Cross-Kirkland Corridor Trail and Bus Rapid Transit Draft Plan April, 2016

Prepared for the City of Kirkland by BRT Planning International, LLC in association with Transpo Group and Perteet

BRTPlan
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Chapter 1 – Overview

To be included in next version

Chapter 2 – What is High-Quality BRT?

Bus Rapid Transit (BRT) is a bus-based rapid transit system that can achieve high capacity and quick trips at relatively low cost by combining dedicated bus lanes, off-board fare collection, platform level boarding, bus priority at intersections, and other quality-of-service elements, such as real-time information technology and strong branding. Special vehicles and iconic full-featured stations can help make a good BRT system great.

Figure 2-1: Five key elements make for high-quality Source: ITDP.org

High quality BRT systems have been implemented in several cities across the United States, and in many cities around the world. Starting in 2010, a committee composed of the world's leading BRT experts[1] came together to define the common elements of the best BRT systems. The result of this effort, first codified in 2012, was *The BRT Standard.*

Similar to environmental building standards *The BRT Standard* is a rating system that scores the quality of BRT. It lays out the essential elements of BRT and provides a framework for engineers, decision makers, and community leaders to compare their own system or plans against best practice. *The BRT Standard* uses design characteristics that have been proven to correlate with enhanced performance and superior customer experience in a wide variety of circumstances. Under *The BRT Standard*, a BRT Corridor of can be certified as gold-standard, silver-standard, bronze-standard, or basic BRT.[2]

[1] Members of *The BRT Standard Technical Committee* include: ITDP, GIZ, Logit Consultoria, BRT Planning International, Slow Research, EMBARQ, and the following individuals: Paulo Custodio; Consultant; Colleen McCaul, Consultant; Gerhard Menckhoff, World Bank (retired); Scott Rutherford, University of Washington; Pedro Szasz, Consultant; and Lloyd Wright, Asian Development Bank.

[2] More Development for your Transit Dollar

BRT Standard Scorecard

CATEGORY	MAX SCORE
BRT Basics	
Dedicated Right-of-Way	8
Busway Alignment	8
Off-board Fare Collection	8
Intersection Treatments	7
Platform-level Boarding	7
Service Planning	
Multiple Routes	4
Express, Limited, and Local Services	3
Control Center	3
Located in Top Ten Corridors	2
Demand Profile	3
Hours of Operations	2
Multi-corridor Network	2
Infrastructure	
Passing Lanes at Stations	4
Minimizing Bus Emissions	3
Stations Set Back from Intersections	3
Center Stations	2
Pavement Quality	2
Stations	
Distances Between Stations	2
Safe and Comfortable Stations	3
Number of Doors on Bus	3
Docking Bays and Sub-stops	1
Sliding Doors in BRT Stations	1

CATEGORY	MAX SCORE
Communications	
Branding	3
Passenger Information	2
Access and Integration	
Universal Access	3
Integration with Other Public Transport	3
Pedestrian Access	3
Secure Bicycle Parking	2
Bicycle Lanes	2
Bicycle-sharing Integration	1
Point Deductions	
Commercial Speeds	-10
Minimum Peak Passengers per Hour per Direction (pphpd) Below 1,000	-5
Lack of Enforcement of Right-of-Way	-5
Significant Gap Between Bus Floor and Station Platform	-5
Overcrowding	-5
Poorly Maintained Busway, Buses, Stations, and Technology Systems	-10
Low Peak Frequency	-3
Low Off-peak Frequency	-2

Minimum Requirements for a Corridor to be Considered BRT

1. At least 5km length with dedicated lanes
2. Score 4 or more points in dedicated right-of-way element
3. Score 4 or more points in busway alignment element
4. Score 20 or more points across all five BRT Basics elements

BRONZE 55–69 points

SILVER 70–84 points

GOLD 85–100 points

Figure 2-2: Scorecard for achieving basic, bronze, silver, or gold-standard BRT. Source: BRT Standard 2014

2.1 Bus Rapid Transit in the United States

In the United States today, there are six cities with BRT[3] that meet *The BRT Standard*, including:

- Cleveland – HealthLine (Silver BRT)
- Pittsburg – MLK, Jr. East Busway (Bronze BRT)
- Los Angeles – Orange Line (Bronze BRT)
- San Bernardino – sbX (Bronze BRT)
- Eugene – EMX Green Line (Bronze BRT)
- Seattle – Downtown Seattle Transit Tunnel and SODO Busway (Bronze BRT)

Figure 2-3: Bronze, Silver, and Gold medals awarded by The BRT Standard. *Source: The BRT Standard.*

Closest to home, the Downtown Seattle Transit Tunnel and SODO Busway provides buses with fast and reliable travel route from Spokane Avenue in SODO to the Convention Center on the north end of Downtown Seattle. The Downtown Seattle Transit Tunnel is ranked as "Bronze BRT" and scores well on dedicated right-of-way, comfortable stations, and a mix of routes that serve many neighborhoods. As Sound Transit Link light rail service in the Transit Tunnel increases buses will be removed, eventually resulting in a rail only tunnel.

Many systems that are branded as BRT actually lack the full suite of BRT treatments and do not meet *The BRT Standard* minimum qualifications. King County Metro's RapidRide lines, which are branded as BRT, do not meet minimum BRT standards as identified by *The BRT Standard*. While RapidRide has some aspects of BRT such as off-board fare payment at high-ridership stops and distinct branding, many of the important elements like dedicated bus lanes, signal priority, service frequently and station designs fall below *The BRT Standard* minimum qualifications.

The BRT concept described throughout this document was developed specially to meet the BRT Gold Standard, which would make it the highest quality BRT system in the US.

[3] CTfastrak opened this year and has not yet been ranked

2.3 Types of Bus Rapid Transit

BRT typically runs along three main types of corridors: arterial streets, former freight rail corridors, and freeways. The section below provides details about each type of corridor.

2.3.1 Arterial BRT

Many BRT systems are built along dense urban arterials, because this is where the most popular bus routes tend to travel, and where employment and housing tend to concentrate. Many of the design elements of BRT are aimed at reducing the types of delay typically found on an urban arterial. For example, bus-only lanes in the middle of the street help buses avoid conflicts with turning vehicles, delivery vehicles, parking vehicles, bicyclists and other slow moving traffic that typically delay buses in the curb lane.

Figure 2-4: Cleveland's HealthLine is the highest-ranking BRT in the US with a silver designation.

The Cleveland HealthLine (pictured above) is typical of high-quality urban arterial BRT. Its implementation not only significantly improved the commute of 15,800 daily passengers, it also helped to stimulate $6.3 billion in new real estate investment along the corridor, significantly contributing to Cleveland's revitalization. The HealthLine cost roughly $50 million for 4.5 miles of silver-standard BRT infrastructure.[4]

Las Vegas and Eugene also have high-quality BRT lines located primarily on urban arterials. The best BRT systems outside the US are located on urban arterials: Bogota's TransMilenio, Curitiba's URBS, Mexico

[4] The oft-quoted $200 million for the HealthLine includes $50 million for the BRT itself plus a host of other urban amenities provided on Euclid Avenue at the same time as the BRT: fiber optic cable, buried power lines, etc.

City's Metrobus, all travel primarily along dense urban arterials. In many cities where downtown streets are too narrow for both BRT and other vehicles, an entire street is dedicated to BRT.

Figure 2-5: Bogota's TransMilenio runs on a bus- and pedestrian-only street downtown

Figure 2-6: Corridor 4 of Mexico City's Metrobus travels through Mexico City's Centro Historico on fully-dedicated BRT-only streets and has had a major hand in revitalizing the historical section of Mexico City

2.3.2 Rail Corridor BRT

BRT along former freight corridor, which best describes BRT on the CKC, is the second most common type of BRT. As cities grow and congestion becomes worse, disused rail freight corridor become an

attractive option for building high-quality BRT. Several of the better BRT systems in the US and Canada, including the Los Angeles Orange Line, Connecticut's CTfastrak, the Pittsburgh BRTs, the Ottawa BRT, along with the Cambridgeshire BRT in England, and a segment of the Cape Town and Brisbane BRT systems utilize former freight rail corridors.

For understandable historical reasons, employment and housing centers are often located away from freight rail corridors, so BRT routes along freight rail corridors may need to provide connections to downtowns and other popular locations. In the best systems, these "last mile" connections are provided on a fully dedicated "busway" or "BRT-way" ensuring a fast and reliable connection. In the case of the LA Orange Line, the BRT route terminates at a metro station. In other systems, where dedicated right of way into a downtown was not provided, the BRT route operates in mixed traffic with other vehicles to provide the connection; this is the case in Pittsburgh, Hartford, and Cambridgeshire.

2.3.3 Freeway BRT

Figure 2-7: Freeway BRT in Chengdu, Source: Karl Fjellstrom, ITDP China

Few BRT systems are built on freeways because dense employment and housing of often located beyond walking distance of a freeway, making stations in the middle of the freeway unattractive. Freeway BRT works best along corridor where the urban fabric is built right up against the freeway, allowing people to easily walk to or from the stations. Alternatively, freeway BRT can work well if the BRT service leaves the freeway BRT using a fully-dedicated arterial or former rail BRT and connects directly to population centers, as is done in Lima, Peru.

Figure 2-8: Freeway BRT in Lima, Peru. Source: Karl Fjellstrom, ITDP China

I-405 BRT could be similar to other freeway BRT systems, however I-405 BRT investments currently under consideration as part of ST 3 may not have all the elements of a BRT system. On I-405 the BRT right-of-way will be shared with other vehicles in the Express Toll Lane and potential general purpose vehicles for some segments. Other elements of a BRT system have yet to be finalized. Most passengers are expected to reach these stations from Park & Rides.

Figure 2-9: The Lima BRT leaves the freeway and operates on exclusive lanes on narrow downtown streets.

2.4 BRT Systems with Trails

The best BRT systems rely on walking and biking as the primary mode of access, therefore BRT and trail investments are mobility investments that support each other. There are a number of BRT routes and trails that share former rail corridors both in the US and internationally.

The Cambridgeshire Guided Busway in the UK, built on the former track bed of the Cambridge and Huntingdon railway, travels on a busway surrounded by grass (though it maintains rubber tires). It parallels a well-traveled multiuse trail.

A bicycle advocate from the Netherlands wrote, “When it's complete and goes all the way to St. Ives, this will be almost certainly the best quality cycle path in the UK, offering a combination of a direct route to somewhere that you might actually want to go with a good degree of safety away from cars, with a width such that it's possible to pass other cyclists, and with a surface quality that allows cyclists to ride at any speed they find comfortable.”[5]

[5] http://www.aviewfromthecyclepath.com/2011/08/best-cycle-path-in-britain.html

Figure 2-10: The Cambridgeshire Trail and BRT is a popular place for cyclists (Source: David Hembrow of the blog A view from the cycle path… http://www.aviewfromthecyclepath.com/2011/08/best-cycle-path-in-britain.html)

Figure 2-11: CTfastrak's new BRT has a parallel path along part of the corridor. Source: State of Connecticut

An example of BRT and trails coexisting in the US include the new CTfastrak BRT system between Hartford and New Britain, Connecticut. Despite a very narrow right-of-way of 60 feet or less in width, the state managed to build a high-quality bike facility along five miles of the corridor. A 100-foot wide corridor such as the CKC would allow for improved separation between the BRT-way and trail.

A more urban example is from Chelsea, a suburb of Boston, where construction is underway for the Silver Line Gateway, a shared use path located next to a BRT-way.

Figure 2-12: Rendering of Silver Line Gateway project to include a shared use path and a BRT

MyCiTi BRT in Cape Town, South Africa is another example of former freight rail corridor and includes both a BRT and a fully separated shared use path.

Figure 2-13: MyCiTi BRT in Cape Town, South Africa was built partially in a disused rail bed and includes a fully-separated shared use path

Chapter 3 – Facility Concept

The CKC as envisioned in the CKC Master Plan, will not only be a great way to get around Kirkland, but it will be a destination in itself. The CKC Master Plan envisions a world-class walking and bicycling trail for transportation and recreation purposes on the west side of the corridor providing great views of Downtown Kirkland and Lake Washington. Consistent with the CKC Master Plan, this document envisions a bus corridor on the east side of the CKC with gorgeous, iconic stations that symbolize Kirkland's past, present, and future.

Figure 14 - Cover of CKC Master Plan showing trail and transit corridor

Both trail and transit would function independently and yet provide important interactivity. The pedestrian and bicycle trail would provide access to the BRT stations allowing passengers to walk or bike to the stations while the BRT offers reliable, congestion-free regional transit connections to destinations while better connecting the city.

Buses and stations on BRTs built alongside trails can either be functional and modest, or fun and inspiring. The "CKC BRT concept" or "BRT-way" as referenced and described throughout the rest of this document, combines all aspects of high-quality BRT systems such as beautiful stations, dedicated rights of way, and convenient, quality bus service.

The goal of the CKC BRT concept is to describe a Gold Standard BRT system that provide real mobility solutions for Kirkland residents and employees now and into the future while also protecting the CKC as a unique and loved trail and open space asset.

3.1 Typical Trail and BRT Cross Section

Figure 3-15: BRT in Cambridgeshire, UK has a path for walking and biking alongside the grassy BRT guideway. (Source: Ed Webster https://www.flickr.com/photos/ed_webster/7245081316/in/photostream/)

Over most of its length, the CKC is 100 feet wide, providing enough room for a primarily trail, secondary trail and BRT-way. As conceived, the BRT-way would require two 12-foot travel lanes and 2-4 feet for shoulders for a total of 28 to 32 feet. As envisioned in the CKC Master Plan a 16-foot wide primary shared-use trail and an 8-foot wide shared use side trail would continue along the full seven miles. Including buffers, this leaves between 44 to 48 feet of space for amenities identified in the CKC Master Plan including landscaping, trees, park benches, picnic tables, activity areas and more .

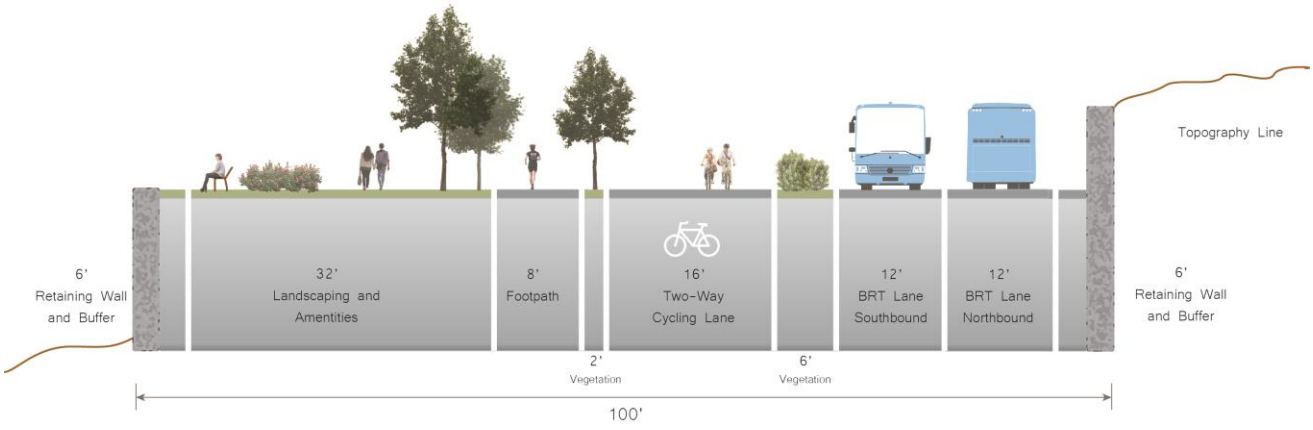


Figure 3-16: Typical CKC Trail and BRT cross section

As envisioned, the BRT-way does not need to be separated from the shared use trail by a wall or fence. A vegetative swale with heavily planted shrubbery could be designed in a way to provide a sufficient

barrier to prevent children, pets and recreational users from entering the BRT-way. Barrier fencing is more important for rail-based modes, where vehicles need longer distances to stop due to their weight and braking systems (see “3.7 Intersections and Non-Motorized Crossings”)

Stations require extra width but using an “offset station” design, the width of stations can be kept to a minimum, fitting within the 100-foot CKC. The offset station design allows one platform in the middle of the BRT-way to serve buses traveling in both directions. This design requires an additional 15 feet in width for the station and 10 feet for buses using the station. The CKC BRT service concept also require one 12 foot passing lane to accommodate express buses, which will get passengers to reach their destinations quicker. However, due to the nature of the offset station, passing lanes are only required on one side of the station.

