Bellevue Grand Connection: I-405 Crossing – Downtown to Eastrail

Structural Type, Size, and Location Report
July 2024

Submitted to
City of Bellevue – Transportation
450 110th Avenue NE
Bellevue, WA 98004

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Revisions

Date	Description	Edited By
June 2024	Draft TS&L Report	FHS/MB/LW
July 2024	Final TS&L Report	FHS/SB/LW

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LIST OF ACRONYMS/ABBREVIATIONS

ADA.....Americans with Disabilities Act
AR.....Greater Kelsey Creek Watershed Assessment Report
BMP..... Best Management Practice
CIP .....Cast-in-Place
DAHP .....Washington State Department of Archaeology and Historic Preservation
dBA..... A-weighted Decibels
Ecology .....Washington State Department of Ecology
ETL ..... Electronic Toll Lane
FHWA..... Federal Highway Administration
GCC .....Grand Connection Crossing
HOV..... High-occupancy Vehicle
HRM ..... Highway Runoff Manual
I-405..... Interstate 405
KGIP .....KG Investment Properties
LID..... Low Impact Development
MR .....Minimum Requirement
NE .....Northeast
NPDES..... National Pollutant Discharge Elimination System
NRHP.....National Register of Historic Places
OSCA.....Open Streams Condition Assessment
PGIS.....Pollution Generating Impervious Surfaces
PT .....Post-tensioned
ROW .....Right-of-Way
station, the.....Sound Transit Bellevue Downtown Station
TESC..... Temporary Erosion and Sediment Control
TS&L ..... Type, Size, and Location
WDFW.....Washington Department of Fish and Wildlife
WSDOT ..... Washington State Department of Transportation

1.0 EXECUTIVE SUMMARY

1.1 Type Selection Process

This report outlines the evaluation process and subsequent recommendations for the configuration and structure type of the proposed Grand Connection Crossing (GCC). Due to the length of the crossing, the GCC was divided into five main structural segments: west tie-in, west node, Interstate 405 (I-405) crossing, east node, and Eastrail tie-in, as shown in Figure 1. Each segment underwent a thorough assessment of various structure types. Cast-in-place (CIP) post-tensioned (PT) concrete box girder, precast concrete girders network tied arch, truss, and cable-stayed structures were evaluated.

Due to the complex geometry of the west and east node structures, all alternatives are to have CIP PT box girder structures at the west and east nodes. Also, Eastrail tie-in structures are to be consistent between the alternatives for consistency of structure. Therefore, comparison of the alternatives were made specifically for the west tie-in and I-405 crossing structures.

Figure 1: Conceptual layout of the Grand Connection Crossing (in blue), with main structural segments identified.

Table 1 lists the evaluation criteria that were assigned to compare the alternatives of the west tie-in and I-405 crossing. Each structure was evaluated with maximum score of 100 and the scores were combined at the end.

Table 1: GCC structure-type evaluation criteria and maximum points.

Evaluation Criteria	Maximum Points
Criterion 1 – Estimated Construction Cost	20
Criterion 2 – User Experience	25
Criterion 3 – Aesthetics	15
Criterion 4 – Maintainability/Life-cycle Costs	20
Criterion 5 – Compatibility with Future Lid	20
Total Score	100

1.2 Evaluation Scores and Construction Cost Estimate

Structure types and estimated construction costs are shown in Table 2, and the evaluation scores are shown in Table 3.

The purpose of the GCC is documented in the project Purpose and Need with an emphasis on providing pedestrian and bicycle-focused connection between downtown Bellevue and Eastrail. Qualitative assessments of the user experience and aesthetics were conducted for each bridge alternative. While evaluation of the user experience focuses on the comfort when being on the

structure, aesthetics refers to the overall look and feel of the bridge from the point of view of external users from vantage points off the GCC.

In addition, maintenance and life-cycle costs associated with the structure type are considered as a part of this study. For example, structural steel and cable-stayed structures will require more frequent maintenance compared to CIP PT concrete box girder structures, which ultimately leads to higher life-cycle costs.

While this report does not include the study of a future lid, it is important for GCC to be compatible with a future lid over I-405. A bridge type that provides more permeable interface with a future lid scores higher than those with more limited interfaces.

Construction costs are based on conceptual level design and are meant to communicate relative cost of one alternative to another for structure type decision-making purposes only. Construction contingency, right-of-way, and cost of construction management are also excluded. A more detailed cost estimate will be developed as part of the 30 percent design effort. Note that the costs below were generated in today's dollars and do not include increases due to inflation or other factors. The estimated construction cost is based on dollar per square footage of the bridge deck area, and they are also based on similar-sized projects in the Seattle area.

Table 2: Estimated construction costs for the bridge alternatives.

Alternative	Bridge Structure Alternative Combination	Construction Cost Estimate		
		Average	Low (75%)	High (125%)
1A	CIP PT Box Girder West Tie-In + CIP PT Box Girder with Pier in I-405	$242,910,000	$182,180,000	$303,640,000
1B	CIP PT Box Girder West Tie-In + CIP PT Box Girder without Pier in I-405	$235,510,000	$176,630,000	$294,390,000
2A	Plaza Extension & CIP PT Box Girder West Tie-In + CIP PT Box Girder with Pier in I-405	$233,110,000	$174,830,000	$291,390,000
2B	**Plaza Extension & CIP PT Box Girder West Tie-In + CIP PT Box Girder without Pier in I-405**	**$225,710,000**	**$169,280,000**	**$282,140,000**
3A	Cable Stayed West Tie-In + CIP PT Box Girder with Pier in I-405	$246,580,000	$184,940,000	$308,230,000
3B	Cable Stayed West Tie-In + CIP PT Box Girder without Pier in I-405	$239,180,000	$179,390,000	$298,980,000
4	Cable Stayed West Tie-In + Network Tied Arch over I-405	$249,710,000	$187,280,000	$312,140,000
5	Steel Truss West Tie-In + Steel Truss over I-405	$297,150,000	$222,860,000	$371,440,000

Table 3: Evaluation scores for the combined west tie-in and I-405 crossing bridge alternatives.

West Tie-In and I-405 Combination Bridge Structure Alternative		Criterion 1 Est. Const. Cost	Criterion 2 User Experience	Criterion 3 Structure Aesthetics	Criterion 4 Maintainability/ Life-Cycle Costs	Criterion 5 Compatibility	TOTAL
	POSSIBLE	40	50	30	40	40	200
West Tie-In Alternative	**I-405 Crossing Alternative**						
CIP PT Box Girder	CIP PT Box Girder + With Center Pier in I-405 ROW	20	35	25	40	35	155
CIP PT Box Girder	CIP PT Box Girder + No Center Pier in I-405 ROW	25	35	25	40	30	155
Plaza Extension + CIP PT Box Girder	CIP PT Box Girder + With Center Pier in I-405 ROW	20	45	25	40	40	170
Plaza Extension + CIP PT Box Girder	**CIP PT Box Girder + No Center Pier in I-405 ROW**	**25**	**45**	**25**	**40**	**35**	**170**
Cable Stayed	CIP PT Box Girder + With Center Pier in I-405 ROW	20	40	25	30	20	135
Cable Stayed	CIP PT Box Girder + No Center Pier in I-405 ROW	25	40	25	30	15	135
Cable Stayed	Network Tied Arch	20	40	30	20	10	120
Steel Truss	Steel Truss	20	45	30	20	10	125

1.3 Recommendation for Proposed Structure

Based on the evaluation of constraints, understanding of goals from the City, and other constituents and scores from this study, which reflect responsiveness of each structural option for these goals, the following combination of structure types for the GCC project were recommended for the City of Bellevue's consideration:

- West Tie-in: Plaza Extension with CIP PT Concrete Box Girders
- West Node: CIP PT Concrete Box Girders
- I-405 Crossing: CIP PT Concrete Box Girders (one span-no pier within WSDOT right-of-way)
- East Node: CIP PT Concrete Box Girders
- Eastrail Connection: CIP PT Concrete Box Girders

City of Bellevue reviewed the content of the draft type, size, and location (TS&L) document, provided detailed comments and feedback that led to modifications to the TS&L preferred alternative, coordinated with the design team and City leadership, and selected a direction for a preferred alternative. This preferred alternative was selected with the understanding that there are several decisions that could adjust elements of this preferred alternative, primarily in relation to the integration with adjacent property uses, development approaches, and timelines. However, the preferred alternative provides a reasonable approach to what is known today, balancing the basic needs of the crossing and goals of an iconic user experience that brings people to the GCC, while respecting desires and limitations for schedule and budget. The preferred alternative is a CIP PT box girder bridge on the northernmost alignment with widened nodes on each side of and a clear span of I-405. The preferred alternative will integrate with building modifications to extend the parking garage and plaza at the west end gateway and use retaining walls to grade into Eastrail at the east end gateway.

2.0 PROJECT BACKGROUND

2.1 Report Overview

This report presents an evaluation and comparison of alignment and structure type alternatives for the Bellevue Grand Connection Crossing (GCC) over Interstate 405 (I-405) between Bellevue City Hall and Eastrail. The body of this report shows the design process and results from supporting documents, studies, and calculations that are collated in the appendices.

This report describes the site conditions/constraints; presents the design considerations, alternatives considered, their cost estimates, and constructability challenges; compares the alternatives using an evaluation matrix; and provides a recommendation to carry forward to 30 percent design.

2.2 Introduction

The City of Bellevue's Grand Connection program consists of 1.5 miles of interconnected public and pedestrian-focused spaces that traverse a diverse set of site and infrastructure conditions on publicly and privately owned land. It starts at Meydenbauer Bay Park and continues east through downtown Bellevue across I-405, connecting to the Eastrail regional trail as shown in Figure 2. It will be a place where people who live, work, and play in Bellevue can walk, bike, roll, relax, gather, eat, and shop. In addition to creating a great experience for people, the Grand Connection program will enhance Bellevue's livability, economic development, and environmental sustainability.

Figure 2: Vicinity map of the Grand Connection program/corridor.

The planning for the Grand Connection program began in 2015. By 2017, the City of Bellevue had completed the Grand Connection Framework Plan and community engagement, which showed three possible options for crossing I-405, ranging from a simple bicycle and pedestrian bridge to a full park lid over the freeway. In 2023, the Bellevue Grand Connector Feasibility Study Report that considered community input on potential bridge options, was published. This report recommended a bridge alignment south of the I-405 guideway but did not resolve how to support a lid structure over I-405 with limited room for support members.

A key element of the Grand Connection program is the crossing over I-405—the GCC, which will link downtown Bellevue to Eastrail and the Wilburton Transit Oriented Development for people traveling without a car. The GCC will support the transformation of the Wilburton study area into Bellevue's

next urban mixed-use community, where improved amenities, greater livability, opportunities for healthy living, and economic vitality will serve the needs of a diverse and growing population.

GCC segment and the limits of this project will start at City Hall Plaza and terminate at Eastrail, ultimately tying downtown Bellevue into a 175-mile regional trail network that connects more than half a million Eastside residents. The purpose of the GCC is to create a safe, high comfort, transformative connector and crossing of I-405 for people walking, biking, and rolling; enhance access to the regional light rail system; and connect downtown Bellevue to the Wilburton neighborhood. This crossing will also be compatible with a future lid park over I-405, which is a long-range vision included in the City's Grand Connection Framework Plan.

The project is needed to provide:

- Safety for active transportation users (non-motorized human transport, i.e., walking, biking, or rolling)
- Multimodal connectivity between City Hall Plaza and Eastrail and access between downtown Bellevue and Wilburton
- Community connection as envisioned in local land use plans

This new crossing will help address safety concerns for those using the existing crossings of I-405, as well as providing a space that encourages and celebrates the use of non-vehicular modes of travel between downtown Bellevue and Wilburton.

2.3 Bridge Site Conditions

The ends of the GCC are City Hall Plaza to the west, at 168 feet elevation, and a point along Eastrail to the east at 140 feet elevation. The bridge ties into Eastrail south of the Eastrail NE 8th St. bridge and north of NE 4th St. The site topography between the two end points of the bridge dips down as much as 73 feet, as shown in Figure 3. Between the end points, the bridge intersects four development sites and four public rights-of-way (including Washington State Department of Transportation's [WSDOT] I-405). Along the way, there are a mix of public and private ownerships and interests, as shown in Figure 4. Of the five sites, the Metro and Lincoln Center sites are publicly owned, and the Legacy and KG Investment Properties (KGIP) are privately owned. None of the sites have development proposals publicly submitted, but the public sites are under study for development opportunities, and the KGIP site ownership is refining development plans. Of the four public rights-of-way that the GCC will span, most notably is WSDOT's I-405 right-of-way. In addition to the WSDOT right-of-way, the structure will span city streets: 112th Ave. NE, 114th Ave. NE, and 116th Ave. NE, and likely connect to two of those city rights-of-way with vertical circulation nodes to/from the main structure, allowing pedestrians and cyclists to connect to the GCC along the Americans with Disabilities Act (ADA) accessible, all-ages and all-abilities route.

Given this complex mix of ownership and property types, it is essential the GCC is owned (or at least have adequate arial or easement rights where ownership is not an option) and operated by the City of Bellevue from opening day and throughout the lifespan of the crossing to ensure continuous public access and use. Along the route, the structure will be designed to connect to public and private developments and city streets on each side of I-405, ensuring a dynamic and seamless connection across, over, and through the surrounding parcels. Over the I-405 segment, the GCC will be designed to connect to a possible future lid park structure south of the GCC.

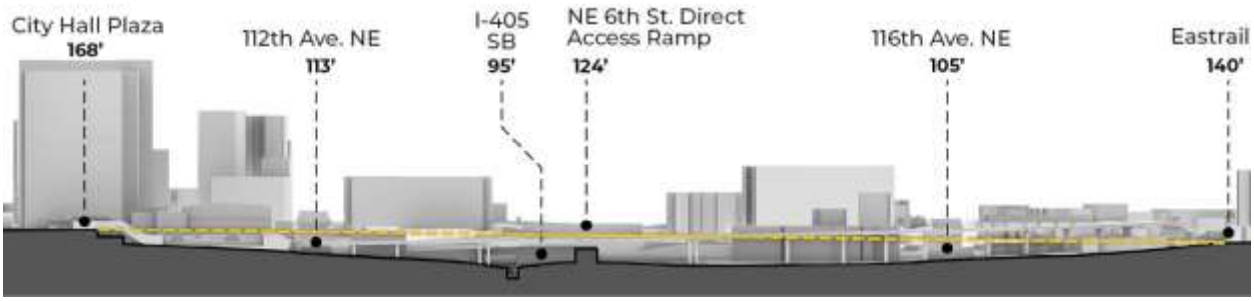

Figure 3: Site section along GCC alignment, elevation view (looking north).

Figure 4: Five sites along GCC alignment, plan view.

2.3.1 Site Descriptions/Development Scenarios

This study considered four developable zones or sites, as shown in Figure 4 above. I-405 is not considered a developable site but included as a notable site of the GCC project. Characteristics, constraints, and opportunities for each site are listed in more detail below. Included figures (Figure 5 to Figure 9) show possible future development scenarios but are not intended to describe every site option or planned/recommended development.

Metro Development Site

The Metro development site is owned by the City of Bellevue and is shown in Figure 5. Surrounding uses include the Sound Transit Bellevue Downtown station to the north, a City parking structure with access ramps to the west, an internal access alley to the south, and the 112th Ave. NE to the east. Current ground level uses include equipment storage for Bellevue Fire and a dog park.

Constrained site/sizes will make building a bridge and future development highly dependent on one another. The site is 117 feet wide and 294 feet long, not considering required setbacks from the Sound Transit structure, parking structure, and infrastructure required to access each (sidewalks, maintenance access, loading/servicing, fire access, etc.).

As the bridge alignment was developed, the design team considered north and south spans for a possible bridge alignment. The Alignment Alternatives Analysis report (see Appendix F) recommends a north span option, as close to the Sound Transit station and guideway as possible, in order to leave the south portion of the site for possible development or ground level use.

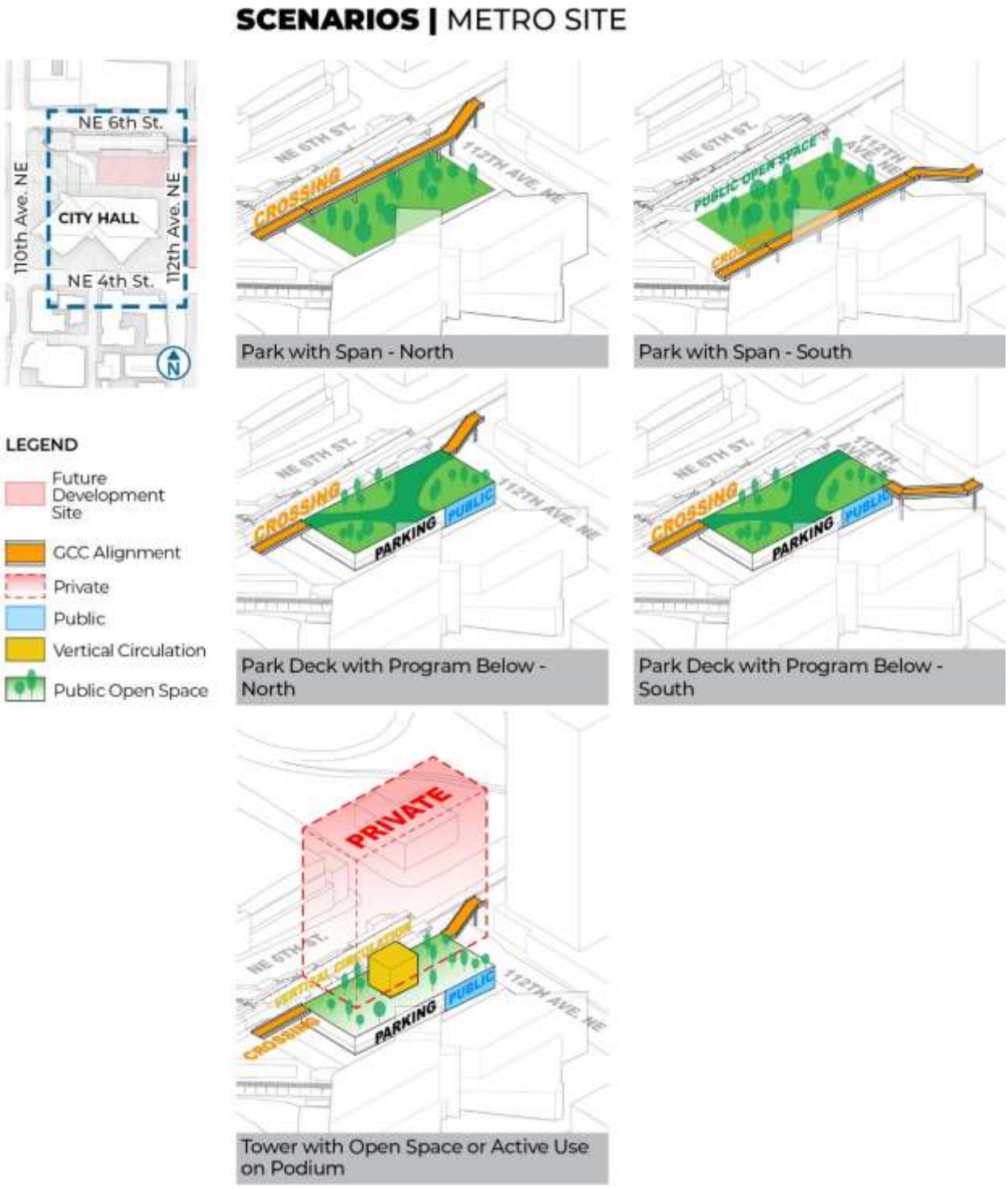

Figure 5: Metro site development scenarios.

Legacy Commercial Real Estate Development Site

The Legacy Commercial Real Estate development site is privately owned and is shown in Figure 6. Surrounding land uses include a Sound Transit guideway on the northern portion of the site, and surrounded by the 112th Ave. NE to the west, the 114th Ave. NE to the east, and the NE 4th St. bridge structure to the south.

Current uses include two 4-story office buildings and a restaurant building, with structured and surface parking to support them. Level 1 Screening alignments studied north site span, north site podium, and center span alignments as shown in Figure 6.

At this site, the GCC will likely include a vertical circulation element with stairs and elevators down to a street level. The analysis also showed that alignment crossings on the north side maximized the site development area. Based on the Alignment Alternatives Analysis report (see Appendix F), alternatives relying on podium connections were eliminated due to possible construction schedule delays that could arise due to coordination with private site owners.

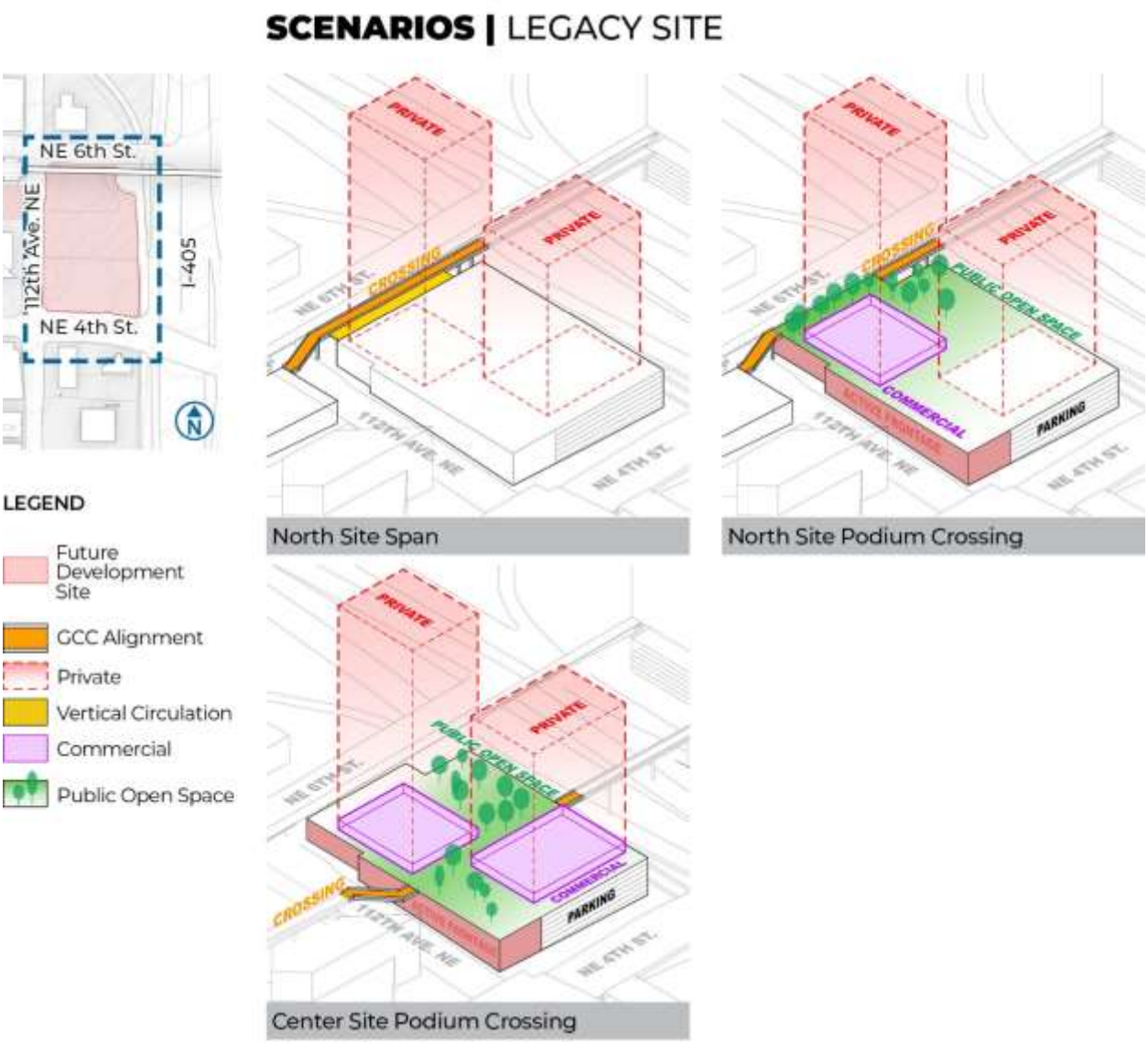

Figure 6: Legacy site development scenarios.

I-405 Right-of-Way - Notable Site

The I-405 right-of-way is not a developable site, is owned by WSDOT, is part of the interstate freeway system, and is subject to corridor-specific design guidelines, including for urban/landscape design. Within the site, there is a two-lane direct access center ramp that allows for on/off access from I-405 to NE 6th St. north of the bridge site, as shown in Figure 7. The surrounding land uses include a Sound Transit guideway to the north, the 114th Ave. NE to the west, the Lincoln Center site to the east, and the NE 4th St. bridge structure to the south.

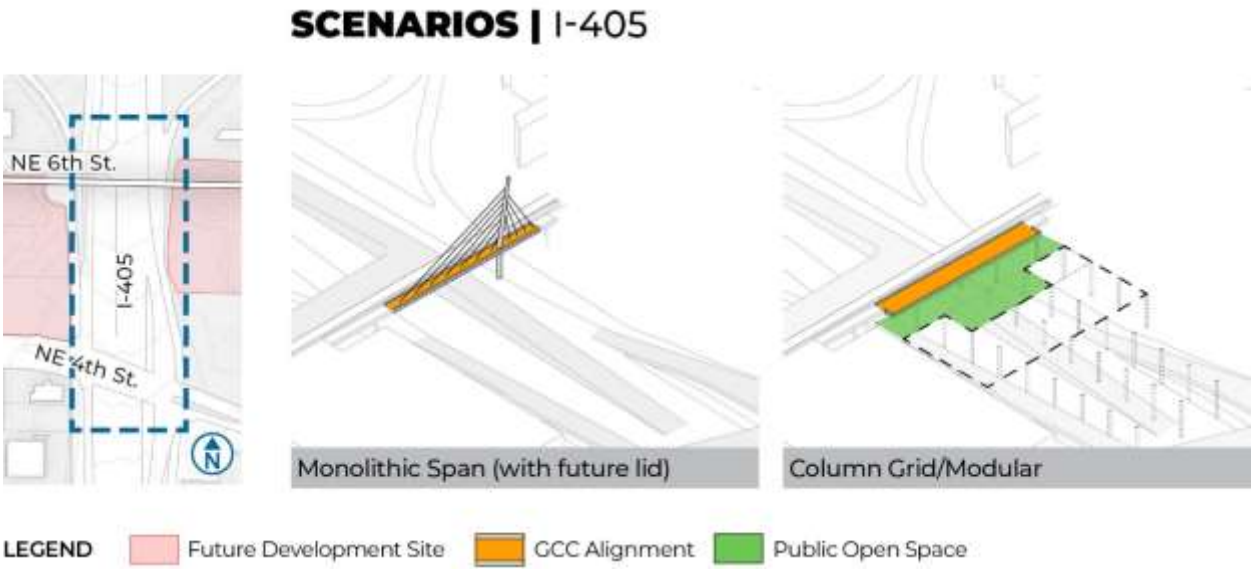

Figure 7: I-405 right-of-way scenarios.

