



## MEMORANDUM

**To: Kathy Brown, David Godfrey – City of Kirkland**  
**From: Annie Weinstock, Walter Hook – BRT Planning International**  
**Re: Kirkland response to Sound Transit 3 Templates**  
**Date: January 22, 2016**

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### Summary and Main Points

The following is a summary of BRTPlan's main recommendations to the City of Kirkland for inclusion in its letter to Sound Transit (ST).

1. **Ridership on E-06: BRT on ERC from Kirkland to Bellevue is underestimated** – The E-06 template included a ridership estimate of 2,500 – 3,500 daily passengers in 2040, a low figure compared to the other templates. BRTPlan's analysis on the same corridor estimated approximately 34,400 daily passengers in 2040.

The main reasons for this divergence:

- E-06 does not assume service integration with King County Metro on the CKC, which, based on BRTPlan's ridership estimates, represented a vast majority of the ridership – nearly 30,000 of the 34,400 riders forecasted.
- E-06 under-counts trips within Kirkland, and the ridership benefits of stations closer to homes, jobs, and key transfer points, due to the limitations of a model designed for regional rather than municipal-level analysis. This accounts for the remainder of the difference, or about 1,300 trips.

There are three elements in E-06 which the City of Kirkland could ask ST to modify in the modeling which will increase the ridership estimate:

- a. **Service Plan: *BRTPlan recommends that the City of Kirkland ask Sound Transit to model the ridership on E-06 assuming not only the service offered by Sound Transit but also any services which King County Metro indicates it is willing to operate on the CKC.***

Routes (and their stopping patterns) under consideration, as discussed with King County Metro Transit (KCM), are shown below:

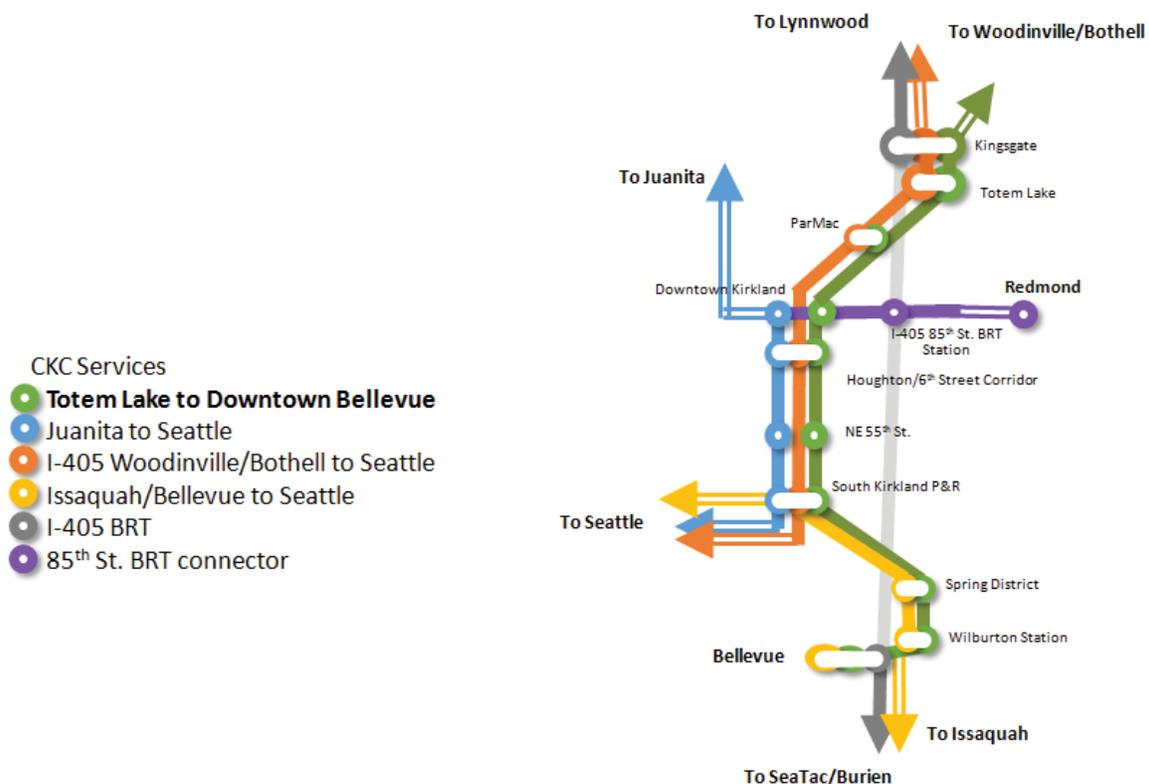


Figure 1: Initial service plan concept for CKC/ERC BRT + NE 85th St & I-405

- b. **Routing is longer and median-lanes are preferred in Downtown Kirkland and Totem Lake:** The service included in E-06 is routed to the Kirkland TC on 3<sup>rd</sup> Street rather than to Park Place/Kirkland Urban on 6<sup>th</sup> Street, adding approximately four minutes of travel time to the route. Further, the E-06 template assumes curbside bus lanes in Downtown Kirkland which incur an additional disbenefit in the Sound Transit ridership model. Additionally, in Totem Lake, ST assumes the route connects to the Totem Lake Transit Center, exposing it to mixed traffic congestion. ***BRTPlan recommends that the City of Kirkland ask Sound Transit to model the Totem Lake to Bellevue service as stopping only at Park Place in Downtown Kirkland and not stopping at the Totem Lake Transit Center, but operating in full BRT infrastructure both in Downtown Kirkland and between Kingsgate Park and Ride and Totem Lake Mall.***
- c. **Frequency for BRT is lower than for LRT:** The E-06 template assumes a frequency of 10 minutes during the peak period. The E-03-SegA (LRT from Totem Lake to Wilburton) template assumes peak headways of 7.5 minutes. This was a

‘policy decision’ according to ST. ***BRTPlan recommends that the City of Kirkland ask Sound Transit to reduce the peak headway in the model for E-06 to 7.5 minutes to remove this modal bias.***

2. **Costing in E-06** – The E-06 template estimates the costs of BRT on the CKC/ERC at \$747 million, approximately \$74.7 million per mile, making it one of the most expensive BRT projects in the country. The template has overestimated costs in the following ways:
  - a. **Bus costs:** The E-06 template costs each bus at \$1.8 million. This is nearly double what 60-ft BRT-style low emissions bus cost in the US and almost triple what 40-ft BRT-style low emissions buses cost in the US. ***BRTPlan recommends that the City of Kirkland ask Sound Transit to reduce the costs of buses to \$800,000.***
  - b. **Land acquisition:** The E-06 template includes a cost of \$84 million for land acquisition. Beyond a small shared cost between projects for a bus maintenance base, there should be no land acquisition in this project. ST indicated that they had assumed side stations directly across from one another which is more land intensive than center stations or offset stations. ***BRTPlan recommends that the City of Kirkland ask Sound Transit to eliminate those land acquisition costs unrelated to the shared bus maintenance base.***
  - c. **Station costs:** While there is no breakdown in the template for station costs, ST has indicated that they have costed for side stations rather than center stations. This doubles the cost of stations. ***BRTPlan recommends that the City of Kirkland ask Sound Transit to cost one center station at each stop rather than two side stations.***

### 3. Comments on the E-02 templates that affect Kirkland

Overall, E-02 brings few benefits to Kirkland in either the lower or intensive capital alternative.

The City of Kirkland should ask ST to combine E-02c1 (Kirkland-NE 85<sup>th</sup> Street BRT Inline Station) and E-02c2 (Kirkland-NE 85<sup>th</sup> Street Bus-Only Lanes) into a single proposal and modeling the benefits and costs together.