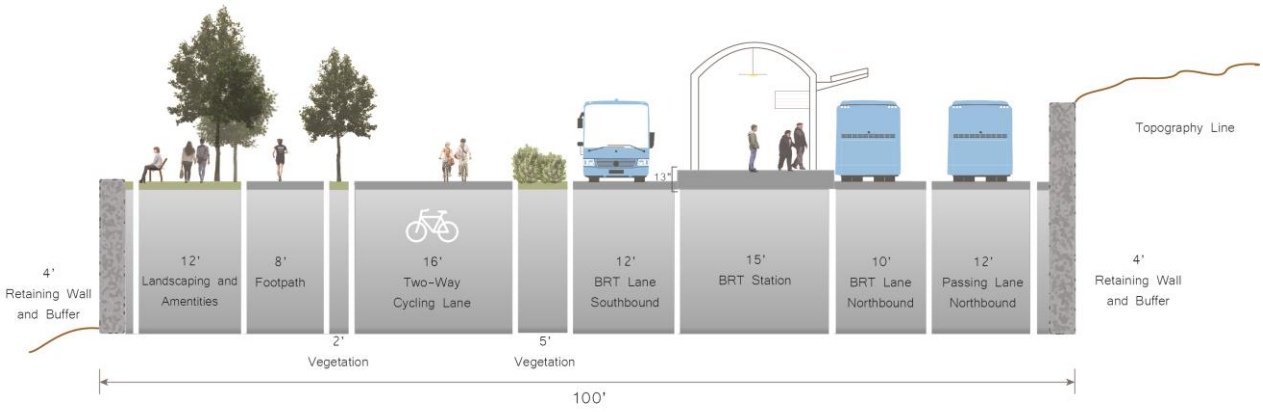


Figure 3-17: Typical CKC Trail and BRT cross section at stations. Platforms are offset and one passing lane is included

Combined, stations require at least 49-feet, leaving 51-feet for the primary trail, secondary trail, buffer and other station amenities like bike parking or seating. The image below from Bogotá, Colombia, provides a visual example of median stations that are offset with one passing lane in each direction, similar to what is proposed here.

Figure 3-18: Offset station with a central median platform, Bogotá, Colombia. Photo: Karl Fjellstrom, Far East BRT Planning Co.

3.2 Pinch Points

Before the City of Kirkland purchased the CKC, a detailed land survey of the corridor was prepared to establish and confirm the boundaries of the property to be purchased. Building off this survey, both the CKC Master Plan and this document assessed and confirm that the corridor is 100-feet wide for a large majority of its length, and that both transit and a trail will fit.

Along the CKC there are five locations where the corridor is less than 100-feet in width. These narrower points, which are typically around 70-feet wide, are shown in the image below.

Figure 3-19: Sections of the CKC where the width is less 100 feet.

A typical cross section was developed for CKC segments with a width of 70-feet as shown in the figure below. Despite the narrowing of the corridor, space for both transit and trail are sufficient.

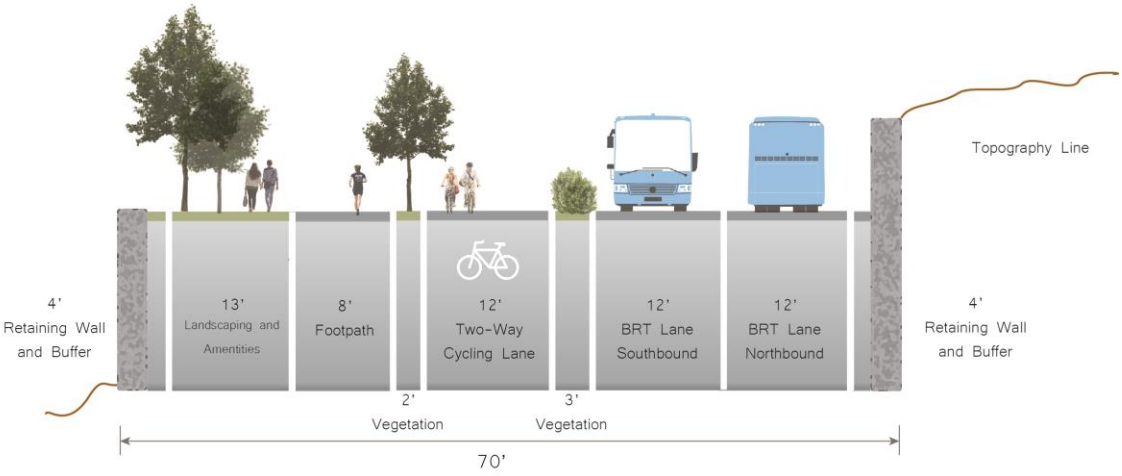


Figure 3-20: CKC Trail and BRT where the right-of-way narrows to 70 feet.

3.3 BRT-Way Segments On the CKC

The CKC BRT concept includes segments both on and off the CKC in strategic locations allowing BRT vehicles to avoid current and future congestion while also serving major residential and employment destinations.

BRT-way segments both on the CKC and off the CKC total approximately 10.4 miles and are proposed as fully dedicated BRT lanes. Of this, 7.3 miles are located on the CKC and Eastside Rail Corridor (ERC); and 3.1 miles are on-street busway, or BRT-ways, in the middle of the street. For the most part, the alignment of the BRT-way and BRT stations would be located to the east side of the CKC corridor. In narrow locations, or location where environmental constraints are present the BRT-way and trail could shift side-to-side, or in some circustance, even switch sides.

Figure 3-21: BRT-way (green) bypassing congestion choke points in Totem Lake and on NE 85th Street

Congestion occurs throughout Kirkland. East-west street such at NE 70th Street, NE 85th Street and NE 124th Street all experience congestion as vehicles work their way to and from I-405. North-south streets such as Lake Washington Boulevard, 108th Avenue NE, Market Street and 124th Avenue NE also experience congestion from commuter avoiding I-405.

These congestion hotspots serve as a guide for where BRT lanes are most needed, and as shown in the image above, the CKC provides a valuable route for BRT to bypass this congestion. The BRT-way on the CKC has been broken into five segments. These segments include:

- South Kirkland Park & Ride to NE 68th Street
- NE 68th Street to Kirkland Way
- Kirkland Way to NE 85th Street
- NE 85th Street to 116th Avenue NE
- 116th Avenue NE to NE 120th Street

Each description includes the segment's charcter, enviornmental and right-of-way characteristics and description of a typical cross section. These segments are also related to the CKC Master Plan to ease reference between this document and the Master Plan.

3.3.1 South Kirkland Park & Ride to NE 68th Street (Yarrow Woods & Houghton Porch Zones)

Segment Character

This segment spans the both the "Yarrow Woods" and "Houghton Porch" zones described in the CKC Master Plan. The southern terminus of this segment is the South Kirkland Park & Ride. Steep cut and fill slopes exist on both sides of this segment of the corridor. There is a thick forested canopy along some parts of the segment and a number of sensitive areas such as wetlands and streams.

There are access points along the corridor, notably the trails that access the Watershed Park as well as street-end access points between NE 52nd Street and NE 64th Street. Single family homes exist adjacent to most of the corridor. Toward the northern portion of this segment, the corridor opens up with lighter vegetation with more level terrain.

Environmental Characteristics

Creek crossings include Yarrow Creek, Carillon Creek, and unnamed creeks. There are several wetlands close to the east side of the corridor. These sensitive areas would be protected to avoid significant impacts with the use of retaining walls or with shifts in the trail/BRT alignment.

Right-of-Way Characteristics

While the typical right-of-way width along the CKC is 100 feet, there are approximately 12 single family residential lots that have encroached on the east side of the corridor right-of-way. In addition, NE 52nd Street crosses the corridor, requiring intersection crossing safety improvements. Where there are pinch points in the corridor, the useable width is approximately 70 feet.

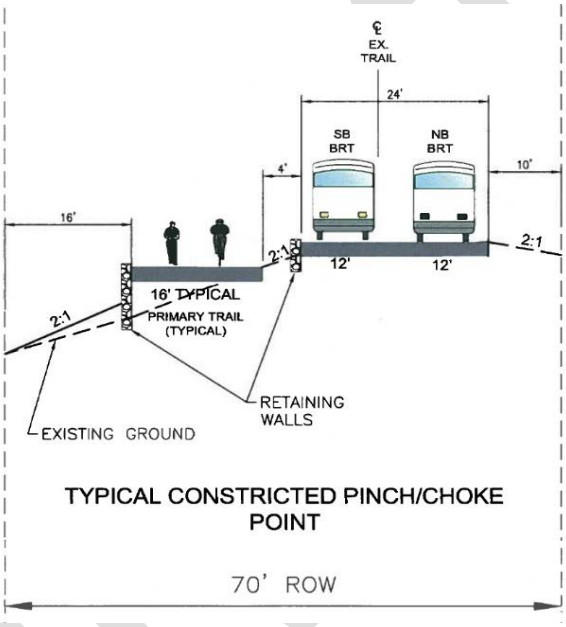


Figure 3-22: Cross section at typical constricted pinch/choke point

Typical Segment Specific Section

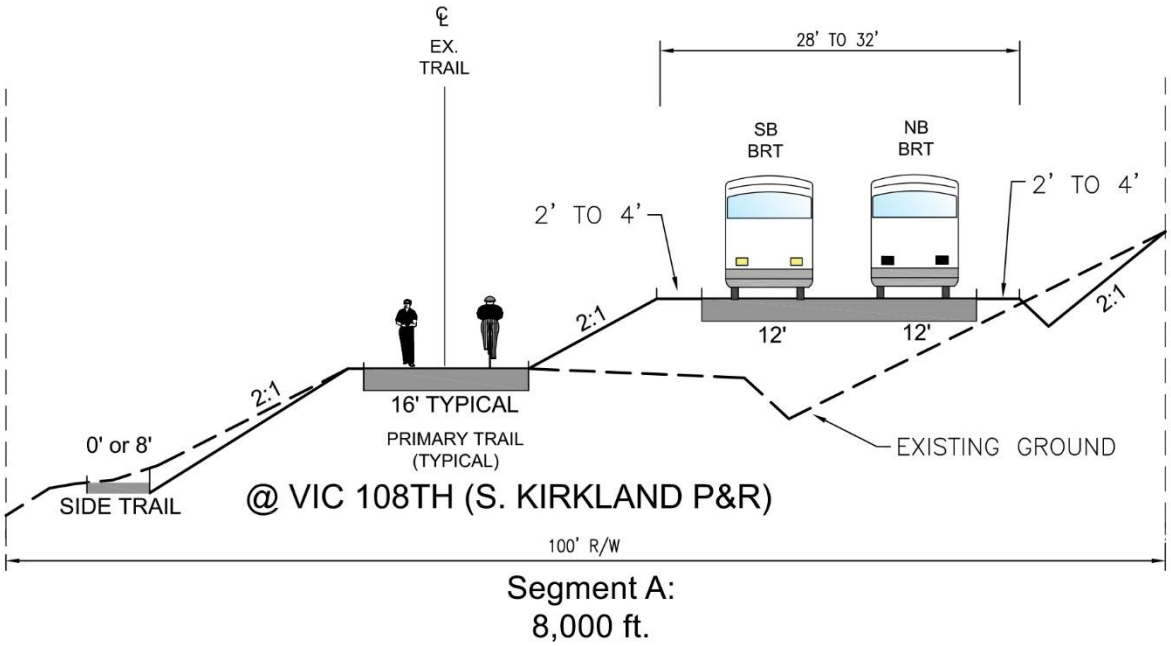


Figure 3-23: Typical cross section in South Kirkland Park & Ride to NE 68th Street segment

The proposed typical cross section for this segment includes a 16-foot-wide primary trail along the old rail bed, with a 28 to 32 foot BRT-way located east of the primary trail but within the corridor. Where the corridor is 100 feet wide, an 8 foot side trail can be constructed west of the primary trail to improve connectivity to access points and provide a more relaxed and slow-paced way to experience the corridor. Retaining walls will be utilized to contain the trail and HCT in areas of steep slopes or sensitive areas. Two stations, one at South Kirkland Park & Ride and one in the vicinity of Northwest University are proposed.

3.3.2 NE 68th Street to Kirkland Way (Convergence & Everest Edge Zones)

Segment Character

This segment spans both the "Convergence" and "Everest Edge" zones described in the CKC Master Plan. The southern terminus is at NE 68th Street and includes the NE 68th Street and Kirkland Avenue overpasses.

The Google campus development and adjacent smaller businesses characterize this segment ("Convergence Zone"), along with the Lakeview Elementary School on the west side and several single family residences on the east side (just north of NE 68th Street). The segment south of the 6th Street S intersection continues to redevelop and is becoming a more important employment center for the City of Kirkland. From the 6th Street S crossing to the northern limits of this segment at Kirkland Avenue, the corridor passes through a wooded area with more level terrain ("Everett Edge Zone") and a light industrial area just south of Kirkland Avenue, with a parallel frontage road, providing a pedestrian connection.

The two existing overpasses at NE 68th Street and Kirkland Way are narrow and originally built to only serve only rail traffic. Steep slopes at each abutment discourage pedestrian access.

Environmental Characteristics

There are no apparent wetlands in this segment. There is a crossing of Everest Creek between NE 6th Street and Kirkland Avenue. Impacts to this stream would be avoided.

Right-of-Way Characteristics

North of NE 68th Street there are approximately five structures on the east side that may encroach slightly on the corridor right-of-way. A large commercial building with a number of smaller businesses appear to be within the 100' wide corridor on the east side between the Google campus and NE 6th Street.

The presence of this commercial building suggests that the trail could be ultimately be constructed on the east side of the CKC corridor and the BRT-way on the west side of the corridor. This would allow connection between the trail and business in this building. The extension of 7th Avenue S on the west side is a further constraint. Elsewhere the right-of-way width is 100 feet.