Three basic crossing options were studied: crossing I-405 with two spans with a central pier located on the direct access center ramp, a single-span crossing that avoids permanent structure within the I-405 right-of-way, and a "diagonal dip" alignment for single-span crossing I-405 diagonally. Based on feedback from WSDOT regarding the State's future plans for adding electronic toll lanes (ETLs) and extending NE 6th St. to the east side of I-405 to 116th Ave. NE, the team has proceeded with an analysis of the single-span option. WSDOT has communicated to the project team their plans for restriping the NE 6th St. direct access ramp into a three-lane configuration that would preclude placing a GCC pier in that location and showed that the addition of the ETL on the northbound and southbound of I-405 would leave no room for permanent structures elsewhere within the WSDOT I-405 right-of-way. Though the pier option has been abandoned for the sake of design advancement, options for pier placement will continue to be explored with WSDOT right-of-way. The "diagonal dip" option was not evaluated any further, as it complicates, and could eliminate, the possibility of future lid construction. Table 4 provides a comparison of the single-span and two-span crossings of I-405 on the northern alignement.

Table 4: Comparing two- and one-span crossings of the I-405 Right-of-Way.

A two-span crossing of the I-405 right-of-way	A single, long span of the I-405 right-of-way
Involves landing structure in WSDOT right-of-way	Fully spans over WSDOT right-of-way
Forward compatible with lid structure	Will require a more consistent width along the crossing
Allows for a structure with varying width	More structural complexity to be compatible with future lid
Less compatible with NE 6th St. direct access ramp	More compatible with NE 6th St. direct access ramps

Lincoln Center Development Site

The Lincoln Center development site is owned by the City of Bellevue and is shown in Figure 8. Surrounding land uses include the Sound Transit guideway to the north, the WSDOT right-of-way to the west, a privately owned parcel and the 116th Ave. NE to the east, and a privately owned parcel to the south.

Current uses include a two-story office building with surface parking. This site, like the Metro development site, is currently under study by the City of Bellevue for feasibility and subject to zoning changes.

At this site, the GCC will likely include a vertical circulation element with stairs and possibly elevators, as well as a potential bike connection ramp, down to the street level.

Two basic crossing options are:

- North span – as close to Sound Transit guideway as possible, leaves south portion of the site for possible development or ground level use.
- South span – uses small pieces of City of Bellevue right-of-way to the south and could align with a southern KGIP site crossing.

These crossing options are partially dictated by the crossing of I-405.

Spanning on the north side provides more room on the south for possible development or ground use and this option will be advanced, and aligns more readily with a central crossing of the KGIP site, in alignment with their preference.

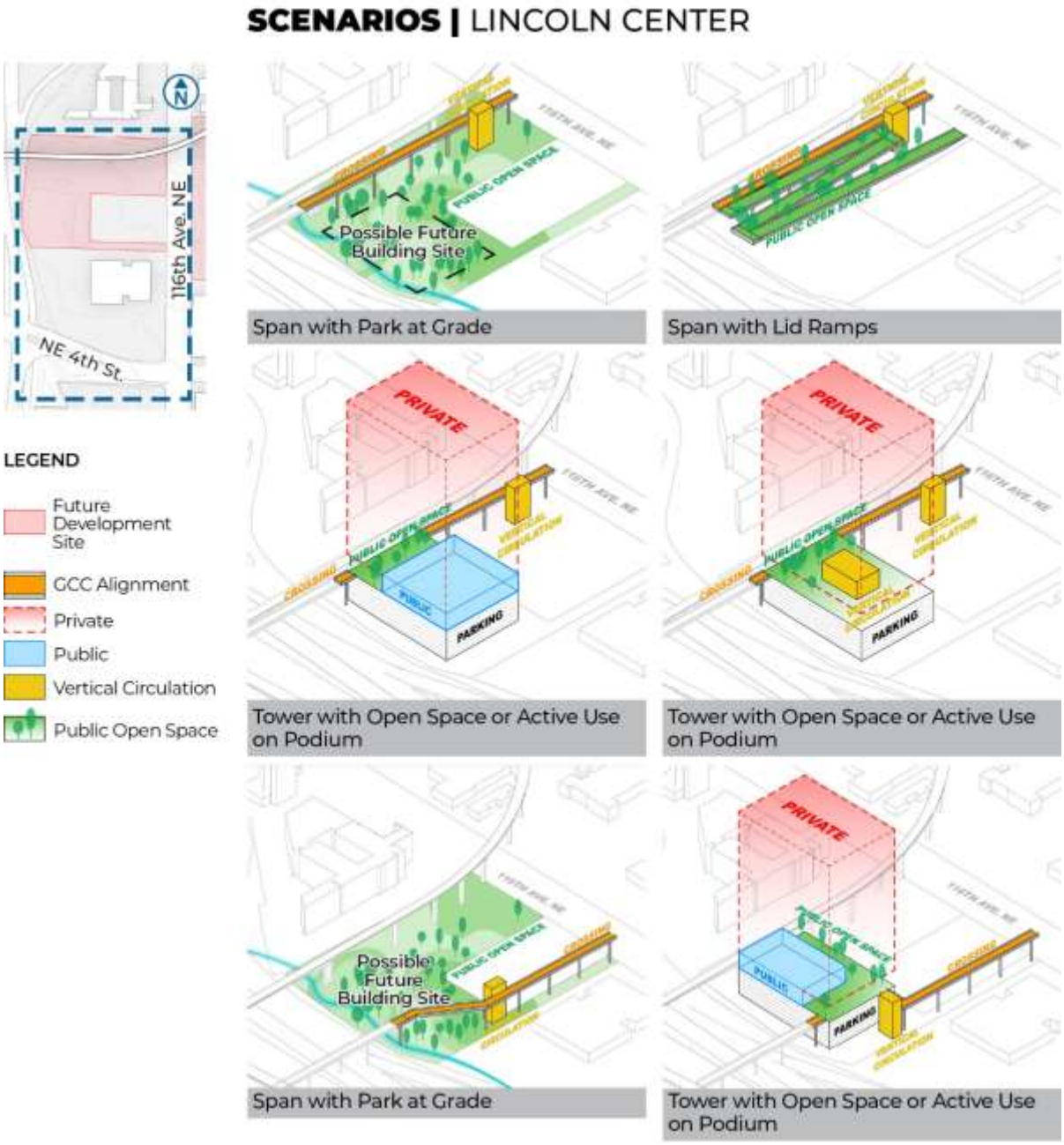

Figure 8: Lincoln Center site development scenarios.

KGIP Development Site

The KGIP development site, between NE 116th Ave. NE and Eastrail, is privately owned and is shown in Figure 9 on the following page. Surrounding land uses include the Sound Transit guideway to the north, the 116th Ave. NE to the west, Eastrail to the east, and a private development parcel to the south.

Current uses include three single-story automobile sales and service-related buildings with surface parking to support.

The KGIP owner has short-term plans to convert the northernmost sales building to a dining destination/beer garden with a trail interface. Long-term plans include a new mixed-used development with substantial trail level activation and integration. This study shows three scenarios to span the site, which allow for connection to the KGIP development at their edges and through spur structures.

This study considers three site structure alignments detailed below:

- North site crossing
  - Follows Sound Transit guideway, avoiding the Energy Auto Sales structure. Coordination with Sound Transit would be needed to integrate into their right-of-way at this location on Eastrail and needs to be coordinated with future light rail expansion plans.
  - Leaves more of site for possible development compared to other options, but could be problematic at Eastrail connection due to space constraints.
  - Needs to coordinate and avoid the NE 8th St. bridge ramp.
- South site crossing
  - Tracks south property line of KGIP's site.
  - Eastrail connection location may be farther south than the City of Bellevue and King County envisioned.
- Center site crossing
  - Bisects site.
  - Will require complex property development coordination to ensure public ownership and access.
  - Possible construction sequence challenges with bridge and private development.
  - Feedback from KGIP is that this crossing location is preferred.

Selected Alignment Alternatives

When the development scenarios are combined, over 2,000 possible crossing alternatives are created, revealing the complexity and relative merits of each individual site crossing as related to all the others. Based on the characteristics of each crossing alternative, 12 possible alignments were selected to run through the first phase of the Alignment Alternatives screening; see Section 2.6 for more discussion of the screening process and its conclusions.

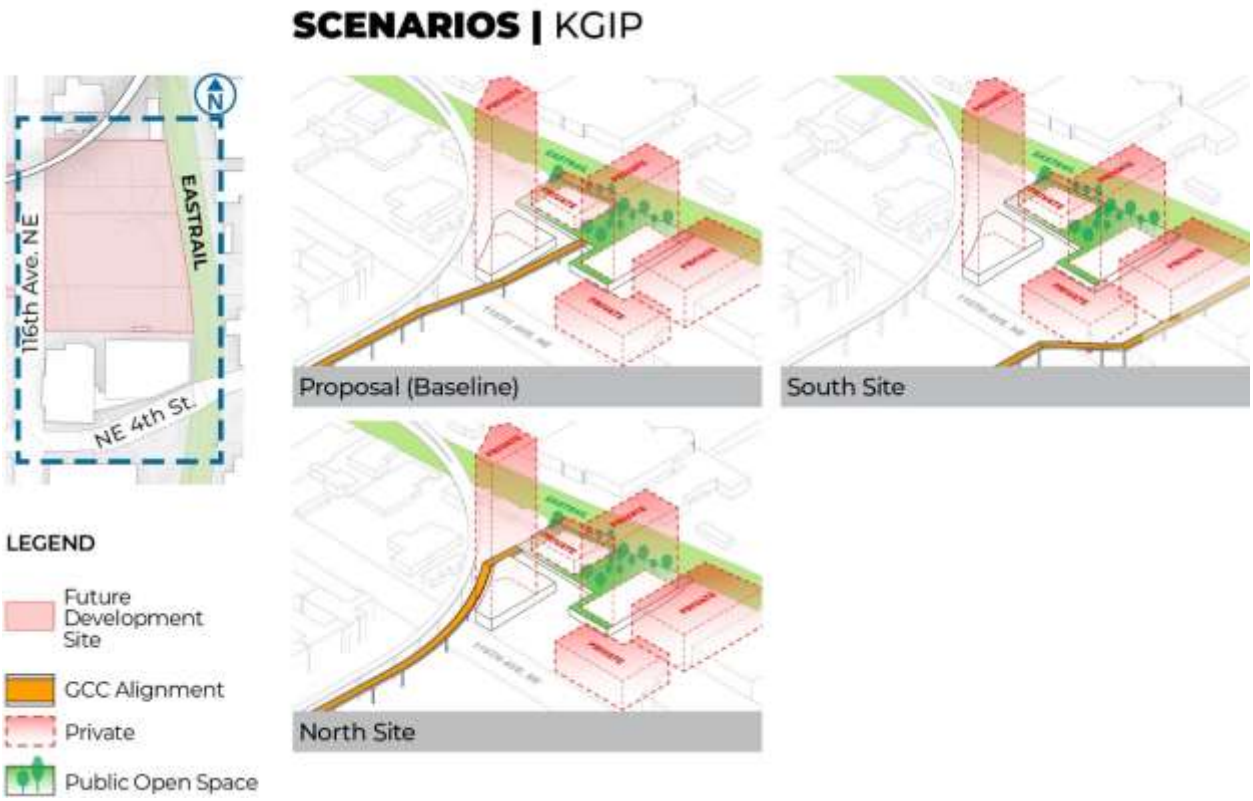

Figure 9: KGIP Site Development Scenarios.

2.3.2 Sturtevant Creek

Existing Conditions

Sturtevant Creek passes through the study corridor just east of I-405. Figure 10 below shows the approximate location of the creek as it passes south through the project limits. The headwaters of the creek form at Lake Bellevue, which receives runoff from primarily piped storm drain systems. Lake Bellevue outlets to a short section of restored open channel before entering a long pipe system. Much of the pipe system is privately owned and maintained. A portion of the pipe system, both upstream and through the project corridor, is within WSDOT I-405 right-of-way.

The City of Bellevue conducted a citywide stream habitat assessment from 2018 to 2020, referred to as the Open Streams Condition Assessment (OSCA), to help characterize city streams and provide a solid foundation for watershed management planning efforts. The OSCA includes summaries of streams and major stream reaches, including habitat composition, streambank conditions, streambed substrate composition, large woody material frequency, and channel measurements. In addition, the OSCA provides descriptions of the habitat conditions, fish passage barriers, and preferred priorities for future work within each reach. The OSCA describes the entire 772-acre Sturtevant Creek basin as primarily consisting of commercial and office land use and public/WSDOT right-of-way, including I-405. As a result, the creek is fragmented and constrained and alternates between open channel and piped reaches, with an overall total of only 1 mile of open channel and about 23 miles of storm drain pipes. Generally, the habitat conditions are considered variable with some in-stream habitat complexity in areas that have been restored; however, no fish were observed. The City of Bellevue has identified four potential barriers to fish passage downstream of the project area.

Figure 10: Approximate project limits relative to Sturtevant Creek.

Sturtevant Creek was also studied as part of the 2021 Greater Kelsey Creek Watershed Assessment Report (AR) by Jacobs Engineering, Inc. and Herrera Environmental Consultants, Inc. Sturtevant Creek is a subbasin within the larger Kelsy Creek Watershed. The main purpose of the AR is to evaluate the conditions within the watershed that are limiting the health of its streams, specifically the effects of stormwater runoff from urban areas. The AR also includes identified opportunities for improving in-stream watershed conditions and is based on information from the OSCA, existing data from past projects and monitoring, and existing project and environmental monitoring data. The geomorphic characterization of the Sturtevant Creek subbasin includes the following:

- Most highly urbanized subbasin, lacking in riparian buffer, and subject to flashy flows and resulting incision.
- Most confined stream due to entrenchment and modifications.
- Streambed material is mostly gravel, and streambank armoring is above average for the subbasin, at 32 percent.
- Large woody material is largely absent with minimal recruitment potential.

According to the AR, the wetlands in the lower portions of Sturtevant Creek will likely provide valuable fish habitat. The AR discusses potential factors limiting stream health in the watershed. For the Sturtevant Creek subbasin, the document identifies the primary limiting factors as stormwater runoff from effective impervious surfaces, loss of floodplain, and riparian function and pollutant loading. The one secondary limiting factor includes road culverts and other physical barriers.

Potential Future Stream Conditions

Although much of Sturtevant Creek is piped, it is still recognized as a stream by both the City of Bellevue environmental code and the Washington Department of Fish and Wildlife (WDFW). As a part of WSDOT's I-405 Master Plan, which includes significant modifications to the NE 8th St. I-405 interchange, it was recognized that there may be a need to "daylight" Sturtevant Creek (i.e., replace piped sections of stream with open channel reaches). WSDOT has developed a conceptual plan showing the creek to be daylighted in the area as a part of the major interchange improvements.

During initial GCC project team discussions, it was understood that the creek daylighting, if it occurs, will be a WSDOT project as part of NE 6th St. Extension project rather than the GCC project. However, it is important that the GCC project plan for the creek "daylighting" in terms of alignment and width in case WSDOT continues to pursue the daylighting planned for in the master plan. During these discussions, a potential alternative was raised by City of Bellevue staff that included pursuing off-site stormwater treatment retrofits and habitat improvements rather than daylighting the creek within the project limits. The thinking behind this option is that off-site stormwater quality retrofits and habitat improvements could offer greater benefit and earlier overall benefit to the creek subbasin, as opposed to daylighting within the project boundaries. The discussions with WSDOT on whether to consider off-site stormwater quality retrofits and habitat improvements as an alternative are ongoing. Should WSDOT favor the off-site mitigation option, the concept would need to be approved by WDFW and local tribal interests.

2.3.3 Sound Transit Guideway

The Sound Transit guideway begins at the Metro site and runs parallel to NE 6th St. and across the Legacy and Lincoln sites on their north side before curving northward and cutting through the northwestern edge of the KGIP site. The plan and elevation sheets of the guideway can be found in Appendix D.4.

Sound Transit does not publish standard minimum clearances from their structures but has expressed a preference for a minimum lateral clearance of 15 feet from the guideway structure to allow for a buffer between adjacent structure and their overhead catenary power system and also to allow for inspection access for the guideway structure. Figure 11 to Figure 13 show how this minimum clearance is met and the relative position of the bridge to the guideway. As shown in the figures, at locations where the bridge is higher or at the same elevation as the guideway, throw fences will be provided on its northern edge to deter pedestrians from throwing objects onto the guideway. Throw fences are standard on pedestrian-accessible bridges adjacent to or crossing rail infrastructures.

Piers for the Sound Transit guideway sit on drilled shaft foundations. All piers for the GCC structure and their foundations will maintain a minimum horizontal clearance of 33 feet from these drilled shafts. The No Build zone around the existing shafts is discussed in Section 3.4. This clearance can be achieved by arranging the GCC bridge spans such that the foundations are not adjacent to the Sound Transit guideway foundations.

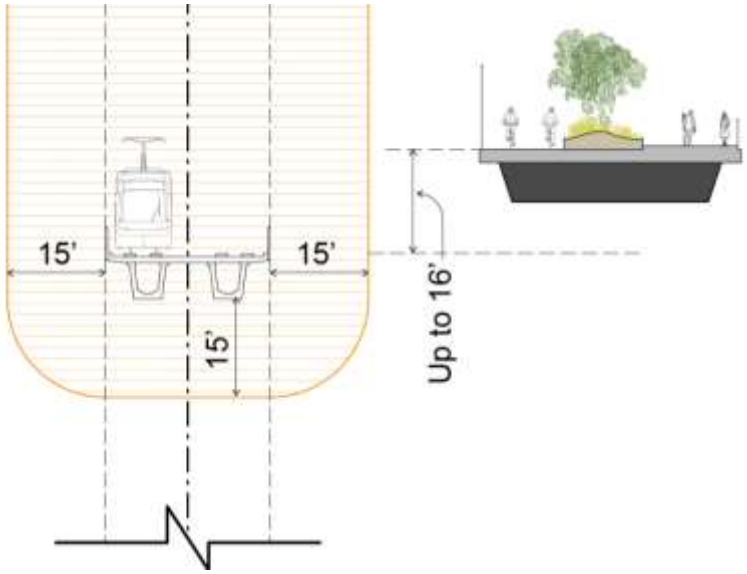

Figure 11: Section showing potential bridge location and required guideway setbacks west of I-405.

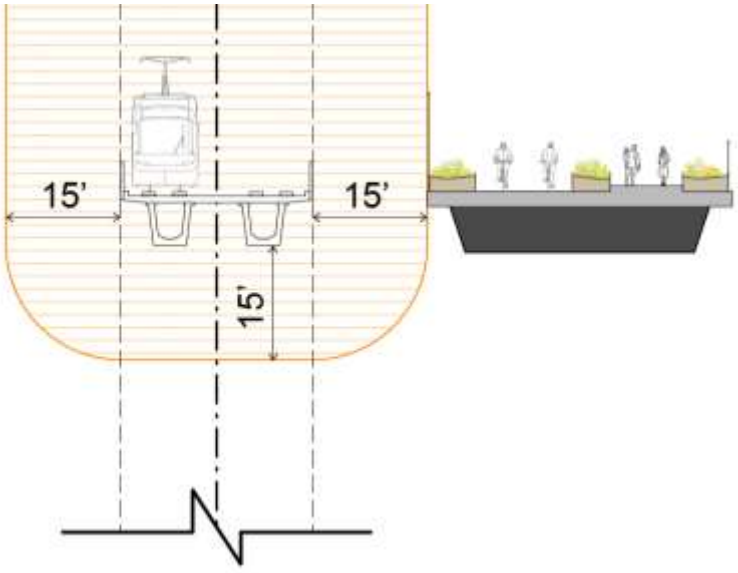

Figure 12: Section showing potential bridge location and required guideway setbacks at I-405.

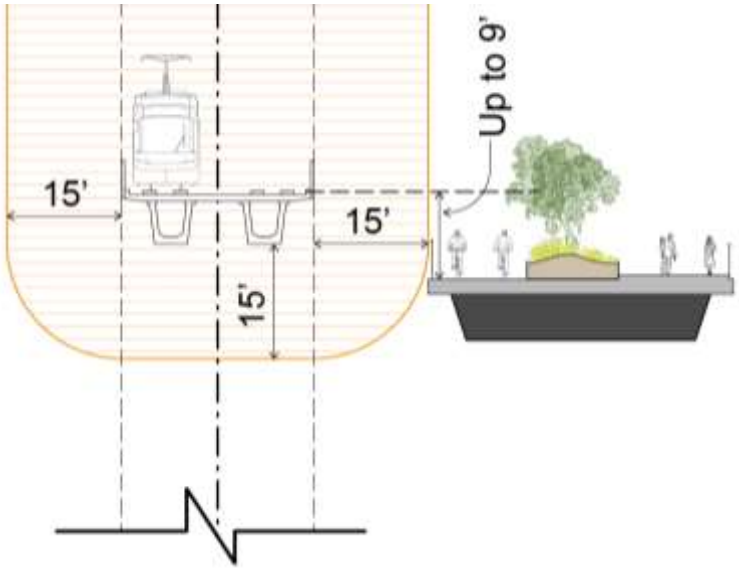

Figure 13: Section showing potential bridge location and required guideway setbacks east of I-405.

2.3.4 Environmental Considerations

As noted in Section 2.2, the limits of the GCC project are from City Hall Plaza on the west to Eastrail on the east, a length of approximately 0.4 miles. Land uses in the project area are consistent with the highly urban environment of downtown Bellevue, including commercial buildings and their associated parking and transportation infrastructure, such as I-405 and the East Link 2 Line. Recreational land uses in the project area include the property to the north of Bellevue City Hall, which is currently used as a dog park, and the Eastrail regional trail on the east side. As described above, within the project area, some of the parcels are owned by the City of Bellevue and some are privately owned. Rights-of-way in the project area include the City of Bellevue for local streets, WSDOT and Federal Highway Administration (FHWA) for I-405, King County for Eastrail, and Sound Transit for the East Link 2 Line.

There are no mapped environmental critical areas west of I-405 and limited mapped environmental critical areas east of I-405 in the GCC project vicinity. Sturtevant Creek, discussed in Section 3.1, passes through the project vicinity just east of I-405 and is primarily in a stormwater pipe. Management and treatment of stormwater within the project area, including stormwater that may be discharged into Sturtevant Creek, are discussed in Sections 3.1.1 and 3.5. The City's Map Viewer GIS information shows some steep slopes in the project limits, including in the vicinity of the Eastrail tie-in for the GCC project. Other steep slopes identified by the City of Bellevue are engineered steep slopes related to I-405 embankments and retaining walls for commercial developments. There are no other mapped environmental critical areas (including wetlands and wildlife habitat).

Existing sources of noise in the project area are primarily related to traffic on I-405 and city streets (including a mix of vehicles, such as cars, trucks, and buses) and operations of the light rail line and at the light rail station. Based on the existing noise sources, the existing noise levels in the area would be expected to be between 66 and 74 dBA, with the higher levels of 74 dBA anticipated closer to or within the I-405 right-of-way related to freeway traffic.

The entire project area is mapped by the Washington State Department of Archaeology and Historic Preservation (DAHP) as being a moderate to high risk area for archaeological resources. While most, if not all, of the ground in the project area has been previously disturbed to varying depths, the moderate to high risk designation means that DAHP would recommend surveys or measures, such as construction monitoring, to identify potential archaeological resources.

Buildings and structures that are 50 years or more in age are potentially eligible for listing in the National Register of Historic Places (NRHP). Many of the buildings within the project area are newer and would not be eligible for listing. The building at 600 116th Ave. NE was built in 1960 and is of historic age. The buildings at 530 112th Ave. NE were built in 1977 and the building at 515 116th Ave. NE was built in 1975; these buildings could be 50 years old when project construction would start. Previously, as part of the National Environmental Policy Act environmental impact statement that Sound Transit completed for East Link, these properties were not identified as eligible for NRHP listing. These previous determinations should be reviewed.

The federal Environmental Justice Executive Order 12898 requires the evaluation of whether a project would result in disproportionate impacts to low-income or minority populations. Washington State's Healthy Environmental for All Act is a statewide approach to environmental justice that looks to address disproportionate environmental and health impacts to vulnerable populations and overburdened communities. The population who lives in the vicinity of the project area includes 10 percent who identify as low-income, which is lower than the state and national average. The population also consists of 55 percent people of color/minorities, which is higher than the state and national average.

2.4 Existing Utilities

The alignment alternatives intersect with several existing public and private utilities, as shown in Figure 14. The bridge design will prioritize minimizing conflict with known overhead and underground utilities to the extent feasible. Where such conflicts are unavoidable, underground utilities that conflict with the construction of the bridge footings and other subsurface structures will need to be relocated or abandoned. Minor modifications to aboveground utility features, such as manholes and utility valves, may be required along the proposed alignment. Major public underground utilities identified within the project area include City of Bellevue storm and sanitary sewer main lines (8-inch to 18-inch diameter) on either side of I-405, City of Bellevue water main lines (8-inch to 12-inch diameter) on either side of I-405, King County Metro sanitary sewer (72-inch diameter) along the Eastrail corridor, and WSDOT storm sewer and underdrains along I-405. Private underground utilities identified within the project area include privately owned storm sewer system, including detention systems on properties on either side of I-405, a fiber optic line along northbound I-405, and power, gas, and various telecommunication lines on either side of I-405. Overhead power lines run north to south along the west side of 116th Ave. NE.

A more detailed evaluation of utility impacts will need to be performed at the 30 percent and 60 percent design phases in the project. When a potential conflict is identified, the City of Bellevue will coordinate with the utility service providers to minimize or avoid temporary or long-term service disruption.

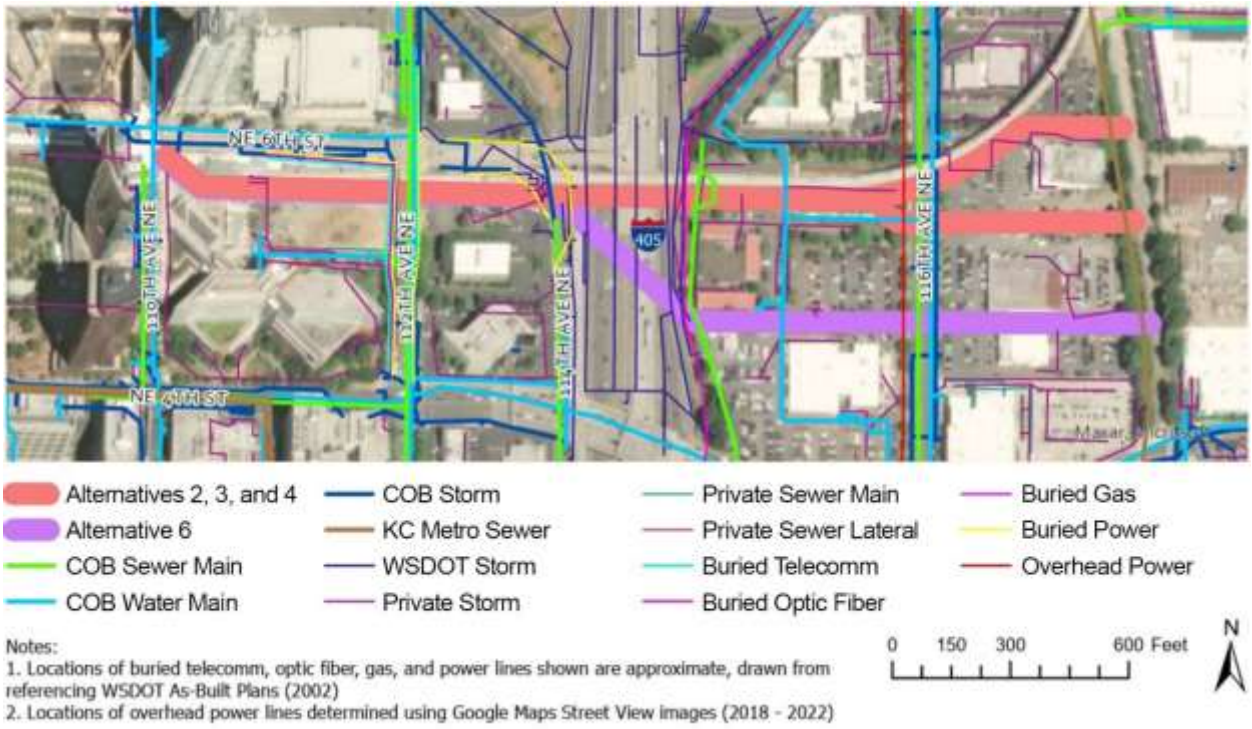

Figure 14: Existing utilities within Grand Connection Crossing project.

