GRANVILLE BRIDGE CONNECTOR

Supplemental Design Guide for Phase 2 Engagement

September 2019

What is this Guide?

This document is intended to supplement the City of Vancouver's ***Granville Bridge Connector*** Phase 2 open house materials.

It provides a more in-depth evaluation of options that have been considered, including the six shortlisted options as well as those that have been eliminated.

For more information on the project, including open house materials, visit ***vancouver.ca/granvilleconnector***.

Contents

Developing & Evaluating Options

Developing Options

Staff explored over 20 options for the Granville Bridge Connector, informed by public and stakeholder feedback, internal analysis, and consultant input.

These design options can be grouped based on their general alignment over the mid-span of the bridge: west side, east side, centre, both sides, or suspended from the existing structure.

Within each alignment group, there are options which vary depending on the number of lanes reallocated or how the ramps are used. These variations may offer benefits such as additional path width, placemaking opportunities, and/or active transportation connectivity, but may have transportation impacts or costs which require further evaluation.

Evaluating Options

Options were evaluated through a multi-step process.

High Level Screening of Long List

The long list of options underwent a high-level screening process, based on critical flaws and ability to meet baseline criteria. All shortlisted options:

- Provide an accessible walking and rolling option for people with disabilities
- Provide a safe environment for all modes of transportation
- Maintain reliable transit and emergency access
- Accommodate current motor vehicle volumes
- Integrate means prevention (to deter self-harm) and environmental features (e.g. rainwater management) into the design

Detailed Evaluation of Short List

A shorter list of options is undergoing a multiple account evaluation, using criteria informed by the project goals. This document includes a preliminary assessment by staff, which may be subject to further refinement based on further analysis, as well as stakeholder, public, and consultant input.

The criteria are highlighted on the next page.

Criteria	Questions or Attributes to Consider
Walking & Rolling Comfort	■ Quality of buffer from traffic ■ Space for people to walk in groups ■ Space for seating & basic amenities ■ Interaction with other modes of travel (e.g. noise from traffic) ■ Grades (steepness of path) ■ Accessibility improvements to existing sidewalks
Walking & Rolling Network	■ Directness to key destinations ■ Additional connections via ramp enhancements ■ Ability to connect with existing sidewalks ■ Additional connections via elevators & stairs
Cycling Comfort	■ Space for passing & accommodating different cycling speeds ■ Space for cycling with others ■ Quality of buffer from traffic ■ Grades (steepness of path)
Cycling Network	■ Directness to key destinations ■ Additional connections via ramp enhancements
Views & Placemaking	■ Quality of views ■ Space for placemaking & programming ■ Compatibility with specific features (e.g. balconies, pocket plazas) ■ Potential for the path to be a destination
Transit	■ Ability to maintain reliable transit ■ Potential to add transit priority measures in the future
Secure & Inclusive Place	■ Ability to provide a space that feels safe & secure for all people, at all hours & times of the year ■ Ability to accommodate fast & efficient emergency service access
Traffic & Parking	■ Ability to accommodate current traffic volumes ■ Local circulation impacts (e.g. from traffic diversion) ■ Parking impacts
Future Flexibility | Compatibility with Related Projects	■ Compatibility with potential elevator serving Granville Island (including bus stops & signalized crossing on bridge deck) ■ Compatibility with Granville Loops removal & replacement ■ Compatibility with Vancouver House redevelopment (which will include elevators & stairs connecting to the sides of the bridge) ■ Compatibility with potential future improvements to the on-/off-ramps (e.g. improving sidewalks, supplemental bike connections, or making ramps car-free public spaces) ■ Compatibility with other potential elevators & staircases (e.g. to Seawall) ■ Ability to reconfigure travel lanes in future
Costs	■ Preliminary cost estimate, including contingencies

Shortlisted Options Overview

Six options have been shortlisted based on their ability to meet core criteria and achieve project goals.

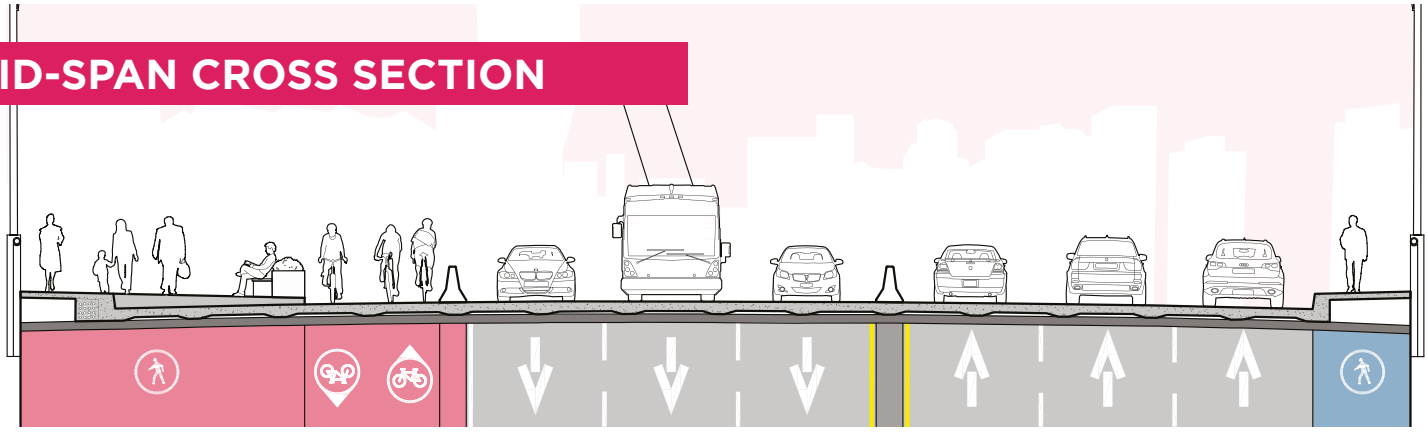
Each option would reallocate two travel lanes on the main span of the bridge, maintain reliable transit, and accommodate existing traffic volumes.

These options are currently undergoing public and stakeholder review, and may be further refined.

WEST SIDE

- Wide sidewalk and two-way bike lane on west side of bridge (approx. 10m)
- New signals at Howe and Fir ramp crossings
- No change to east sidewalk

MID-SPAN CROSS SECTION



KEY FEATURES

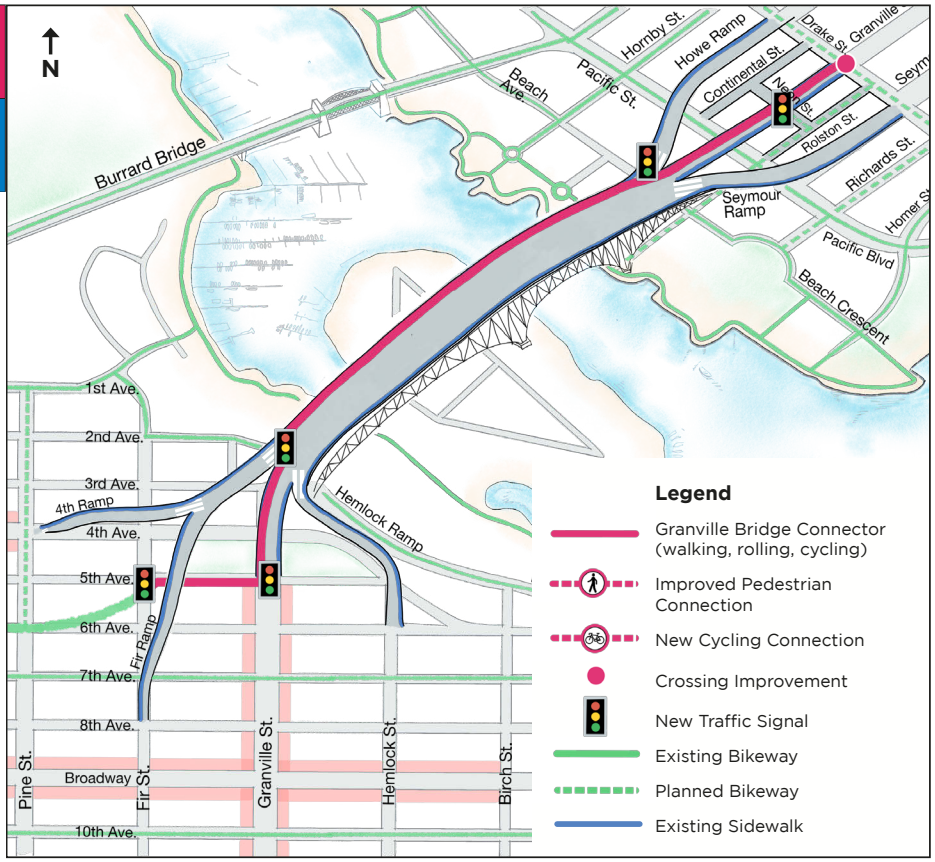
COST: $20M-30M*

BENEFITS

+ Traffic only on one side of path
+ Views to west over False Creek
+ Up to 4m extra space for seating, amenities, & programming
+ Potential to use extra space for wider sidewalks and/or bike lanes
+ Connects to existing sidewalks on 4th, Fir, & Howe ramps
+ Most compatible with potential transit priority

CHALLENGES

- Requires signalized crossings at Howe & Fir ramps

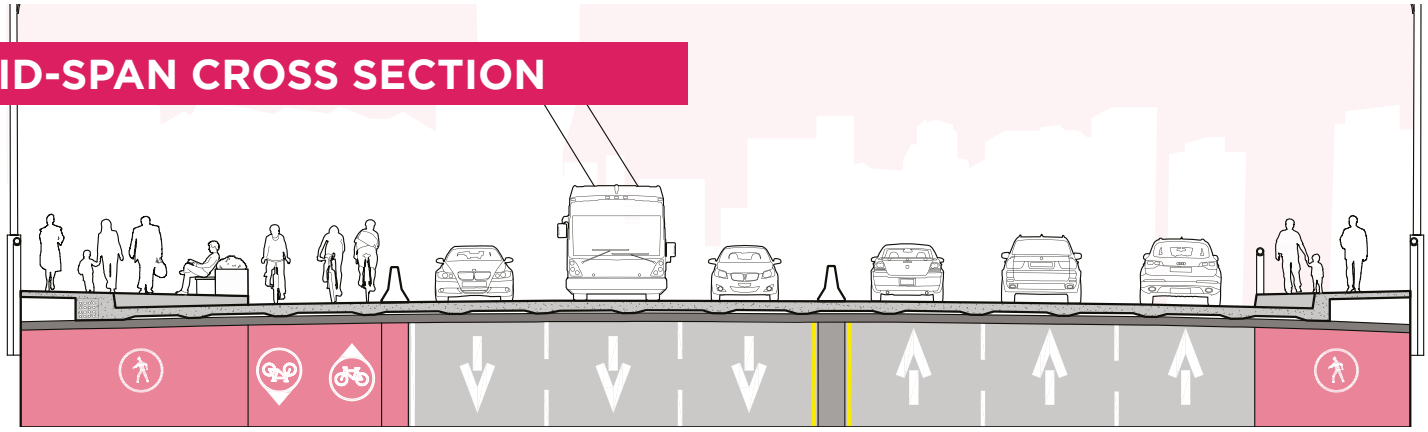


* **Preliminary cost estimates are based on conceptual designs & developed for comparative purposes only.** As many details are not yet determined, estimates include a large contingency and will be refined significantly once a recommended option is selected. Estimates do not include means prevention fencing.