Typical Segment Specific Section

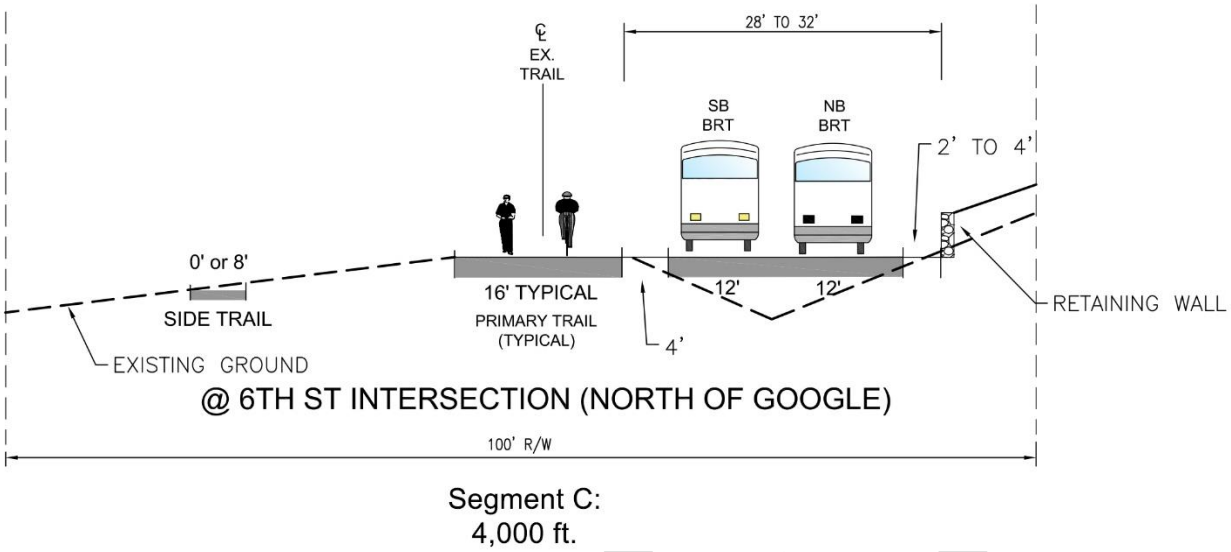
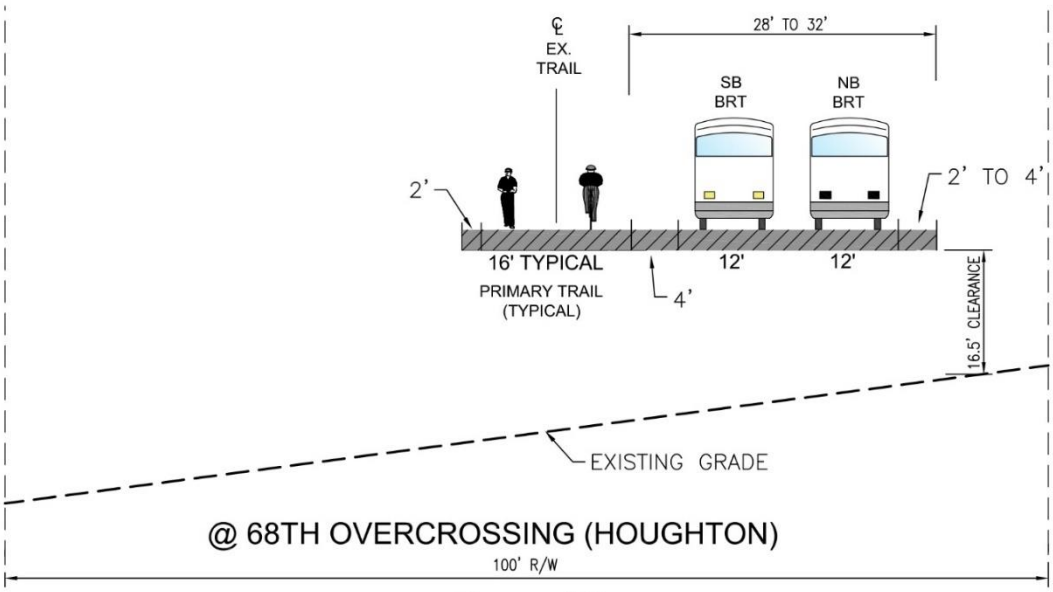


Figure 3-24: Typical cross section for NE 68th Street to Kirkland Way segment

The proposed typical cross section for this segment includes a 16-foot-wide primary trail along the old rail bed, with a 28 to 32 foot BRT-way located east of the primary trail but within the existing right-of-way. Where the right-of-way is 100 feet, an 8 foot side trail or connection to development can be constructed. Short retaining walls will be required mostly along the east side of the corridor north of NE 6th Street.

The proposed section for bridges at NE 68th Street and Kirkland Way would provide a wider crossing structure and abutment/retaining walls at each location, approximately 50 foot wide, including a 16 foot wide primary trail as shown in Figure 3-25. The BRT-way would be 28 to 32 foot HCT width for two-way travel located east of the primary trail but within the existing (and constrained at some locations) right-of-way. One station in the Google/NE 6th Street vicinity is proposed.



Segment B:
(1) 140 ft. - NE 68th St.
(2) 190 ft. - Kirkland Ave.
(3) 1,600 ft. - NE 124th St.
Total: 1,930 ft.

Figure 3-25: Typical bridge cross section

3.3.3: Kirkland Way to NE 85th Street (Everest Edge Zone)

Segment Character

This segment consists of the remainder of "Everest Edge" zone. Light industrial uses on the east side (encroaching into the right-of-way) and single/multi-family residential units on the west side predominate this segment. Topography along the old rail bed of the corridor itself is flat while slops exist on the edges of the CKC right-of-way.

Environmental Characteristics

There are no apparent sensitive areas (streams/wetlands) in this segment of the corridor.

Right-of-Way Characteristics

The majority of this segment has constrained right-of-way of approximately 70 feet. This is due to encroachment by two large light industrial building along the east side of the corridor.

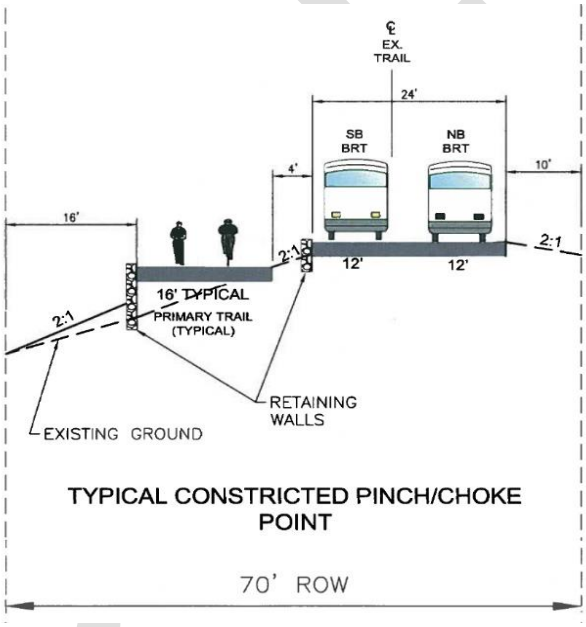


Figure 3-26: Typical constricted pinch/choke point for Kirkland Way to NE 85th Street segment

- **Typical Segment Specific Section**

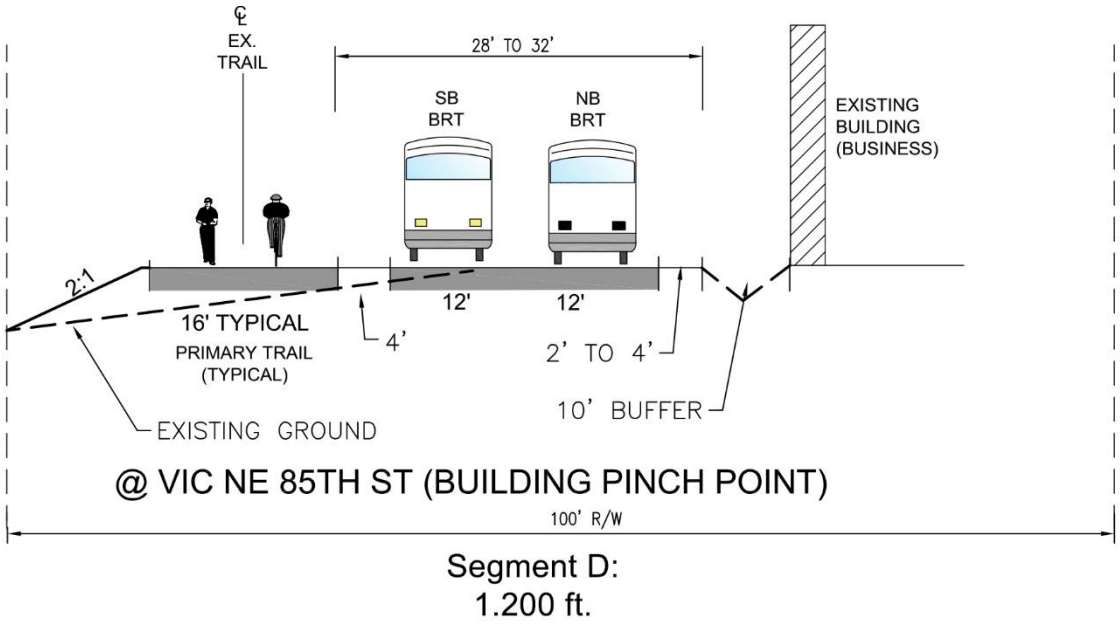


Figure 3-27: Typical cross section Kirkland Way to NE 85th Street segment

Due to the constrained nature of the right-of-way and pinch points, the typical section for this segment consists of a 16-foot-wide primary trail along the existing old rail bed, with a 28 to 32 foot HCT width for two-way travel located east of the primary trail but within the existing right-of-way. There is insufficient right-of-way to construct a side trail. Short retaining walls on the east side will be required to avoid impacts to the light industrial properties.

3.3.4 NE 85th Street to 116th Avenue NE (Norkirk Edge & Highlands Pass Zones)

Segment Character

This segment spans from NE 85th Street ("Norkirk Edge Zone") to approximately 116· Avenue NE ("Highlands Pass Zone"). The "Norkirk Edge Zone" (from NE 85th Street to 12th Avenue) is characterized by light industrial/commercial development on the west. The Highlands Neighborhood borders on the east side with primarily single-family homes. Access to Peter Kirk Elementary crossed the CKC at NE 97th Street. Topography slopes downward from east to west on either side of the relatively flat old rail bed.

The "Highlands Pass Zone" (from 12th Avenue to approximately 116th Avenue NE) features dense vegetation and forest canopy and a definite undeveloped atmosphere. There are formal and informal access points along the corridor including a crossing that leads up to Crestwood Park. Topographic

transitions creating a canyon-like sense along parts of this corridor. At the norther end of the segment the CKC cross Forbes Creek.

Environmental Characteristics

There is an unnamed creek crossing and a fairly large wetland located on the east side of the CKC between 11th and 12th Avenue at the northern end of the "Norkirk Edge Zone". Retaining walls could be used to avoid or minimize impacts to the wetland and/or buffer. Impacts to the stream crossing would not be anticipated. There are approximately seven unnamed creek crossings, a large apparent wetland at on the west side south of 17th Avenue, and a large apparent wetland on the east side between 17th Avenue and 19th Place within the "Highlands Pass zone". Retaining walls could be used to avoid or minimize impacts to the wetland and/or buffers. Impacts to the stream crossing likely could be avoided wherever possible. If necessary, retaining walls could be utilized to minimize or avoid stream and buffer impacts.

Right-of-Way Characteristics

While the typical right-of-way width is 100 feet, there are three single family residential lots that have been developed (one on the west side and two on the east side), that encroach on the corridor right-of-way. In addition, NE 97th Avenue crosses the corridor requiring intersection crossing safety improvements. Where there are pinch points in the corridor, the useable width is between 70 and 90 feet.

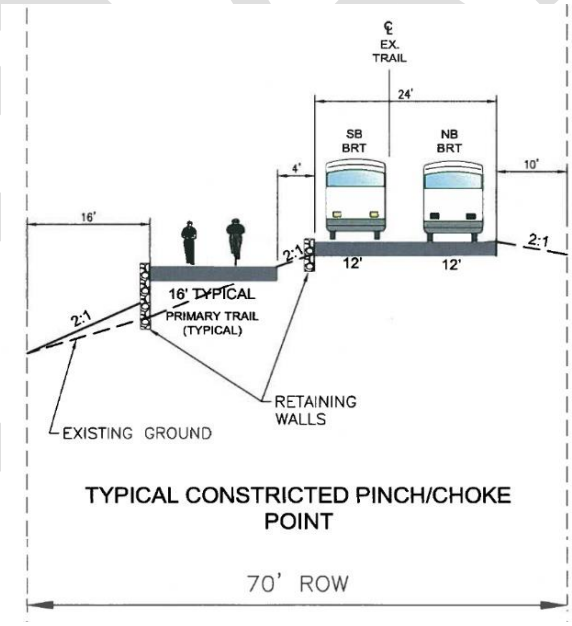


Figure 3-28: Typical constricted pinch/choke point for NE 85th Street to 116th Avenue NE segment

Typical Segment Specific Section

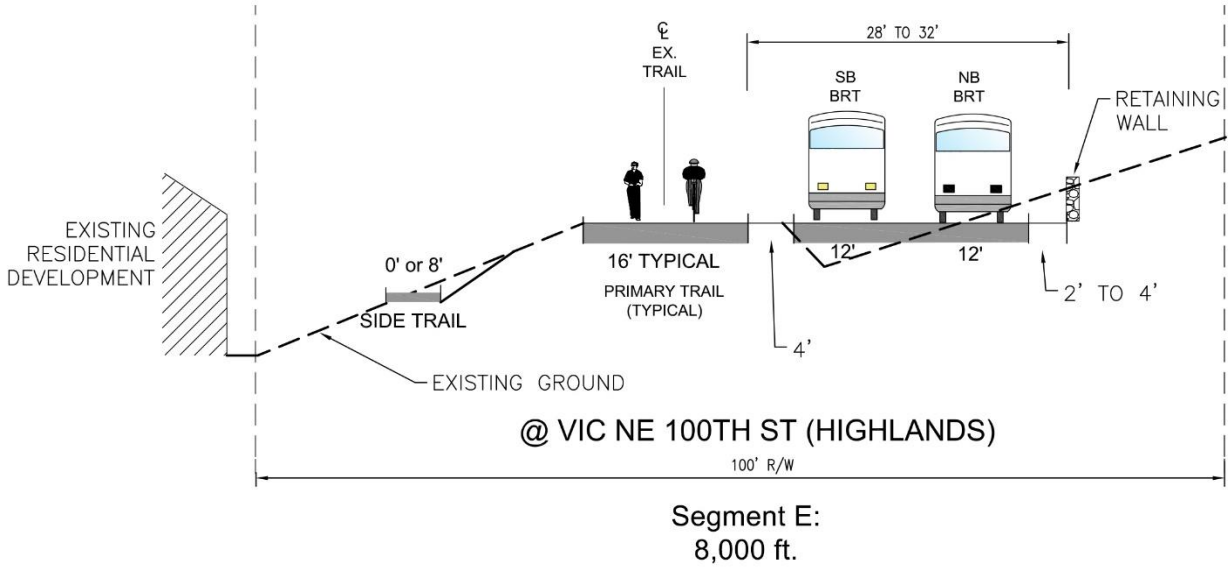


Figure 3-29: Typical cross section for NE 85th Street to 116th Avenue NE segment

Light industrial/commercial development exists on the west side of the corridor within the "Norkirk Edge Zone". fill retaining walls can be used as needed to avoid impacts to these businesses and access on the west and residences on the east. The proposed section for this segment typically includes a 16 foot wide primary trail along the existing old rail bed, with a 28 to 32 foot HCT width for two way travel located east of the primary trail but within the existing right-of-way. Where the right-of-way is 100 feet, an 8 foot side trail can be constructed west of the primary trail. Retaining walls will be utilized to contain the trail and HCT in areas of steep slopes or sensitive areas.

3.3.5 116th Avenue NE to NE 120th Street (Active/West Totem Lake Connector Zones)

Segment Character

This segment spans from approximately 116th Avenue NE at the southern end of the ParMac "Active Zone" to approximately NE 120th Street at the southern end of the "Totem Lake" segment, including the "West Totem Lake Connector" segment. Extensive commercial and industrial development exists along both sides of the corridor. In general, the zone is fairly flat in topography north of the Forbes Creek crossing. Street crossings include the NE 112th Street and 120th Avenue NE at-grade crossing as well as the recently widened NE 116th Street overpass and the I-405 overpass.