2.5 Constituents

This project has a variety of constituents summarized as follows:

- People who live, work, and play in Bellevue
- Project partners: WSDOT, Sound Transit, FHWA, Bellevue Parks and Community Services, Bellevue Planning and Community Development, Bellevue Department of Finance and Asset Management, and King County Department of Parks and Natural Resources
- Nearby existing and future property owners of future development sites, including KGIP, Legacy, Lincoln Center and Metro sites
- Other key constituents include the Friends of the Grand Connection (https://www.friendsofgrandconnection.org/), Eastrail Partners, Bellevue Downtown Association, Bellevue Chamber of Commerce, and Justice40 community members and partners
- City leadership, including the City Manager and City Council
- Boards and Commissions

For a full list of audiences and constituents and approach to engagement for this project, see Appendix E, Public Engagement Plans and Reports.

2.6 Alignment Alternatives

"Sites Approach" for Alternative Development

The Bellevue's Grand Connection program provides a wide variety of experiences to users, and this theme should also extend to the GCC over I-405. The sites spanned by the alignment, city-owned ones in particular, present an opportunity to provide different experiences, such as a building podium, open space parks, and an iconic structure. Alternatives were developed as a combination of different site scenarios to incorporate a range of experiences by changing site usage and alignment location. This "Sites Approach" to alternative development allows us to accommodate for changing private development plans due to its shorter lifecycle as compared to public infrastructure. Using this approach, 10 alternatives are developed and have been described in detail in Appendix F.

Level 1 Screening Criteria and Evaluation

Level 1 screening was a high-level qualitative evaluation of all alternatives that filtered out those that do not meet the purpose and need statement. The following evaluation criteria were developed for this level:

1. Purpose and Need: This can be subdivided into safety, high comfort, multimodal connectivity, and community connection.
2. Future Compatibility: Alternatives need to be compatible with adjacent private and city-owned development I-405 Master Plan, and a future lid over I-405.
3. Schedule and Approvals: Alternatives must receive the required permits and approvals and be constructed in a reasonable timeframe (end of 2028).
4. Cost Feasibility: Alternative should provide benefit commensurate with cost.

Table 5 shows the rating for each alternative along with its discussion. Alternatives 2, 3, 4, and 6 are moved to the next level.

Table 5: Level 1 Evaluation Matrix.

Alternative	Level 1 Criteria									Discussion
	Meets Purpose and Need				Future Compatibility					
	Safety	High Comfort	Multimodal Connectivity	Community Connection	With Dev. Sites	With Future Lid	Schedule	Required Permits & Approvals	Cost Feasibility	
1. 2023 Feasibility Study	●	●	●	●	○	◑	●	◑	●	Uses podium crossing on Legacy site and commits the City to park/ramp usage at Lincoln site
2. Simple Spans	●	●	●	●	●	◑	●	◑	●	Follows Sound Transit guideway alignment without connections to development sites; satisfies most of these criteria
3. Public Open Spaces	●	●	●	●	◑	◑	◑	◑	●	This has to be coordinated with the City based on their development plans for City-owned sites
4. Public Active Edges	●	●	●	●	◑	◑	◑	◑	●	This has to be coordinated with the City based on their development plans for City-owned sites
5. Down the Middle	●	●	●	●	○	◑	◑	◑	●	Divides Legacy site using either a podium crossing or a freestanding structure
6. The Dip	●	●	●	●	◑	◑	◑	◑	●	This has to be coordinated with the City based on their development plans for City-owned sites
7. South Side	●	○	●	●	◑	◑	◑	○	●	Proximity to a parallel roadway, NE 4th Street will increase the noise experienced by users; requires retrofit of City Hall
8. NE 6th Street Spans	●	○	●	●	●	○	◑	○	○	Proximity to a parallel roadway, NE 6th Street will increase the noise experienced by users; major challenges accommodating I-405 Master Plan
9. NE 4th Street Spans	●	○	●	●	◑	◑	◑	○	●	Similar to No. 7, South Side, above; in addition, would need to coordinate a grade-separated Eastrail crossing of NE 4th Street
10. NE 4th Street at Grade	○	○	◑	◑	◑	●	●	●	●	A fully at-grade alignment does not deliver on safety or comfort for users

● = Meets criteria ◑ = Partially meets criteria ○ = Does not meet criteria

Level 2 Screening Criteria and Evaluation

As part of the second level screening process, options that passed the Level 1 screening were evaluated in greater detail in Level 2 screening criteria below in Table 6, which are more specific and detailed criteria developed based on the categories identified in Level 1 screening evaluation.

Table 6: Level 2 Screening Evaluation Criteria.

Level 1 Screening Criteria	Level 2 Screening Criteria
Connectivity	Bicycle System Connectivity
	Pedestrian Connectivity
	Multimodal Access
	Access to Opportunities
	Potential to Reduce Vehicle Trips
Safety	Wayfinding
Comfort	Separation from Other Modes
	Noise
Transformative/Iconic	Reliance on Future Lid
	Delivers Iconic Experience
	Signature Bridge Structure
Future Flexibility	Advances Grand Framework Plan
	Consistency and Benefit to Future Plans
Schedule and Approvals	Ability to Receive Permits and Approvals
	Construction Schedule Risk
	Endangered Species Act (ESA)
	Environmental Justice Impacts
	Impacts to Cultural Resources
Cost Feasibility	Construction Cost
	Operation/Maintenance Cost
	Ability to Receive Full Funding
	Enhanced Property Values
	Traffic Disruption

The criteria and scoring methodology are described in greater detail in Appendix F. The scoring used in the Level 2 screening is a numerical 3-point scale, with a score of 1 representing the least effective option and 3 representing the most effective option.

The four remaining alternatives from Level 1 screening were evaluated on their effectiveness under conditions of both prior to and after lid construction. This evaluation structure was developed to account for the complexity and potential longer-term horizon of constructing a lid over I-405.

Table 7 and Table 8 show the evaluation of each alternative before and after the lid is constructed.

Table 7: Level 2 Screening Evaluation Matrix (prior to lid construction).

		Without a full lid over I-405			
		Alt 2	Alt 3	Alt 4	Alt 6
	Criteria	Simple Spans	Public Open Spaces	Public Active Edges	Diagonal Dip
Connectivity	Bicycle System Connectivity	3	3	3	3
	Pedestrian Connectivity	2	2	2	2
	Multimodal Access	3	3	3	3
	Access to Opportunities	1	3	2	2
	Potential to Reduce Vehicle Trips	3	3	3	3
Safety	Wayfinding	3	2	2	1
Comfort	Separation from Other Modes	2	2	2	2
	Noise	2	2	2	2
Transformative / Iconic	Reliance on Future Lid	1	3	2	3
	Delivers Iconic Experience	1	2	2	2
	Signature Bridge Structure	2	2	2	3
Future Flexibility	Advances Grand Framework Plan	2	2	2	2
	Consistency and Benefit to Future Plans	3	2	2	2
Schedule and Approvals	Ability to Receive Permits and Approvals	3	3	3	3
	Construction Schedule Risk	3	2	2	1
	ESA	3	3	3	3
	EJ Impacts	3	3	3	3
	Impacts to Cultural Resources	2	2	2	3
Cost Feasibility	Construction Cost	3	2	2	2
	Operation/Maintenance Cost	3	2	2	2
	Ability to Receive Full Funding	3	3	3	2
	Enhanced Property Values	3	3	3	3
	Traffic Disruption	3	3	3	3

Table 8: Level 2 Screening Evaluation Matrix (after lid construction).

		With a full lid over I-405			
		Alt 2	Alt 3	Alt 4	Alt 6
	Criteria	Simple Spans	Public Open Spaces	Public Active Edges	Diagonal Dip
Connectivity	Bicycle System Connectivity	3	NA	3	3
	Pedestrian Connectivity	3		3	3
	Multimodal Access	3		3	3
	Access to Opportunities	2		3	3
	Potential to Reduce Vehicle Trips	3		3	3
Safety	Wayfinding	3	NA	2	2
Comfort	Separation from Other Modes	3	NA	3	3
	Noise	3		3	2
Transformative / Iconic	Delivers Iconic Experience	1	NA	2	3
	Signature Bridge Structure	2		2	3
Future Flexibility	Advances Grand Framework Plan	3	NA	3	3
	Consistency and Benefit to Future Plans	3		2	2
Schedule and Approvals	Ability to Receive Permits and Approvals	2	NA	2	2
	Construction Schedule Risk	3		2	1
	ESA	3		3	3
	EJ Impacts	3		3	3
	Impacts to Cultural Resources	2		2	3
Cost Feasibility	Construction Cost	3	NA	1	1
	Operation/Maintenance Cost	3		2	2
	Ability to Receive Full Funding	3		3	2
	Enhanced Property Values	3		3	3
	Traffic Disruption	2		2	2

Based on the Level 2 screening evaluation, Alternatives 2, 3, and 4, as one alignment, and Alternative 6 as the second alignment are recommended for consideration in the next stage.

Post Screening Alignment Updates

After Level 1 and Level 2 screening, feedback from private site owners and other agencies has also helped refine the alternatives.

Alternatives 2, 3, and 4 show a south spur (Alignment Option 1) in the alignment over the KGIP site in addition to the north spur (Alignment Option 2) along the Sound Transit guideway (see Figure 15). The two spurs for the alignment were reviewed for the eastern section of the crossing as it approaches the Eastrail connection. The northern spur was an option to limit the impact on the KGIP parcel by crossing at its northernmost boundary. The southern spur was an option to travel through the KGIP site in a more integrated location with their planned development. The northern spur option was abandoned based on City and KGIP mutual desires to provide a more integrated alignment.

Alternative 6 shows a diagonal dip over I-405 in Level 2 screening (see Figure 16 on the following page). This alternative is feasible with a future lid only if piers are located within WSDOT right-of-way. Based on WSDOT feedback collected after the Alignment Alternatives Analysis prepared by WSP in 2024 (Appendix F), there is a disproportionate risk that the piers within the I-405 right-of-way will not be compatible with the I-405 Master Plan, or could be cost prohibitive. As such, Alternative 6 carries a high risk not only that it will be incompatible with a future lid but, more significantly, it would preclude the ability for a lid to exist in this location. As such, Alternative 6 was not considered further.

Figure 15: Bridge Alignment Alternatives 2, 3, and 4 after screening process.

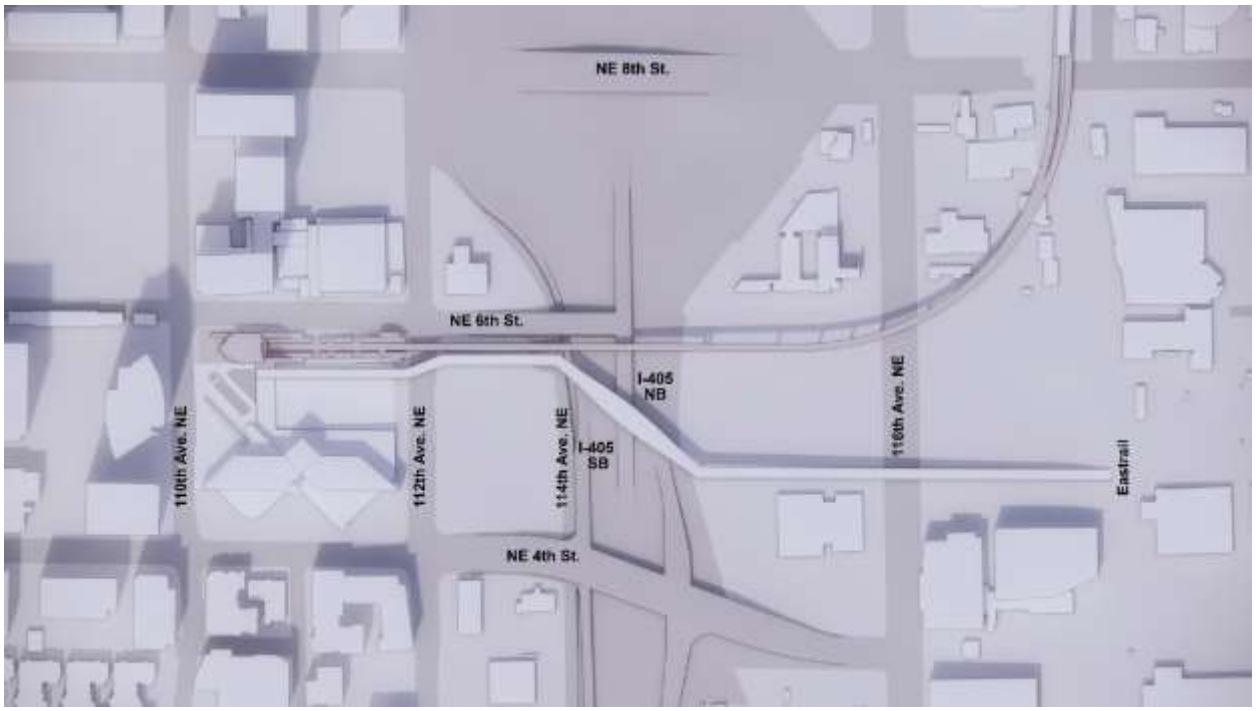

Figure 16: Bridge Alignment Alternative 6 after screening process.

2.7 Bridge Profile Grade

The maximum profile grading of a pedestrian bridge set by ADA is 5 percent. In addition, the node structures must have 0 percent profile grade, as they are not considered to be pedestrian paths, but rather plaza, or pedestrian stopping/mixing areas. While the overall profile at the nodes will be flat, the deck surface will include cross slopes that will not exceed 2 percent to facilitate drainage.

In addition to the ADA design requirements listed above, the profile grade of the GCC project must consider the following:

- Tie-in points at the west end (Bellevue City Hall Plaza) and the east end (Eastrail). Both ends of the project must tie into the existing facilities. Where necessary, fill and retaining wall will be provided to achieve the required elevations at the tie-in points.
- Limit the severity of the grading for better user experience. Having a long stretch of steep grading is not desirable for pedestrians and cyclists and especially for people with limited mobility and/or people in wheelchairs.
- Keeping the elevations of the node structures as low as possible to simplify the vertical connections to the street level below.
- Drainage considerations: stormwater must be transported off the bridge by gravity.
- For any CIP constructions, falsework must have vertical clearance of 17.5 feet above existing features, such as the NE 6th St. direct access ramp, below.
- The initial construction of the GCC will need to consider the feasibility of future lid connection.

2.8 Bridge Width

The width of the bridge is expected to vary across its length, and will be based on structural needs, placemaking opportunities, user experience, owner and constituent feedback, development coordination of adjacent sites, and operational needs, such as accommodating stairways and elevators. Summary of bridge width is provided in Table 10 below and detailed cross sections are provided in Section 4.0, Bridge Alternatives.

Table 9: Summary of bridge widths.

West Tie-in	West Node	I-450 Crossing	East Node	Eastrail Tie-in
30'-0"	30' to 80'	40'-0"	30' to 105'	30'-0"

A strictly minimalist approach to the bridge width would offer an approximately 14-foot-wide shared use path, similar to other regional shared use paths like the path that crosses Lake Washington on the Evergreen Point (State Route 520) Bridge. But such a minimalist approach is not in line with the project's goals and vision, expressed in the "Purpose and Need" statement because it would provide an uncomfortable, noisy, and not particularly transformative experience for users. Additionally, consistent public feedback has indicated a strong public preference for bicycle and pedestrian traffic to occupy physically separated spaces and for the bridge to be a shielded from noise as possible. Thus, the minimum assumed width of the bridge is considerably wider than the minimalist approach would provide. At its narrowest (at the west tie-in segment, where structural lightness will be a priority to maintain the garage and driveway overhead clearances while still tying into City Hall Plaza and where keeping the Metro site as open as possible will aid its future development), the bridge deck is anticipated to be 30 feet wide, curb to curb, with space for bicycle and pedestrian lanes.

At the west and east nodes, the bridge can vary to reconcile the width differences of the structures on either side (the west or east tie-ins and the I-405 crossing). Additionally, widening here allows for a plaza-like feel at the top of the vertical circulation elements–stairs and elevator(s)–and will accommodate placemaking features and landscaping. In the nodes, the user experience can take priority. It is expected that the nodes could be as wide as 100 feet in these areas.

Between the nodes, the bridge width of the I-405 crossing will be driven by user comfort and safety, balanced by structural practicalities like vertical clearance over the NE 6th St. direct access ramp. A 40-foot width over I-405 is the maximum that is structurally manageable based on the parameters of the span. This width is also ideal for the user experience here; this allows for 12 feet for biking and rolling, 12 feet for a pedestrian path, and an additional 16 feet that can be dedicated to landscape, amenities like benches, or other flexible space as the design progresses. There will be landscaping arranged on both the north and south edges of the bridge structure to provide stand off and dampening as noise mitigation from the sounds of the freeway below.

At the east tie-in, where the GCC connects from the east node to Eastrail, the bridge is expected to be 30 feet wide, maintaining the two 12-foot lanes as provided on the rest of the bridge, while also providing enough space for landscaping and amenities. The 30-foot dimension also corresponds with anticipated width communicated by the KGIP site development team.

3.0 BRIDGE DESIGN CONSIDERATIONS

The section below describes various considerations that have contributed to the bridge structure type selection for the various structural segments on the Grand Connection Crossing, including various geometric constraints in the corridor, aesthetic factors influencing bridge architecture and landscape architecture, geotechnical factors, drainage/stormwater management, operations and maintenance considerations, and other requirements.

A vicinity map of the project location and proposed bridge are shown in the figures below.

Figure 17: Project vicinity map within the context of the full Bellevue Grand Connection (background image credit: Google Maps).

Figure 18: Vicinity map of the Bellevue Grand Connection Crossing (background image credit: Google Maps).

3.1 Geometric Considerations and Constraints

Sound Transit Bellevue Downtown Station and Existing Guideway Structure

The west end of the project ties into the existing City Hall Plaza. As depicted in the figures below, the west tie-in structure must accommodate the opening of Bellevue City Hall's parking garage and Sound Transit Bellevue Downtown Station (the station)/garage's driveway. Relevant as-built sheets of the two structures are included in Appendix D.

Vertical clearances and the allocated superstructure depths at the two structures are as follows:

- Bellevue City Hall: vertical clearance of 7.5 feet (includes depth of future beam) and superstructure depth of 7.5 feet
- The station: vertical clearance of 13.5 feet and superstructure depth of 25 inches

Because the plaza level for both structures share an elevation, the west tie-in structure will have to accommodate the governing geometry of the station with superstructure depth of 25 inches.

In addition to the geometric constraints, the original approach to the GCC design was to minimize or eliminate induced loads from the west tie-in structure to the existing structures. This resulted in a proposed structure of a 120 feet of cantilever from the open area between the ramp and the south face of the station with very limited superstructure depth. However, during the refinement of this TS&L report, it was determined that the bridge geometry of a cantilevered structure would make it more challenging to integrate with future adjacent development on the Metro site. Three additional alternatives that do not rely on cantilevered structure were considered.

The first alternative is to extend City Hall Plaza eastward by approximately 125 feet; the west tie-in structure ties into the east edge of the extended plaza. The second alternative changes the last 165 feet of the bridge alignment to place a pier between the station driveway and the City Hall parking garage. The second alternative west tie-in structure ties into City Hall Plaza but requires a significant gravity and seismic retrofit of the foundations of the City Hall Plaza and parking garage. The third alternative keeps the same alignment as the cable-stayed structure but ramps high to accommodate the 13.5-foot station ramp clearance and continues to ramp down on top of City Hall Plaza. After initial study, the design team decided to eliminate the third alternative from further study.

Sound Transit requires a minimum horizontal clearance of 15 feet from their structure. Alignment of the project will be located to satisfy this requirement; however, ability to get closer to their structure will be explored with them as the design advances.

Figure 19: West tie-in schematic layout showing geometric constraints, plan view (background image credit: Google Maps).

Figure 20: Sound Transit Bellevue Downtown Station, street view looking north.

Note the tight approximate 24-inch clearance between the City Hall Plaza grade and the parking garage. The GCC superstructure must maintain clearance while meeting the Plaza's finished grade elevation. Options to build over the plaza to meet grade were reviewed but are not desired due to the cascading impacts to the plaza and user circulation.

Figure 21: West tie-in schematic layout with plaza extension (background image credit: Google Maps).

As the Metro site is a narrow site, the width to accommodate both the west tie-in bridge and a potential building structure is limited. The design team will need to keep coordinating with the sites study work and any developers that are involved in the site throughout the design process.

West of I-405 (Metro and Legacy Sites)

To allow for future development of the Metro site, the bridge structure will follow parallel to the guideway's alignment while maintaining the horizontal clearances discussed above to minimize impact on the site as much as possible. As plans for the Metro site develop, the plans for the GCC structure can be modified to integrate with adjacent development as a podium if desired.

The bridge structure will continue alongside the guideway's alignment as it crosses over the Legacy site. As shown in Figure 22, the Legacy site consists of three buildings; two commercial office buildings to the south and a restaurant on the north side. The restaurant, built in 1977, is close to 50 years old and will potentially be eligible for the NRHP when the project construction starts. In addition to the bridge structure overhead, this site will also accommodate a vertical circulation node, with elevators to meet ADA code and a staircase, on its west side.

On the west side of I-405, the bridge will also span over the 114th Ave. NE cul-de-sac. This cul-de-sac may be used for staging purposes during construction, as discussed further in the larger constructability description. The 114th Ave. NE cul-de-sac may also be impacted by placement of columns for the bridge structure and may need to be adjusted around the bridge structure. Additionally, while footing placement will prioritize avoiding existing utilities, at this location such avoidance may not be possible, potentially requiring some utility relocation.

Figure 22: West of I-405, including the east portion of the Metro Legacy sites (background image credit: Google Maps).

Current I-405 Lane Configuration

As shown in Figure 23, I-405 is currently three general purpose lanes and one high-occupancy-vehicle (HOV) lane in each direction within the project limits. Both directions have outside shoulders up to 24 feet wide and inside shoulders that are 4 feet wide. There is a direct access, an HOV on- and off-ramp (NE 6th St. direct access ramp), between NE 4th St. and NE 6th St. that is built on retaining walls. The median NE 6th St. direct access ramp is one lane in each direction with 8-foot outside shoulders, 2-foot inside shoulders, and a median concrete barrier. There are on- and off-ramps to and from NE 4th St. built on retaining walls within the project limits and two lanes in each direction. There is a single lane on-ramp from NE 8th St. that goes below grade underneath the NE 6th St. bridge, NE 4th St. off-ramp, and NE 4th St. bridge. A single-lane off-ramp to NE 8th St. that begins south of Main St. is also present within the project limits.

The current lane configuration may need to be temporarily rechannelized to provide falsework and temporary support during the construction of I-405 crossing structure.

Figure 23: Current I-405 lane configuration within the project limits (background image credit: Google Maps).

Ultimate I-405 Lane Configuration

The conceptual I-405 forward compatible master plan shows I-405 as four general purposes lanes and two express toll lanes in each direction (see Figure 24). Outside shoulders would be reduced to 10 feet wide and inside shoulders would remain at 4 feet wide. The NE 6th St. direct access ramp between NE 4th St. and NE 6th St. would remain in a similar configuration to the existing condition, though WSDOT has expressed that to serve the extension of NE 6th St., the median NE 6th St. direct access ramp would be channelized for three lanes.

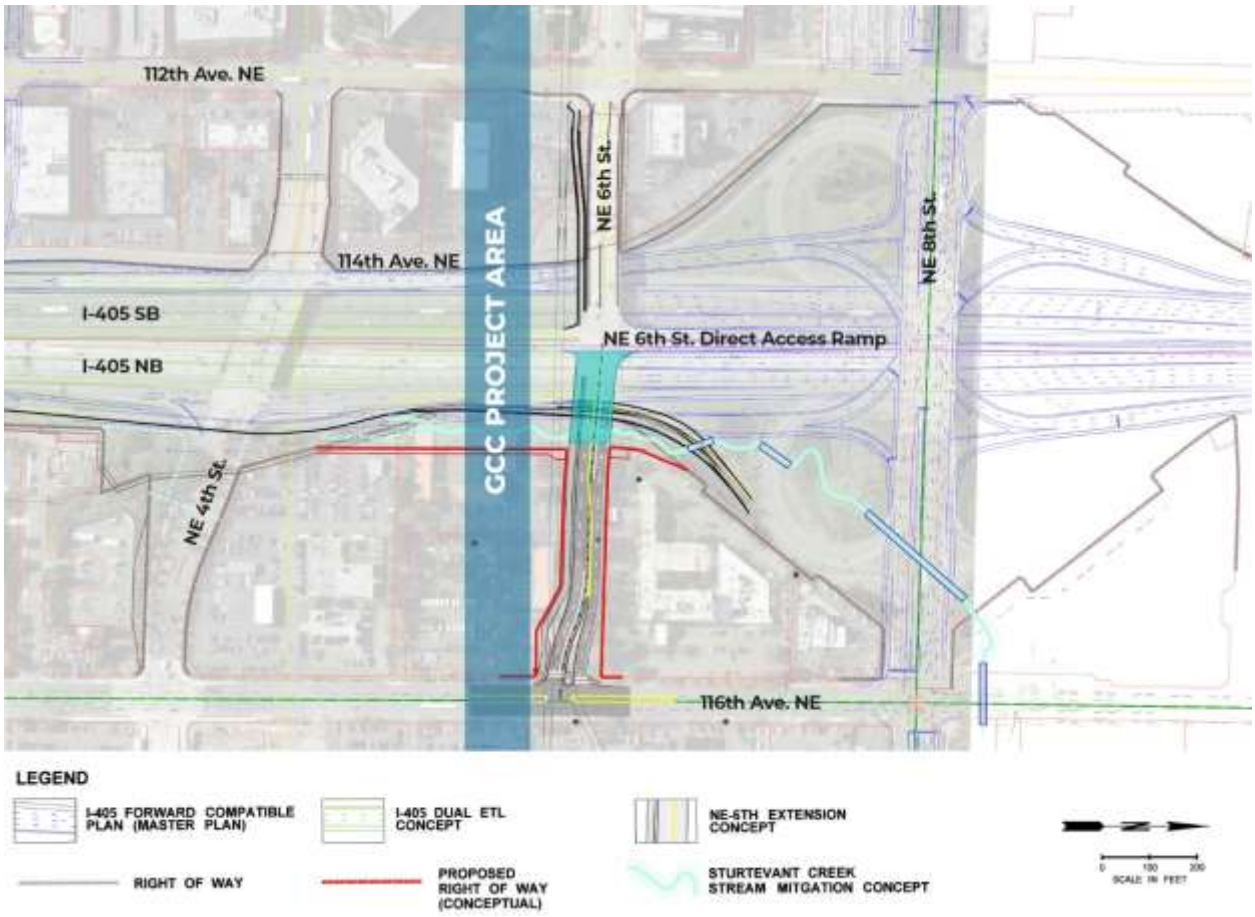

Figure 24: Current concept for I-405 lane configuration in the project vicinity (emphasis added), provided by WSDOT, based on the I-405 Master Plan.