WEST SIDE +

- Wide sidewalk and two-way bike lane on west side of bridge (approx. 8m)
- Wide accessible sidewalk on east side and Hemlock ramp
- Relatively flat two-way bike lane on Fir ramp to 10th Ave
- New signals at Howe and Fir ramp crossings

MID-SPAN CROSS SECTION



KEY FEATURES

COST: $30M-40M*

BENEFITS

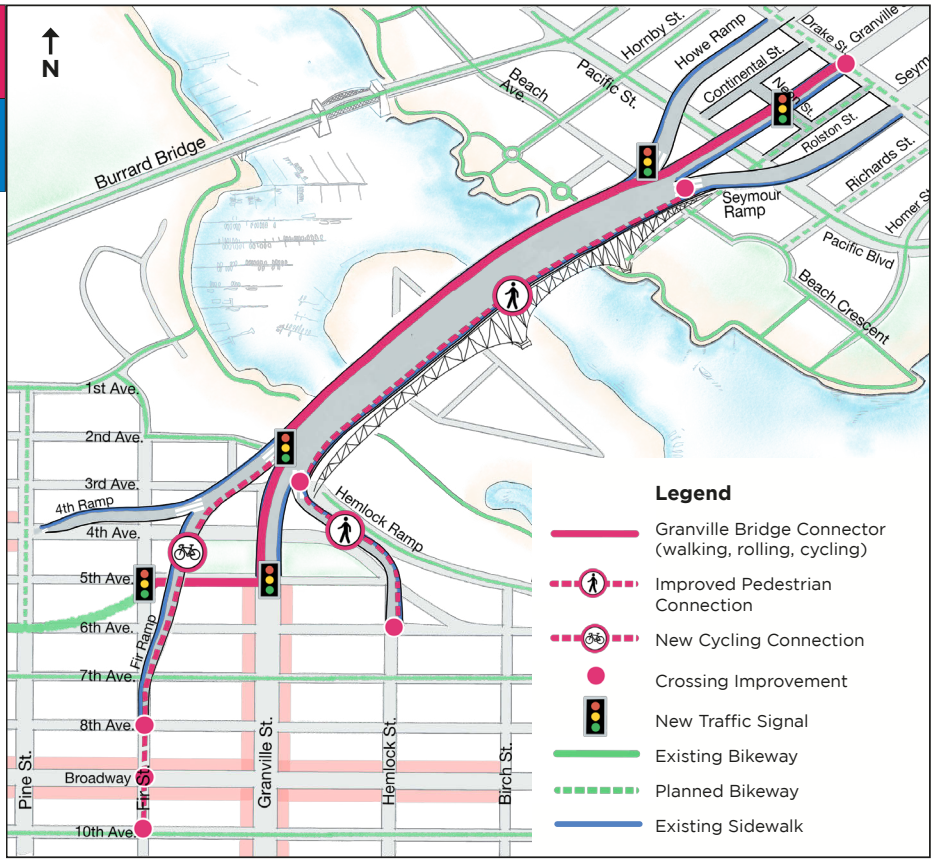
Same as 'West Side' option, except:

+ Accessible & wide sidewalks on both sides of bridge, & Hemlock ramp
+ Views to west & east over False Creek
+ Relatively flat two-way bike connection on Fir ramp to/from 10th Ave
+ Up to 2m for seating & amenities on west side

CHALLENGES

Same as 'West Side' option, except:

- Some vehicle delay and circulation impacts around Fir St
- Less room on path for public space compared to 'West Side' option



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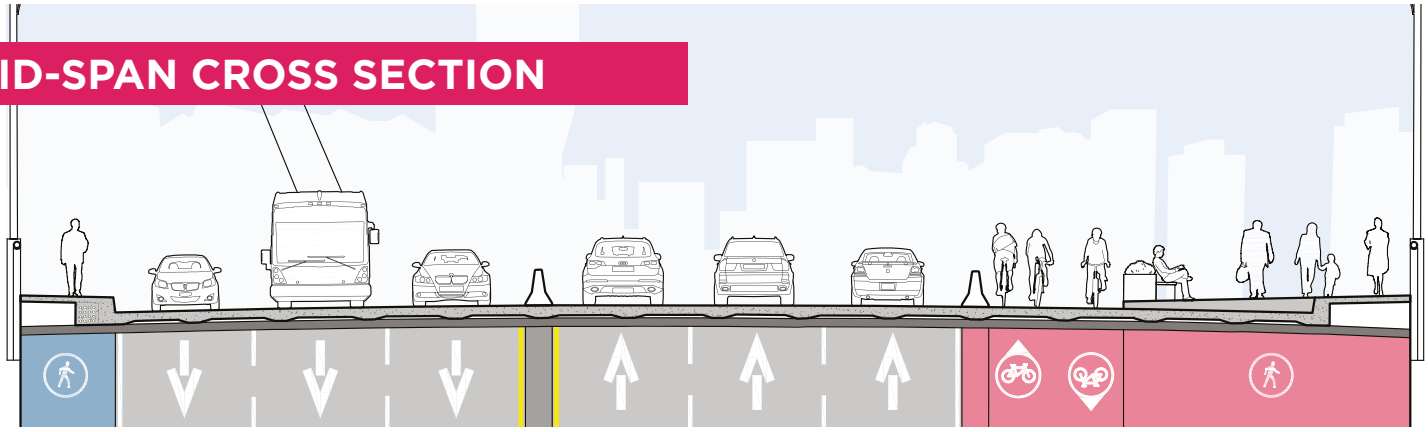
EAST SIDE

- Wide sidewalk and two-way bike lane on east side of bridge (approx. 10m)
- New signals at Hemlock and Seymour ramp crossings
- No change to west sidewalk

MID-SPAN CROSS SECTION



KEY FEATURES

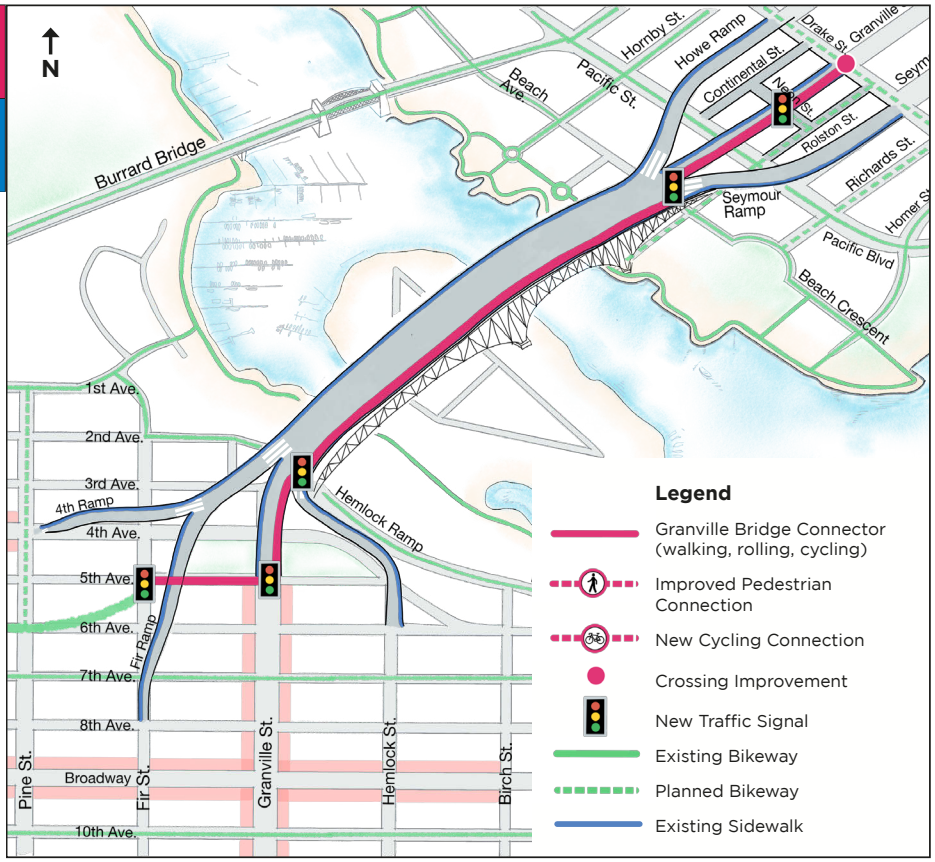
COST: $20M-30M*

BENEFITS

+ Traffic only on one side of path
+ Views to east over False Creek
+ Up to 4m extra space for seating, amenities, and programming
+ Potential to use extra space for wider sidewalks and/or bike lanes
+ Connects to existing sidewalks on Hemlock & Seymour ramps
+ Compatible with some transit priority

CHALLENGES

- Requires signalized crossings at Hemlock & Seymour ramps
- Signalizing Seymour ramp may impact transit by encouraging some traffic to remain on Granville St
- Limits ability to add northbound transit priority



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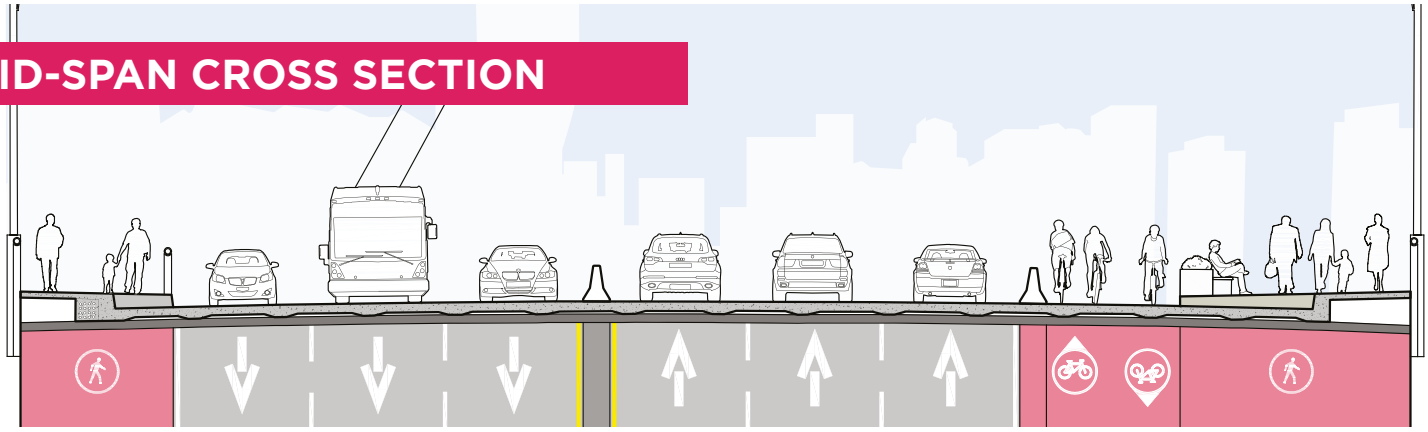
EAST SIDE +

