WTA

Rapid Transit Study – Feasibility

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1 Introduction to the Rapid Transit Study

In 2022-2023, Whatcom Transit Authority (WTA) embarked on the Rapid Transit Study, a year-long study to determine the viability of rapid transit in Bellingham on two key Go Line corridors. The purpose of this study was to identify desired rapid transit features and to prioritize one corridor for further planning and design. The study was also intended to provide several design options for addressing key areas of bus delay.

Why were these corridors selected for study?

WTA's existing Go Lines history and performance served as the basis for future candidate rapid transit lines. Located in corridors with the highest potential transit demand, Go Lines serve the greatest concentrations of WTA's priority populations and have the most ridership. They serve the community's most significant destinations including downtown, Western Washington University, Cordata, Barkley Village, and Sunset Square.

Out of the four possible Go Lines for study, the Gold, Green and Blue lines were selected for further analysis. The Green and Blue Go Lines were analyzed as one corridor due to the logical linear north-south alignment and greatest potential for transit-oriented development.

Figure 1 illustrates the Rapid Transit study corridors. The Gold Go Line (Route 331) is a circuitous north-south and east-west alignment connecting the Cordata Station (CTS) and the Bellingham Station (BTS) in downtown Bellingham. The route serves several important destinations including downtown, Whatcom Community College (WCC), Barkley Village, and Sunset Square.

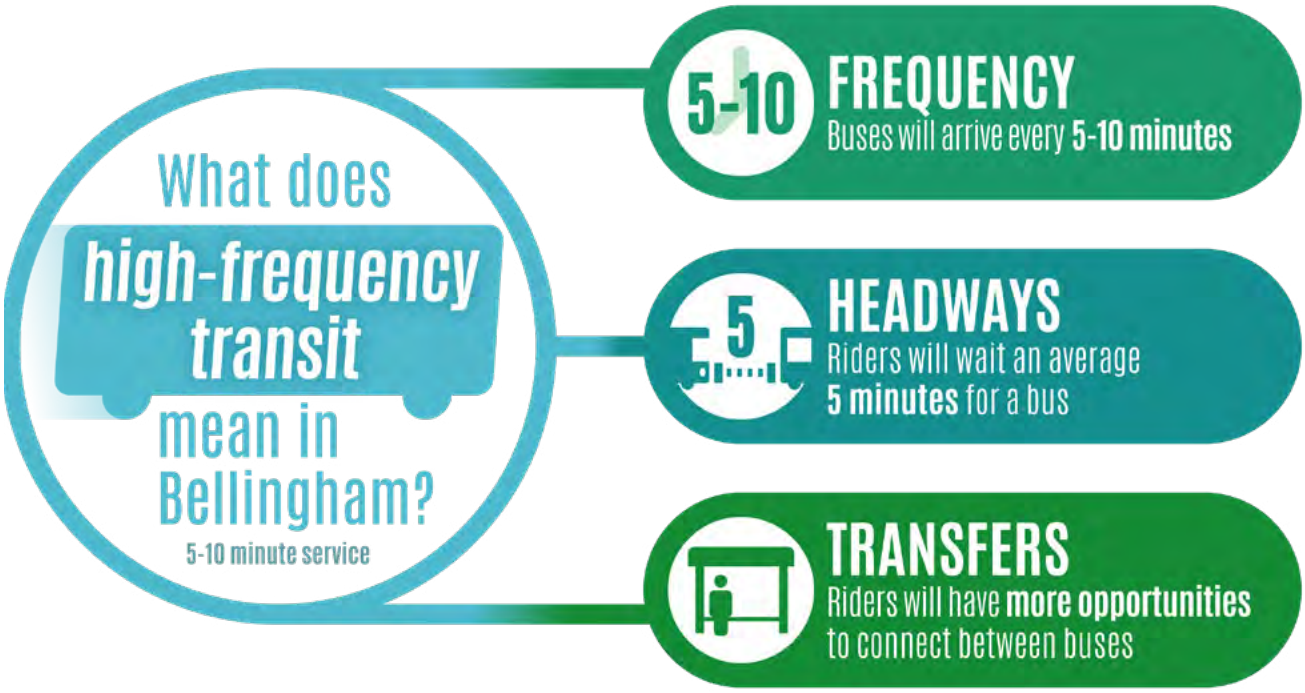
The Green plus Blue (Green/Blue) Go Lines (Routes 232 and the portion of the 100-series routes following the path of Route 190) is a fairly direct alignment connecting CTS, BTS, Western Washington University (WWU), and Lincoln Street. The Green Go Line serves downtown, Cordata, and the Birchwood neighborhood area. The Blue Go Line's primary destination is WWU, with a secondary destination of the Lakeway/Lincoln commercial area.

What problems does the study address?

The primary purpose of this study is to assess the potential for bus rapid transit (BRT) in two primary transit corridors in order to offer the community enhanced mobility and provide support for development in key activity centers and corridors. This study is also intended to seek opportunities to enhance existing transit services along high frequency routes by implementing speed and reliability improvements. Specifically, this study:

- Identifies and analyzes the feasibility of transit infrastructure improvements to improve the speed and reliability of transit along key high frequency corridors.
- Assesses alternatives and opportunities, including land use initiatives along corridors, to identify a Locally Preferred Alternative for a potential bus rapid transit system.
- Prepares work and documentation that would enable WTA to obtain local, state, and federal funding, including entering into the FTA's Project Development phase for a possible Capital Investment Grant.

Figure 1: Study Corridors



Current ridership is strong on the Gold, Green and Blue Go Lines. These Go Lines serve as a backbone to the entire WTA transit network, providing convenient service for riders traveling from smaller cities and rural areas into Bellingham for work, education, medical visits, shopping, and recreation. The routes that make up these Go Lines constituted approximately 60% of the total system ridership in 2022/2023. WWU generates the highest ridership demand of any destination in Bellingham.

Despite high ridership on these routes, mid-route transfers are difficult on the Go Lines. Headways of 15 minutes impact route connections; missed connections lead to rider frustration and impact the rider experience.

The City of Bellingham has shown strong policy support for transit service and transit-supportive development. Development is rapidly occurring in the designated Urban Villages, located along key transit corridors. The City's seven urban villages comprise less than 4% of the city's land area but are expected to accommodate 30% of future growth. While Bellingham is experiencing densification, much of the existing development pattern outside of the Urban Villages is low-density single-family residential or auto-oriented commercial development. Several Comprehensive Plan elements, including the Multimodal Transportation chapter and the Land Use, Urban Design and Housing chapter, include goals and policies supporting Transit-Oriented Development (TOD) and increasing mixed-use development intensity along transit corridors.

In addition, increased congestion from growth both inside and outside the city is causing delays, steadily decreasing runtimes, and decreasing reliability on transit routes. Bus arrivals can be highly variable, with some buses arriving on time and some arriving very late, causing rider anxiety and loss of ridership. Delays on buses can cause a spiraling effect where former bus riders switch to driving, causing even more congestion and bus delays. In 2018, WTA had to increase the number of buses on the Green and Gold Go Lines to maintain the same level of service due to increasing runtimes.

Over time, congestion will worsen, causing even more bus delays. The Whatcom Council of Governments (WCOG) traffic model for the year 2045 shows heavy congestion on most arterial streets during peak hours, including on all Go Line corridors. Daily vehicle hours traveled, which is the time that vehicle drivers spend driving, is expected to increase by 85 percent in Whatcom County and 111 percent in Bellingham from by 2045.

Growth in congestion and other challenges make continual operational investments unsustainable. Transit signal priority (TSP) exists at many signals, but this tool has limited ability to appreciably affect travel times. The existing transit service is constrained by limited rights-of-way. The arterial and collector street layout outside of the downtown area does not provide many options for alternative running ways. In some areas, there are pinch points that hamper efficient movement.

Definition, Goals and Objectives

The definition of rapid transit, and the goals and objectives for the study area are rooted in WTA's mission.

The mission is to enhance the community by:

Delivering safe, reliable, efficient, and friendly service

Offering environmentally sound transportation choices

Providing leadership in creating innovative transportation solutions

Partnering with our community to improve transportation systems

Definition of Rapid Transit

The WTA 2040 plan, adopted February 2022, provides these definitions of bus rapid transit (BRT) characteristics:

- **Very Frequent Service.** Buses arrive as often as every 5 to 10 minutes throughout the day, creating a backbone network of frequent service which improves the ability to transfer to different routes.
- **Specialized Vehicles**. Custom buses have unique designs and provide more capacity, more doors, and lower floors than typical buses for easier loading and unloading.
- **Efficient Boarding Process.** Bus dwell times are minimized and passengers load without waiting in line, using treatments such as: off-board fare collection or no fare collection; level boarding; or multi-door loading.
- **Additional Elements.** Transit priority treatments provided to improve speed and reliability, and enhancements at stations, such as real-time arrival signage. These improve the rider's experience.
- **Special Branding.** Unique designs make buses and stations more visible, raising awareness of rapid transit and increasing customer expectations for higher levels of service.

With the WTA 2040 plan as a foundation, this study developed three tiers of rapid transit definition. The tiered system defines levels of rapid transit improvements that allow WTA to provide phased implementation. These may improve financial feasibility and allow tailored rapid transit roll out to the context of the WTA system. The tiers range from Tier 1, a fully improved corridor, to Tier 3, localized improvements. The tier rapid transit definitions are:

Levels of Rapid Transit Improvements

Tier 1

This tier provides for the most rapid and frequent services and includes all the features for enhanced transit. It is considered full implementation of rapid transit.

- Service frequency of 5 to 10 minutes or less during weekdays; frequency of 30 minutes or less on weekends; and, provision of late-night service
- Dedicated transit lanes and Business Access Transit lanes (BAT) along most of the route
- Optimized bus stop spacing
- Branded rapid transit vehicles, bus stops, and other facilities
- Level platform boarding at stations and stops

- Transit signal priority enhancements and queue jump lanes
- Transit amenity enhancements along routes such as bike lockers, bike share, pedestrian-scale lighting, enhanced pedestrian crossings, and mobility hubs
- Off-board or zero fare payment systems
- Proximity to transit-oriented development and/or mixed-uses
- Real-time bus information at stations and stops

Tier 2

This tier provides enhancements to increase frequency and efficiency of transit service but does not include larger infrastructure improvements.

- Service frequency of 5 to 10 minutes or less for most of the day
- Some areas of dedicated lanes, BAT lanes, and bus/bike lanes along the route
- Optimized bus stop spacing
- Branded rapid transit vehicles, bus stops, and other facilities
- Enhanced pedestrian crossings
- Transit signal priority enhancements and queue jump lanes
- Off-board or zero fare payment, multiple on- board readers for loading at both doors
- Route proximity to transit-oriented development/mixed uses
- Real-time bus information at stations and stops

Tier 3

This tier provides local improvements at hot spots along the route. This tier includes some features of fully-realized rapid transit, which upgrade the existing service.

- Maintain existing Go Line frequencies
- Spot improvements at key intersections to provide dedicated lanes, such as BAT lanes or bus/bike shared lanes
- Transit signal priority enhancements and queue jump lanes
- Off-board payment or multiple on-board readers for loading at both doors
- Real-time bus information at stations and stops

Goals, Objectives, and Measures

The goals and objectives, on Exhibit A, are based on the rapid transit definitions and expand on the WTA 2040 vision of an enhanced network. The measures were developed to assess how well the rapid transit alternatives meet the goals and objectives.

Exhibit A: *Goals, Objectives, and Measures*

GOAL	OBJECTIVE	MEASURE
Improve safety and comfort for bus riders, pedestrians, and bicyclists along the corridor	• Meet all ADA requirements at stop and station locations • Improve accessibility along the corridor, specifically targeting routes to and from transit stops and stations • Enhance stops along the corridor for rider comfort and ease of use • Reduce conflicts between buses and other modes along the corridor	• Reduce transit conflicts with other modes • Improve rider access
Provide for more efficient transit operation along the proposed rapid transit corridor	• Reduce bus dwell time at stops • Maintain or improve on-time performance for transit • Optimize bus travel routes to minimize delays related to congestion • Provide bus rapid transit treatments (e.g., managed lanes, queue jumps, transit signal priority, etc.)	• Increase transit speed and reduce running time
Use transit to increase access to higher density land uses and activity opportunities along the corridor	• Increase ease of transit use to and from key land uses and specifically those with higher activity such as grocery stores, malls, medical facilities, etc. • Consider existing and future land use patterns in the placement of transit stops • Ensure partner agencies have coordinated plans that consider transit accessibility in future corridor improvements and redevelopment of parcels • Ensure that land use regulations along the corridor reflect/ support/require transit-oriented communities	• Increase ridership • Presence of transit-supportive land uses • Development of streetscape designed for non-motorized use

2 Existing and Future Conditions

This chapter provides an overview of existing conditions along the alternative routes. Appendix A provides the detailed technical memorandum describing existing conditions.

Service

The Gold Go Line (Route 331) currently operates between Cordata Station and Bellingham Station. Service is offered Monday through Friday from 6:40 a.m. to 10:40 p.m., Saturdays from 7:55 a.m. to 10:40 p.m. and Sundays from 8:10 a.m. to 8:10 p.m. Service on weekdays has 15-minute headways during the day and 30- to 60-minute headways in the evening. Headways for weekend service are 15 to 30 minutes. The scheduled runtime is 30 minutes in each direction.

The Blue Go Line (portions of Routes 105, 107, 108, 190, 196, and 197) currently operates Monday through Sunday. The combination of the routes offers 15-minute headways on weekdays, with up to 7 buses arriving in a given hour (some routes share arrival times). Service is provided on weekdays from 6:40 a.m. to 11:00 p.m. and on Saturdays from 8:25 a.m. to 11:00 p.m. Service on Sundays is provided from 8:25 a.m. to approximately 10:00 p.m. and operated with 30-minute headways during peak periods.

The scheduled run time for Route 190, which most closely matches the Blue Go Line corridor analyzed in this study, is 33 minutes in the inbound direction (including a 5 minute layover at Haggard Hall on the WWU campus, and 20 minutes in the outbound direction.

The Green Go Line (Route 232) currently operates Monday through Friday from 6:40 a.m. to 10:31 p.m. and Saturdays from 8:10 a.m. to 10:31 p.m. with 30-minute headways. Weekday service includes 15-minute headways during the day and 30- to 60-minute headways in the evening. Headways on the weekend service are 15 to 30 minutes.

On Sundays, Route 232 runs from 8:10 a.m. to 8:01 p.m. with 30-minute headways. The scheduled run time is 20-21 minutes in each direction.

Roadway and Traffic Signal Context

Table 1 summarizes the existing street network for the transit routes. The roadways along the study corridors are 2- to 5-lane facilities. Many corridors include bike lanes.

Construction of the following planned improvements begins in 2023.

- Telegraph Road between Deemer Road and James Street will be reconstructed with sidewalks, bike lanes, new bus stops , a center turn lane, and flashing pedestrian crossings.
- A full traffic signal will be constructed at the Lincoln Street/E Maple Street intersection.
- Lincoln Street north of E Maple Street to the south Fred Meyer driveway will be rechanneled from 5 to 3 lanes and buffered bike lanes created.

Table 1: *Existing Street Network Summary*

ROADWAY	TRANSIT ROUTE	CLASSIFICATION[1]	SPEED LIMIT[2]	# LANES	PEDESTRIAN FACILITIES	BICYCLE FACILITIES	ON-STREET PARKING
James Street	Gold	Secondary Arterial	25 mph	2 to 3	Yes	No	Yes
Woburn Street	Gold	Principal Arterial	35 mph	2 to 5[1]	Yes	Yes[2]	Intermittent
Alabama Street	Gold	Secondary Arterial	30 mph	3 to 5[3]	Yes	Yes[3]	No
Cornwall Avenue	Gold	Secondary Arterial	25 mph	3	Yes	Yes	Yes[4]
Billy Frank Jr. Street	Blue	Collector Arterial	25 mph	2	Yes	Yes5	Yes[5]
High Street	Blue	Collector Arterial	25 mph	2	Yes	No	Yes
Billy McDonald Parkway	Blue	Secondary Arterial	25 to 35 mph	2	Yes	Yes	No
Lincoln Street	Blue	Secondary Arterial	25 to 35 mph	2 to 5	Yes	Yes	No
Northwest Avenue	Green	Principal Arterial	25 mph	2 to 3	Yes	Yes	Yes[6]
Sunset Drive	Gold	Principal Arterial	35 mph	5	Yes	Yes	No
Telegraph Road	Gold	Collector Arterial	25 mph	2 to 3	Intermittent	No	No
Dupont Street	Green	Principal Arterial	25 mph	2	Yes	Yes	Yes
Lakeway Drive	Blue	Principal Arterial	25 mph	5	Yes	No	No
Cordata Parkway	Green & Gold	Secondary Arterial	35 mph	2 to 3	Yes	Intermittent	No

Source: Transpo Group, August 2022

1. *Roadway narrows south of Newmarket Street.*
2. *Bicycle facilities are provided south of Texas Street.*
3. *Roadway narrows west of James Street where bike lanes are also provided.*
4. *On-street parking is available along the east side of the roadway.*
5. *On-street parking with sharrow bike facilities is provided northeast of E Chestnut Street. A bike lane is provided along the northwest side with on-street parking along the southeast side southwest of E Chestnut Street.*
6. *Parking allowed along the east side south of Alderwood Avenue.*

- A flashing crosswalk will be installed at Lincoln Street/Viking Circle and an ADA-compliant transit island will be constructed at the southwest corner.

All transit stops on these routes have a bus stop sign designating the location along with a posted schedule. Most are ADA accessible and provide a bench and/or a shelter. In addition, approximately 45 transit stops have power allowing for electronic messaging and information for passengers.

Many signalized intersections along the routes have transit signal priority (TSP) or signal preemption technologies (see list on next page). These are intended to expedite bus movements through the intersection. It is unclear how well the existing TSP is working to reduce overall runtimes. This question will be the subject of a future analysis.

The Gold Go Line also has a queue-jump lane at the James St/Alabama St intersection. The lane includes a bus-activated green signal to clear out the westbound through movement queue. The queue-jump allows a bus driver to more quickly access the westbound right turn lane and clear the intersection. Observations at this intersection indicate that some drivers are not utilizing the queue jump and instead are waiting and merging into traffic with the through movement.

WTA staff has indicated that some operators only use the queue jump when they are behind schedule.

Existing Locations with Transit Signal Priority

Gold Go Line

- Cordata Parkway/W Bakerview Rd
- Orleans St/E Sunset Dr (SR 542)
- Racine St/E Sunset Dr (SR 542)
- Woburn St/E Sunset Dr (SR 542)
- Woburn St/Rimland Dr
- Woburn St/Barkley Boulevard
- Woburn St/Premier Way
- Woburn St/Alabama St
- Pacific St/Alabama St
- Orleans St/Alabama St
- James St/Alabama St
- Cornwall Ave/Alabama St
- Cornwall Ave/Halleck St/Ohio St
- Cornwall Ave/York St

Green Go Line

- Eliza Ave/W Bakerview Rd
- Northwest Ave/Birchwood Ave
- Northwest Ave/Lynn St
- Elm St/Broadway Str

Blue Go Line

- Ellis St/Potter St
- Lincoln St/Lakeway Dr
- King St/Lakeway Dr

Land Use and Population Characteristics

Existing

Table 2 provides an overview of the existing population, employment and households within ¼-mile of the study corridors. Additional details on land use are provided in Appendices A and B.

Transit ridership is influenced by population (housing) and employment (jobs) densities, as well as population characteristics such as vehicle ownership/zero car households, income, and proximity to key destinations. Higher household and employment densities support higher frequency transit service and allow for more household members to be less auto dependent. People living in locations with a dense mix of uses have shorter travel distances to a range of destinations, reducing auto needs for most daily trips.

Providing transit within a 5- to 15-minute walk (¼ to ½ mile) of uses, coupled with high transit frequencies, reduces wait times and makes transit a more attractive and viable mode of transportation for more people.

Figure 2 shows the travel modes for the City of Bellingham, the rest of Whatcom County, and the areas outside of Whatcom County region, based on the Whatcom Council of Governments (WCOG) 2019 Regional Transportation Study.

The study shows that most trips occur in single occupancy vehicles cars. Transit (other than school bus transit) is used for only 4 percent of the city trips and 1 percent of the county trips.

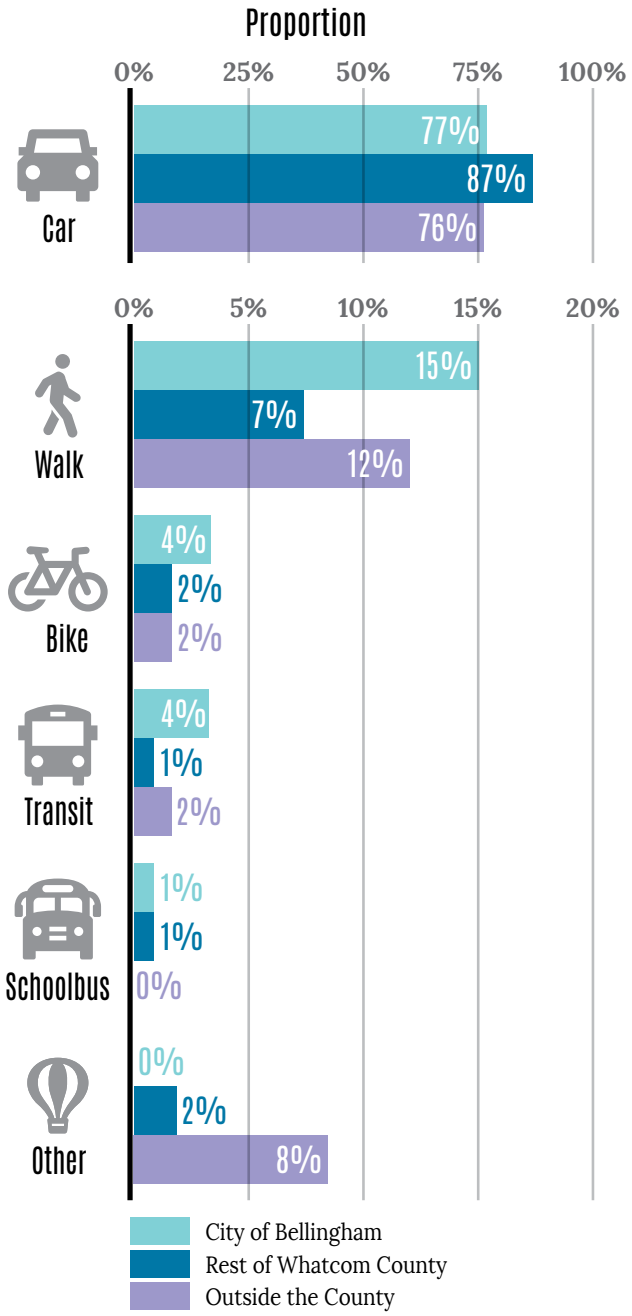
Vehicle ownership also influences the choice to travel by transit. Households without vehicles or those with lower-than-average vehicle ownership may represent a potential transit-dependent population. As shown on Figure 3, most Bellingham households have 1 or more vehicles.

Table 2: Existing Population and Land Use within 1/4 -Mile of the Study Routes

ROUTE	POPULATION	HOUSEHOLDS	EMPLOYMENT
Gold Go Line	9,670 people	5,300 houses	14,785 jobs
Green Go Line	8,375 people	5,260 houses	7,795 jobs
Blue Go Line	10,465 people	4,415 houses	12,875 jobs

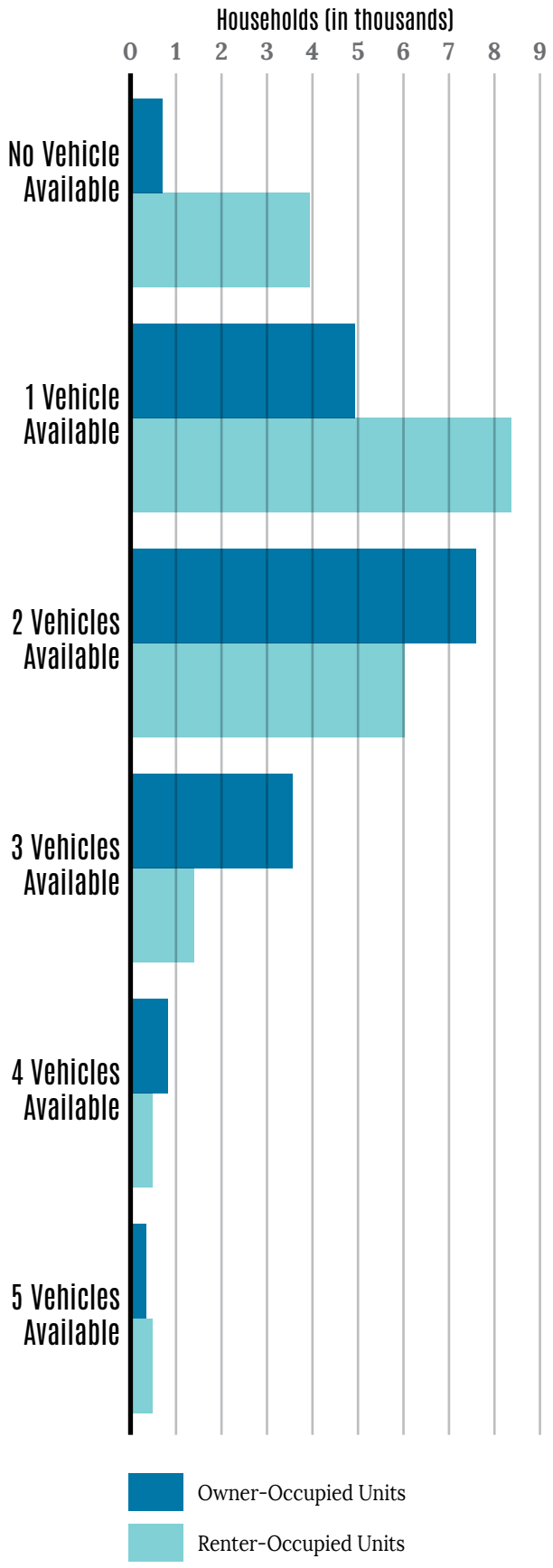
Source: WTA and Transpo Group, September 2022

Figure 2: *Trips Mode by Destination (Excludes Taxi/Transportation Network Companies)*



Source: Whatcom Council of Governments (WCOG) Whatcom Regional Transportation Study Analysis Report April 10, 2019.

Figure 3: *Access to Vehicle by Household for Bellingham*



Source: American Community Survey Estimates 2020

Ownership data were reviewed for households within a 10-minute walking distance (1/2 mile) of the Go Lines. Figure 4 illustrates the location of no-vehicle households in relation to the Go Lines.

The southern ends of the Gold and Green Go Lines serve the largest concentration of zero vehicle households. Households adjacent to Downtown appear to have fewer vehicles per household. Downtown residents may use transit and non-motorized transportation modes rather than relying on private vehicles. Further from Bellingham Station, the Gold Go Line serves many zero-vehicle households. These areas have more multi-family residential units and zoning. The Blue Line serves a smaller share of zero vehicle households compared to the Gold and Green Go Lines. The exception is in the area to the south of Bill McDonald Parkway. The South Hill, Happy Valley, and Sehome neighborhoods are primarily zoned single family residential. This zoning typically relates to a higher number of vehicles per household.

Future

Figure 5 illustrates the 2045 employment density proximate to the Go Lines. The Gold Line will serve the greatest projected employment density by 2045. This route serves the Downtown District, Barkley Urban Village, and the Bellis Fair Mall, all of which are currently employment centers. The Green Line will serve the second greatest future employment density, connecting Bellis Fair Mall to the Downtown District. The Blue Line will serve the least amount of future employment density, connecting the Downtown District to the Samish Urban Village adjacent to I-5. Western Washington University is an employment hub but is expected to have flat growth over the planning horizon due to flat or dropping enrollment rates enrollment rates per the WWU Office of Institutional Effectiveness.

Figure 6 illustrates the anticipated 2045 housing density proximate to the Go Lines. The Blue Line will serve the greatest projected housing density by 2045 based on the multifamily zoning in this area. The Gold Line will serve the second greatest future housing density, due to the large amounts of multi-family zoning along Alabama St and its alignment within several Urban Villages. The Green Line will serve the least amount of future housing density, as there are large expanses of single-family zoning between the two station areas.

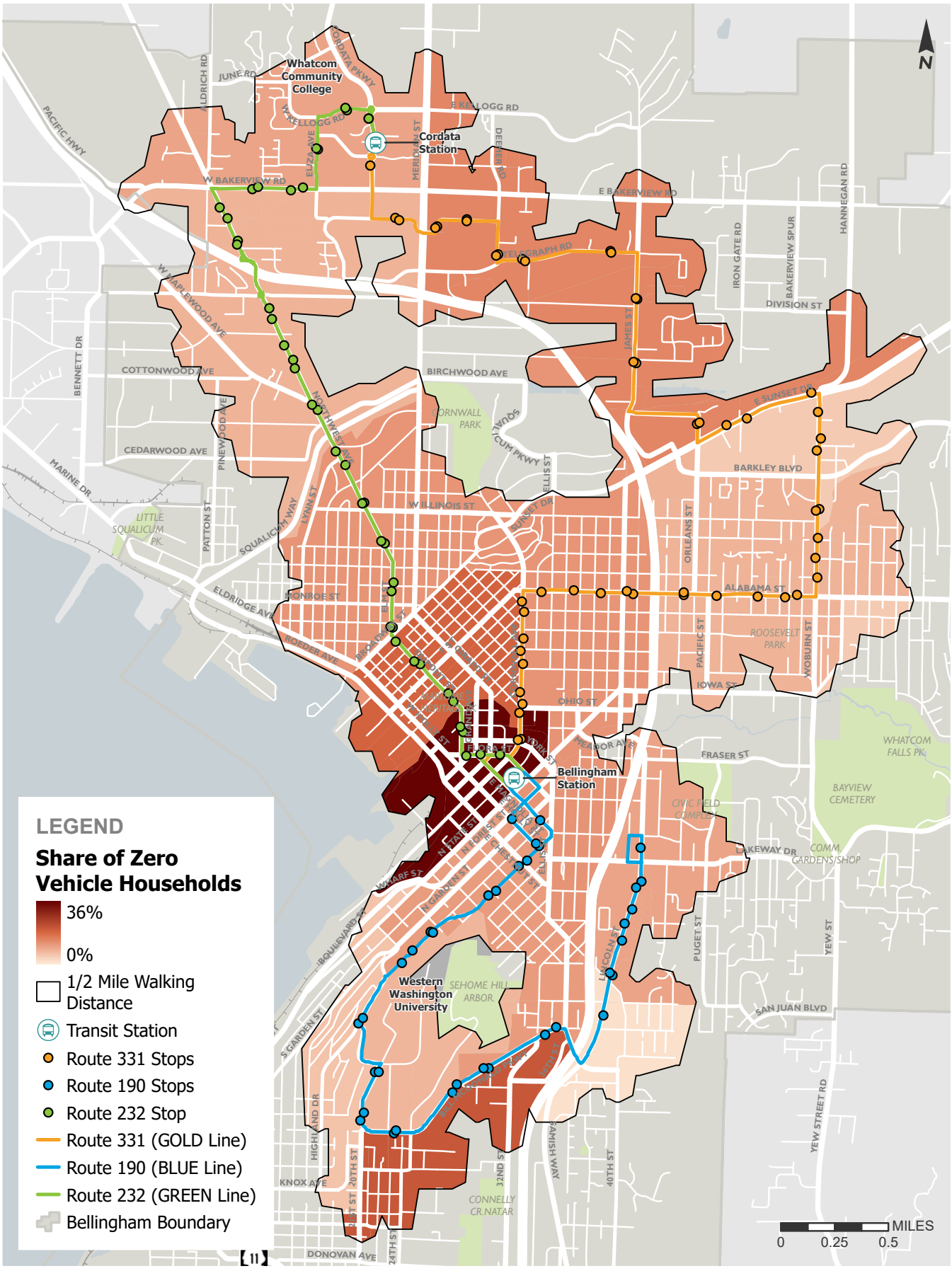


Figure 4: Zero Vehicle Households Proximate to the Gold and Green/Blue Go Lines

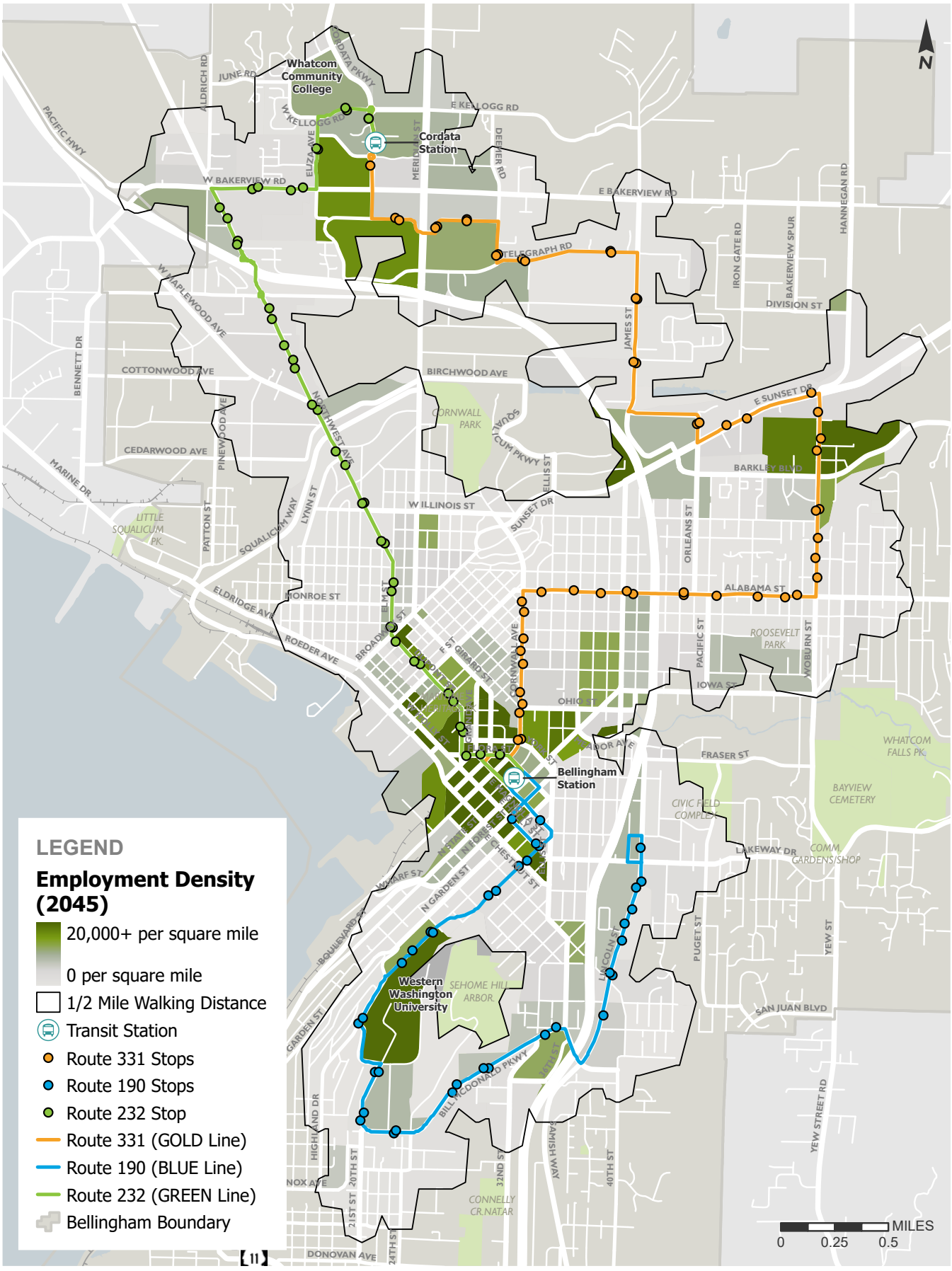


Figure 5: Year 2045 Employment Density Proximate to the Gold and Green/Blue Go Line