Existing Median NE 6th St. Direct Access Ramp

The NE 6th St. direct access ramp between NE 4th St. and NE 6th St. is one lane in each direction with 8-foot outside shoulder, 2-foot inside shoulders, and a median concrete barrier (see Figure 25). The ramp is currently supported by a pair of mechanically stabilized earth retaining walls with straps extending beneath the ramp.

In the existing channelization, it would be feasible to place a GCC bridge pier in the center of the ramp, but as shown in the I-405 Master Plan configuration and as discussed with the WSDOT I-405/State Route 167 Program Office, there will be three lanes on the existing ramp, which would not be feasible without modifying/widening the ramp roadway.

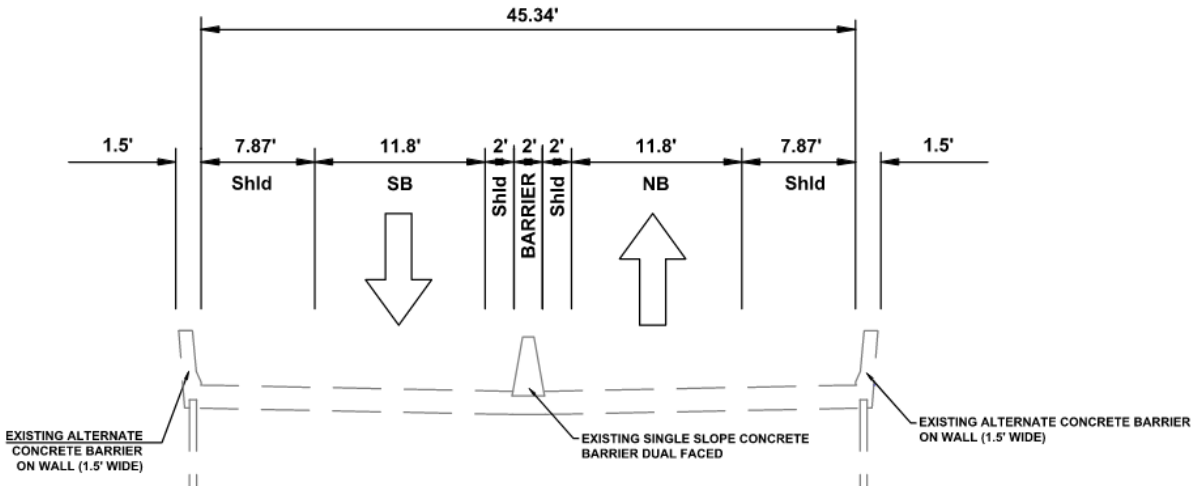

Figure 25: Lane arrangement of the existing NE 6th St. direct access ramp.
After the completion of the NE 6th St. extension to 116th Ave. NE,
WSDOT expects to add a turn lane for vehicles exiting the freeway.

A solution to accommodate a pier within the ramp is shown in Figure 26. However, as stated above, this will require a significant retrofit to the ramp. This option will be discussed with WSDOT in the future design phases.

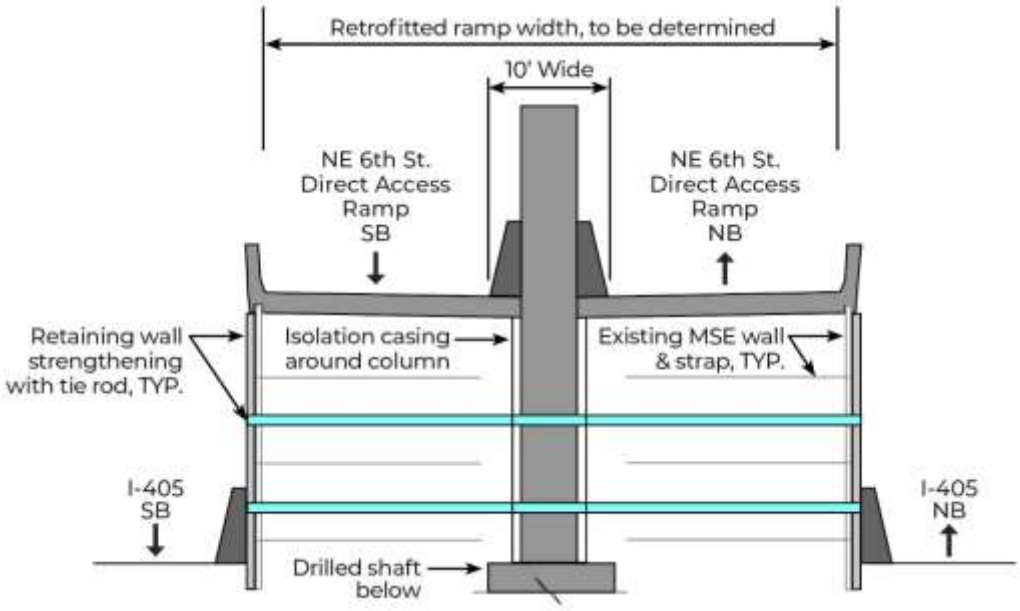

Figure 26: Section view of the NE 6th St. direct access ramp to accommodate a pier.

East of I-405 (Lincoln and KGIP Sites)

The Lincoln Center site has a structure built in 1975 that will potentially be eligible for the NRHP when project construction starts. The site also has a parking lot around this structure. The east side of the site will have a vertical circulation node with stairs and potentially a bike ramp and/or elevators and will impact the existing parking lot. The vertical circulation node will be surrounded by a plaza

at street level facilitating the transition from the street and sidewalk onto the bridge and acting as a gateway between the city and the bridge. The design team will need to keep coordinating with the sites study work and any developers that are involved in the site throughout the design process.

The bridge structure spans over 116th Ave. NE to the KGIP site; see Figure 27.

The KGIP site currently consists of a parking lot and a car dealership building that is of historic age. Based on feedback from the property owner and the City of Bellevue, the alignment will not follow the guideway structure, but instead go south of the dealership building. For the purposes of this report, this segment of the bridge will be considered as a free-standing structure to enable compatibility with future developments on this site as shown in Alternative Alignments 2, 3, and 4 in the Alternative Analysis Report. As coordination with the property owner progresses, this assumption will be revisited.

Figure 27: East of I-405, including Lincoln and KGIP sites (background image credit: Google Maps).

Eastrail

The alignment of Eastrail tie-in structure depends on the KGIP sites and the right-of-way line of Sound Transit. The structure will be configured to limit the impact to the KGIP sites and right-of-way in the Eastrail. This connection will also need to be widened to facilitate pedestrian and bicycle movements onto and off of Eastrail. This detail will be developed for the 30 percent design.

Eastrail tie-in structure will be nearly leveled to the existing elevation. Fill and retaining wall will be used to accommodate the leveled tie in.

Sturtevant Creek

Sturtevant Creek existing conditions were discussed in Section 2.3.2, as well as the potential for future daylighting of the creek that may be pursued by WSDOT. Section 2.3.2 also mentions an option of off-site mitigation in the form of stormwater quality retrofits and stream enhancements rather than future daylighting. If WSDOT moves forward with daylighting of the stream, it would be located east of the I-405 crossing structure's east pier, which will be aligned with existing Sound Transit Guideway structure's pier. Design of the east pier and its foundation will need to consider the potential invert

elevation of the creek, if daylighted, to avoid scour potential. It is also possible, the alignment of a daylighted creek to be shifted slightly eastward to provide more clearance from the piers.

3.2 Aesthetics

3.2.1 User Experience

This bridge structure will become a place where people will congregate, in addition to a place that people will traverse. There are three key principles underlying the user experience and types of places along the GCC. The three principles emerged from the team's evaluation of the sites, and how the urban design and performance goals fit within the city's vision for the crossing. These place characteristics, combined with the experience principles, will ensure the GCC provides an iconic and dynamic user experience from end to end. The bridge channelization and configuration of mixing zones (City Hall Plaza, West and East Nodes, and Eastrail Tie-In) are being studied and the design team will know more by 30 percent design.

The three user experience principles are:

- Connectivity
  - To adjacent development parcels and a future lid
  - To existing and planned mobility networks, as shown in Figure 28

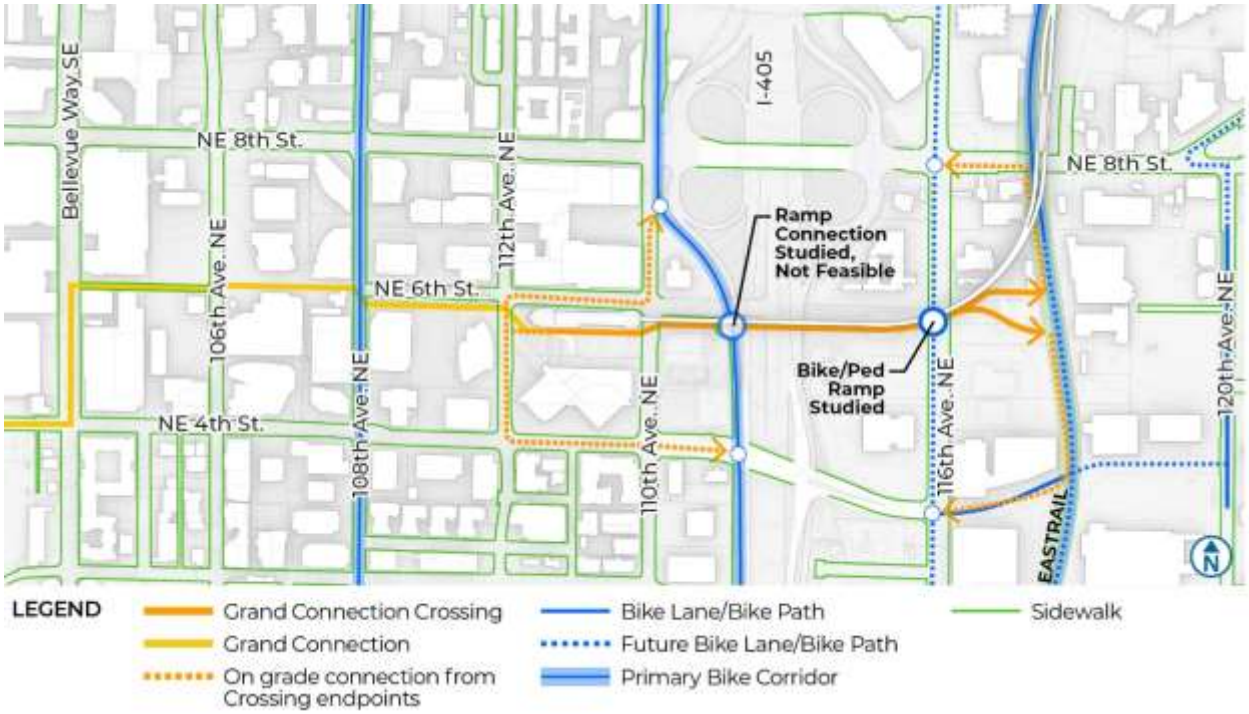

Figure 28: Mobility network and connections.

- Accessibility and Safety
  - All ages and abilities
  - Welcoming to a diversity of potential users
  - Multiple points of entry and exit
  - Ample lighting and clear sight lines

- Activity
  - Daily users and amenities
  - Connections to public and private development, plazas, and a future lid
  - Occasional hosting of active programming on crossing or future lid
  - A magnet for downtown community members, visitors, and commuters
  - A sequence of experiences that varies across the alignment
  - Active all times of day and year

There are four different types of places along the GCC–gateways (overlap tie-in structures), nodes, the I-405 crossing, and the connecting spans between these elements; see Figure 29. These different types of places and connections build on the "sequence of experiences" that is the GCC, and allow for unique placemaking opportunities and experiences along the route. Public feedback on this project has emphasized that some key things people love about Bellevue are feelings of connection to nature–trees and landscape–and cultural/artistic programming. Both will be included throughout the GCC.

Figure 29: Important places along the GCC (background image credit: Google Maps).

These four different types of places include:

- Gateways Places; see Figure 30 on the following page
  - Located at each end of GCC, City Hall Plaza in the west, and Eastrail in the east.
  - May include landscape feature, art/cultural elements, seating, play, vending, welcome kiosk, signage and wayfinding, overhead weather protection, and special events.
  - Circulation type is mixing zone.
- Nodes; see Figure 31 on the following page
  - Provide vertical and horizontal connections to/from bridge structure to/from development and the street below.
  - Multi-level placemaking and plaza opportunities, including landscape feature, art/cultural elements, seating, play, vending, welcome kiosk, signage and wayfinding, overhead weather protection, and special events.
  - Circulation type is a mixing zone.
  - At the street level at each node, a plaza-type space will provide a mid-crossing gateway from the street onto the structure.

Figure 30: Gateway character and activity examples.

Figure 31: Nodes character and activity examples.

- I-405 Crossing; see Figure 32 on the following page
  - May include viewpoints, overhead weather protection, separated bicycle and pedestrian circulation, seating, signature landscape features, and details/geometry designed to abate freeway noise.
  - Truss option may include multi-level bicycle and pedestrian decks.
  - Girder and arch options may include signature landscape.
  - Circulation type is dedicated/separated bicycle and pedestrian facilities.
  - Will be designed to maximize compatibility with possible future lid structures.

Figure 32: I-405 crossing character and activity examples.

- Connecting segments between Tie-In Structures, Nodes, and I-405 Crossing; see Figure 33
  - Circulation type is dedicated/separated bicycle and pedestrian facilities, each a minimum of 12 feet in width. Will be designed to maximize connectivity to possible future adjacent developments.
  - Throw barriers will be integrated when at or above the Sound Transit guideway.
  - There will be opportunities for art elements landscaping and other other urban design features (lighting, benches, etc.) that will facilitate a contiguous experience between the gateways and nodes.

Figure 33: Path character and activity examples.

3.2.2 Aesthetics of Structure and Structure Type

The city's vision for the GCC is a unified structure that delivers an iconic userexperience from start to finish. Public feedback at both the early project design charrette and at the subsequent project open houses have confirmed the public's desire for an activated, thoughtful, and delightful crossing experience.

With the use of contemporary materials and a unified design vocabulary, the crossing will lead and be visually compatible with the contemporary architecture of downtown Bellevue and emerging mixed-use neighborhood of Wilburton. Across the GCC, there will be multiple structure types with associated aesthetic opportunities for each type. On the I-405 span, there are three different structure

type alternatives. With all these variables together, the design will provide a cohesive aesthetic experience that ties together the disparate materials and structural systems into a unified system and experience, providing a forward-looking architectural expression visually compatible with downtown Bellevue and Wilburton. From I-405, views of the new structure will be limited by WSDOT sign structures and existing bridges to the north and south.

The baseline section for the GCC will be a CIP PT concrete box girder. For these sections edge profiles, columns and piers, formliner finishes, lighting, and fall protection/throw barriers will be customized for visual compatibility with other structure elements. The east and west nodes will serve as mobility hubs where there is vertical circulation to the ground below and connection to private development. As will be discussed in more detail in Section 4.0, the current design shows CIP concrete with a finish on the deck that is consistent with other plazas in downtown Bellevue. There is an opportunity to enhance the design aesthetic of the CIP concrete structure, as well as to specify upgraded finishes on the plaza. The width of the nodes will vary based on program and use.

On the I-405 span, three structural alternatives have been considered; tied arch, truss, and CIP PT box girder. Each one has different characteristics and aesthetic opportunities and weaknesses, presented in detail in Section 4.0 below. For each type, utilities, signage, and other appurtenances will not be attached to the edge of the bridge, allowing the structure to read clearly and to facilitate future compatibility with a lid structure.

For the I-405 crossing, as the project progresses, we will continue to coordinate with WSDOT to satisfy the aesthetic expectations defined by the I-405 Master Plan, while also incorporating unique elements to support the iconic user experience, for those portions of the bridge subject to those expectations. An example of WSDOT expectations for a bridge overcrossing I-405 is shown in Figure 34, below.

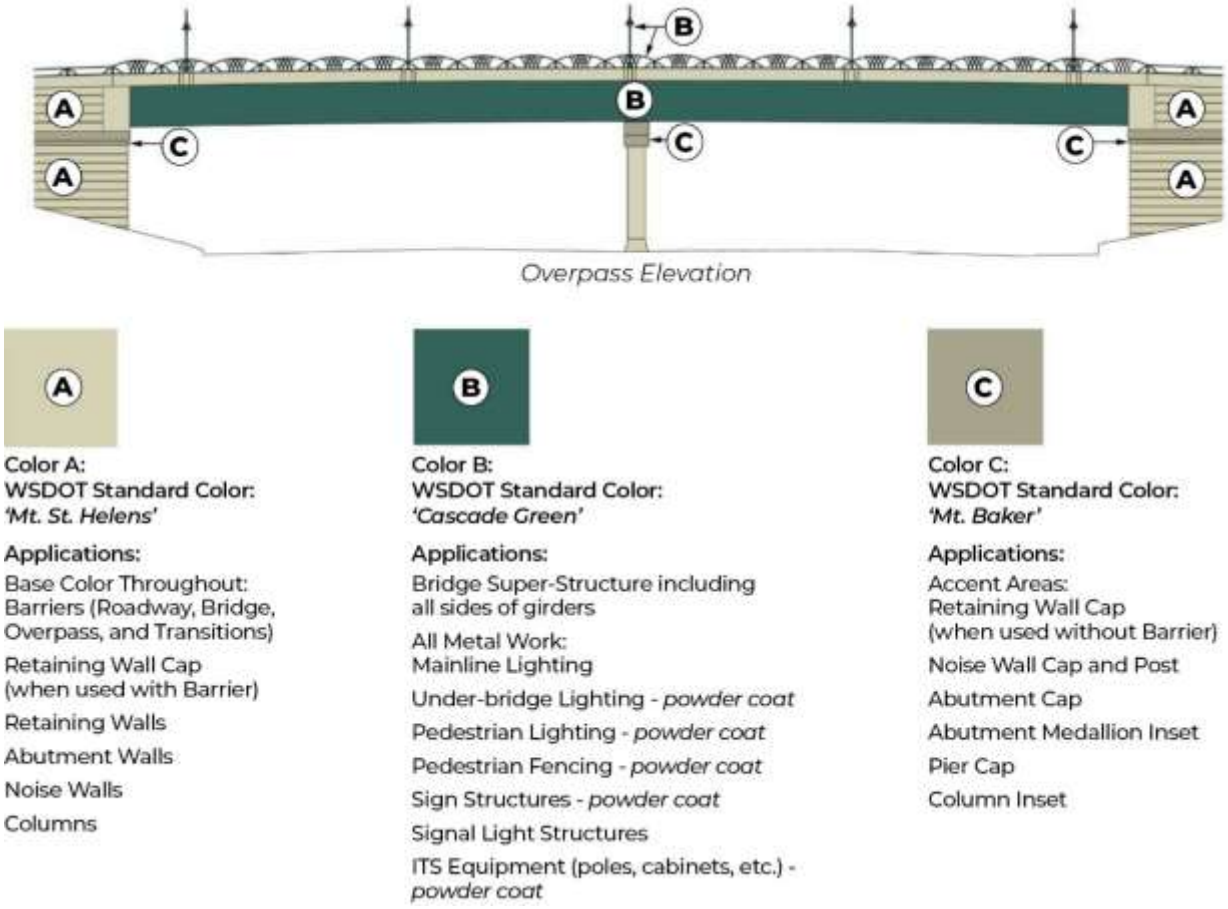

Figure 34: Excerpt from WSDOT's I-405 Urban Design Criteria, December 2022.

3.2.3 Landscape and Urban Design

In the following section, preliminary hardscape materials, landscape lighting requirements, irrigation, soil and drainage, and site amenities are detailed. This list precedes the actual design, so it is likely to evolve and change as the design progresses. It is included to give a sense of the types of materials and systems that will be included for the landscape and urban design elements on the bridge.

Hardscape Materials

It is anticipated that paved hardscape surfaces will be composed of scored and/or colored concrete. Bike paths will be a part of the bridge structure, which is CIP concrete with a natural grey color, demarcated with thermoplastic lane delineation and bike-lane symbols.

Pedestrian paths will be CIP reinforced concrete on top of concrete bridge deck structure with path concrete to be enhanced with color and texture. Reinforcing the concrete, even on the pedestrian pathway, will improve durability and longevity. Contrasting surface finishing treatments will be used to delineate path use type and spatial definition. It is anticipated that at-grade entry points will be paved with concrete unit pavers.

Fixed raised planters heights vary from 6 inches to 42 inches above adjacent finish grade, with tree stabilization provided for all trees. Special seating elements of concrete and wood integrated into hardscape and planting layout to create soil volumes.

Site Electrical and Lighting

Lighting will be integrated into the structure and into the user experience to assist in creating a safe and accessible environment and accent points of interest and landscape features. Area lights will be spaced to provide the foot-candles to meet the local codes for egress requirements. If desired by the City of Bellevue, various 'Smart City' features, such as WiFi, can be integrated into the site to provide full coverage. Bridge accent lighting will be integrated into structure and bridge site features. Convenience power receptacles integrated into hardscape for charging of personal devices shall be waterproof duplex outlets and supporting conduit in each amenity space.

Soils, Grading, Drainage, and Irrigation

On the bridge structure, lightweight planting soil systems and structural foam will be used to reduce weight loads in areas where soil profiles vary. Raised plantings will create a physical barrier between bike and pedestrian paths, as well as create the soil depths required for various types of plantings, including ornamental plants and large trees.

Surface drain structures and inlets located in hardscape will be ADA compliant and will coordinate with bridge aesthetics. In addition, subsurface drainage will be located on-structure in the form of sustainable green roof technology systems connected to mechanical, electrical, and storm drainage infrastructure, and located on-grade in the form of 6-inch perforated pipe in filter fabric sock between drains under planted areas and solid polyvinyl chloride pipe under paved areas connected to civil storm drainage infrastructure.

All landscaping will be irrigated.

Planting

The final landscape design will coordinate with the following sections of the WSDOT I-405 Urban Design Criteria: Plant Material List, 'Signature Community Plant Material' designated for Bellevue segment of I-405, and planting setbacks.

The plantings will be a mixture of deciduous and evergreen species, and will include trees, ornamental plantings, vines, and lawn. Plantings are integrated for both aesthetics and noise dampening.

Site Amenities

Site amenities will include fixed benches integrated into the layout of planting and hardscape design, furnishings, such as movable bistro tables and chairs (basis of design landscape forms), drinking fountains, removable bollards at the east and west at-grade connection points, and waste receptacles.

Bike repair stations or bike racks may also be provided adjacent to the bike path for convenience.

Specialty Features

Other specialty features, such as an arbor structure, themed lighting elements, an entry/exit feature, and a sculptural play element for children or adults, could be included on or under the bridge structure.

The assumption at this phase of design development is that the City of Bellevue will maintain all elements of the GCC.

3.3 Eastrail Tie-in

To keep the same structure type throughout the GCC, the structure approaching the Eastrail tie-in is expected to be a CIP PT box girder. However, precast tub girder with integral piers is a viable option.

The bridge abutment at the Eastrail tie-in will likely take the form of an abutment wall with wingwalls that retain fill that brings the finish grade up to the same level as the Eastrail profile. The abutment will likely be founded on drilled shafts and the wingwall on spread footings. Because this is a standard construction method in Washington State, construction challenges and impact to traffic are anticipated to be minimal.

3.4 Geotechnical and Foundation Concepts

The existing Sound Transit guideway structure is founded on drilled shafts. Along the project corridor, most of those are single drilled shafts supporting the column. At the I-405 crossing, it is a pile group of four drilled shafts; this can be seen below in Figure 35.

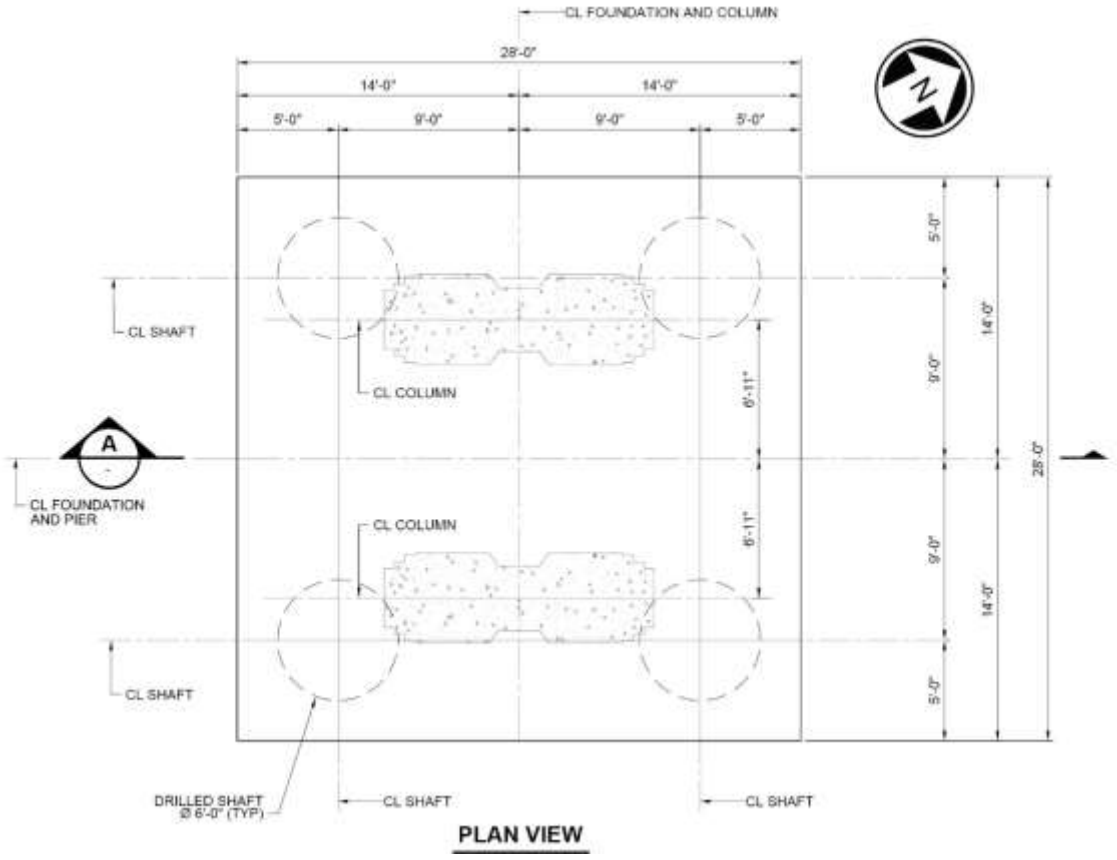

Figure 35: Drilled shaft layout for the I-405 crossing for the Sound Transit guideway.