- Wide sidewalk and two-way bike lane on east side of bridge (approx. 8m)
- Wide accessible sidewalk on west side and 4th ramp
- Relatively flat two-way bike lane on Hemlock ramp to 7th Ave
- New signals at Hemlock and Seymour ramp crossings

MID-SPAN CROSS SECTION



KEY FEATURES

COST: $25M-35M*

BENEFITS

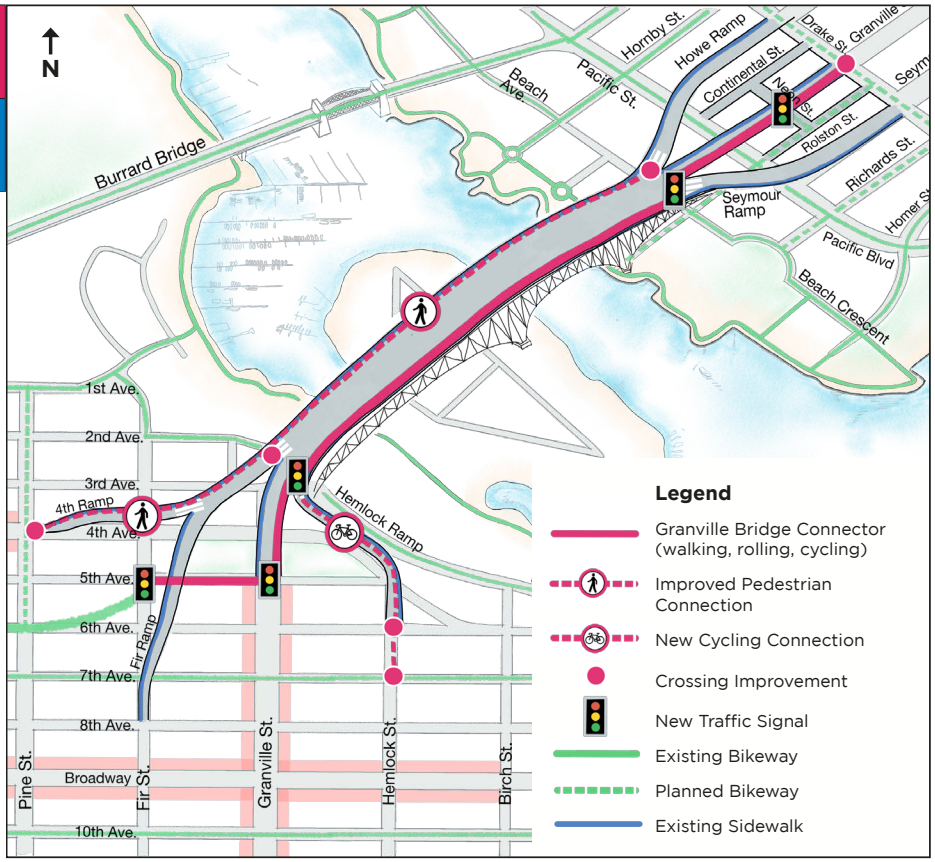
Same as 'East Side' option, except:

+ Views to west & east over False Creek
+ Accessible & wide sidewalks on both sides of bridge, and 4th ramp
+ Relatively flat two-way bike connection on Hemlock ramp to/from 7th Ave
+ Up to 2m for seating & amenities on east side

CHALLENGES

Same as 'East Side' option, except:

- Some vehicle delay & circulation impacts around Hemlock St
- Less room for public space compared to 'East Side' option



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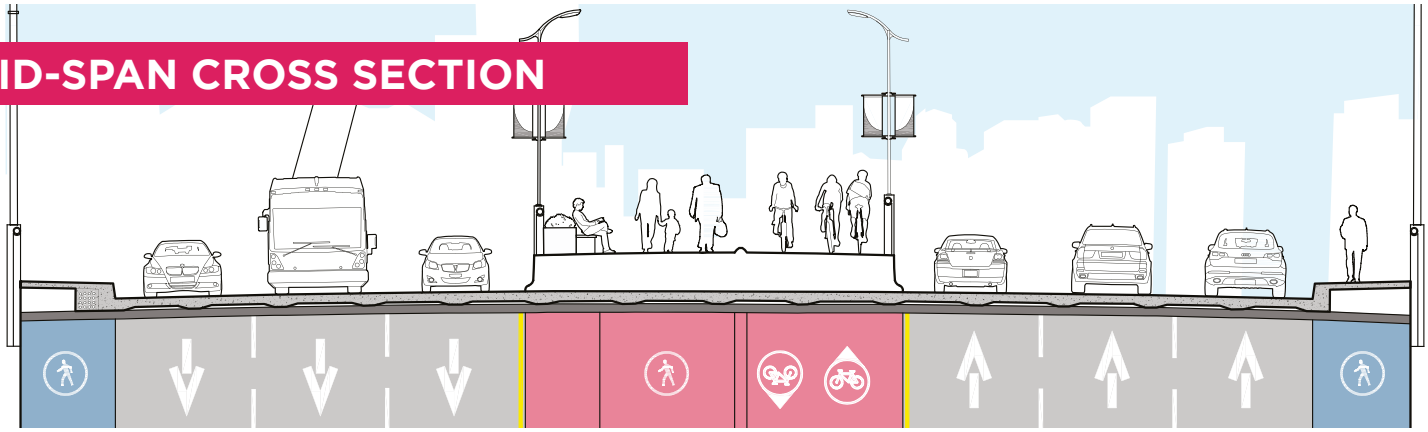
RAISED CENTRE

- Wide sidewalk and two-way bike lane down centre of bridge (approx. 8m)
- Path elevated ~1m above bridge deck to provide views and separation from traffic
- No change to existing sidewalks on east and west sides

MID-SPAN CROSS SECTION



KEY FEATURES

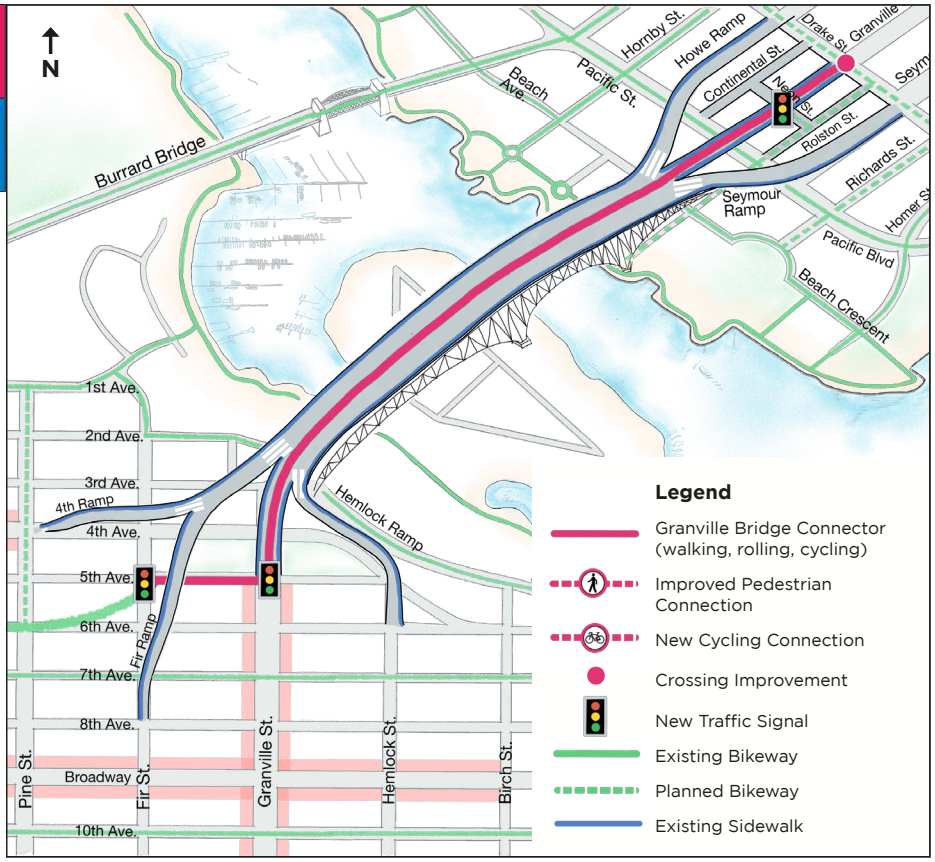
COST: $45M-55M*

BENEFITS

+ Avoids need to cross on-/off-ramps at either end of bridge
+ Unique view from middle of bridge, raised 1m to see over most traffic
+ Up to 2m for seating & amenities
+ Compatible with some transit priority

CHALLENGES

- Limited views of water
- Motor vehicles on both sides of path
- Does not address accessibility challenges with existing sidewalks
- No access to new path from existing ramp sidewalks
- Less room for public space compared to 'West Side' & 'East Side' options
- Limits ability to add southbound transit priority



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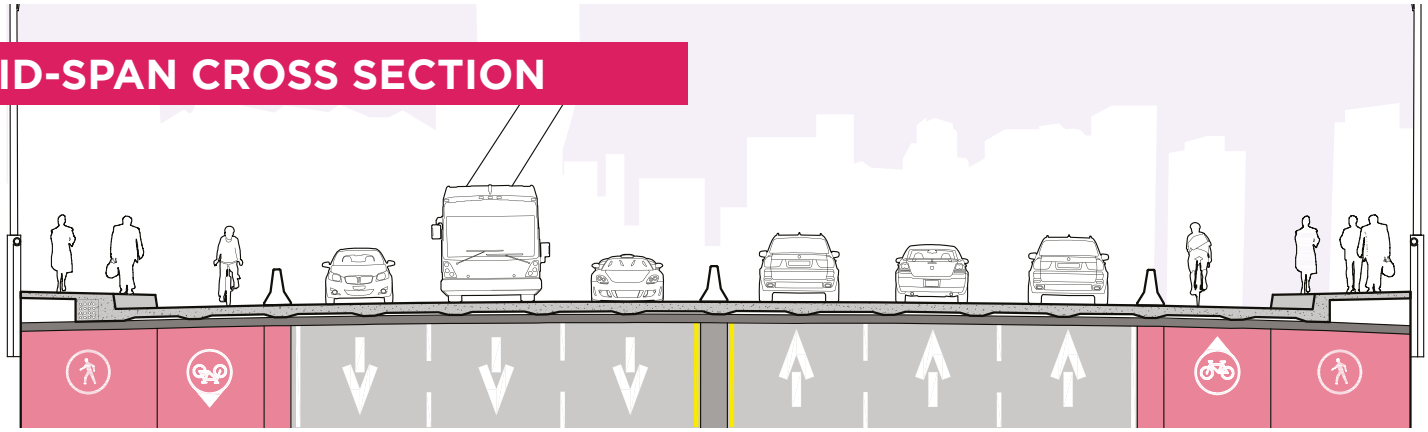
BOTH SIDES

- Slightly widen existing sidewalks on main span of bridge
- One-way bike lanes on both sides (similar to Burrard Bridge)
- New signals at Howe, Fir, Hemlock, and Seymour ramp crossings