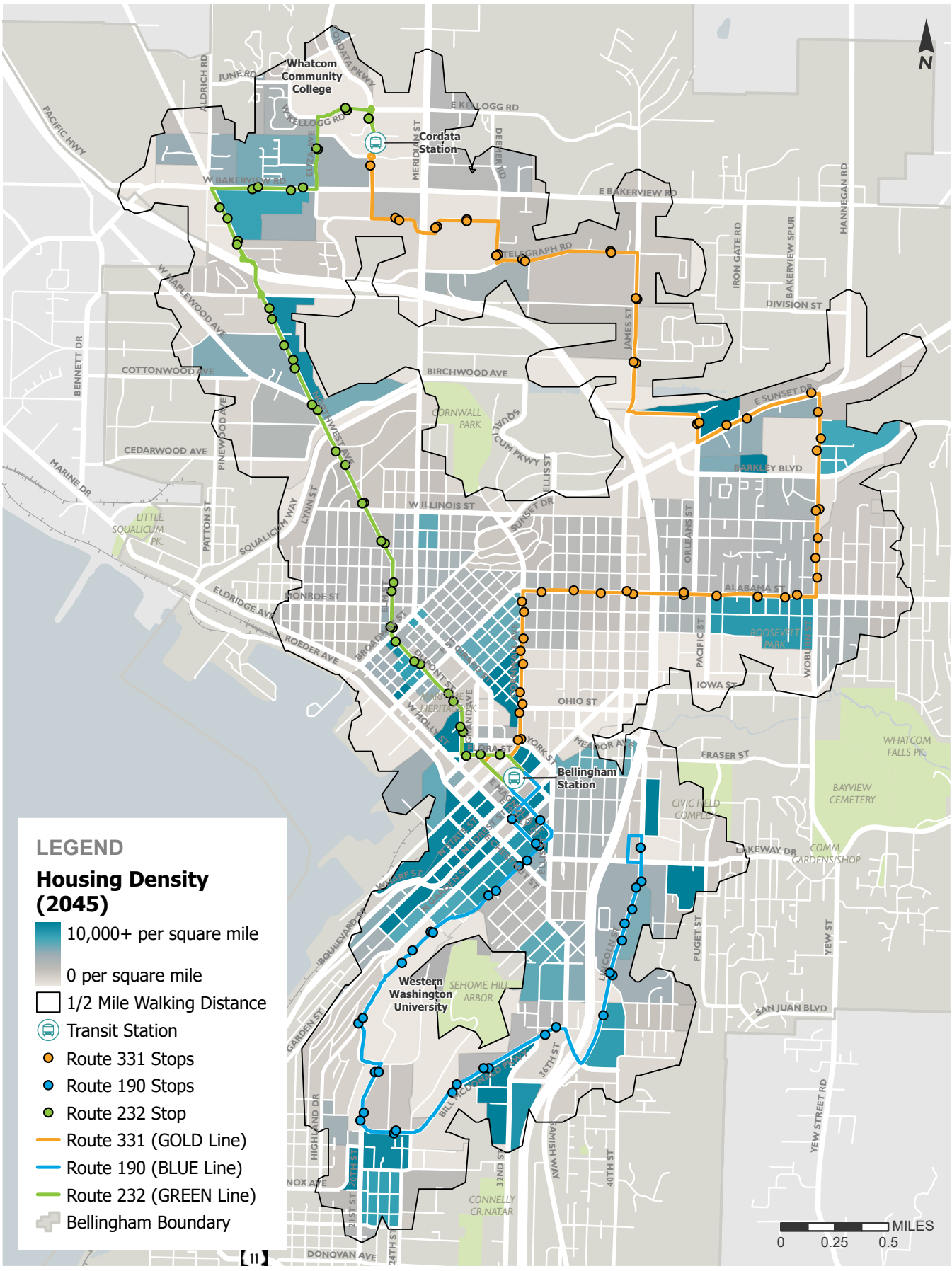


Figure 6: Year 2045 Housing Density Proximate to the Gold and Green/Blue Go Line

On-Time Performance and Traffic Congestion

WTA considers a bus to be on time if it arrives at timepoint locations within 5 minutes of scheduled service. WTA aims for the morning and midday transit trips to be on-time 95 percent or more of the time. PM peak period trips should be on-time 90 percent of the time or more. The Gold and Green Go Lines meet current on-time performance standards. However, WTA has adjusted run times and add buses to the Gold and Green Go Lines to meet on-time performance to address delays caused by traffic congestion. The Blue Go Line does not meet standards due to pinch points in the WWU campus area and near I-5, as well as long dwell times due to heavy loads and slow boarding. It can take 2-3 minutes to board students at each stop due to the card reader system for WWU. Overall, on-time performance is expected to suffer in future conditions without instigation of rapid transit.

Figure 7 illustrates the "hot spots" or pinch points along the transit routes.

Pinch Points

- **Lincoln St/E Maple St:** (*A traffic signal is planned at this location for 2023 such that this should not be a congestion point for transit.*)
- **Nevada St/Lakeway Dr**
- **Orleans St/Sunset Dr**
- **Orleans St/Lakeway Dr**
- **King St/Potter St/I-5 NB Ramps**
- **James St/E Sunset Dr** (*westbound turn-lane from Sunset St to James St*)
- **I-5 NB Ramps/E Sunset Dr**
- **Woburn St/E Illinois St**
- **N Samish Way/Abbott St**
- **S Samish Way/I-5 NB Off-Ramp**
- **Lincoln St/Lakeway Dr**
- **I-5 SB Ramps/Lakeway Dr**
- **James St/Meador Ave**
- **Lincoln St/Potter St**
- **Ellis St/N Forest St/York St**
- **King St/Lakeway Dr**
- **Northwest Dr/W Bakerview Rd**

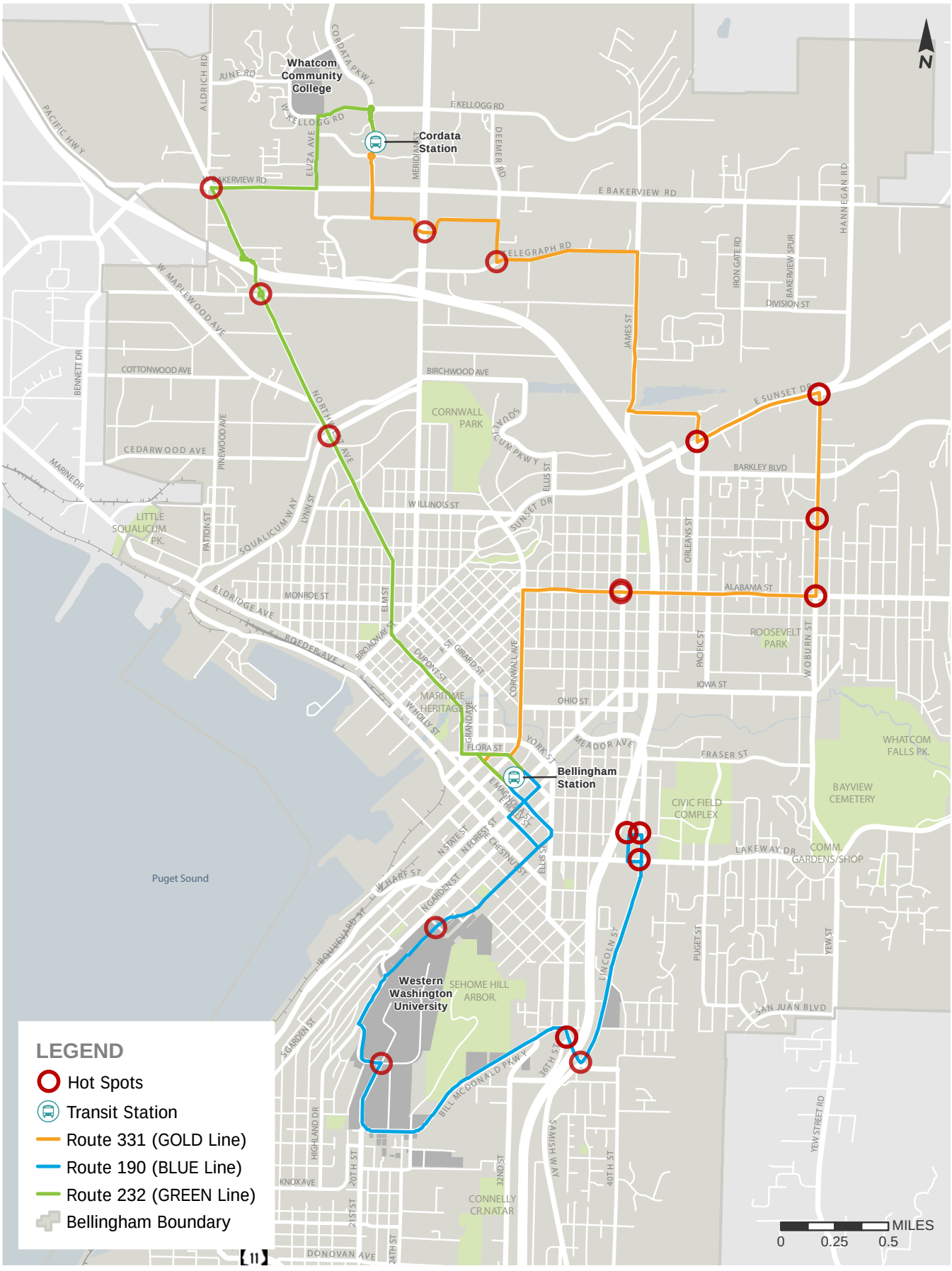


Figure 7: Existing Hot Spots Along Gold & Green/Blue Go Lines

Ridership

Total ridership, as measured in October 2022, was 70 percent of October 2019. The average 2022 median ridership for the Gold Go Line was approximately 35,560 boardings per month. The stops with the highest boardings were the Bellingham and Cordata Stations, as well as Orleans Street at Sunset Square and Woburn Street at North Street.

The average 2022 median ridership for the Green/Blue Go Line was approximately 38,460 boardings per month. For the Green Go Line, stops with the highest boardings are Cordata and Bellingham Stations, Northwest Avenue at Bakerview Road, and Northwest Avenue at Birchwood Center. The Blue Go Line's highest boardings are at WWU campus stops including at the Viking Union and Haggard Hall.[1]

Ridership forecasts were developed in TBEST ridership forecasting model by WTA staff. The model included multiple runs of transit service supply and population/employment inputs (year 2019 and 2040) to understand the potential riders with rapid transit service on the Gold and Green/Blue Go Line. Appendix C provides summary documentation related to the ridership forecasts.

The Gold rapid transit service is estimated to have 730,000 annual boardings in 2040, or approximately 24,000 annual boardings per mile. The Green/Blue rapid transit service is estimated to have 1.3 million annual boardings in 2040, or approximately 65,000 annual boardings per mile. Overall, ridership is anticipated to be higher with the Green/Blue Go Line.

WTA Systemwide Ridership:

- 7.7 million annual boardings in 2040 with the implementation of just the Gold rapid transit route (83 percent growth from 2019 estimates)
- 6.7 million annual boardings in 2040 with the implementation of just the Green/Blue rapid transit route (62 percent growth from 2019 estimates)
- Forecast ridership along the existing Green/Blue Go Line increases significantly within the Gold rapid transit scenario while forecast ridership along the existing Gold Go Line increases only moderately within the Green/Blue rapid transit route scenario. This, in part, explains the significant difference in systemwide ridership[2]

Route Boardings:

- 730,000 annual boardings in 2040 along the Gold rapid transit route (growth from 2019 estimate is 124 percent)
- 1.3 million annual boardings along the Green/Blue rapid transit route in 2040 (growth from 2019 estimate is 51 percent)

WTA Systemwide Revenue Hours:

- 238,000 revenue-hours of bus service annually in 2040, and an average of 32.2 boardings/hour for the Gold rapid transit route (change from 2019 estimates is 52 percent and –12 percent, respectively)
- 221,000 revenue-hours of bus service annually in 2040, and 30.1 boardings/hour for the Green/Blue rapid transit route (change from 2019 estimates is 41 percent and –17 percent, respectively)

The review of revenue hours shows implementing the Gold rapid transit would require WTA to provide more bus service hours systemwide and each service hour would, on average, be more productive than with the Green/Blue route. The reason the Gold rapid transit is more productive is because it has a greater potential for ridership capture. However, the ridership forecast analysis performed assumes the ability to implement rapid transit along both the Gold and Green/Blue Go Line routes. In addition, the forecast model does not account for the potential decreases in run times related to improvements. Refinements of ridership forecasts will be completed in future phases of the rapid transit project.

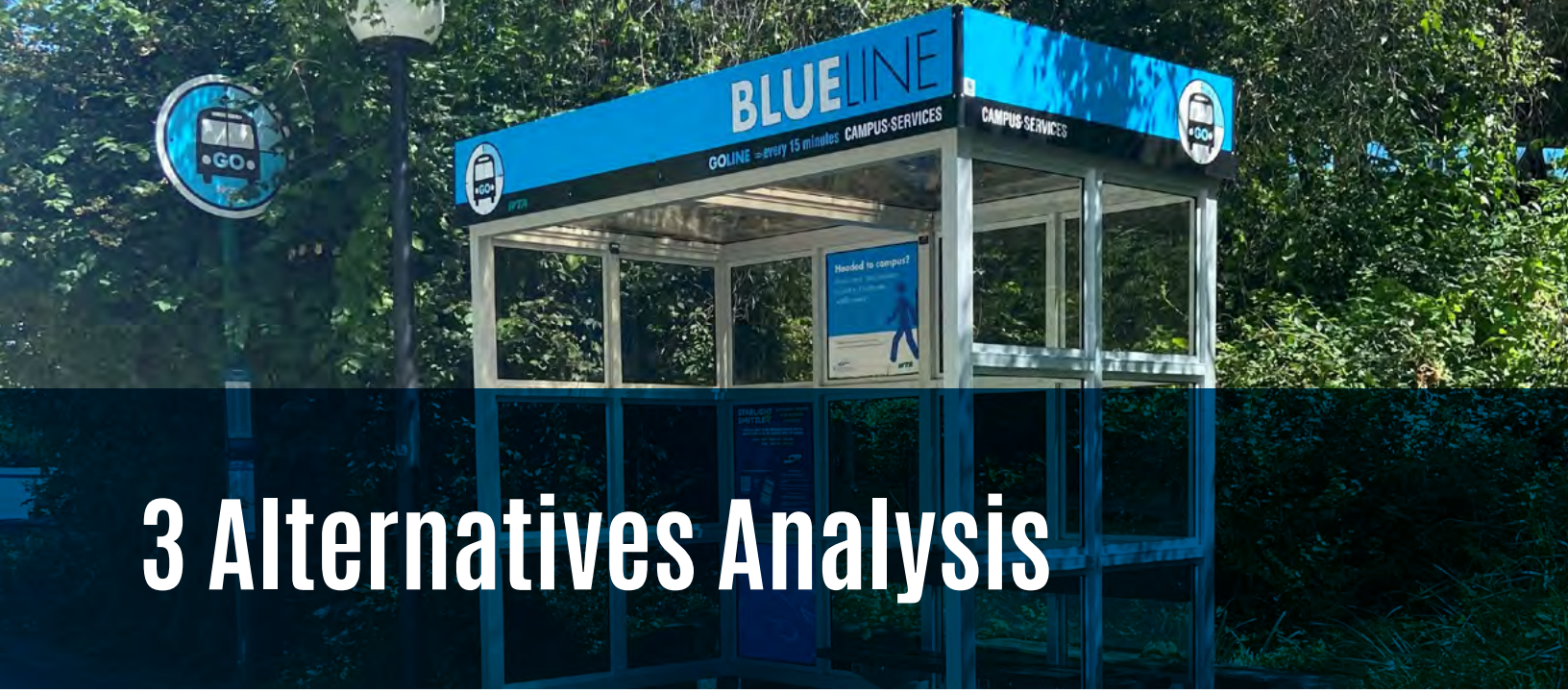
1. *Note that ridership has been slowly recovering from its low in 2020 at the height of the pandemic. While ridership figures used in this report are based on 2022 data, ridership is even higher in 2023.*

2. *Note that ridership projections are acknowledged to be conservatively high; these should be refined in later planning phases of a future rapid transit project using the Federal Transit Administration (FTA) forecast method.*

Key Findings

Findings for consideration in developing the rapid transit corridor alternatives include:

- **Gold Go Line Roadway Characteristics.** Travels along several roadways and makes numerous turns between the Cordata and Bellingham Stations. Vehicle turns and traffic congestion impact travel times. The Woburn St/Alabama St intersection and East Sunset Drive are key problem areas related to turns and congestion for this route.
- **Green/Blue Go Line Roadway Characteristics.** The Lincoln St/Lakeway Dr intersection, High Street between Oak and Campus Way, and the road segments from Bill McDonald to Lincoln Street on Samish Way are key areas where congestion impacts travel times for this route.
- **Land Use and Population Characteristics.** A review of the jobs/housing balance along the routes shows a correlation for transit usage between dense housing and employment areas.
- **Stop Spacing.** There are closely spaced stops, along the Gold, Green and Blue Go Lines, with little-to-no ridership that should be considered for elimination or consolidation. Consolidation equates to fewer stops for buses, thus reducing the route running times. This stop consolidation may help with on-time performance.
- **On-Time Performance.** There are several intersections where congestion and queuing are contributing to bus delays. The evaluation showed on-time performance was met for the Gold and Green Go Lines, but due to congestion, WTA has added buses and adjusted run times to meet this metric. The Blue Go Line is not meeting the current on-time performance metric due to congestion along the route.



3 Alternatives Analysis

This chapter summarizes the processes, methods, and evaluation to determine if a corridor meets the criteria to move forward into a detailed conceptual study for rapid transit implementation. The process includes:

1. **Description of Alternatives**. This study develops concepts for rapid transit improvements along the 2 corridors (Gold Go Line and Green/ Blue Go Line). The intent of the concept development is to illustrate potential transit improvements needed for a successful rapid transit project along each route.
2. **Evaluate and Compare Alternatives**. The study then reviews the transit concepts based on a set of project readiness measures. This allows for prioritizing the conceptual alternatives for implementation and demonstrates how the alternatives meet the goals established at the outset of this study.

The evaluation is based on consideration of the goals, objectives, and measures that were presented in the previous chapter. The measures are used to quantitatively compare the 2 corridors.

As described previously, 3 goals have been established for rapid transit:

- Improve safety and comfort for bus riders, pedestrians, and bicyclists along the corridor
- Provide for more efficient transit operation along the proposed rapid transit corridor
- Use transit to increase access to higher density land uses and activity opportunities along the corridor

The objectives outlined in the previous chapter further describe the intent and outcomes of the goals. Measures were developed to quantify how each corridor alternative meets the intent of the objectives. Six measures (summarized on Exhibit A in Chapter 1) were selected that correspond with one of the three (3) goals and objectives for WTA's rapid transit project. Additional details on how the measures are used for the evaluation and comparison are provided in the section after the description of the alternatives.

Description of Alternatives

Based on coordination with the technical advisory committee (TAC), the highest priority for rapid transit is to achieve 5- to 10-minute or less service, so riders do not need to rely on a schedule. The treatments below reduce the bus delays, which is essential to achieving the desired wait times.

Key operational improvements incorporated into the conceptual alternatives include the following:

- One-half mile stop spacing through stop consolidation and relocation
- Signal treatments including queue jumps, transit signal priority (TSP), and/or timing improvements
- Far-side stop locations
- Lane treatments including shared BAT/bike lanes

In addition to meeting the goals and objectives, WTA would provide branded rapid transit buses. A successful rapid transit alternative would also include transit-supportive land uses along most of the corridor and street design that supports non-motorized access to the stops.

Gold Go Line (Route 331)

The proposed improvements along the Gold Go Line (Route 331) are summarized in Figure 8. The improvements identified were deemed to be most feasible.

General improvements necessary for implementation of rapid transit include:

- Additional buses to accommodate greater frequencies;
- 60-foot articulated buses to accommodate heavy passenger loads; and,
- On- or off-board fare collection system that reduces dwell times

Key improvements along the Gold Go Line to help address congestion and increase speed and reliability include the following measures.

- Shared BAT/bike lanes along Woburn Street between E Illinois Street and Alabama Street and along Alabama Street between James Street and Cornwall Avenue
- Coordinated transit signal priority throughout the corridor
- Development of a bus-only contraflow lane along E Champion Street between Cornwall and Railroad Avenues, allowing inbound buses to go directly to the Bellingham Transit Station rather than circling around the block (assuming the station stays in its current location in the long-term)
- Queue jumps at the James St/Birchwood Ave/ Orchard Dr intersection (northbound only), at the Cordata Pkwy/W Bakerview Rd intersection (southbound only), and at the East Bellis Fair Pkwy/Guide Meridian Road intersection
- Extended turn lane or other improvements for westbound buses on Sunset Drive turning north onto James Street, as well as and signal improvements at Orleans St/Sunset Dr
- One-half mile stop spacing and far-side stops through stop consolidation and relocation. While the stop locations for the entire route should be reviewed, Cornwall Avenue between Alabama Street and Champion Street is the priority

Green/Blue Go Lines (routes 232 and 100-series following the path of route 190)

The proposed improvements along the Green/ Blue Go Line (Routes 232 and 100-series following the path of route 190) are summarized in Figure 9.

General improvements necessary for implementation of rapid transit include:

- Additional buses to accommodate greater frequencies;
- 60-foot articulated buses to accommodate heavy passenger loads; and,
- On- or off-board fare collection system that reduces dwell times.

Key improvements along the Green/Blue Go Line to help address congestion and increase speed and reliability include these features.

- Coordinated transit signal improvements throughout the corridor
- Roundabout at the Lincoln/Potter intersection to enable bus turnarounds (included in the City's Lakeway Multimodal Transportation Study)
- Stop consolidation, especially along Northwest Avenue between W Bakerview Road and Elm Street and along Lincoln Street;
- Queue jumps at key intersections (see Figure 9)
- A BAT- lane along Northwest Avenue
- Bus-only contraflow lane along E Champion Street allowing inbound buses to go directly to the BTS rather than circling around the block (assuming the BTS stays in its current location)
- Widen High Street between E Oak Street and W Campus Way. The narrow roadway causes buses to bunch due to lack of passing space, resulting in operational delays
- Improve the signal at the Bill McDonald Pkwy/W College Way intersection to prevent pedestrian crossings while buses are turning. Coordinate with WWU on a potential pedestrian scramble signal operations
- Re-channelizing Bill McDonald Parkway between W College Drive and S Samish Way to provide a shared BAT/ bike lane. There is available width along this portion of the route to allow for the inclusion of a BAT/bike lane in each direction utilizing existing median and bike lanes.
- Provide signal improvements at Samish Way intersections with Bill McDonald Parkway and Lincoln Street

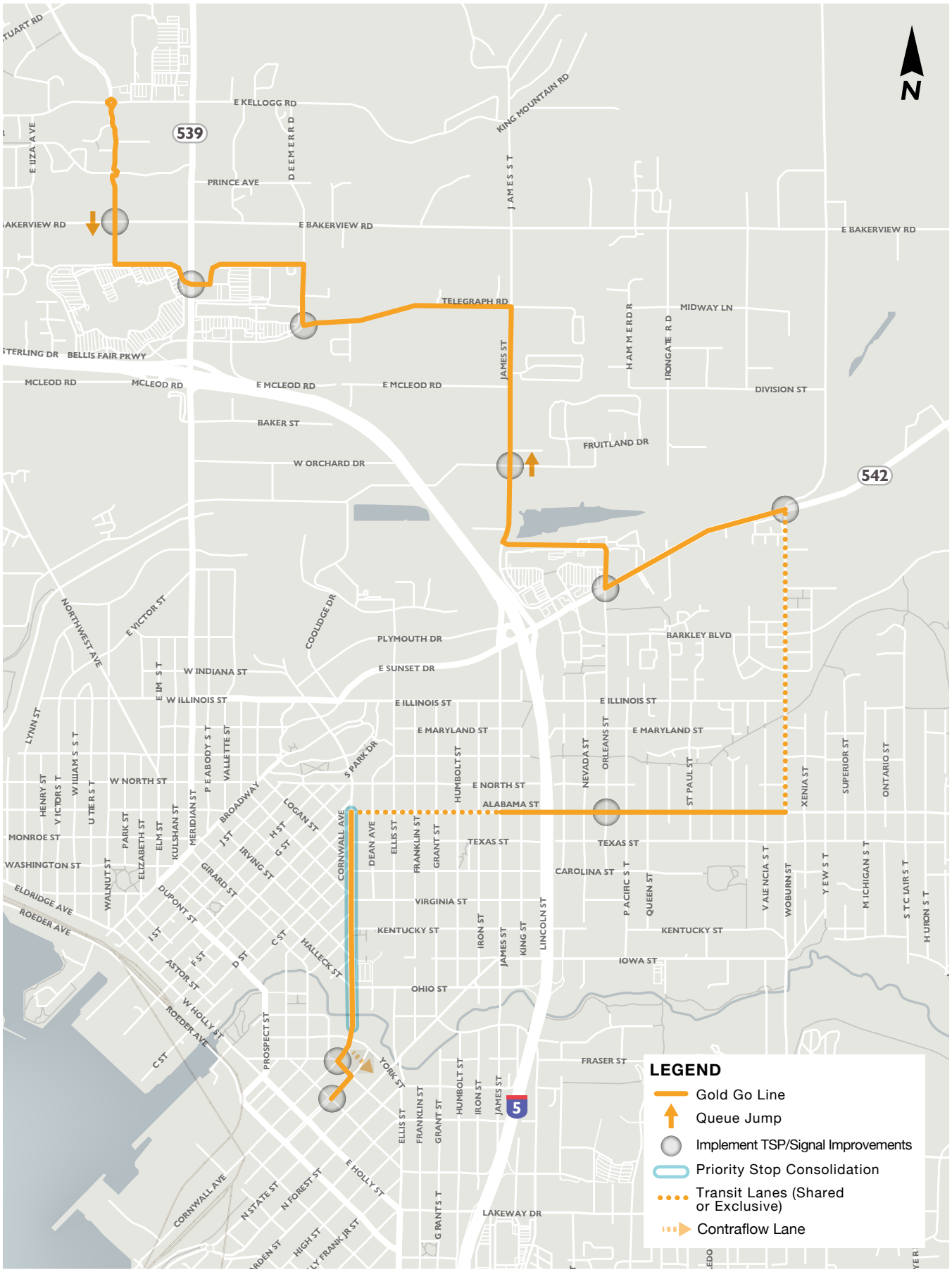


Figure 8: Proposed Gold Go Line Improvements

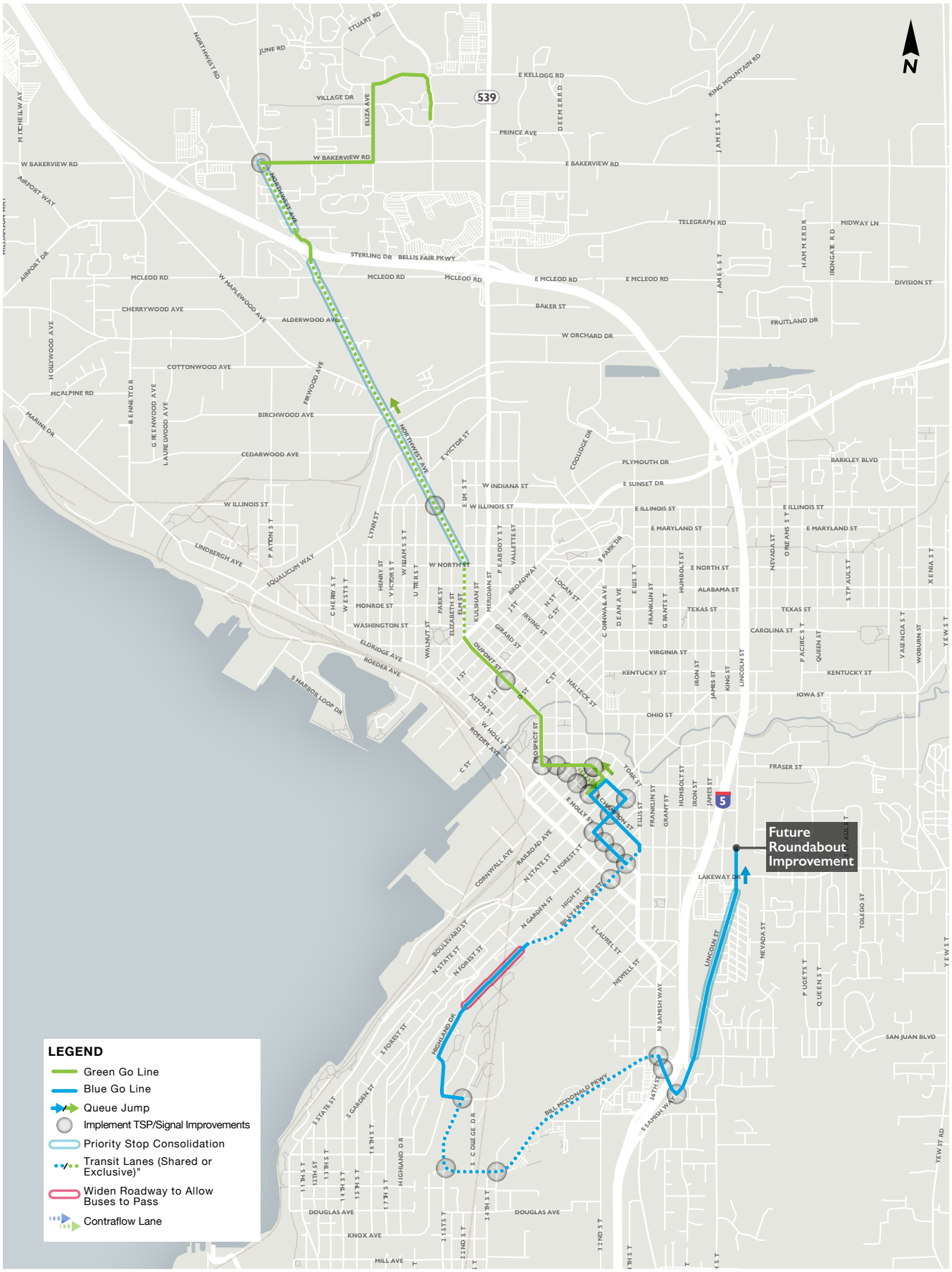


Figure 9: Proposed Green/Blue Go Lines Improvements

Evaluate and Compare Alternatives

This section provides an evaluation and comparison of the alternatives described above based on the measures outlined in Chapter 1. The intent of the evaluation is to determine which corridor has the most potential to meet the overall goals and objective to implement a rapid transit corridor and identify a recommended Locally Preferred Alternative (LPA). The 6 measures are described in detail in the following sections.

Rating System

Six evaluation measures were selected to quantitatively compare the 2 corridors. Each measure corresponds to 1 of the 3 goals for WTA rapid transit. The corridors are evaluated based on a rating system of 1 to 3 to assess compatibility with the measure, where 3 is the most compatible in meeting the intent of the measure or has the best outcome and 1 is least compatible. There is a maximum score of 18 for the corridor alternatives.