To address Sound Transit's concerns regarding their existing guideway, it is assumed that no drilled shafts for the proposed crossing will be within 30 to 33 feet of the existing drilled shafts. Providing sufficient clearance from the foundation of existing guideway structure avoids triggering the bearing resistance reduction factor of drilled shafts, as outlined in AASHTO LRFD. This stand-off distance is shown with orange "circles" seen in Figure 36.

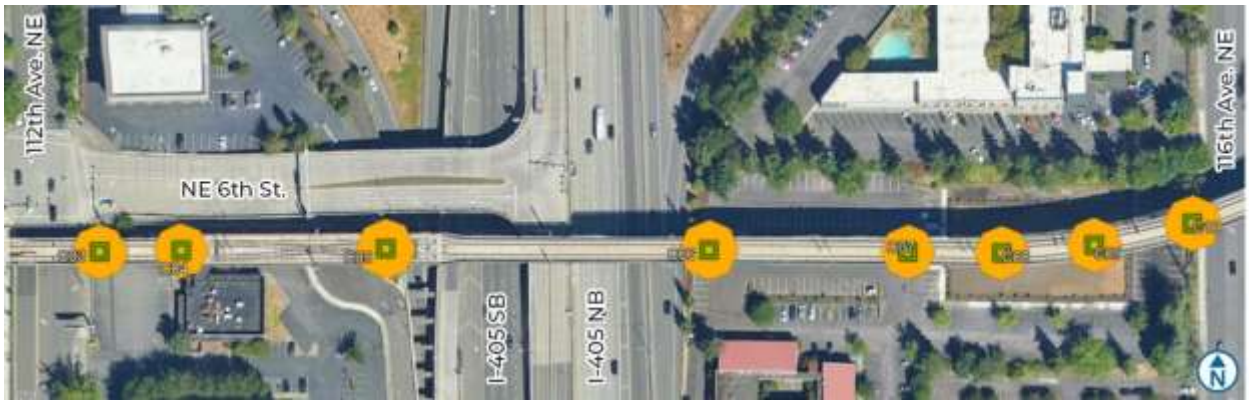

Figure 36: No Build Zone around Existing Drilled Shafts (background image credit: Google Maps).

It is assumed at this time that all new structures described in this report will be founded on drilled shaft foundations. Further recommendations regarding shaft sizes and lengths can be found in the geotechnical engineering report being developed by this team.

It is anticipated that embankment/retaining walls will be necessary to tie the I-405 crossing into the existing Eastrail elevation; additional information can be found in the geotechnical engineering report.

3.5 Stormwater Management and Drainage Design

The stormwater management system for the project must comply with the City of Bellevue Utilities Department's 2024 Storm and Surface Water Engineering Standards. This document provides the minimum stormwater design requirements for new and redevelopment within the city. The project will be classified as a "redevelopment" project because the existing underlying surfaces of the site have greater than 35 percent of existing impervious coverage. For the portion of the project above I-405, the 2019 WSDOT Highway Runoff Manual (HRM) and the 2023 WSDOT Hydraulics Manual must also be considered.

Table 10 provides a summary of the City's minimum requirements and explains how they will be satisfied.

Table 10: Summary of Drainage Requirements.

Minimum Requirement	Description	How Requirement Will Be Satisfied
MR 1	Preparation of Stormwater Site Plans	A separate Stormwater Drainage Report will be prepared that includes Stormwater Site Plans and narrative describing how the project meets the City's Storm and Surface Water Standards.
MR 2	Construction Stormwater Pollution Prevention	Construction Stormwater Pollution Prevention Planning consists of the preparation of the Temporary Erosion and Sediment Control (TESC) Narrative and TESC plans meeting City requirements. Obtaining and complying with the National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit and all monitoring and reporting requirements will also be required.

Minimum Requirement	Description	How Requirement Will Be Satisfied
MR 3	Source Control of Pollution	During the construction phase of the project, source control measures will be implemented in accordance with the TESC Narrative and TESC plans. Several best management practices (BMPs) that could be employed as source control measures are temporary and permanent seeding, compost socks, silt fencing, plastic covering and mulching of slopes and disturbed areas, and stabilized construction entrances. Source control BMPs shall be identified/described in the stormwater site plan document.
MR 4	Preservation of Natural Drainage Systems and Outfalls	The drainage design to be developed will mimic natural drainage patterns (i.e., drain to the same downstream system) as much as practicable. All drainage will eventually drain to a drainage system within the Sturtevant Creek Basin. Some minor adjustment of drainage patterns may be recommended to have the drainage above the I-405 right-of-way contribute to a City of Bellevue-maintained system rather than the WSDOT storm sewer system. This will be analyzed further as the design progresses and survey basemaps are developed.
MR 5	On-site Stormwater Management	On-site Stormwater Management considers implementing low impact development (LID) and infiltration BMPs to the extent feasible and in accordance with Bellevue standards. Compliance with MR 5 is required for the project. There are two ways to meet this standard. The first way is to provide stormwater detention to meet the LID performance standard (where the developed condition discharge durations match the pre-developed discharges rates from 8% of the two-year peak flow to 50% of the two-year peak flow). This approach would add to the detention storage required to meet MR 7 – Flow Control. The pre-developed condition would be “existing” site conditions. In addition to meeting the LID performance standard, the post-project pervious surfaces would need to meet soil and quality depth requirements (the City of Bellevue standards reference BMP T5.13). The second way of meeting MR 5 is to implement infiltration BMPs from the List 2 in the manual (in order of preference defined by the manual) wherever feasible for various types of surfaces, including lawns/landscape areas, roofs, and hard surfaces. A geotechnical study being conducted will assess the suitability of the soils for infiltration. In areas where infiltration is not feasible, due to high groundwater or poor soils, the project will need to meet the LID performance standard. Where soils are favorable, the project may either meet the LID performance standard or implement a LID BMP, likely bioretention.

Minimum Requirement	Description	How Requirement Will Be Satisfied
MR 6	Runoff Treatment	Runoff treatment is typically required when there are pollution generating impervious surfaces (PGIS). Because the project includes a non-motorized bridge and trail, it will be used infrequently by vehicles (maintenance and emergency access only). Based on the City of Bellevue's manual, the bridge will not be considered PGIS; therefore, no or possibly limited treatment (if there is new PGIS) is required. To meet this requirement, the City of Bellevue will need to include signage that prohibits vehicles on the bridge.
MR 7	Flow Control	The City of Bellevue's requirements for flow control within the Sturtevant Creek basin are different than other areas of the city. The City of Bellevue completed a study that determined that all of the Sturtevant Creek basin is eligible for an alternative stormwater detention standard for highly urbanized areas. This standard, which is allowable by the Washington State Department of Ecology (Ecology) as a part of their NPDES Phase II Municipal Stormwater Permit, states that development or redevelopment projects are allowed to detain to existing land use conditions rather than historic, forested conditions. Ecology recognized that under some circumstances, streams within heavily urbanized basins can, over time, become equilibrated to a new hydrologic regime (and are not experiencing significant erosion or sedimentation). Ecology established the standard as basins having had at least 40% total impervious area for at least 20 years and showing no significant erosion or sedimentation. The City of Bellevue conducted historical mapping of impervious areas to demonstrate this. The City of Bellevue has adopted this standard for the basin. It is also noted that WSDOT has a similar policy that allows detention to existing conditions for basins that meet the 40% impervious standard (HRM Section 3-3.6.4). Because most of the existing surfaces are impervious, flow control BMPs (detention) will only be required for the pervious areas converted to impervious, which only includes an area on the west side of I-405.
MR 8	Wetlands Protection	There are no mapped wetlands within the project corridor; therefore, this requirement does not apply.
MR 9	Operation and Maintenance	All drainage facilities will be publicly owned by the City of Bellevue (including those above I-405) and will be maintained by the City of Bellevue.

The above discussions focus on surface collected drainage and compliance with the City of Bellevue's drainage standards. Another aspect of stormwater management for the project includes subsurface drainage for pervious (i.e., landscaped) areas of the bridge. All landscaped areas of the bridge must have an underlying drainage layer/mat that allows rainwater/irrigation to flow to an outlet so that it does not become ponded and result in wet soils unfavorable to vegetation. Selecting the appropriate drainage mat is an important consideration because past experience (mostly by

WSDOT) has shown that a drainage mat system that flows too well is not conducive to retaining moisture and results in the need for much more irrigation water than desirable. A drainage mat system that does not have sufficient flow retains too much moisture in the above soils and can inhibit proper vegetation growth.

Figure 37 shows the concept of a drainage mat system below pervious areas. The drainage mat will need to be connected to a sump or pipe system at its downstream end.

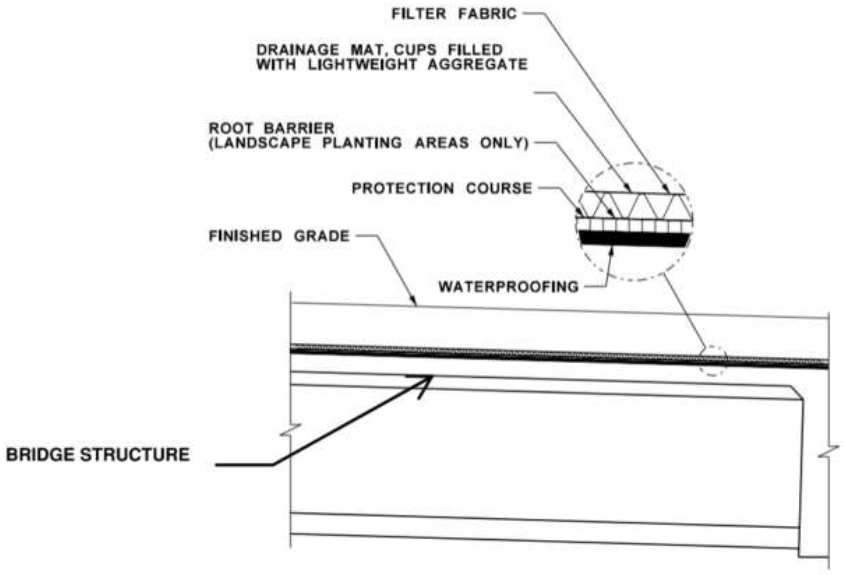

Figure 37: Concept of drainage mat system (Source WSDOT Mountlake LID Bridge Design-Build Package).

3.6 Operations and Maintenance Cost Comparison

A more detailed discussion of the likely operations and maintenance costs of the GCC will be developed as part of future design phases and is beyond the scope of this stage of the design. However, a high-level comparison of one structure type to another, primarily for the I-405 portion of the GCC, is possible at this stage. Generally, the steel bridge types (the arch and the truss) will require more maintenance than the CIP concrete option in order to maintain the coatings and any other corrosion protection systems.

3.7 Additional Structures

3.7.1 City Hall Plaza

Current configuration of City Hall Plaza is not suitable for pedestrian and cyclist flow after the completion of the project, as landscaping features, pedestrian flow to/from the station, and additional pedestrian and cyclist traffic volume may lead to congestion. Therefore, construction of GCC will require a modification of the plaza's landscape features in the vicinity of the path to and from the GCC from 110th Ave. NE.

The need for any structure modifications and retrofit to the City Hall garage will be evaluated in future design phases. Construction cost estimate of the structural modifications and retrofit are discussed in Section 4.3.

3.7.2 Eastrail

Eastrail is an elevated area compared to the existing KGIP site. Therefore, wingwalls adjacent to the abutment will need to be constructed to facilitate the connection to Eastrail.

3.7.3 Vertical Circulation Structures at the Nodes

The purpose of the vertical circulation structures is to provide ADA-compliant options for the trail users to access the bridge to/from the street near the Legacy and Lincoln properties. Elevators are needed because the assumption the GCC timeline is sooner than adjacent development. To make the GCC structure accessible at these two sites, there must be an ADA-compliant ramp or an elevator tower. There are two elevators provided at each point of vertical circulation as a maintenance and design best practice, when one elevator is under maintenance the second elevator provides the ADA-compliant means of entry and egress.

At the west node, stairs and two elevators are proposed. The elevator tower is located in the center of the oculus with the stairs circulating around the core in Figure 38.

Figure 38: Conceptual rendering of the vertical circulation structure at the west node.

At the east node, stairs are proposed, as well as an elevator tower. The elevator tower is located in the center of the oculus with the stairs circulating around the core in Figure 39.

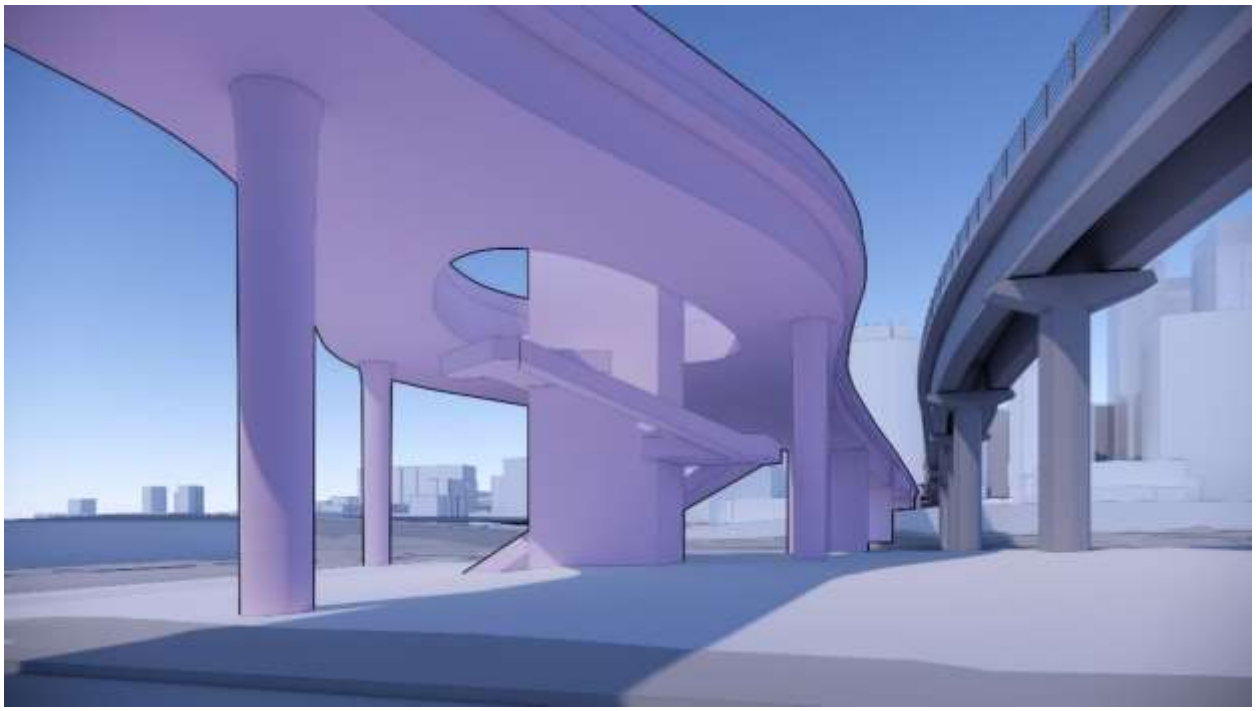

Figure 39: Conceptual rendering of the vertical circulation structure at the east node.

The elevator, stairs, and ramp concepts are based on the preliminary bridge elevations and available space at the Legacy and Lincoln Center sites. These designs and configurations, including lighting for safety and detail for these lower level plaza-type spaces, will be coordinated with the property owners and refined in future design phases.

3.7.4 Weather Protection Structure on Bridge

Where it is feasible, weather protection structures, such as a canopy, will be considered on the bridge structure. Configuration and design of the weather protection structure will be developed in the future design phases.

3.7.5 Future Connection Structures

One of the design requirements is to make the GCC structure accessible to and from future development at several developable sites along the bridge structure.

It is uncertain how the properties will develop at this time. However, one of the design scenarios is for the future development to have a podium at the bridge elevation and allow for pedestrian flow with a skybridge/gangway spans as shown in Figure 40. This figure represents a generalized relationship between the GCC and future development; it is not site specific. This concept will be communicated and refined throughout the future design phases.

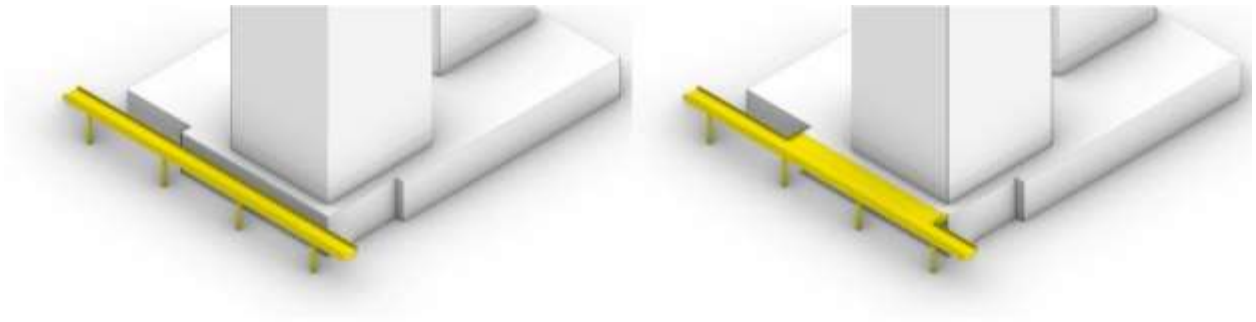

Figure 40: Diagram of the future podium integration (not site specific).

3.8 Compatibility with Future Lid

Another consideration of the bridge design, specifically for the portion over I-405, is the compatibility of the GCC structure with a future lid to the south. The purpose of this lid is to create an expanded gathering and engagement space and is not a space for vehicles. Based on earlier feasibility studies and evaluation of other lids, it is assumed that a lid will need to be a multi-span structure over I-405, meaning that the lid will require intermediate piers within the I-405 right-of-way. Based on this geometry and on the expected features provided on a lid, it is expected that the lid will be a CIP concrete box structure.

The GCC bridge type most compatible with a future lid is a bridge that more or less matches that of the lid—a multi-span CIP concrete box. Matching the span arrangement allows for maximum permeability between the two structures because the deflections of the adjacent structures will be similar, simplifying the joint that would be needed to span from one structure to the other.

That said, connections from other bridge types or span arrangements are feasible, albeit less straightforward. The GCC bridge type with a superstructure above the bridge deck will create interference points at the vertical structural elements (truss verticals/diagonals, arch ribs, suspender ropes), limiting, but not eliminating, pedestrian permeability with the lid.

3.9 Additional Requirements and Considerations

Utilities that are to be carried by the bridge will be determined through coordination with the necessary agencies and private owners. For the preliminary design of the structure, three sets of following utility lines were considered:

- One 3-inch-diameter pipe for supply water
- Two 8-inch-diameter pipes for drainage
- One 6-inch-diameter pipe for fire

Current feedback from the City of Bellevue is that the bridge will need to be accessible for an ambulance-sized vehicle for emergency response and that a fire-protection dry standpipe be provided across the length of the bridge. It is expected that the standpipe will require firehose valves spaced at 200 feet or less.

Traffic will be impacted during construction of the bridge. Limited lane closures are expected on I-405 in order to install temporary shoring towers. While the temporary shoring is in place, there may be some temporary lane shifts or configurations on both northbound and southbound I-405.

Similarly, temporary lane closures are expected on some city streets, particularly 114th Ave. NE, where a nearby bridge foundation will be built.

It is expected that Eastrail will be impacted, including temporary trail closures, by construction of the GCC segments on the east end of the bridge alignment.

It is not anticipated that construction of the GCC will impact light rail operations of the Sound Transit Guideway.

In terms of Level of Service, it is expected that the bicycle and pedestrian lane widths selected for the GCC will provide for free-flowing movement of users on the bridge. This expectation will be evaluated further as the design progresses.

4.0 BRIDGE ALTERNATIVES

This section describes and compares the bridge alternatives with an emphasis on structural analysis, construction cost, constructability, and maintenance for each.

Table 11 shows the criteria and weighting used to evaluate each of the alternatives. The goal of scoring each of the alternatives is to determine the most suitable bridge alternative. The criteria and scoring are described in further detail below.

Table 11: Evaluation Criteria.

Evaluation Criteria	Maximum Points
Criterion 1 – Estimated Construction Cost	20
Criterion 2 – User Experience	25
Criterion 3 – Aesthetics	15
Criterion 4 – Maintainability/Life-cycle Costs	20
Criterion 5 – Compatibility with Future Lid	20
Total Score	100

Estimated Construction Cost

The estimated construction cost makes up 20 percent of the bridge-type selection. This criterion includes several elements, such as the initial construction cost, material escalation risk, and perceived construction risk. At the time of the type selection study, the estimated construction cost is based on dollar per square-footage of the bridge deck area.

Constructability is considered as a part of the square-footage cost. Fabrication, need for temporary support and falsework, and erection complexity are all part of the construction cost, and it will contribute to the overall score.

User Experience

User experience makes up 25 percent of the bridge-type selection. Most of the user experience will be shaped by the hardscape and landscape features. However, profile grade of the I-405 crossing, as described above, will influence the comfort level and the user experience as it directly correlates to the structure type.

Aesthetics

Bridge aesthetics make up 15 percent of the bridge-type selection. As distinguished from “User Experience,” bridge aesthetics refer to the overall look and feel of the various bridge segments from the point of view of external users from vantage points off the GCC. The bridge aesthetics criteria will have the biggest impact on the I-405 crossing segment, where different potential structure types will create large aesthetic impacts.

Maintainability/Life-cycle Costs

Maintainability and life-cycle costs make up 20 percent of the bridge-type selection. Structure types with relatively lower total maintenance cost and ease of inspection will score higher.

The total maintenance cost is tied to the width of the bridge, amount of structural steel, and its need for regular painting, planters, presence of bike lanes, and sidewalks, in addition to cable inspections and bearing replacements.

Compatibility with Future Lid

Compatibility of the I-405 portion of the GCC with a future lid makes up 20 percent of the bridge-type selection. Bridge structures that provide a more permeable interface with a future lid will score higher than those with more limited interfaces.

4.1 Structural Studies

4.1.1 West Tie-in Structure

As described in Section 3.1, three tie-in alternatives were studied: plaza extension, modified tie-in, and cantilevered structures.

As shown in Figure 41, plaza extension, approximately 130 feet by 130 feet, covers the existing parking structure and curved ramp for the westernmost section of the west tie-in structure. This extension will be an expansion of the existing structure type. The CIP PT box girder bridge structure is a two-span structure with span lengths of 136 feet and 136 feet. It will connect to the plaza extension and continue to the west node structure. The plaza extension structure and west tie-in bridge structure will be separated by a joint to allow independent behavior from the two differing structure types.

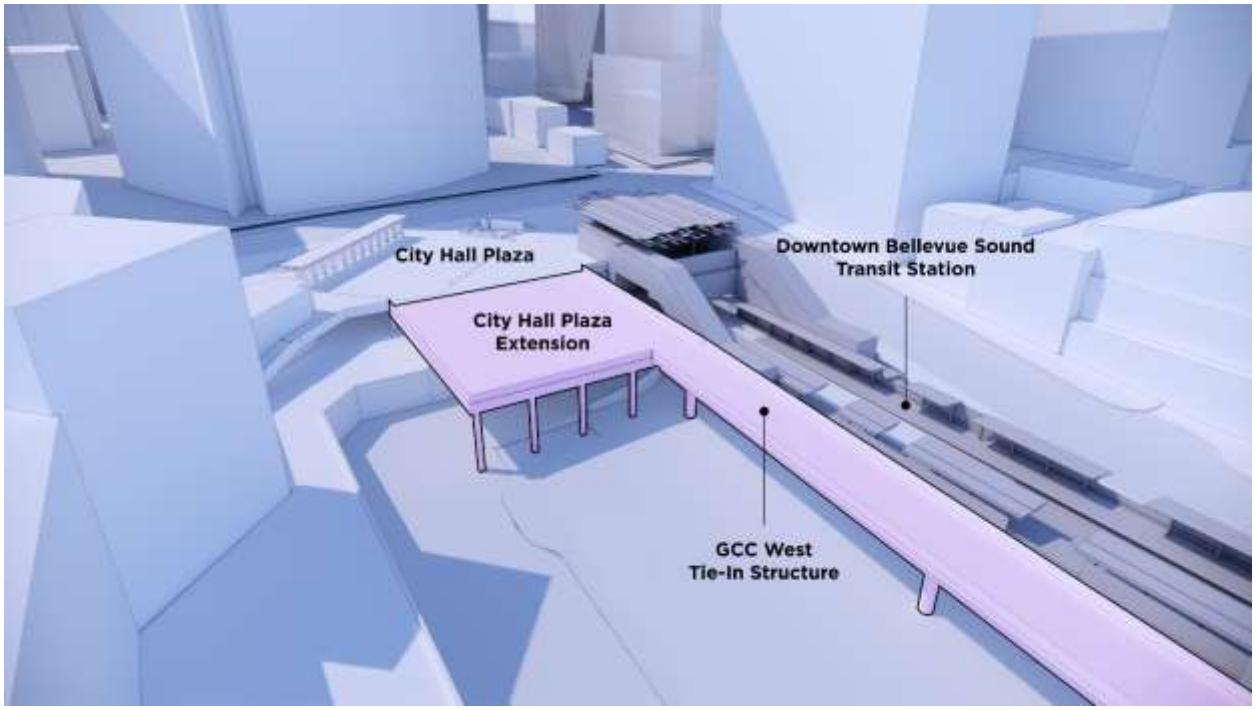

Figure 41: Conceptual rendering of west tie-in structure, Plaza Extension.

Figure 42 shows the modified tie-in with CIP PT box girder tying into the plaza directly. Alignment of this alternative is curved at the west end, as the vertical clearance is difficult to achieve when the bridge structure is closer to the station. Similar to the plaza extension alternative, this will require structural retrofit to accommodate additional gravity and seismic forces after the bridge structure is constructed on the parking garage.