MID-SPAN CROSS SECTION



KEY FEATURES

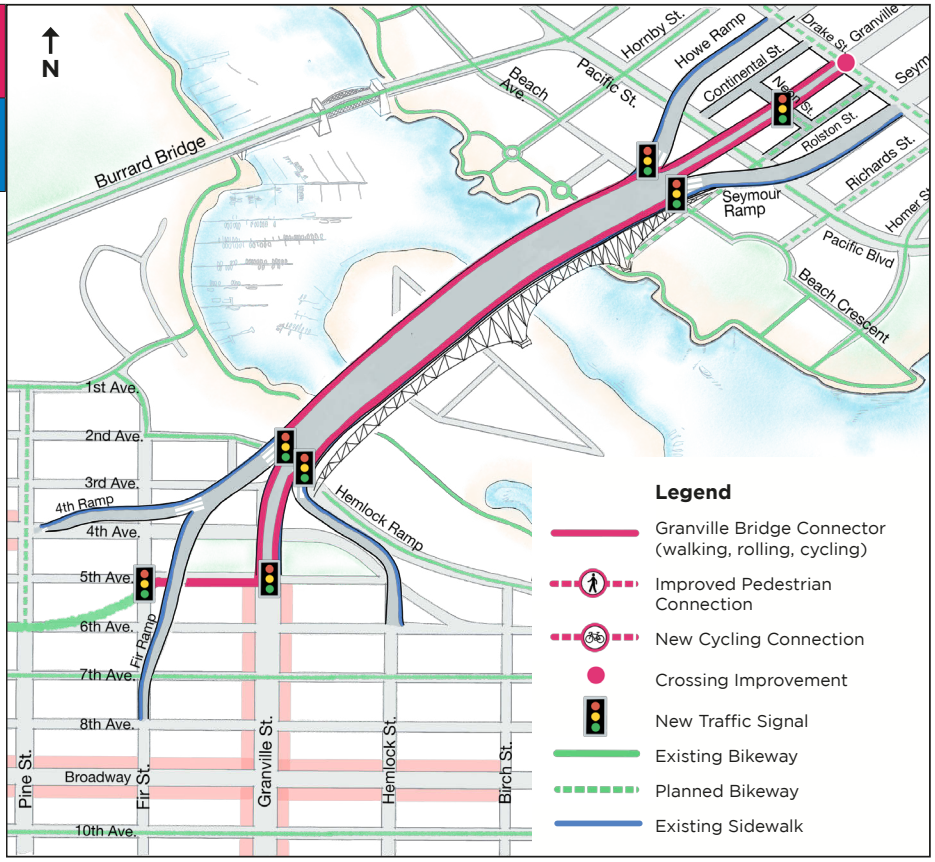
COST: $20M-30M*

BENEFITS

+ Traffic on one side of path only
+ Views to west & east over False Creek
+ Accessible & widened sidewalks on both sides of bridge
+ Connects to existing sidewalks on 4th, Fir, Hemlock, Howe, & Seymour ramps

CHALLENGES

- Requires signalized crossings at Hemlock, Seymour, Howe, & Fir ramps
- Signalizing Seymour ramp may impact transit by encouraging some northbound traffic to stay on Granville St
- Minimal space for seating, railings, or other path enhancements
- Very limited compatibility with potential transit priority



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Shortlisted Options Evaluation

This is a preliminary assessment of shortlisted options conducted by staff. It may be subject to further refinement based on additional analysis, as well as stakeholder, public, and consultant input.

CRITERIA 1: WALKING & ROLLING COMFORT

	West Side	West Side +	East Side	East Side +	Raised Centre	Both Sides
OVERALL GRADE	A	A+	A	A+	B	A+
Quality of buffer from traffic	Bike lane provides additional separation from traffic	Bike lane provides additional separation from traffic	Bike lane provides additional separation from traffic	Bike lane provides additional separation from traffic	Limited lateral buffer from traffic	Bike lanes provide additional separation from traffic
Space for people to walk in groups **Space for seating & basic amenities**	Allows for 3m minimum path Plus up to 4m of additional space	Allows for 3m minimum path Plus up to 2m of additional space	Allows for 3m minimum path Plus up to 4m of additional space	Allows for 3m minimum path Plus up to 2m of additional space	Allows for 3m minimum path Plus up to 2m of additional space	Widens existing sidewalks to ~3m Space for occasional bench
Interaction with other modes of travel	Dedicated pedestrian-only space Motor vehicle traffic on one side	Dedicated pedestrian-only space Motor vehicle traffic on one side	Dedicated pedestrian-only space Motor vehicle traffic on one side	Dedicated pedestrian-only space Motor vehicle traffic on one side	Dedicated pedestrian-only space Motor vehicle traffic on both sides	Dedicated pedestrian-only space Motor vehicle traffic on one side
Grades (steepness of path)	2.5% to 3.5%	2.5% to 3.5% Additional level connection via Hemlock ramp	2.5% to 3.5%	2.5% to 3.5% Additional level connection via 4th ramp	3% to 4.5% Raising the path ~1m requires making the path steeper	2.5% to 3.5%
Accessibility improvements to existing crosswalks	Addresses one side	Addresses both sides	Addresses one side	Addresses both sides	Does not address either side	Addresses both sides
Consistent Connector width (doesn't have to pinch at ends)	✓	✓	✓	✓	Requires narrowing Granville St sidewalks south of Drake for 1 block	Requires narrowing Granville St sidewalks south of Drake for 1 block
Number of ramps to cross when walking main span	2 Crossings would be signalized	2 Crossings would be signalized	2 Crossings would be signalized	2 Crossings would be signalized	0 Avoids need to cross ramps	2 Crossings would be signalized

CRITERIA 2: WALKING & ROLLING NETWORK

	West Side	West Side +	East Side	East Side +	Raised Centre	Both Sides
OVERALL GRADE	B	A	B	A	C	A
Directness to key destinations, e.g. ■ Granville-Granville ■ Arbutus Greenway	✓	✓	✓	✓	✓	✓
Additional walking connections via ramp enhancements	None Potential for enhancements to Fir/4th ramps in future	Improvements on Hemlock ramp provide an accessible connection to 6th Ave	None Potential for enhancements to Hemlock ramp in future	Improvements on the 4th ramp for an accessible connection to Pine St	None	None Potential for enhancements to Fir/4th/Hemlock ramps in future
Ability to connect with existing ramp sidewalks	Fir/4th & Howe ramps	All ramps	Hemlock & Seymour ramps	All ramps	Not possible	All ramps
Elevator/stair access to new public space below Granville Bridge via Vancouver House	Direct access	Direct access	Direct access	Direct access	Access one block away via future Granville-Neon intersection	Direct access
Pedestrian delay					Fewer signalized crossings for walking trip between Drake and 5th Ave	

CRITERIA 3: CYCLING COMFORT

	West Side	West Side +	East Side	East Side +	Raised Centre	Both Sides
OVERALL GRADE	**A**	**A-**	**A**	**A-**	**B**	**A**
Space for passing & accommodating different cycling speeds **Space for cycling with others**	Allows for 3m minimum path Plus up to 4m of additional space	Allows for 3m minimum path Plus up to 2m of additional space	Allows for 3m minimum path Plus up to 4m of additional space	Allows for 3m minimum path Plus up to 2m of additional space	Allows for 3m minimum path Plus up to 2m of additional space	2.5m one-way cycling paths on each side of bridge allow for passing
Interaction with other modes of travel	Dedicated cycling-only space Motor vehicle traffic on one side	Dedicated cycling-only space Motor vehicle traffic on one side	Dedicated cycling-only space Motor vehicle traffic on one side	Dedicated cycling-only space Motor vehicle traffic on one side	Dedicated cycling-only space Motor vehicle traffic on both sides	Dedicated cycling-only space Motor vehicle traffic on one side
Grades (steepness of path)	2.5% to 3.5%	2.5% to 3.5% Additional level connection with 10th Ave via Fir ramp	2.5% to 3.5%	2.5% to 3.5% Additional level connection with 7th Ave via Hemlock ramp	3% to 4.5% Raising the path ~1m requires making the path steeper	2.5% to 3.5%
Consistent Connector width (doesn't have to pinch at ends)	✓	✓	✓	✓	May require narrowing path at ends to accommodate movement on & off the centre path	Requires narrowing bike lanes at north end to accommodate a southbound bus boarding island
Number of ramps to cross when cycling main span	2 Crossings would be signalized	2 Crossings would be signalized	2 Crossings would be signalized	2 Crossings would be signalized	0 Avoids need to cross ramps	2 Crossings would be signalized

CRITERIA 4: CYCLING NETWORK

	West Side	West Side +	East Side	East Side +	Raised Centre	Both Sides
OVERALL GRADE	B	A	B	A	B	B
Directness to key destinations, e.g. ■ Granville-Granville ■ Arbutus Greenway	✓	✓	✓	✓	✓	✓
Additional cycling connections via ramp enhancements	None Potential for enhancements to Fir/4th ramps in future	Additional level connection with the 10th Ave bike route via Fir ramp	None Potential for enhancements to Hemlock ramp in future	Additional level connection with 7th Ave bike route via Hemlock ramp	None	None Potential for enhancements to Hemlock and Fir/4th ramps in future (but might encourage wrong-way cycling)
Elevator/stair access to new public space below Granville Bridge via Vancouver House	Direct access	Direct access	Direct access	Direct access	Access one block away via future Granville-Neon intersection	Direct access
Cycling delay					Fewer signalized crossings for cycling trip between Drake and 5th Ave	

CRITERIA 5A: VIEWS

	West Side	West Side +	East Side	East Side +	Raised Centre	Both Sides
OVERALL GRADE	A	A+	B+	A+	C	A+
Quality of Views	Unobstructed west side views for people walking & cycling	Unobstructed west side views for people walking & cycling Unobstructed east side views for people walking Unique views for people walking via Hemlock ramp Unique views for people cycling via Fir ramp	Unobstructed east side views for people walking & cycling	Unobstructed east side views for people walking & cycling Unobstructed west side views for people walking Unique views for people cycling via Hemlock ramp	Unique experience Limited water views in both directions Hinders views in one direction for people driving or taking transit	Unobstructed west side views for people walking & cycling Unobstructed east side views for people walking & cycling

CRITERIA 5B: PLACEMAKING

	West Side	West Side +	East Side	East Side +	Raised Centre	Both Sides
OVERALL GRADE	A	B	A	B	C	D
Space for placemaking & programming	Up to 4m of additional space	Up to 2m of additional space	Up to 4m of additional space	Up to 2m of additional space	Up to 2m of additional space	Very limited space
Compatibility with specific features	Compatible with balconettes, pocket plazas, additional staircases	Compatible with balconettes, additional staircases	Compatible with balconettes, pocket plazas, additional staircases	Compatible with balconettes, additional staircases	Not compatible with balconettes or additional staircases	Compatible with balconettes, additional staircases

CRITERIA 6: TRANSIT RELIABILITY & FUTURE PRIORITY

	West Side	West Side +	East Side	East Side +	Raised Centre	Both Sides
OVERALL GRADE	A	A	B	B	B	C
Maintains reliable transit	✓	✓	✓	✓	✓	✓
Potential for northbound transit priority downtown beyond Drake St	✓	✓	Significant impacts Would divert northbound general traffic to signalized Seymour ramp	Significant impacts Would divert northbound general traffic to signalized Seymour ramp	✓	Significant impacts Would divert northbound general traffic to signalized Seymour ramp
Potential for northbound transit priority in South Granville	✓	✓	✓	✓	Limited potential due to space constraints at Granville & 5th Ave	Limited potential due to space constraints at Granville & 5th Ave
Potential for southbound transit priority downtown	✓	✓	✓	✓	Limited potential due to space constraints at Granville & Drake	✓
Potential for southbound transit priority in South Granville	✓	✓	✓	✓	Limited potential due to space constraints at Granville & 5th Ave	Limited potential due to space constraints at Granville & 5th Ave