As described previously, the alternatives are the Gold Go Line and the Green/Blue Go Line. The Green/Blue Go Line is being considered as 1 alternative for rapid transit implementation. Given the different characteristics along the Green and Blue Go Lines, each line is rated separately for compatibility. Then a final score is determined by averaging the Green and Blue individual scores. Only the final score, of the combined Green/ Blue Go Line, is presented in this chapter.

Measures Evaluation

1. Reduce Transit Conflicts with Other Modes

Description

This measures the number of reductions in conflicts of transit with other modes, such as personal vehicle traffic (particularly in higher congestion areas) or pedestrians.

Conflict reduction between personal vehicles and buses could be provided through BAT or shared transit-bike lanes. Vehicle-bus conflict reduction is measured in the length of BAT or shared transit-bike lanes identified along the route.

Reductions in pedestrian-bus conflicts are accomplished through the filling in missing sidewalk connections and through larger waiting areas for riders (separating riders waiting for buses from other users of the sidewalks). Conflict reduction is measured in the amount of improved or new sidewalks and/or passenger waiting areas that can be provided based on available rights-of-way (ROW) estimates, the built environment, and topography.

Goal

Improve safety and comfort for bus riders, pedestrians, and bicyclists along the corridor.

Why it is important

Safety is a priority for WTA. Areas where transit vehicles conflict with other modes can result in potential collisions. The ability to have designated transit travel ways or signal priority for transit at intersections can reduce conflicts.

Separating bikes from vehicle traffic with designated bike lanes can also reduce conflicts with transit vehicles. Lastly, the ability to provide adequate space in rider waiting areas means sufficient space for both transit and non-transit pedestrian and keeps pedestrians on the sidewalk areas.

Methods and Data Sources

- Scoring was based on the percent of total linear feet of roadway with available width for adding BAT lanes. The potential for dedicated BAT lanes was based on existing and potential ROW.
- Pedestrian conflicts were assessed through a review of the available passenger waiting areas at each stop along the route. The assessment identified insufficient waiting space or missing sidewalk.. This evaluation used aerial imagery with field verification as needed. ROW were evaluated to determine if any such insufficiencies could be addressed. ROW data were provided by WTA staff.

Table 3 provides a summary of the evaluation. High percentages are given a 3 and low percentages are given a 1, and then the results are averaged. As noted previously, only the final score is presented for the combined Green/Blue Go Line.

As shown in Table 3, the Green/Blue Go Line scores the highest for reducing transit conflicts with other modes. The score is based on availability of waiting areas, availability of sufficiently-sized waiting areas, and having a high portion of the route with sufficient right-of-way where BAT lanes can be provided.

Table 3: Evaluation Results by Alternative: Reduce Transit Conflicts with Other Modes

GO LINE	% OF STOPS WITH ADEQUATE PEDESTRIAN WAITING AREAS (SCORE)	% OF STOPS WITH ABILITY TO PROVIDE MISSING WAITING AREAS (SCORE)	% ROUTE WITH POTENTIAL FOR BUS LANES (SCORE)	SCORE[1]
Gold	66% (1.0)	42% (1.0)	66% (1.0)	1.0
Green/Blue[2]	75% (2.5)	77% (2.5)	88% (2.5)	2.5

Source: Transpo Group, June 2023

1. *Score is the average of the individual scores for each characteristic related to waiting area and bus lanes.*
2. *Percentage and score represent the average between the Green and Blue Go Line characteristics.*

2. Improve Rider Access

Description

A measure of the extent to which the area surrounding the rapid transit corridor is conducive to pedestrian access.

Goal

Improve safety and comfort for bus riders, pedestrians, and bicyclists along the corridor.

Why it is important

All transit riders are pedestrians at some point in their journey. Some are bicyclists. Designing a network that supports a transit-oriented lifestyle means making it easier to use transit for all trip types, not just commuting to work.

Methods and Data Sources

- The evaluation looked at sidewalk facilities leading up to the transit stops and the sidewalk network within ¼-mile of the transit lines to understand missing infrastructure. This evaluation was completed via aerial imagery, GIS data provided by WTA, and field verification.
- The evaluation considers ROW available to enhance or construct sidewalks in areas with missing links or infrastructure. ROW data were provided by WTA.

While the criteria identify areas of missing or deficient sidewalks, it does not attempt to account for issues around the overall pedestrian environment and the level of stress experienced by people walking to a bus stop. In some areas, particularly at heavily congested intersections like Orleans St/Sunset Dr, it may be very uncomfortable to walk, despite the presence of sidewalks, intersection markings, and pedestrian signals. This discomfort affects perceived access to transit stops and reduces ridership.

Figure 10 summarizes the existing sidewalk facilities and highlights the ¼-mile walking distance to the Gold and Green/Blue Go Line.

As shown on Figure 10 for the Gold Go Line, there are currently areas of missing sidewalk along the route and to and from the route. Notable areas of missing sidewalks are along James Street, Telegraph Road, neighborhoods leading to and from James Street, and neighborhoods leading to and from W Bakerview Road. The area around Bellingham Station has a robust sidewalk network.

Other pedestrian access issues identified include deficiencies along E Sunset Drive. E Sunset Drive is a 5-lane facility along the transit route with a posted speed limit of 35 mph. The roadway can be difficult to cross due to the traffic volumes, number of lanes, and vehicle speeds. Pedestrian crossing facilities are limited to signalized intersections, where the roadway can also be wider due to turn lanes. Additional barriers such as the I-5 Corridor exist along the Gold Go Line, which limits crossing opportunities. Where there are crossings in the I-5 area, sidewalks are narrow.

Figure 10 also shows that sidewalks are provided along the majority of the Green/Blue Go Line. A small section is missing along the west side of Northwest Avenue. Along W Bakerview Road, pedestrian facilities are lacking or degrading, primarily along undeveloped parcels.

Missing links along the west side of Highland Drive, W College Way, and Bill McDonald Parkway are planned to be constructed as part of the city's TIP. In addition to the sidewalks shown, there are sidewalk facilities on the WWU campus, increasing pedestrian connectivity along the Green/Blue Go Line.

Table 4 provides a summary of the pedestrian access evaluation by ranking the corridors against existing access and planned improvements. Areas with good pedestrian access and potential for future improvements were given a 3. Limited pedestrian access and fewer areas of future improvement were given a 1, and then the results are averaged to determine the score.

As shown in Table 4, the score for the Green/Blue Go Line is higher for pedestrian access compared to the Gold Go Line.

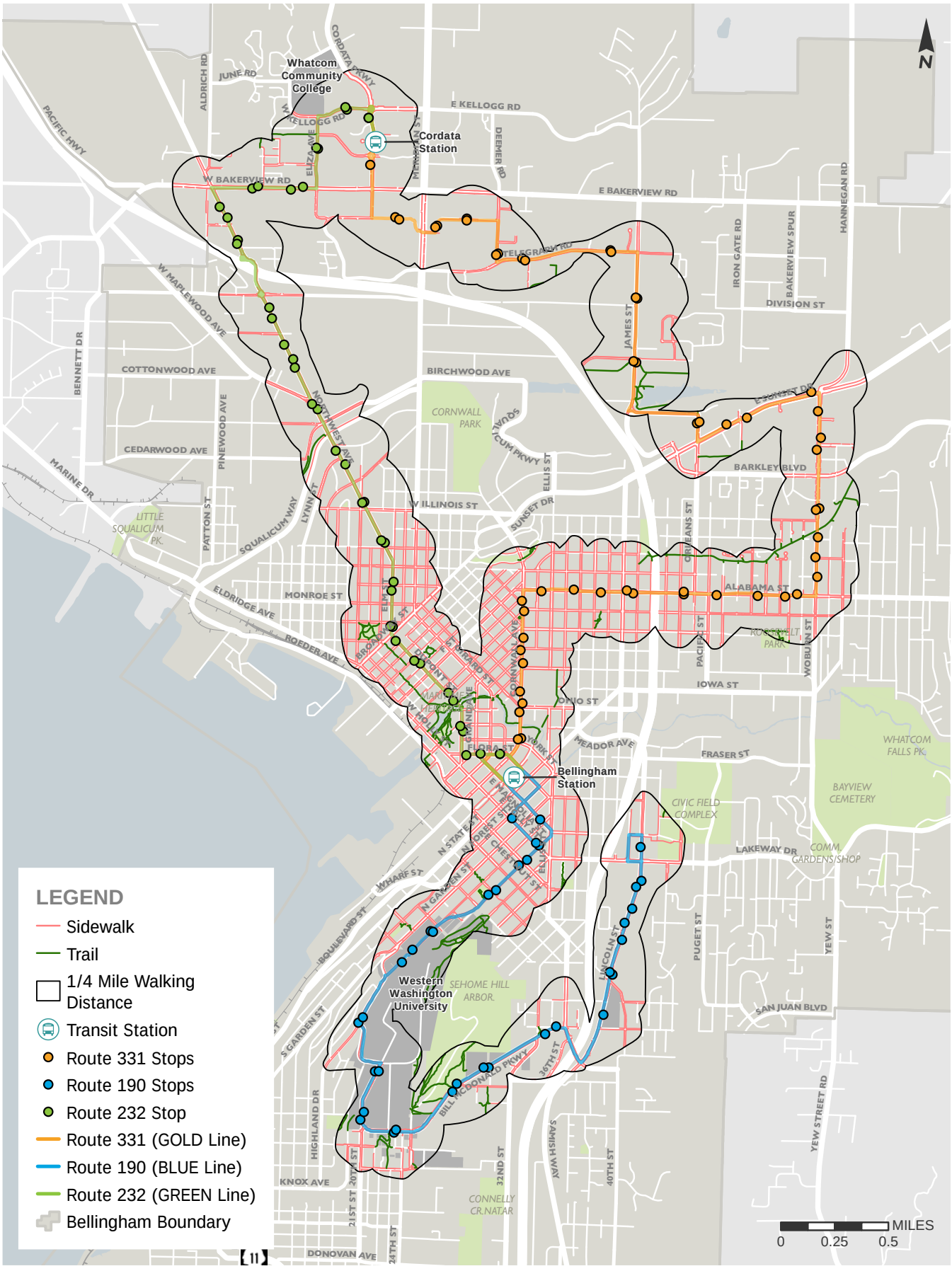


Figure 10: Sidewalk and Trail Facilities Proximate to Gold and Green/Blue Go Line

Table 4: Evaluation Results by Alternative: Pedestrian Access

GO LINE	EXISTING PEDESTRIAN ACCESS	FUTURE PEDESTRIAN ACCESS WITH IMPROVEMENTS	SCORE[1]
Gold	1.0	1.0	1.0
Green/Blue	2.5	2.5	2.5

Source: Transpo Group, June 2023

1. *Score is the average of the existing and future pedestrian access.*

3. Increase Transit Speed and Reduce Running Time

Description

This measure reviews opportunities to provide signal improvements including transit signal priority (TSP) and queue jumps to increase the speed of the bus by reducing the amount of time spent by transit vehicles waiting at signals. In addition, the measure reviews the percent reduction in projected end-to-end rapid transit running time (in minutes) compared to running time (in minutes) of an existing local route operating in comparable space and time.

Goal

Provide for more efficient transit operation along the proposed rapid transit corridor

Why it is important

The project's Technical Advisory Committee (TAC) indicated that frequency was the highest priority for rapid transit service. Maintaining speed and reliability support this priority. Roadway congestion relates directly to bus delays. Long wait times between buses impact riders' convenience and ultimately impact ridership.

This measure addresses the potential to reduce travel times for customers and speed up service. It highlights the impact of limited-stop operations (i.e., consolidating stops), off-board fare collection, and other service improvements on high-ridership routes.

In addition, infrastructure improvements reduce delays, improve speeds, and provide ROW for buses. The ability to provide infrastructure improvements impacts whether a route can achieve the desired speeds and potential for 10-minute or less headways.

Methods and Data Sources

- The number of signalized intersections along the routes where TSP exists or could be implemented was considered.
- The quantity of intersections along the routes where queue jumps exist or could be added was reviewed. Intersections with current or future signalized traffic control and right-turn lanes were determined to be eligible for implementation of a queue jump for this initial scan.
- A high-level stop consolidation review was based on the stop spacing and ridership. One-half mile stop spacing for rapid transit is ideal. Some stops are currently spaced closer than ½ mile or have low ridership.

Figure 11 shows the existing TSP locations along the Go Lines. More TSP locations are along the Gold Go Line than the Green/Blue Go Line.

Stop spacing and ridership were reviewed to determine the ability to consolidate, eliminate, or relocate stops to place them ½ miles apart. The majority of stop spacing now is ¼ mile along both corridors. Figure 8 (see Description of Alternatives) showed the priority for stop consolidation on the Gold Go Line along Cornwall Avenue between Alabama Street and York Street. Along the Green/Blue Go Line, priority stop consolidation is along Northwest Avenue between W Bakerview Road and W North Street and along Lincoln Street between Byron Avenue and 1st Street as shown on Figure 9 (see Description of Alternatives).

Table 5 shows the number of signals where potential improvements could be made to either existing TSP or queue jumps or by providing new TSP and queue jump technology. In addition, Table 5 also shows the potential reduction in run time for each Go Line. This runtime reduction is based on the number of stops that could be consolidated or eliminated. The difference in route length was

Figure 11: Existing Gold and Green/Blue Go Line TSP Locations

normalized by calculating signal improvements per mile and the reduction in run time per mile.

Providing signal improvements with TSP and queue jumps will allow for transit operations to be improved over current conditions, and increases the likelihood that transit running speeds can be increased. In addition, consolidating or eliminating stops would reduce the run time along the route. Areas with the most potential signal improvements per mile or reduction in run time per mile were given a 3. Areas with limited potential for signal improvements or reduction are given a 1. The results were averaged to determine the score.

As shown in Table 5, the Green/Blue Go Line would have slightly more opportunities per mile for signal improvements compared to the Gold Go Line. The reduction in run time per mile is similar for both alternatives

4. Increase Ridership

Description

This measure considers future ridership potential for a route, assuming rapid transit can be implemented.

Goal

Use transit to increase access to higher density land uses and activity opportunities along the corridor

Why it is important

The measure assesses the extent to which providing rapid transit would result in additional ridership within the corridor. It assumes that rapid transit can be developed with corridor improvements and that the land use patterns support rapid transit.

Methods and Data Sources

- Ridership forecasts were developed in TBEST by WTA staff, transit-service supply and population and employment inputs are used to project 2040 riders. This informs the potential ridership with rapid transit implementation on either the Gold or Green/Blue Go Lines.
- Higher ridership receives a higher score.

Table 6 summarizes the ridership potential and scoring. The annual boardings were normalized to annual boardings per mile for comparison. Highest annual boardings per mile were given a 3.

Implementing the Gold Line would require WTA providing more bus service hours system wide. Each service hour would on average be more productive than with the Green/Blue Line. The ridership forecast analysis performed assumes the ability to implement rapid transit along both the Gold and Green/Blue Line.

Table 5: Evaluation Results by Alternative: Increase Speed and Reduce Run Time

GO LINE	NUMBER OF TRAFFIC SIGNAL IMPROVEMENT OPPORTUNITIES	SIGNAL IMPROVEMENTS PER MILE[1] (SCORE)	POTENTIAL REDUCTION IN RUN TIME[2]	REDUCTION IN RUN TIME PER MILE (SCORE)	SCORE[3]
Gold	22	1.5 (2)	9.5 minutes	0.66 minutes per mile (2)	2.0
Green/ Blue	33	1.7 (3)	13 minutes	0.65 minutes per mile (2)	2.5

Source: Transpo Group, June 2023

1. *The number of traffic signal improvements opportunities is divided by the total length of the Line, which is 14.42 miles for the Gold Go Line and 19.98 miles for the Green/Blue Go Line.*
2. *Reduction is calculated by determining the number of stops that could be eliminated multiplied by the dwell time. The analysis assumes 26 stops eliminated for Gold Go Line and 36 stops for Green/Blue Go Line, with an average dwell time of 22 seconds for the Gold Go Line, 19 seconds for the Green Go Line, and 26 seconds for the Blue Go Line.*
3. *Score is the average of signal improvements and run time reduction.*

Table 6: Evaluation Results by Line: Increase Ridership

GO LINE	2040 ROUTE RIDERSHIP (ANNUAL PASSENGER BOARDINGS)	2040 ANNUAL BOARDINGS PER MILE[1] (SCORE)	SCORE
Gold	730K	50,600 [2]	2.0
Green/Blue	1.3M	65,100 [3]	3.0

Source: Transpo Group, June 2023

1. *Annual boardings divided by the total 2-way length of the Go Line, which is 14.42 miles for the Gold Go Line and 19.98 miles for the Green/Blue Go Line.*

5. Transit-Supportive Land Use

Appendix B provides a comprehensive review of land-use policies in the City of Bellingham applicable to the transit alternatives.

Description

A measure of how well areas surrounding the rapid transit corridor are planned to be supportive of frequent transit service.

Goal

Use transit to increase access to nhigher density land uses and activity opportunities along the corridor.

Why it is important

The success of transit depends on the surrounding land use and activity environments for ridership. Carefully-planned land use is key to the long-term success of investments for rapid transit.

Methods and Data Sources

- Each route was measured against policy, planning, and demographic conditions and given a numeric score ranging from 1 to 3 based on a route's compatibility with the variable being measured.
- Land use type emphasizing multi-family, mixed use, urban village, and institutional uses represent those most compatible with transit (see Figure 12).
- Evaluations consider zero vehicle household areas combined with student population areas as those residents are more likely to use transit.
- Future employment density areas for Year 2045 were based on the Whatcom County Council of Governments (WCCOG) travel demand model.
- Future housing density areas for Year 2045 were based on the WCCOG model

Table 7 summarizes the scoring for transit-supportive land use, which is described in more detail in Appendix B.

As shown in Table 7, the Gold Go Line has the highest score relative to transit-supportive land uses, given the existing and future land use conditions along the route.

Table 7: *Evaluation Results by Alternative: Transit-Supportive Land use*

GO LINE	EXISTING LAND USE PATTERN	ZERO VEHICLE HOUSEHOLDS/ STUDENT POPULATION	2045 EMPLOYMENT DENSITY	2045 RESIDENTIAL DENSITY	SCORE[1]
Gold	2.0	1.0	3.0	3.0	2.3
Green/Blue	2.0	2.5	1.5	2.0	2.0

Source: BERK, June 2023

1. *Represents the average score for transit-supportive land use characteristics reviewed.*

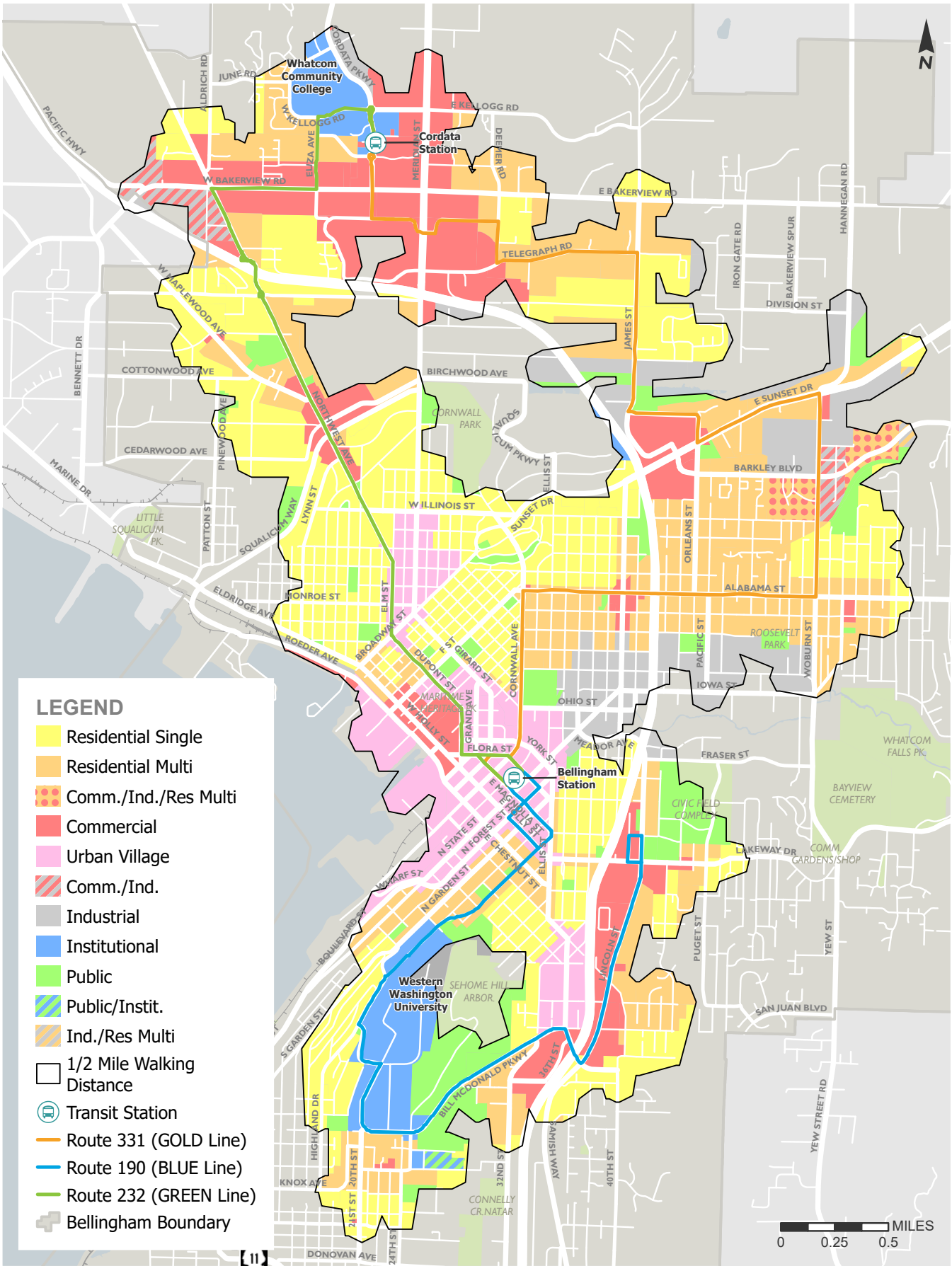


Figure 12: Existing Land Uses Near Gold and Green/Blue Go Lines

6. Streetscape Designed for Non-Motorized Use

Description

A measure of the extent the transportation network adjacent to the Go Line corridors supports connectivity. First and last mile connection quality to and from adjacent land uses is critical for the success of any transit system, but especially for rapid transit.

This measure of streetscape design is different from measure 2 "Improve Rider Access" because it relates to the quality of the non-motorized design such that it encourages walking and biking and users feel safe and secure whereas measure 2 evaluates if there are missing links.

Goal

Use transit to increase access to higher density land uses and activity opportunities along the corridor.

Why it is important

The success of transit depends largely on the surrounding physical environment and the ability of riders to access stops. Designing a transportation network that supports a transit-oriented lifestyle means making it easier to use transit for more than just to and from work.

Methods and Data Sources

The land use review for the areas adjacent to the Go Lines included consideration of how the non-motorized transportation network is integrated with the neighborhoods to provide good first- and last-mile connections. Additional detail is provided in Appendix B.

Table 8 summarizes the scoring for the review of the bicycle and pedestrian network design and shows that the Gold Go Line currently has a non-motorized network that is more integrated with the neighborhoods and provides better connections.

Table 8: *Evaluation Results by Alternative: Non-Motorized Design*

GO LINE	BICYCLE NETWORK	PEDESTRIAN NETWORK	SCORE[1]
Gold	3.0	3.0	3.0
Green/Blue	1.5	1.5	1.5

1. *Represents the average score for bicycle and pedestrian network design.*

Capital Costs

Planning-level capital costs were reviewed for the corridor alternatives. The planning-level costs are provided for context and were not considered as a measure to evaluate the alternatives. It is noted that the opportunities for rapid transit improvements along the Gold Go Line are fewer due to right-of-way constraints, which results in a lower capital cost for the Gold Go Line alternative. Table 9 provides an overview of the factors considered in estimating the costs for each route.

Table 10 provides a summary of the estimated planning level capital cost by route.

As shown in Table 10, the cost per mile would be lowest along the Gold Go Line. As mentioned, the primary reason the costs would be lower is because there are fewer opportunities for transportation improvements. The limited opportunities to make transit improvements means it may be more difficult to improve speed and reliability and achieve 5- to 10-minute headways in this corridor. The Green/Blue Go Line has more opportunities to allow for transit improvements that would in turn allow for a more reliable system. In this way, buses would be able to maintain speeds to achieve 5- to 10-minute headways.

***Table 9:** Capital Cost Route Factors*

COST ELEMENT	GOLD GO LINE	GREEN/BLUE GO LINE
2-Way Route Length	14.42 miles	19.98 miles
Minimum Headways	5-10 minutes	5-10 minutes
Total Run Time	30 minutes	40 – 50 minutes
Number of Traffic Signal Improvements	8 traffic signals	24 traffic signals
Potential Transit Stop Right-of-Way Needs	800 square -feet	2,080 square -feet
Vehicles (60-foot Articulated Electric Bus)	9 buses	14 buses
Stop Spacing	½ mile	½ mile
Number of Rapid Transit Stations	30 stations	42 stations

Source: Transpo Group, June 2023

***Table 10:** Evaluation Results by Line: Capital Cost*

COST ELEMENT	UNIT COST	GOLD GO LINE TOTAL COST	GREEN/BLUE GO LINE
Vehicles[1]	$1,500,000 per vehicle	$13,500,000	$21,000,000
Stations[2]	$750,000 per station	$22,500,000	$31,500,000
Transit Improvements[2, 3]	$300,000 per signal + $270 per linear foot	$5,500,000	$20,900,000
Potential Right-of-Way Needs for Stops	$80 per square-foot	$96,000	$134,400
Planning/Engineering Services[4]		$9,800,000	$18,300,000
Total (Low End Contingency 10%)		$56,500,000	$101,000,000
Total (High End Contingency (25%)		$64,200,000	$114,800,000
Cost per Mile (in Millions of Dollars)[5]		**$3,900,000 - $4,500,000**	**$5,000,000 - $5,700,000**

Source: Transpo Group, June 2023

1. *Based on Whatcom Transportation Authority Zero Emissions Bus Transition Study, July 2023.*
2. *Based Community Transit Orange Line Feasibility Study, August 2018.*
3. *Based on cost estimates for preliminary design concepts prepared by KPFF Consulting.*
4. *Assumed to be 35 percent of construction costs.*
5. *Cost per mile is total cost divided by the 2-way length of the route.*

Recommendations

Table 11 summarizes the alternatives evaluation and provides a recommendation related to identifying a locally preferred alternative (LPA).

Table 11: Evaluation Results by Measure by Alternative

MEASURE	GOLD 1	GOLD 2	GOLD 3	GREEN/BLUE 1	GREEN/BLUE 2	GREEN/BLUE 3
Reduce Transit Conflicts with Other Modes	★			★	★	½★
Pedestrian Access	★			★	★	½★
Increase Transit Speed and Reduce Run Time	★	★		★	★	½★
Increase Ridership	★	★		★	★	★
Transit-Supportive Land Use	★	★	½★	★	★	
Streetscape Designed for Non-Motorized Use	★	★	★	★	½★	
		11.3 TOTAL			14 TOTAL	

Locally Preferred Alternative (LPA) Recommendation

This study shows that rapid transit is judged to be feasible within Bellingham and that WTA should proceed to the next phase to move forward with additional planning and eventual implementation of rapid transit. This study shows that the Green/Blue Line Alternative has the highest score for compatibility of a rapid transit corridor and should be the route considered for the LPA.

4 Next Steps

This chapter addresses the next steps for WTA in moving the rapid transit project forward and identifies near-term improvements that could be considered along the routes. The near-term improvements address bus delays identified in the feasibility analysis through projects that WTA could implement while continuing.

Project Timeline

The project timeline (see Figure 13) identifies an 8-year schedule, with key milestones shown for each year. The project began with this study, intended to determine the feasibility of rapid transit in Bellingham and to recommend an LPA. The next major milestone will be to conduct outreach and refine the rapid transit alternatives. The project schedule assumes no right-of- way acquisition is required with the project being completed within the existing public right-of-way. The schedule could be longer if ROW acquisition is required, given the time needed to negotiate and purchase right-of-way.

Near-Term Steps

Rapid transit bus lines typically require long lead times to develop. In the interim, WTA intends to implement shorter-term measures to enhance existing services on both the Gold and the Green/Blue Go Line corridors. Shorter-term improvements will include increased bus frequencies, transit signal priority adjustments, hot spot street improvements, and possibly stop consolidation.

These recommended next steps will facilitate shorter-term enhanced transit service and support longer-term rapid transit in the community. These will also position WTA well for potential funding and future implementation steps for the rapid transit project:

- **Staff Resources.** Identify WTA staff resources to champion rapid transit. At least 1 full-time staff will be required to manage the project and interface with the Federal Transit Administration (FTA). Additional staff may be needed to help prepare the work. This could be done through consultant assistance or a mix of consultant work and part-time WTA staff.
- **Funding and Budgeting for Additional Work.** WTA should explore funding and budgeting to accommodate additional steps to implement the rapid transit LPA. The next steps to be funded would be outreach and refinement of the alternatives, which would include additional stakeholder engagement, public involvement, and coordination with funding and jurisdictional partners. Future work will also include 30 percent design and environmental analysis. The FTA does not fund these initial steps in the process. WTA will need to secure alternative funds.

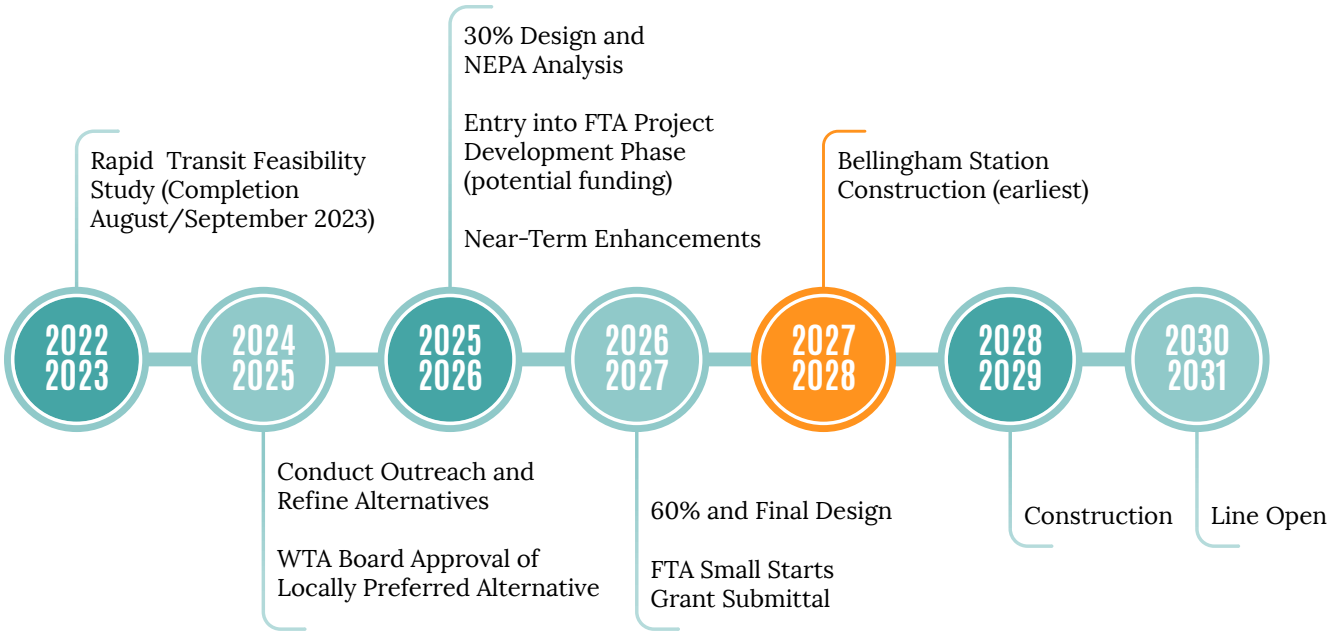


Figure 13: WTA Rapid Transit Project Timeline

- **Review Transit Stops.** This study established that some existing transit stops along both Go Line corridors are underutilized. Implementation of rapid transit will require elimination of stops along the routes to maintain speed and reliability. WTA should conduct a more detailed review of transit stops along the LPA route and the other alternative and consider eliminating and consolidating transit stops. This provides more efficient spacing and reduces the number of stops with little-to-no ridership.
- **Transit Signal Priority.** WTA should conduct a more detailed review of TSP operations within the transit system and consider modifying operations to a true TSP system rather than a preemption system. The TSP should be modified to work within the existing signal system parameters. This will improve efficiency of transit operations while maintaining progress of all traffic along the corridor, rather than disrupting overall corridor progression with a preemption system.
- **Land Use Coordination.** Having transit-supportive land uses along transit routes is important for attracting new riders to rapid transit service. Transit-supportive land use means density of uses, a mix of residential and commercial uses, and providing good urban design to connect riders to and from transit stops. The City of Bellingham will be updating the Comprehensive Plan by 2025. WTA should coordinate with the City on recommended land uses and help identify areas where transit-supportive land use could increase transit ridership, especially along the LPA. The City already has Urban Villages that allow for mixed-use, dense land use development. However, areas adjacent to parts of the Green/Blue Go Line route have no Urban Villages. WTA should work with the City to identifying transit overlay areas where even greater densities may be allowed to support transit ridership and help decrease auto dependency. Within the transit overlay areas, consideration should be given to both land use and urban design. Additional details related to land use and policy considerations are provided in Appendix B and below.
- **Bus Needs.** WTA should investigate the need for 60- foot articulated buses on either corridor to accommodate projected transit rider loads. This analysis is needed early in the process to ensure related facility improvements, such as sufficient maintenance space and curb space at stops, are included with the design of those facilities.