Environmental Characteristics

The major creek crossing is Forbes Creek at the southern end of the corridor. The goal will be to avoid any impacts to the crossing and buffers. Restoration planting would likely be provided where required. There are no other apparent sensitive areas (streams/wetlands) in this segment of the corridor.

Right-of-Way Characteristics

Several parts of this segment has a width less than 100 feet from NE 112th Street to NE 116th Street as well as the I-405 overpass. Commercial/light industrial buildings on the west side abut the right-of-way line.

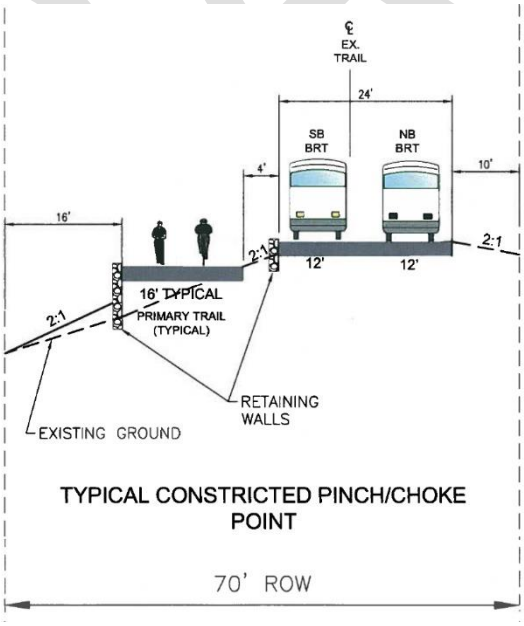


Figure 3-30: Typical constricted pinch/choke point for 116th Avenue NE to NE 120th Street segment

Typical Segment Specific Section

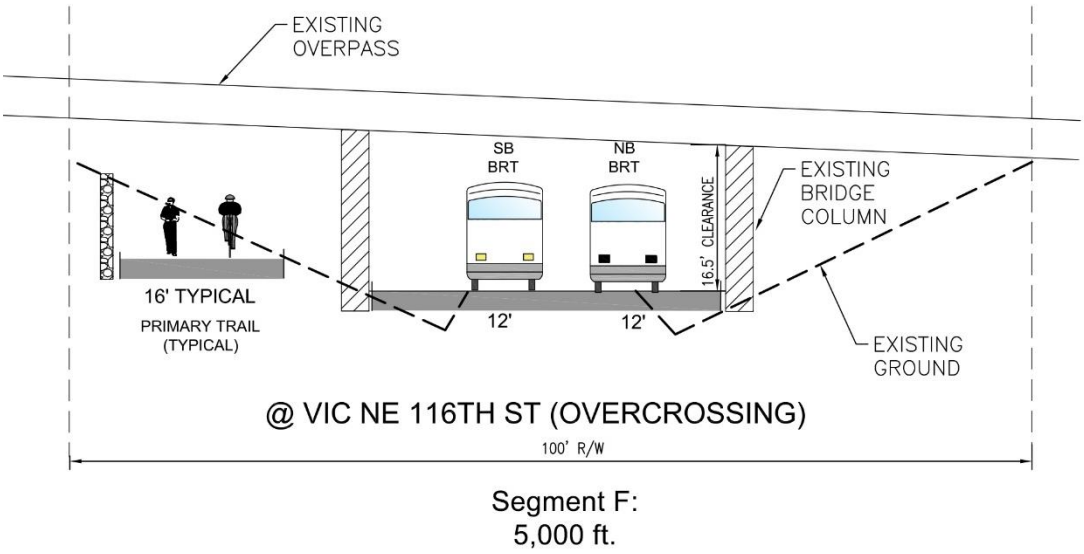


Figure 3-31: Typical cross section for 116th Avenue NE to NE 120th Street segment

Existing light industrial/commercial development exists on both sides of the corridor within the "Active Zone". Where needed, short retaining walls could be used to avoid impacts to these businesses, parking and access. The proposed section for this segment typically includes a 16 foot wide primary trail along the old rail bed, with a 28 to 32 foot HCT width for two way travel located east of the primary trail but within the existing right-of-way. Where the right-of-way is 100 feet, an 8 foot side trail can be constructed. Retaining walls can be utilized to contain the trail and HCT in areas of steep slopes or sensitive areas.

At NE 116th Street overpass, the typical section will be modified to route the 28 to 32 foot HCT width between the support columns and route the 16 foot wide primary trail west of the columns. Retaining walls will be used to contain the cut slope within the existing right-of-way. When passing under I-405 the BRT-way and trail would use the same configuration. One station in the ParMac vicinity is proposed.

3.4 BRT-Way Segments off the CKC

A key component of the BRT service concept described in Chapter 4 is the idea of an "open" BRT-way which allows multiple buses route to use the corridor, entering and exit the BRT-way along its length. To support this concept the BRT-way requires high-quality connections which extend beyond the CKC in four places:

- **Bellevue Transit Center to South Kirkland Park & Ride:** A connection could be made in several ways using the Bellevue segment of the ERC or 116th Avenue NE, with a connection into Downtown Bellevue via NE 6th Street.

- **South Kirkland Park & Ride to SR 520 HOV Direct Access Ramps:** Connection would improve access to 520 for routes to and from Seattle.
- **Downtown Kirkland to I-405:** Connection to Downtown Kirkland via new center bus lanes on NE 85th Street and direct connection between the CKC and NE 85th Street. The concept also includes bus lanes and BRT service extending toward Redmond on NE 85th Street.
- **Kingsgate Park & Ride to NE 120th Street:** Provides a high-quality connection between CKC and NE 132nd and points beyond via Totem Lake Boulevard and a bus-only bridge.

These connections are described in further detail below.

3.4.1 Bellevue Transit Center to South Kirkland Park & Ride

Extending the CKC BRT into Bellevue would benefit residents of Kirkland and Bellevue alike who today must either drive or take bus routes which are delayed in traffic.

In Bellevue, the CKC designation of the greater Eastside Rail Corridor (ERC) ends. Conceptual discussions with the City of Bellevue staff regarding how to route BRT on the Bellevue portion of the ERC have occurred and three general routing concepts were identified. These concepts were identified because a number of physical constraints exist along the Bellevue ERC segment and a non-ERC alignments could better align the CKC BRT concept with the City of Bellevue's Transit Master Plan. These alignment concepts include both at-grade and aerial routing along the ERC as well as routing along 116th Avenue NE. The CKC BRT concept includes two stations along this segment, one on the edge of the Spring District and a second at the Wilburton Link Station.

As conceived, the CKC BRT concept would connect to the Bellevue Transit Center via an extension of the HOV/Express Toll Lane NE 6th Street bridge as described in the City of Bellevue NE 6th Street Extension Design Report (August 2012). This connection would provide a one-seat ride between Downtown Bellevue and the rest of the corridor.

3.4.2 South Kirkland Park & Ride to SR 520 HOV Direct Access Ramps

A direct connection between the CKC and the SR 520 HOV lanes is an important aspect of the CKC BRT concept because several routes described in the service plan concept will use this connection. A variety of changes to this segment could be made.

Elimination of the circuitous buses through the S Kirkland Park & Ride would eliminate four turns and reduce the number of intersections buses must pass through. Analysis of this concept should be conducted to determine the best way to increase the speed and reliably of BRT along this short stretch. Construction of BAT lanes or center running bus lanes are consistent with the level of capital investment envisioned as part of the overall CKC BRT concept.

3.4.3 Downtown Kirkland to I-405

Downtown Kirkland is a vibrant and walkable center which continues to grow. Kirkland Urban will be a 1.1 million square foot complex with over 3,000 new jobs and 250-300 new housing units. The nearby Google Campus has recently expanded to 180,000 square feet with 2,000 new employees. A BRT connection between the CKC and Downtown Kirkland is, therefore, critical to ensure that Downtown Kirkland continues to thrive, while those who live and work downtown can have easy access to both the amenities of the CKC but also to nearby regional activity centers.

Figure 3-32: Downtown Kirkland's mix of uses makes for a vibrant nightlife. Source: City of Kirkland

To provide a high-quality connection between the CKC and Downtown Kirkland reconstruction of NE 85th Street with median bus lanes is identified as part of the CKC BRT concept. Construction of median bus lanes would extend from 6th Street NE to I-405 and preferably beyond I-405.

In addition to median bus lanes this concept requires construction of direct access ramp between NE 85th Street and the CKC similar to the SR 520 direct access ramps at 108th Avenue NE. Direct access ramps would be constructed in the northbound to westbound and southbound to westbound directions only, due to topographical considerations and service needs. As described later in this service concept chapter, some BRT routes would not use this route providing express connections to and from Seattle.

Using these infrastructure investments, BRT routes would travel from the CKC down the NE 85th Street BRT-way towards Downtown Kirkland, turning south at 6th Street where they would either terminate or return to the CKC after serving a new BRT station near the intersection of 6th Street and 4th Avenue. A roundabout was explored as one solution to allow buses to turn around, another option would be to route buses to the CKC south of downtown via surface streets.

Building the BRT-way on NE 85th Street requires widening NE 85th Street as illustrated in the figures below. Due to the unique nature of this design and topographical complexities of this area, conceptual design and engineering is required to fully assess feasibility, cost, ROW needs, and other impacts. As

part of ST 3 construction of curb bus lanes on NE 85th Street from 6th Street to 132nd Avenue NE (not including the direct access ramp and downtown station improvements) was estimated to cost approximately $100 million.

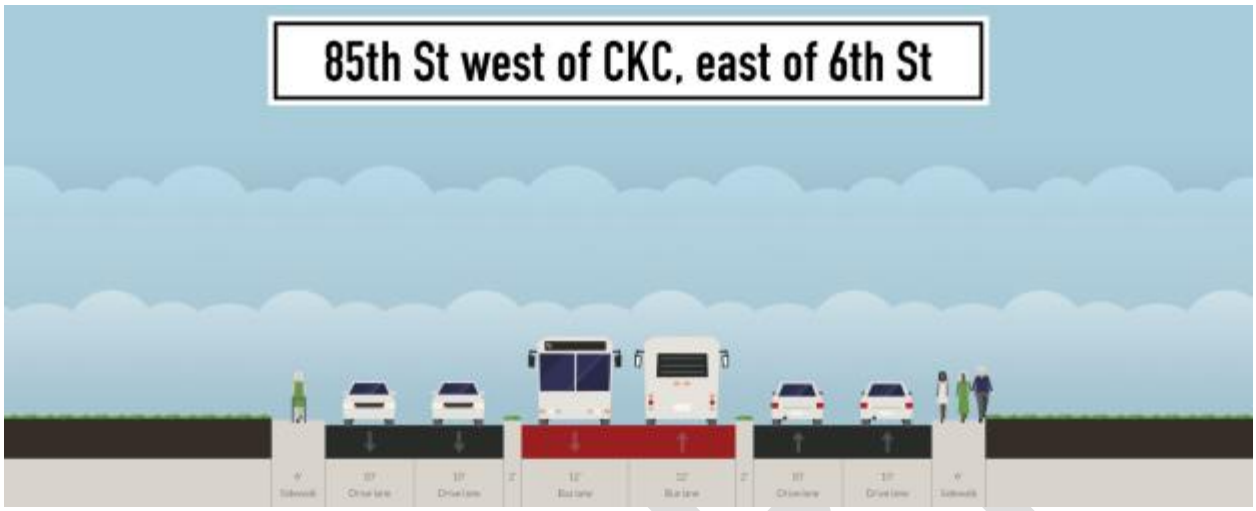


Figure 3-33: Full BRT treatments on NE 85th Street, between the CKC and 6th Street in Downtown Kirkland

Figure 3-34: Configuration of connection between CKC and 85th Street BRT via ramps in the median

3.4.4 Kingsgate Park & Ride to NE 120th Street

Over the next twenty years, much of Kirkland's growth is anticipated to occur in the Totem Lake area which is a PSRC designated Regional Urban Growth Center. Traffic congestion is already a challenge in the Totem Lake area and HCT is essential for managing growth as the area grows. A major focus of the

CKC Trail and BRT concept is providing transit improvements between Totem Lake and the regional as well as improving non-motorized circulation and building a sense of place within Totem Lake. Both of these improvements would help catalyze the type of walkable, mixed-use growth that the City envisions.

Today, the CKC is missing a short but important link at the complicated and congested intersection of NE 124th Street and Totem Lake Boulevard NE. As a result, CKC trail users today must cross two busy streets in order to continue their journey. To solve this challenge, the CKC Master Plan identified a pedestrian and bicycle bridge connection for this location.

Figure 3-35: Totem Lake Gateway: a bicycle/pedestrian bridge across NE 124th Street. Source: Cross Kirkland Corridor Master Plan

Likewise, the CKC BRT concept envisions a new aerial BRT connection roughly a block to the west of the pedestrian and bicycle bridge. This aerial bridge would directly connect the CKC near I-405 to Totem Lake Boulevard NE west of the Totem Lake Boulevard NE and 120th Avenue NE intersection. This connection would allow buses to bypass 2-3 intersections including the congested NE 124th Street corridor, reducing travel times by several minutes from an on-street alignment.

To ensure fast and reliable travel times, especially as the area grows, median-aligned bus lanes on Totem Lake Boulevard could be constructed from the aerial structure to NE 128th Street where BRT routes could either access I-405 at the Totem Lake Freeway station, terminate at the Kingsgate Park &

Ride or serve the Kingsgate neighborhood. At the Totem Lake Freeway station, BRT passengers would be able to either continue north via I-405, or transfer to other regional I-405 BRT/bus service.

This concept leverages past BRT investment like the I-405 Totem Lake Freeway Station and would provide congestion free travel while also providing flexibility to serve other destinations in the area. The Orange Line, as described in the service concept chapter, would provide direct connections between Totem Lake, Downtown Kirkland, and other points throughout Kirkland, as well as Seattle, without the need for a transfer.

3.5 Stations

BRT stations along the CKC are envisioned as prominent, full featured enclosures that are comfortable for passengers in any type of weather, and enhance the natural beauty of the corridor. Great BRT stations provide amenities similar to, or better than, light rail stations. They are highly functional, designed to minimize the time it takes for passengers to board the buses, and help to avoid the long queues and delays at more crowded stops that are typical of regular bus systems. At the same time, they are aesthetically pleasing.

3.5.1 Design

In many cities, BRT stations have become iconic, reflecting the character of the city, or symbolizing a city's regeneration.

In Johannesburg, new, sleek red and white highly modern stations have played a key role in the revitalization of the downtown into a prosperous twenty-first century international center.

Figure 3-36: Glass-enclosed modern stations for Johannesburg's Rea Vaya BRT provide a comfortable place to wait with an interesting play of light and shadows

BRT in Kirkland could have similarly high-quality stations along the CKC, designed to reflect Kirkland's heart and soul. The following station elements should be included:

- Enclosed stations with weather protection and wind barrier for the full length of the station;
- Seating for waiting passengers;
- Station platforms that are level with bus floors, allowing easy boarding and alighting for passengers;
- 120-foot platform length per direction, where feasible, in order to accommodate up to two buses boarding at the same time;
- Off-board fare collection system at all stations with ticketing vending machines and closed circuit security camera systems;
- Real-time bus arrival signs;
- Station wayfinding, signage, system information, and signature branding elements;
- Americans with Disabilities Act (ADA) compatibility;
- Trash and recycling bins;
- Pleasant lighting;
- Elevators and escalators where there is a direct connection to East Link; and
- Bicycle storage.