Kirkland should ask that demand on both NE 85<sup>th</sup> Street and at the NE 85<sup>th</sup> Street Inline Station be modeled to include services that King County Metro has indicated willingness to operate, such as an upgraded express 248 (also requested by Redmond), a rerouting of the 245 onto NE 85<sup>th</sup> Street, and the 235 from Totem Lake to Bellevue. With these changes, daily ridership on the NE 85<sup>th</sup> Street BRT is estimated to be approximately 4,500 by 2040. Daily boardings at the NE 85<sup>th</sup> Street Inline Station, currently estimated at less than 1,000, are more likely to be comparable with estimated demand on the other E-02 stations, or approximately, 1,500. The costs should also be estimated for a single median station option, both along the length of the

I-405 BRT and on 85<sup>th</sup> Street, if KCM indicates a willingness to operate buses with doors on both sides (as they will be doing for the Madison Street BRT in Seattle).

## Detailed Response

On December 4, 2015, Sound Transit released a set of draft project templates which comprise a set of transit projects that may be included in the proposed Sound Transit3 (ST3) package. BRT Planning International, LLC (BRTPlan) has reviewed those ST3 templates which are most relevant to the City of Kirkland:

- a. E-02a-SegA: I-405 BRT – Lynnwood Transit Center to Bellevue Transit Center (Lower Capital)
- b. E-02b-SegA: I-405 BRT – Lynnwood Transit Center to Bellevue Transit Center (Intensive Capital)
- c. E-02c1: Kirkland-NE 85<sup>th</sup> Street BRT Inline Station (Intensive Capital)
- d. E-02c2: Kirkland-NE 85<sup>th</sup> Street Bus-Only Lanes (Intensive Capital)
- e. E-03-SegA: Totem Lake to Wilburton Station LRT
- f. E-06: BRT on Eastside Rail Corridor from Kirkland to Bellevue

On January 4, 2016, BRTPlan, Transpo Group, and the City of Kirkland met with Sound Transit to clarify some outstanding questions related to the development of the templates.

The following memo details BRTPlan's review and response to the ST3 templates that relate to BRT (E-02b-SegA, E-02c1, E-02c2, E-06) with reference to the LRT template where pertinent.

Our comments are organized as follows:

- Comments on the general methodology and approach
- Comments on the comparison of projects using the data in the project templates
- Comments on the individual templates

## Comments on the general approach of the ST3 templates

### 1. Templates should provide a clear way of comparing results

The ST3 templates represent the results of a significant modeling and evaluation effort put forth by Sound Transit and its consultants; however, the presentation of results make it difficult to compare the benefits of one project to another. While projected ridership, cost per rider, and trip time are shown, these are not compared against any baseline conditions, and hence provide no way to estimate project benefits relative to project cost.

As there is no clear basis for comparing the relative technical merits of each project, the Board and the public are given no basis for determining the fairness of each project's inclusion in or exclusion from the final ST3 package, or the proposed timeline for project implementation.

For example, in order to prioritize funding for transit projects from among a set of project applications, the Federal Transit Authority (FTA), performs a comparative analysis using various metrics, the most significant of which is a cost effectiveness analysis, requiring each project to demonstrate a cost per user benefit, or 'dollars per transit user benefit hours.' This 'dollars per transit user benefit hours' indicator provides a way of comparing one project against another.

Benefit in a transit project is typically calculated by first determining the travel time and ridership for a set of services under existing conditions, and then comparing this to travel time and ridership after the project is implemented. Additional time savings and additional riders are then weighed against the project's cost. Even a very expensive project may be viable if it brings enough new passengers and new time savings.

The ST3 templates include projected trip lengths and travel times for several projects, but because they do not compare this to the current time required to make the same trip by bus, nor the current demand, there is no way to compare the projects' potential benefits under 'build' and 'no build' conditions. Without such a measure of user benefit, it is difficult to objectively compare higher and lower cost options.

Because it seems unlikely that ST will alter its methodology for comparing projects, we recommend at least clearing up some of the main differences between ST's estimates and BRTPlan/Kirkland's estimates with respect to ridership, travel time, and cost per passenger. In this way, Kirkland can ensure that its projects are more competitive with the other project templates.

2. Templates should model all important expected service changes that impact each project

One of the most important factors in projecting ridership for a proposed project is the service plan that will operate in conjunction with the project. What the model assumes about the service plan, as well as what will happen to the existing bus services, will generally determine ridership projections.

For example, the ST CKC/ERC BRT project includes one service that runs from Totem Lake to Bellevue. All other Metro and ST bus services are assumed to remain as they currently exist.

As such, ridership on the CKC/ERC BRT appears much lower than it might be with a more sophisticated service plan in which KCM would also operate services on the CKC/ERC BRT infrastructure. KCM has indicated its openness to making some changes to several existing bus routes to take advantage of the new BRT infrastructure.

If only one ST-operated BRT service is assumed on the CKC, and no other bus service changes are assumed, competition between existing bus routes and the new BRT service will draw riders away from the new BRT, thereby decreasing projected ridership.

At a meeting on January 4<sup>th</sup>, Sound Transit indicated a willingness to discuss service changes with KCM, but it indicated that most service planning decisions would come in a later design phase.

While this may not significantly alter other templates, it has a very significant impact on the viability of the projects affecting Kirkland, most particularly E-06, E-02c1, and E-02c2. Unlike other template projects, these projects could benefit significantly from services largely operated by KCM. Therefore, if ST only models likely service changes after the ST3 package has been finalized, it will be prejudicial to Kirkland-supported projects.

*We recommend asking Sound Transit to model a basic service plan which includes reasonable service changes agreed with KCM appropriate to each project, and to provide those service planning assumptions as an element in each template. Specific recommendations regarding the CKC/ERC service plan are listed below.*

## Comparison of ST3 project template data

While the templates do not provide any standardized indicators to compare projects, they do provide estimates on the following project elements:

1. Capital cost,
2. Operating cost,
3. Ridership,
4. Fleet size,
5. Project length.

From this data, the following metrics can be calculated, allowing for a more controlled comparison between projects:

1. Cost per vehicle,
2. Capital cost per mile,
3. Capital cost per passenger,
4. Operating cost per mile.

While these cost metrics are not sufficient to judge a project's merits, since a higher cost project may well be justified if the benefits are also higher, they do provide some basis of comparison. The purpose of this section is not to question the results but rather to compare them as given, examine the data more carefully, and make recommendations on places where some adjustments might be made.

The following table shows data as provided by Sound Transit for the projects of concern in this memo, as well as several additional projects described in the templates. Since most of the data elements in the table below were absent for "E-02c1: Kirkland-NE 85<sup>th</sup> Street BRT Inline Station" and "E-02c2: Kirkland-NE 85<sup>th</sup> Street Bus-Only Lanes (Intensive Capital)" those projects are not in the table.

ST Template	Cost of each vehicle (millions)	Capital cost per mile (millions)	Capital cost per daily project rider	Operating cost per mile (millions)
E-01: Redmond LRT extension	\$ 5.3	\$ 301.1	\$ 247,556	\$ 3.2
E-02a-SegA: I-405 BRT Lynnwood TC to Bellevue TC (Lower Capital)	\$ 1.8	\$ 6.7	\$ 14,111	\$ 0.9
E-02b-SegA: I-405 BRT (Intensive Capital)	\$ 1.8	\$ 35.3	\$ 74,556	\$ 1.0
E-03: Issaquah to Totem Lake LRT	\$ 5.3	\$ 193.1	\$ 250,296	\$ 2.4
E-03-SegA: Totem Lake to Wilburton LRT	\$ 5.7	\$ 181.0	\$ 321,778	\$ 3.0
E-06: BRT on ERC Kirkland to Bellevue	\$ 1.8	\$ 74.7	\$ 249,000	\$ 1.5

Table 1: Controlled comparison of project data

This table tells us the following:

1. **Cost of each vehicle:** On cost of each vehicle, the BRT projects all outperform the LRT projects on an order of between 2.9 and 3.1 times. That is, Sound Transit estimates the cost of light rail vehicles as being between 2.9 and 3.1 times more expensive than BRT vehicles (although \$1.82 million per bus is well above BRT industry averages, as addressed below).