Table 12: Recommended Changes to Parking Spaces Required Based on Residential Land Use

USE	MINIMUM PER DWELLING UNIT	MAXIMUM PER DWELLING UNIT
Single-Family/Manufactured Home	1 per dwelling unit	2 per dwelling unit
Duplex/Multifamily	Studio: 0 1 bedroom: 1 2 bedroom: 1 3+ bedroom: 1	Studio: 1 1 bedroom: 1 2 bedroom: 1.5 3+ bedroom: 1.5
Live/Work Unit	1 per dwelling unit	1 per dwelling unit
Urban Village Residential – Fairhaven, Fountain District, and Samish Way	Studio: 0 1 bedroom: 1	Studio: 1 1 bedroom: 1
Urban Village Residential – Waterfront District	2 bedroom: 1	2 bedroom: 1.5
Urban Village Residential – Downtown District	3+ bedroom: 1	3+ bedroom: 1.5

Source: BERK, 2023

Table 13: Recommended Changes to Densities for Residential Land Use to Support Transit

RANGE	MINIMUM DENSITY	MAXIMUM DENSITY
Low Density	7,200 sf/unit (6 units/acre)	4,000 sf/unit (11 units/acre)
Medium Density	3,500 sf/unit (12 units/acre)	1,450 sf/unit (30 units/acre)
High Density	1,450 sf/unit (30 units/acre)	None

Source: BERK, 2023

Land Use Policy and Code Change Recommendations.

As described above, having transit-supportive land use is important to attracting ridership. The City of Bellingham parking requirements and land use densities were reviewed, and the following summarizes recommended changes that should be considered along rapid transit corridors to encourage transit use and reduce reliance on single occupant vehicles. Appendix B provides additional details.

Parking.

Limiting parking supplies can help discourage reliance on personal autos and encourage use of other modes like transit. Table 12 outlines recommended changes to parking space requirements for residential uses to encourage use of non-private vehicle modes of transportation. As the code is currently written, the required parking standards are inflexible; there is no range between the minimum and maximum required. To build flexibility and reduce the redundancy of parking spaces, it is recommended that a standard minimum parking space per unit be established, with consideration made for unit sizes. This reduction in required parking spaces will allow greater residential density per acre and encourage the use of alternatives to single occupancy vehicles.

Land Use

Table 13 provides recommendations for changes in allowed residential densities. Areas with medium-to-high density residential development are more likely to generate transit ridership than those with low density land use. Recommended changes in other density categories can ensure appropriate transitions between low-, medium-, and high-density development.

The existing land use code minimum and maximum densities are below the average minimum densities desired for bus rapid transit. It is recommended that Residential Multi-Zoning densities increase to align with targets for rapid transit. In addition, it is recommended that low and medium densities also be updated to stagger with the higher density range. High-density residential uses must be at least 1,450 gross square feet per unit (30 units per acre) with no maximum, encouraging developers to build more efficient, higher-density developments adjacent to the rapid transit corridors.

The City of Bellingham's commercial zoning is specific to neighborhoods and is generally within the context of what is needed to support rapid transit. One concern is the maximum height allowance for both Planned Commercial and Neighborhood Commercial uses. This may be a limiting factor in accommodating dense future employment and housing centers, counter to the desire to densify future employment along rapid transit corridors. Higher employment density results in greater demand for multimodal transportation options. Land uses that undermine the effectiveness of rapid transit (commercial and industrial uses with no ground floor activation/visual transparency) should be avoided along rapid transit corridors.

Potential Transit Improvements

This study also identified potential rapid transit improvements that could help improve operational efficiencies along the corridors. The improvements could be implemented as stand-alone projects as part of Tier 2 or 3 implementation of rapid transit. These improvements could also be integrated throughout the transit system to improve speed and reliability of the existing bus service. The following 3 categories of improvements were identified:

- **Bus Island.** Bus islands could be placed along corridors with bike lanes, allowing cyclists to go behind the transit stop to reduce conflicts between the bus and bikes. The design of the island stop could include a bus pullout or the bus could stop in lane.
- **Transit Stop Location.** Ideally, transit stops would be placed on the far side of intersections, reducing conflicts with right-turning vehicles.
- **Business Access Transit Lanes (BAT).** Exclusive transit lanes allow for buses to operate in a dedicated area, eliminating conflicts and delays due to general purpose traffic while increasing bus operational speed and reliability. BAT lanes are typically provided on the outside curb lane and general vehicle drivers to use the lane for accessing businesses or make right turns at intersections. The City could also consider allowing bikes to share the BATs, where appropriate. BAT lanes could be installed at spot locations along a transit corridor. However, a more successful Tier 1 rapid transit corridor would include BAT lanes along most of the route. There are multiple options for providing BAT lanes within the existing rights-of-way of streets served by the WTA system. These include re-striping a corridor to prioritize transit and reducing the number or width of lanes[1] for general purpose vehicles or providing transit lanes in only one direction along a corridor. Additionally, a corridor could be widened to provide additional transit and bike lanes, assuming the rights-of-way can be acquired at a reasonable cost and within an acceptable time frame.
- **High Street Improvements.** WTA operates within the Western Washington University (WWU) campus and along High Street. Challenges exist along this street due to the narrow roadway and on-street parking. A specific review of potential improvement options was conducted for the High Street corridor. Potential improvements include widening High Street, allowing buses to travel both north and south without conflicts, and providing pocket areas along the road for parking. Another option is to provide spot widening in some areas of the road so buses can pass each other. However, narrow areas would still require buses to yield the right of way. A full widening of High Street would reduce conflicts between buses, provide designated parking and reduce conflicts between buses and parking. Full widening would allow for a roadway that provides a gateway for the rapid transit project[2].

Conceptual plans for these potential improvements are provided in Appendix D

1. *Assuming roadway standards and safety can be satisfied.*
2. *Note that concerns about vehicles speeds may increase with a widened roadway, and WWU overall design concerns would need to be considered.*

Funding

The LPA would be explored further to meet application requirements for an FTA Small Starts Grant. WTA may want to explore other funding sources to continue the rapid transit planning process and implement near-term Tier 3 or Tier 2 improvements along the corridors. The Washington State Department of Transportation (WSDOT) has grant funding programs for public transportation. Additional coordination with WSDOT should occur to understand the next grant opportunity windows and consider the potential for capital improvement, first/last mile, or other types of grants.

WTA has also had a successful partnership with the City of Bellingham on projects. Coordination on potential near or long-term improvements and demonstration of how the improvements could fit into other capital projects the City may have planned could save time and money for transit projects.

Appendix A Rapid Transit Study: Existing Conditions

FINALTECHNICAL MEMORANDUM

Date:	December 22, 2022	**TG:**	1.21322.00
To:	Tim Wilder – Whatcom Transit Authority Chris Comeau, FAICP-CTP – City of Bellingham		
From:	Stefanie Herzstein and Jessica Lambert – Transpo Group		
cc:	John Duesing – Transpo Group		
Subject:	Rapid Transit Study – Existing Conditions		

This technical memorandum summarizes the existing conditions for the Whatcom Transportation Authority High Frequency Transit Study. The study focuses on two (2) Whatcom Transportation Authority (WTA) corridors: (1) Gold Line (route 331) and (2) Blue plus Green Lines (100-series routes and 232) in Bellingham, WA. The evaluation of the Blue Line is focused on the Route 190 alignment with consideration of the 100-series service levels.

This memorandum describes the roadway context (existing and planned), transit service, safety, land use (existing and forecasted) and vehicle ownership, socioeconomic characteristics, ridership, and on-time performance. The memorandum has been summarized at a high level and more detail is available on a GIS database.

Background & Purpose

Figure 1 illustrates the study corridors. The Gold Go Line (route 331) provides service between the Cordata Station at Whatcom Community College (WCC) and the Bellingham Station in downtown Bellingham. Service is primarily provided along Cordata Parkway, Bellis Fair Parkway, Deemer Road, Telegraph Road, James Street, E Sunset Drive, Woburn Street, Alabama Street, and Cornwall Avenue.

The Green plus Blue Go Lines (routes 232 and 100-series following the path of the route 190) provide service between the Cordata Station at WCC, the downtown Bellingham Station, Western Washington University (WWU), and Lincoln Street. The Green Go Line provides service between the Cordata Station, and the downtown Bellingham Station and the Blue Go Line provides service between the downtown Bellingham Station, WWU, and Lincoln Street. The Lines primarily operate along Eliza Avenue, W Bakerview Road, Northwest Drive, Elm Street, Dupont Street, Billy Frank Jr. Street, High Street, Highland Drive, W College Way, Bill McDonald Parkway, and Lincoln Street.

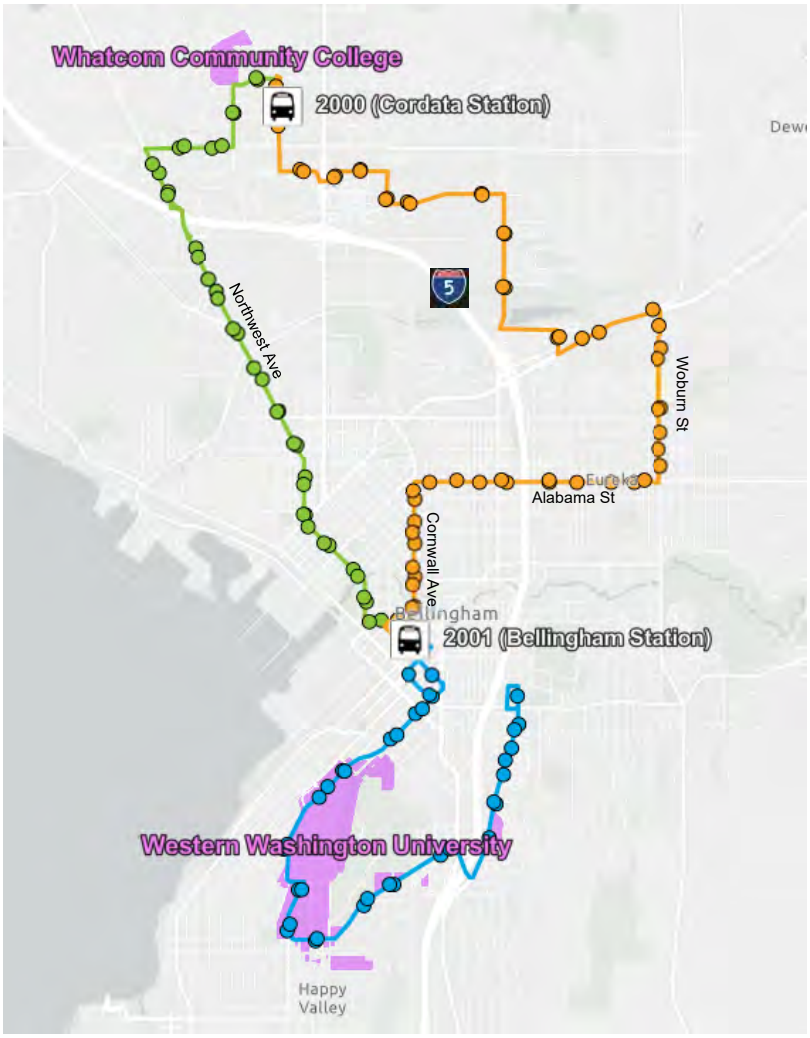


Figure 1 Study Corridors

As shown in Figure 1, all of the routes involve a number of turning maneuvers requiring the buses to make left and right-turns which can slow down drivetimes. There are also numerous closely spaced locations along Woburn Street, Cornwall Avenue, and Northwestern Avenue.

The routes identified for this analysis currently have scheduled headways of 15-minutes; however, growth and resulting congestion are causing delays. This memorandum reviews and analyzes data for the existing conditions of the Gold, Green, and Blue Go Lines as well as the roadways the routes operate along.

The purpose of this study is to assess speed and reliability improvements and the potential for bus rapid transit (BRT) in each corridor, while also considering changes in land use plans to better support more frequent transit service. Specifically, the Rapid Transit Study will:

- Identify and analyze the feasibility of transit infrastructure improvements to improve the speed and reliability of transit along key high frequency corridors
- Assess alternatives and opportunities, including land use initiatives along corridors, to identify a Locally Preferred Alternative for potential bus rapid transit system

- Prepare work and documentation that would enable WTA to obtain local, state and federal funding, including entering into the FTA's Project Development phase for a possible Capital Investment Grant

This technical memorandum provides the foundation for determining the corridor conditions and needs to determine a preferred alternative and identify transit improvements for rapid transit corridors. Much of the analysis focuses on areas within ¼ and ½ mile walking distance of the transit lines. The distances are measured based on sidewalk and trail connectivity to/from the transit routes.

Transit Service

The study routes and each of the stops along the routes are provided in Attachment A.

The Gold Go Line (Route 331) currently operates between Cordata Station and Bellingham Station. Service is offered Monday through Friday from 6:40 a.m. to 10:40 p.m., Saturdays from 7:55 a.m. to 10:40 p.m. and Sundays from 8:10 a.m. to 8:10 p.m. Service is offered with 15-minute headways with the exception of service before 7:10 a.m. and service after 5:40 p.m. Service is offered with 30-minute headways before 7:10 a.m. and between 5:40 and 8:40 p.m. and the headways are 60 minutes after 8:40 p.m. Headways on the weekend service are 15 to 30 minutes. The scheduled run time is 30 minutes in each direction.

The Blue Go Line (Route 105, 107, 108, 190, 196 and 197) currently operates Monday through Saturday and the combination of the routes offers 15-minute headways. Service is provided on weekdays from 6:40 a.m. to 11 p.m. Saturdays from 8:25 a.m. to 11:00 p.m. Service on Sundays is provided from 8:25 a.m. to approximately 10 p.m. and operated with 30-minute headways during peak periods.

The Green Go Line (Route 232) currently operates Monday through Friday from 6:40 a.m. to 10:31 p.m. and Saturdays from 8:10 a.m. to 10:31 p.m. with 30-minute headways. Similar to the Gold Go Line service is offered with 15-minute headways with the exception of service before 7:10 a.m. and service after 5:40 p.m. Service is offered with 30-minute headways before 7:10 a.m. and between 5:40 and 8:40 p.m. and the headways are 60 minutes after 8:40 p.m. Headways on the weekend service are 15 to 30 minutes. Sundays, route 232 runs from 8:10 a.m. to 8:01 p.m. with a 30-minute headway.

Bus fare is collected using cash, WTA's Umo Card or Western Washington University (WWU)/Whatcom Community College (WCC) bus passes. The Umo Card can be loaded with any pass option. An Umo Card can be purchases and loaded online on the WTA website, or in person at several retailers. Bus pass options include a Whatcom County Day or monthly pass, Skagit-Whatcom County Connector day or monthly pass, a pack of 11 passes, or a 92-day pass. The pass options and fees are shown on Figure 2. The bus passes account for approximately 40 percent of the ridership and cash is also a large portion of the fare collected.

General	
Day Pass	$3
Skagit-Whatcom Day Pass	$6
11 Ride Ticket	$10
31-Day Pass	$30
County Connector 31-Day Pass	$50
92-Day Pass	$90
Gold Card	Free

Figure 2 Bus Fare Costs

An inventory of the transit stops was conducted for each route. The inventory reviewed the stop for amenities including a bench, shelter, ADA accessibility, pedestrian pad, signage and ability to connect to power. ADA accessibility was determined by assessing nearby curb-ramps and sidewalk condition. Stops that had a nearby curb-ramp and sidewalk were determined to be ADA accessible. The review of accessibility did not verify if the curb ramps and amenities meet current ADA guidelines. The City of Bellingham has an adopted ADA Transition Plan and is working to implement recommended changes for pedestrian facilities within the public right of way to remove barriers and provide access for individuals with disabilities.

Most transit stops are ADA accessible, have a sign designating the location and provide a bench and/or a shelter. In addition, power is available for approximately 40 to 45 percent of the transit stops providing the ability to have electronic messages and information for passengers. Solar power could be a consideration for locations without connections to power.

The non-accessible stops were observed to have no sidewalks making the stop difficult to access. There are also areas with narrow sidewalks and frequent interruptions by driveways as well as stops located adjacent to driveways with limited space for waiting. These factors cause barriers for individuals to access. Widened sidewalks, ADA compliant curb ramps and a designated waiting area outside of the sidewalk would improve ADA accessibility.

Along the Gold Go Line the majority of non-accessible bus stops were along Telegraph Road and the James Street at McLeod Road stops. Telegraph Road will be reconstructed in 2023 and all bus stops will be ADA-compliant and aligned with flashing crosswalks. While the City may be able to work with WTA to make some temporary/interim improvements to bus stops along James Street between Telegraph/James and Birchwood/James/Orchard, the permanent improvement is a paved multiuse pathway along the west side of James Street between Telegraph and Birchwood, which is estimated to cost $10 million and is not currently funded.

Study Area

The Gold Line study area encompasses approximately seven miles between Bellingham Station and Cordata Station via James Street, E Sunset Drive, Woburn Street and Alabama Street. Key intersections for the Gold Line include:

- Cornwall Avenue/York Street
- Cornwall Avenue/Ohio Street

- Cornwall Avenue/Kentucky Street
- Cornwall Avenue/Virginia Street
- Cornwall Avenue/Texas Street
- Alabama Street/Dean Avenue
- Alabama Street/Humboldt Street
- Alabama Street/James Street
- Alabama Street/Nevada Street
- Alabama Street/Queen Street
- Alabama Street/St Paul Street
- Alabama Street/Undine St
- Woburn Street/North Street
- Woburn Street/Maryland Street
- Woburn Street/Barkley Boulevard
- Woburn Street/Rimland Drive
- Sunset Drive/Woburn Street
- Sunset Drive/Racine Street
- James Street/McLeod Road
- Telegraph Road/James Street
- Telegraph Road/Primrose Lane
- Deemer Road/Telegraph Road

Green plus Blue Line study area encompasses approximately ten miles between Cordata Station, Bellingham Station, and Lincoln Street via West Bakerview Road, Northwest Avenue, Elm Street, Dupont Street, High Street, Billy McDonald Parkway and Lincoln Street. Key intersections in the study area for the Green/Blue Line include:

- Magnolia Street/High Street
- Billy Frank Junior Street/Holly Street
- Billy Frank Junior S/Chestnut Street
- Billy Frank Junior Street/Laurel Street
- Bill McDonald Parkway/Ferry Ave
- Bill McDonald Parkway/Samish Way
- Lincoln Steet/Maple Street
- Lincoln Street/Lakeview Drive
- Champion Street/Unity Street
- Champion Street/Grand Avenue
- Prospect Street/Flora Street
- Dupont Street/C Street
- Dupont Street/G Street
- Elm Street/Broadway
- Elm Street/Jefferson Street
- Northwest Avenue/Connecticut Street
- Northwest Avenue/Illinois Street
- Northwest Avenue/Lynn Street
- Northwest Avenue/McLeod Road
- Northwest Avenue/Sterling Drive
- Northwest Avenue/Bakerview Road
- Bakerview Road/Palisade Way
- Bakerview Road/Eliza Avenue
- Eliza Avenue/ Darby Drive

The route maps and stops locations are summarized in Attachment A.

Roadway Context

This section describes the vehicle, pedestrian and biking facilities as well as transit signals along the study corridors. Table 1 summarizes the key characteristics of the study corridors.

Table 1. Existing Street Network Summary

Roadway	Transit Route	Classification[1]	Speed Limit[2]	# Lanes	Pedestrian Facilities	Bicycle Facilities	On-Street Parking
James Street	Gold (331)	Secondary Arterial	25 mph	2 to 3	Yes	No	Yes
Woburn Street	Gold (331)	Principal Arterial	35 mph	2 to 5[1]	Yes	Yes[2]	Intermittent
Alabama Street	Gold (331)	Secondary Arterial	30 mph	3 to 5[3]	Yes	Yes[3]	No
Cornwall Avenue	Gold (331)	Secondary Arterial	25 mph	3	Yes	Yes	Yes[4]
Billy Frank Jr. Street	Blue (190)	Collector Arterial	25 mph	2	Yes	Yes[5]	Yes[5]
High Street	Blue (190)	Collector Arterial	25 mph	2	Yes	No	Yes
Billy McDonald Parkway	Blue (190)	Secondary Arterial	25 to 35 mph	2	Yes	Yes	No
Lincoln Street	Blue (190)	Secondary Arterial	25 to 35 mph	2 to 5	Yes	Yes	No
Northwest Avenue	Green (232)	Principal Arterial	25 mph	2 to 3	Yes	Yes	Yes[6]
Sunset Drive	Gold (331)	Principal Arterial	35 mph	5	Yes	Yes	No
Telegraph Road	Gold (331)	Collector Arterial	25 mph	2 to 3	Intermittent	No	No
Dupont Street	Green (232)	Principal Arterial	25 mph	2	Yes	Yes	Yes
Lakeway Drive	Blue (190)	Principal Arterial	25 mph	5	Yes	No	No
Cordata Parkway	Green (232)/ Gold (331)	Secondary Arterial	35 mph	2 to 3	Yes	Intermittent	No

Source: Transpo Group, August 2022
1. Roadway narrows south of Newmarket Street.
2. Bicycle facilities provided south of Texas Street.
3. Roadway narrows west of James Street where bike lanes are also provided.
4. Along the east side of the roadway.
5. On-street parking with sharrow bike facilities is provided northeast of E Chestnut Street. A bike lane is provided along the northwest side with on-street parking along the southeast side southwest of E Chestnut Street.
6. Parking allowed along the east side south of Alderwood Avenue.

As shown in Table 1, the roadways along the study corridors are 2 to 5-lane facilities. Sidewalks are provided along all of the primary roadways on at least one side of the roadway, with pedestrian crosswalks present at each signalized intersection. Designated bike lanes are present along many of the corridors.

Some signalized intersections along the routes have transit signal priority (TSP) or signal preemption technologies to try to expedite buses movements through the intersection. TSP locations are depicted on the GIS database. The majority of intersections are running low priority signal preemption rather than TSP. The preemption system is the same system used for emergency vehicles; however, the bus emits a different pulse (low pulse) than the emergency vehicles.

As defined by the Manual on Uniform Traffic Control Devices (MUTCD), traffic signal preemption is “the transfer of normal operations of a traffic control signal to a special control mode of operation”. The preemption control is designed and operated to give certain vehicles the right of way through the signal by interrupting the normal signal operations and transferring right of way to the direction of certain vehicles. Preemption also allows for the shortening or omission of pedestrian walk intervals and/or changes to the pedestrian interval permission. Signal preemption can have impacts to traffic/corridor operations because it replaces the normal timing and logic with preemptive timing and logic to serve specific vehicle types. Following alterations to the green time

for the preempted vehicle, the traffic signal goes through a recovery or transition period back to normal operations.[1]

Transit signal priority (TSP) operations work differently than preemption systems. TSP modifies signal operations process to better accommodate transit vehicles while preemption interrupts the normal signal operations for special events such as an approaching fire engine. TSP aims to reduce delay experienced by transit vehicles at intersections and involves communication between the bus and traffic signals so that the signal can alter its timing to give priority to transit. Priority at signals can be granted in a number of methods including extension of the greens on specific phases, altering the phase sequencing, and including special phases without interrupting coordination between signals at adjacent intersection.[1] The intent of TSP is to not have major disruptions in corridor operations but rather to work within parameters to improve efficiency of transit operations while maintaining progress of traffic along the corridor. Comparatively, signal preemption disrupts corridor operations and while it serves to improve efficiency for the transit vehicle as it passes through the intersection it can make corridor/intersection operations worse for a period of time, which could make operations less efficient for transit vehicle coming after.

The Gold Go Line also has a queue jump lane with a bus activated signal for the westbound through movement where the bus can utilize the right-turn lane to through the intersection, avoiding westbound through vehicle queuing. The queue jump lane is at the James Street/Alabama Street intersection. Observations at this intersection indicate that buses may not be utilizing the queue jump and may instead be waiting and getting into traffic with the through movement. WTA has indicated that drivers only use the queue jump when they are behind schedule.

Planned Improvements

There are several projects planned in the study area along Route 331,190 and 232 corridors by the City of Bellingham. In 2023, Telegraph Road between Deemer Road and James Street in the area that Route 331 serves will be reconstructed and will have sidewalks, bike lanes, a center turn-lane and flashing pedestrian crossings will be added to ensure users safety. The flashing pedestrian crossings will be added at locations where there are existing WTA stops. The City of Bellingham also has planned improvements to add a full traffic signal at the Lincoln Street/E Maple Street intersection. In addition, Lincoln Street north of E Maple Street to the south Fred Meyer driveway will be rechanneled from 5- to 3-lanes and buffered bike lanes will be provided. A flashing crosswalk will be installed at Lincoln/Viking Circle and an ADA-compliant transit island will be constructed at the southwest corner.

Safety

Collision data were obtained from WSDOT and reviewed along the study corridors for the five-year period between 2017 and 2021. Collison data is summarized in Table 2 for key intersections along the Gold Go Line and Table 3 summarizes collision along key intersections for the Green & Blue Go Line routes.

[1] U.S. Department of Transportation Federal Highway Administration, Chapter 9, Advanced Signal Timing Topics.

Table 2. Five-Year Collision Summary – Gold Go Line

Intersection	Traffic Control	Number of Collisions					Total	Annual Average
		2017	2018	2019	2020	2021		
Cornwall Avenue/York Street	Signal	1	2	1	0	1	5	1
Cornwall Avenue/Ohio Street	Signal	2	1	0	0	3	6	1
Cornwall Avenue/Kentucky Street	Stop Controlled	1	0	1	1	0	3	1
Cornwall Avenue/Virginia Street	Stop Controlled	0	0	0	0	1	1	0
Cornwall Avenue/Texas Street	Stop Controlled	0	0	1	0	1	2	0
Alabama Street/Dean Avenue	Stop Controlled	0	0	0	0	0	0	0
Alabama Street/Humboldt Street	Stop Controlled	0	0	1	0	0	1	0
Alabama Street/James Street	Signal	1	3	5	4	3	16	3
Alabama Street/Nevada Street	Stop Controlled	0	1	0	0	0	1	0
Alabama Street/Queen Street	Stop Controlled	0	0	1	0	0	1	0
Alabama Street/St Paul Street	HAWK Signal	1	2	0	1	0	4	1
Alabama Street/Undine St	Stop Controlled	1	0	1	0	1	3	1
Woburn Street/North Street	Stop Controlled	0	1	0	0	0	1	0
Woburn Street/Maryland Street	Stop Controlled	0	0	1	0	0	1	0
Woburn Street/Barkley Blvd	Signal	6	2	5	1	2	16	3
Woburn Street/Rimland Drive	Signal	0	0	0	0	0	0	0
Sunset Drive/Woburn Street	Signal	0	0	0	0	0	0	0
Sunset Drive/Racine Street	Signal	0	0	0	0	0	0	0
James Street/McLeod Road	Stop Controlled	0	1	0	0	1	2	0
Telegraph Road/James Street	Stop Controlled	0	2	0	3	3	8	2
Telegraph Road/Primrose Lane	Stop Controlled	0	0	0	0	0	0	0
Deemer Road/Telegraph Road	Stop Controlled	2	1	1	0	0	4	1

Source: WSDOT, Transpo Group 2022

Note: Under 23 U.S. Code § 409 and 23 U.S. Code § 148, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

As shown in Table 2, collisions along the Gold Go Line route are relatively low with many locations having on average no collisions. The highest number of collisions were at the Alabama Street/James Street and the Woburn Street/Barkley Boulevard intersections, which each had an annual average of 3 collisions per year so still a low number of collisions. The Telegraph Road intersections with James Street and Primrose Lane will be signalized in 2023. Overall, no specific safety issues are identified along the Gold Go Line route.

Table 3. Five-Year Collision Summary – Green & Blue Go Line

Intersection	Traffic Control	Number of Collisions					Total	Annual Average
		2017	2018	2019	2020	2021		
Magnolia Street/High Street	Stop Controlled	0	0	0	0	0	0	0
Billy Frank Junior Street/Holly Street	Signal	0	1	2	3	2	8	2
Billy Frank Junior S/Chestnut Street	Signal	1	1	0	2	8	12	2
Billy Frank Junior Street/Laurel Street	Stop Controlled	0	0	0	0	0	0	0
Bill McDonald Parkway/Ferry Ave	Stop Controlled / OH Flashing Crosswalk	3	3	2	1	0	9	2
Bill McDonald Parkway/Samish Way	Signal	1	3	0	4	2	10	2
Lincoln Steet/E Maple Street	Stop Controlled	3	1	0	2	0	6	1
Lincoln Street/Lakeview Drive	Signal	0	0	0	0	0	0	0
Champion Street/Unity Street	Stop Controlled	0	0	0	0	0	0	0
Champion Street/Grand Avenue	Signal	1	0	1	0	0	2	0
Prospect Street/Flora Street	Stop Controlled	0	0	0	0	0	0	0
Dupont Street/C Street	Stop Controlled	0	1	1	0	0	2	0
Dupont Street/G Street	Stop Controlled	0	2	0	0	0	2	0
Elm Street/Broadway	Signal	2	1	2	0	3	8	2
Elm Street/Jefferson Street	Stop Controlled	0	0	0	0	0	0	0
Northwest Avenue/Connecticut Street	Stop Controlled RRFB	0	0	0	1	0	1	0
Northwest Avenue/Illinois Street	Signal	0	2	0	0	0	2	0
Northwest Avenue/Lynn Street	Signal	0	1	1	0	0	2	0
Northwest Avenue/McLeod Road	Roundabout	1	0	0	3	0	4	1
Northwest Avenue/Sterling Drive	Stop Controlled	0	0	0	2	0	2	0
Northwest Avenue/Bakerview Road	Signal	9	8	9	12	10	48	10
Bakerview Road/Palisade Way	Stop Controlled	1	0	0	0	0	1	0
Bakerview Road/Eliza Avenue	Signal	3	6	2	1	3	15	3
Eliza Avenue/ Darby Drive	Stop Controlled	0	0	0	0	0	0	0

Source: WSDOT, Transpo Group 2022

Note: Under 23 U.S. Code § 409 and 23 U.S. Code § 148, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

OH = overhead flashing crosswalk; RRFB = rectangular rapid flashing beacon

As shown in Table 3, collisions along the Green and Blue Go Line route are relatively low with many locations having on average no collisions except at the Northwest Avenue/Bakerview Road intersection. The Northwest Avenue/Bakerview Road intersection has an annual average of 10 collisions per year and the 5-year review shows a slight increase in collisions in 2020 and 2021. The most frequently reported collision at the Northwest Avenue/Bakerview Road intersection was an approach turn followed by rear-end. Rear-end collisions are common at signalized intersections where there is stop-and-go traffic. Approach turn collisions occur when vehicles are approaching from the same or opposite directions and one turns while the other does not yield. The Northwest Avenue and Bakerview Road approaches have protected permitted left-turn signal timing, which means during the permitted phase yielding would need to occur for vehicles to make turns. The Green Go Line transit vehicles do turn left heading westbound from Bakerview Road onto Northwest Avenue to head south; there were not reported transit collisions at this intersection (see more detail in the following section).

The City will install a traffic signal at Lincoln Street/E Maple Street in 2023. In addition, the 2022 Pedestrian Master Plan Update identified the potential for a HAWK signal to facilitate pedestrian crossings at the Bakerview Road/Palisade Way intersection.

The WSDOT data only reflects two reported collisions with transit buses in the five-year period, collisions along the corridor can also delay transit service. The transit related collisions were reported in 2019 and 2020 and involved property damage only. Transit related collisions were reported at the Humboldt Street/Alabama and Alabama Street/St Paul Street intersection.

In addition to the WSDOT data, specific collision data from WTA was reviewed. The data includes the collisions reported in the WSDOT as well as additional collisions that may not have occurred at intersections or were not reported. Data provided by WTA indicated in the five-year period between 2019 and 2021 that 14 collisions occurred involving buses. The specific collisions are summarized in Table 4.

Table 4. Five-Year Transit Collision Summary

Location	Collision Type	Route	Collision Year
1200 block of Chestnut Street	Other Vehicle	Blue (190)	2019
Prospect Street and Flora Avenue	Fixed Object	Green (232)	2021
Prospect St. and Central Avenue	Fixed Object	Green (232)	2019
Cornwall Avenue and Magnolia Avenue (Intersection)	Other Vehicle	Green (232)	2018
Railroad Avenue and Magnolia Avenue	Transit Vehicle	Green (232)	2018
Northwest Avenue and Illinois Street	Other Vehicle	Green (232)	2017
Cornwall Avenue and Alabama Street	Other Vehicle	Gold (331)	2021
James Street and Telegraph Road (Intersection)	Other Vehicle	Gold (331)	2021
Cornwall Avenue and Champion Street	Other Vehicle	Gold (331)	2021
Alabama Street and Undine Street (Bus stop)	Other Vehicle	Gold (331)	2020
Alabama Street and Toledo Street	Other Vehicle	Gold (331)	2020
Alabama Street and Pacific Street	Bicycle	Gold (331)	2019
Alabama Street and Humboldt Street	Other Vehicle	Gold (331)	2019
Alabama Street and Cornwall Avenue	Other Vehicle	Gold (331)	2019

Source: WTA, Transpo Group 2022

As shown in Table 4, the majority of the collisions involved other vehicles with one reported collision with a bicycle. Of the 14 reported collisions over the last 5-years, 6 were reported along the Green/Blue Go Line and 8 were reported along the Gold Go Line. The highest number of collisions were reported along Alabama Street. There is no distinct pattern to the collisions or specific location with more collisions. No specific safety issues related to transit have been identified for the study area.