CRITERIA 7: SECURE & INCLUSIVE SPACE

	West Side	West Side +	East Side	East Side +	Raised Centre	Both Sides
OVERALL GRADE	A	A	A	A	B	A
Safe & secure space for all people, at all hours & times of the year	✓	✓	✓	✓	Raised path with traffic on either side may feel isolating to some people Less visibility into path from rest of bridge	✓
Accommodates fast & efficient emergency access	✓	✓	✓	✓	Difficult for emergency services to access	✓

CRITERIA 8: TRAFFIC & PARKING

	West Side	West Side +	East Side	East Side +	Raised Centre	Both Sides
OVERALL GRADE	A	B	A	B	A	B
Accommodates current traffic volumes	✓	✓	✓	✓	✓	✓
Potential delays	New signals at Howe and Fir ramps could slightly increase southbound travel times for trips using ramps	New signals at Howe and Fir ramps could slightly increase southbound travel times for trips using ramps Potential for some localized delays around Fir St	New signals at Hemlock and Seymour ramps could slightly increase northbound travel times for trips using ramps Seymour ramp signal may divert some northbound traffic to Granville St downtown	New signals at Hemlock and Seymour ramps could slightly increase northbound travel times for trips using ramps Seymour ramp signal may divert some northbound traffic to Granville St downtown Potential for some localized delays around Fir St	Slightly less delay for vehicles using on-/off- ramps compared to east or west side options, since ramps are not signalized Slight more delay for vehicles traveling between Granville St downtown and south Granville, due to wider crosswalk and longer signals at 5th and at Drake	New signals at Howe, Fir, Hemlock, and Seymour ramps could slightly increase travel times for trips using ramps (northbound and southbound) Seymour ramp signal may divert some northbound traffic to Granville St downtown
Local circulation or parking impacts	N/A	May require restricting left turn from northbound Fir to westbound Broadway May require vehicle circulation changes on 10th Ave	N/A	May require restricting northbound right turn and southbound left turn at Hemlock & 6th Ave May require vehicle circulation changes on 7th Ave May require a few parking stalls to be removed on Granville between 6th & 8th Ave	May require a few parking stalls to be removed at Granville & 5th Ave	May require a few parking stalls to be removed at Granville & 5th Ave

CRITERIA 9: FUTURE FLEXIBILITY | COMPATIBILITY WITH RELATED PROJECTS

	West Side	West Side +	East Side	East Side +	Raised Centre	Both Sides
OVERALL GRADE	A	A	A	A	C	B
Compatibility with Granville Island Elevator, including: ■ staircase ■ bus stops on bridge ■ signalized crossing on bridge Note: elevator would be on one side or both sides, not in centre	✓	✓	✓	✓	✓ Allows for two-stage signalized crossing, which would have less impacts to traffic than other options Requires modifications to Connector so that it ramps down to bridge deck level at crossing	✓ Designing to accommodate bus stops requires narrowing the path for a significant stretch above Granville Island
Compatibility with potential future improvements to on-/ off-ramps	✓	✓	✓	✓	Difficult to connect ramp improvements to raised Connector	✓ Additional bike connections on Fir and/or Hemlock ramps could encourage wrong-way cycling
Compatibility with other elevators & staircases (e.g. Seawall)	✓	✓	✓	✓	Not compatible, since sides of bridge can't be reached from centre path without full signal	✓
Ability to reconfigure travel lanes in future	✓	✓	✓	✓	Difficult & more costly to alter the raised centre structure	✓

CRITERIA 10: COST						
	West Side	**West Side +**	**East Side**	**East Side +**	**Raised Centre**	**Both Sides**
Cost Note: estimates are preliminary & include a large contingency. They are intended for comparative purposes only.	**$20M to $30M**	**$30M to $40M**	**$20M to $30M**	**$25M to $35M**	**$45M to $55M**	**$20M to $30M**

Eliminated Options Overview

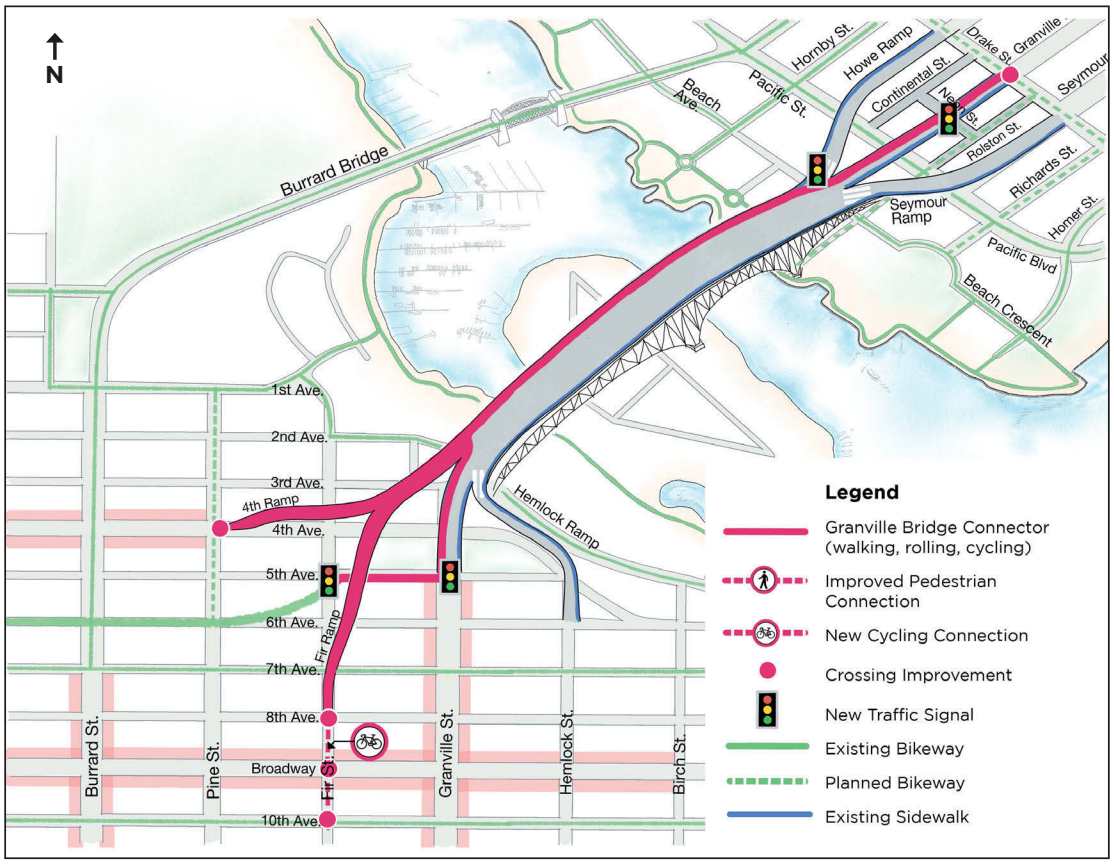
Staff looked at **more than 20 options** leading up to Phase 2. Many were eliminated during the screening process because of **critical flaws** or **inability to achieve project goals**. Others went through a more rigorous internal evaluation process.

Many of the eliminated options are highlighted in this section, though some subtle variations are not shown.

WEST SIDE OPTION
CAR-FREE RAMPS VARIANT

DESCRIPTION

- Expand on the shortlisted 'West Side' option by making the Fir & 4th Ave off-ramps car-free public spaces with walking & cycling connections



BENEFITS

Same as 'West Side' except:

+ Eliminates the need for a crossing at Fir ramp
+ Creates a 'NYC High Line' public space on the Fir ramp with a birds-eye view of the city
+ Relatively flat walking, rolling, and cycling connections via Fir & 4th Ave ramps

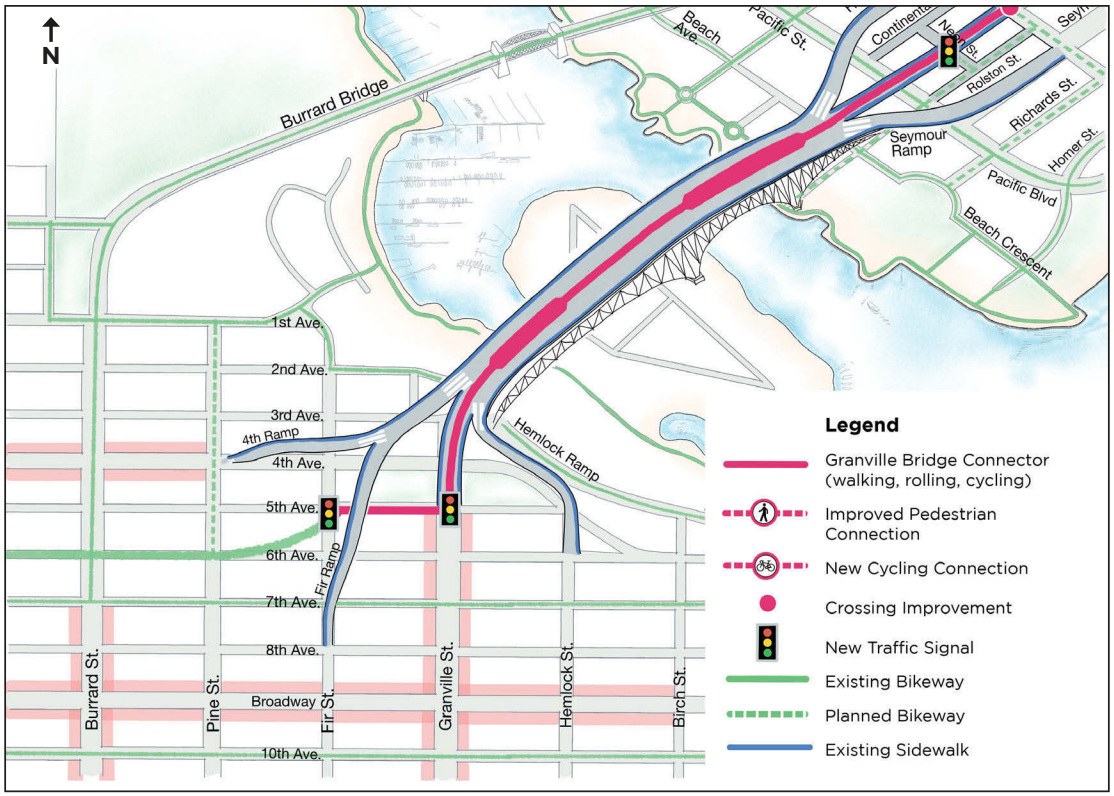
CHALLENGES

- All southbound bridge traffic would be routed via Granville St to at least 5th Ave; this would lead to increases in traffic further south on Granville
- Very challenging for Vancouver Fire & Rescue services as 4th ramp provides critical access to higher risk neighbourhood with older buildings
- Some vehicle delay, circulation, and parking impacts around Fir St