Stations should be designed with guidance from Kirkland residents on how stations should look and feel. Art should be included in the stations using the 1% for art program and other funding.

3.5.2 Location

A total of six stations on the CKC and four stations off the CKC are proposed. Most of the stations will follow a standard design template, but a few must be specially designed. The six proposed stations on the CKC are:

1. **Wilburton**: Standard full-featured station with direct connections, ideally by elevator and escalator, to the Wilburton Link Station
2. **Spring District**: Standard full-featured station with direction connections, ideally by elevator and escalator, to Spring District Station area
3. **South Kirkland Park & Ride**: Full-featured station plus a pedestrian elevator (planned) to the South Kirkland Park & Ride lot. This station is along the CKC and not in the Park & Ride.
4. **Northwest University**: Standard full-featured station
5. **Houghton/NE 6th Street**: Standard full-featured station
6. **ParMac**: Standard full-featured station

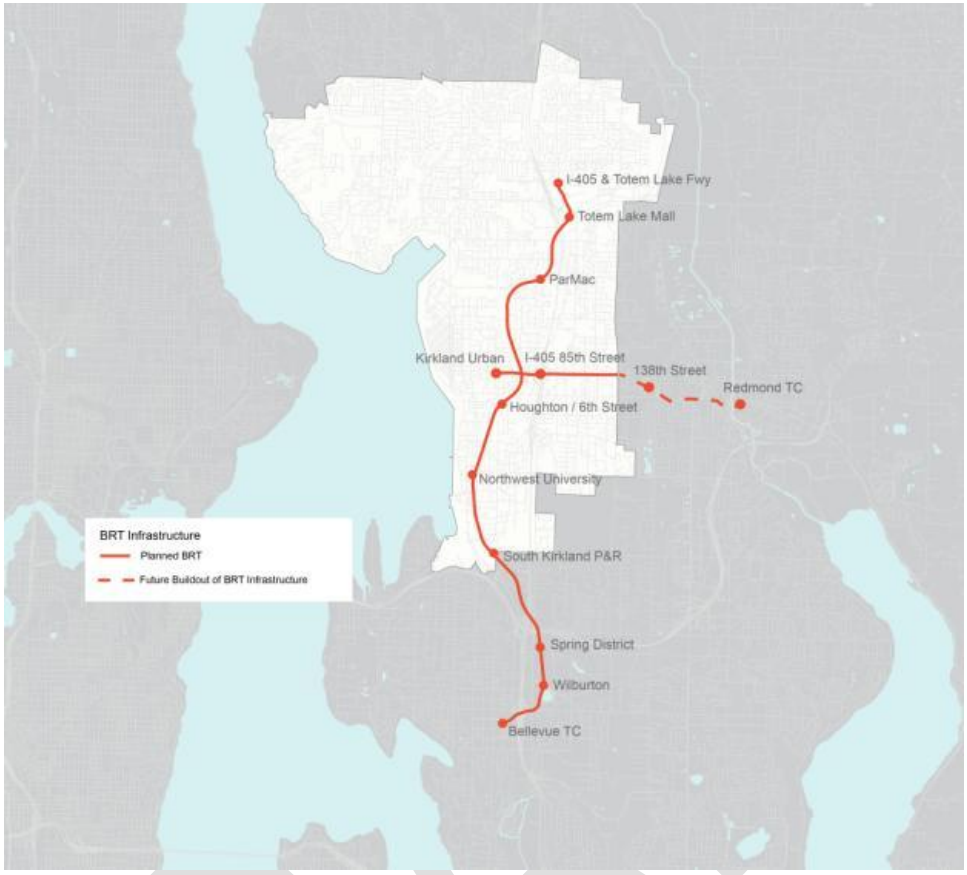


Figure 3-37: Approximate locations of BRT stations. Final station locations to be determined together with adjacent communities

Off the CKC, four full-featured BRT stations are proposed:

1. **Bellevue Transit Center**: Full-featured station, specially designed to fit into existing transit center facilities
2. **Downtown Kirkland**: Full-featured station .
3. **Totem Lake Mall**: Full-featured station in the vicinity of the Totem Lake Park and Mall
4. **Totem Lake/I-405 Freeway**: Full-featured station on the existing I-405 Freeway Station structure.

These station locations are initial concepts only. Final station count and locations would be determined based on a more detailed concept development.

3.5.3 Access

The general approach for the CKC BRT concept is to encourage walking and bicycling access, unlike other I-405 BRT proposals, which rely heavily on Park & Ride access. Bicycle parking and bike sharing stations

could be located at each of the CKC BRT stations, ensuring that the last mile from any station can be easily reached by bicycle.

Figure 3-38: Bike share stations integrated into BRT stations can help solve the "last mile" access problem. Source: Seattle Bike Blog

Further, the service plan for the CKC BRT has been designed to provide BRT access throughout many neighborhoods around Kirkland, mirroring the routes of several existing bus routes. Like many of the existing bus routes, the BRT routes will be accessed largely on foot. Park & Ride access will be available at the Kingsgate Park & Ride and South Kirkland Park & Ride. A program to minimize commuter Hide & Ride parking around stations in residential neighborhoods can be implemented if needed and are fairly straight forward to design.

3.5.4 Regional Transit Integration and Connections

As conceived, the CKC BRT concept not only adds to a connected and integrated transit network, it actually strengthens the exiting regional transit network by consolidating bus service throughout the greater Eastside into a high-quality spine. Transit riders from Bellevue, Redmond, Issaquah and the length of I-405 would all see improved connectivity to Kirkland as well as other parts of the region including Seattle.

In order to ensure the greatest regional connectivity, the CKC BRT concept was conceived to maximize connections to other high-capacity transit. These connections include:

- **East Link:** Connection to East Link would be possible at Wilburton Station and Bellevue Transit Center
- **I-405 BRT:** Connections would be possible at the Totem Lake Freeway Station and NE 85th Street
- **SR 520 Buses:** Connection to Seattle bound buses would be possible at the Montlake Freeway Station, Evergreen Point Freeway Station and Clyde Hill/Yarrow Point Freeway Station
- **Central Link:** Connection to light rail in Seattle would be possible either at University of Washington Station or Westlake Tunnel Station (and all other Downtown Transit Tunnel stations)
- **I-90 Corridor HCT:** Connections to BRT or LRT service in the I-90 corridor could be possible at South Kirkland Park & Ride, Wilburton Station, and Eastgate Park & Ride

3.6 Vehicles

BRT is a far cry from regular bus service, and "gold standard" BRT vehicles are a far cry from run-of-the-mill buses. The CKC BRT concept is intended to be a high-quality facility with comfortable, quiet, low or zero emission vehicles.

Express routes would likely need 60-foot articulated buses to meet ridership demand while other routes could potentially use standard 40-foot buses.

There are many options for stylized BRT vehicles. Las Vegas purchased 50 hybrid buses manufactured by Wright StreetCar for their Strip-Downtown Express BRT project. These buses are "designed to mimic trams" and have wheel covers and slanted noses.

Figure 3-39: Las Vegas SDX buses are Wright StreetCar hybrid buses

Nantes, France purchased 20 stylized natural gas-powered Mercedes-Benz Citaro G buses for their *Line 4* BRT.

Figure 3-40: Nantes, France uses natural gas-powered Mercedes-Benz BRT vehicles. Source: City of Nantes

In Rouen, France, the TEOR BRT operates a fleet of 28 low-emissions Euro 3 diesel Irisbus Citelis buses with a slanted nose, extra wide doors, and a sleek style.

Figure 3-41: Rouen operates a fleet of Irisbus low-emission diesel buses with wide doors and level boarding

Fully electric buses have the benefit of generating no local emissions and quite operations. King County Metro, a likely operator of many of the bus routes on the CKC BRT, continues to be on the forefront of efforts to introduce fully electric buses. Metro was one of the first transit agency in to the US to use hybrid-electric buses in the early 2000's and is currently has the largest fleet of hybrid-electric buses in the US. Additionally, Metro is currently testing Proterra electric buses in standard operations on several Eastside route.

As fully electric buses become more widely available, their prices will likely fall and the distances they can travel without recharging will increase. By the time the CKC BRT is ready to begin operation, it is highly likely that fully electric buses will be in widespread commercial use in the US, or else the problems of local air pollution and noise will have been addressed by hybrids or other technologies.

Another vehicle option is electric trolley buses which use quiet, fuel-efficient, pollution-free technology and are currently used by King County Metro. Metro has the 2nd largest trolley fleet in the US and is currently updating their entire fleet to an even quieter, low-floor trolley fleet.

More readily available today in North America are CNG/electric hybrids. These vehicles are a mature technology, already available from Buy-America compliant suppliers, with very low emissions, superior fuel efficiency and are extremely quiet. They cost, on average, around $800,000. Ultra-low sulfur diesel buses are somewhat noisier, but also have extremely low emissions and are more economical. Either could be considered for the CKC until full electric buses become more affordable and widely commercially available.

3.7 Intersections and Non-Motorized Crossings

As well as being a trail for commuting cyclists and cycling enthusiasts, the CKC is also heavily used by children and families for recreational purposes. Protecting the safety as well as the aesthetic experience

for these recreational users has been at the core of community concerns. The City of Kirkland places the highest priority on the safety and environmental quality of the CKC trail.

The City of Kirkland's recently-adopted Transportation Master Plan includes a "Vision Zero" safety goal. This goal aspires to eliminate all transportation-related fatalities and serious injuries on Kirkland's transportation system by the year 2035.[6] This Vision Zero goal provides a clear policy basis for how the CKC Trail and BRT concept should be designed.

In a September 2013 report, the Rails to Trails Conservancy found that "rails-with-trails are safe, common, and increasing in number" and that "There is a growing trend of rail-with-trail development alongside local and regional transit corridors. Fifteen percent of the active rails-with-trails identified in this study are located adjacent to mass transit corridors."[7] The report goes on to say that, "a well-designed pathway provides a safe travel alternative and reduces the incentive to trespass or use the tracks as a shortcut."

The CKC BRT concept fully embraces the dual nature of the corridor and anticipates maintain and adding a majority of the 32 existing or potential access points identified by the CKC Master Plan. Crossing points would be clearly marked as crosswalks and could be improved using tools such as enhanced lighting, rapid flashing beacons and safety measures.

[6] City of Kirkland Transportation Master Plan.
http://www.kirklandwa.gov/Assets/Boards+and+Commissions/Boards+and+Commissions+PDFs/Transportation+Commission/City+of+Kirkland+Transportation+Master+Plan.pdf
[7] http://www.railstotrails.org/resourcehandler.ashx?id=2982

Figure 42 - Existing and Proposed Trail Access Points

As conceived, separation between the trail and BRT vehicles could be provided by low-lying but thick vegetation, shrubbery or a vegetative swale. These solutions complement the character of the corridor while creating a physical barrier to separate pedestrians and cyclists safely from BRT vehicles.

Because of the small number of street crossings, the CKC BRT will experience limited intersection-related delays. Still, priority should be given to BRT on the CKC such a transit signal priority which would allow buses to pass through intersections with minimal delay. These treatments are used throughout the US and have been shown to improve transit speed and reliability without increasing congestion. In-fact, routing of buses on the CKC will likely reduce congestion on streets like 108th Ave NE, 6th Street and Market Street because fewer buses will not be stopping in the road, blocking cars every few blocks.

Where the CKC crosses surface streets, three types of crossing treatments are proposed:

1. *Underpass*: The CKC Trail and BRT will pass under the intersection
2. *Overpass*: The CKC Trail and BRT will pass over the intersection on a bridge
3. *At-grade with BRT signal priority*: The CKC Trail and BRT will remain at-grade but an advanced traffic signal will be installed to give priority to approaching BRT vehicles.

The following CKC crossings will require new treatments, proposed as follows:

1. **I-405 and 116th Avenue NE @ NE 6th Street, Bellevue**: *Overpass*
2. **NE 8th Street, Bellevue**: *Depends on alignment*
3. **NE 12th Street, Bellevue**: *Depends on alignment*
4. **Northup Way, Bellevue**: *Underpass*

5. **SR 520, Bellevue**: *Underpass*
6. **I-405 @ 115th Avenue NE, Bellevue**: *Underpass*
7. **108th Avenue NE, Kirkland**: *At grade with BRT signal priority*
8. **NE 52nd Street, Kirkland**: *At grade with BRT signal priority*
9. **NE 68th Street, Kirkland**: *Overpass*
10. **Kirkland Way, Kirkland**: *Overpass*
11. **6th Street, Kirkland**: *At grade with BRT signal priority*
12. **NE 85th Street, Kirkland**: *Underpass*[8]
13. **7th Avenue /NE 87th Street, Kirkland**: *At grade with BRT signal priority*
14. **12th Avenue /110th Avenue NE, Kirkland**: *At grade with BRT signal priority*
15. **NE 112th Street, Kirkland**: *At grade with BRT signal priority*
16. **NE 116th Street, Kirkland**: *Underpass*
17. **120th Avenue NE, Kirkland**: *At grade with BRT signal priority*
18. **I-405 @ Totem Lake, Kirkland:** *Underpass*
19. **NE 124th Street/Totem Lake Blvd, Kirkland:** *Overpass*

[8] Modifications required to allow for direct BRT access ramps from CKC to NE 85th Street

Chapter 4 – Service Concept

The CKC BRT concept includes the full suite of BRT elements including both capital investments as well as service investments. One of the main advantages of BRT is that its vehicles can travel on a mixture of facilities, including old freight corridors like the CKC, on surface streets, and on freeways. This allows BRT to pick up or drop off passengers at popular destinations.

Figure 4-1. Proposed Places for full BRT treatments

This service pattern avoids forcing all the passengers to transfer at a park & ride lot or a bus stop, which can take extra time and complciation. Instead, passengers could walk directly to a bus stop in their neighborhood for a bus that will eventually move onto the BRT-way. BRT vehicles can also easily pass one another at stations, making it possible to run express routes, passing less popular stops and reducing travel time between popular destinations.

Much of the bus-based transit in the region is designed around park & rides. The park & ride model, while beneficial at bringing more passengers to transit, also means building parking around stations

where land is valuable and adding to traffic congestion. Walking or biking is greener, healthier, and more in line with the goals adopted by the City Council.

BRT infrastructure is designed around a set of routes, to increase their speed and capacity. Unlike urban rail systems, where services often simply run up and down the rail infrastructure and stop at every station, designing a service plan with several routes, to give passengers the best possible experience, is at the heart of BRT system planning.

4.1 Existing and Future Travel Patterns

The CKC BRT service concept was designed to provide Kirkland residents and employees fast and reliable access to the places they want to go. To develop the service concept, analysis of current travel patterns and ridership data was first conducted. This analysis included mapping data and determine peak demand loads of existing routes. Routes were then designed to provide frequent, direct service between the major destinations.