Land Use and Population Characteristics

This section summarizes the land use and key population characteristics relative to transit. Table 5 provides an overview of the existing land use and population within x-miles of the study corridors. The ridership for transit service is influenced by population (housing) and employment (jobs) densities as well as population characteristics such as vehicle ownership, zero car households and income. Higher household/employment densities support a transit system and allow for more households to not be auto dependent. Having higher housing and employment densities allows for the population to have shorter travel distances reducing auto needs for most daily trips. Providing

transit within a 5 to 15-minute walk (1/4 to 1/2 mile) of uses coupled with higher frequencies, such that riders have reduced wait times, further reduces the dependence on personal autos and makes transit a more attractive and viable mode of transportation for more people.

Table 5. Existing Population and Land Use within 1/4-Mile of the Study Routes

Route	Population	Households	Employment
Gold Go Line (331)	9,670 people	5,300 houses	14,785 jobs
Green Go Line (232)	8,375 people	5,260 houses	7,795 jobs
Blue Go Line (190)	10,465 people	4,415 houses	12,875 jobs

Source: WTA and Transpo Group, September 2022
1. Percent of stops along that route that have the amenity.

Land Use

The current and future land use densities surrounding the study routes were evaluated based on data from the Whatcom County of Governments (WCOG) travel demand model.

Gold Go Line

Figure 3 and Figure 4 shows the existing housing and employment density, respectively, overlayed with the Go Lines and approximately a ¼-mile walking distance from the lines.

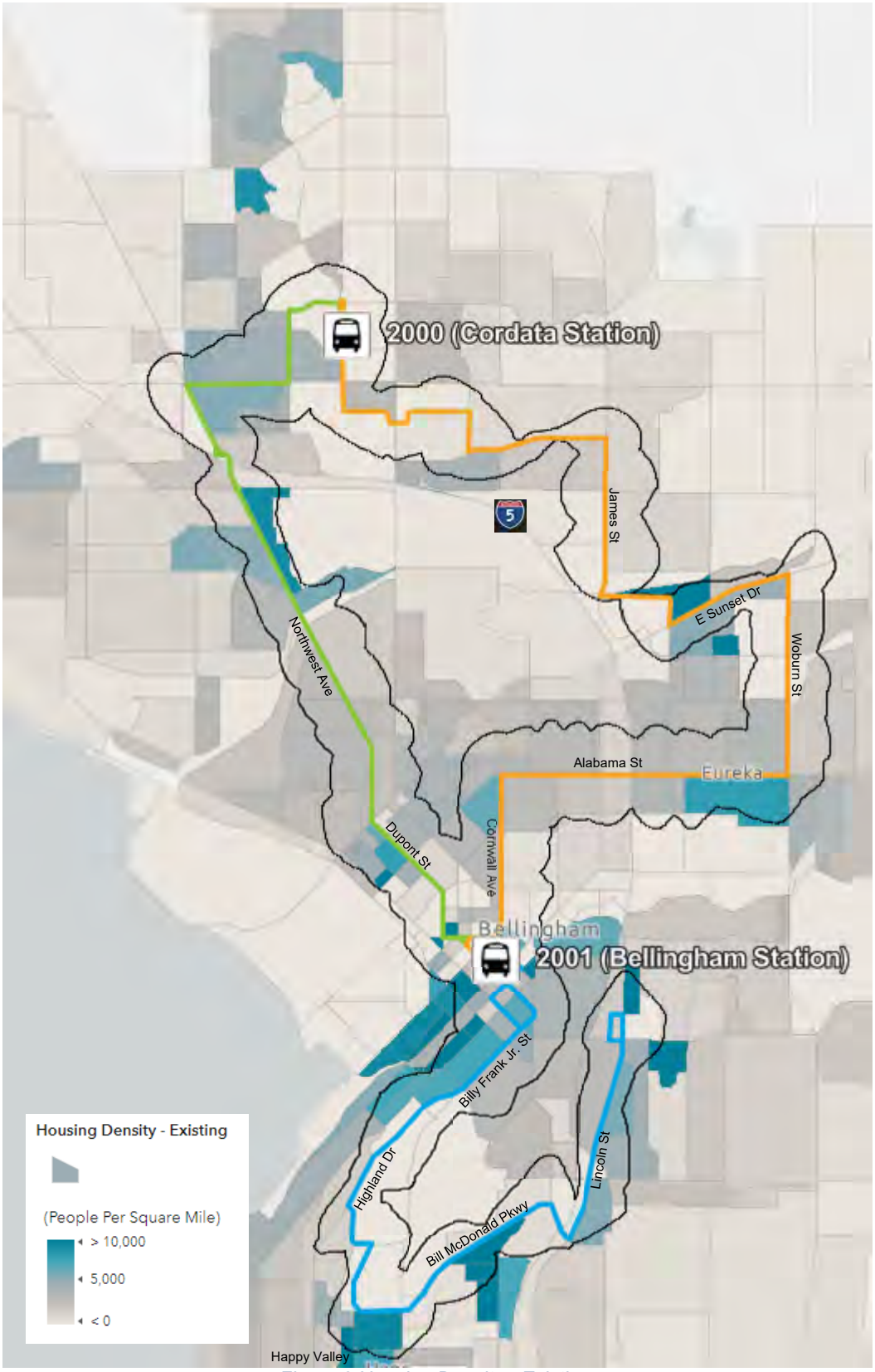


Figure 3 Housing Density - Existing

As shown on Figure 3, the highest housing densities are along the transit routes including north of E Sunset Drive, South of Alabama Street, Cornwall Avenue, Northwest Avenue, Billy Frank Jr. Street, Bill McDonald Parkway, Lincoln Street, and Downtown Bellingham and Western Washington University. Overall, the current route alignment serves the denser housing areas. High density areas not currently served by transit include the Happy Valley area (south and east of Bill McDonald Parkway) and areas north of the Cordata Station.

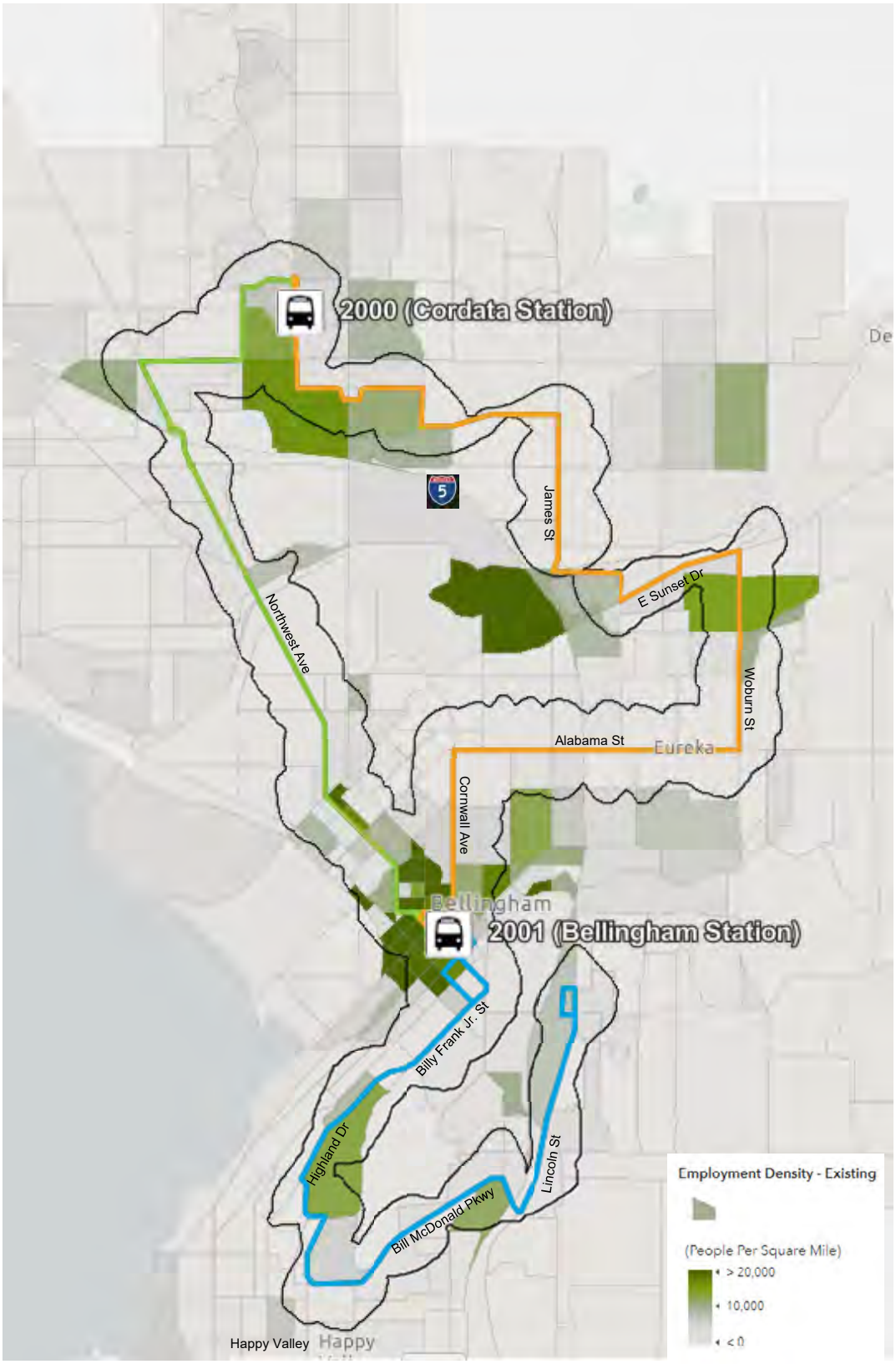


Figure 4 Gold Go Line Employment Density - Existing

As shown on Figure 4, some of the highest employment density is near WCC, Woburn Street and Barkley Boulevard, southeast of Highland Drive, South of Bill McDonald, WWU and in Downtown Bellingham. Similar to the housing, the route alignment is near the higher density areas of employment. The only area not served is located south of I-5, PeaceHealth Hospital area, and east of the Cordata Station.

Future 2045 housing densities are shown on Figure 5 and the forecast increase between existing and 2045 is shown on Figure 6.

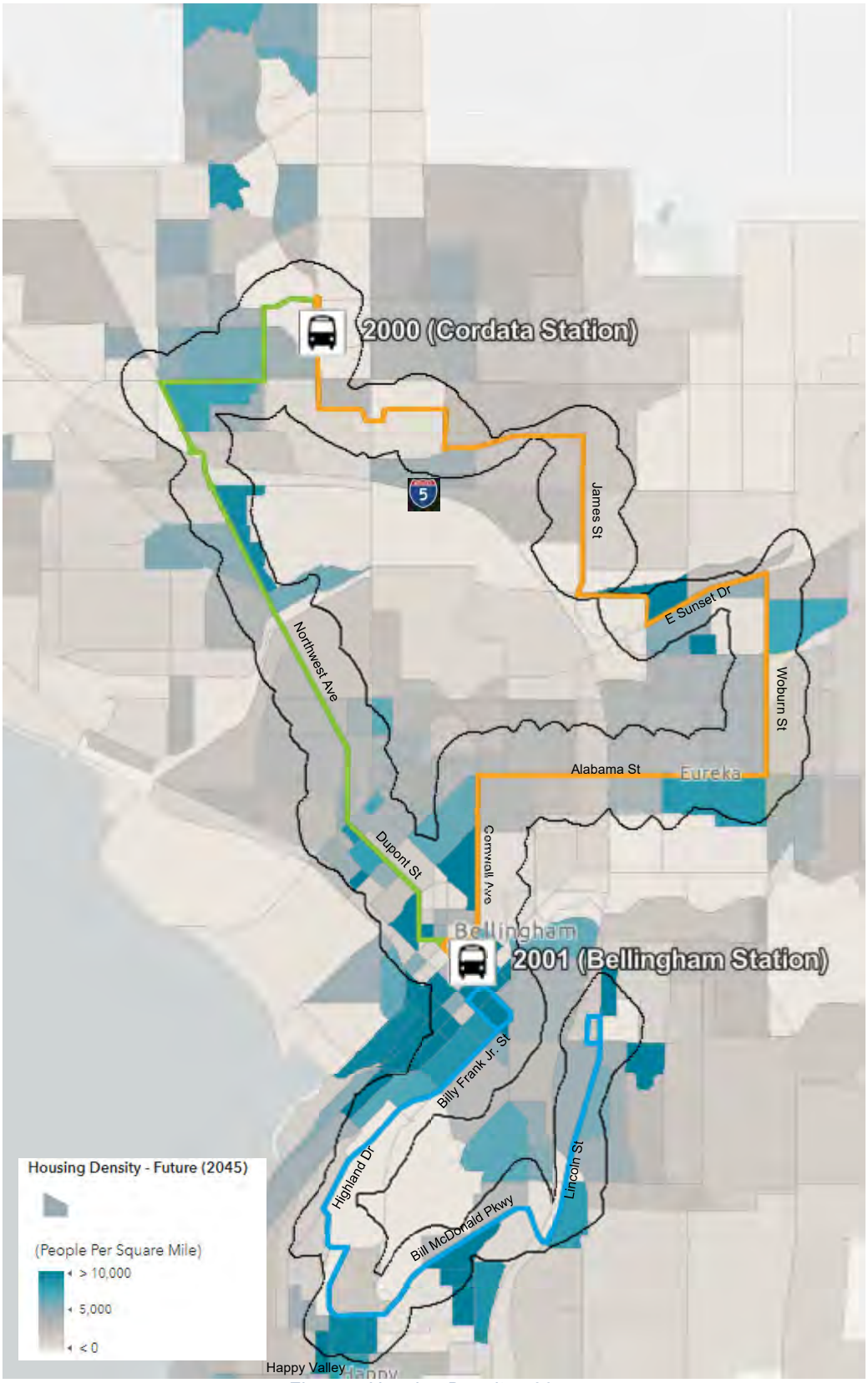


Figure 5 Housing Density - 2045

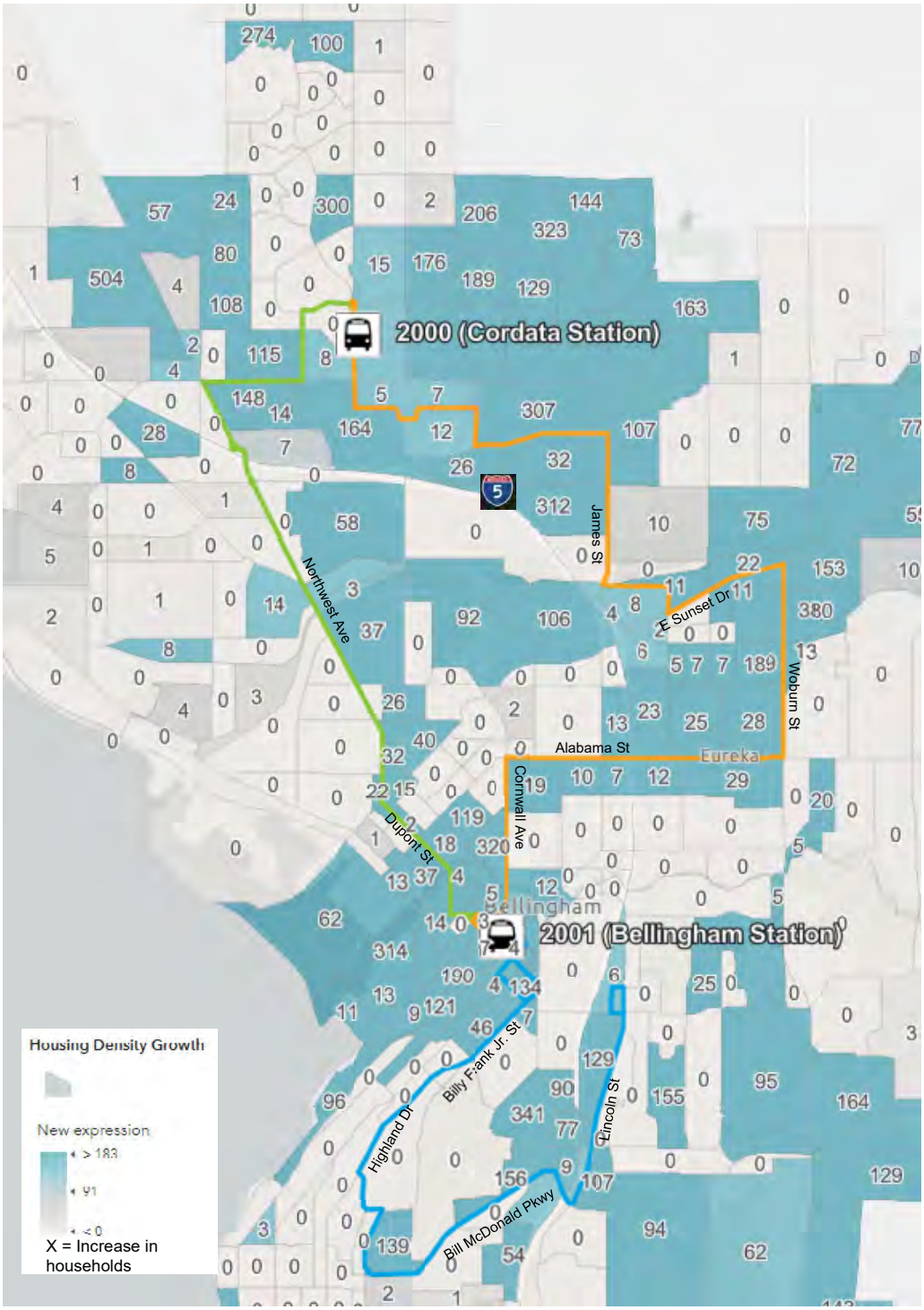


Figure 6 Growth in Households

As shown on Figure 6, some of the highest anticipated growth areas not currently served by transit are areas north and east of Cordata Station, west of I-5, and in parts of Downtown closer to the waterfront. the highest housing densities are along the transit routes include along Telegraph Road, Woburn Street, west of Cornwall Avenue, east of Northwest Avenue, Billy Frank Jr. Street, Bill McDonald Parkway, and Lincoln Street. Overall, the current route alignment serves some of

the anticipated higher density housing areas. Opportunities include the areas north and east of the Cordata Station and west of I-5. Areas along Northwest Drive north of Bakerview Road are currently served by Route 27.

Future 2045 employment densities are shown on Figure 7 and the forecast increase between existing and 2045 employment is shown on Figure 8.

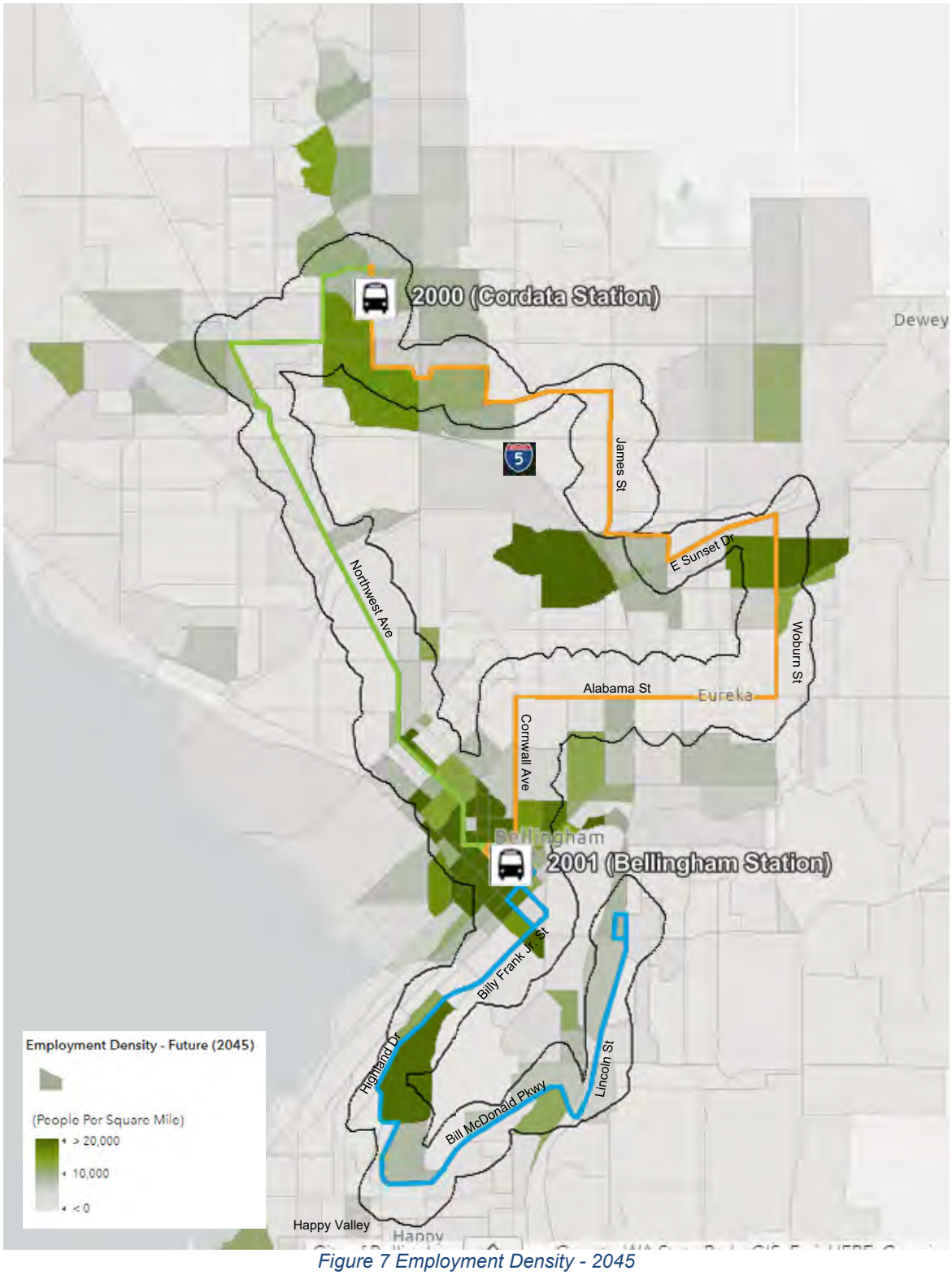


Figure 7 Employment Density - 2045

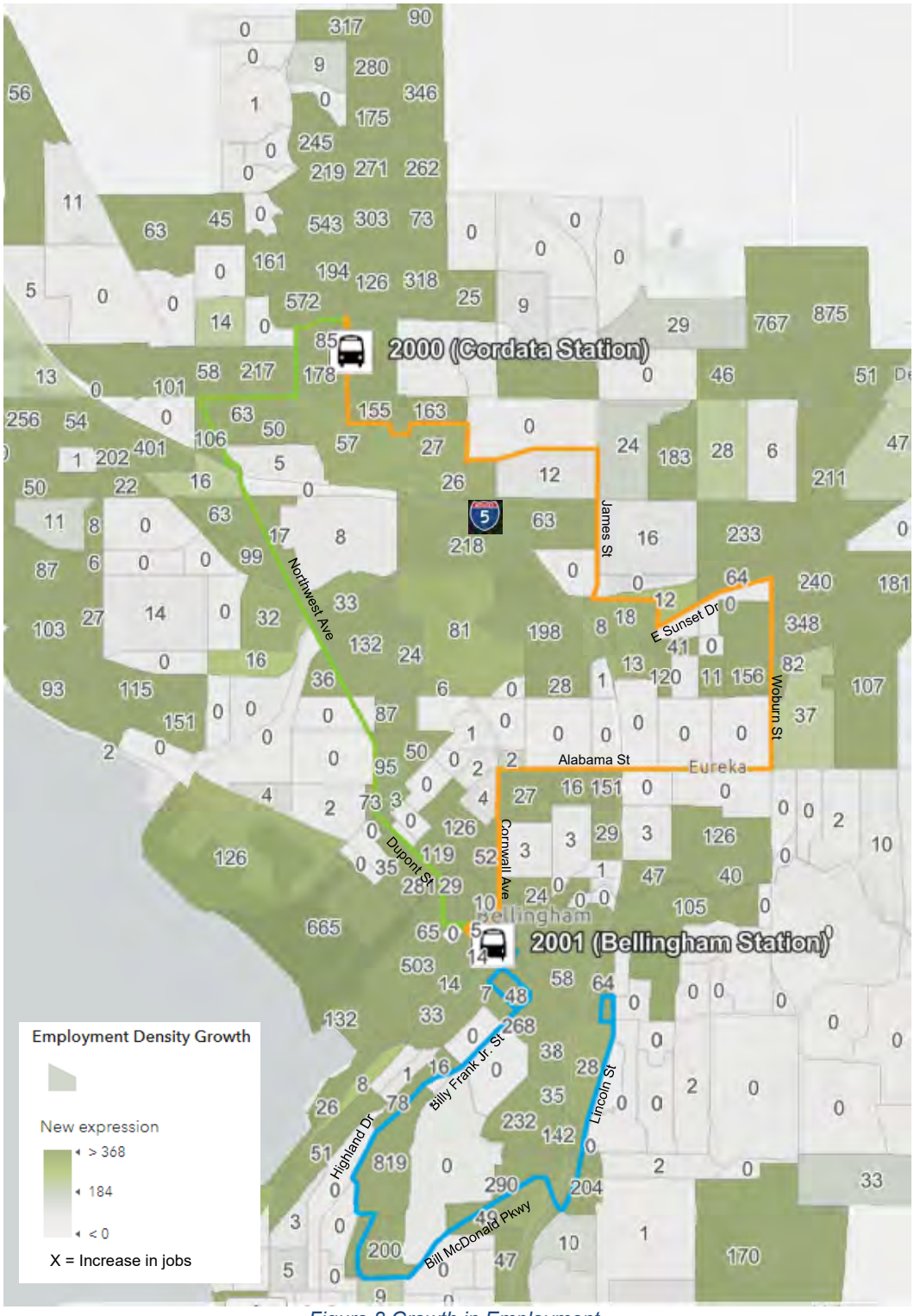


Figure 8 Growth in Employment

As shown in Figure 8, the largest growth areas currently not served by the subject routes are north of the Cordata Station, west of I-5, and areas of Downtown near the waterfront. Areas currently

served by the transit are near WWU along Highland Drive, Bill McDonald Parkway and Lincoln Street and along Woburn Street.

The City of Bellingham currently has a significant amount of housing, retail/commercial, and mixed-use developments in-process. Figure 9 shows the buildable lands proximate to the Go lines where areas could develop or redevelop (i.e., vacant/developable land). The buildable lands show that there are areas in the future that could be developed near the Green, Blue and Gold Lines. Along with developable land, the City also tracks work in progress. The City's dashboard indicates that approximately 1,500 units are under construction and 450 are in application review. A large majority of the applications and permitting are within close proximately of Downtown.

Figure 9 Buildable Lands Proximate to the Go Lines

The evaluation presented in the existing conditions study for land use provides a high-level understanding of patterns around the corridors. Further detail review and input on land use will be conducted as part of the recommended alternative including providing input on whether future/existing land use supports Rapid Transit and what changes/policies should be considered by the City to provide transit supportive land use.

Population Travel Characteristics

The 2020 US Census data for the City of Bellingham were reviewed to understand where workers live and work, how they commute to work, and vehicle ownership. The census data was based on:

- **OnTheMap** data showing where people who live in Bellingham work and where people who work in Bellingham live
- **2020 American Community Survey Estimates** for Journey to Work (i.e., commuting) and Vehicle Ownership

Table 6 provides a summary of where workers live who are employed in Bellingham and where workers are employed who live in Bellingham.

Table 6. Live/Work Census Data for Bellingham

City	Where Workers Live Who are Employed in Bellingham	Where Workers are Employed Who Live in Bellingham
Bellingham	53%	59%
Ferndale	7%	6%
Lynden	5%	3%
Blaine	3%	2%
Sedro Woolley	2%	1%
Everson	2%	1%
Everett	0%	2%
Mount Vernon	2%	3%
Other[1]	26%	23%

Source: OnTheMap, Transpo Group 2022
1. Made up of multiple areas with very low percentages to/from each City.

As shown in Table 6, the majority of people live and work in Bellingham with the next largest share either commuting to or from Bellingham living or working in Ferndale, approximately 9 miles northwest of Bellingham. Having a large portion of population living and working within Bellingham means there is opportunity for transit to serve these trips especially since the review of land use shows that the study routes are located along the corridors with the densest housing and employment. In addition, Ferndale is accessible via Route 27 to Cordata Station and providing Rapid Transit could reduce transfer times to/from Ferndale.

The current modes used to travel to work were reviewed for the whole City as well as by tenure (i.e., owner occupied versus renter occupied housing units).

Figure 10 shows the journey to work modes for the City of Bellingham.

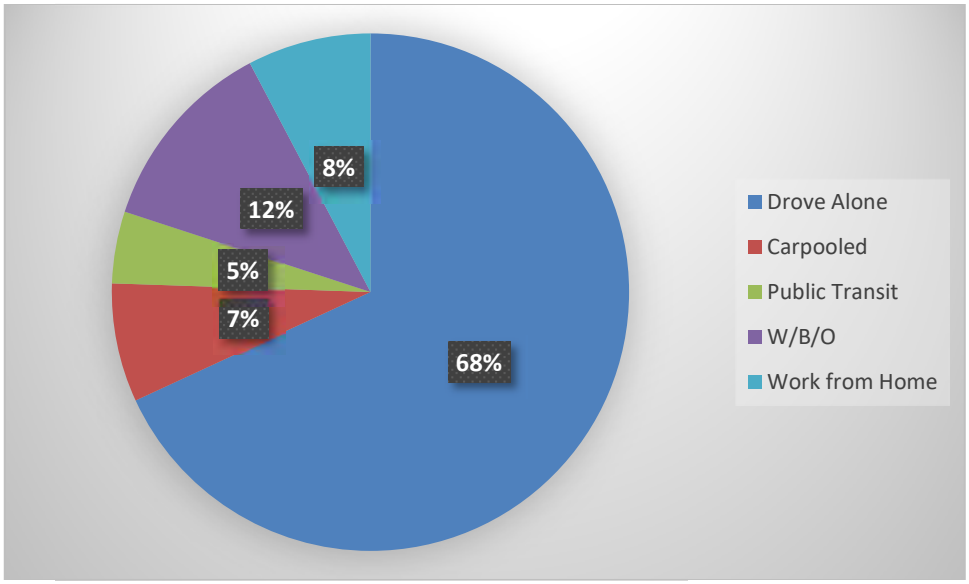


Figure 10 City of Bellingham Journey to Work Modes

As shown on Figure 10, the majority of residents (approximately 76 percent) commuted via vehicle with 68 percent driving alone and 7 percent carpooling. Approximately 5 percent of people use public transit as their primary means of commuting to work. Figure 11 and Figure 12 provide the journey to work breakdown for the owner occupied and renter occupied units, respectively.

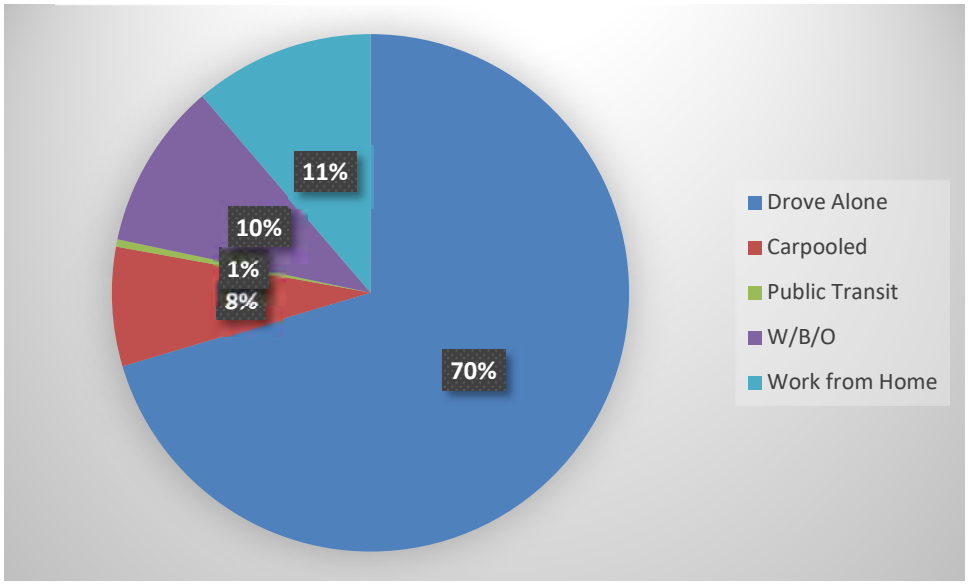


Figure 11 Journey to Work Modes for Owner Occupied Units

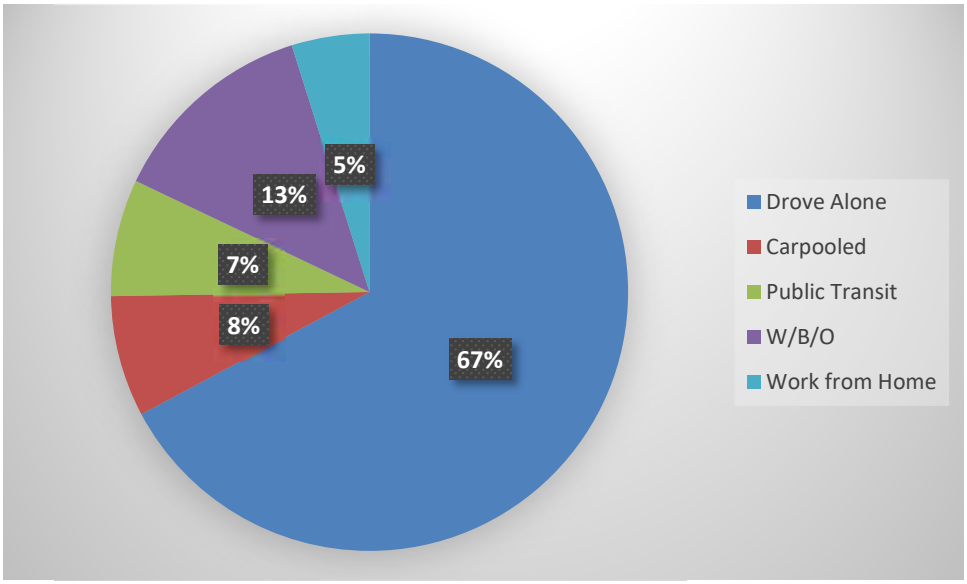


Figure 12 Journey to Work Modes for Renter Occupied Units

As shown on Figure 11 and Figure 12, both owner and renter occupied units have similar drive alone, carpooling, and walk/bike/other trends. The two differ on transit and work from home trends with renter occupied units using transit more and owner-occupied workers tending to work from home more. When considering changes to stops and routing, the journey to work data would support changes and service near multi-family/renter housing units.