RAISED CENTRE OPTION
FOUR-LANE VARIANT

DESCRIPTION

- Expand on the shortlisted 'Raised Centre' option by reallocating four lanes instead of two
- Leaves four lanes on the bridge deck with 1.5m shoulders to facilitate access for emergency services and bridge maintenance work
- Path narrows mid-span to accommodate potential bus stops to serve the Granville Bridge elevator



BENEFITS

Same as 'Raised Centre' except:

+ Widens Connector by ~2m mid-span to provide additional space for path enhancements and placemaking (~10m total)

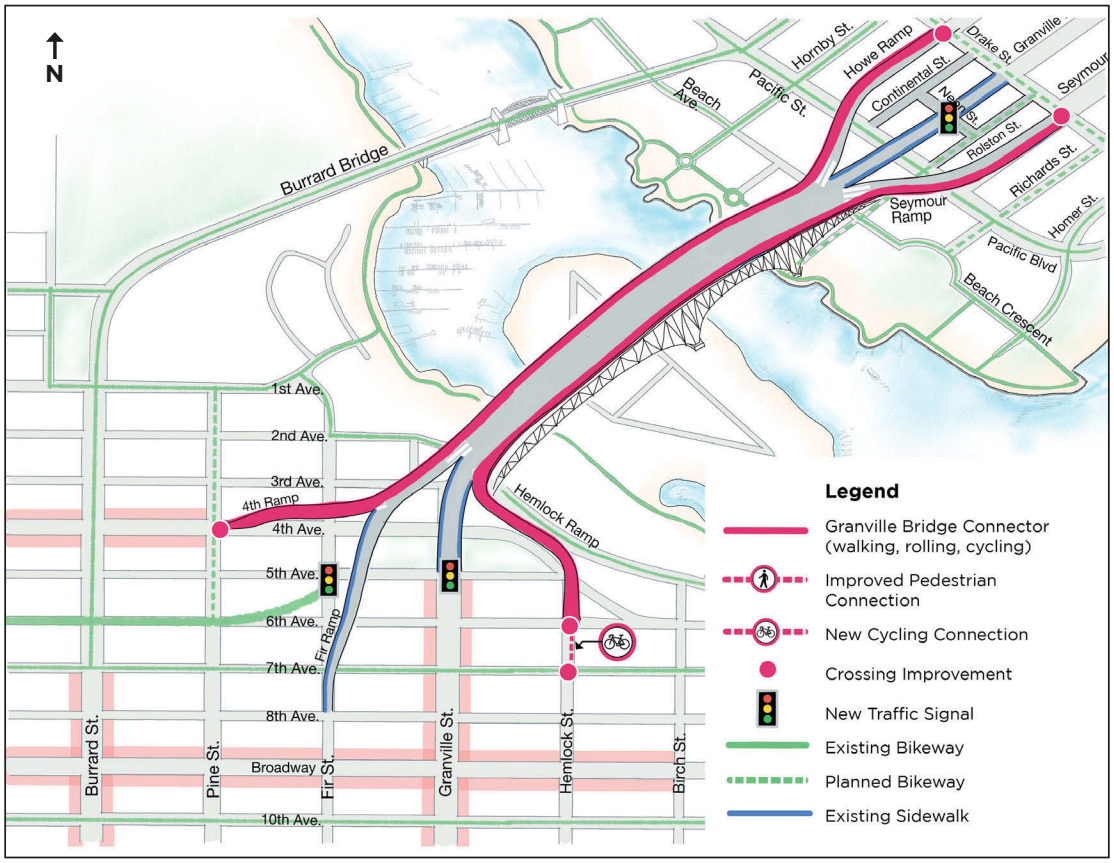
CHALLENGES

- Significant northbound traffic, transit, and emergency service delays on Granville St due to single-lane approaches to bridge (would require ~30% reduction in northbound traffic volumes)
- Requirements for 1.5m shoulder limits additional width that would otherwise be provided by extra lane reallocation
- Additional width would only be for ~25% of bridge length, since Connector would have to narrow at ends to accommodate traffic, and mid-span to allow for potential bus stops to serve a future Granville elevator
- Limited lane flexibility could result in more frequent lane closures for maintenance and emergency operations, further impacting transit service

BOTH SIDES OPTION
'FOLLOW THE RAMPS' VARIANT

DESCRIPTION

- Same as shortlisted 'Both Sides' option but continues paths along on-/off-ramps instead of connecting to Granville St
- Requires making 4th and Hemlock ramps car-free, and narrowing Seymour and Howe ramps to a single traffic lane



BENEFITS

Same as 'Both Sides' except:

+ Avoids need to cross ramps at either end of the bridge

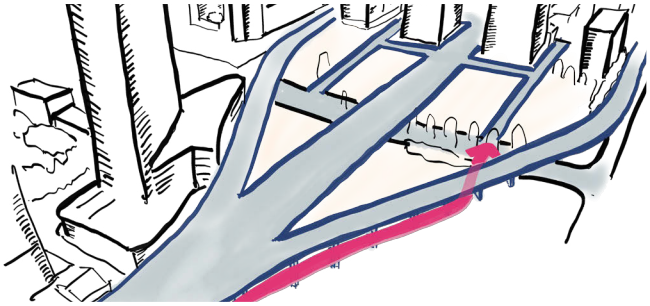
CHALLENGES

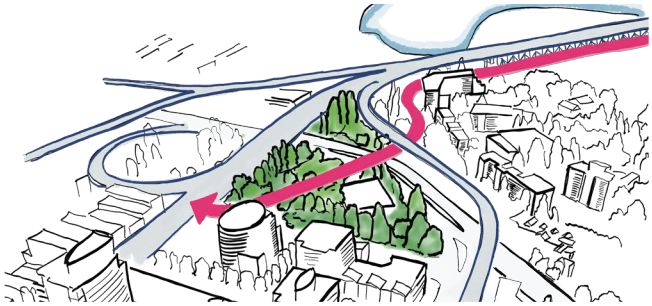
- Does not provide direct connections to Granville St downtown or South Granville shopping district
- Significant traffic delays in both directions (would require a ~30% reduction in traffic)
- Significant delays to transit along Granville St unless major transit priority measures are implemented
- Very challenging for Vancouver Fire & Rescue services as 4th ramp provides critical access to higher risk neighbourhood with older buildings
- A narrow section on the Seymour ramp would require a section with sub-standard sidewalk width

UNDERSIDE OPTION

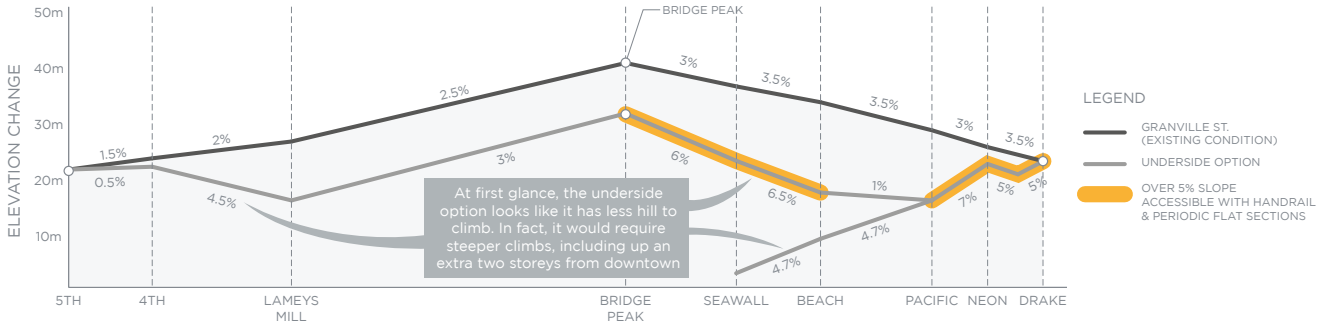
DESCRIPTION

- New structure underneath the bridge deck, cantilevered off the east side
- Connect near Granville at 5th Ave (south end) and to Beach Cr or Pacific St (north end)
- Potential for direct connections to Seawall via additional elevators, staircases, and switchback ramps
- Note: an underside connection on the west side of the bridge is not feasible due to existing buildings, development, and land ownership





UNDERSIDE ROUTE DIFFICULTY ANALYSIS



BENEFITS

+ Avoids any traffic impacts to bridge beyond those incurred from a new signal at 5th Ave
+ Avoids the need to cross on-/off-ramps at either end of the bridge
+ Potential for rain protected space

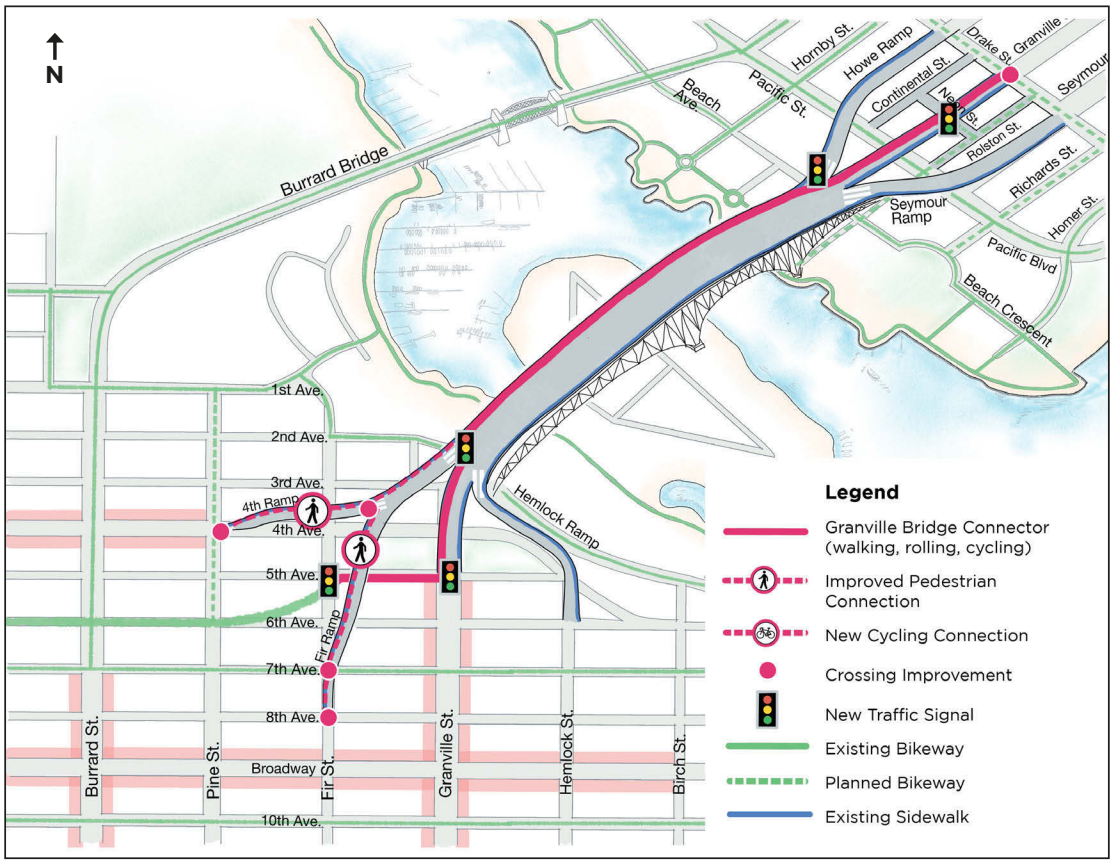
CHALLENGES

- Significantly more expensive than other options ($150M+)
- Weaving through bridge structure while ensuring appropriate clearances for streets and False Creek's navigable channel results in an additional 2-storey climb (6m) relative to using the existing bridge, plus steep grades at the north end (6% to 7%)
- Very challenging access for emergency services
- Potential to feel less safe and secure for some people due to fewer 'eyes on the space' and perception of feeling trapped
- Significant impacts to parks at south end, which includes mature trees
- Requires property acquisition at north end

