CITY OF VANCOUVER

CITY CLERK'S DEPARTMENT
Access to Information & Privacy

File No.: 04-1000-20-2019-255

May 22, 2019

s.22(1)

Dear s.22(1)

Re: **Request for Access to Records under the Freedom of Information and Protection of Privacy Act (the "Act")**

I am responding to your request of April 16, 2019 for:

> **Copy of the peer review/high level review by David Tyler, DCT Project Solutions for City of Vancouver about the Broadway Rapid Transit Line in 2014.**

All responsive records are attached. Please note that the Rapid Transit Office has confirmed that no peer review was undertaken; however, David Tyler was involved with the report authored by Westco Consulting Inc. that is included as the responsive records.

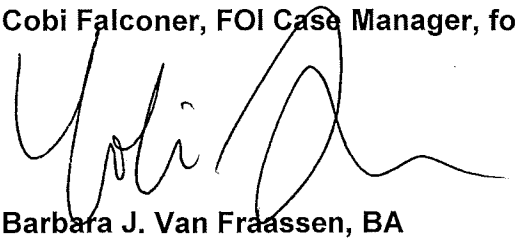
Under section 52 of the Act you may ask the Information & Privacy Commissioner to review any matter related to the City's response to your request. The Act allows you 30 business days from the date you receive this notice to request a review by writing to: Office of the Information & Privacy Commissioner, info@oipc.bc.ca or by phoning 250-387-5629.

If you request a review, please provide the Commissioner's office with: 1) the request number assigned to your request (#04-1000-20-2019-255); 2) a copy of this letter; 3) a copy of your original request for information sent to the City of Vancouver; and 4) detailed reasons or grounds on which you are seeking the review.

Please do not hesitate to contact the Freedom of Information Office at foi@vancouver.ca if you have any questions.

Yours truly,

Cobi Falconer, FOI Case Manager, for



Barbara J. Van Fraassen, BA
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Barbara.vanfraassen@vancouver.ca
453 W. 12th Avenue Vancouver BC V5Y 1V4

*If you have any questions, please email us at foi@vancouver.ca and we will respond to you as soon as possible. Or you can call the FOI Case Manager at 604.871.6584.

Encl.

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TECHNICAL MEMO

Date: April 9, 2014

To: TransLink and City of Vancouver

From: Westco Consulting Inc.

Re: Broadway Corridor – Construction Considerations for Elevated Guideway

1. Introduction

1.1. Existing Broadway Corridor

- Existing Broadway corridor has a typical street right-of-way width of 27.0 m
- Existing Broadway corridor has a typical curb to curb width of 20.0 m accommodating 6 travel lanes (3 in each direction), with the curb travel lanes used for parking in the off-peak conditions.
- Existing Broadway corridor is a fairly dense, developed corridor with mixed uses of retail, commercial, office, residential, and institutional uses on both sides of the street, with most buildings having minimal setbacks from the property line.

1.2. Elevated Guideway

- TransLink and the City of Vancouver has requested a review of the potential construction considerations for an elevated guideway along the centre of the Broadway corridor based on previous elevated guideway construction in the region.
- The elevated guideway would emerge from a tunnel portal west of Main Street connecting to a tunnel section running east to Great Northern Way. The tunnel section between Great Northern Way and the Broadway corridor may be required as there is significant grade change and the maximum track grade allowed is a 6% slope for rail rapid transit. Also, an elevated guideway would require additional property acquisitions, and potential building demolitions to accommodate the guideway alignment between Great Northern Way and Broadway.
- Actual construction period impacts will vary depending on the final design, contractor's specific construction methodology and sequencing, and Owner's requirements around traffic management constraints, night work / noise constraints, and available temporary property / staging areas.
- Traffic Management considerations by the Owner should include the following: Business and Residential impacts for traffic and pedestrian access, peak hour vehicle, truck and transit capacity during construction along the corridor, road closures and diversions.
- These construction considerations provide an outline framework document for further discussions between TransLink and the City of Vancouver on some of the potential construction issues of an elevated guideway along the centre of the Broadway corridor. This is a high level summary provided over a few days based on previous projects, and is not an exhaustive review. Input from

contractors into these elements may also be beneficial.