4.1.1 Where do Kirkland residents want to go?

CKC BRT routes were designed first and foremost to serve and improve existing trips for Kirkland residents. Initially, existing trips will make up the majority of HCT trips as origins and destinations change slowly. The most popular transit trips for Kirkland residents today[9] are shown in the map below:

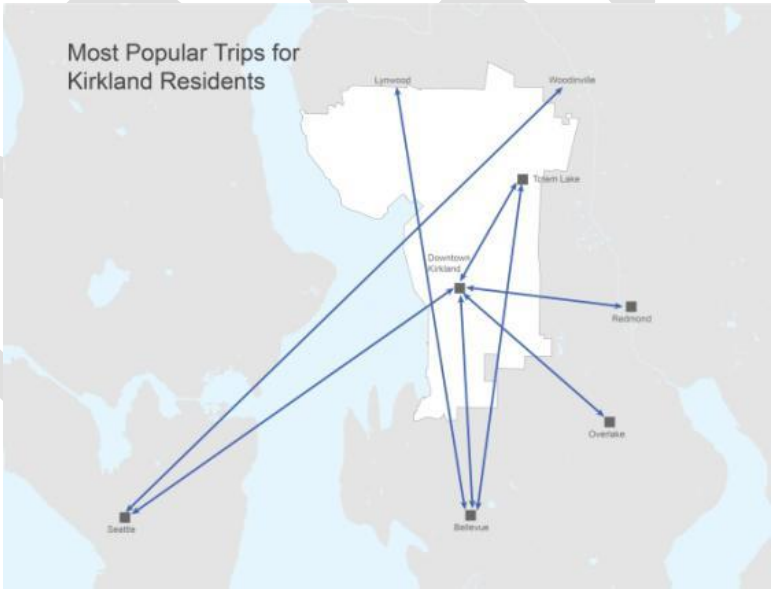


Figure 4-2: Most popular transit origins and destinations for Kirkland residents

[9] Determined based on existing bus routes and ridership

The majority of BRT users, in any system, come from pre-existing bus routes. Therefore, the design of the CKC BRT routes was based on the existing routing of King County Metro and Sound Transit bus routes through Kirkland. However, some modifications were made to take advantage of dedicated BRT-ways, to serve new developments and to create new transfer-free rides.

Figure 4-3: Existing map of transit routes in Kirkland

Today, there are about 23,800 bus trips taken in Kirkland every day. Roughly 72% of these trips, or about 17,100 trips, are carried seven bus routes as shown in the figure below.

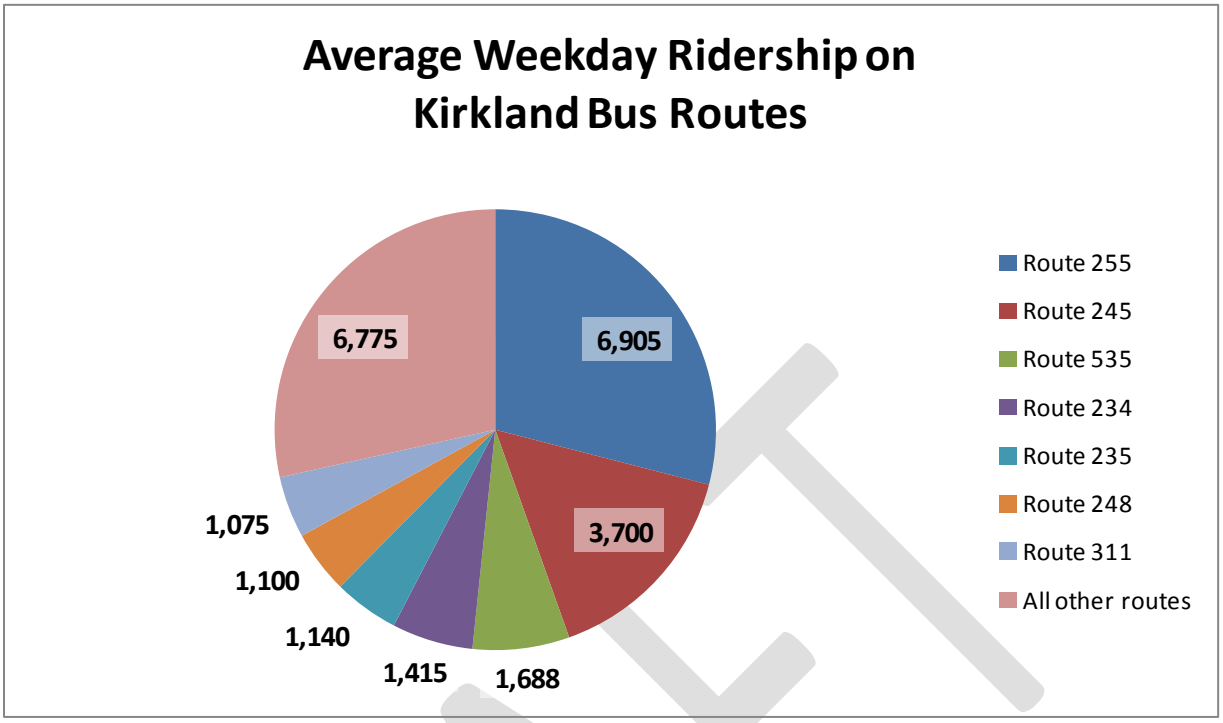


Figure 4-4: 72% of weekday trips on bus routes in Kirkland are divided among the top 7 routes

4.1.2 Where will future Kirkland residents want to go?

Downtown Kirkland has histroically been the densest part of the city and continues to densify today with some significant projects in the development pipeline such as Kirkland Urban. The 6th Street corridor is also becomeing a major high-tech employment corridor.

Figure 4-5: Kirkland Urban, planned development in downtown Kirkland

Totem Lake, the City's PSRC designated Regional Urban Growth Center, is currently undergoing major changes as well, with redvelopment of the Totem Lake Mall currently under way. Kirkland has completed the rezoning of a number of areas for additional growth, particularly in the ParMac area, where extensive new development is expected.

Figure 4-6. Planned redevelopment of Totem Lake Mall. The BRT station will be on Totem Lake Boulevard

These centers of growth are clustered along or near the CKC. Improved transit connections to Seattle, Bellevue, Redmond, Overlake, and other key residential and employment centers is key for the continued ecconomic growth of Kirkland. Access to transportation choices is becoming an ever important priority for employees as regional roads become more and more congested. Similiarly, improved regional transit service to Kirkland is key for maintaining the quality of life that Kirkland residents enjoy today. To this end, the CKC service plan was designed to serve, and reinforce connections to these growth centers.

4.2 BRT Service Concept

The following is a concept for how routes could operate on and around the CKC. This concept illustrates what could be done with BRT on the CKC but would ultimately have to be coordinated with King County Metro, Sound Transit, and the other surrounding communities.

The overall purpose of this service concept was to create a transit spine that runs north-south through Kirkland with frequent services and an express service overlay. Routes were developed because they serve the most popular destinations – both on and off the spine – for current and future residents of Kirkland.

The CKC service concept includes four routes:

- Orange Line: Woodinville/Bothell to Seattle (Express)

- Blue Line: Juanita to Seattle via Downtown Kirkland (Local)
- Green Line: Totem Lake to Bellevue Transit Center via Downtown Kirkland (Local)
- Gold Line: Issaquah to Seattle via Bellevue TC (Express)

A fifth BRT route would operate on the 85th Street BRT connector:

- Purple Line: Downtown Kirkland to Redmond TC (Local)

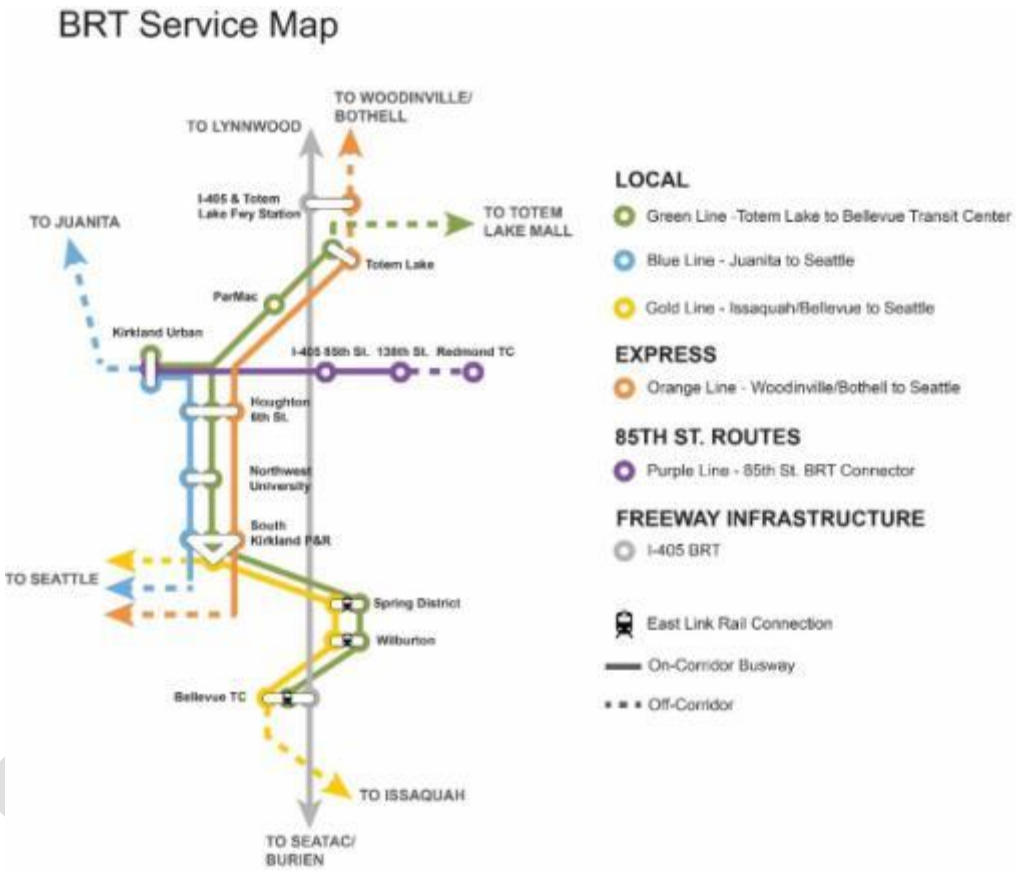


Figure 4-7: Full service map for BRT in Kirkland

These routes were largely based on travel patterns on the current bus system. For example, roughly 30,000 passengers used King County Metro and Sound Transit bus service to cross Lake Washington on SR 520 in 2014/2015. Therefore, 3 of the 5 routes identified in this service concept travel to and from Seattle via SR 520.

Existing bus routes were re-routed onto the CKC where it provided an equivalent or more direct connection between popular trip origins and destinations. Metro's draft Long Range Plan concept were also taken into consideration. Additionally, stop and routing decisions considered future developments planned in the City of Kirkland.

Like other major service restructure, if the CKC BRT concept is advanced, King County Metro, Sound Transit, and other agencies like the City of Kirkland would work together to redesign the transit network both on the CKC as well as off the CKC. The goal of the restructure would be to maximize benefits of the CKC BRT-way, improve access to this service while ensuring adequate service coverage.

Details of this service concept are provided by route in the following sections..

4.2.1 Orange Line - Woodinville/Bothell to Seattle (Express)

Figure 4-8: Orange Line route map

The Orange Line would be the quickest way for people in Totem Lake to reach Seattle. It would establish a new HCT link between Downtown Kirkland, Woodinville, and Bothell. It would also be a fast and reliable connection for Seattle-bound buses on I-405.

As envisioned this route begins at the Woodinville Park & Ride and would make a limited number of stops in Woodinville, then using SR 522 travel to I-405, stopping at the Brickyard Park & Ride before exiting I-405 at the Totem Lake Freeway Station. From here the route enters the BRT-way on Totem Lake Boulevard, and travels express to Seattle stopping at Houghton/6th Street and South Kirkland Park & Ride before entering the SR 520 HOV lanes. To reduce travel time this route would not stop at Downtown Kirkland and other intermediate stops along the CKC BRT-way.

4.2.2 Blue Line - Juanita to Seattle via Downtown Kirkland (Local)

Figure 4-9: Blue Line route map

The Blue Line would be the quickest way for most people in Kirkland to reach Seattle. It would connect Juanita to Downtown Kirkland via Market Street in mixed traffic. It joins the BRT-way in Downtown Kirkland, then follows the CKC BRT corridor, making all stops on the CKC while heading toward the South Kirkland Park & Ride. From there, it would join the SR 520 HOV lanes heading into Downtown Seattle.

4.2.3 Green Line - Totem Lake to Bellevue Transit Center via Downtown Kirkland (Local)

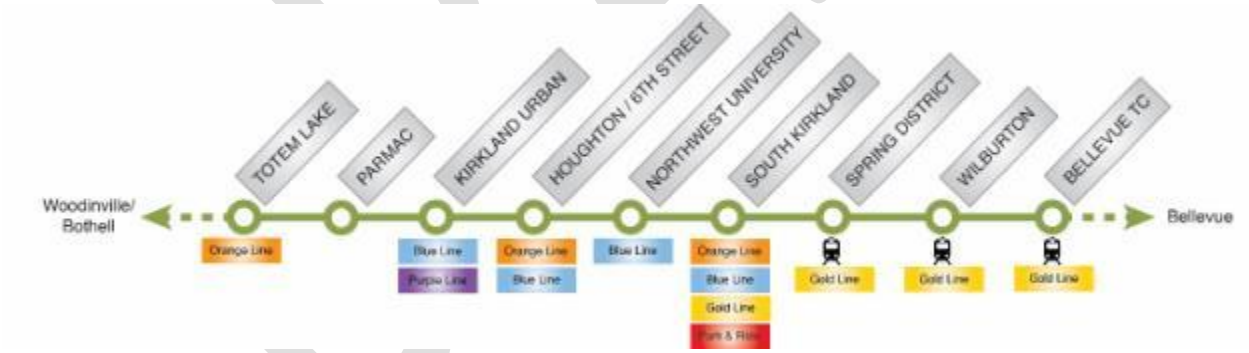


Figure 4-10: Green Line route map

The Green Line would provide backbone service along the entirety of the CKC BRT-way beginning at the Totem Lake Transit Center before joins the BRT-way on Totem Lake Boulevard near the Totem Lake Mall BRT station. From there it makes all local stops on the CKC/ERC to the Bellevue Transit Center, including at the new East Link stations at Spring District and Wilburton.

4.2.4 Gold Line - Issaquah to Seattle via Bellevue Transit Center (Express)

Figure 4-11: Gold Line route map

The Gold Line would provide a direct express connection between South Kirkland Park & Ride, Issaquah, Bellevue and Seattle. The concept for the Gold Line is mixed traffic operations from Issaquah following the route of the 271[10] as far as the Bellevue Transit Center. From there it could join the CKC BRT-way, stopping at Wilburton Station and Spring District. From there, it could stop at the South Kirkland Park & Ride and enter the SR 520 HOV lanes on its way to the University of Washington Link Station. Like all the proceeding routes, this route in particular would require consultation with a variety of stakeholders.

This would be the fastest route to the University of Washington for passengers transferring from I-405 BRT, local bus service and even East Link passengers heading to the University of Washington.

4.2.5 Purple Line – Downtown Kirkland to Downtown Redmond

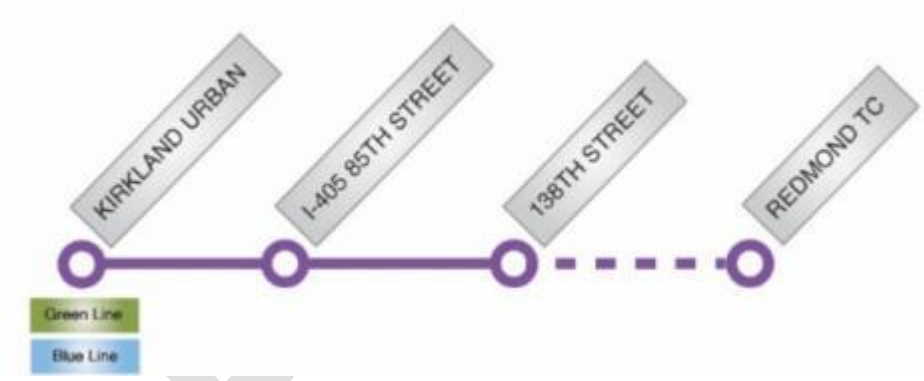


Figure 4-12: Purple Line route map

The Purple Line would provide a direct express link between downtown Kirkland and the Redmond Transit Center. It is the only route identified in the CKC BRT concept that does not use the CKC, instead using bus lanes and mixed traffic lanes of NE 85th Street. The route would start at Downtown Kirkland

[10] Metro is currently examining the routing for the 271 so it is possible that some changes could be made to the Gold Line concept.

stopping at, the I-405 BRT station at NE 85th Street, stations along NE 85th Street and ending and Redmond. This route would be useful for downtown Redmond riders trying to access I-405 BRT service to north King County and Snohomish County.

