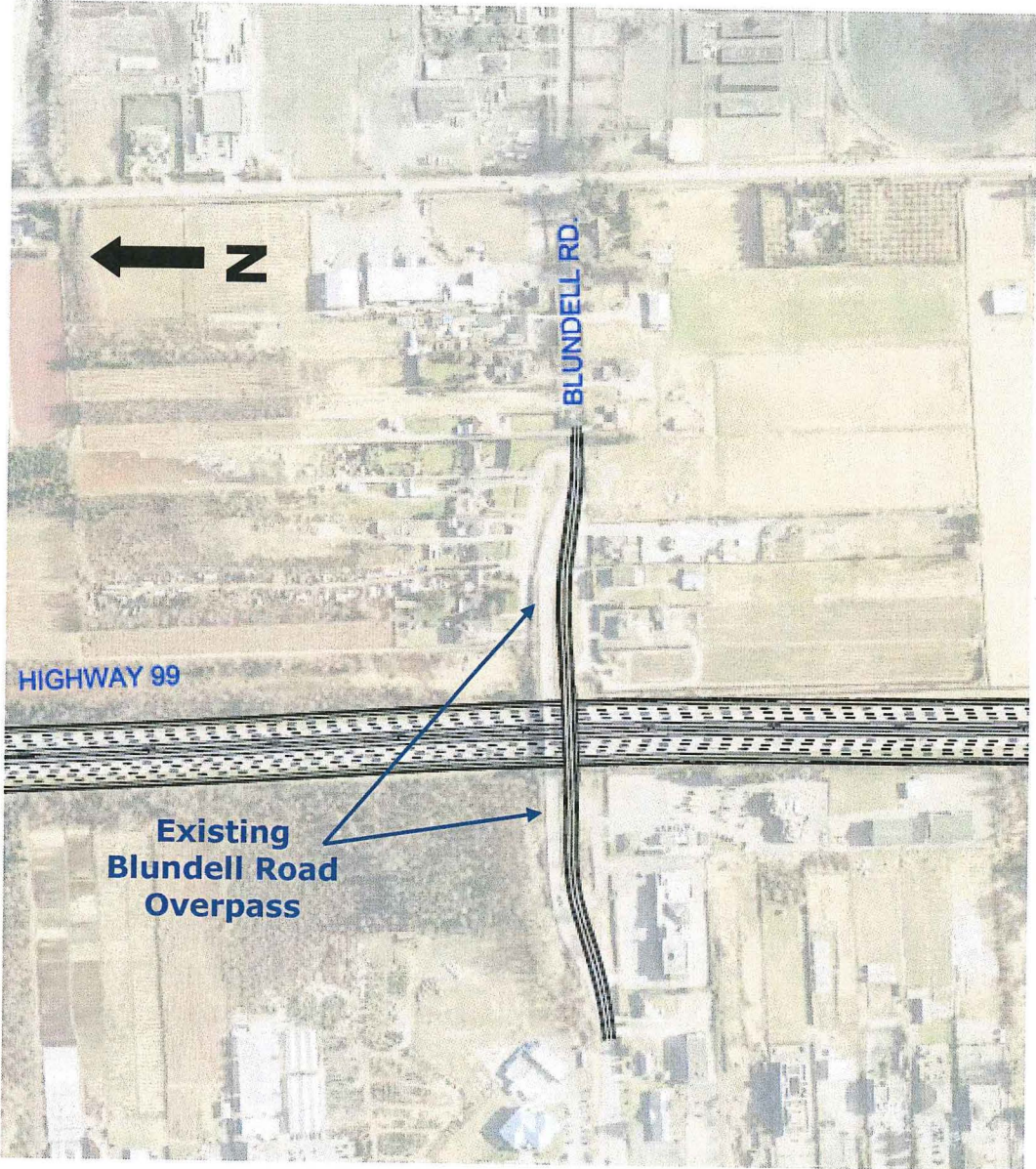


Looking south toward Steveston Highway Interchange

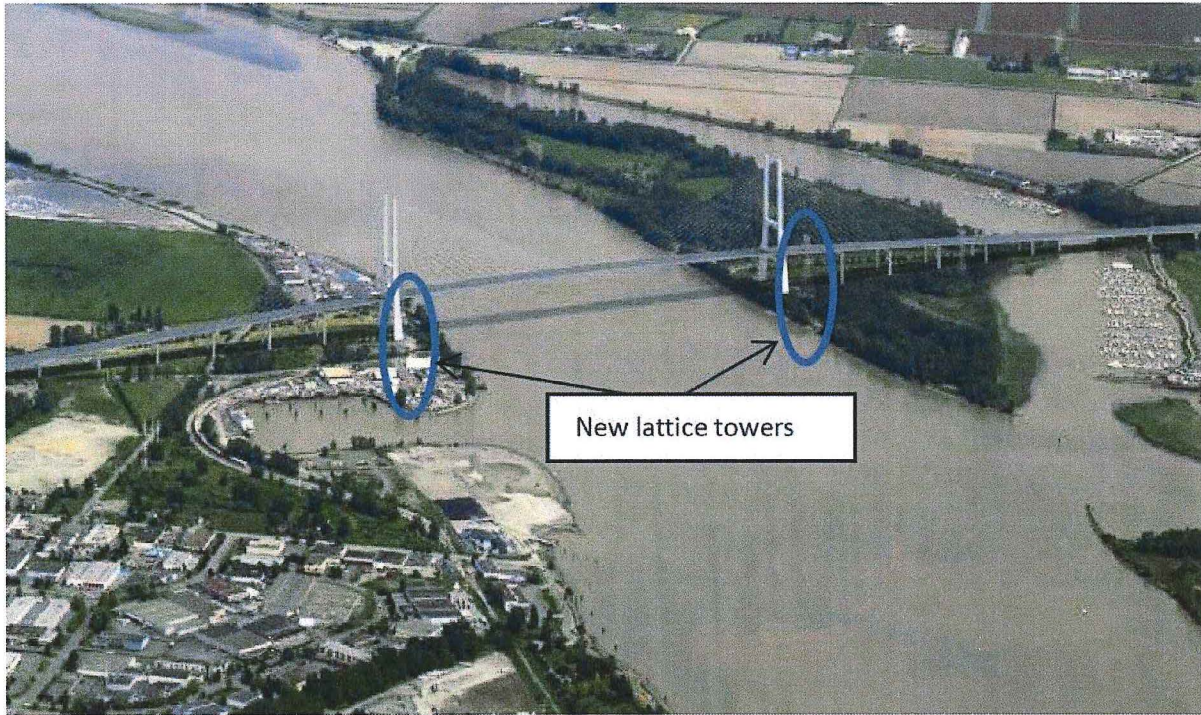


Looking south toward Steveston Highway Interchange

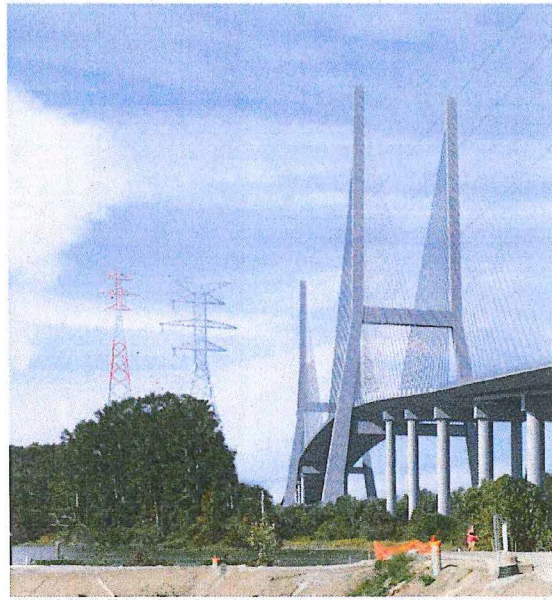
Blundell Road Overpass