WEST SIDE OPTION
WIDENED RAMPS SIDEWALK VARIANT

DESCRIPTION

- Expand on the shortlisted 'West Side' option by also widening the existing sidewalks on both the Fir and 4th off-ramps



BENEFITS

Same as 'West Side' except:

+ Makes the existing substandard sidewalks on the Fir and 4th ramps accessible

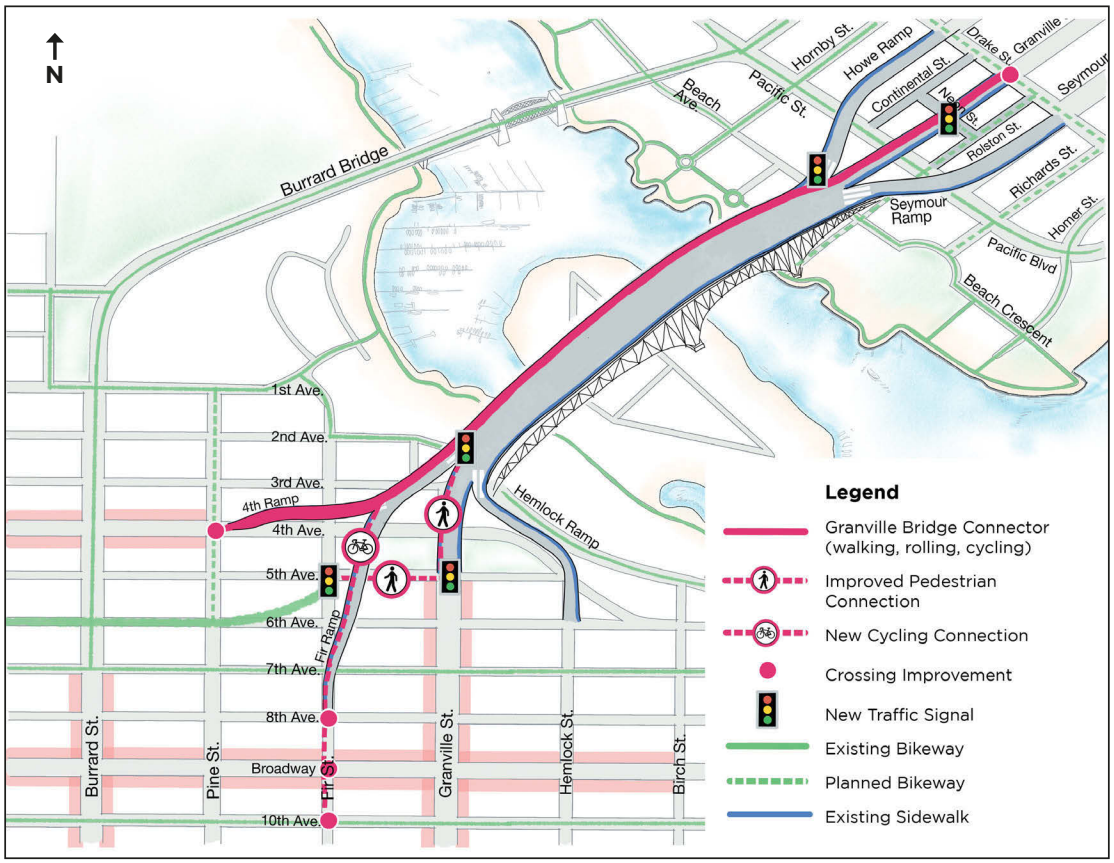
CHALLENGES

- Very challenging to improve the crosswalk at the fork on the Fir ramp
- Many people likely to cycle on the widened sidewalks on the Fir and 4th ramps, because they provide more direct connections to 10th Ave and the Seawall; likely to result in conflicts between people walking and cycling

WEST SIDE OPTION
CAR-FREE 4th RAMP & BIKE LANES ON FIR RAMP VARIANT

DESCRIPTION

- Expand on the shortlisted 'West Side' option by making the 4th ramp car-free and adding two-way protected bike lanes down the Fir ramp



BENEFITS

Same as 'West Side' except:

+ Eliminates the need for a crossing at Fir ramp
+ Accessible and wide sidewalk on the 4th ramp
+ Relatively flat cycling connections on the Fir & 4th Ave ramps
+ Car-free public space on 4th Ave ramp

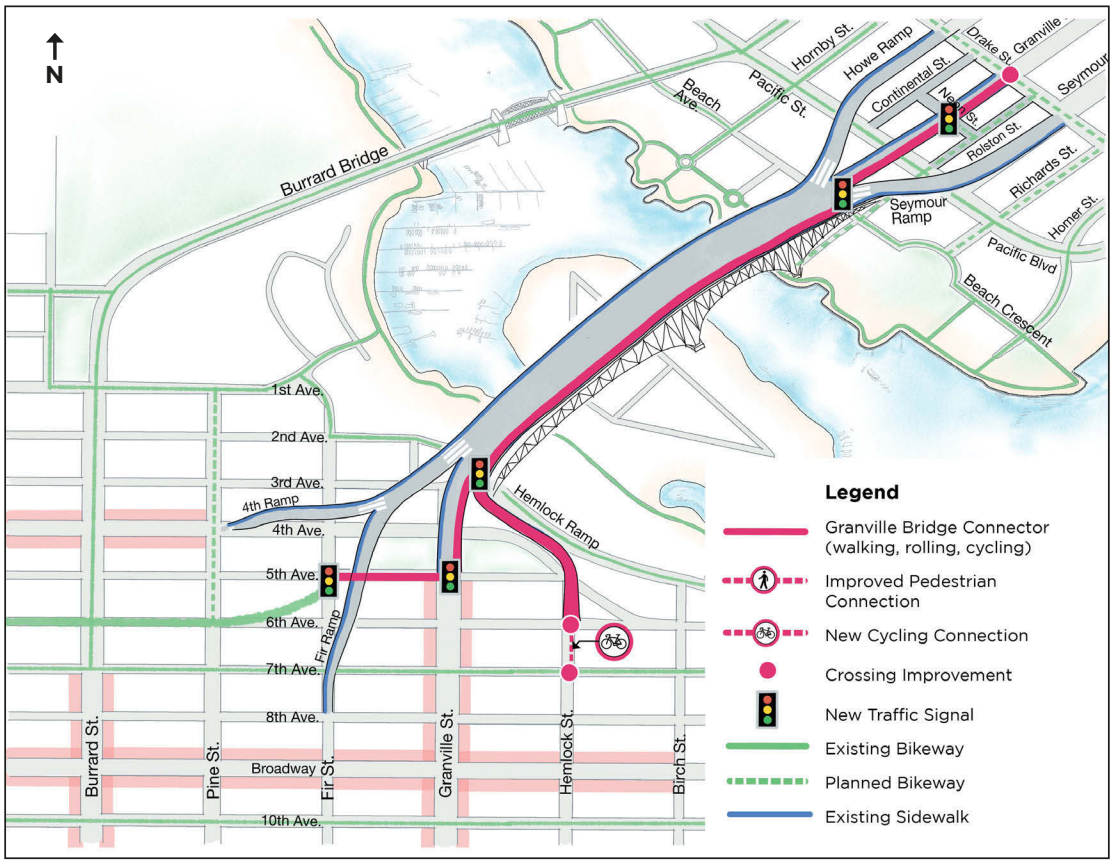
CHALLENGES

- Very challenging for Vancouver Fire & Rescue services as 4th ramp provides critical access to higher risk neighbourhood with older buildings
- Some vehicle delay, circulation, and parking impacts around Fir St
- Space at the Fir ramp is very tight, limiting the ability to provide a direct bike connection with South Granville

EAST SIDE OPTION
CAR-FREE HEMLOCK RAMP VARIANT

DESCRIPTION

- Expand on the shortlisted 'East Side' option by making the Hemlock on-ramp a car-free public space with walking & cycling connections



BENEFITS

Same as 'East Side' except:

+ Creates a 'NYC High Line' public space on the Hemlock ramp with a birds-eye view of the city
+ Relatively flat walking, rolling, and cycling connections via Hemlock ramp

CHALLENGES

- Significant northbound traffic impacts from diverting existing Hemlock ramp traffic onto Granville St south of the bridge
    - not feasible to divert existing northbound Hemlock traffic at 5th or 6th Ave; most northbound traffic would access Granville at Broadway or 16th Ave
    - Converting Granville St south to two southbound and four northbound lanes could mitigate impacts, but would require turn restrictions at Broadway-Granville (two truck routes) and have significant parking impacts
- Significant local traffic access impacts on 6th and 7th Ave

RAISED CENTRE OPTION EXTRA-HEIGHT VARIANT

DESCRIPTION

- Adjust the shortlisted 'Raised Centre' option, raising it high enough so that it can span over travel lanes below, providing more public space and improved views

BENEFITS

Same as 'Raised Centre' except:

+ Provides improved views
+ Provides additional width for path enhancements and more public space

CHALLENGES

- Extremely challenging from a structural point of view due to increased weight, increased wind-loading, and altered seismic response of bridge
- Steeper path with more challenging grades over a longer distance (4% to 5% on south end, 5% to 6% on north end)
- Significantly more expensive than basic 'Raised Centre' option due to increased seismic upgrades required
- Complicates connections with potential future elevator to Granville Island
- Requires costly new trolley infrastructure across the entire bridge

SEAWALL-TO-SEAWALL (NEW STRUCTURE)

DESCRIPTION

- A new bridge for walking, rolling, and cycling across False Creek, connecting to the Seawall on each side
- Would not necessarily have to follow Granville Bridge alignment (e.g. could be elsewhere in False Creek / English Bay)

BENEFITS

+ Provides direct Seawall-to-Seawall connection
+ Potential for relatively level connection if a movable design were pursued (e.g. draw bridge or swing bridge), or with changes to navigable waters legislation

CHALLENGES

- Very high cost
- Likely requires land acquisition
- Requires thorough review of navigable waters legislation and integration with sea level rise mitigation/adaptation efforts
- Does not address existing safety and accessibility issues on Granville Bridge
- Primarily recreational; may have less impact on non-recreational mode share

BOTH SIDES OPTION
BI-DIRECTIONAL BIKE LANES VARIANT

DESCRIPTION

- Adjust the shortlisted 'Both Sides' option so that two-way bike lanes are provided on each side of the bridge rather than one-way lanes
- Consider additional two-way bike connections on the Fir ramp (similar to 'West Side +' option) and Hemlock ramp (similar to 'East Side +' option)

BENEFITS

Similar to 'Both Sides', except

+ Provides excellent cycling network connectivity

CHALLENGES

Similar to 'Both Sides', except

- Existing sidewalks could be widened only ~0.3m at most, leaving no room for seating, placemaking, or other path enhancements
- Very challenging and costly to remove stairs in crosswalks
- Requires ending one of the two-way bike paths at Granville-Neon due to space constraints

REVERSIBLE LANE
(VARIANT ON ALL SHORTLISTED OPTIONS)

DESCRIPTION

- Reallocate three lanes instead of two towards the Connector, leaving five general traffic lanes (two in each direction plus a reversible lane)

BENEFITS

+ Provides additional ~3m of space for path

CHALLENGES

- Increased operating costs
- Requires complex signing and lane transitions that could be confusing to drivers
- Potential delays to transit and traffic in the off-peak direction

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Eliminated Options Selected Evaluation

This section highlights staff evaluation of selected options that were eliminated.