While LRT vehicles carry more people, if we control for vehicle cost per rider, BRT vehicles still come out lower in cost than LRT vehicles. The type of BRT vehicle specified (an articulated bus) normally has a capacity of 150, and the LRT vehicle specified has a capacity of closer to 230, yielding \$12,000 per BRT passenger (at the estimated prices) and \$22,000 per passengers for an LRT vehicle, still about half the cost. Both figures are relevant since neither system is planning to operate at anywhere near capacity (i.e., a vehicle with a 150 capacity would be sufficient given the projected demand and frequency).

2. **Capital cost per mile:** While total capital project cost is important since it impacts the ST3 package budget, from an assessment perspective it is more important to look at capital cost per mile since this metric provides a more controlled way of comparing project costs. If we were to reorder the projects in the table according to capital cost per mile, we would have the following:

ST Template	Capital cost per mile (millions)
E-02a-SegA: I-405 BRT Lynnwood TC to Bellevue TC (Lower Capital)	\$ 6.7
E-02b-SegA: I-405 BRT (Intensive Capital)	\$ 35.3
E-06: BRT on ERC Kirkland to Bellevue	\$ 74.7
E-03-SegA: Totem Lake to Wilburton LRT	\$ 181.0
E-03: Issaquah to Totem Lake LRT	\$ 193.1
E-01: Redmond LRT extension	\$ 301.1

Table 2: Projects ordered by Capital cost per mile

Thus, per mile, BRT from Totem Lake to Bellevue (E-06) costs less than half as much as LRT with roughly the same routing (E-03-SegA).

3. **Capital cost per passenger:** The cost of each project per forecasted passenger is generally differentiated, I-405 projects having the low capital cost and BRT and LRT on the CKC/ERC having higher capital costs. However, it should be noted that this measure is sensitive to both project cost and ridership. BRTPlan believes that the E-06 ridership forecasts are low, for a variety of reasons as described below. Addressing the issues with the ridership forecast should result in a much lower capital cost per passenger for the E-06 template.
4. **Operating cost per mile:** The BRT projects also fare better on the metric of annual operating cost per mile. It is important to note that frequencies for the BRT projects are set lower than for the LRT projects, as follows:

ST Template	Frequency (veh/peak hr)
E-01: Redmond LRT extension	10
E-02a-SegA: I-405 BRT Lynnwood TC to Bellevue TC (Lower Capital)	6
E-02b-SegA: I-405 BRT (Intensive Capital)	6
E-03: Issaquah to Totem Lake LRT	8
E-03-SegA: Totem Lake to Wilburton LRT	8
E-06: BRT on ERC Kirkland to Bellevue	6

Table 3: Assumed peak hour vehicle frequency per hour in each ST template

While this is something that BRTPlan recommends querying (see below), if all frequencies were brought to the same level (i.e., 10 vehicles per hour, as in the highest frequency project on the list), annual operating costs per mile on the BRT projects would still perform better than for the LRT projects, as follows:

ST Template	Operating cost per mile, adjusted
E-01: Redmond LRT extension	\$3.20
E-02a-SegA: I-405 BRT Lynnwood TC to Bellevue TC (Lower Capital)	\$1.64
E-02b-SegA: I-405 BRT (Intensive Capital)	\$1.69
E-03: Issaquah to Totem Lake LRT	\$3.01
E-03-SegA: Totem Lake to Wilburton LRT	\$3.78
E-06: BRT on ERC Kirkland to Bellevue	\$2.45

Table 4: Annual operating cost per mile, adjusted to create comparable frequencies

In conclusion, based on the results from the ST3 templates, the BRT projects all perform better than the LRT projects on most of the metrics. The following sections take a closer look at the data presented, raising pertinent questions and making recommendations for improving the analysis.

## Response to individual ST3 templates

The following section lays out BRTPlan’s comments on the individual templates.

### E06: BRT on Eastside Rail Corridor from Kirkland to Bellevue

Over the past decade, the City of Kirkland has been developing a vision for “a welcoming, transportation-oriented facility for pedestrians and bicyclists, coupled with a high-capacity transit system that connects Kirkland to the region.”<sup>1</sup> This vision came one step closer to reality with the 2012 purchase of a portion of the East Rail Corridor, now known in Kirkland as the Cross Kirkland Corridor (CKC).

In the last year, the City of Kirkland has been looking in more depth into the options for high-capacity transit on the CKC/ERC. In September 2015, BRTPlan was retained to explore gold-standard Bus Rapid Transit as the mode which could best serve the people of Kirkland while also fitting into the unique context of the CKC/ERC.

BRTPlan conducted an independent analysis of BRT on the CKC/ERC and how it could be designed to best achieve the vision a long time in the making.

The City of Kirkland has been actively engaged in Sound Transit’s ST3 planning and was pleased to see BRT on the ERC included on the ST3 Candidate Project List. Working in coordination with the City as well as other consultant staff, BRTPlan developed a BRT concept for the CKC/ERC and submitted this to Sound Transit in early October. While Sound Transit’s template integrates

<sup>1</sup> Kirkland ERC Interest Statement, approved April 19, 2011

some aspects of the concepts, such as station locations, it does not include other important aspects of the concept.

## Ridership

The ridership estimated in the E-06 template is 2,500 – 3,500 daily passengers in 2040. BRTPlan estimated 34,400 riders in 2040. The bulk of the discrepancy is accounted for by differences in services assumptions. BRTPlan assumed that King County Metro would also be using the CKC/ERC BRT for three Seattle-bound services, whereas Sound Transit assumed the BRT corridor would be used only by one Sound Transit service between Kingsgate/Totem Lake and Bellevue. This accounts for about 30,100 of the difference in riders. The balance of the difference is explained by differences in travel time assumptions, explained below.

To put this in context, in 2015, Metro’s Route 255 carried an average of 6,905 passengers, Route 235 carried an average of 1,140 passengers, Route 234 carried an average of 1,145 passengers, and Route 311 carried an average of 1,075 passengers. If just these four routes used the CKC/ERC BRT for part of their trip, there would be over 10,000 daily riders on the first day of operation.

Route	Daily 2015 Ridership
255	6905
235	1140
234	1415
311	1075

Table 5: KCM and ST 2015 daily ridership on 4 routes near the CKC/ERC

Viewing the 2040 projected ridership for E-06 in relation to other BRT projects around the country, Cleveland’s HealthLine today has an average of 15,800 riders. The HealthLine is the highest ranked BRT project in the United States in terms of design. Eugene, Oregon’s Emerald Express (EmX) BRT gets 10,000 daily riders and Eugene is part of a much smaller metropolitan area than Kirkland, also with far lower overall transit use. Los Angeles’ Orange Line, in the San Fernando Valley, comparable in density and pre-existing transit demand to Kirkland, comes in at 33,000 daily riders.

BRTPlan has estimated ridership on the CKC/ERC BRT to be 15,300 were it to open in 2015. By 2040 this demand is estimated to grow to 34,500.<sup>2</sup>

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<sup>2</sup> 2015 demand based on existing bus ridership, 2040 demand based on 3.3% annual growth factor as found in “I-405 South Corridor Bus Rapid Transit Pre-Design”, June 16, 2005.

Project	2015 daily ridership
Los Angeles Orange Line	33,000
Cleveland HealthLine	15,800
Eugene Emerald Express (EmX)	10,000
CKC/ERC BRT Kirkland Proposed Services	15,300
E-06: BRT on ERC Kirkland to Bellevue	3,000
E-03-Seg-A: Totem Lake to Wilburton LRT	4,000

Table 6: 2015 daily ridership on comparable projects

This figure is significantly greater than what was estimated in the ST templates. There are several reasons for this.