Vehicle ownership also plays a role in transit use. Households without access to vehicles or with fewer vehicles than necessary to satisfy the transportation needs of all household members, represent a potential transit-dependent population. Figure 13 summarizes the households by vehicles available for owner and renter occupied units.

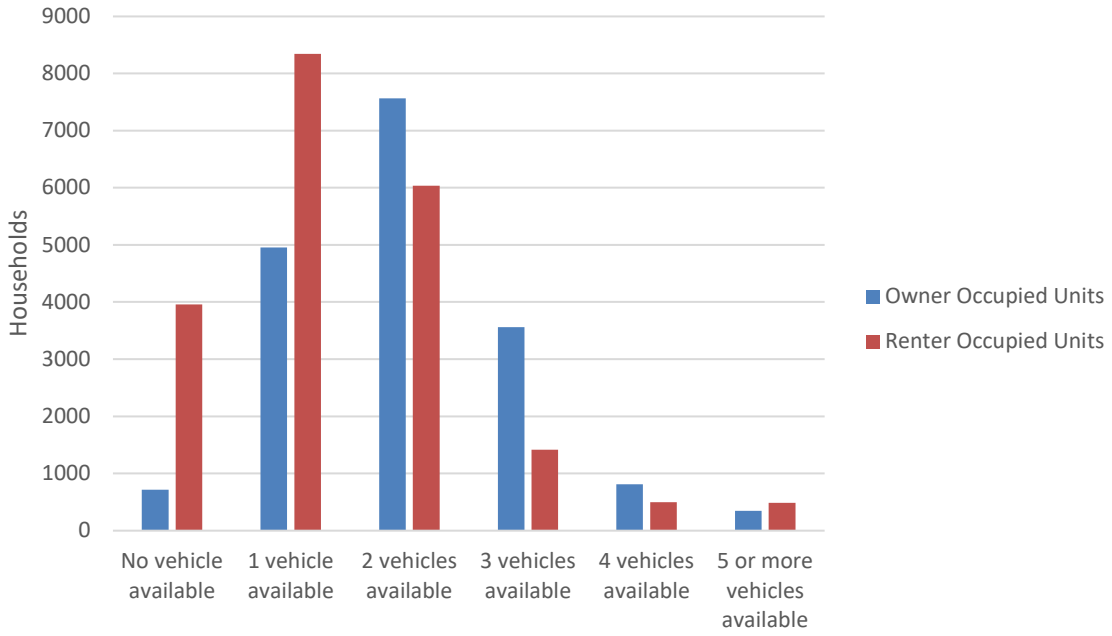


Figure 13 Tenure by Vehicles Available

As shown on Figure 13, for owner occupied units, the majority of households have two vehicles available where renter occupied units have one vehicle available. Additionally, the renter occupied units are far more likely not to own any vehicle at. The vehicle ownership further reinforces that any changes to routes should consider multi-family/renter occupied residential areas which tend to be higher in density and/or the City could consider zoning/rezoning that encourages higher density multifamily development. These multi-family facilities show up as the higher density areas on the existing and forecast land use like along Northwest Avenue south of I-5, north of E Sunset Drive and in Downtown.

Zero vehicle households were also reviewed relative to the Go lines. Ownership data were reviewed within approximately a 10-minute walking distance from the lines. The percent of households with no vehicles relative to the Gold and Green Go Line is shown on Figure 14 and Figure 15 for the Blue Go Line.

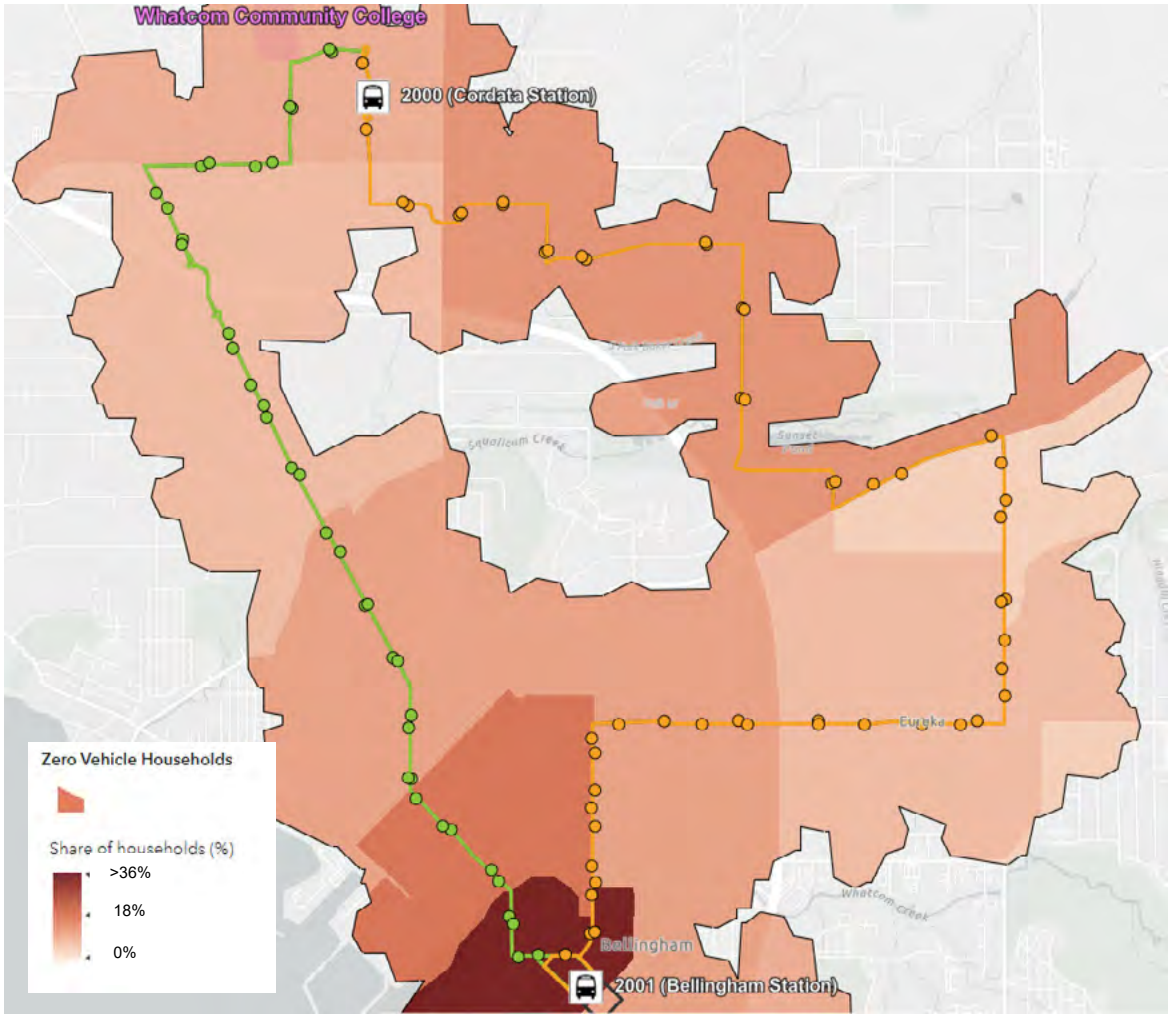


Figure 14 Zero Vehicle Households Proximate to the Gold & Green Go Line (331 & 232)

As shown in Figure 14, the highest percentage of zero vehicle households is in Downtown where it is easiest for residents to walk or access transit to make daily trips.

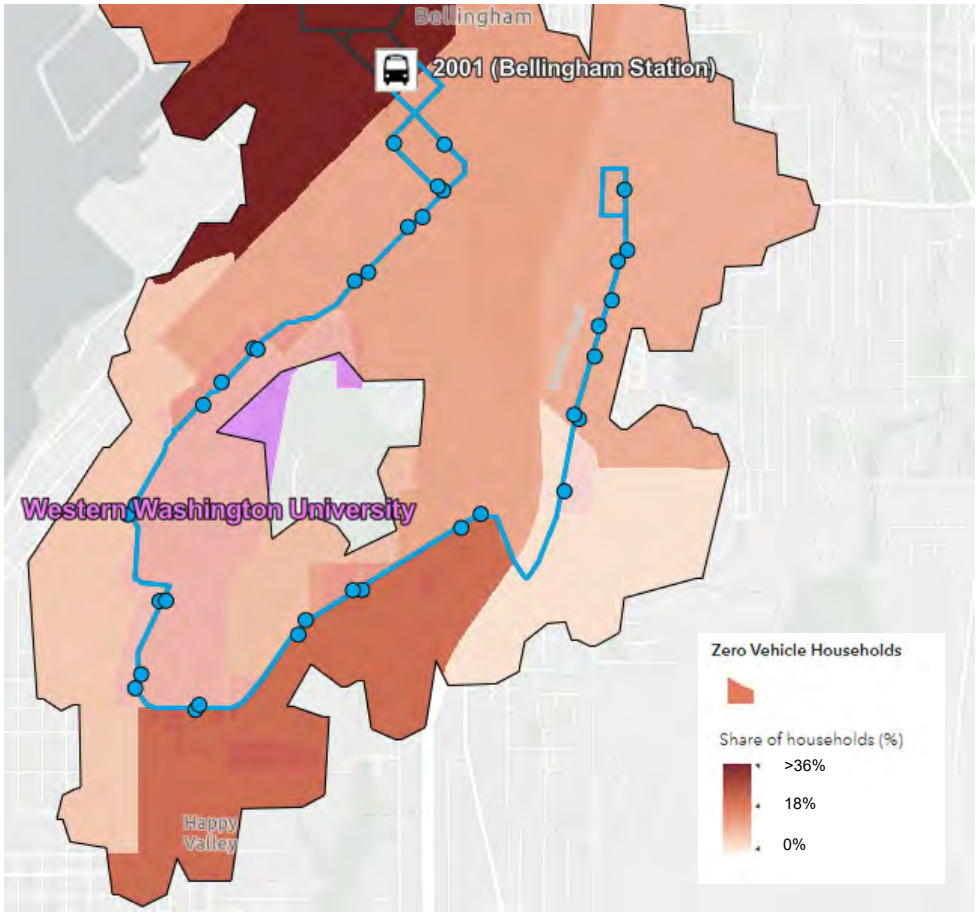


Figure 15 Zero Vehicle Households Proximate to the Blue Go Line (190)

Similar to the Gold and Green Go Lines, the highest zero vehicle households are located in Downtown. For the Blue Go Line, another area with higher zero vehicle households is located at southeast of Western Washington University near higher density housing.

Socioeconomic Characteristics

The following summarize the socioeconomic characteristics along the different routes completed by WTA. The maps highlight areas within ¼-mile of the routes with above average shares of minority, limited English proficiency (LEP), and low-income households, summarized at the Title VI Index. The index compares the share of minorities, LEP, and low-income households within each census block to the service area average.[2] In the following figures a 3 (dark blue) represents a higher share of total Title VI households and white represents areas where the Title VI share is lower than the service area average for the census block. Transit can be a mode of transportation to serve lower income population, which often have limited or no access to vehicles.

Title VI characteristics for the Gold Go Line (331) is summarized in Figure 16, Figure 17 summarizes the characteristics for the Green Go Line (232), and Figure 18 summarizes the Blue Go Line (190).

[2] Each category (minority, LEP, low-income) is scored a 0 or a 1 based on the share of each factor in the census tract with 1 representing a greater share of that population. A score of 3 indicates a census tract with a higher portion of each of the categories.

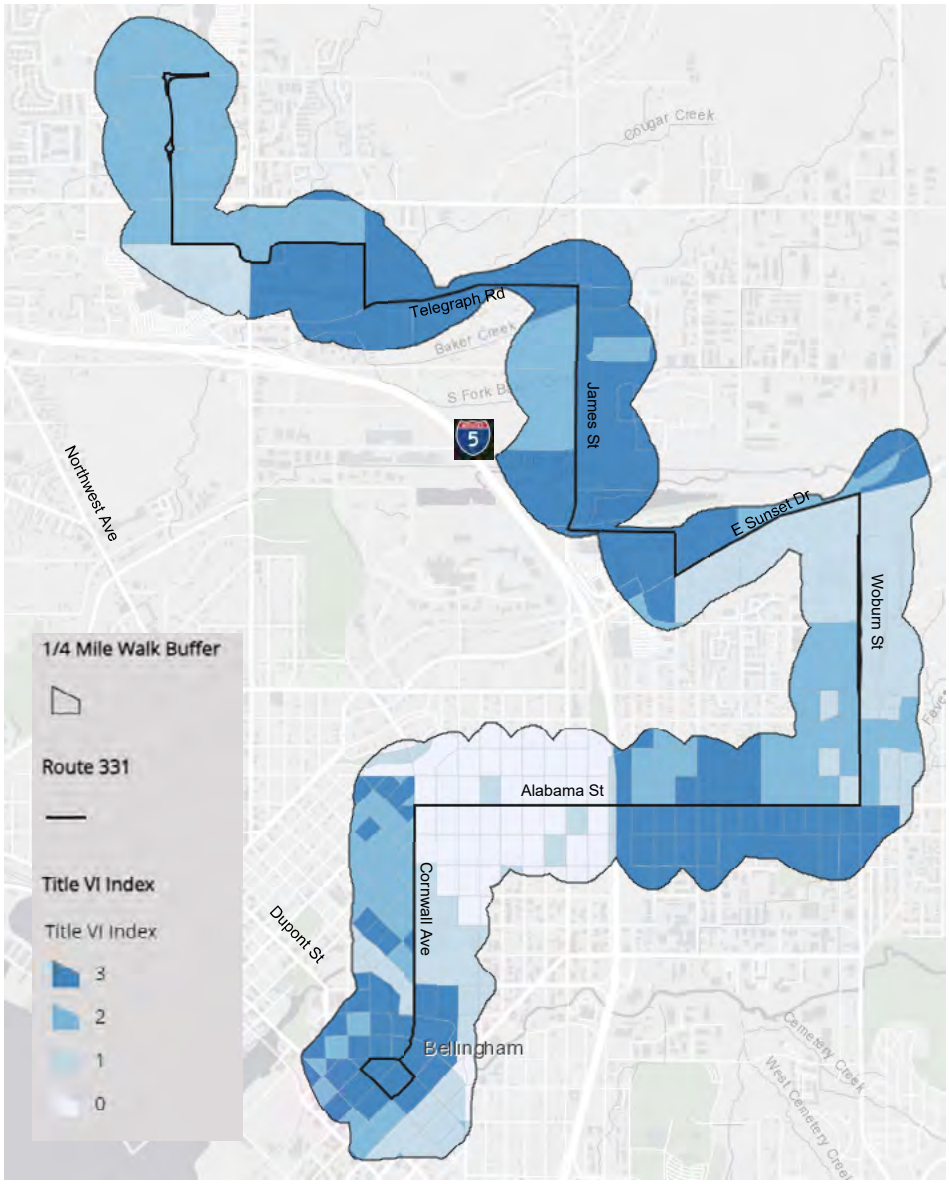


Figure 16 Title VI Census Blocks - Gold Go Line (331)

As shown in Figure 16, the highest concentration of Title IV residents is near Telegraph Road, East of James Street, south of Alabama Street east of I-5, and in Downtown.

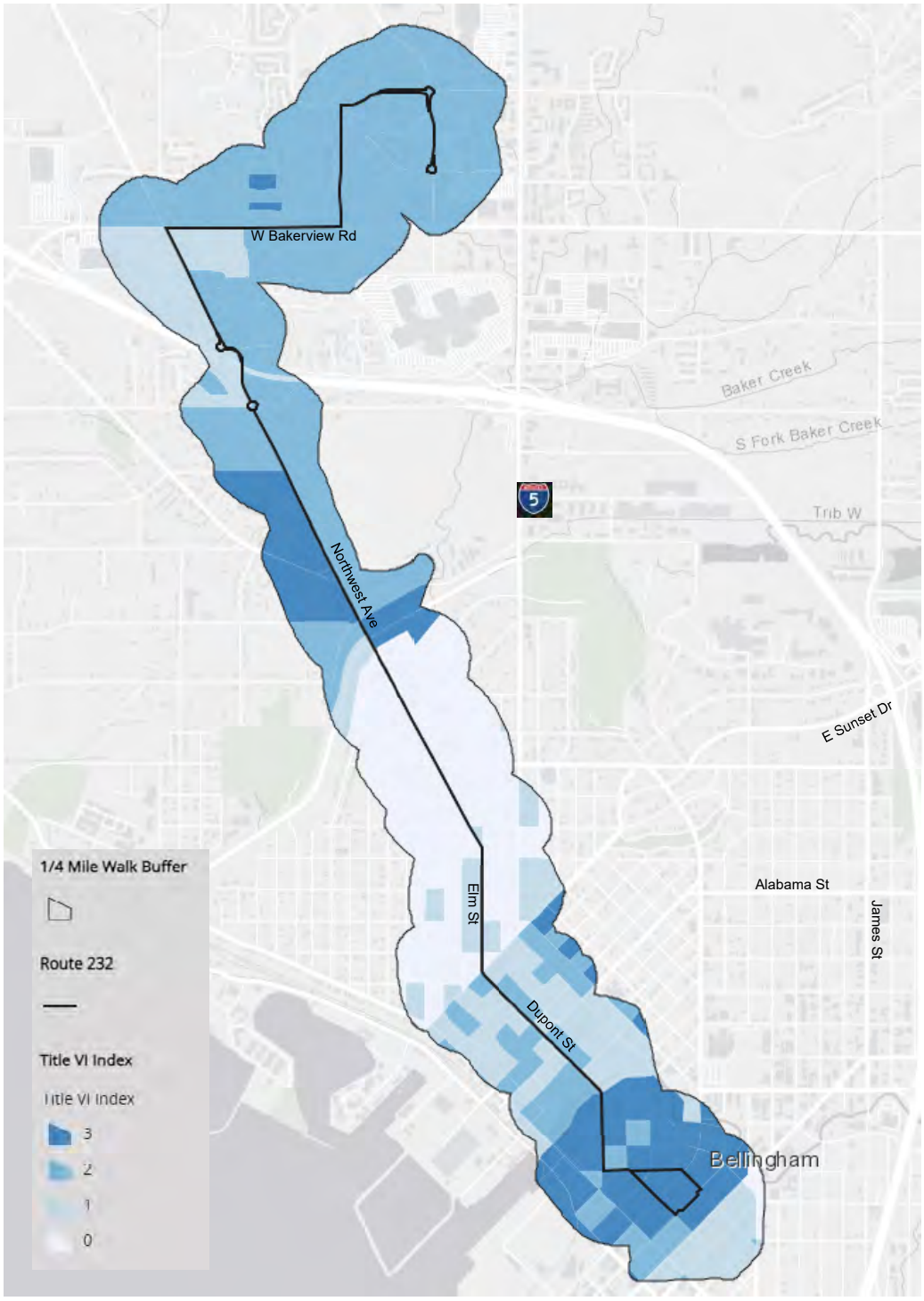


Figure 17 Title VI Census Blocks - Green Go Line (232)

As shown in Figure 17, along the Green Go Line the highest Title VI concentrations are west of Northwest Avenue and in Downtown Bellingham.

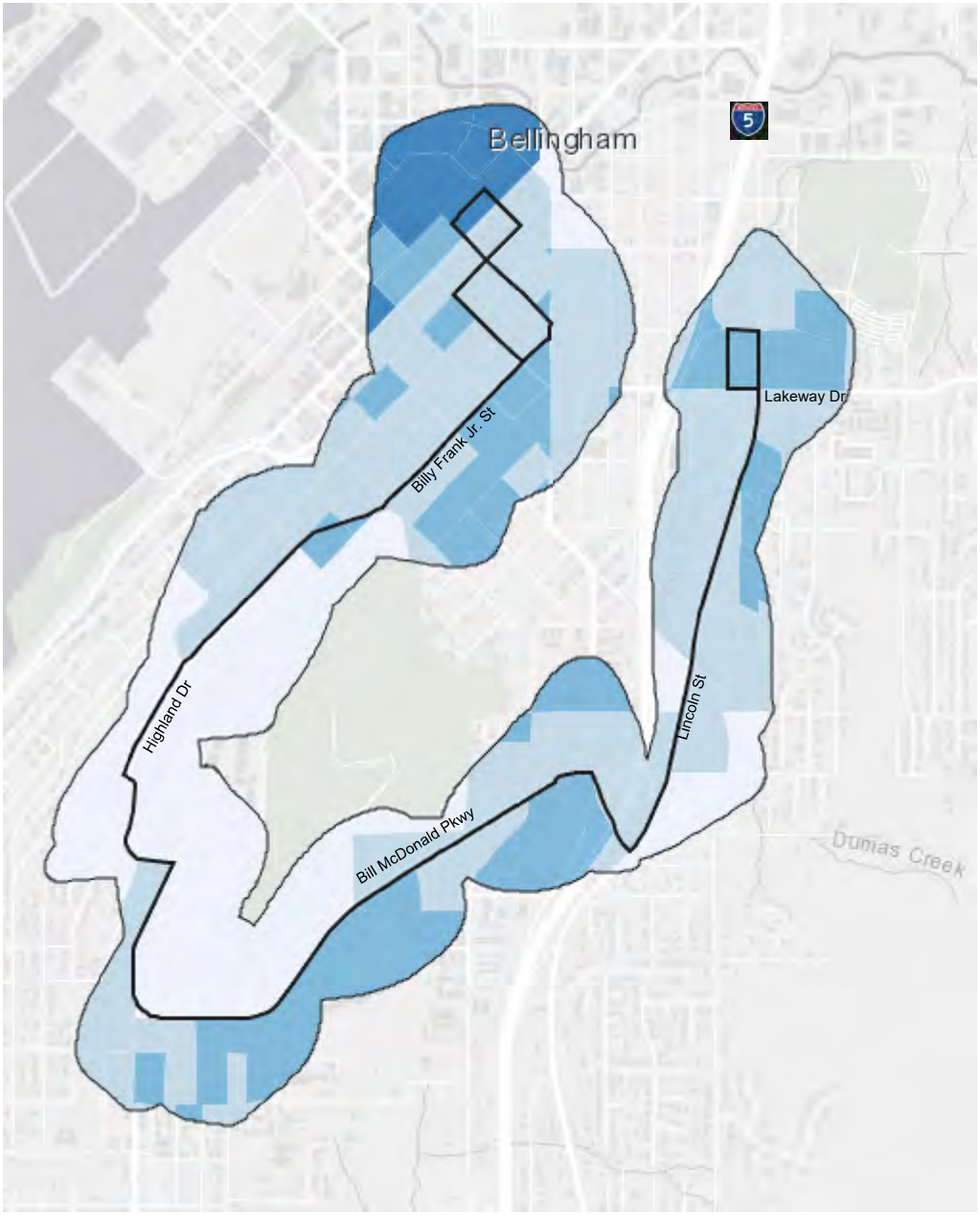


Figure 18 Title VI Census Blocks - Blue Go Line (190)

As shown in Figure 18, the highest Title VI areas are in Downtown with medium concentrations north of Lakeway Drive and south of Bill McDonald Parkway.

Ridership

Existing Gold, Green, and Blue Go Line ridership data were obtained from WTA. The data was reviewed for 2018, 2019 and 2022 conditions. Ridership is approximately 55 percent on average of what it was pre-pandemic across the three Go Lines; however, it is continuing to increase and it is anticipated that ridership will return to the level seen in previous years. Therefore, the 2018 and 2019 ridership levels represent the ridership without the influence of the pandemic.

WTA captures alightings by conducting periodic surveys while boardings are recorded as passengers enter the transit vehicles. Prior to 2020, boardings were only collected at the aggregated level and not by stops unless a survey was conducted. Therefore, only monthly data was available for 2019 while both boardings and alightings were available for 2018 when a survey was conducted. Boardings data is available for 2022 as a survey has not been conducted for alightings.

Transpo reviewed the monthly data from 2019 (before the COVID-19 pandemic) and for the first 5 months of 2022. Figure 19 provides a summary of the monthly boardings for 2019 and 2022 for the Gold Go Line and Figure 20 provides a summary for the Blue and Green Go Lines.

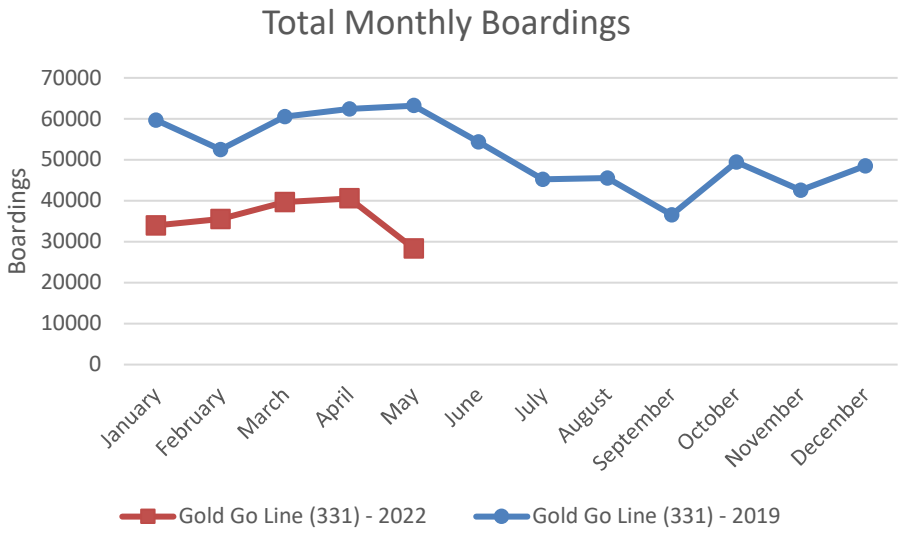


Figure 19 Monthly Ridership – Gold Go Line (331)

As shown on Figure 19, overall ridership was lower in 2022 as compared to 2019 due to the COVID-19 pandemic. The average monthly boardings for the first part of 2022 was over 35,500 boardings for the Gold Go Line. February 2022 represents the median ridership for the first 5 months of the year with February and June representing the median ridership in 2019. The review of 2019 data shows there is a decrease in ridership in the summer, which is due to the colleges and universities enrollment being less during this period.

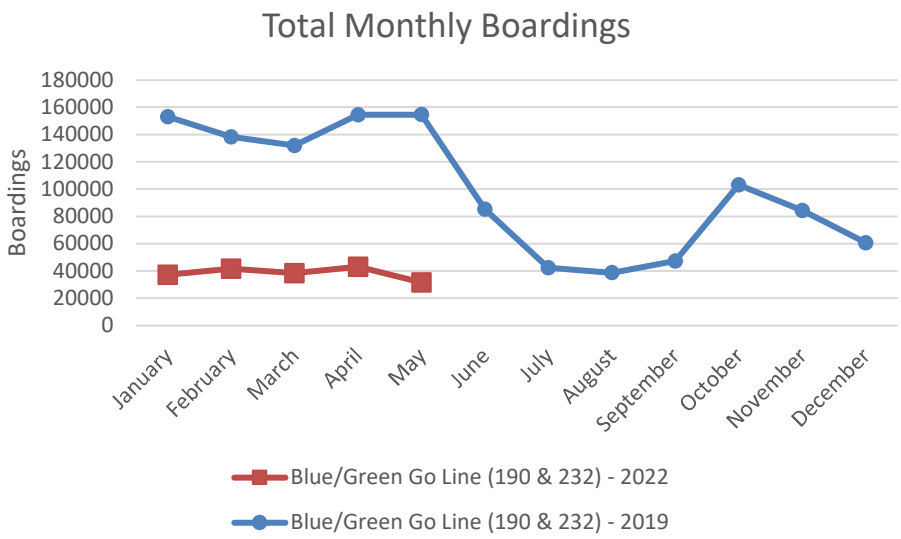


Figure 20 Monthly Ridership – Blue & Green Go Lines (232 & 190)

As shown on Figure 20, similar to the Gold Go Line, the 2022 ridership is down compared to the 2019 data. March 2022 represents the median ridership while in 2019 June represents the median. Similar to the Gold Go Line, ridership decreases in the summer consistent with the lower enrollment at the colleges and universities. The change is ridership is more pronounced for the Blue/Green Go Lines varying from a high of 154,625 to 38,850 boardings since it serves both WWU and WCC and WWU has a higher enrollment change. It is noted that the review of ridership focused on Route 190, which is the alignment that is being considered. The other 100-series routes that also serve these stops result in approximately 35,000 additional boardings in March.

It is noted based on a review of October 2022 data that WTA ridership is increasing and has recovered to around 70 percent.

Monthly Gold Go Line (331)

ridership by stop was reviewed for the median month for 2022. As discussed above, 2022 ridership is down due to the COVID-19 pandemic, but this information is considered to provide a benchmark of existing conditions. The total boardings for February was 35,564 boardings. Not all data recorded with the stop number; however, this represented only 1,300 boardings or less than 4 percent. Figure 21 provides a summary of total monthly boardings at each stop along the Gold Go Line.

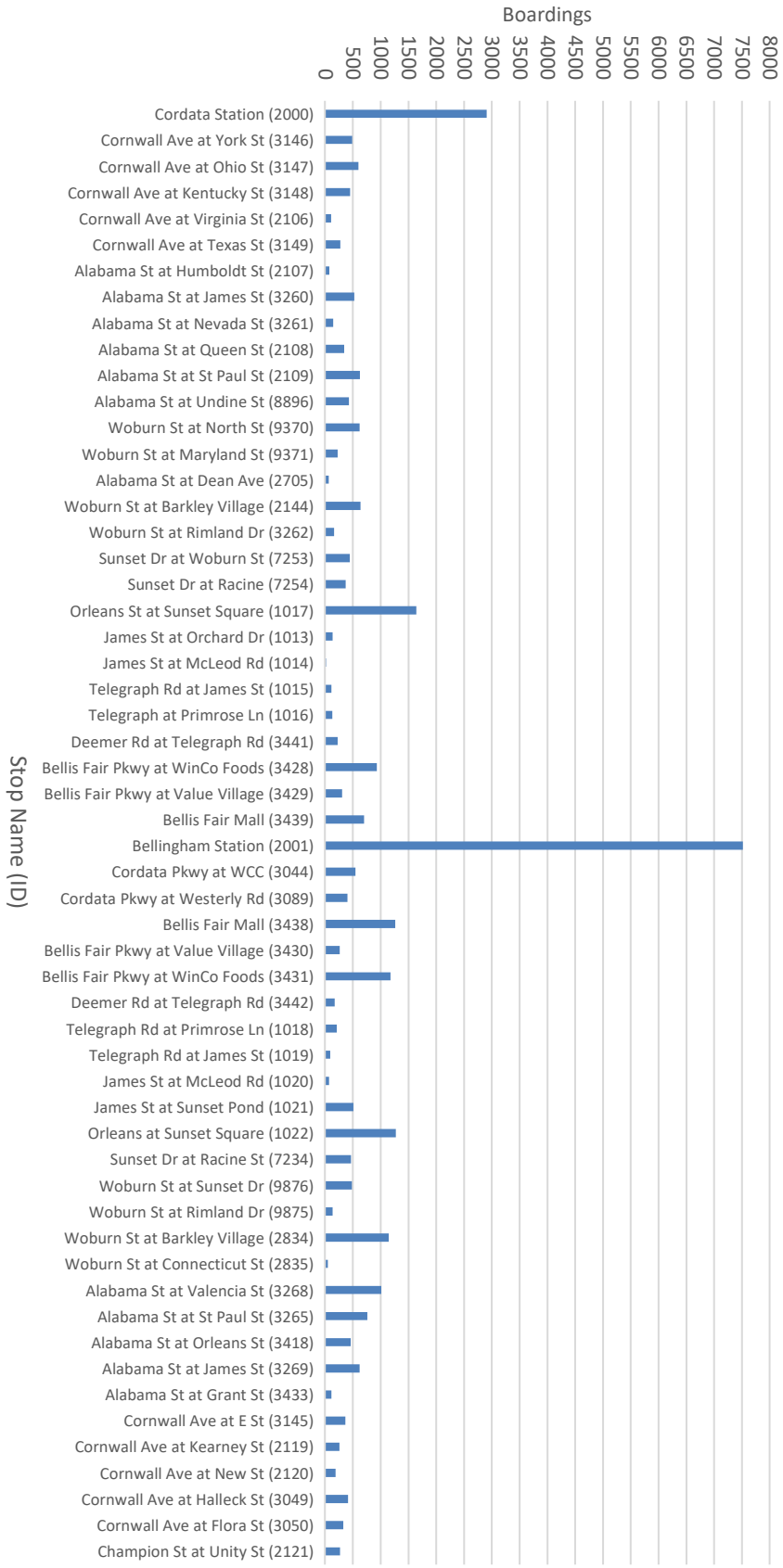


Figure 21 Total Boardings by Stop – February 2022 – Gold Go Line (331)

As shown on Figure 21 the highest number of monthly boardings were at the Cordata and Bellingham Stations. Other stops at over 1,000 total monthly boardings included:

- Alabama Street at Valencia Street (3268)
- Woburn Street at Barkley Village (2834)
- Bellis Fair Parkway at WinCo Foods (3431)
- Bellis Fair Mall (3438)
- Orleans Street at Sunset Square (1017 & 1022)

Stops with less than 100 boardings during the month included:

- James St at McLeod Rd (1014 & 1020)
- Woburn St at Connecticut St (2835)
- Alabama St at Dean Ave (2705)
- Alabama St at Humboldt St (2107)
- Telegraph Rd at James St (1019)

Daily ridership was also reviewed for the route for a typical day in February 2022 and April 2018. April 2018 is when WTA conducted a ridership survey, and the data reflects both boardings and alightings. The 2018 daily ridership is summarized on Figure 22 and Figure 23 shows the 2022 typical day ridership by stop. The review of a typical day ridership helps to understand if stops serve little to no riders and could be considered for elimination or consolidation. Consolidating or eliminating stops with little to no riders can help improve transit speed by minimizing stops that generally do not get used.