2. Permanent Transit Facilities Associated With Elevated Guideway

2.1. Segmental Guideway – Typical Elements

- Typical elements for SkyTrain segmental guideway include the following:
  - Typical span length / columns spacing: 30 m to 42 m (longer spans may result in special structures)
  - Typical Column Diameter is 1.8 m to 2.4 m
  - Column foundations (such as caissons or piles with pile cap)
  - Dual guideway width – 8.0 m
  - Horizontal clearance to vehicle lanes (from column face) – 0.5m for turning vehicles lanes and 1.0 m to 1.5 m for through vehicle lanes
  - Vertical clearance – 5.5 m road clearance to the underside of structure

2.2. Segmental Guideway – Broadway Corridor Considerations

- With the guideway centred along Broadway (and excluding bent structures), typical median width would be approximately 4.0 m to 5.0 m.
- With the typical current 20.0 m curb to curb road width, this would potentially leave 4 permanent vehicle lanes along the corridor (2 in each direction).
- Depending on the final configuration and location of the column at the intersections, left turns will need to be "protected" left turns as there may be sight line issues with permissive left turns on green. Also, additional land rights may be required to accommodate the left turn lane.

2.3. Elevated Side Platform Stations (Mezzanine Level) – Typical Elements

- Typical Elevated Side Platform Station at the widest location is approximately 26 m (comprising of guideway, platforms, vertical circulation blocks with up and down escalators and stairs) for approximately 35 m to 40 m in length of the 80 m to 90 m total length.
- Typical Elevated Side Platform Station is approximately 80 m to 90 m in length
- Mezzanine side platform stations are typically provided for stations located with a guideway in the middle of a road such as Brentwood Town Centre Station on the Millennium Line.
- These side platform stations have a mezzanine level to provide access from a station entry headhouse on one or both side of street to each of the side platforms.
- Mezzanine stations would require the guideway platform level to be raised to 12 m to 14 m in height above the road to accommodate the mezzanine level below the platform level, and maintain the 5.5 m vertical road clearance to the underside of the mezzanine level.

2.4. Elevated Side Platform Stations (Mezzanine Level) – Broadway Corridor Considerations

- With the guideway centred along Broadway, a mezzanine station may be needed to keep the guideway centred along the Broadway corridor and to reduce property impacts.
- The mezzanine station may also require some of the station ancillary space /

equipment rooms to be located on one side of the road on private property

- The typical 26 m width may be reduced by up to 4 m to 22 m, if vertical circulation elements between the platform and mezzanine level were split to be an inline configuration (i.e. escalators and stairs oriented to be inline rather than side by side), all to be constructed with the typical 27 m wide Broadway corridor road width. Additional vertical circulation elements would be required at the headhouses on one or both sides of the road between the mezzanine level and the street entry.
- Centre platforms stations have not been considered but would impose additional property and construction requirements to split the guideway.

2.5. Elevated Side Platform Stations (No Mezzanine) – Typical Elements

- Typical Elevated Side Platform Station at the widest location is approximately 26 m wide (comprising of guideway, platforms, vertical circulation blocks with up and down escalators and stairs) for approximately 35 m to 40 m in length of the 80 m to 90 m total length.
- Typical Elevated Side Platform Station is approximately 80 m to 90 m in length
- These stations are typically provided along one side of a street corridor as the passengers come down to a common entry plaza from the two side platforms. (e.g. Holdem Station on the Millennium Line)

2.6. Elevated Side Platform Stations (No Mezzanine) – Broadway Corridor Considerations

- The guideway alignment along the centre of the corridor would need to transition to one side to accommodate an Elevated Side Platform Station with no mezzanine. This will likely require bent structures to accommodate the guideway transition over the vehicle lanes.
- Additional private property rights and costs would be required to accommodate the footprint of the station, and the guideway transition from the centre of the road to the station.

2.7. Portal Structure / Elevated transition

- Typical width for a permanent tunnel portal is 9m to 10m wide while its length will be dependent on the approach grade slope.