Staff have highlighted these options given the amount of discussion they generated in Phase 1 of public engagement (spring 2019).

CRITERIA 1: WALKING & ROLLING COMFORT

	West Side Car Free Ramps Variant	Raised Centre Four Lane Variant	Both Sides 'Follow the Ramps' Variant	Underside
Quality of buffer from traffic	Bike lane provides additional separation from traffic	Limited lateral buffer from traffic	Bike lane provides additional separation from traffic	Fully grade separated from traffic, with some weather protection
Space for people to walk in groups **Space for seating & basic amenities**	Allows for 3m minimum path Plus up to 4m of additional space	Allows for 3m minimum path Plus up to 4m of additional space	Widens existing sidewalks to ~3m Space for occasional bench	Assume 3m minimum path Space for occasional bench
Interaction with other modes of travel	Dedicated pedestrian-only space Motor vehicle traffic on one side	Dedicated pedestrian-only space Motor vehicle traffic on both sides	Dedicated pedestrian-only space Motor vehicle traffic on one side	Dedicated pedestrian-only space Motor vehicle traffic on different level
Grades (steepness of path)	2.5% to 3.5% Additional level connections on Fir and 4th ramps	3% to 4.5% Raising the path ~1m requires making the path steeper	2.5% to 3.5% Additional level connection via 4th and Hemlock ramps	1% to 7% Significant accessibility challenges
Accessibility improvements to existing crosswalks	Addresses one side	Does not address either side	Addresses both sides	Does not address either side
Consistent Connector width (doesn't have to pinch at ends)	✓	Requires narrowing Granville St sidewalks south of Drake for one block	✓	✓
Number of ramps to cross when walking centre span	1 Crossing would be signalized	0 Avoids need to cross ramps	0 Avoids need to cross ramps	0 Avoids need to cross ramps

CRITERIA 2: WALKING & ROLLING NETWORK

	West Side Car Free Ramps Variant	Raised Centre Four Lane Variant	Both Sides 'Follow the Ramps' Variant	Underside
Directness to key destinations, e.g. ▪ Granville-Granville ▪ Arbutus Greenway	✓	✓	Does not provide direct Granville-to-Granville connection	Does not provide direct Granville-to-Granville connection Slightly more direct Seawall connection on north end
Additional walking connections via ramp enhancements	Improvements on Fir and 4th ramps provide accessible connections	None	N/A (paths are already on ramps)	None
Ability to connect with existing ramp sidewalks	Howe ramp	Not possible	N/A (paths are already on ramps)	Not possible
Elevator/stair access to new public space below Granville Bridge via Vancouver House	Direct access	Access one block away via future Granville-Neon intersection	None	N/A Connector lands close to new public space

CRITERIA 3: CYCLING COMFORT

	West Side Car Free Ramps Variant	Raised Centre Four Lane Variant	Both Sides 'Follow the Ramps' Variant	Underside
Space for passing & accommodating different cycling speeds **Space for cycling with other**	Allows for 3m minimum path Plus up to 4m of additional space	Allows for 3m minimum path Plus up to 4m of additional space	2.5m one-way cycling paths on each side of bridge allow for passing	Assume 3m minimum path
Interaction with other modes of travel	Dedicated cycling-only space Motor vehicle traffic on one side	Dedicated cycling-only space Motor vehicle traffic on both sides	Dedicated cycling-only space Motor vehicle traffic on one side	Dedicated cycling-only space Motor vehicle traffic on different level
Grades (steepness of path)	2.5% to 3.5% Additional level connection with 10th Ave via Fir ramp Additional connection to Pine via 4th ramp	3% to 4.5% Raising the path ~1m requires making the path steeper	2.5% to 3.5% Additional level connection via 4th and Hemlock ramps	1% to 7% Significant accessibility challenges
Consistent Connector width (doesn't have to pinch at ends)	✓	May require narrowing path at ends to accommodate movement on & off the centre path	✓	✓
Number of ramps to cross when cycling mid-span	1 Crossing would be signalized	0 Avoids need to cross ramps	0 Avoids need to cross ramps	0 Avoids need to cross ramps

CRITERIA 4: CYCLING NETWORK

	West Side Car Free Ramps Variant	Raised Centre Four Lane Variant	Both Sides 'Follow the Ramps' Variant	Underside
Directness to key destinations, e.g. ■ Granville-Granville ■ Arbutus Greenway	✓	✓	Does not provide direct Granville-to-Granville connection	Does not provide direct Granville-to-Granville connection Slightly more direct Seawall connection on north end
Additional cycling connections via ramp enhancements	Additional level connection with 10th Ave via Fir ramp Additional connection to Pine via 4th ramp	None	Additional level connection to Pine via 4th ramp Additional level connection to 7th Ave via Hemlock ramp	None
Elevator/stair access to new public space below Granville Bridge via Vancouver House	Direct access	Access one block away via future Granville-Neon intersection	None	N/A Connector lands close to new public space

CRITERIA 5A: VIEWS

	West Side Car Free Ramps Variant	Raised Centre Four Lane Variant	Both Sides 'Follow the Ramps' Variant	Underside
Quality of Views	Unobstructed west side views for people walking & cycling Unique view for people walking and cycling via 4th and Fir ramps	Unique experience Limited water views in both directions Hinders views in one direction for people driving or taking transit	Unobstructed west side views for people walking & cycling Unobstructed east side views for people walking & cycling Uniqure views from Fir and Hemlock ramps for people walking and cycling	Unobstructed view looking down and east towards False Creek Close up view of bridge structure No views of mountains or skyline

CRITERIA 5B: PLACEMAKING

	West Side Car Free Ramps Variant	Raised Centre Four Lane Variant	Both Sides 'Follow the Ramps' Variant	Underside
Space for placemaking & programming	Up to 4m of additional space	Up to 4m of additional space	Very limited space	Very limited space
Compatibility with specific features	Compatible with balconettes, pocket plazas, additional staircases	Not compatible with balconettes, additional staircases	Compatible with balconettes, additional staircases	Compatible with additional staircases

CRITERIA 6: TRANSIT RELIABILITY & FUTURE PRIORITY

	West Side Car Free Ramps Variant	Raised Centre Four Lane Variant	Both Sides 'Follow the Ramps' Variant	Underside
Maintains reliable transit	Some impacts	Significant impacts	Significant impacts	✓
Potential for northbound transit priority downtown beyond Drake St	✓	✓	Very challenging as changes to Seymour ramp already divert significant general traffic to Granville St downtown	✓
Potential for northbound transit priority in South Granville	✓	Limited potential due to space constraints at Granville-5th Ave	Very challenging as car-free Hemlock ramp diverts significant general traffic to Granville St	✓
Potential for southbound transit priority downtown	✓	Limited potential due to space constraints at Granville-Drake	✓	✓
Potential for southbound transit priority in South Granville	✓	Limited potential due to space constraints at Granville-5th Ave	✓	✓

CRITERIA 7: SECURE & INCLUSIVE SPACE				
	West Side Car Free Ramps Variant	**Raised Centre Four Lane Variant**	**Both Sides 'Follow the Ramps' Variant**	**Underside**
Safe & secure space for all people, at all hours & times of the year	✓	Raised path with traffic on either side may feel isolating to some people Less visibility into path from rest of bridge	✓	May feel isolating to some people No visibility into path from rest of bridge
Accommodates fast & efficient emergency access	Challenging for Vancouver Fire & Rescue, as 4th ramp provides important access to higher risk area with older buildings	Very difficult for emergency services to access Traffic delays could cause additional access challenges	Single lane sections could be challenging for emergency access Traffic delays could cause additional access challenges	Extremely difficult for emergency services to access

CRITERIA 8: TRAFFIC & PARKING

	West Side Car Free Ramps Variant	Raised Centre Four Lane Variant	Both Sides 'Follow the Ramps' Variant	Underside
Accommodates current traffic volumes	Significant impacts	Significant impacts	Significant impacts	✓
Potential delays	All southbound bridge traffic would be routed via Granville St to at least 5th Ave; this would lead to increases in traffic further south on Granville Potential for localized delays on Fir St.	Significant northbound delays on Granville St due to it having to merge to a single lane Would require a 30% reduction in northbound traffic to operate at a reasonable level of service	Significant delays due to car-free ramps at south end and narrowing both the Seymour and Howe ramps to a single lane Would require a 30% reduction in traffic in both directions to operate at a reasonable level of service	None
Local circulation or parking impacts	May require restricting left turn from northbound Fir to westbound Broadway May require vehicle circulation changes on 10th Ave May require removal of parking along west side of Fir St with a southbound travel lane from 5th Ave to Broadway	May require a few parking stalls to be removed at Granville & 5th Ave	Challenging to accommodate slip lanes at north ends of Howe and Seymour ramps - may impact local access	None

CRITERIA 9: FUTURE FLEXIBILITY | COMPATIBILITY WITH RELATED PROJECTS

	West Side Car Free Ramps Variant	Raised Centre Four Lane Variant	Both Sides 'Follow the Ramps' Variant	Underside
Compatibility with Granville Island Elevator, including: ■ staircase ■ bus stops on bridge ■ signalized crossing on bridge Note: elevator would be on one side or both sides, not in centre	✓	✓ Allows for two-stage signalized crossing, which would have less impacts to traffic than other options Requires modifications to Connector so that it ramps down to bridge deck level at crossing	✓ Designing to accommodate bus stops requires narrowing the path for a significant stretch above Granville Island	✓
Compatibility with potential future improvements to on-/ off-ramps	✓	Difficult to connect ramp improvements to raised Connector	N/A Path is already on ramps	✓
Compatibility with other elevators & staircases (e.g. Seawall)	✓	Not compatible, since sides of bridge can't be reached from centre path without full signal	✓	✓
Ability to reconfigure travel lanes in future	✓	Difficult & more costly to alter the raised centre structure	✓	✓

CRITERIA 10: COST				
	West Side Car Free Ramps Variant	**Raised Centre Four Lane Variant**	**Both Sides 'Follow the Ramps' Variant**	**Underside**
Cost Note: estimates are preliminary & include a large contingency. They are intended for comparative purposes only		**$50M to $60M**		**$150M+**

GRANVILLE BRIDGE CONNECTOR