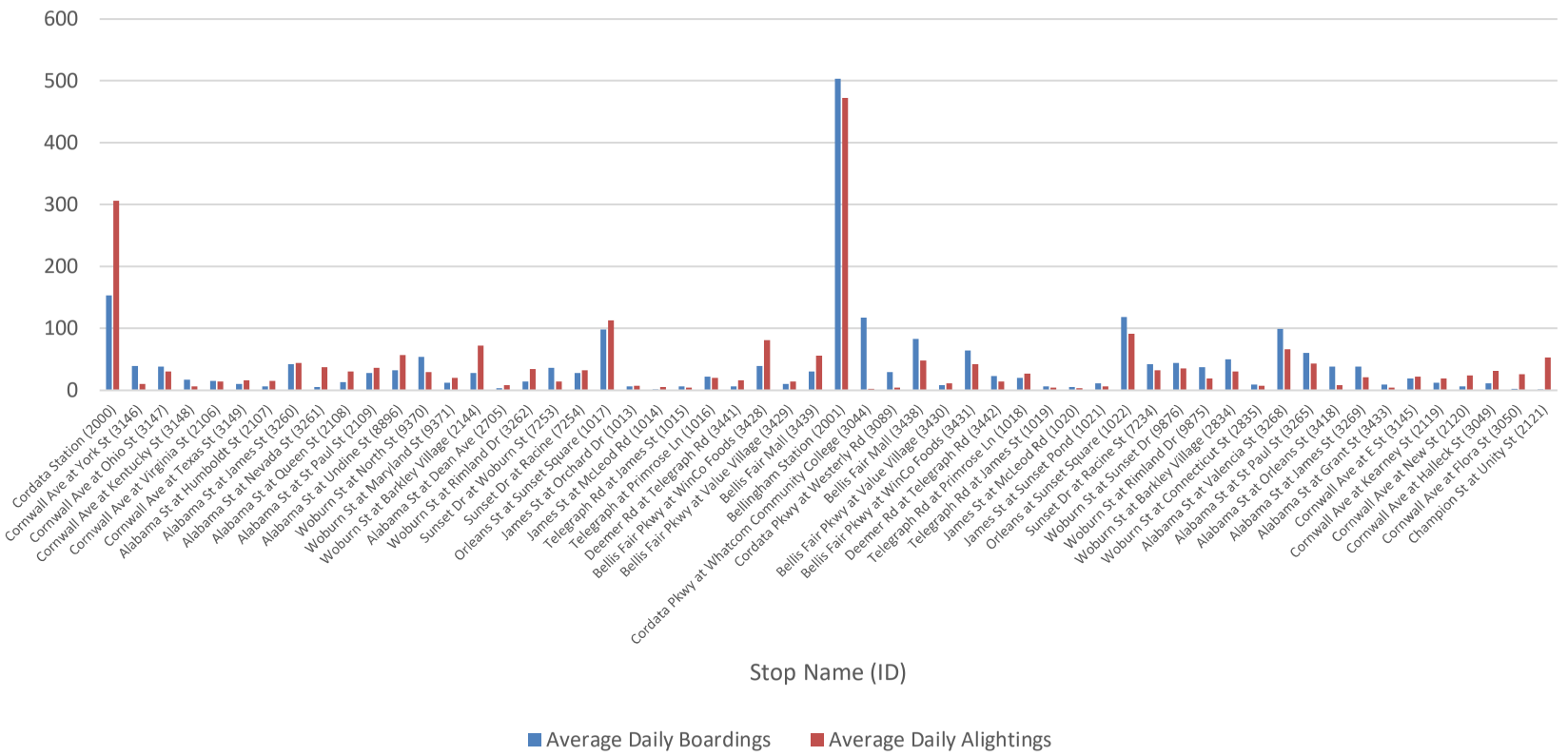


Figure 22 April 2018 Average Weekday Daily Boarding & Alighting Survey Results – Gold Go Line (331)

Figure 23 Total Boardings by Stop - Typical Day February 2022 - Gold Go Line (331)

As shown in Figure 22 and Figure 23, consistent with the total monthly boardings the stops representing the highest ridership are the Bellingham and Cordata Stations, as well as Orleans Street at Sunset Square and Woburn Street at North Street.

Some stops had little or no boardings over the course of a day and very low boardings over the month. These stops include:

- James St at McLeod Rd – towards Cordata (1014) – 0 boardings on a typical day and 15 in the month of February. It is noted that there is a lack of sidewalks in this area.
- James St at McLeod Rd towards Downtown (1020) – 3 daily boardings, 68 monthly
- Alabama St at Dean Ave (2705) – 0 boardings on a typical day and 67 in the month of February.
- Woburn St at Connecticut St (2835) – 4 daily boardings, 48 monthly

Additionally, the 2018 boarding and alighting survey showed lower levels of alightings at the intersections listed above with a maximum of 8 alightings. It is important to note that James Street lacks any kind of pedestrian facilities, which severely limits access to existing bus stops. The City has targeted James Street for future pedestrian improvements, which may increase ridership at these stops.

Cornwall also has a series of stops spaced less than 1/8-mile apart, making consolidation in the segment between Ohio and Alabama a feasible option to improve transit speeds. Segments along Alabama and Woburn may likewise benefit from stop consolidation.

Green and Blue Go Line (232 & 190)

For the Green and Blue Go Lines March 2022 represented the median ridership. The total boardings for March was 38,458 boardings. Not all data recorded with the stop number; however, only 552 boardings or less than 2 percent of the boardings is not represented in the data. The data also indicated that occasionally the bus makes stops at locations that are not part of the route. Figure 24 provides a summary of total monthly boardings at each stop along the Green Go Line and Figure 25 summarizes the total monthly boardings by stop for the Blue Go Line.

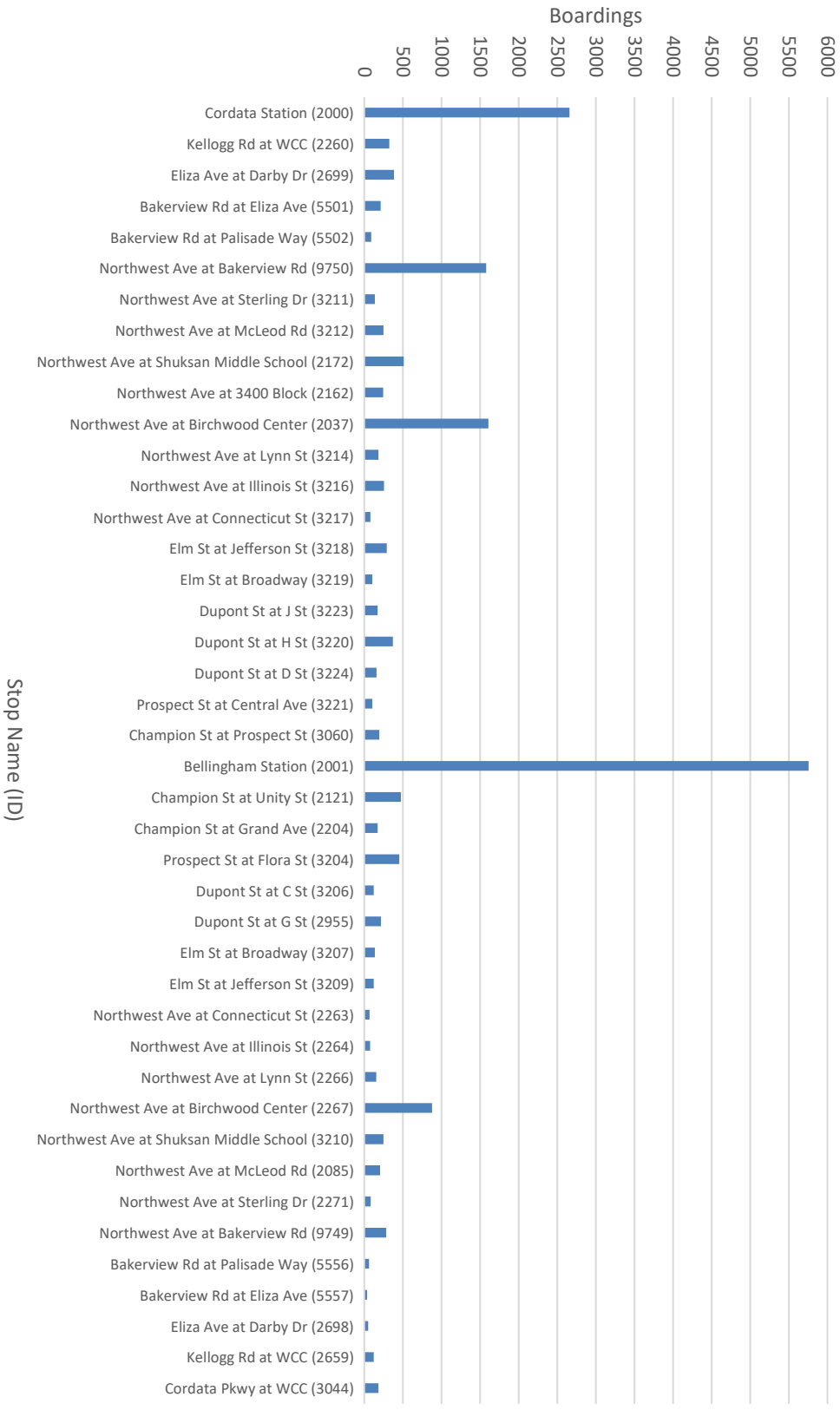


Figure 24 Total Boardings by Stop – March 2022 – Green Go Line (232)

48

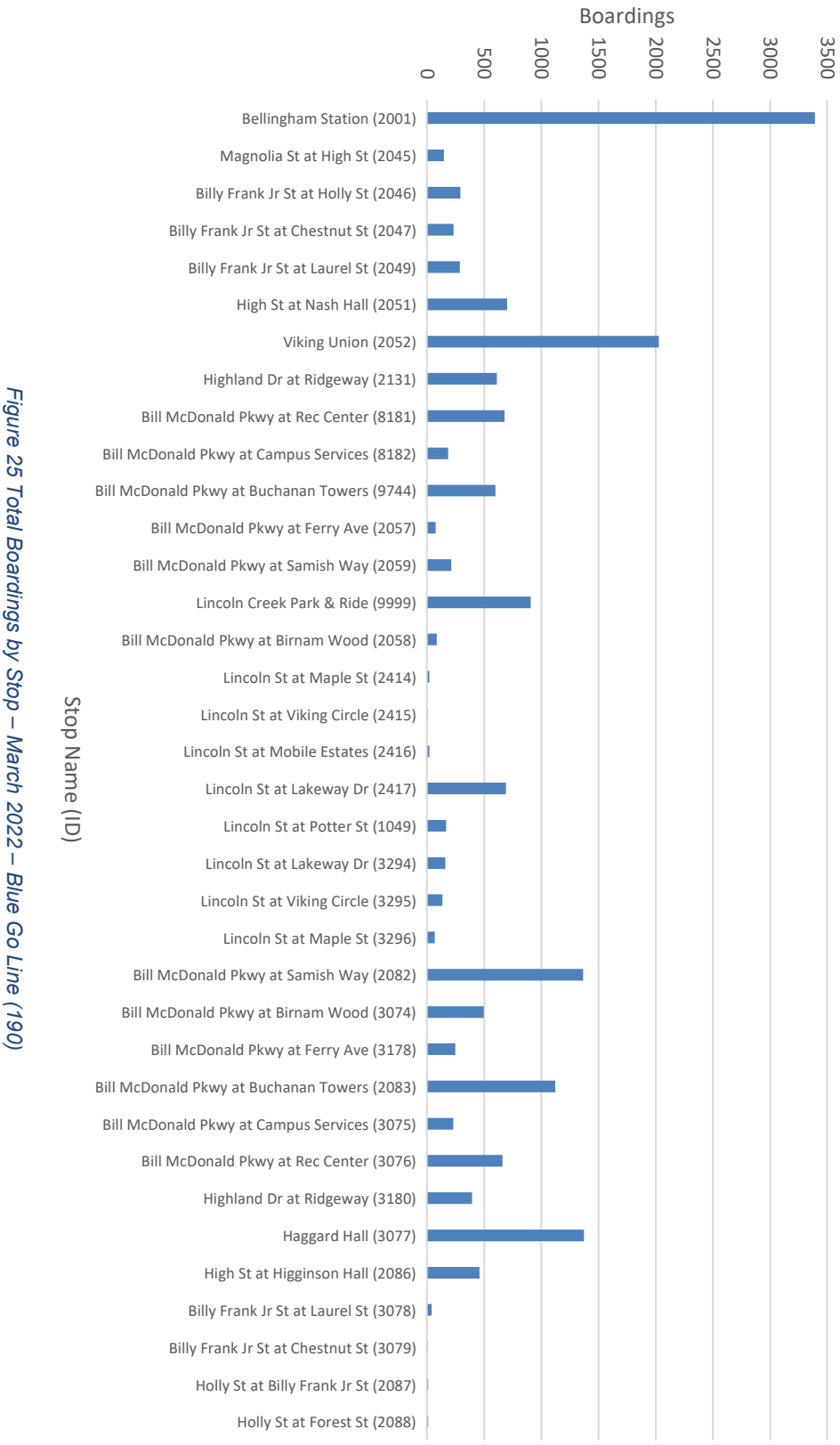


Figure 25 Total Boardings by Stop – March 2022 – Blue Go Line (190)

As shown in Figure 24, the stops with the most total monthly boardings included the Bellingham Station, Cordata Station, Northwest Avenue/Bakerview Road, and Northwest Avenue/Birchwood Center stations. Stops with less than 100 boardings during the month include the following:

- Bakerview Rd at Palisade Way (5502 & 5556)) – There is a potential for a future HAWK signal at this location, which could increase boardings.
- Northwest Ave at Connecticut St (2263 & 3217)
- Northwest Ave at Illinois St (2264)
- Northwest Ave at Sterling Dr (2271)
- Bakerview Rd at Eliza Ave (5557)
- Eliza Ave at Darby Dr (2698)

The stop with the lowest total monthly boardings was the Bakerview Road/Eliza Avenue stop with 36 boardings for the month.

For the Blue Go Line, shown on Figure 25, again the Bellingham Station had the most boardings. The next stations with more than 1,000 total monthly boardings include the following:

- Viking Union (2052)
- Bill McDonald Pkwy at Samish Way (2082)
- Bill McDonald Pkwy at Buchanan Towers (2083)
- Haggard Hall (3077)

Stops with lower boardings during the month of March include:

- Bill McDonald Pkwy at Ferry Ave (2057)
- Bill McDonald Pkwy at Birnam Wood (2058)
- Billy Frank Jr St at Laurel St (3078)
- Billy Frank Jr St at Chestnut St (3079)
- Holly St at Billy Frank Jr St (2087)
- Holly St at Forest St (2088)

Daily ridership was also reviewed for the routes for a typical day in March 2022 and April 2018. For the Green Go Line, the 2018 daily ridership is summarized on Figure 26 and the 2022 typical day ridership by stop is summarized on Figure 27. For the Blue Go Line, the 2018 daily ridership is summarized on Figure 28 and the 2022 typical day ridership by stop is summarized on Figure 29.

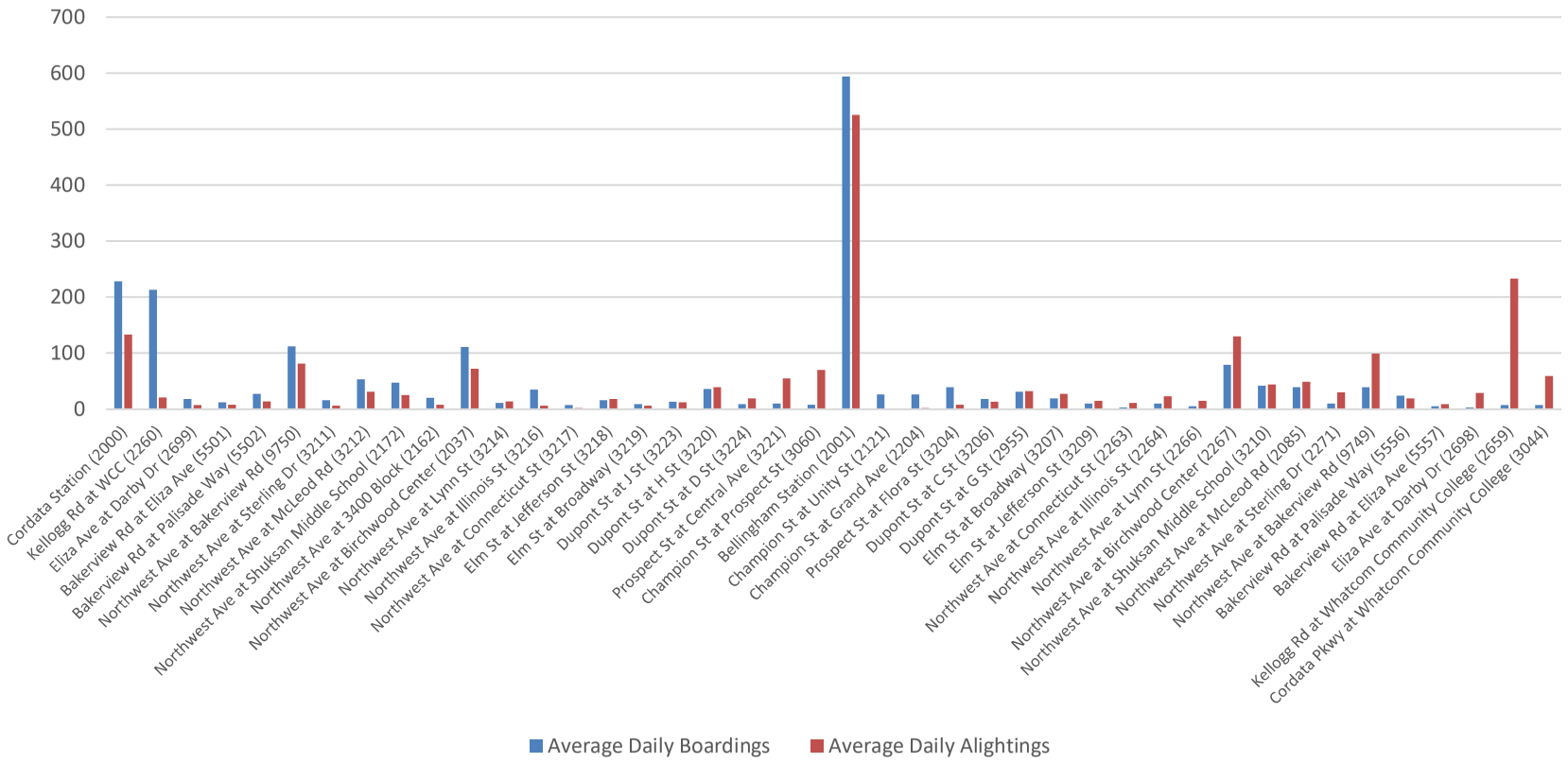


Figure 26 April 2018 Average Weekday Daily Boarding & Alighting Survey Results – Green Go Line (232)

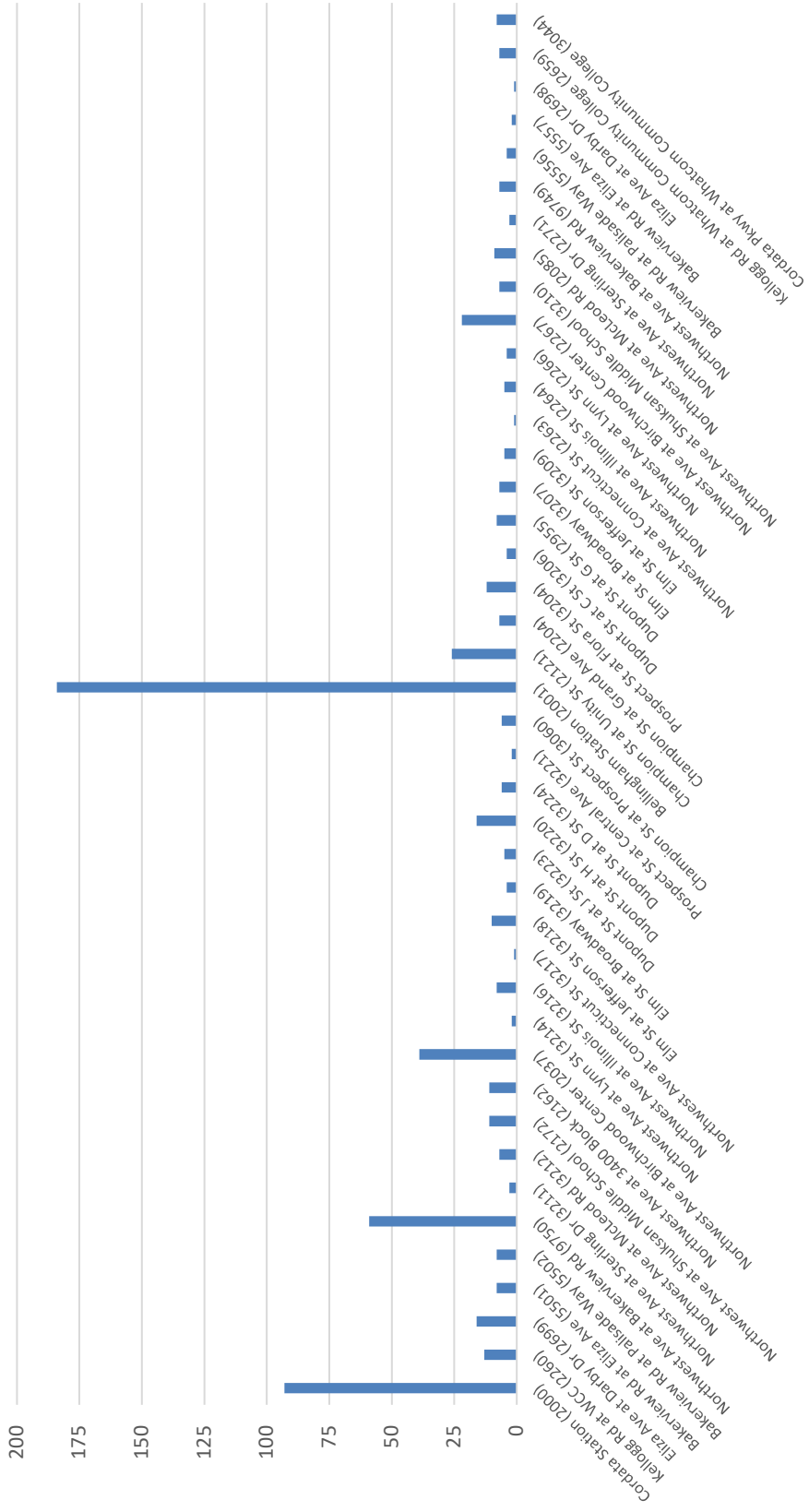


Figure 27 Total Boardings by Stop - Typical Day March 2022 - Green Go Line (232)

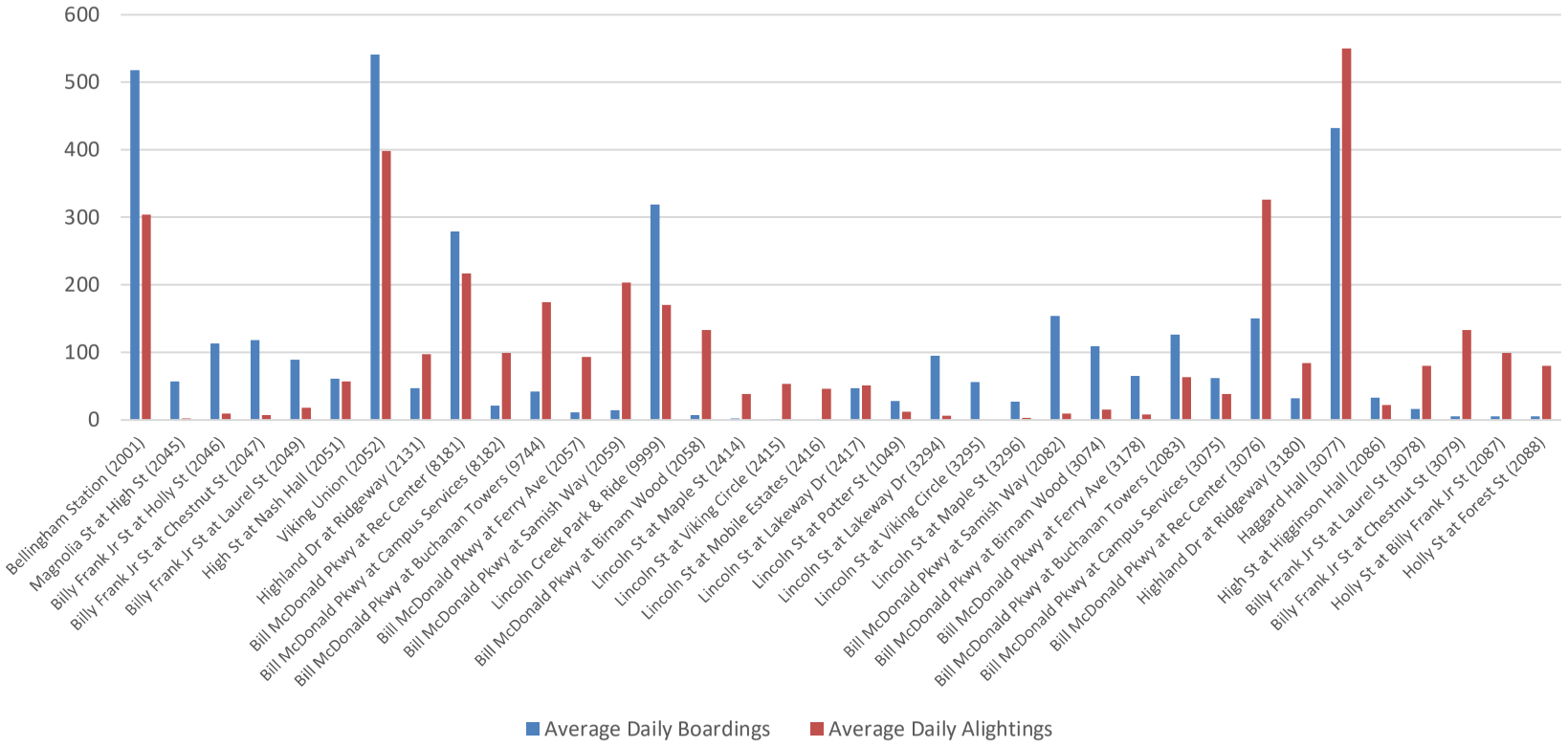


Figure 28 April 2018 Average Weekday Daily Boarding & Alighting Survey Results – Blue Go Line (190)

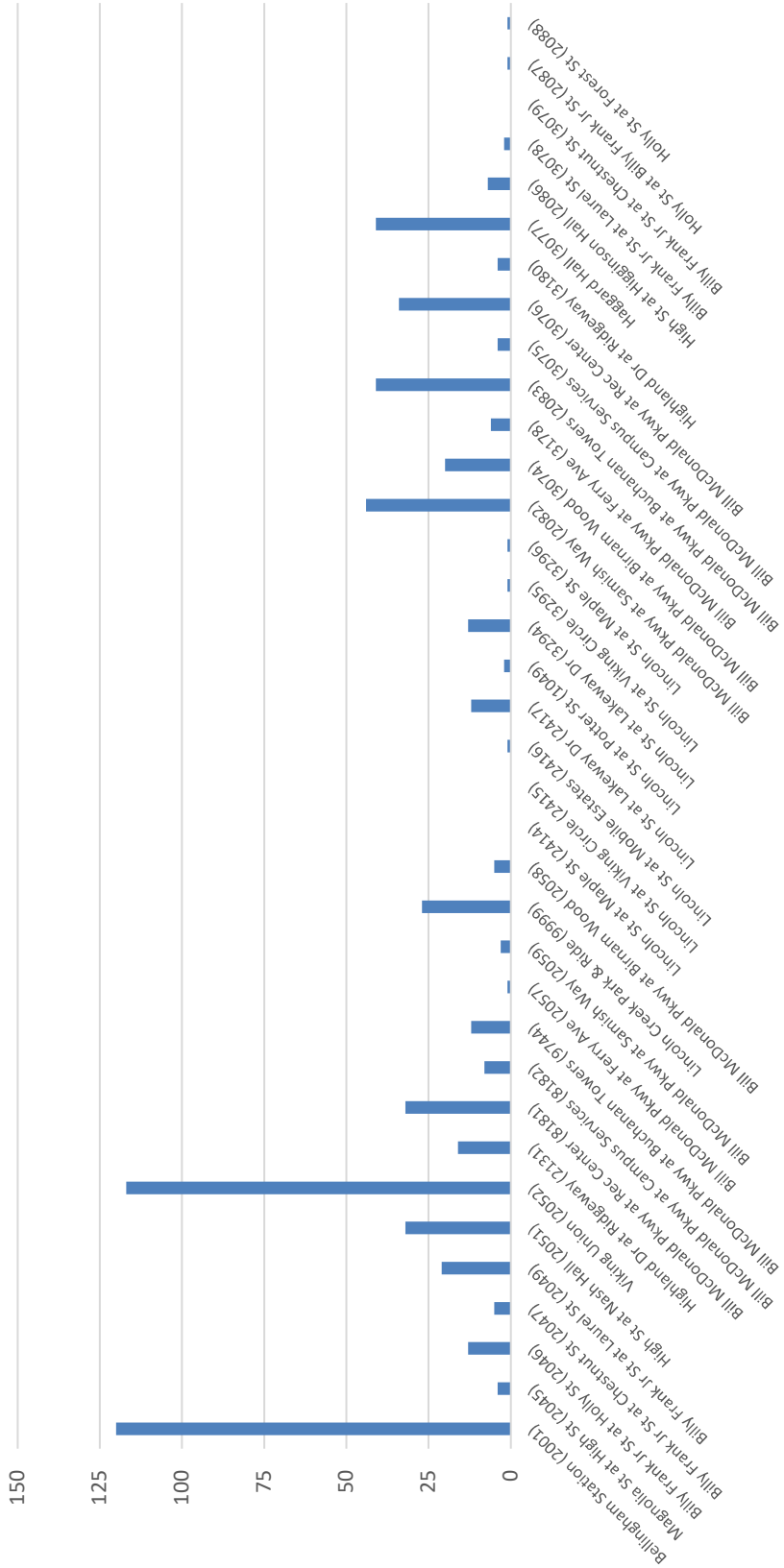


Figure 29 Total Boardings by Stop - Typical Day March 2022 - Blue Go Line (190)

For the Green Go Line, the Cordata and Bellingham stations had the most boardings. Other stops with higher boardings in both years are the Northwest Avenue at Bakerview Road and Northwest Avenue at Birchwood Center stops. From the 2018 data, the Kellogg Road at WCC stop also represents a stop with a high number of alightings. Similar to the Gold Go Line, ridership is down from 2018.

Similar to the other Go Lines, the Bellingham Stations represents the highest ridership for the Blue Go Line. Other stops with higher ridership were the Viking Union and Haggard Hall. The ridership in 2022 is much lower than in 2018, likely representing impacts of the pandemic and utilization of remote learning/working practices. It is noted that as of October 2022 ridership has recovered to around 70 percent.

Along the Green Go Line there were no stops that had zero boardings. Several had low average daily ridership but higher monthly ridership. The four stops with the lowest ridership were:

- Bakerview Rd at Eliza Ave (5557) – 2 daily and 36 monthly boardings
- Eliza Ave at Darby Dr (2698) – 1 daily and 51 monthly boardings
- Bakerview Rd at Palisade Way (5556) – 4 daily and 60 monthly boardings (City has identified potentially installing a HAWK at this location, which could increase pedestrian accessibility and potentially riders.)
- Northwest Ave at Connecticut St (2263) – 1 daily and 68 monthly boardings

The 2018 survey data showed that the stops above had between 9 and 29 alightings.

Some stops along the Blue Go Line had little or no ridership over the course of a day and very low ridership over the month. These stops include:

- Billy Frank Jr St at Chestnut St (3079)
- Holly St at Billy Frank Jr St (2087)
- Holly St at Forest St (2088)

The 2018 boarding and alighting survey showed most of the stops listed above had a higher number of alightings.

It is noted that this review generally focuses on the Route 190 ridership, which is the alignment that is being considered. The other 100-series routes result in an additional 35,000 boardings based on a review of March data.