4.3 Service Frequency

Headways of 10 minutes or less means that passengers can show up at a bus stop at any time and in on average a bus will come within 5 minutes. This means passengers don't have to plan their trips around a schedule.

As is described by Jarrett Walker in his book "Human Transit," the freedom to be flexible is critical to public transit passengers and depends on high-frequency services.[11] For BRT services, maximum headway, or time between buses, should be 10 minutes. Routes with higher ridership should have shorter headways to avoid overcrowding. Based on projected ridership and 40-foot vehicles (capacity of 60 people) routes on the CKC BRT-way should come every 6 to 10 minutes during the peak period.

Table 4-1: Calculated peak headway per route, peak direction

BRT ROUTE	HEADWAY (min)
Orange	6
Blue	8
Green	10
Gold	8

The headways shown in this table are estimates and could be adjusted as demand grows. These estimates show that the CKC BRT concept has sufficient capacity to meet projected ridership demand.

On sections of the CKC where routes overlap, the combined headways of buses is less than any of the individual routes. Based on the identified headways in **Error! Reference source not found.**, from Totem Lake Mall to Downtown Kirkland, the average combined headway for the Orange and Green Lines would be four minutes in the peak direction. From Houghton/6th to the South Kirkland Park & Ride, where the Orange, Blue and Green Lines all run, the average headway would be three minutes per direction. From the South Kirkland Park & Ride to the Bellevue TC, where the Green and Gold Lines run, the average headway would be four minutes per direction.

[11] Jarrett Walker, *Human Transit: How Clearer Thinking about Public Transit Can Enrich Our Communities and Lives*," (Washington, DC: Island Press), Chapter 7.

Table 4-2: Composite headways on CKC sections where routes overlap

SECTION	HEADWAY (min)
Totem Lake to Kirkland Urban	4
Houghton/6th to South Kirkland P&R	3
South Kirkland P&R to Bellevue TC	4

4.4 Value and Limitation of I-405 BRT

I-405 BRT as described in the Draft Sound Transit 3 templates, would provide long-distance regional express bus service throughout Snohomish County and the Eastside using the existing HOT lanes where available. This route would largely be an upgrade of existing ST Express Bus Service with some enhancement to existing stations and park & ride lots. Several new stations would also be built including, most notably, a station in "Central Kirkland," in the vicinity of NE 85th Street. I-405 BRT provides additional transit service on the existing I-405 HOT lanes and therefore, is likely to benefit those passengers currently traveling on I-405 bus services between Eastside destinations.

There is only one service proposed for I-405 BRT, traveling between Lynnwood, Bellevue, and Renton along I-405, and making ten stops. Two of these will be in Kirkland: the existing in-line station at Totem Lake (NE 128th Street) and Central Kirkland (NE 85th Street). With two stations in Kirkland, I-405 BRT will have some value to people making trips between Eastside destinations but provides only limited utility for trips within Kirkland.

Stations will be in the middle of the freeway. Few residents of Kirkland live within walking distance of these stations, especially compared to stops on the CKC. Pedestrian access to these two stations are not particularly inviting and providing access to freeway stops in general is often difficult. It is also difficult to construct pleasant stations in the environment of the freeway.

I-405 BRT, as defined in the Sound Transit 3 templates, would primarily consist of expanded park & ride capacity, including at Kingsgate Park & Ride. This means that while passengers might drive to park & ride lots to access I-405 BRT, with a few exceptions such as Downtown Bellevue, passengers will require a transfer to reach their final destination.

The draft I-405 BRT template also includes curbside bus lanes along NE 85th Street which would provide some transit access to I-405 BRT but passengers using this service would have to take up to three buses to get from origin to destination: one bus from Downtown Kirkland to the I-405 BRT station, a second bus on I-405 BRT, and a third bus to reach their destination. Additionally, no bus service is included in the Draft ST 3 system plan along NE 85th Street.

As proposed by Sound Transit, I-405 BRT does not serve Seattle-bound trips with a one-seat ride. , there is no direct HOV connection between I-405 and SR 520. As such, Seattle-bound buses on I-405 would be stuck in the worsening congestion at the I-405/SR 520 interchange.

The CKC BRT, by comparison, with nine stops within walking distance of over 25,000 Kirkland residents and 1,800 businesses, serves trips within Kirkland. People could walk or bike to the CKC BRT because access would be nearby, easy, and pleasant.

The CKC BRT also better serves Kirkland residents headed into Seattle. With a direct connection to and from the east via the SR 520 HOV lane, Seattle-bound customers could make the trip with a one-seat ride, largely free of traffic congestion.

Chapter 5 – System Performance

The value of BRT on the CKC can be measured using a variety of metrics. BRT is at its best when it has been designed to reduce travel times for existing bus passengers. The more travel time that can be reduced through the full toolbox of BRT elements, the more successful the system is. Evidence from BRT systems around the world has shown that decreased travel times translate directly into higher ridership. As part of the analysis of BRT on the CKC, a travel time savings analysis and a passenger ridership forecast analysis were performed. The results of this analysis are described below.

5.1 Travel Time & Reliability Estimate

CKC BRT could reduce time to regional destinations for many Kirkland residents. Based on this analysis travel time savings would be realized from the first day of service and grow as delays on freeways and Kirkland's surface streets grow.

5.1.1 Assumptions and Methodology

A travel time savings analysis was conducted for trips between popular destinations in and around Kirkland. Existing AM peak hour (7am – 8am) travel times between popular destinations were determined based on the fastest current bus routing and the associated bus schedules, including waiting times for transfers between routes. BRT travel times were calculated from the same origins and destinations but with a different (usually shorter) route length and an assumed congestion-free trip, where the BRT-way, or BRT lanes, are proposed.

Where BRT vehicles are expected to travel in mixed traffic, current bus travel times were used. BRT boarding times were assumed to be 1.2 seconds per boarding passenger, assuming off-board fare collection and level boarding, in accordance with experience from other BRT systems with these features. This number was divided by 3, to account for the three doors on the BRT vehicle. A fixed dwell time (the time every BRT vehicle takes to arrive and depart from stations, regardless of passengers boarding) of 14 seconds was used for every station. Finally, waiting times for passengers were based on one-half (i.e., average –assuming uniform arrivals of passengers) of the existing and proposed route-by-route frequencies.

5.1.2 Travel Time Savings Summary

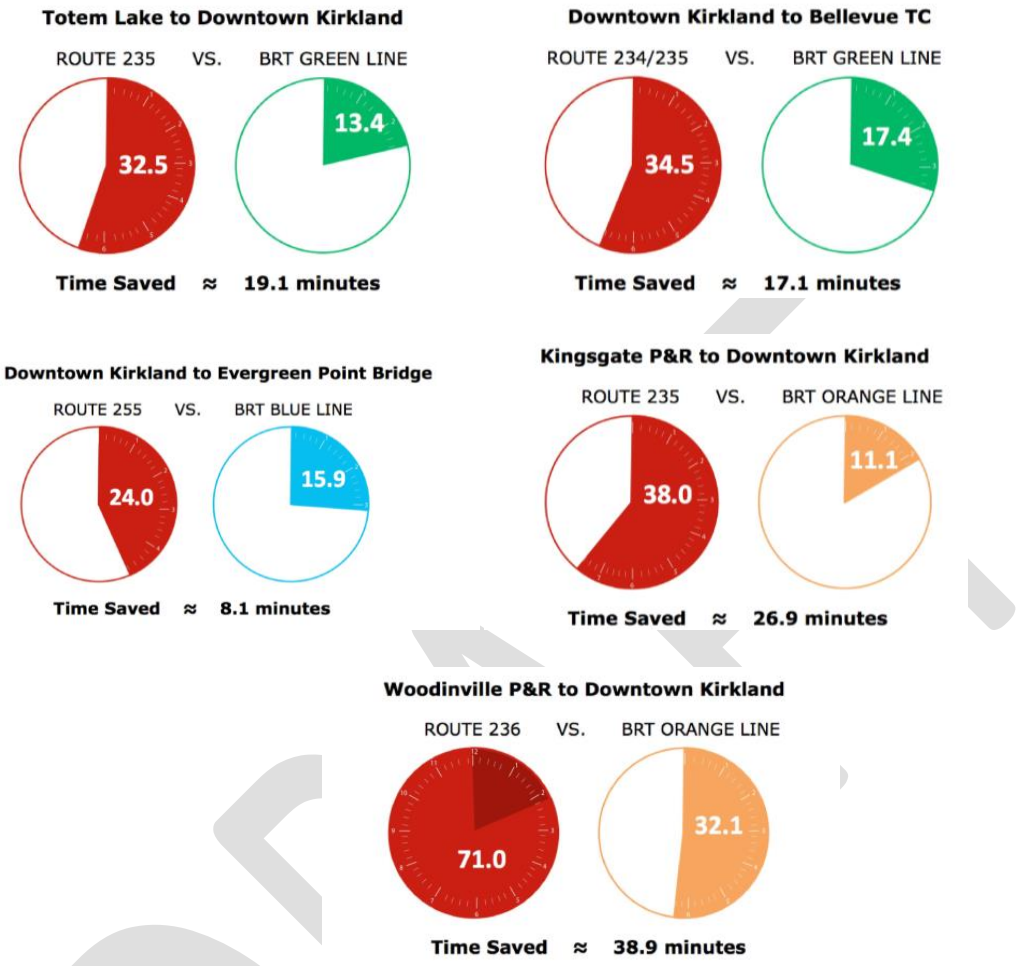


Figure 5-1: Travel time savings for popular origins and destinations in and around Kirkland in the AM peak hour (7am - 8am). Existing routing vs. BRT

Table 5-1 below compares existing peak hour (7am – 8am) travel times between popular destinations using current bus routes and the CKC BRT routes. All travel time estimates are calculated based on current speeds. Over time, surface street bus speeds will slow, while BRT on separate ways will stay the same, so the savings from BRT will grow.

Table 5-1: Travel time savings for popular trips made between 7am – 8am (current year)[12]

FROM	TO	LOCAL/EXPRESS	BUS (MINUTES)	BRT (MINUTES)	MINUTES SAVED
Totem Lake	Downtown Kirkland	Local	32.5	13.4	**19.1**
Downtown Kirkland	Bellevue TC	Local	34.5	17.4	**17.1**
Downtown Kirkland	Evergreen Pt (to Seattle)	Local	24.0	15.9	**8.1**
Kingsgate P&R	Downtown Kirkland	Express	38.0	11.1	**26.9**
Woodinville P&R	Downtown Kirkland	Express	71.0	32.1	**38.9**
Kingsgate P&R	Evergreen Pt (to Seattle)	Express	22.5	21.3	**1.2**
Woodinville P&R	Evergreen Pt (to Seattle)	Express	44.5	42.3	**2.2**

These benefits are achieved for a number of reasons of roughly equal importance:

1. **Less congestion:** The BRT is not subject to traffic congestion because it is fully separated from traffic.
2. **Directness of routes:** Because the CKC creates a new direct link across Kirkland, most of the BRT routes are more direct than the current bus routes.
3. **Fewer stops:** The BRT stops less frequently than the current bus routes so there is less dwell time at stations.
4. **Faster boarding times:** Off-board fare collection and at-level boarding features ensure that the boarding process is swift.

5.1.3 Travel Time Savings Details

Totem Lake to Downtown Kirkland

The CKC BRT will create the first quick and convenient connection between Kirkland's two most important growth centers: Downtown Kirkland and Totem Lake. Travel times between Totem Lake and Downtown Kirkland are estimated to be about 13 minutes on the BRT Green Line during the peak hour. Today, the same trip takes about 32 minutes on the 235 during the peak hour, a 19-minute time savings and a 59% improvement. Not only is this trip significantly quicker than the current bus route, it is also competitive with car travel and would be much more reliable.

Downtown Kirkland to Bellevue

The connection between Downtown Kirkland and Bellevue is forecasted to be much improved. The trip currently takes 35 minutes on average during the peak hour (via the 234 or the 235), while on the new BRT Green Line the trip is estimated to take 17 minutes: a 17-minute reduction and a 49% improvement.

[12] Travel time savings based on station to station travel times, as derived from King County Metro 2015 bus ridership data. Includes average waiting time, calculated as the existing peak hour bus headway divided by 2. Headways for BRT range from 6-10 minutes, depending on the route.

Downtown Kirkland to Seattle

Trips between Downtown Kirkland and Seattle are expected to see significant travel time reduction and improved reliability. Passengers riding the Blue Line from Downtown Kirkland to the Evergreen Point Bridge (and onwards to Seattle) are expected to see an 8 minute travel time savings, with this benefit increasing substantially as congestion worsens. This is due, in part, to the direct access to the SR 520 HOV lane.

Kingsgate Park & Ride to Downtown Kirkland

Passengers from the Kingsgate Park & Ride or the Totem Lake Freeway Station on I-405 BRT will have an even faster connection to Downtown Kirkland via the Orange Line. Estimates show that passengers will be able to make the trip in only 11 minutes, compared to 38 minutes during the peak hour today, a 27-minute savings and a 71% improvement.

Woodinville to Downtown Kirkland

Traveling by transit between Downtown Kirkland and other nearby cities will also become much quicker. Passengers traveling from the Woodinville Park & Ride to Downtown Kirkland would be able to travel to Houghton and 6th Station near the Google Campus, using the Orange Line and walk or transfer to get to Downtown Kirkland. Their travel time will drop from 71 minutes during the peak hour to 32 minutes, a 38.9 minute savings and a 55% reduction.[13]

Kirkland to Redmond

Passengers travelling between Kirkland and Redmond will also see significant time savings. The Route 248 takes about 15 minutes during the peak hour and only comes every 30 minutes. The new Purple Line BRT connection is envisioned to run on 10 minute headways and will take about 11 minutes[14], saving about 14 minutes.

5.1.4 Reliability

Bus systems have a poor reputation with respect to schedule reliability. This reputation is, all too often, apt. The more buses are stuck in traffic, or are subject to variability in the boarding time of passengers, the more likely they are to fall behind schedule.

BRT systems are designed to minimize factors that make transit unreliable. The following elements of the CKC BRT will provide much greater reliability in the BRT system:

[13] Note that the travel time savings from Woodinville to Seattle is much lower than from Woodinville to Downtown Kirkland, due to the existence of a single bus route from Woodinville to Seattle with higher frequency. To get to Downtown Kirkland from Woodinville, passengers must either take two bus routes or must take the much lower frequency – and much slower – 236.

[14] A more precise estimate cannot be made until further design discussions are held with the City of Redmond.

1. **BRT-way:** By providing BRT vehicles with their own dedicated right-of-way, as is proposed on the CKC BRT concept, as well as on some extensions, they will less often be subject to the variability of traffic congestion.
2. **Off-board fare collection:** By handling fare collection at the stations, the time BRT vehicles spend stopped at stations will be reduced and made more consistent. This is because the amount of time each passenger spends paying their fair can vary and this variability adds up. The number of passengers boarding also varies and by reducing boarding times, the total variability also decreases.
3. **Level boarding:** By providing a level platform from which to board, passengers who have a harder time boarding or are disabled, can board much more easily. This, once again, reduce the variability of boarding times which will result in much greater reliability for the BRT system.
4. **Intersections:** Improvements to all intersections along the CKC are identified in the CKC BRT concept, reducing or eliminating delay experienced by BRT vehicles passing through the intersections.