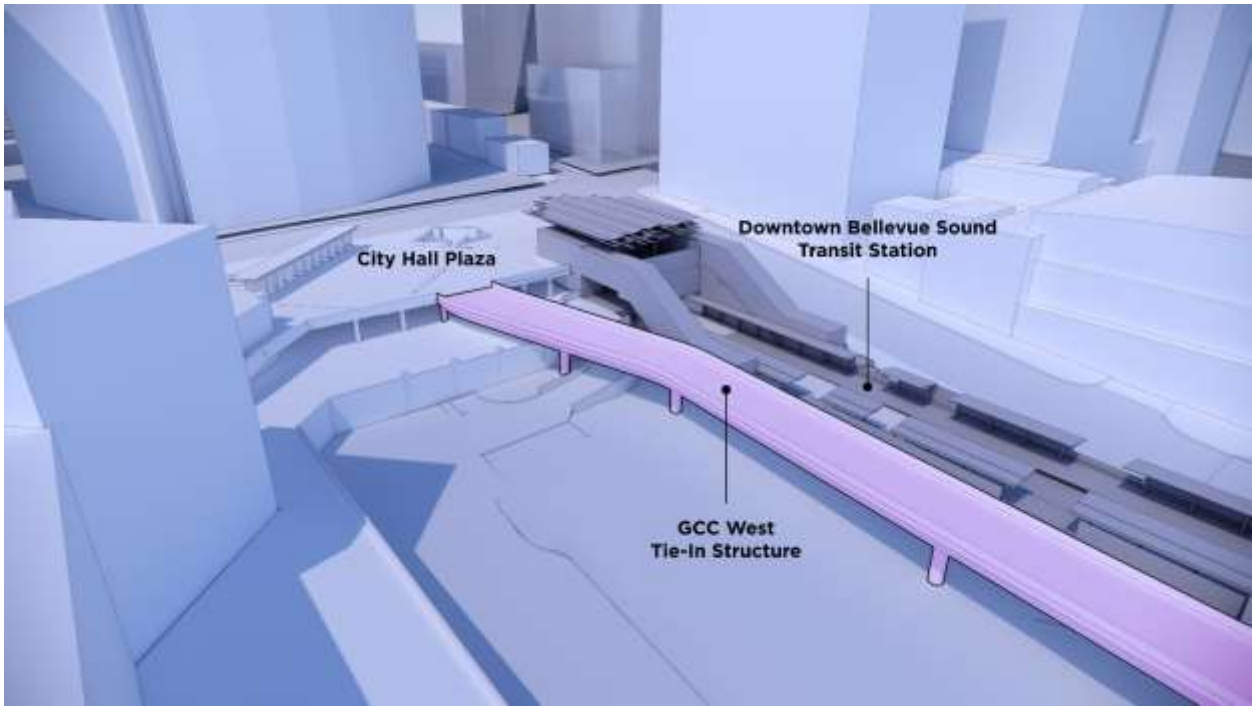

Figure 42: Conceptual rendering of west tie-in structure, CIP PT Box Girder.

The initial recommendation of the west tie-in was a cantilever structures (cable-stayed and steel truss), as shown in Figure 43 and Figure 44. The benefit of these structural types is to eliminate any additional loads from the west tie-in structure to the existing structure, simplifying the design and construction by avoiding major structural retrofit to an existing structure.

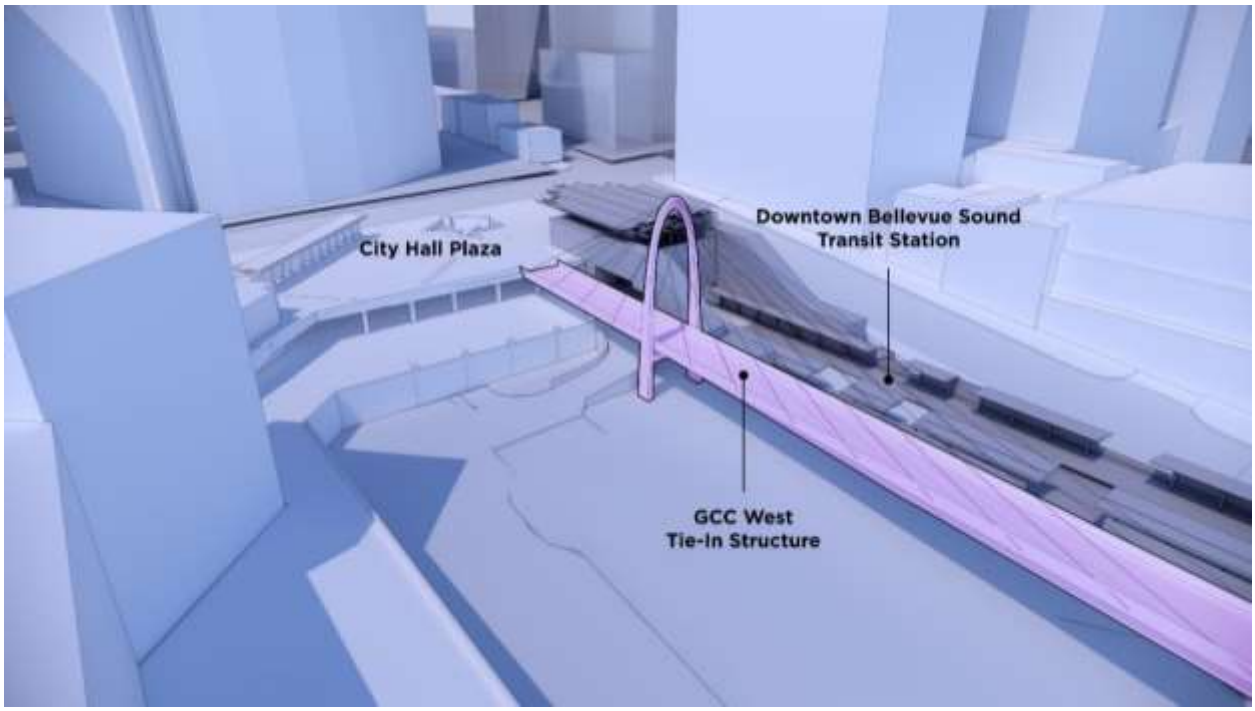

Figure 43. Conceptual rendering of west tie-in structure, Cable-Stayed Cantilever.

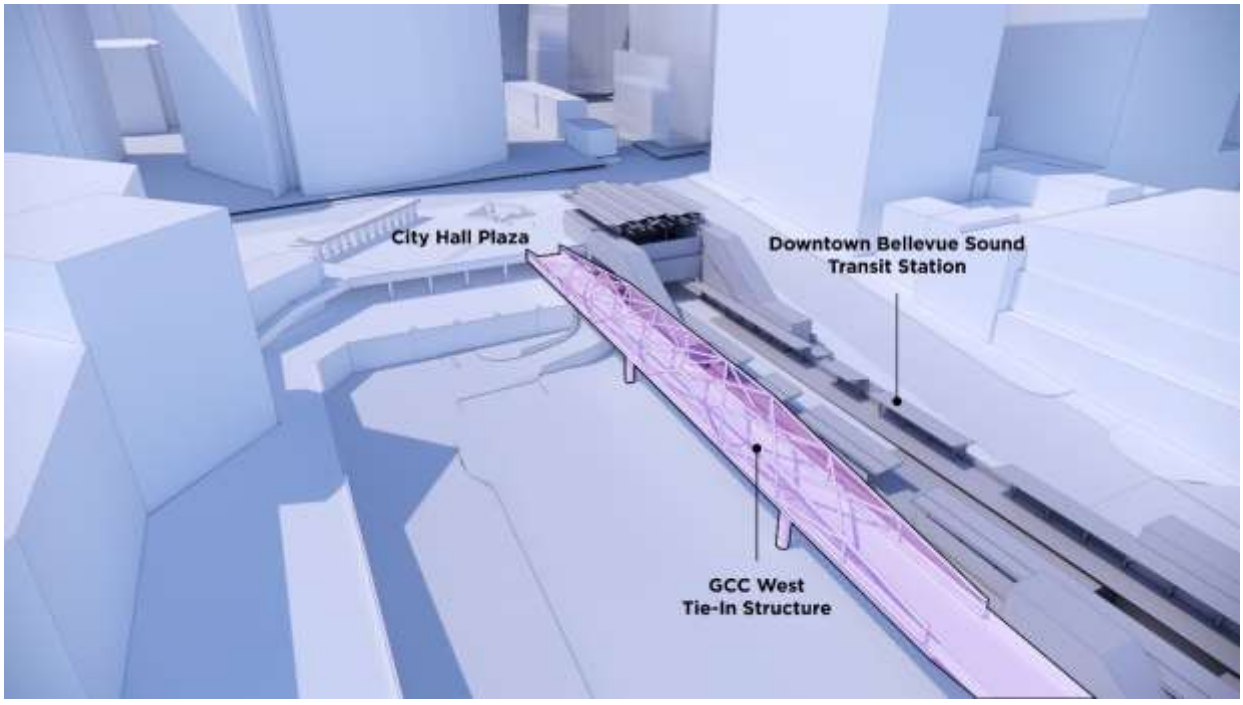

Figure 44: Conceptual rendering of west tie-in structure, Steel Truss Cantilever.

After further evaluation and coordination with the City of Bellevue, it was determined that a cantilevered structure design will create physical impediments and limitations on future connections to the Metro site.

The preference is for the modified tie-in with CIP PT box girders for the entirety of the west tie-in structure or a transition to a plaza extension structure. Advancement of the design will determine which connection type, plaza extension, or concrete girder structure is most feasible for the west end of the west tie-in.

Design of landscaping and bike and pedestrian lane configuration on the plaza extension will be developed during the 30 percent and 60 percent design phases.

Section alternatives of the west tie-in structure is shown in Figure 45, Figure 46, and Figure 47; more section alternative graphics, refer to Appendix A. The section shown in Figure 45 follows feedback from the city and the public for a clear separation between the modes of travel. The design team introduced a landscape feature to achieve a clear separation, and an addition landscape feature on the southern edge to enclose the pedestrians in a verdant environment.

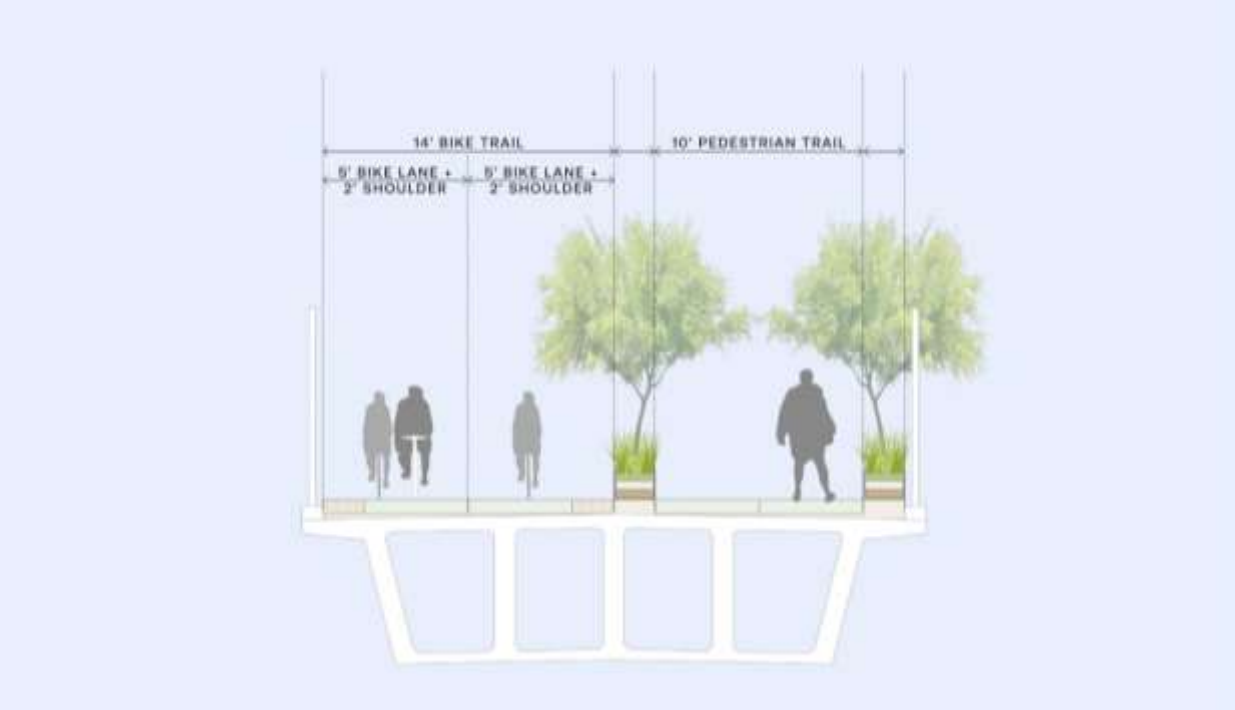

Figure 45: Section of the west tie-in structure, CIP PT box girder alternative.

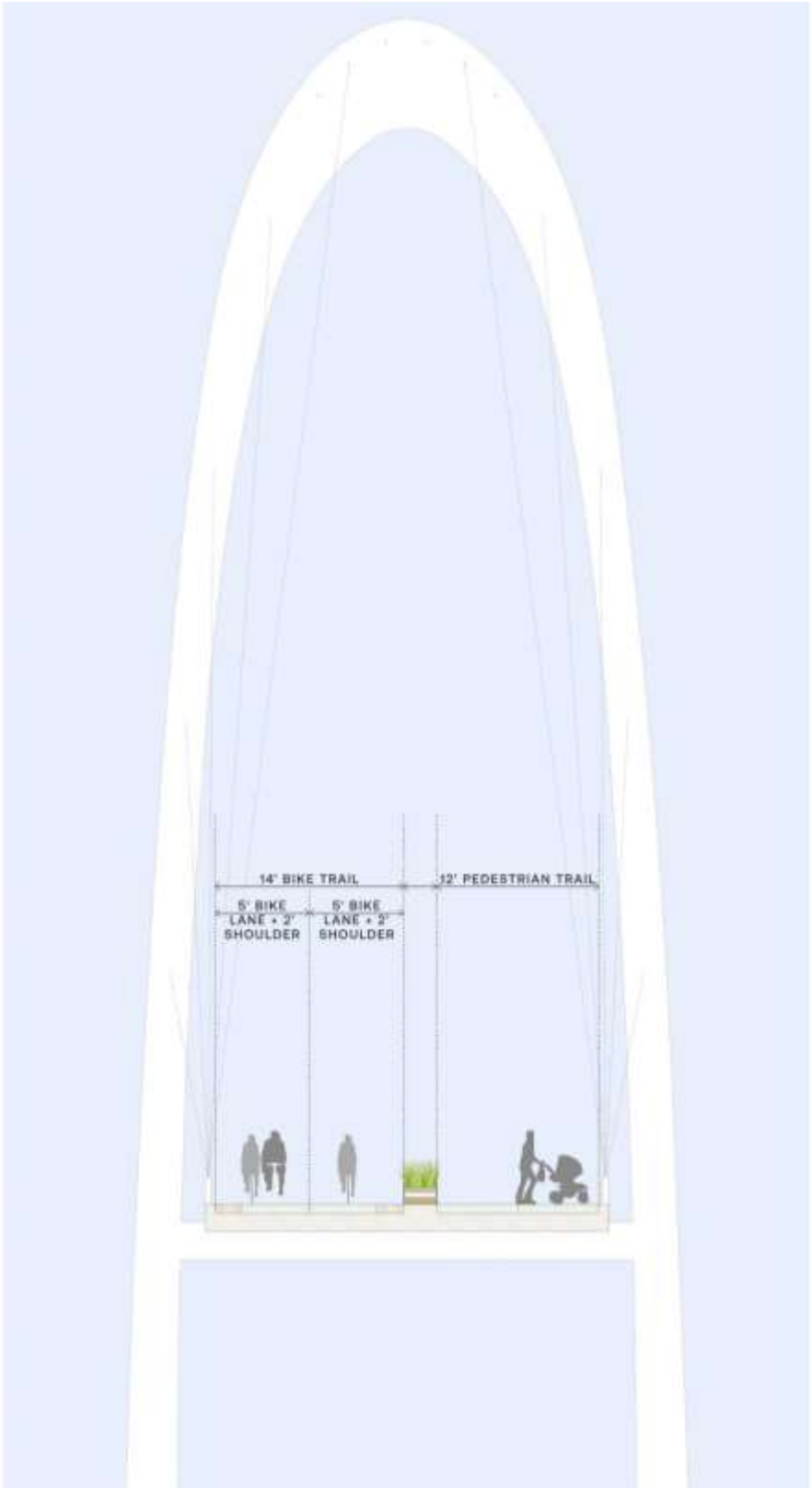

Figure 46: Section of the west tie-in structure, Cable-Stayed cantilever alternative.

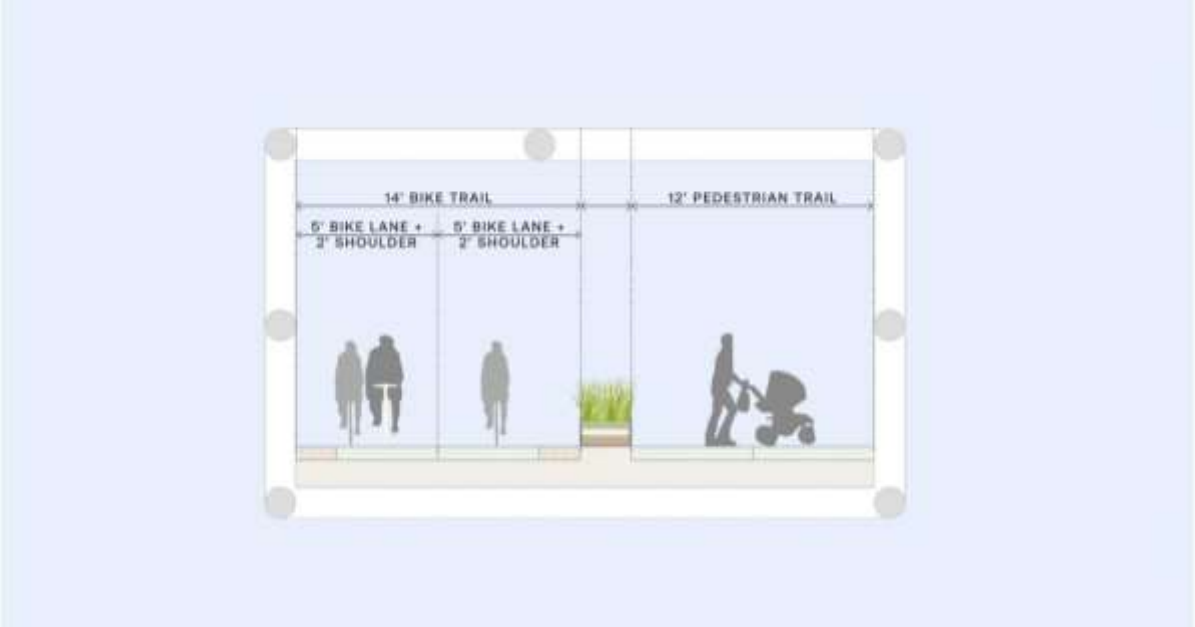

Figure 47: Section of the west tie-in structure, Steel Truss Cantilever alternative.

4.1.2 West Node Structure

The west node structure serves as the transition between the west tie-in and the I-405 crossing structures as shown in Figure 48. This structure facilitates the transition of structural width from 30 feet to up to 80 feet and a shift of the bridge alignment. In addition, the west node will provide a vertical circulation element with stairs and elevators to street level.

The following structural systems were considered for the west node structure:

- Cast-in-place post-tensioned box girder
- Structural steel frame system

Due to the complex geometry, exposure of structure from below, and the dead load induced by the landscape features, CIP PT box girder was selected as the only feasible alternative. Complexity of the fabrication of structural steel and its resulting cost and the appearance from below were deemed not desirable for the west node structure.

A throw barrier will be provided on the north side of the west node structure for protection of the Sound Transit station and guideway.

Along with the plaza-like experience at the west node on the bridge, there will be a plaza at-grade under the node that acts as gateway to the bridge from 112th Ave. NE.

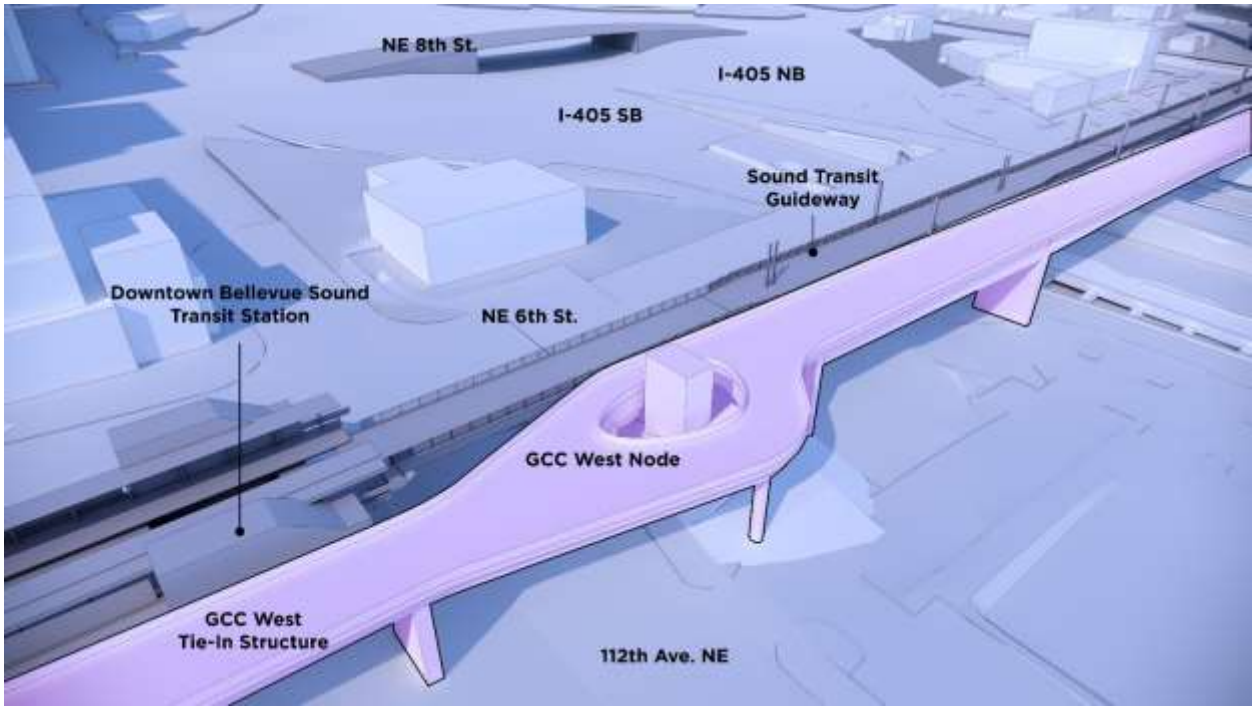

Figure 48: Conceptual rendering of the west node structure.

4.1.3 I-405 Crossing

The span configuration of the I-405 crossing is approximately 230 feet by 370 feet by 230 feet and the total width of the bridge deck is proposed to be 40 feet. This section of the bridge is to provide a total of 26 feet of pedestrian/cyclist path, 14 feet dedicated for cyclists and 12 feet for pedestrians, and up to 14 feet of landscaping, which results in significant dead load and structure member sizes. Landscaping is arranged outside the pedestrian paths in order to provide horizontal offsets from the edge of the bridge that can serve as sound mitigation.

As discussed above, construction of any piers in I-405 will require extensive coordination with WSDOT to address current I-405 usage, planned improvements, tolling impacts, and any construction impacts; however, temporary support within existing gore and shoulders are feasible. Based on the span length, aesthetics, and feasibility of temporary support, three structure types are considered for the I-405 crossing: CIP PT box girder, network tied arch, and steel truss.

I-405 Span Alternative – Cast-in-Place Post-tensioned Box Girder

The CIP PT box girder has the steepest profile slope of the three I-405 span alternatives as seen in Figure 49. The east approach is set to a 3.28 percent slope in order for the 12-foot-deep structure at midspan to clear the NE 6th St. direct access ramp. A clearance box of 21 feet (17.5-foot temporary vehicle clearance and 3.5-foot falsework clearance) must be provided on all the bridge alternatives; the CIP PT box girder provides a 21-foot clearance.

A throw barrier will be provided on the north side of the west approach, the I-405 span, and some of the east approach for protection of the Sound Transit guideway. The section width of the three spans of the CIP PT box girder are 40 feet as seen in Figure 51. Landscaping is used as an aesthetic and sound mitigation feature on the far edges of the section.

Aesthetic Discussion

A CIP PT box structure will be visually consistent with other structures along I-405, including the adjacent Sound Transit guideway, see Figure 49. Of the evaluated bridge types, it has the highest required clearances for structure and construction, which results in higher deck profile with steeper grades. As with the other alternatives, there are opportunties for weather protection structures to be attached to the superstructure.

In the absence of a signature structure overhead and adjacent to the deck (such as is the case of an arch or a truss), the CIP PT box girder presents a versatile set of opportunites for the integration of above-deck landscape and hardscape elements, offering creative freedom in design.

The section in Figure 51 has a landscape feature separating the modes of travel as noted above. The landscape feature on the southern edge of the crossing is to buffer and protect pedestrians from loud noise of the highway below. For more section alternvative graphics, refer to Appendix A.

Figure 49: Elevation of CIP PT box girder I-405 span alternative (looking north).

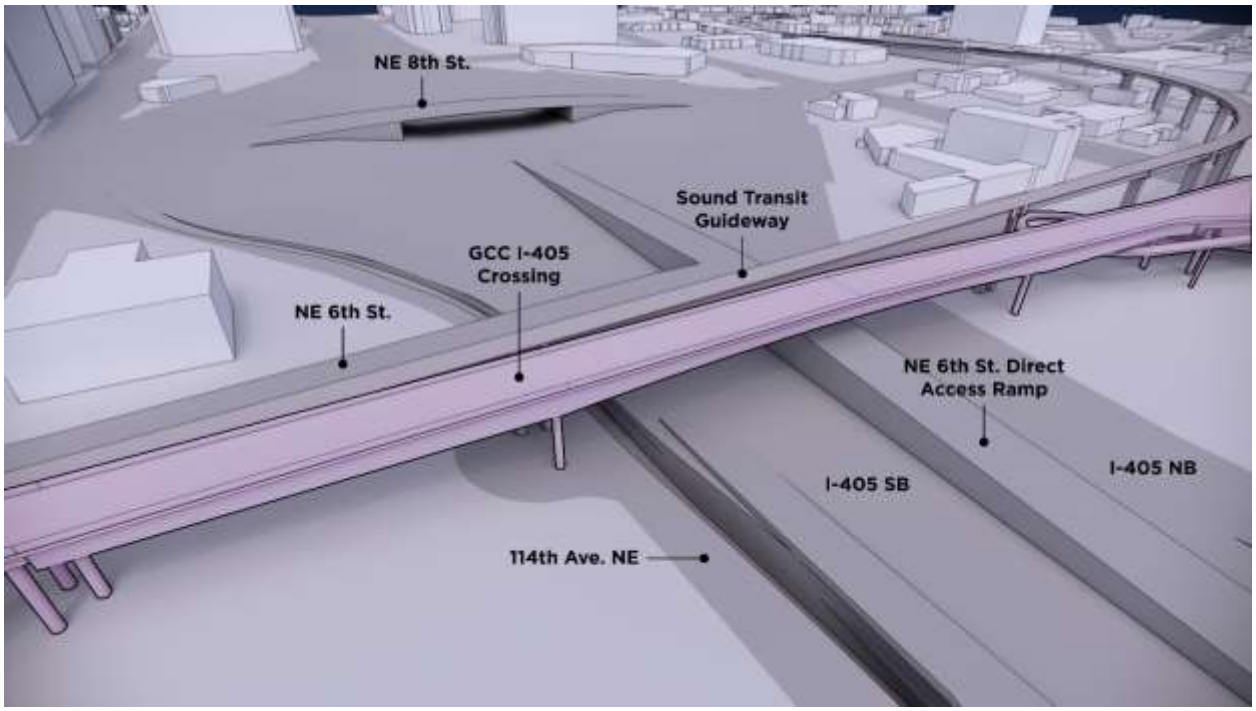

Figure 50: Conceptual rendering of the I-405 crossing structure, CIP PT box girder alternative (looking north).