1. Service Plan

In order to project ridership, one has to first determine which services will operate on the corridor. Sound Transit selected one service for BRT on the CKC/ERC and based its ridership projections off the modeling results of this service. The service is as follows:

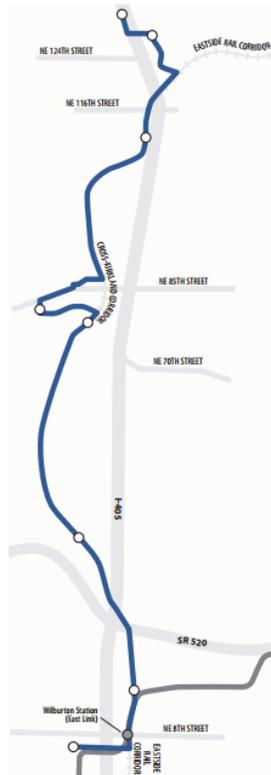


Figure 2: Service modeled for ST3 BRT on the ERC template

E-06 BRT service is a faster and more direct route for currently 1,100 daily passengers on route 235 between Totem Lake and Bellevue.

However, by adjusting more KCM services to also use the CKC/ERC, as KCM has indicated it is open to doing, operating “direct services,” or “trunk-and-branch” services, E-06 has the potential to draw significantly more riders to the system. Most critically, the E-06 BRT service plan fails to bring benefits to the majority of transit trips in the area, most of which are Seattle-bound. Minor route adjustments discussed with KCM would allow critical high volume Seattle-bound services to also use the CKC/ERC BRT. This is especially important since the E-02-SegA templates (I-405 BRT, lower and intensive capital) do little to improve Seattle-bound transit trips.

BRTPlan has developed an initial service plan concept for BRT on the CKC/ERC that could better serve popular transit origin-destination pairs and better avoid the critical traffic bottleneck at the I-405/SR 520 interchange. As a result, ridership along the CKC/ERC is estimated to be far higher than if only the one proposed service operated on the CKC/ERC corridor.

BRTPlan’s ridership estimate is based on a sketch-planning model build from existing boarding and alighting survey data from KCM on each route affected by the CKC/ERC corridor. Realistic assumptions were made on how this existing demand would be divided among the proposed routes, and then increased based on realistic assumptions about modal shift from similar projects, and future growth assumptions taken from regional averages extrapolated from Sound Transit data.

While this proposed service plan includes a route very similar to the one proposed by Sound Transit (the Green Line), it also adds three others. These routes are diagrammed in Figure 3.

One route (the Orange Line) in the proposed service plan mimics the 311 (and other similar routes) which runs from Seattle to Woodinville, but instead of taking I-405 and the SR520 interchange, it enters the CKC/ERC at Kingsgate, then runs express to South Kirkland and on to Seattle via the SR 520 HOV direct access ramps at 108th Ave NE. This improves transit connectivity between Kirkland the communities to the north and helps buses avoid general purpose congestion in and around the SR 520 and I-405 interchange which is particularly bad in the PM peak.

Another route (the Blue Line) mimics the 255 (Totem Lake to Seattle) and 234 (Totem Lake to Bellevue) north of downtown Kirkland but avoids congestion on 108th Ave NE and other surface roads by using the CKC/ERC south of downtown Kirkland.

Finally, a fourth route (the Gold Line) would allow an alternative pathway and improved Seattle to Eastside connectivity for the current 271 (Issaquah to University of Washington via Bellevue) and other Sound Transit routes such as the 555 and 556 to reach Seattle, via the ERC in Bellevue.

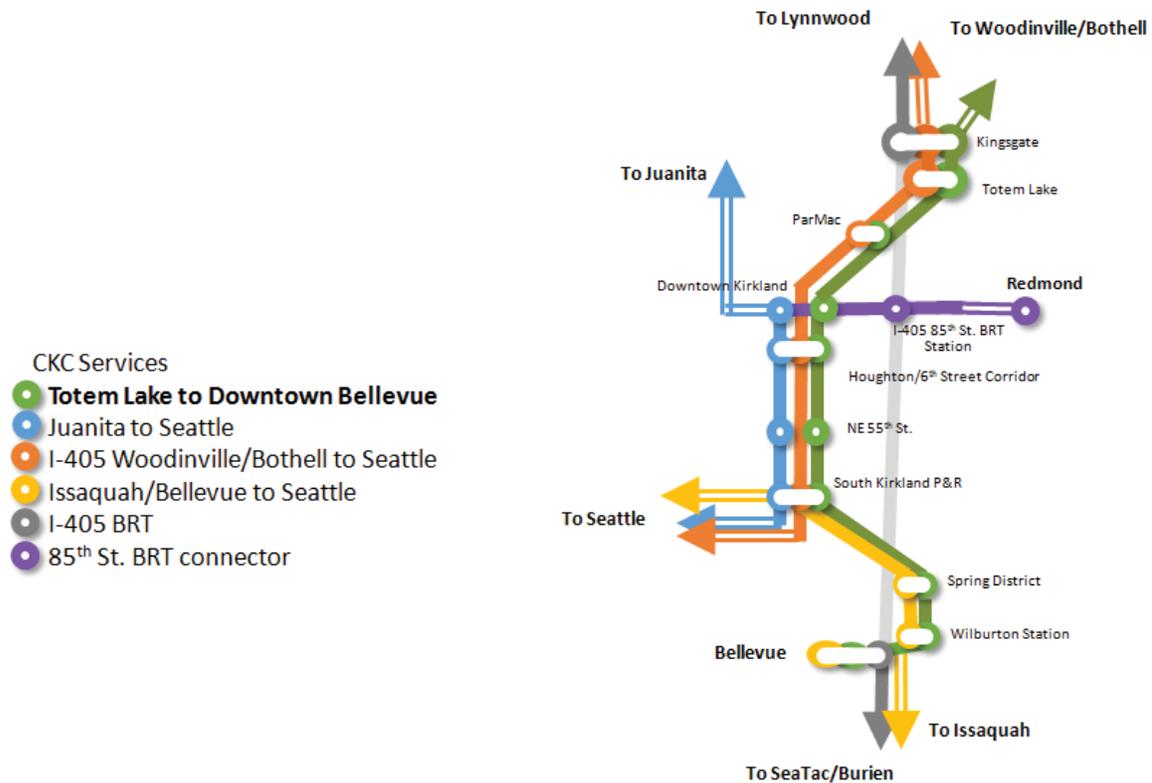


Figure 3: Schematic of BRTPlan service plan

The CKC/ERC BRT is able to improve both Totem Lake to Bellevue as well as Seattle-bound transit service. This in turn significantly increases the number of riders on the CKC/ERC BRT and the total projected time savings benefits.

Additionally, both the Orange and the Blue Lines operate as express services, skipping stops along the way. Such limited-stop services are able to achieve much higher average speeds, speeds similar to those modeled for the LRT project.

Initial conversations with King County Metro have indicated that they are interested in this concept and would be open to operating Metro services on the corridor if CKC/ERC BRT were constructed.

The table below shows estimated ridership by route.

Year	Orange	Blue	Green	Gold	Total
2015	3,500	5,000	2,000	5,000	15,500
2040	7,500	11,500	4,000	11,000	34,500

Table 7: Estimated 2015 and 2040 ridership by route for BRTPlan service plan

The Green Line, which is the service most similar to the service modeled for the ST template, comes closest to the estimated ridership for this project in the ST template. Note, however, that of all of the routes, the Green Line has the lowest ridership.

*BRTPlan recommends that the City of Kirkland ask Sound Transit to model this service plan, including both the local and the express services, in order to more accurately reflect the targeted service concept presented here. The resulting ridership should reflect aggregate ridership on all routes and a range of travel times should reflect local and express services.*

Beyond the service plan that uses the CKC/ERC, some initial determination needs to be made regarding what will happen to existing services – whether they will be adjusted to better interact with the planned new service, or left as they are. Sound Transit assumed that all other bus services would continue to operate where and how they currently operate, competing for passengers with the new service.

If routes such as 255, 234, and 235 are pulled onto the CKC/ERC from parallel roads, additional local service would need to be provided and aligned with the BRT services. What happens to the existing services will have an impact on ridership in the templates and should therefore be considered at the template stage, rather than after the ST3 package has been finalized, as indicated by the ST process.