5.2 Ridership Forecast

The previous section estimated how much time potential BRT customers will save. This section discusses how many passengers are forecasted to use the CKC BRT, both in opening year and in the future.

Conservative estimates, using existing ridership data, indicated that the CKC BRT concept could attract roughly 15,500 daily passengers if it opened in 2018. Due to projected growth in Kirkland and the region, ridership on CKC BRT would be expected to grow to 25,500 daily passengers by 2030. An estimated 2,500 daily passengers would be expected to use the BRT Connector on NE 85th Street in 2018, growing to an estimated 4,000 passengers by 2030.

5.2.1 Assumptions and Methodology

Ridership forecasts were developed at the planning level and are based on existing Metro bus ridership data. Ridership demand on existing bus routes serving similar trip origins and destinations on the BRT routes was assumed to transfer to the BRT routes when the travel time was shorter. The following assumptions were made by route to form the basis of the ridership forecast:

- **Route 255**: Most passengers north of NE 124th Street would use the Orange Line and most passengers south of NE 124th Street would use the Blue Line.
- **Route 245**: Most passengers would use the Purple Line on NE 85th Street.
- **Route 535:** This route would be replaced by the proposed I-405 BRT service.
- **Route 234:** Most passengers north of Downtown Kirkland would use the Blue Line and most passengers south of Downtown Kirkland would use the Green Line.
- **Route 235:** It is a “U” shaped route, and does not take people going directly from Totem Lake to Bellevue, as these passengers have faster options with I-405 express services.
- **Route 248:** Most people will use the Purple Line on NE 85th Street.

- **Route 311:** Most passengers would use the Orange Line.

Stops eliminated by the BRT routes that were far from proposed BRT stations were not added to the projected demand. Once the above assumptions were made, an increase of 20% was assumed for mode shift based on the attractiveness of the BRT relative to driving. This a conservative estimate in line with existing mode shift data in the US which has shown an average 20% increase of existing ridership for BRT routes in the early years of service (ridership on two of Metro's RapidRide corridors, which include only some of the BRT elements described here, is reported to have grown up to 50%)[15]. An additional 3.3% per year growth factor was added as a conservative projection estimate.[16] However, this growth was distributed according to the City's growth plans (e.g., Totem Lake and ParMac will likely receive a higher proportion of the growth than NE 55th Street).

5.2.2 Forecast by Route

Broken down by route, the estimated forecasted daily ridership on the CKC BRT is shown in the table below. A separate column for the Purple Line is included at the end since the Purple Line does not operate on the CKC but is still an important piece of the network.

Table 5-2: Estimated daily ridership on the CKC BRT routes plus the NE 85th Street Purple Line.[17]

YEAR	ORANGE	BLUE	GREEN	GOLD	CKC TOTAL	PURPLE
2018	3,500	5,000	2,000	5,000	15,500	2,500
2030	5,500	8,500	3,000	8,500	25,500	4,000

Another way of depicting the route by route ridership is in a pie chart which provides a better picture of the share of each route to the total CKC ridership.

[15] King County Metro RapidRide Performance Evaluation Report, 2014.
[16] A 3.3% annual growth factor was used by Sound Transit in "I-405 South Corridor Bus Rapid Transit Pre-Design", June 16, 2005.
[17] Ridership projections used King County Metro boarding and alighting data as a basis with some proportion shifting to nearby BRT stations. Station by station ridership estimates were then increased by conservative expectations about modal shift from other similar projects around the US, and then by standard growth factors to Year 2030.

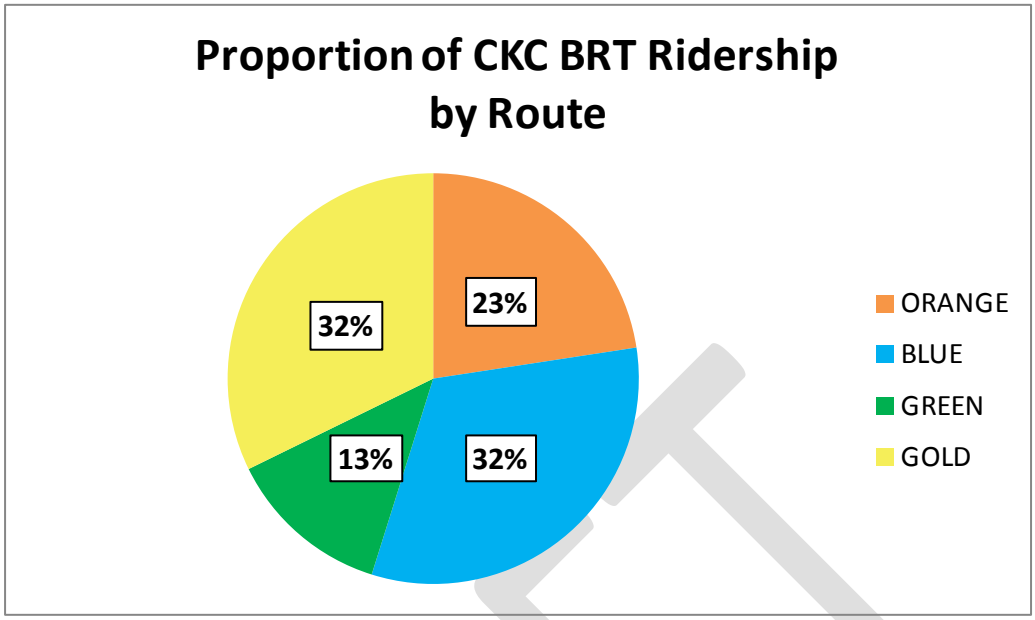


Figure 5-2: Proportion of CKC BRT Ridership by Route:

This pie chart demonstrates that the BRT route between Totem Lake, Downtown Kirkland and Bellevue, which Sound Transit assumed in its ST3 BRT and LRT template for the CKC, only represents 13% of the overall ridership along the corridor. The Blue, Gold, and Orange Lines which all go into Seattle make up a much larger proportion of the total ridership market, yet none of the concepts advanced by Sound Transit as part of the Draft ST3 package improve travel for these markets.[18]

5.2.3 Forecast by Segment and Station

Ridership data can be depicted in another way for planning purposes. Transit ridership on all of the routes travel through Kirkland can be displayed in terms of the peak number of passengers (load) traveling between stations during AM peak hour (7am – 8am). This method allows planners to understand where the largest passenger demands are, and how, the system can handle it.

The image below shows ridership loads for all routes put together between stations. The line that is colored in dark blue indicates demand on the CKC and the line colored in orange indicates demand off the CKC but related to the CKC BRT routes.

[18] Because of its large share of total trips, more analysis on the Gold Line would be useful, pending further conversations with Bellevue and Issaquah, the primary beneficiaries of the Gold Line.

Figure 5-3: Projected 2030 AM inbound peak hour (7am – 8am) loads, CKC BRT

This image shows that combined, the CKC would experience the heaviest demand in the morning at the approach to the South Kirkland Park & Ride. This demand would reach about 1,100 passengers over the course of the 7am – 8am hour. These volumes can be handled by BRT and demonstrate the need for HCT on the CKC.

The estimated AM peak hour inbound boarding and alighting numbers per station in 2030 are shown in **Error! Reference source not found.** below.[19] (Graphic to be developed) Boarding and alighting in opening year would show lower at ParMac (where there is currently limited development), Totem Lake, Downtown Kirkland, and Houghton/6th Street.

[19] Because inbound, for the purposes of this analysis, is southbound, note that all passengers at Bellevue are alighting. In the PM peak, all Bellevue passengers would be boarding.

5.2.4 Comparison to Other BRT Systems

Viewing the CKC BRT in the context of other BRT systems around the country, the projected opening year ridership of 15,500 falls in the middle range.

Table 5-3: average daily weekday ridership for BRT systems around the country[20]

BRT SYSTEM	AVERAGE DAILY WEEKDAY RIDERSHIP
Pittsburgh MLK, Jr. East Busway	28,000
Los Angeles Orange Line	25,000
Las Vegas SDX	16,700
Cleveland HealthLine	15,800
Kirkland CKC BRT (estimated)	**15,500**
CTfastrak	14,000
Eugene EmX	10,000
San Bernardino sbX	2,300

Based on ridership forecasts, CKC BRT on the whole would be roughly on par with the Las Vegas SDX, Cleveland's HealthLine, and CTfastrak systems, and would outperform Eugene's Emerald Express (EmX) and San Bernardino's sbX BRT. All of these system are considered successful and have received awards and which are experiencing consistent ridership growth. The relatively high ridership projections for the CKC BRT indicate that this project is sorely needed and that if built it will be a key investment that meet growing transportation needs.

5.3 Cost Estimate

To follow in final version

[20] Pittsburg MLK, Jr. East Busway ridership from http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp90v1_cs/Pittsburgh.pdf

LA Orange Line ridership from https://www.metro.net/news/ridership-statistics/
Las Vegas SDX, Cleveland HealthLine, and Eugene EmX ridership from https://www.itdp.org/wp-content/uploads/2013/11/More-Development-For-Your-Transit-Dollar_ITDP.pdf, p. 25

CTfastrak ridership from http://blog.tstc.org/2015/05/07/ctfastrak-ridership-exceeds-projections/

San Bernardino sbX ridership from http://www.pe.com/articles/sbx-771011-san-bernardino.html

Chapter 6 – City Outreach and Desires

6.1 Community Concerns

The City of Kirkland has conducted a broad program of public outreach to gather comments concerning Sound Transit 3 in general, and BRT on the CKC more specifically. Sound Transit staff have helped to support this effort and presented at the larger of these meetings. Information was distributed in a number of formats. The following is a summary of such meetings for the period October through February.

Meeting	Location	Date/time
Kirkland Business Round Table	Kirkland	October 14, 7:30 am
Chamber of Commerce: Public Policy Committee	Kirkland	October 19, 12:45 pm
Transportation Commission	City Hall	October 28, 6:00 pm
City Council Meeting: Special Presentation "Transit options on the CKC Update"	City Hall	November 4, 7:30 pm
Moss Bay Neighborhood Meeting	Heritage Hall	November 16, 7:00 pm
Highlands Neighborhood Meeting	Maintenance Center	November 18, 7:00 pm
Keeping Kirkland Moving Community Open House	Kirkland Performance Center	November 19, 6:30 pm
Kirklnad Alliance of Neighborhoods	Heritage Hall	November 23, 7:00 pm
CKC Brown Bag	Council Chambers	November 30, noon
Norkirk Neighborhood Meeting	Heritage Hall	December 2, 7:00 pm
Youth Council	City Hall	December 3, 4:00 pm
Totem Lake Conversations	Café Veloce	December 7, noon
Transportation Commission	City Hall	December 9, 6 pm
ST3 Presentation to Park Board	City Hall	December 9, 6 pm
Chamber of Commerce Executive Board	Arete	December 14, noon
Houghton Community Council	City Hall	December 14, 6pm
Eastside Transportation Association	Master Builder's office	December 16, 8:00 am
City Council Meeting	City Hall	January 5, 7:30 pm

Public Meeting	Lake Washington Institute of Technology	January 11, 6:00 pm
South Rose Hill- Bridle Trails Neighborhood Meeting	LW Methodist Church	January 12, 7:00 pm
Joint Meeting: Planning Commission, Transportation Commission & Park Board	City Hall	January 14, 6:00 pm
Special Transportation Commission Meeting	City Hall – Rose Hill Room	January 14, 7:15 pm
City Council Meeting	City Hall	January 19, 7:30 pm
Market Neighborhood Meeting	Heritage Hall	January 20
Everest Neighborhood Meeting		January 26
City Council Meeting	City Hall	February 2
City Council Meeting	City Hall	February 16
Transportation Commission	City Hall- Peter Kirk Room	February 24

Based on these outreach efforts the following community concerns surfaced. Some of these concerns are directly addressed in this document, others require more detailed planning and design, and others are policy decisions that must be made by the city.

1. **Safety for trail users.** The proximity of trail users and transit vehicles and safety concerns about crossing HCT to access the corridor.

2. **Accessing the corridor**. There is a perception that HCT will form a barrier in the community and prohibit crossings in many places where they now exist.

3. **Impacts to natural environment**. Concerns have been raised about environmental impacts to wetlands, trees, and views. These concerns have raised questions about where (laterally) on the corridor HCT and the trail will be located.

4. **Need for a trail to remain**. There is a worry in the community that if HCT is built on the CKC, there will not be a trail or, the trail will be inadequate to meet community needs.

5. **Other places for transit.** Because of its perceived negative impacts on the trail, some community members are suggesting that transit should be located somewhere else (such as on I-405) and believe that other locations could be equally effective for transit.

6. **Negative impacts of transit vehicles.** Visual and noise impacts of transit vehicles.

7. **Frequency of buses.** Concern that bus frequencies will exacerbate concerns 1, 5 and 6.

8. **Ability to fit on the corridor.** There is a perception that the corridor is not wide enough to support proper development of a trail and HCT together, or that there are parts of the corridor where width is not adequate. (See item 3)

9. **Commitment from Sound Transit.** There is an overarching concern from community members – even those with different viewpoints about HCT on the CKC – that Sound Transit may construct the corridor in a way that does not take Kirkland's interests into account. Some of those who have said they oppose HCT on the CKC have said that they would support it if there were a "legally binding" way to obtain assurance that the CKC would be built out according to the CKC Master Plan vision.

10. **Parking impacts.** Community members have expressed the need for added parking areas for corridor access and failure to adequately plan for this will cause impacts from parking in neighborhoods.

11. **Property values.** Some people who live along the corridor are concerned that adding HCT will decrease property values.

12. **CKC transit will be for "others."** The concern here is that BRT on the CKC may serve routes that carry people who are passing through Kirkland, impacting the corridor without direct benefits to residents of Kirkland.

13. **Construction impacts.** Concern that during construction, the entire trail or portions of the trail will be closed for long periods of time.

6.2 City Priorities

The City of Kirkland has established a set of objectives related to the CKC Trail with BRT in order to ensure a high-quality, high-functioning BRT while also maintaining a first-class trail.

In a January 20, 2016 letter to Sound Transit, the City identified seven themes that must be met for BRT on the CKC:

1. *Projects serving Kirkland must deliver capital and service components that significantly advance the structure of transit service in Kirkland. Fulfilling the regional vision of transit on the ERC in Kirkland and Bellevue is key to this objective.*
2. *Any transit on the CKC should address the community's concerns about noise, safety, visual impacts, and environmental impacts.*
3. *Any project constructing High Capacity Transit (HCT on the CKC should include design and construction of a trail that implements the CKC Master Plan vision for the main trail.*
4. *Within the bounds of any existing easements, HCT on the CKC must generally be to the east of the centerline of the corridor unless a different alignment is needed to preserve the natural features of the corridor that enhance the trail experience. HCT needs to be on the edges of the CKC to ensure the remaining width is sufficient to fulfill the CKC Master Plan vision.*

5. *Accessibility across the corridor should be preserved. Numerous access points and safe crossings, in addition to those at intersections, should be provided in keeping with the CKC Master Plan vision.*
6. *Only vehicles that are quiet and have zero or near-zero emissions, such as electric vehicles, should operate on the CKC.*
7. *The City of Kirkland will work to mitigate any parking impacts from station locations.*[21]

[21] Kirkland City Council Letter to Sound Transit Board of Directors, January 20, 2016.