2.8. Portal Structure / Elevated transition – Broadway Corridor Considerations

- A tunnel portal west of Main Street is provided to transition from a tunnel from the False Creek Flats to a guideway centred along Broadway.
- With the 9m to 10m width of a permanent portal structure, plus lateral setbacks of approximately 1.0 m on each side, additional property rights and costs may be required to maintain a permanent 4 lane configuration along the Broadway corridor, as the existing 27.0 m width will not be sufficient.

3. Temporary Construction Considerations associated with the Elevated Guideway

3.1. Segmental Guideway

- For the construction of a typical segmental elevated guideway, working space is required for construction staging and equipment. For the construction of the

column foundations and columns, a 10 m wide working space is typically required. This working space can be reduced for the segmental guideway span erection.

- With the 10 m working space, there would be a temporary reduction of 3 to 4 lanes of the 6 lanes currently along Broadway, depending on the actual location of the guideway alignment and shy distance from any fencing or barriers for the work space.
- Access space may also be required beyond the 10 m working space for the delivery of construction materials. Construction traffic will add to the congestion of the remaining vehicle lanes.
- For the temporary traffic management to accommodate this work space, the contractor may want to phase these diversions into discrete phases to allow efficiency in construction staging, and to provide the travelling public with manageable traffic changes.
- For the purpose of this exercise, it is assumed that the Broadway corridor could be broken into four construction segments from Main to Arbutus (Main to Cambie to Oak to Granville to Arbutus). With each segment being considered approximately 900m in length, the duration of the 10m working space required to complete all the columns and foundations within the segment will be approximately 5 to 6 months.
- Following completion of the column construction, it may be possible to reinstate Broadway to its permanent laning configuration (see 2.2. above). However, delivery of the precast segments would require 1 lane closure, albeit for limited periods.
- Staging areas would be required for the start and end of the segmental guideway for the delivery, assembly, erection, testing, and disassembly of the segmental guideway assembly truss.
- Utility relocations would need to occur in advance of the column construction.

3.2. Stations

- Station construction requires significant laydown space, typically 10m to 20m wide by typically 80 m to 90 m in length.
- For mezzanine stations, further traffic lane closures down to 2 lanes may be required for duration of 3 to 4 months (over and above that required for columns).

3.3. Portal

- For the tunnel portal along Broadway located west of Main Street, additional temporary working space over and above 10m width for the permanent structure would be required for excavation and temporary shoring.
- To accommodate the portal, the temporary works could result in 4 lane reductions within the existing road right-of-way, or additional property rights and costs may be required to provide additional space for vehicle lanes. Temporary bridging the excavation area may be another means of recovering space for traffic lanes but with additional costs.
- If the tunnel is constructed with a Tunnel Boring Machine (TBM), a tunnel exit shaft would also be required. With a typical TBM diameter of 5.6 m for SkyTrain, this would result in a 17 m wide temporary tunnel exit shaft which would

transition to the 10 m wide portal structure. Additional property rights or temporary bridging of the excavation area may be required to provide additional space for vehicle traffic lanes but with additional costs.

3.4. Tunnel Construction

- There are many different types of tunneling construction methods with varying impacts, including the following, with some of their general attributes:
  - Tunnel Boring Machine: Minimizes disruption to the surface, except for the entry and exit shafts. Requires TBM support area at the entry for muck handling and tunnel liner staging. TBM can deal with diverse ground conditions and groundwater conditions. Larger start up costs due to the specialized equipment, but becomes more cost effective with longer tunnels.
  - Tunnel Mining with road headers: Minimizes disruption to the surface, as tunnels are mined underground. Mined tunnels with road headers are only practical with good ground conditions such as sandstone where the ground is largely self supporting. Tunnel construction can occur on multiple fronts, and will likely extract excavated materials at the station locations.
  - Cut and Cover: Tunnel construction with open excavation for the width of the tunnel similar to the Canada Line construction along Cambie Street, and backfilling and restoring the road following completion of the tunnel construction. Results in utility and surface disruptions during the open excavation, including requirements for adjacent construction support activities, resulting in larger traffic and surface disruptions. Tunnel construction can occur on multiple fronts.