**BC Hydro Transmission Line Relocation:
Location of New Lattice Towers**

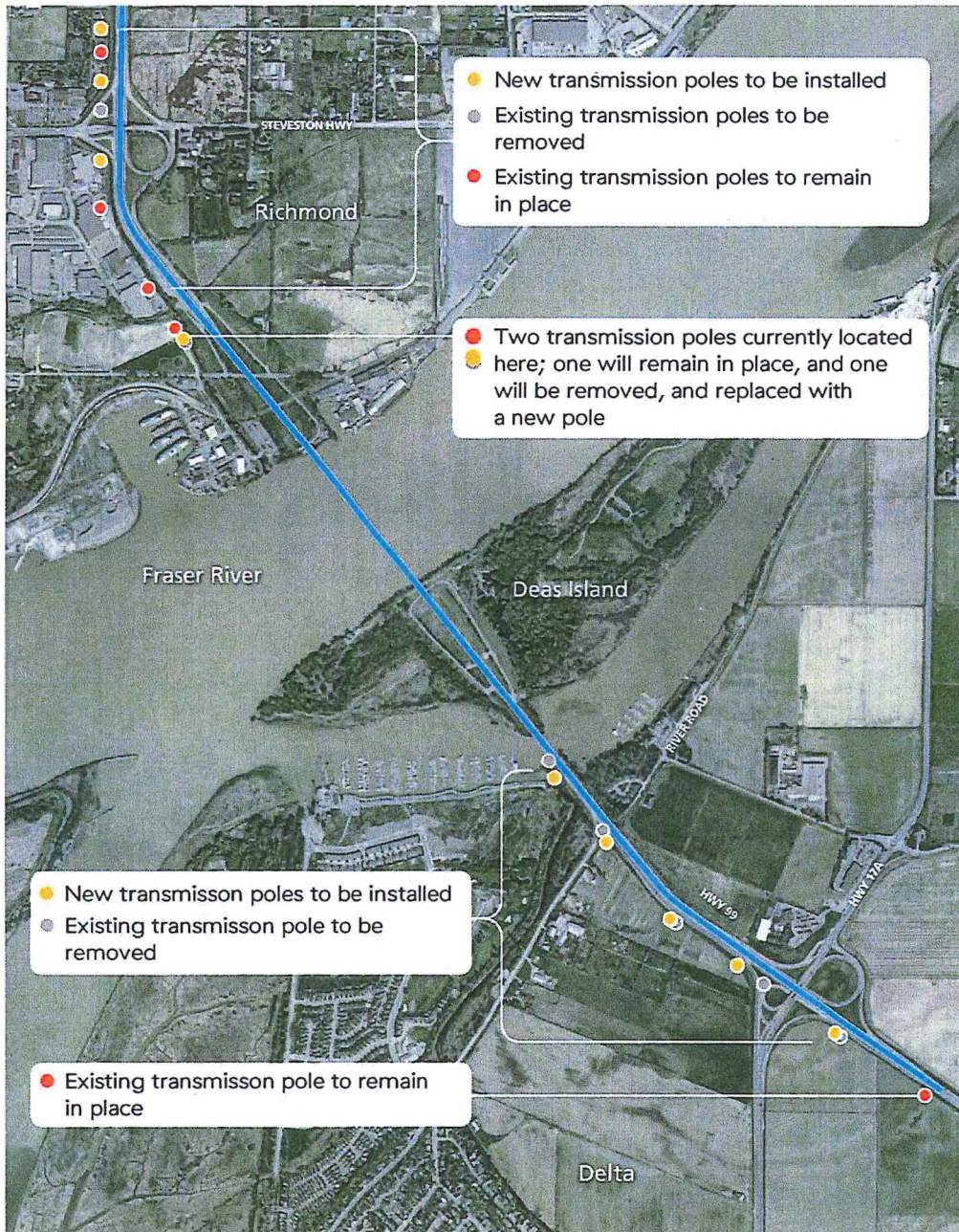


Rendering of the Overhead Transmission Line Alternative from Captain's Cove Marina, Delta (looking East-Northeast)



Rendering of the Overhead Transmission Line Alternative from Millennium Trail near Captain's Cove Marina, Delta (looking northeast)

BC Hydro Transmission Line Relocation: Installation of New and Removal of Existing Transmission Poles



PROPOSED LOCATION OF NEW BRIDGE AND HWY. 99 IMPROVEMENT PROJECT
Locations are approximate/structures not to scale.