While the Green Line, above, is similar to that proposed in the ST3 service, the estimated ridership on Green Line is still higher than the ridership estimate on the ST3 template. There are several more factors that account for this, including travel time.

## 2. Travel time

Sound Transit has estimated travel times on the proposed service that are noticeably slower than BRTPlan’s estimates. Ridership forecasts are sensitive to travel time and thus, an accurate travel time estimate is necessary; slower travel times translate into a lower demand estimate.

ST estimated a travel time of 35 minutes from the Totem Lake Transit Center (TC) to the Bellevue TC on the BRT. The service that would travel from Totem Lake to Bellevue most closely mimics the existing 235 bus route. Currently, the trip on the 235 between Totem Lake TC and

the Bellevue TC takes 37 minutes. This means that the trip will only be two minutes faster on the BRT than on the current 235 bus route, which does not make intuitive sense.

BRTPlan conducted its own travel time analysis and determined that the trip on the Green Line from Totem Lake TC to Bellevue TC would take roughly 27.5 minutes end to end.

There are two reasons for the discrepancy between the 37 minute travel time estimated in the E-06 template and BRTPlan's estimate of 27.5 minutes: routing differences and speed differences.

These differences in in-vehicle travel time ignore another important element in door-to-door travel time that profoundly affects travel behavior – the time spent accessing the station and the time spent reaching one's destination from the station. Since most people do not live immediately adjacent to a BRT station stop, part of everyone's total trip time is taken up reaching the station or returning home from the station. More stations mean more people live and work near the transit stations. This should translate into shorter door-to-door travel times for more people and hence higher ridership. These important differences cannot be measured using Sound Transit's ridership model.

Finally, the model also factors in waiting time as a function of vehicle frequency. ST modeled the LRT option at a peak hour frequency of one vehicle every 7.5 minutes and a BRT frequency of one vehicle every 10 minutes. This creates extra delay for passengers on the BRT, as discussed below.

a. Routing and infrastructure through downtown Kirkland

Kirkland's concept for BRT on the CKC/ERC would provide a direct connection to CKC/ERC by providing one service which exits the CKC/ERC and travels into Downtown Kirkland on full BRT infrastructure. ST took this concept on board when they prepared the templates. However, there are some discrepancies between what Sound Transit modeled and Kirkland's preferred option.

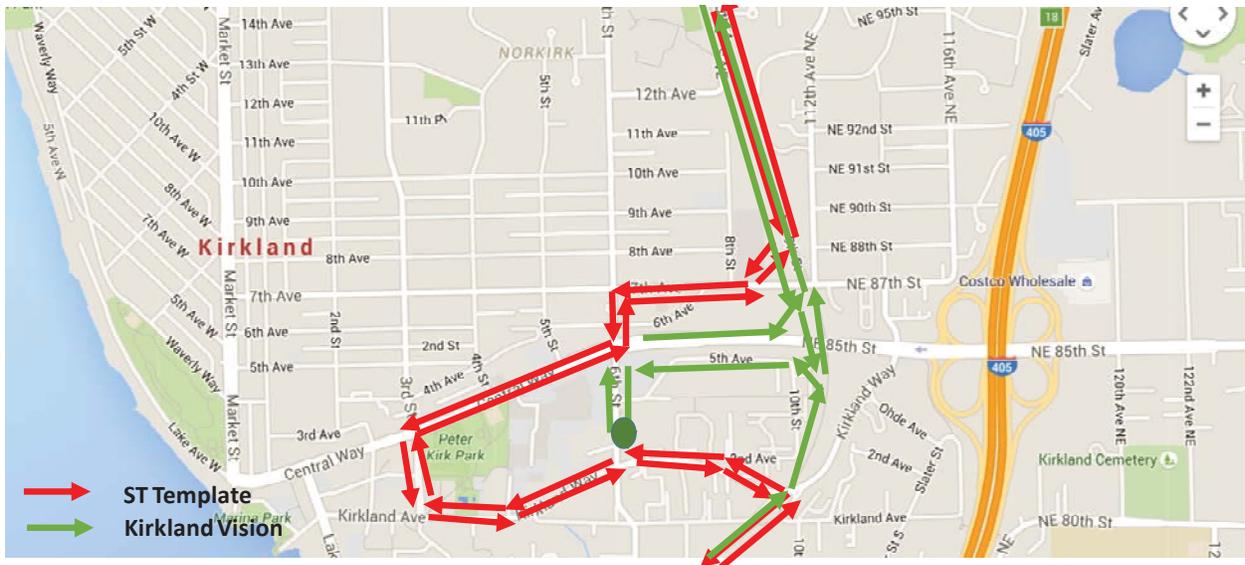


Figure 4: Downtown Kirkland Routing: ST Template vs. Kirkland Concept

Kirkland’s preferred option is to have one downtown station in the vicinity of Park Place/Kirkland Urban at roughly 6<sup>th</sup> Street and 4<sup>th</sup> Avenue. This location balances the needs of pedestrian access to downtown while also minimizing the diversion from the CKC/ERC for BRT vehicles and the additional delay caused by the extra stop. Kirkland also prefers full, median-aligned BRT infrastructure along this downtown segment, fully insulating the service from future year congestion.

ST’s template included two stations: one at 6<sup>th</sup> Street and one at the Kirkland TC on 3<sup>rd</sup> Street, with the routing shown above, and curbside bus lanes along the length of the shown routing. In a meeting on January 4<sup>th</sup>, ST estimated approximately 4 minutes of additional travel time between 6<sup>th</sup> Street and the Kirkland TC (2 minutes in each direction). Additionally, ST’s modeling assumes that curbside bus lanes will be subject to future congestion due to business access and right-turning vehicles which therefore, adds further travel time. ST assumed a downtown speed of approximately 15mph compared to BRTPlan/Kirkland’s design speed of 21 mph. Median-aligned bus lanes, by virtue of being in the center of the road, are far less susceptible to future congestion and would therefore not incur the added travel time inherent in curbside bus lanes.

*BRTPlan recommends that the City of Kirkland ask Sound Transit to route the CKC/ERC BRT to Park Place/Kirkland Urban and do so in median-aligned bus lanes at a speed of 21 mph.*

b. Routing through Totem Lake

In the Totem Lake area, Kirkland asked for full BRT infrastructure throughout Totem Lake to the Kingsgate Park and Ride, and an elevated busway over 124<sup>th</sup> Street. ST indicated that they

assumed BAT lanes through Totem Lake, subjecting the BRT to future year congestion delay between the Kingsgate Park and Ride, Totem Lake TC, and Totem Lake Mall, and signal delay at 124<sup>th</sup> Street. This also causes additional delay that is not assumed by BRTPlan.

c. Dwell time

ST indicated an assumed fixed dwell time of about 20 seconds per BRT station stop, and an additional 20 seconds of delay from acceleration and deceleration reflected in slower link speeds. Generally in the US, 'fixed dwell time' (decelerating, stopping, opening doors, closing doors, accelerating) causes a delay of about 16 seconds for an articulated bus, and 'variable dwell time' (time per boarding and alighting passenger) is approximately 0.7 seconds per passenger, depending on the specific BRT characteristics included. All told, using a 16 second per station fixed dwell time and a 0.7 second multiplier per projected passenger, BRTPlan estimated a lower per-station dwell time than Sound Transit.

d. Station access time

ST's model does not accurately measure differences in station access time between scenarios. The model is designed for large-scale regional planning rather than for detailed planning at a local level. As a result, the model uses large "Forecast Analysis Zones" (FAZs). All of Kirkland is made up of just three FAZs, as shown in the map below.

The model assumes that all people live and work at the middle point of each zone, (known as the 'zone centroid'). For regional analysis, this is a reasonable simplifying assumption. However, this assumption means the model cannot distinguish between the average access trip differences under different station-location scenarios when the different stations are located in the same zone. For example, the model cannot distinguish between people living in Everest versus people living in Lakeview, or between people living in Totem Lake and people living and working in Downtown Kirkland.