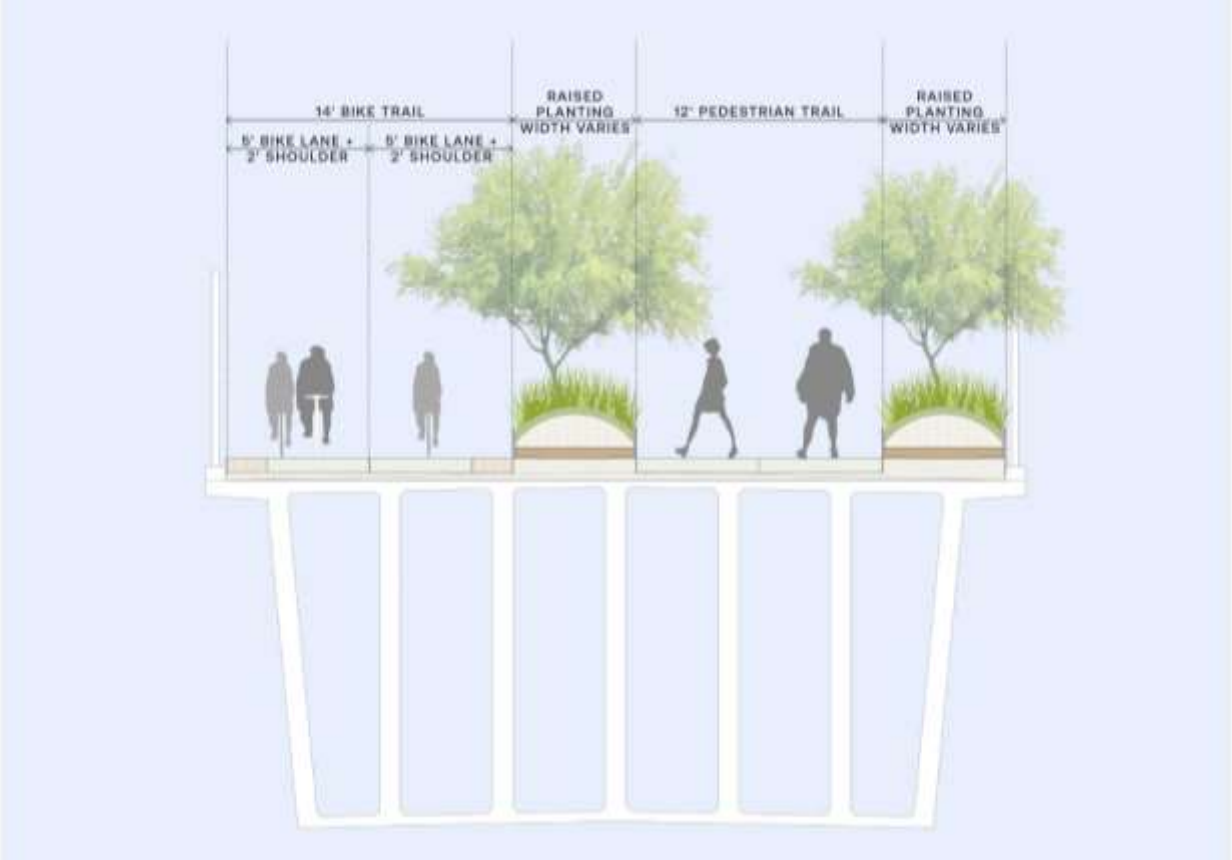

Figure 51. Section of the CIP PT box girder alternative over the I-405 span.

I-405 Span Alternative – Arch

The arch I-405 span alternative has a 2.5 percent profile slope on the east approach and across the 420-foot I-405 span. This span configuration provides a clearance box of 22.5 feet between the bottom of structure and the NE 6th St. direct access ramp. The arch alternative requires the west approach to slope negative 1 percent in order for the west tie-in structure to slope greater than 1 percent to tie into City Hall Plaza. A throw barrier will be provided on the north side of the west approach, I-405 span, and some of the east approach for protection of the Sound Transit guideway. The section width of the three spans of the arch are 40 feet as seen in Figure 52 with a rendering in Figure 53. Landscaping is used as an aesthetic and sound mitigation feature on the north and south edges of the section. The section in Figure 54 has a landscape feature separating the modes of travel as noted above. The landscape feature on the southern edge of the crossing is to buffer and protect pedestrians from loud noise of the highway below. For more section alternative graphics, refer to Appendix A.

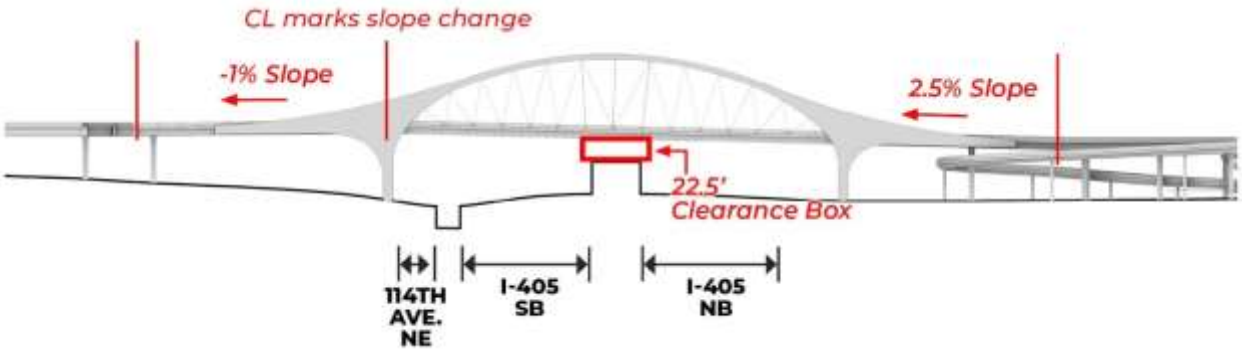

Figure 52: Elevation of the arch I-405 span alternative (looking north).

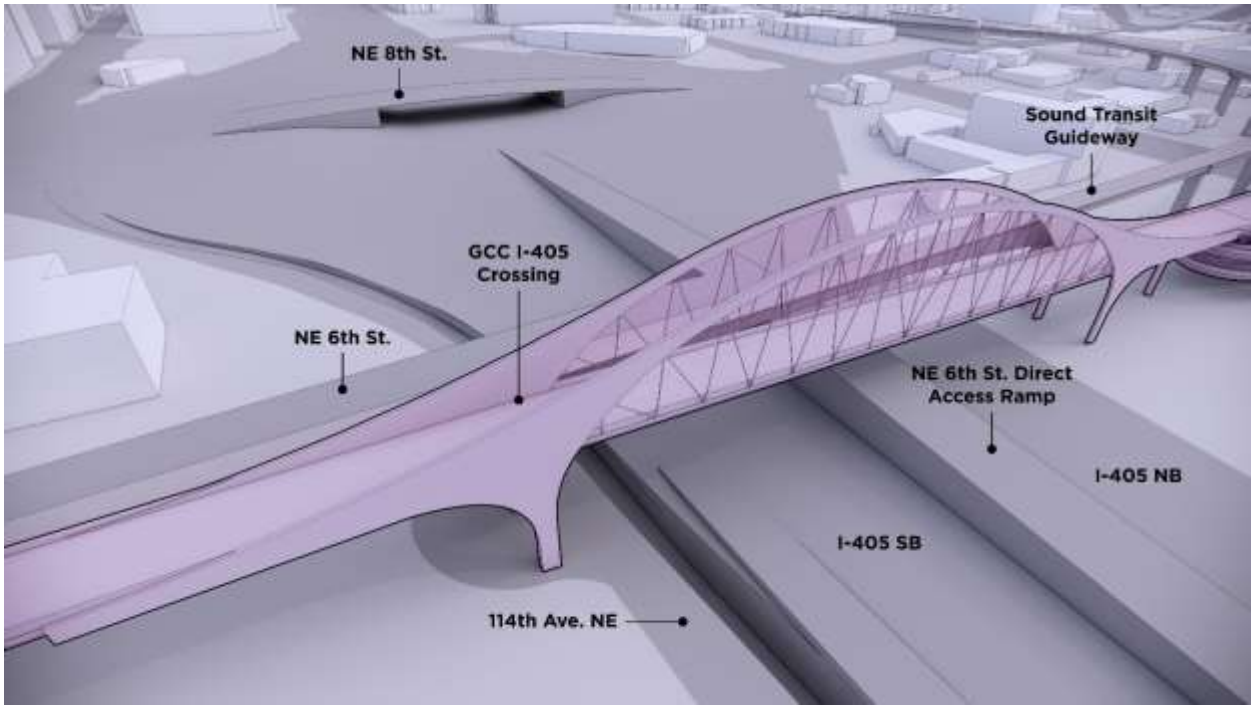

Figure 53: Conceptual rendering of the I-405 crossing structure, network tied arch alternative (looking north).

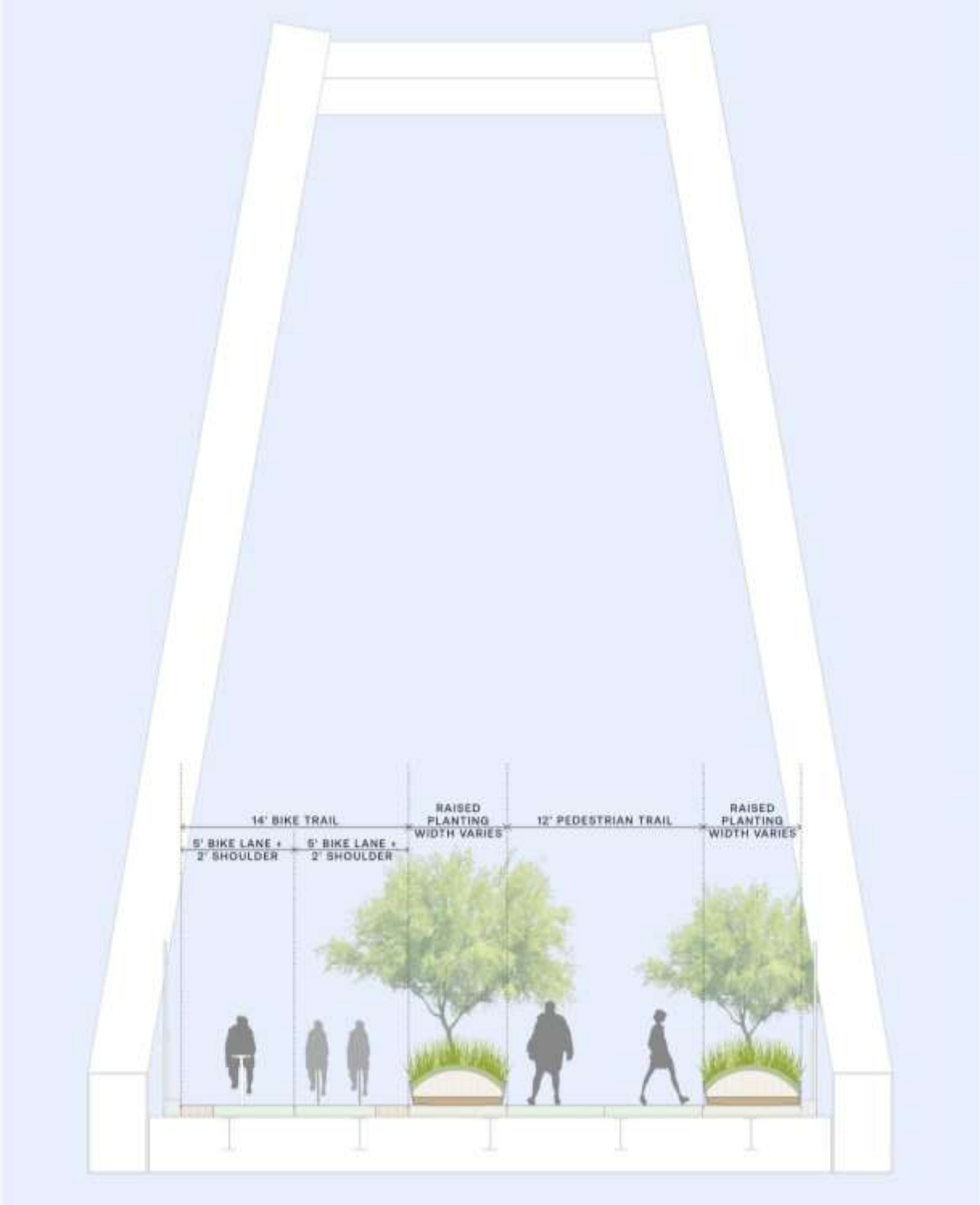

Figure 54: Section of the deck level of the arch alternative over the I-405 span.

Aesthetic Discussion

The network tied arch offers the opportunity for dramatic and aesthetic features. The angled arch suspender ropes provided in a network tied arch add visual attraction and opportunities for innovative

lighting elements. The arch concept shown above includes “fairings” near the spring point of the arch rib that work to visually integrate the vertical arch geometry into the horizontal bridge in a more cohesive way. A 40-foot-wide deck provides potential for landscape opportunities and sound mitigating placement of those landscape features. This arch concept offers enhanced design features at either end of the arch where the “fairings” and columns meet.

The arch provides a shallow deck superstructure compared to the CIP PT box girder, which benefits the profile grade of the GCC and may add in constructability.

Cables that connect arch rib to the chord member will be closely spaced to support the dead loads, and they will be inclined to provide additional stiffness. With this cable configuration, permeability of users with future lid could decrease.

The width of the bridge provides opportunities for overhead weather protection, most likely mounted to the bridge deck, but possibly supported by the arch rib.

I-405 Span Alternative – Truss

The truss I-405 span alternative has a 2.5 percent profile slope on the east approach and across the 420-foot I-405 span. This span configuration provides a clearance box of 22.5 feet between the bottom of structure and the NE 6th St. direct access ramp. The truss alternative requires the west approach to slope negative 1 percent in order for the west tie-in structure to slope greater than 1 percent to tie into City Hall Plaza.

A throw barrier will be provided on the north side of the west approach, I-405 span, and some of the east approach for protection of the Sound Transit guideway. In the truss alternative, the throw barrier can be integrated into truss vertical and diagonal steel members.

The section width of the three spans of the truss are as follows (see Figure 55 and a rendering in Figure 56):

- East approach: 54 feet down to 28 feet
- I-405 span: 28 feet total, divided between two levels
- East approach: 28 feet up to 40 feet

The section in Figure 57 has the modes of travel completley separted in a structural way leaving opportunity to have landscape features on both sides of of the pedestrian lower deck. For more section alternvative graphics, refer to Appendix A. Figure 58 is showing the condition of the cycling deck ramping down on the east and west sides of the I-405 span.

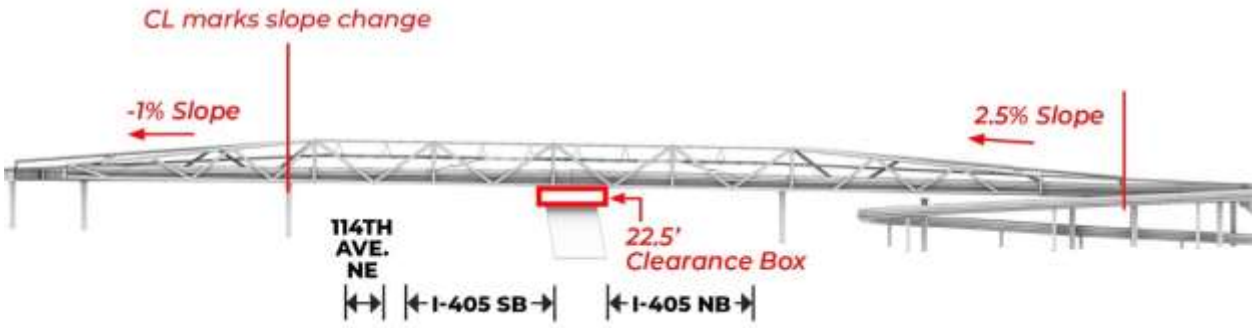

Figure 55: Elevation of the truss alternative over the I-405 span (looking north).

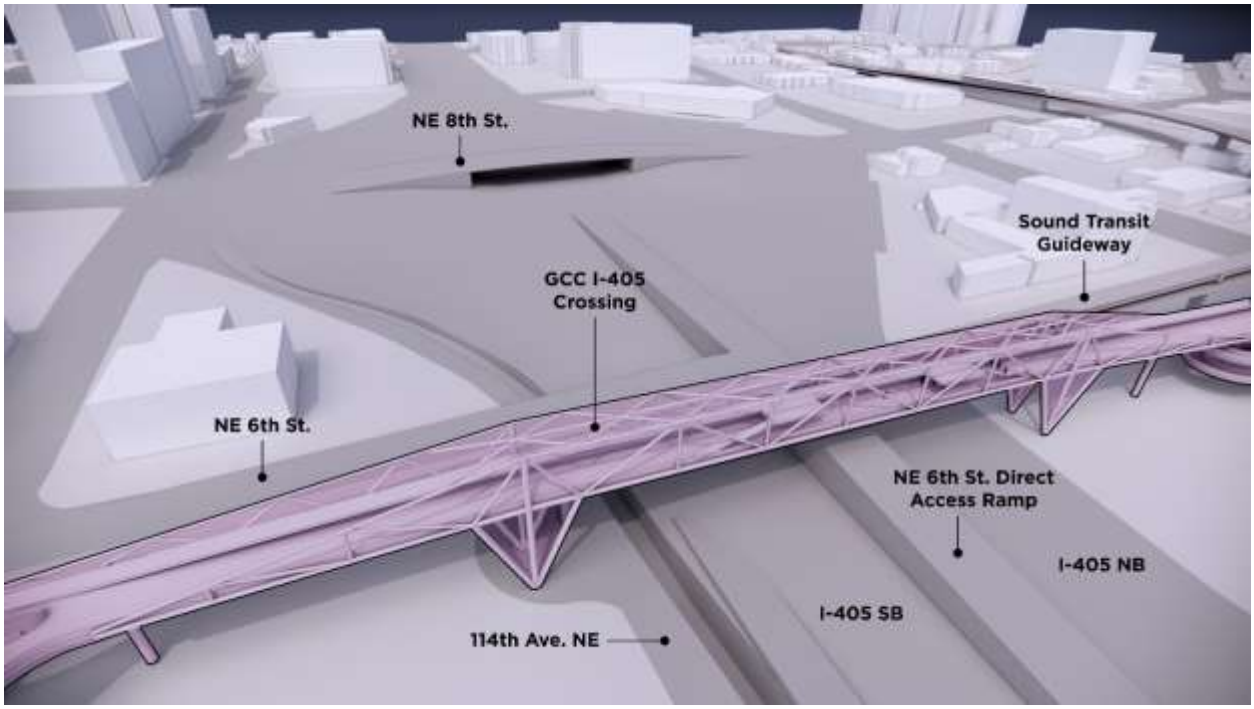

Figure 56: Conceptual rendering of the I-405 crossing structure, steel truss alternative (looking north).

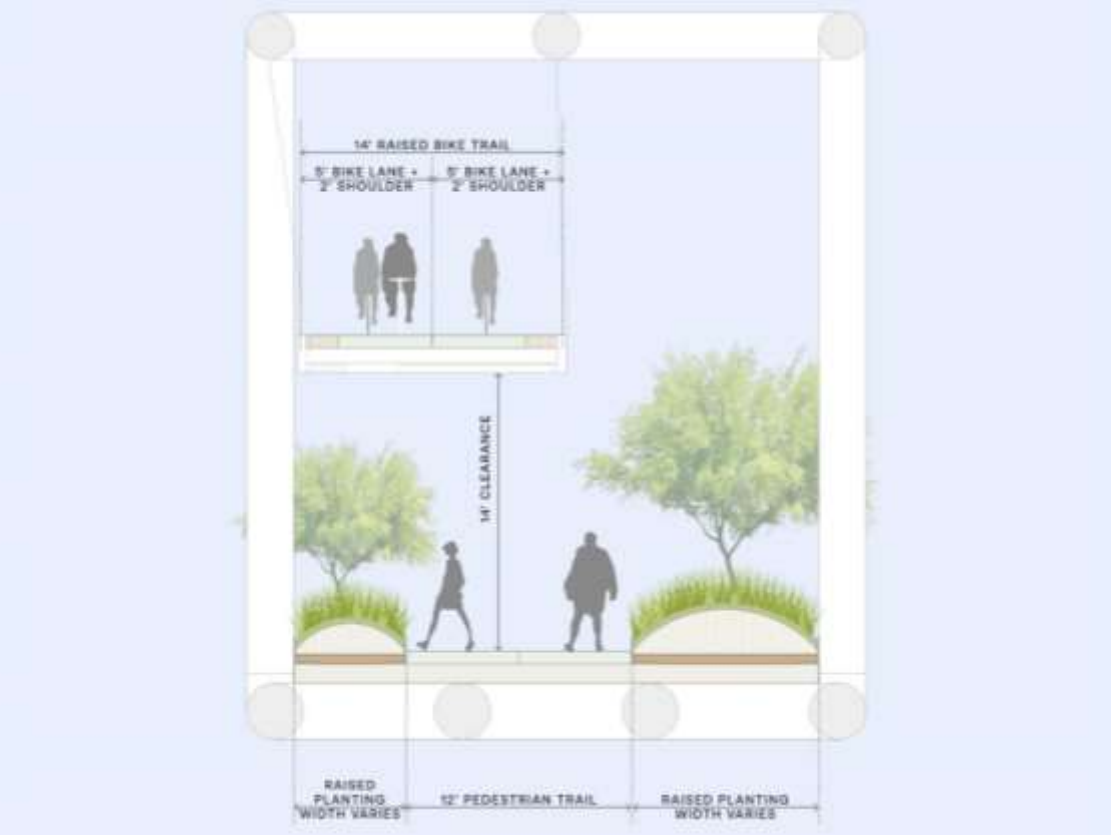

Figure 57: Section of the truss alternative over the I-405 span.

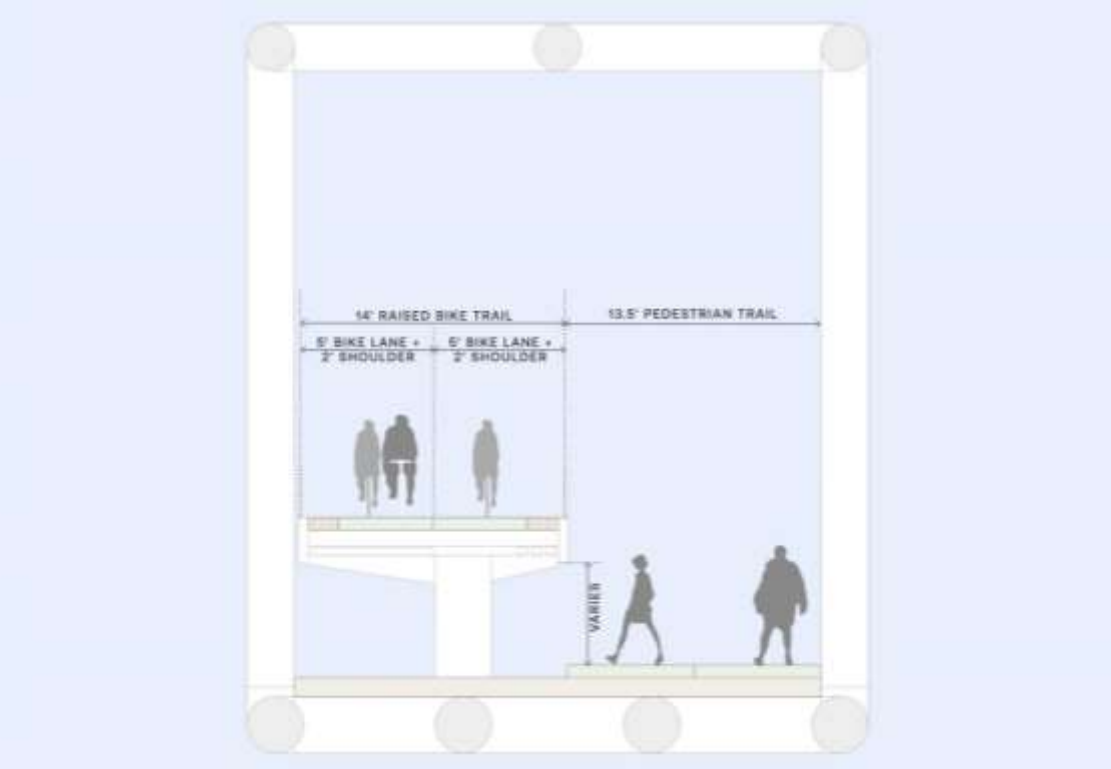

Figure 58: Section of the truss alternative over the I-405 span - bike path ramp.

Aesthetic Discussion

Truss designs can vary from utilitarian to elegant and can provide a signature visual element to the GCC. Diagonal and vertical truss members can evoke elements of advanced fabrication and technology, in line with the theme of a vision of the future and consistent with the feel of downtown Bellevue and the future Wilburton neighborhood.

The height of the truss provides an opportunity to have two decks within the structure, with the top deck for cyclists and other rolling modes of mobility and the bottom deck for pedestrians and provides meandering. Due to its double-decked nature, the truss allows a narrower section over I-405.

A truss provides opportunities for overhead weather protection and systems integration with barriers and rails.

4.1.4 East Node Structure

East node structure serves similar function as the west node: the structure facilitates geometric transition from the I-405 crossing to the Eastrail tie-in and is a node for vertical circulation to the street level.

The preferred east node alternative (Figure 59) is to provide two modes of vertical circulation: stairs and elevator. Initially, an idea of an ADA ramp that loops around and below the GCC main structure was proposed. However, due to the cost and geometry constraints, addition of an ADA ramp is no longer considered. Structurally, similar to the west node structure, the east node will be a CIP PT concrete multi-cell box structure. This structure type accommodates the varying widths anticipated for this structural segment. The rationale for selecting concrete over steel is identical to that for the west node segment.