The E-03-SegA template (LRT from Totem Lake to Wilburton) includes fewer stations than included in E-06 SegA. In reality, the limited number of stations in that template should mean fewer riders. However, the station placement in E-03-SegA is much better aligned with the zone structure in the PSRC model. As a result, the model predicts no ridership loss incurred by the reduction in the number of stations from E-06 to E-03-SegA.

At the same time, each additional station in E-06 translated in the model to an additional 40 or more seconds of dwell time for buses and slower speeds between stations due to starting and stopping. This creates a less attractive service for passengers already on the bus. Thus, each additional station in the E-06 template, beyond those included in the E-03-SegA template (LRT from Totem Lake to Wilburton), resulted in a loss of ridership for the project.

BRTPlan corrected for this problem by estimating ridership based on extrapolations from detailed station-level transit ridership data, rather than on OD pairs between FAZs. This method helps to avoid such distortion.

BRTPlan recommends that Kirkland ask ST to disaggregate the FAZs in Kirkland, Bellevue, and Redmond using census and other data. This is the standard method of modeling more localized trips and providing a more fine-grained demand analysis.

### 3. Peak frequency

Frequency of service is another important factor that influences ridership. As service becomes more frequent it becomes more attractive to riders due to reduced waiting times. The E-06 template lists a peak frequency of one bus every 10 minutes. The E-03-SegA template lists a peak frequency of one train every 7.5 minutes. ST explained that this was the policy of Sound Transit, rather than being the outcome of estimated demand levels.

Should the service plan laid out above be implemented, a peak frequency of one bus every 2-3 minutes, for all of the routes combined could be maintained. If only the Sound Transit proposed service is accepted, the BRT frequency should at least be the same as the E-03-SegA frequency (7.5 minutes).

*BRTPlan recommends that the City of Kirkland ask Sound Transit to model the suggested frequencies.*

### Costs

The ST template lists the total capital cost for the E-06 template as \$747 million. With approximately 10 miles of new infrastructure, this averages out to \$74.7 million per mile. This is a much higher cost per mile than most BRT projects developed in the United States. For

example, CTfastrak’s BRT, built on a converted freight rail line like the proposed CKC/ERC BRT, is widely known to be a very expensive project. The cost for the CTfastrak BRT was \$567 million for 9.4 miles, or an average of \$60.32 million per mile, still less than the CKC/ERC BRT estimate. Los Angeles’ Orange Line was similarly on an old rail line and cost around \$30 million per mile, and Pittsburgh’s Martin Luther King, Jr. East Busway also cost around \$30 million per mile. Only Boston’s Silver Line Waterfront, which averaged to \$80 million per mile, is more expensive and that is because it included a new tunnel under Boston Harbor.

The ratio of cost between the E-06 and E-03-SegA templates (BRT and LRT from Totem Lake to Bellevue) provides another point of comparison. In this case, the cost ratio between the E-03-SegA and E-06 is 2.42 to 1. Normally the ratio between LRT and BRT projects is around 3.7 to 1, so it is probable that the LRT numbers are underestimated, the BRT numbers are inflated, or both.

We compared the E-03-SegA and E-06 cost details below in order to elucidate any potential points of discrepancy.

	Total capital cost (millions)	Capital cost/mile (millions)	Cost of each vehicle (millions)	Land Acquisition (millions)	# Stations
E-03-SegA: Totem Lake to Willburton LRT	\$ 1,448	\$ 181	\$ 5.67	\$118	4
E-06: Kirkland to Bellevue ERC BRT	\$ 747	\$ 74.7	\$ 1.82	\$84	9

Table 8: Comparison of Capital Costs E-03-SegA and E-06

From this table, we find the following discrepancies:

**1. Vehicle costs:**

ST estimates the cost of a BRT bus at \$1.8 million each which is more than double industry norms. Typically, a good CNG hybrid electric BRT bus costs a maximum of \$900,000 per bus, which is half of what was estimated.<sup>3</sup>

Sound Transit indicated that their estimates were based on the cost of the King County Metro RapidRide vehicles which were \$1.2 million each. They then added approximately \$100,000 for ST customization and another \$500,000 for inflation to 2014. While RapidRide includes a varied fleet, the most recent RapidRide fleet, acquired in 2015, cost an average of \$940,000 each.

The Connecticut Department of Transportation’s CTfastrak in March 2015, is the most recent BRT to open in the US. CTfastrak is a full BRT on a converted freight rail line running between

<sup>3</sup> A typical LRT vehicle costs around \$5.5 million. The ST templates reasonably estimated the LRT vehicle costs at between \$5.26 million and \$5.67 million each.

Hartford and New Britain, Connecticut. CTfastrak includes 42 new hybrid electric buses, with costs as follows:

- Twelve 60-foot articulated vehicles by Nova Bus at a cost of **\$906,633** each;
- Eighteen 40-foot transit buses by New Flyer at a cost of **\$620,609** each; and
- Twelve 30-foot transit buses by Gillig at a cost of **\$625,439** each.<sup>4</sup>

*Because a combination of 60- and 40-foot buses is recommended on the CKC/ERC, BRTPlan recommends asking Sound Transit to reduce the cost of each bus to \$800,000, a conservative estimate of the average cost of 60- and 40-foot buses.*

## **2. Land acquisition costs:**

The E-06 template includes \$84 million in land acquisition costs. Sound Transit explained that a portion of this is a per bus contribution towards a new maintenance base shared among all new BRT vehicles across the region. However, given the limited fleet (9 buses) this would come to \$9,333,333 per bus. Further, the E-02-SegA I-405 BRT project, which includes a purchase of 18 new buses, includes \$4.84 million in land acquisition costs. Therefore, the majority of the \$84 million is intended for a different purpose.

In ST's October 2015 memo providing responses to Kirkland's project template request, ST indicated that they would be assuming offset stations. Offset stations are no more land intensive than center stations and should not require land acquisition, as the existing right-of-way is sufficient in all planned station locations. Later, ST clarified that they had instead assumed bilateral stations – i.e., stations directly across from each other. These are generally more land intensive and likely account for the remainder of the land acquisition costs. We did not receive full clarification from Sound Transit regarding land acquisition costs. *We recommend asking Sound Transit to eliminate this \$84 million land acquisition cost.*

## **3. Station costs**

Stations are a primary expense of any transit project. Insufficient detail has been provided regarding what portion of total construction costs is reserved for stations. However, ST has indicated that they have assumed stations on each side of a bus way or track instead of one center station at each station location. Side stations double the cost of stations over center stations due to the need for two, rather than one station at each location. *We recommend asking Sound Transit to redevelop its cost for this project based on center stations, thereby halving the total cost of stations.*

## **4. The Kingsgate Park and Ride**

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<sup>4</sup> <http://www.fleetsandfuels.com/fuels/hybrids/2015/03/ctfastrak-scores-two-score-hybrids/>

The capital cost for the Kingsgate Park and Ride in the E-06 template includes \$37.87 million for a 1,000 vehicle structured parking garage. Kirkland requested a TOD development at the Park and Ride. This parking facility, and its associated costs, is also included in E-02a-SegA and E-02b-SegA (Lower and Intensive Capital). This represents a double counting and should not be counted as part of both templates.

### **E-02a-SegA and E-02b-SegA: I-405 BRT Projects, Lynnwood TC to Bellevue TC (Lower & Intensive Capital)**

The ST3 templates for the I-405 BRT projects from Lynnwood Transit Center to Bellevue Transit Center include a lower capital alternative and an intensive capital alternative.

#### **E-02a-SegA (Lower capital)**

The lower capital alternative for this segment includes:

- off board fare collection;
- minor station improvements;
- pedestrian connections at UW Bothell;
- new buses;
- real time passenger information; and
- a 1,000 vehicle parking garage at the Kingsgate Park & Ride.

It uses existing outside lane flyer stops for all stations where there is not an existing direct access ramp to inside HOV lanes, and includes no direct access ramps or HOV to HOV connections between the I-405 HOV and I-5.

Of the \$127 million project, \$55 million is spent on the Kingsgate parking garage (note the difference in cost between this template and E-06), which adds 498 parking spaces to the existing 502 spaces.

Sound Transit's 2014 Sound Transit Central/East High Capacity Transit Corridor Study<sup>5</sup> indicated that this lower capital alternative would save about three minutes of trip time from Lynnwood to Bellevue. However, there is no indication of the projected time savings from any baseline in the current templates so it is unclear whether the modeled project has done this.

#### **E-02b-SegA (Intensive capital)**

The intensive capital alternative includes:

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<sup>5</sup>[http://www.soundtransit.org/sites/default/files/documents/pdf/projects/HCT\\_2014/STCentralEastHCT\\_CorridorReport\\_KBI.pdf](http://www.soundtransit.org/sites/default/files/documents/pdf/projects/HCT_2014/STCentralEastHCT_CorridorReport_KBI.pdf)

- BRT station improvements at the Lynnwood Transit Center, Canyon Park and Ride, UW Bothell campus, Kingsgate/Totem Lake at NE 128<sup>th</sup> Street, and Bellevue Transit Center;
- a new direct access inline BRT station at Brickyard Park and Ride;
- a two-way direct HOV connection to I-5;
- an inline station in Kirkland at NE 112<sup>th</sup> St;
- parking garages at Canyon, Brickyard, and Kingsgate Park and Rides;
- a financial contribution towards the completion of the NE 6<sup>th</sup> Street connection from I-405 to 120<sup>th</sup> Ave NE in Bellevue; and
- new buses.

In this alternative, the main benefits to Kirkland over the lower-capital alternative are:

1. The addition of an inline station at NE 112<sup>th</sup> Street: As there is a lot of projected growth at ParMac, inclusion of this in-line stop should add ridership to the E-02b-SegA project but it does not. Kirkland should make sure that the growth projections for ParMac are reflected in the future year demand estimates.

### Comparison of lower capital and intensive capital alternatives

According to the ST3 templates, there is no ridership benefit between the lower and intensive-capital alternatives – both are estimated to attract 9,000 daily riders. As there are only six planned station stops in the lower capital scenario, this averages to only 1,500 boardings per stop in 2040. As the intensive capital scenario adds no passengers but adds one station, the average boardings per station drops to 1,285 passengers per stop.

There is a one mile-per-hour speed benefit which results in a one minute travel time reduction for the intensive capital alternative but this appears to have no impact on ridership. Further, despite the minor speed increase, the intensive-capital alternative has a higher annual operating cost than the lower-intensive alternative.

	Total capital cost (millions)	Annual operating cost (millions)	Ridership	Travel time (minutes)	Speed
E-02a-SegA: I-405 BRT Lynnwood TC to Bellevue TC (Lower Capital)	\$ 127	\$ 18.66	9,000	41	28
E-02b-SegA: I-405 BRT (Intensive Capital)	\$ 671	\$ 19.28	9,000	40	29

Table 9: E-02a-SegA (Lower Capital) and E-02b-SegA (Intensive Capital) compared

According to the Sound Transit Central/East High Capacity Transit Corridor Study (2014) similar lower capital measures between Lynnwood and Bellevue would result in a total travel time savings of 3 minutes, and similar intensive capital measures led to about 8 minutes of travel time savings from existing conditions. While the templates do not provide information on travel

times under existing conditions, the speed differences in the earlier report between the lower and intensive-capital alternatives are not reflected in the current ST templates. There should also be some time savings from the HOV-to-HOV connection between I-5 and I-405, but this also is not reflected.

The Northeast 112<sup>th</sup> Street station is the only benefit to Kirkland specific to E-02b-SegA (intensive capital). ST explained that the reason the addition of 112<sup>th</sup> Street did not yield any additional riders was because the station is close to the Kingsgate Park and Ride stop, and the two stops split the demand rather than generating new demand. This could be the result of the same modeling shortcoming pointed about above related to over-sized FAZs, and should be tested by the same remedy suggested above: breaking the FAZs into smaller zones.

Kirkland had stated its preference to ST for a trunk and branch approach. ST stated, in its October response, that it is planning to operate a trunk route with no branches, but is open to discussing additional services with King County Metro.

According to the “I-405 South Corridor Bus Rapid Transit Pre-Design” study (p.32) which studied the full I-405 BRT corridor (not broken down by segments as in the templates), the single line BRT would have 13,430 daily riders by 2030. A trunk and branch service would have 20,900 passengers by 2030 according to the same report.

Both the lower- and intensive-capital alternatives assume that there would be one BRT service running exclusively on the I-405 HOV corridor from Lynnwood to Bellevue, and no services that would extend beyond the I-405 corridor.

To fully evaluate these options, BRTPlan recommends that the City ask ST to consider these other additional service routes, in dialog with KCM, and reflect, accordingly, the additional ridership.

### **E-02c1 Kirkland-NE 85<sup>th</sup> Street Inline station on I-405 BRT and E-02c2 85<sup>th</sup> St Bus-Only Lanes**

The City of Kirkland requested the inclusion of a BRT station at Northeast 85<sup>th</sup> Street as the best possible connection into the I-405 BRT. In response, Sound Transit modeled this station and prepared a project template for it. The City of Kirkland also requested the inclusion of bus-only lanes connecting the I-405 BRT station – as well as the CKC/ERC BRT – to Downtown Kirkland. Sound Transit has also modeled this project and prepared a project template for it.

### **Cost-benefit of NE 85<sup>th</sup> St inline BRT station as proposed by ST**

Because this is the only station to be modeled as a standalone project, and all other I-405 BRT stations are included in the I-405 BRT project templates, it is difficult to compare the costs and benefits of this one particular project. This section of the memo attempts to quantify the costs and benefits in relation to the other projects.

In template E-02c1, ST estimated the cost of an inline station at Northeast 85th Street and I-405 to be \$260 million.

The estimated additional ridership for the NE 85<sup>th</sup> Street inline station is listed as less than 1,000 passengers. Earlier demand estimates for this station from other studies put this number close to 900 by 2040. If we assume the inline station adds 900 passengers to the 9,000 passengers on the light capital scenario, it would result in an average of 1,414 passengers per stop; better than the intensive capital scenario but fewer than the light capital scenario.

This suggests that an inline station at NE 85<sup>th</sup> Street, rather than at 112<sup>th</sup> Street, should be included as part of the 'intensive capital' scenario.

It should be pointed out, however that the demand number of 900 is low as it assumes no changes in KCM services that would feed passengers to the in-line station. In fact, early working versions of the KCM Long Range Plan show an increase in the frequency of services reaching the in-line station at NE 85<sup>th</sup> Street.

### **Comparison of Kirkland's request for NE 85<sup>th</sup> St vs ST3 template**

Kirkland requested that Sound Transit consider a fully dedicated, central median-aligned bus lane along Northeast 85<sup>th</sup> Street from 6<sup>th</sup> Street to I-405 that would interface with a new BRT station at 6<sup>th</sup> Street/Park Place.

Part of the concept was to use the Northeast 85th Street BRT facility to connect both the CKC/ERC connection and the I-405 station to downtown Kirkland. This would allow one bus lane (bi-directional) to serve both functions, minimizing the exposure of residents to increased bus traffic and disrupting less traffic in downtown Kirkland with bus only lanes.

The figure below illustrates Kirkland's request to Sound Transit with regards to Northeast 85<sup>th</sup> Street and how the CKC/ERC connection and I-405 connection are able to share infrastructure.