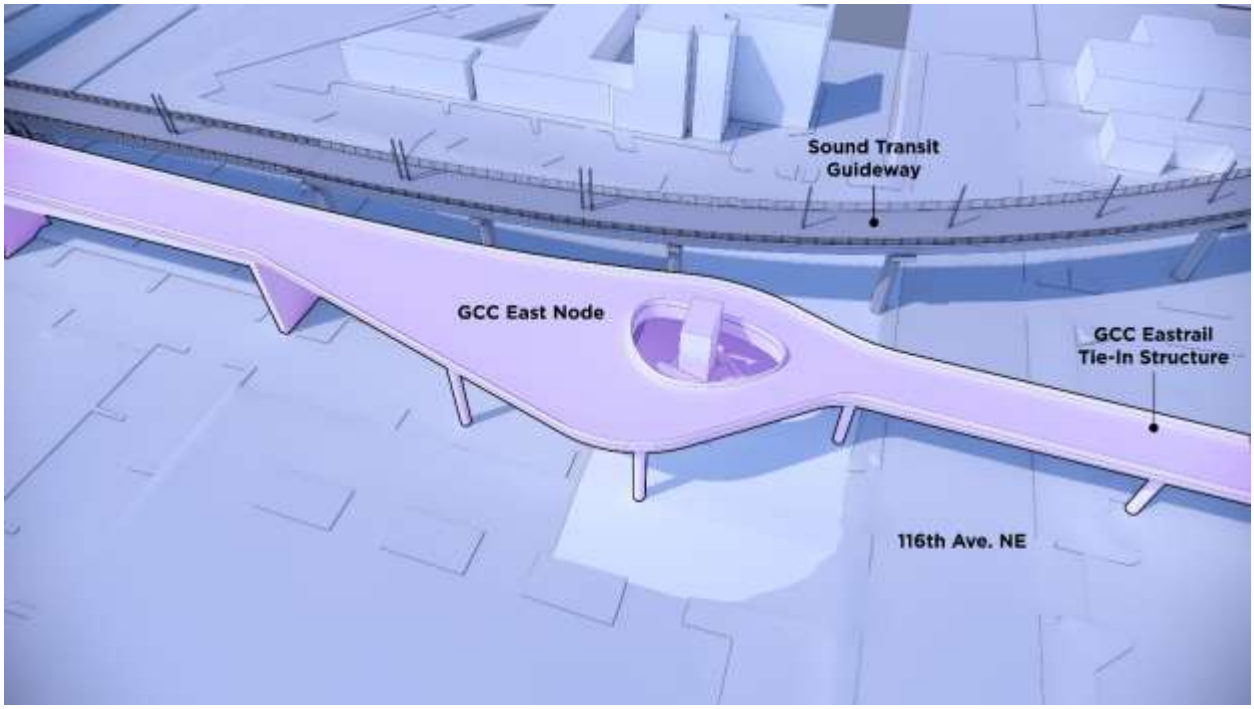

Figure 59: Conceptual rendering of the east node structure (looking northwest).

4.1.5 Eastrail Tie-in Structure

The total length of the Eastrail tie-in structure is approximately 584 feet and the width is 30 feet throughout the structure, comfortably accommodating landscaping features along with the pedestrian and multiuse path; see Figure 60. The west end of this structure will be supported by the west node structure, while the east end will be supported by an abutment with embankment and retaining walls behind, tying into Eastrail and matching its elevation. This connection will also need to be widened to facilitate pedestrian and bicycle movements onto and off of Eastrail. This detail will be developed for the 30 percent design.

The geometric constraints for this segment of the project are minimal and the span lengths can range from 140 to 165 feet, depending on the underground utilities, parking lot configurations, and others. Because this is expected to be a “standard” pedestrian bridge, either precast concrete tub girders with CIP concrete decks or CIP PT box girders are proposed for the Eastrail tie-in structure. Use of precast girders will speed up construction relative to CIP concrete and reduce maintenance costs relative to a steel superstructure. Washington State has a robust precast concrete industry, so this structure type is also an economical option. However, because all other segments of GCC are CIP PT box girders, maintaining consistent structural appearance is an important aspect.

The section in Figure 61 has a landscape feature separating the modes of travel as noted above. There is no landscape feature on the southern edge of the strucutre to facilitate integration into future private development. For more section alternvative graphics, refer to Appendix A.

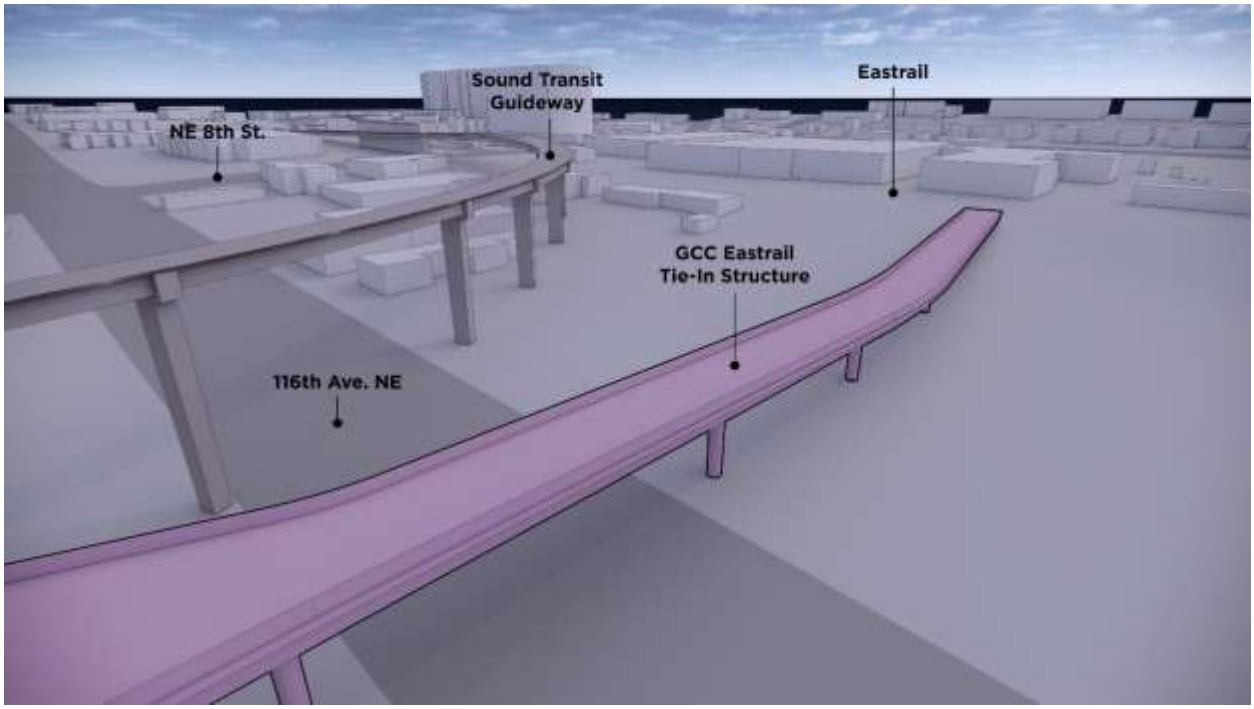

Figure 60: Conceptual rendering of the Eastrail tie-in structure (looking northeast).

Figure 61: Section of the Eastrail tie-in structure.

4.2 Constructability/Stage Construction/Temporary Support

This section outlines the feasibility of construction of the west tie-in, east and west nodes, I-405 crossing, and Eastrail tie-in structures.

4.2.1 West Tie-in

Two alternatives with CIP PT box girders require structural retrofit of the existing plaza structure. Unlike the cantilever options discussed in Section 4.1.1, CIP PT box girders cannot cantilever over the existing ramp and parking structure. Therefore, there are two ways to accommodate CIP PT box girders at the west tie-in: (1) to extend the plaza and (2) to construct a pier near the plaza.

Span configuration of the cantilevered west tie-in structure is approximately 125 to 240 feet from west to east and the width is 30 feet. Due to the geometric constraints at the station and the parking structure of Bellevue City Hall discussed in Section 3.1, no supporting elements are permitted below the west span of this structure.

Plaza Extension and CIP PT Box Girders

Most challenging aspect of this alternative is the structural retrofit of the existing plaza structure. Retrofitting will be evaluated in the future design phases. However, strengthening of the columns and foundations should be expected and the facility will be inoperative during the retrofit construction.

Construction of the eastern end of the west tie-in CIP PT box girders is expected to be straightforward, as there is no traffic underneath the proposed structure.

CIP PT Box Girders Tie-In

Similar to the plaza extension, the existing structure will need to be retrofitted. Retrofit for this alternative is more challenging than plaza extension, as a new substructure and foundation will need to be constructed to support the westernmost pier.

Construction of the CIP PT box girders is also more complicated than the plaza extension, as the room to place the falsework is limited.

Cable-stayed Structure

One of the feasible construction approaches of the west tie-in cable-stayed structure is to build as follows:

1. Construct the pylon and the pier of the back span.
2. Erect the temporary support of the back span and construct the back span.
3. Tension the cables for the back span.
4. Start erecting the cantilever span, segment by segment.

This construction approach will use the available space underneath the back span and eliminates the need for balanced cantilever construction method, which may add complexity and construction time. Any uplift of the superstructure during the construction of cantilever span will be evaluated and can be addressed by adding counterweight to the back span.

Another feasible construction approach of the west-tie in cable-stayed structure is to adopt balanced cantilevered construction approach:

1. Construct the pylon.
2. Erect the superstructure of the west and east spans by equal-length segments until 125 feet of both spans are erected.

3. Construct the pier of the back span and temporary support.
4. Complete the east span and tension the cables.

Steel Truss

There are several methods to erect the steel truss structure. One traditional approach is to fabricate segments of the steel truss off site, assemble them through bolt splices near the bridge location, and lift them into place. However, this may pose significant construction challenges due to the size of assembled structure and limited room for crane operation. Instead, the structures can be erected by segments and field spliced in-place:

1. Erect both piers and necessary temporary support for field splice.
2. Construct the east span, field splice where necessary.
3. Erect the west cantilever span, field splice in-place.

Another construction approach is to incrementally launch the truss structure from the east end. This construction approach is favorable when spanning over a river or valley, where lift operations are not feasible. This site allows for lift operations; however, the available width of the Metro site is less than the length of west tie-in structure (365 feet). Therefore, this construction method is not feasible.

4.2.2 West and East Node Structures

To accommodate their highly asymmetric and curved geometry, the west and east node structures are anticipated to be CIP PT structures, which will require falsework and temporary support systems.

Given that the node structures are located within the existing parking lots of the Legacy and Lincoln sites, construction limitations and traffic impacts will be local to those sites and can be mitigated.

4.2.3 I-405 Crossing

The I-405 crossing structure is to span approximately 420 feet. Given that this span length exceeds the capabilities of precast girder structures, three superstructure types are under consideration: CIP PT box, network-tied-arch, and steel truss. Regardless of the chosen alternative, the need for temporary falsework and maintenance of traffic on I-405 during construction is expected.

Requirements for the temporary falsework, including the minimum horizontal and vertical clearance, and permitted area are as follows; see Figure 62:

- 2-foot shoulders, 11-foot lanes, and the same number of lanes as existing
- The gore merge area between the I-405 lanes and on-ramp must be free of obstructions per WSDOT Design Manual Chapter 1360
- 17.5-foot vertical clearance per WSDOT Design Manual (M 22-01) 720.03(5)(a)

Figure 62: Permitted area (highlighted in green) of falsework and temporary support structures (photo credit to Google Earth).

In addition, staging areas to facilitate construction of the I-405 crossing structure will be necessary. Approximate staging areas are shown in Figure 63.

Figure 63: Potential staging area for I-405 crossing structure construction (photo credit to Google Earth).

Cast-in-Place Post-tensioned Box

The CIP PT box would be constructed using falsework, with a support system similar to that used on the adjacent Sound Transit guideway structure during its construction. Figure 64 and Figure 65 depict the falsework used on that structure during construction.

The vertical clearance discussed in Section 4.1.3 is measured to the bottom of the falsework. Depth of the falsework is a function of span length and weight of the superstructure. For the designated area of falsework shown in Figure 64, expected span lengths of falsework are as follows:

- 100 feet from the west abutment to the gore in the southbound traffic
- 70 feet from the gore in southbound traffic to the shoulder between southbound traffic and NE 6th St. direct access ramp
- 50 feet over the NE 6th St. direct access ramp
- 90 feet from the shoulder between the northbound traffic and northbound on-ramp shoulder
- 80 feet from the northbound on-ramp shoulder to east abutment

Figure 64: Falsework of Sound Transit's guideway structure on I-405 southbound traffic, looking north (photo credit to Google Map, Oct 2018).

Figure 65: Falsework of Sound Transit's guideway structure on I-405 northbound traffic, looking north (photo credit to Google Map, Oct 2018).

Network-Tied-Arch and Steel Truss

Both network-tied-arch and steel truss can be prefabricated off site and then transported to the site using a “drop-in” erection scheme, as illustrated in Figure 66. This method offers the advantage of minimizing on-site construction time and reducing the impact of traffic on I-405. However, due to the size, weight, and geometric constraints outlined in Section 3.1, this construction method may not be viable for the I-405 crossing structure.

Figure 66: Construction of Northaven Trail Bridge in Dallas, Texas. Network-tied-arch constructed off-site transported and set in place (photo credit to Mike Bird and Texas Contractor).

An alternative construction approach involves on-site assembly, as depicted in Figure 67. With this method, smaller segments are prefabricated off site, lifted into place, and supported by temporary towers. These segments are then connected using bolted field splices. Temporary bracings ensure the stability of the structure until the ribs and tie girders are joined, and the cables are tensioned. This approach is capable of accommodating the size of the I-405 crossing structure.

Figure 67: Construction of the Broadway Bridge in Arkansas. Segments of network-tied-arch supported by temporary support towers and temporary bracing (photo credit to Genesis Structures).

A third construction approach involves the use of stay towers, as shown in Figure 68. Temporary stay towers would be erected near the ends of the 420-foot span, with temporary stay cables extending to the piers supporting the node structures. Construction proceeds over the 420-foot span as shown, with temporary supports in place until the network arch cables are tensioned.

This construction sequence is favorable when temporary supports between the piers are not possible.

The network-tied-arch structure would span over the WSDOT right-of-way only. For this alternative, precast tub girders with integral piers are proposed to connect the ends of I-405 crossing to the node structures over the Legacy and Lincoln sites. Because the construction of precast girders is common in Washington State, construction challenges and the impact to traffic are minimal.

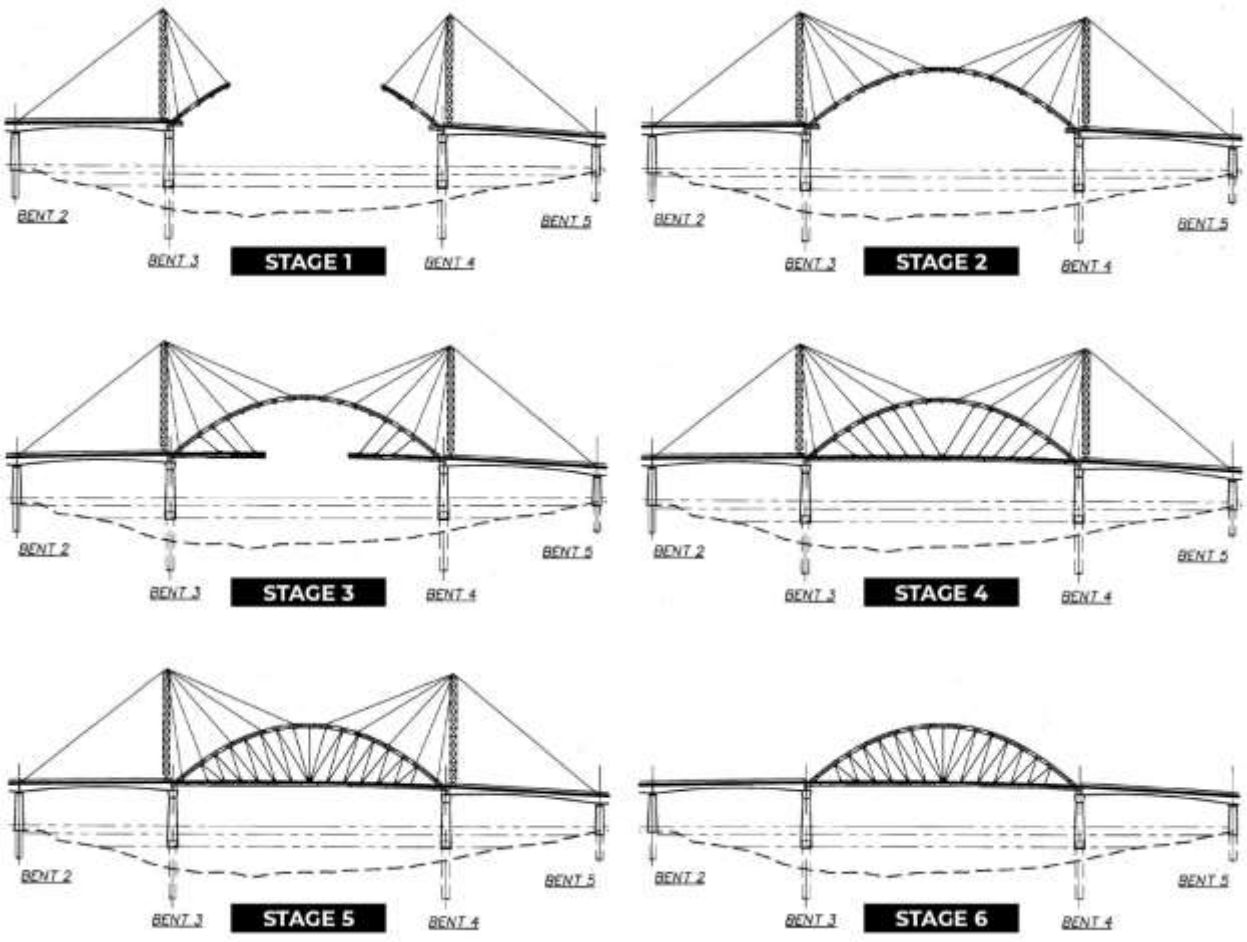

Figure 68: Suggested construction scheme of Sauvie Island Bridge (Wapato Bridge) in Multnomah County, Oregon. A similar method could be employed for arch construction over I-405.

4.3 Cost

4.3.1 Construction Cost Estimate

Bridge Structure

The preliminary construction cost estimate of the bridge structure was calculated for the following five combinations of structure alternatives:

- Alternatives 1A and 1B: CIP PT box girder west tie-in + CIP PT box girder I-405 crossing. Alternative 1A is with a pier in I-405 right-of-way and Alternative 1B is without a pier in I-405 right-of-way.
- Alternatives 2A and 2B: Plaza extension and CIP PT box girder west tie-in + CIP PT box girder I-405 crossing. Alternative 2A is with a pier in I-405 right-of-way and Alternative 2B is without a pier in I-405 right-of-way.
- Alternatives 3A and 3B: Cable-stayed west tie-in + CIP PT box girder I-405 crossing. Alternative 3A is with a pier in I-405 right-of-way and Alternative 3B is without a pier in I-405 right-of-way.
- Alternative 4: Cable-stayed west tie-in + network tied arch I-405 crossing.
- Alternative 5: Steel truss west tie-in + steel truss I-405 crossing.

This cost estimate is based on the bridge square-footage cost, including the landscaping and architectural features on the bridge, as well as the vertical circulation structures and plaza modification/retrofit. The square-footage cost considered variable cost for different structure types and complexity of construction. For example, the square-footage cost for precast girder segment is less expensive than network-tied-arch span, structure segment over the I-405 is more expensive than the approach spans. More detailed calculations of the preliminary cost estimate are included in Appendix B.

Table 12: Preliminary Construction Cost Estimates of the Bridge Structures.

Alternative	Bridge Structure Alternative Combination	Construction Cost Estimate		
		Average	Low (75%)	High (125%)
1A	CIP PT Box Girder West Tie-In + CIP PT Box Girder with Pier in I-405	$242,910,000	$182,180,000	$303,640,000
1B	CIP PT Box Girder West Tie-In + CIP PT Box Girder without Pier in I-405	$235,510,000	$176,630,000	$294,390,000
2A	Plaza Extension & CIP PT Box Girder West Tie-In + CIP PT Box Girder with Pier in I-405	$233,110,000	$174,830,000	$291,390,000
2B	**Plaza Extension & CIP PT Box Girder West Tie-In + CIP PT Box Girder without Pier in I-405**	**$225,710,000**	**$169,280,000**	**$282,140,000**
3A	Cable Stayed West Tie-In + CIP PT Box Girder with Pier in I-405	$246,580,000	$184,940,000	$308,230,000
3B	Cable Stayed West Tie-In + CIP PT Box Girder without Pier in I-405	$239,180,000	$179,390,000	$298,980,000

Alternative	Bridge Structure Alternative Combination	Construction Cost Estimate		
		Average	Low (75%)	High (125%)
4	Cable Stayed West Tie-In + Network Tied Arch over I-405	$249,710,000	$187,280,000	$312,140,000
5	Steel Truss West Tie-In + Steel Truss over I-405	$297,150,000	$222,860,000	$371,440,000

Construction costs are based on conceptual level design and are meant to communicate relative cost of one alternative to another for structure type decision-making purposes only. They do not include cost of placemaking under the nodes. Construction contingency, right-of-way, and cost of construction management are also excluded. A more detailed cost estimate will be developed as part of the 30 percent design effort. Note that the costs were generated in today's dollars and do not include increases due to inflation or other factors.

5.0 DESIGN CRITERIA

The bridge design criteria are described in detail in the Basis of Design document in Appendix C, which covers:

- Design codes
- Materials
- Bridge geometry
- Design loads
- Deflection criteria
- Foundation considerations

5.1 Bridge Design - WSDOT Bridge Design Manual

All five segments of the bridge structure and the ramp structure at west node will be designed in accordance with WSDOT Bridge Design Manual.

5.2 Non-bridge Structure Design - International Building Code

Non-bridge structures, such as the vertical circulation at east and west nodes (stairs and elevators) and weather protection roof on the bridge structure, will be designed in accordance with the International Building Code, Washington State amendments, and City amendments.

5.3 WSDOT and I-405 Urban Design Criteria

WSDOT's stated purpose is to "produce an attractive and unified highway system that will enhance corridor continuity and help guide traffic safely through the I-405 corridor."

All examples shown are vehicular structure, which this is not. The GCC is a signature element for the City that might include a new lid connection. It is proposed that the urban design and bridge architecture system that provides elements of continuity and elements of distinction.

Continuity elements are the places where we conform directly to the WSDOT Utilities Department guidelines. We can generate, in conjunction with the City and WSDOT, a list of these elements,

possibly including wall profiles, joint alignment, retaining wall cap details, mainline and ramp lighting, plant mix, etc.

Distinction elements are places where the GCC would respectfully diverge from the Utilities Department guidelines, potentially including bridge superstructure color, fall protection/guiderails (pedestrian crossing railing), pier/column formliner finish, abutment formliner finish, column details, bridge pedestrian and structure lighting, paving and details, planting setbacks, etc.

This proposal will require close coordination and collaboration with both the City and WSDOT I-405 Program.

5.4 City of Bellevue Design Requirements

The GCC will be designed in accordance with applicable City of Bellevue design codes, such as Transportation Design Manual and Complete Streets Guide and Utilities Codes and Standards. The pedestrian and bike elements will also be designed in accordance with Chapter 1515 of the WSDOT Design Manual.

6.0 CONCLUSIONS

The bridge alternative evaluation criteria were developed based on the Purpose and Need for the GCC - to create a safe, high comfort, transformative connector between Downtown Bellevue and Eastrail/Wilburton while overcoming the challenges posed by the current and future site conditions. This comprehensive list of criteria allowed for objective evaluation of different alternatives.

Based on the current stage of the design, the bridge alternative: ***Plaza extension and CIP PT box girder west tie-in with CIP PT box girder with no pier in I-405 Right-of-Way*** is the highest scoring alternative and is recommended for advancement to the 30 percent design.

Table 13: Evaluation scores for west tie-in bridge alternatives.

West Tie-In Bridge Structure Alternative		Criterion 1 Est. Const. Cost	Criterion 2 User Experience	Criterion 3 Structure Aesthetics	Criterion 4 Maintainability/ Life-Cycle Costs	Criterion 5 Compatibility with Metro Site Development	TOTAL
POSSIBLE		20	25	15	20	20	**100**
CIP PT Box Girder	CIP PT Box Girder Tie-In	10	15	15	20	15	75
	Plaza Extension	**10**	**25**	**15**	**20**	**20**	**90**
Signature Bridge	Cable Stayed	10	20	15	10	0	55
	Steel Truss	10	20	15	10	0	55

Table 14: Evaluation scores for I-405 crossing alternatives.

I-405 Crossing Bridge Structure Alternative		Criterion 1 Est. Const. Cost	Criterion 2 User Experience	Criterion 3 Structure Aesthetics	Criterion 4 Maintainability/ Life-Cycle Costs	Criterion 5 Compatibility with Future Lid	TOTAL
POSSIBLE		20	25	15	20	20	**100**
CIP PT Box Girder	With Center Pier in I-405 ROW	10	20	10	20	20	80
	No Pier in I-405 ROW	**15**	**20**	**10**	**20**	**15**	**80**
Signature Bridge	Network Tied Arch	10	20	15	10	10	65
	Steel Truss	10	25	15	10	10	70

Table 15: Evaluation scores for GCC alternatives.

West Tie-In and 405 Combination Bridge Structure Alternative		Criterion 1 Est. Const. Cost	Criterion 2 User Experience	Criterion 3 Structure Aesthetics	Criterion 4 Maintainability/ Life-Cycle Costs	Criterion 5 Compatibility	TOTAL
POSSIBLE		40	50	30	40	40	**200**
West Tie-In Alternative	I-405 Crossing Alternative						
CIP PT Box Girder Tie-In	CIP PT Box Girder + With Center Pier in I-405 ROW	20	35	25	40	35	155
CIP PT Box Girder Tie-In	CIP PT Box Girder + No Center Pier in I-405 ROW	25	35	25	40	30	155
Plaza Extension + CIP PT Box Girder	CIP PT Box Girder + With Center Pier in I-405 ROW	20	45	25	40	40	170
Plaza Extension + CIP PT Box Girder	**CIP PT Box Girder + No Center Pier in I-405 ROW**	**25**	**45**	**25**	**40**	**35**	**170**
Cable Stayed	CIP PT Box Girder + With Center Pier in I-405 ROW	20	40	25	30	20	135
Cable Stayed	CIP PT Box Girder + No Center Pier in I-405 ROW	25	40	25	30	15	135
Cable Stayed	Network Tied Arch	20	40	30	20	10	120
Steel Truss	Steel Truss	20	45	30	20	10	125

It is understood by the City of Bellevue that discussion of allowing pier construction within the WSDOT right-of-way is still underway. The design team understands that providing a pier in the WSDOT right-of-way is an important goal of the City of Bellevue to keep the bridge superstructure profile lower. Due to risks of schedule, cost escalation, and impacts to the development of I-405, the preferred alternative does not include a pier in the WSDOT right-of-way. As the construction cost estimate and details of the 30 percent design development alignment depend on this decision, the design team will keep coordinating with the City and WSDOT throughout the design process and this decision may adjust if applicable.

The City of Bellevue has reviewed the content of this TS&L document, provided detailed comment and feedback that led to modifications to the TS&L preferred alternative, coordinated with the design team and City leadership, and selected a direction for a preferred alternative. This preferred alternative was selected with the understanding that there are several decisions that could adjust elements of this preferred alternative, primarily in relation to the integration with adjacent property uses, development approaches, and timelines. However, the preferred alternative provides a reasonable approach to what is known today, balancing the basic needs of the crossing and goals of an iconic user experience that brings people to the Grand Connection Crossing, while respecting desires and limitations for schedule and budget. The preferred alternative is a CIP PT box girder bridge on the northernmost alignment with widened nodes on each side of and a clear span of I-405. The preferred alternative will integrate with building modifications to extend the parking garage and plaza at the west end gateway and use retaining walls to grade into Eastrail at the east end gateway.