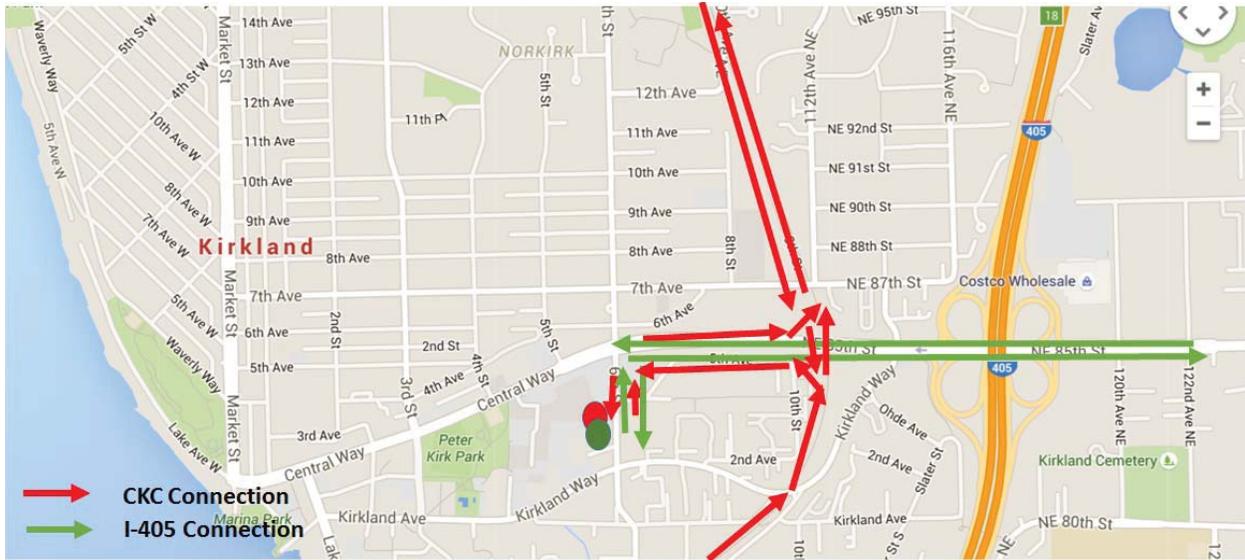


Figure 6: Kirkland requested BRT on 85th St: CKC/ERC & I-405 Connections



Figure 7: Services on the NE 85th Street BRT link

This relatively short BRT link would be used by three services to bypass the bottleneck that currently exists at the Northeast 85<sup>th</sup> Street I-405 interchange. The 248 bus route could be upgraded to a BRT level of service and provide a faster connection between downtown Kirkland (Park Place) and downtown Redmond. This would bring additional demand to the proposed I-405/85<sup>th</sup> Street inline BRT station from passengers traveling from Redmond to towns north of Kirkland, as there is currently no good northbound connection from Redmond today. The high frequency Route 245 could be rerouted from its current I-405 crossing at Northeast 70<sup>th</sup> Street to Northeast 85<sup>th</sup> Street to provide a link between Overlake and the I-405 BRT which would be used by people headed northbound on I-405. The link could also be used by a modified 235.

Most of the demand on the current Route 235 would be rerouted onto the CKC/ERC BRT. There is, however, significant demand on the existing Route 235 between Totem Lake Mall and Downtown Kirkland that will not be served by the new CKC/ERC BRT services. For this reason, a modified Route 235 will need to continue to provide a normal bus service between Totem Lake and downtown Kirkland on Northeast 124<sup>th</sup> St, using Northeast 85<sup>th</sup> St to connect to downtown Kirkland as it currently does. Each of these services would feed some passengers to the I-405/85<sup>th</sup> Street inline station.

In addition, the short stretch of BRT between the CKC/ERC and 6<sup>th</sup> Street would also serve the two CKC/ERC BRT services that go to the Park Place/Kirkland Urban station.

In this way, this short stretch of BRT would reduce the travel times on bus routes connecting Redmond, Totem Lake, Overlake, and downtown Kirkland, and also serve the proposed BRT service connection between Totem Lake and Bellevue.

The ST template for the NE 85<sup>th</sup> Street bus-only lanes listed the ridership as being “N/A.” BRTPlan’s analysis showed that by 2040, roughly 2,500 daily passengers could use this stretch of BRT to avoid the I-405 interchange bottleneck and the 6<sup>th</sup> Street and 85<sup>th</sup> Street bottlenecks, in addition to the roughly 2,500 daily passengers that would use the CKC/ERC BRT from Totem Lake to Bellevue via the Park Place BRT stop in downtown Kirkland that would also avoid the downtown Kirkland bottleneck.

Thus, an estimated 5,000 daily passengers could use the one mile BRT on Northeast 85<sup>th</sup> Street. At a cost of \$105 million, it would cost about \$21,000 per passenger, and save an estimated 5 minutes per beneficiary per day by bypassing two bottlenecks: one at 6<sup>th</sup> Street/85<sup>th</sup> Street and one at I-405/85<sup>th</sup> Street. This compares favorably with the I-405 BRT system which saves 3 minutes per trip for 9,000 passengers, or 8 minutes per trip for 9,000 passengers at a cost of \$74,500 per passenger.

The link on Northeast 85th would need to be central median-aligned because the traffic bottleneck the BRT is aiming to avoid is the cloverleaf interchange at the I-405. A central median busway would allow buses to bypass this interchange without conflicting with turning traffic.

The Sound Transit template offers a different routing for the Northeast 85<sup>th</sup> Street bus lanes (shown in green below). They offered a two-way curb-aligned busway from 132<sup>nd</sup> Avenue NE Street to 6<sup>th</sup> St, then a one-way loop southbound on 6<sup>th</sup> Street, westbound on Kirkland Way, northbound on 3<sup>rd</sup> Street (at the Kirkland Transit Center) and eastbound on Central Avenue. Sound Transit remained open to service adjustments that might utilize this facility pending discussion.

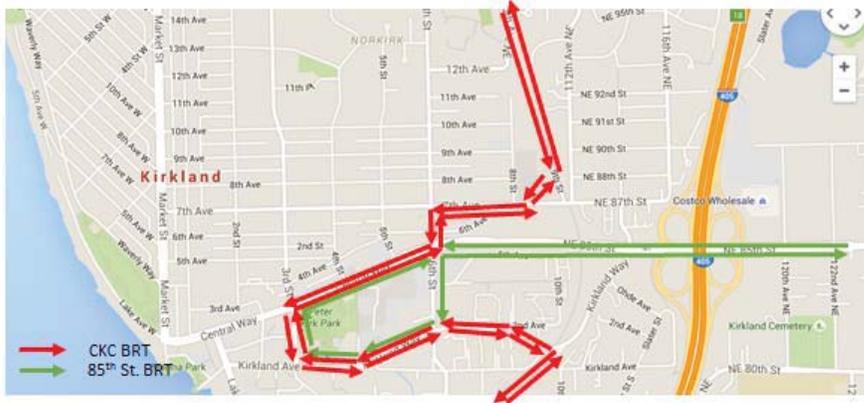


Figure 8: Sound Transit's proposed routing through Downtown Kirkland varies for the CKC/ERC BRT connection and the I-405 BRT connection

The curb alignment, however, would conflict with turning traffic at the I-405/85<sup>th</sup> Street interchange and significantly compromise any potential time savings benefit, unless the interchange were reconstructed as a Single Point Urban Interchange (SPUI). A curb alignment would also impact the left-turn at 6<sup>th</sup> Street.

#### NE 85<sup>th</sup> St bus only lanes and NE 85<sup>th</sup> Street inline station as a combined project

If the template for an inline station at Northeast 85<sup>th</sup> Street were combined with the NE 85<sup>th</sup> Street bus only lanes, specifically using Kirkland's requested median alignment, the ridership on both projects could be considerably increased.

*Therefore, BRTPlan suggests that the City of Kirkland request that the inline station at NE 85<sup>th</sup> Street, and the dedicated bus lane on NE 85<sup>th</sup> Street, be included as part of the basic 'intensive capital' scenario.* The demand for these facilities should be based on discussions with KCM about projected future services serving these facilities, and the speeds for now on the 85<sup>th</sup> Street BRT link should be assumed to be BRT speeds. This should yield an increase in passengers at the NE 85<sup>th</sup> Street station, on the I-405 BRT more generally, and thus make the project in general more competitive.