On-Time Performance

WTA also collects data related to the on-time performance of the buses. WTA considers a bus to be on-time if it arrives at timepoint locations within 5 minutes of scheduled service. The current routes have headways of 15 minutes or more; with Rapid Transit's higher frequency of 10-minutes or less on-time consideration will need to be given to changing the on-time performance standards. Arrival would need to be better than 5 minutes otherwise the transit vehicles may begin to bunch. Based on the current service standard, WTA aims for the AM and Mid-Day time periods to be on time 95 percent or more of the time and during the PM periods for the service to be on-time 90 percent of the time or more.

The on-time performance for the analysis from February for the Gold Go Line is shown on Figure 30. The Green Go Line and Blue Go Line are summarized on Figure 31 and Figure 32, respectively.

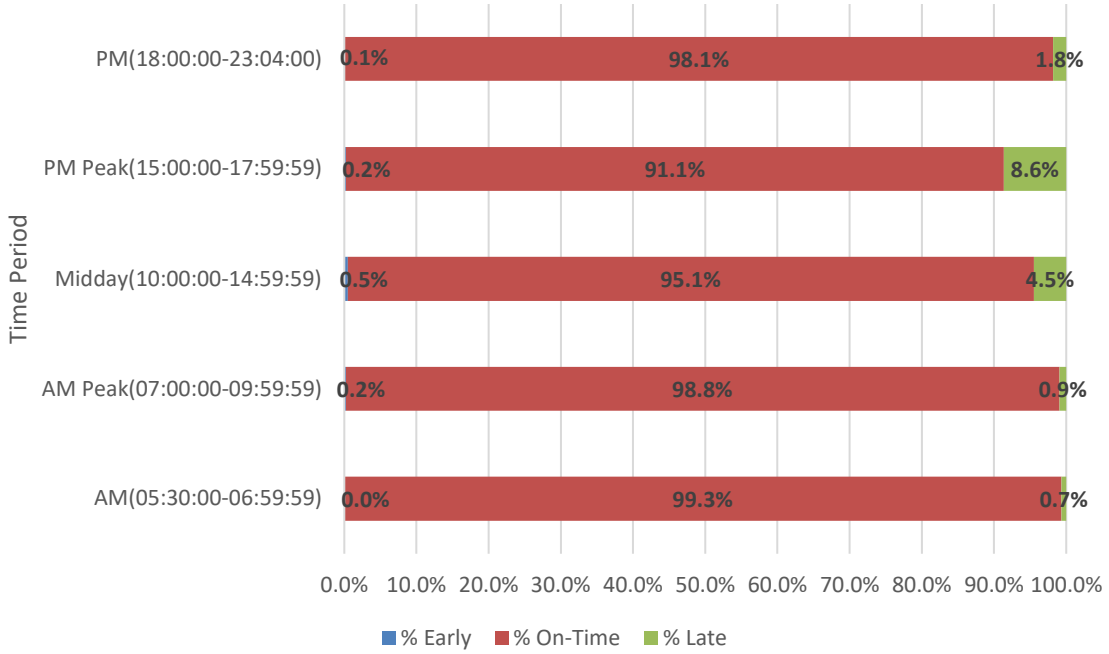


Figure 30 On-Time Performance - Gold Go Line - February 2022

As shown on Figure 30, generally service is on time for the Gold Go Route based on the February 2022. The largest on-time difficulties during the PM commute period between 3 and 6 PM with approximately 9 percent of buses running late, which is also the period with the highest traffic volumes/congestion. The average schedule deviation was 6.3 minutes during the 3 to 6 PM peak period.

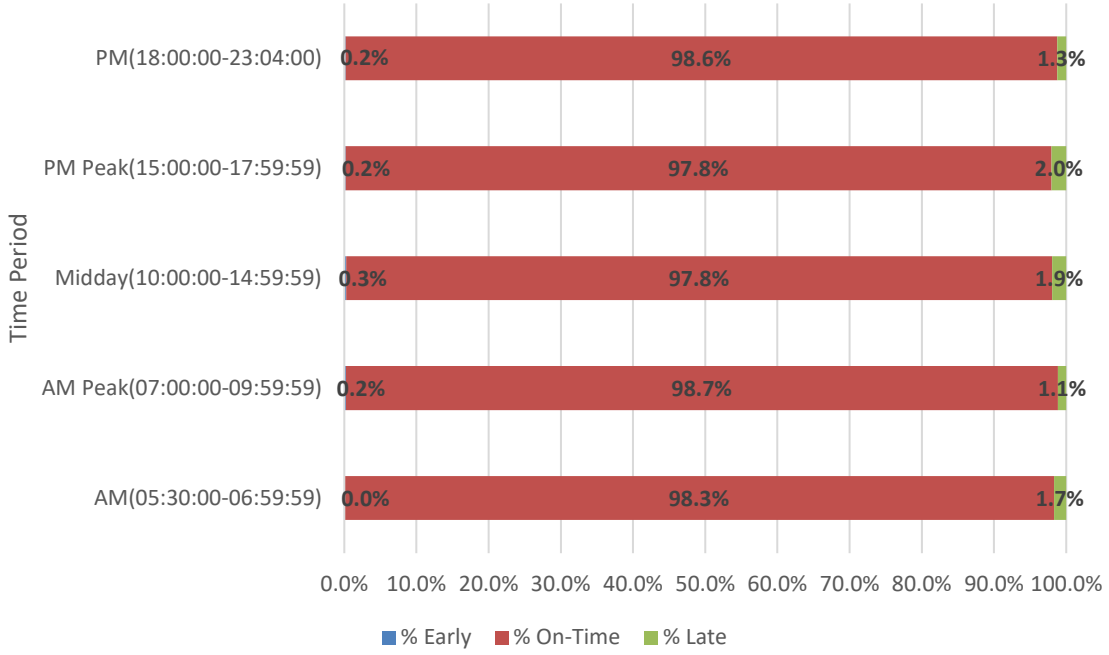


Figure 31 On-Time Performance - Green Go Line - March 2022

As shown on Figure 31, buses along the Green Go Line are on-time over 97 percent of the time. The largest instance of buses running late is during the PM peak period between 3 and 6 PM. All time periods meet the on-time standards.

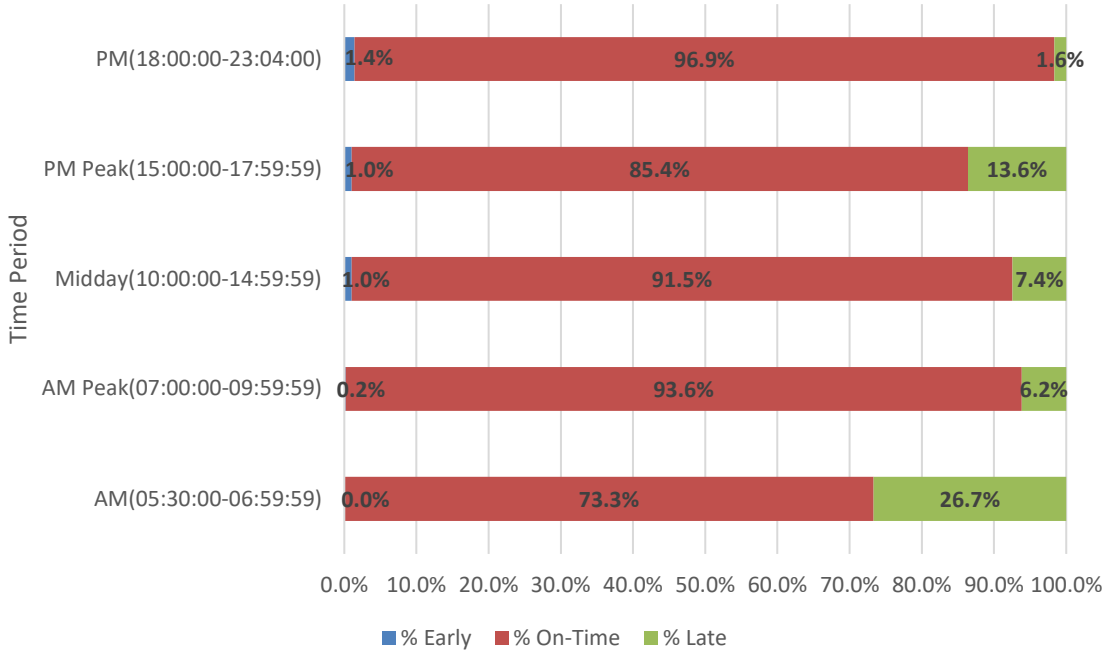


Figure 32 On-Time Performance - Blue Go Line - February 2022

As shown on Figure 32, the Blue Go Line has the largest instances of running late with approximately 27 percent of vehicles late during the AM peak period. . Currently, the only time period meeting the on-time standards is during the PM period between 6 and 11 PM.

A review of on-time performance for October 2022 shows that as traffic is increasing performance for buses is worsening. The percent of buses late has increased since February 2022.

During the AM peak period, the buses ran an average of 6.65 minutes late. Additionally, the majority of delays occurred at the Haggard Hall timepoint. During the 3 to 6 PM peak period, the bus was an average of approximately 6.7 minutes late and occurred at 6 different stop locations. The most frequent timepoint location with late buses was the Lincoln at Lakeway Stop followed by the Haggard Hall stop. Both of these stops are along corridors that experience congestion during the peak commuter periods. Of the late buses, approximately 75 percent were headed toward Downtown. It should be noted that there is a bus signal at the Lincoln Street/Lakeway Drive intersection; however, it is only in the westbound direction. Buses for the Blue Go Line make northbound left-turning (to Lakeway) and southbound through (to WWU) movements at the intersection.

Buses at the Haggard Hall stop could be delayed due to the gate utilized to restrict traffic which results in a one lane road to service buses and service vehicles. The stop is also located between numerous crosswalks. Depending on the time of day and level of pedestrian activity could delay bus movements. The gate and crosswalk locations are shown on Figure 33.

Figure 33 Roadway Leading Up to Haggard Hall Stop

Additionally, as discussed further, there are a number of maneuvers the bus has to make at the turnaround point near the Lincoln Street/Lakeway Drive intersection.

Dwell time at the stops was also reviewed to understand potential issues associated with on-time performance. Bus travel times are impacted to the amount of time spent at a stop or dwell time and delays related to traffic congestion within the corridors. There are a few stops where dwell time was not available and those stops were skipped as part of the analysis. The average weekday peak hour dwell time by stop is summarized on Figure 34 for the Gold Go Line, Figure 35 for the Green Go Line, and Figure 36 for the Blue Go Line.

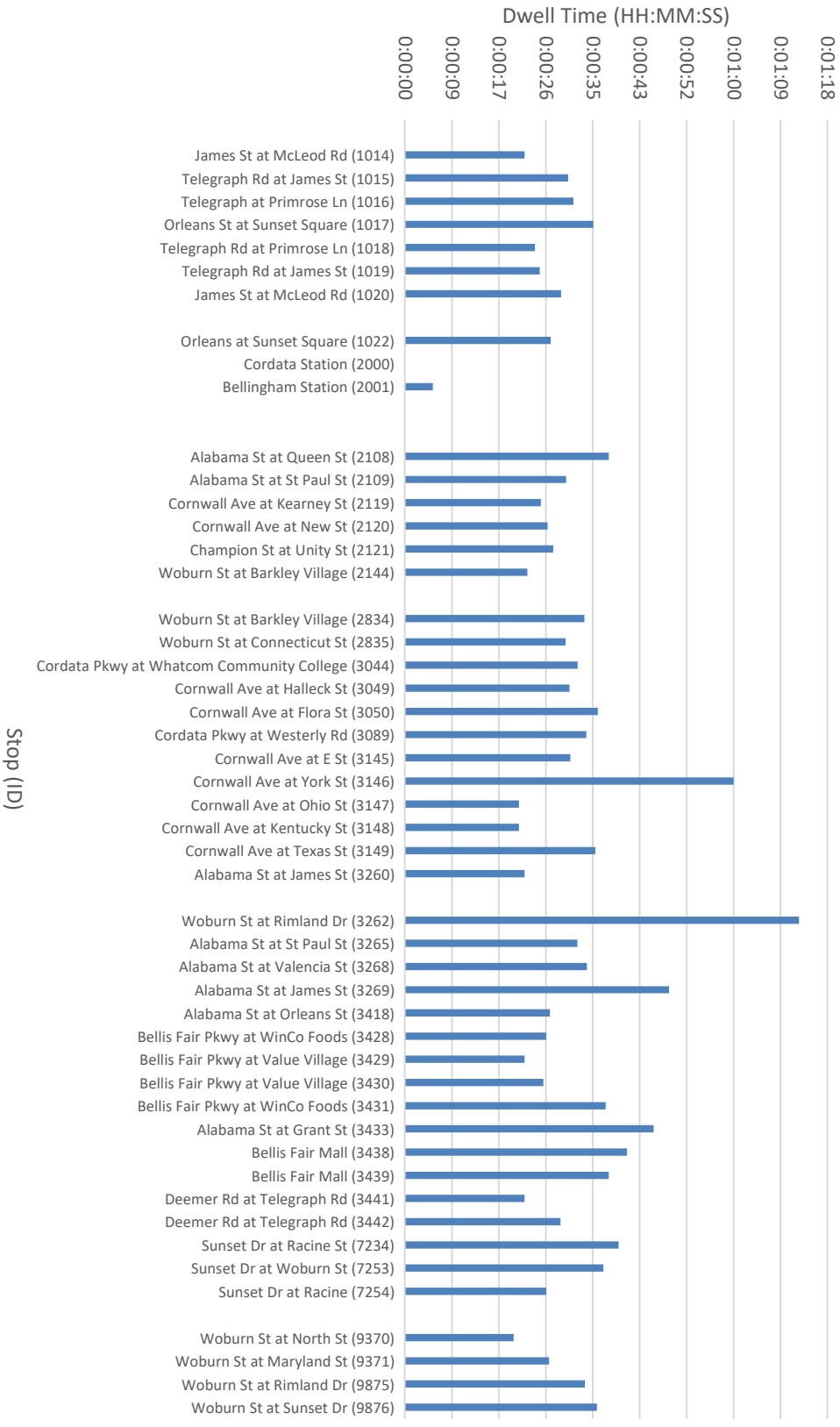


Figure 34 Average Dwell Time - February 2022 - Gold Go Line

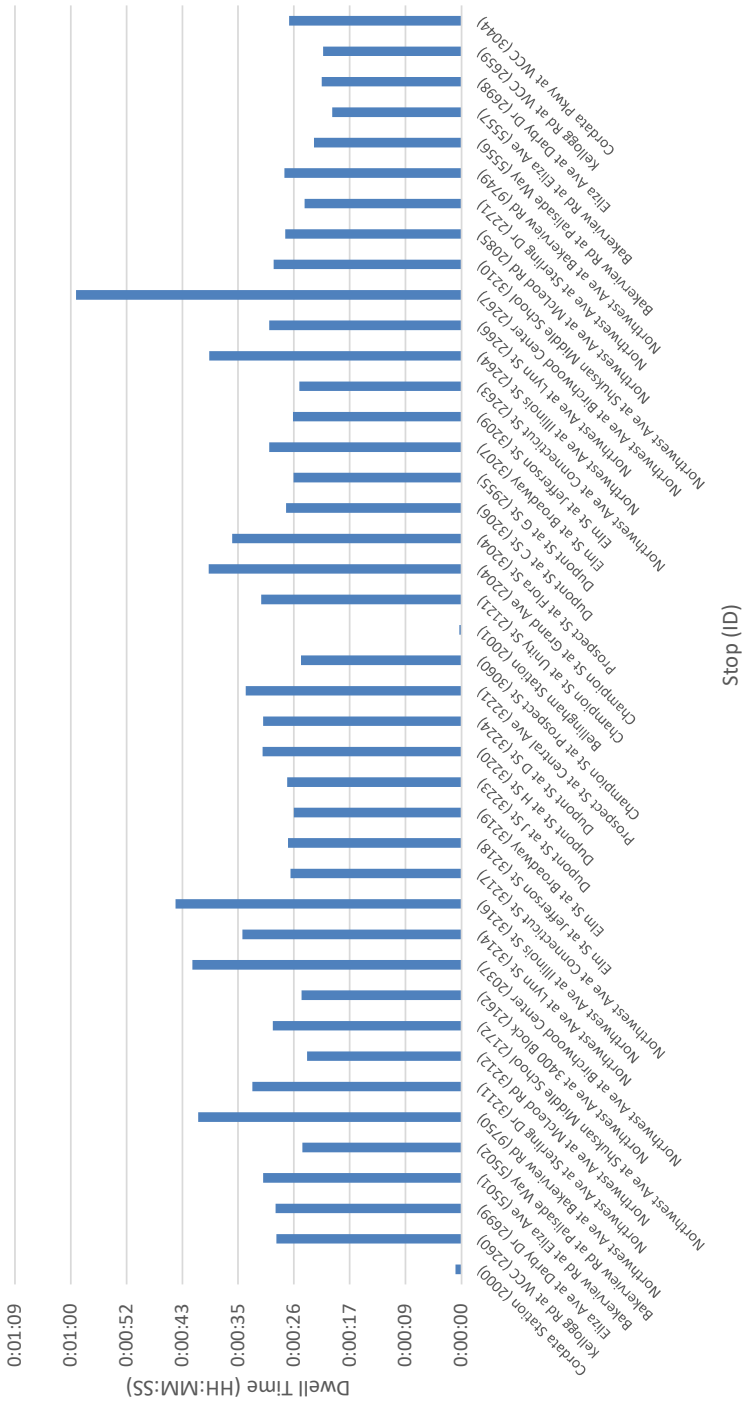


Figure 35 Average Dwell Time - March 2022 - Green Go Line

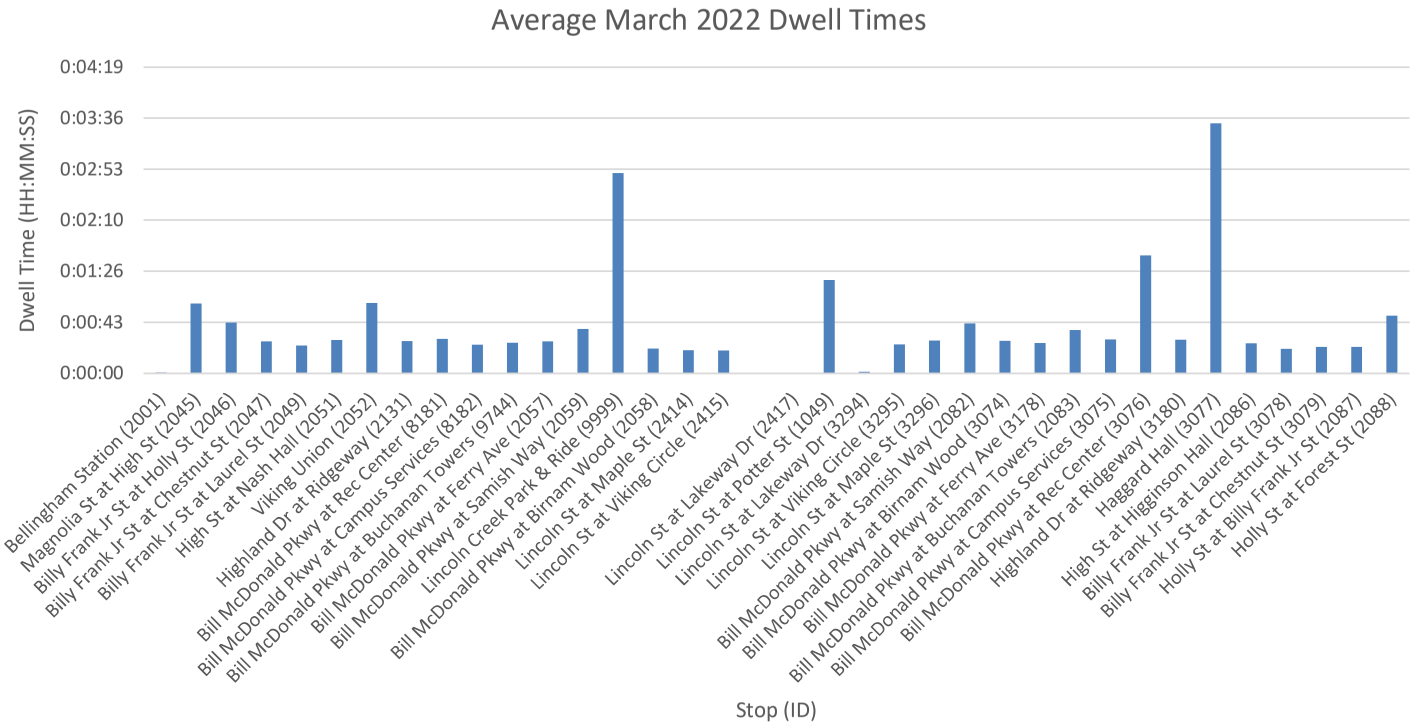


Figure 36 Average Dwell Time - March 2022 - Blue Go Line

On average dwell times at stops are short at 30 seconds or less for the Gold and Green Go Line. Average dwell times for the Blue Go Line were longer at 40 seconds. As shown on Figure 34, the longest dwell times along the Gold Go Line are at the Cornwall Avenue at York Street and Woburn Street at Rimland Drive with average dwell times at or over 1 minute. The Cornwall/ York stop has slightly more than the median monthly ridership and the Woburn/Rimland stop has less than the median monthly ridership. Additional stops with dwell times over 30 seconds include the following stops:

- Telegraph at Primrose Ln (1016)
- Orleans St at Sunset Square (1017)
- Alabama St at Queen St (2108)
- Woburn St at Barkley Village (2834)
- Cordata Pkwy at Whatcom Community College (3044)
- Cornwall Ave at Flora St (3050)
- Cordata Pkwy at Westerly Rd (3089)
- Cornwall Ave at Texas St (3149)
- Woburn St at Rimland Dr (3262)
- Alabama St at St Paul St (3265)
- Alabama St at Valencia St (3268)
- Alabama St at James St (3269)
- Bellis Fair Pkwy at WinCo Foods (3431)
- Alabama St at Grant St (3433)
- Bellis Fair Mall (3438)
- Bellis Fair Mall (3439)
- Sunset Dr at Racine St (7234)
- Sunset Dr at Woburn St (7253)
- Woburn St at Sunset Dr (9876)

As shown on Figure 35, the longest average dwell time for the Green Go Line was at the Northwest Avenue at Birchwood Center Stop at approximately 1 minute and does represent some of the higher ridership for the line. Additional stops with dwell times over 30 seconds include the following stops:

- Bakerview Rd at Eliza Ave (5501)
- Northwest Ave at Bakerview Rd (9750)
- Northwest Ave at Sterling Dr (3211)
- Northwest Ave at Lynn St (3214)
- Northwest Ave at Illinois St (3216)
- Dupont St at H St (3220)
- Dupont St at D St (3224)
- Prospect St at Central Ave (3221)
- Champion St at Unity St (2121)
- Champion St at Grand Ave (2204)
- Prospect St at Flora St (3204)
- Northwest Ave at Illinois St (2264)

As shown in Figure 36, the longest dwell times along the Blue Go Line include the Lincoln Creek Park and Ride and Haggard Hall. Average dwell time at these two stops were over two minutes and three minutes, respectively. Both of these stops have some of the highest ridership along the lines. Some of the higher dwell times are related to riders having to sometimes move off the bus to allow fpassengers to get on or off. Additional stops with dwell times over 30 seconds include the following stops:

- Magnolia St at High St (2045)
- Billy Frank Jr St at Holly St (2046)
- Viking Union (2052)
- Bill McDonald Pkwy at Samish Way (2059)
- Lincoln St at Potter St (1049)
- Bill McDonald Pkwy at Samish Way (2082)
- Bill McDonald Pkwy at Buchanan Towers (2083)
- Bill McDonald Pkwy at Rec Center (3076)
- Holly St at Forest St (2088)

Based on field observations, performance analysis, and coordination with WTA staff, buses experience delays and difficulties maneuvering at several locations along the routes. These operational issues can impact travel time. Key locations include:

Woburn Street/Alabama Street Southbound Direction. The southbound right-turn lane has limited storage and the southbound through-lane backs up beyond the start of the right-turn pocket. The intersection currently operations at LOS D during the weekday AM and PM peak hours. During the AM peak hour, the average southbound queue is approximately 350 feet with a 95th percentile queue length of approximately 450 feet. During the PM peak hour, the average queue length is approximately 375 feet with a 95th percentile queue of approximately 525 feet. The distance between the southbound through stop bar at Alabama and the next adjacent intersection (Woburn Street/E North Street) is approximately 415 feet indicating that during the peak commute periods the vehicles are queueing close to or past the next intersection. The queuing for the southbound through movement can result in delays for the bus wishing to make a right-turn.

Lincoln Street/Lakeway Drive. The evaluation of the on-time performance shows that Lincoln Street Lakeway Drive stands out as a potential problem area for the buses. The Lincoln Street area was also identified as an on-time performance issue area in the Lincoln-Lakeway Multimodal Transportation Study.[3] For the Blue Go Line (190) the routing requires a number of maneuvers for the bus as shown on Figure 37 including short merging segments and turns. During the PM peak hour, the Lincoln Street/Lakeway Drive intersection operates at LOS D. However, many of the maneuvers for the bus routing at Lakeway Drive experience longer delays and may experience peak period queuing issues. Table 7 provides a summary of the intersection operations and queueing following the bus route near the Lincoln Street/Lakeway Drive intersection.

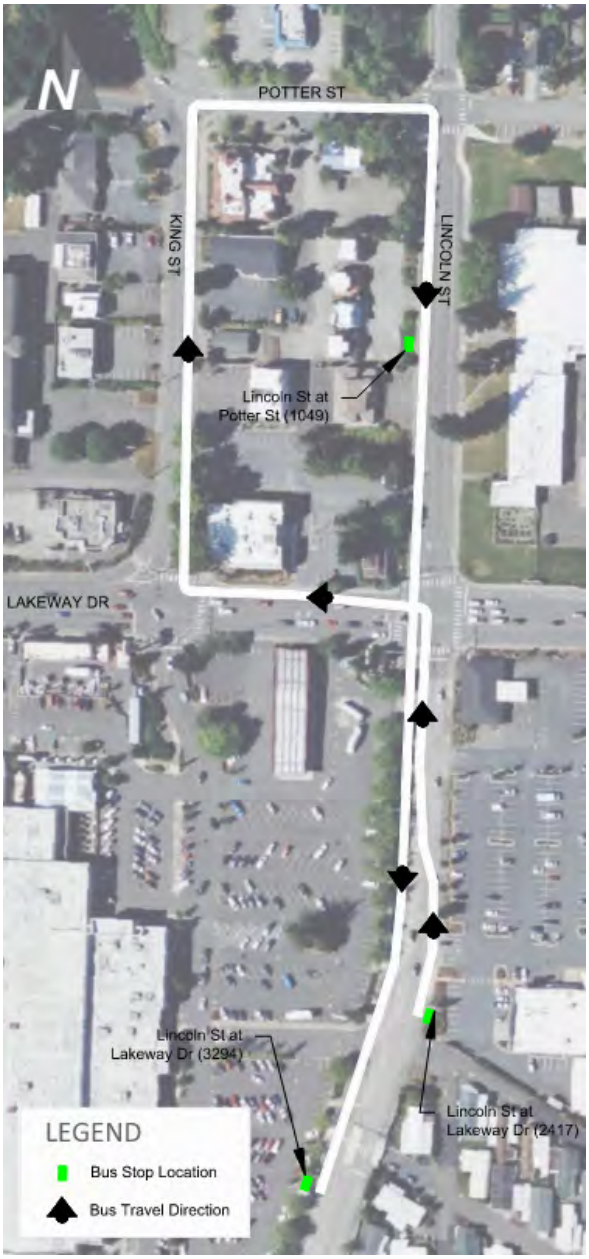


Figure 37 Lincoln Street/Lakeway Drive Bus Routing

[3] *Lincoln-Lakeway Multimodal Transportation Study,* Transpo Group, October 2021

Table 7. Existing Weekday PM Peak Hour LOS and Queuing Summary – Lincoln St/Lakeway Dr

Intersection & Movement	Intersection Operations		Queue Lengths[3]	
	LOS[1]	Delay[2]	Average	95th Percentile
Lincoln Street/Lakeway Drive	D	44	-	-
Northbound Left-Turn	E	69	175	350
Northbound Through	F	81	225	450
Southbound Through-Right	F	105	**250**	500
King Street/Lakeway Drive	C	34	-	-
Westbound Through-Right	C	23	125	150
Lincoln Street/Potter Street	D	27	-	-
Eastbound	D	27	-	50

Notes: queue lengths in **bold**, volume exceeds capacity, queue is theoretically infinite. Queue lengths in red, 95th percentile volume exceeds capacity, queue may be longer. Queue lengths in gray, volume for 95th percentile queue is metered by an upstream signal.
1. Level of Service (A – F) as defined by the *Highway Capacity Manual* (TRB, 2016)
2. Average delay per vehicle in seconds
3. Queue length in feet rounded to the nearest 25 feet

As shown in Table 7, there are several movements where the bus could experience delays over 1 minute. The current routing through this intersection is resulting in on-time performance issues for the Blue Go Line.

Existing and future LOS was also reviewed at approximately 70 locations to understand where other key congestion points may be for the Gold, Green and Blue Lines. The following intersections current operate at LOS E or F during the weekday PM peak hour:

- Lincoln Street/E Maple Street – A traffic signal is planned at this location for 2023 such that this should not be a congestion point for transit.
- Lincoln Street/Bryon Avenue
- Nevada Street/Lakeway Drive
- Orleans Street/Lakeway Drive
- Lincoln Street/Fraser Street
- King Street/Potter Street/I-5 NB Ramps
- James Street/E Sunset Drive
- I-5 NB Ramps/E Sunset Drive
- Woburn Street/E Illinois Street

Without improvements, the intersection above will continue to operate at LOS E or F given projected increases in traffic. Along with the intersections above, the following additional intersections are anticipated to operate at LOS E or F during the weekday PM peak hour under 2040 conditions:

- N Samish Way/Abbott Street
- S Samish Way/I-5 NB Off-Ramp
- Lincoln Street/Lakeway Drive
- I-5 SB Ramps/Lakeway Drive
- James Street/Meador Avenue
- Lincoln Street/Potter Street

- Ellis Street/N Forest Street/York Street
- 36th Street/I-5 SB On-Ramp/Fielding Avenue
- King Street/Lakeway Drive
- Woburn Street/Yew Street/Lakeway Drive
- Northwest Drive/W Bakerview Road

These locations currently are or will be congestion points for WTA without additonal improvements. Based on coordination with WTA, some other key congestion areas are Bellis Fair Parkway at Meridian and Sunset at Orleans for the Gold Line and High Street between Oak and Campus Way and Bill McDonald and Lincoln Street for the Blue Line.

Key Findings

The following provides a summary of the key findings for consideration in development of alternatives for the Rapid Transit Study.

- **Gold Go Line Roadway Characteristics.** Route 331 travels primarily on James Street, Woburn Street, Alabama Street and Cornwall Avenue. In addition, the route travels along a number of other roadways and makes numerous turns between the Cordata and Bellingham Stations, which could impact on-time performance and transit safety. The route provides service to 58 stops. The Woburn Street/Alabama Street intersection as well as along Bellis Fair Parkway and E Sunset are a key problem area for this route.
- **Green and Blue Go Line Roadway Characteristics.** Route 190 provides service primarily along Billy Frank Jr. Street, High Street, Billy McDonald Parkway and Lincoln Street. Route 232 travels along primarily Northwest Avenue, Elm Street and Dupont Street. The Blue and Green Go Lines combined provide service to 64 stops. Along with the Woburn Street/Alabama Street intersection, the Lincoln Street/Lakeway Drive intersection, High Street between Oak and Campus Way, and the road segments from Bill McDonald to Lincoln Street are a key problem areas for this study route.
- **Traffic Signals.** Transit signal priority (TSP) should be considered overuse of signal preemption.
- **Bus Stops.** The majority of stops are ADA accessible and have signage available noting the stop location. Over half of the stops have a bench, shelter, and concrete pad. Less than half of the stops have a power connection.
- **Land Use and Population Characteristics.** A review of the job/housing balance along the routes shows connections between dense housing and employment areas. To serve these areas, the routing is circuitous and makes frequent turning maneuvers. The land use patterns for the future are similar to existing conditions with increases in housing and employment densities. A review of the census data indicates that between 67 and 70 percent of people commute to work driving alone. The data also indicate that renter occupied housing is more likely to utilize transit and to not own a vehicle. The highest rates of no vehicle homes are in Downtown.
- **Ridership.** There are a number of closely spaced stops with little to no ridership that should be considered for elimination or consolidation.
- **On-Time Performance.** Based on current on-time performance metrics the Gold and Green Go Lines meet on-time performance criteria. The Blue Go Line does not meet all on-time performance criteria. With frequent transit and the decrease in headways of the service, consideration should be given to the measure of the on-time performance and when a bus is

considered late or early. There are a number of intersections where congestion and queuing can contribute to bus delays.

Next Steps

The findings of the existing conditions review are used to develop alternatives and a set of guiding principles, objectives, measures to evaluate alternatives for the Rapid Transit study. This study provides an understanding of key elements that should be considered in developing the alternatives including bus stop amenities and access, stop consolidation, improvements to address on-time performance and considering connectivity to key land uses that generate ridership. The affected environment study in conjunction with the alternatives analysis also provides context in determining the type, stop locations, and routing of bus that should be provided along the existing or amended service for the Gold, Green, and Blue Go Lines.

Attachment A – Route & Stop Maps

Gold Line


2000 (Cordata Station)
2001 (Bellingham Station)
PUGET SOUND
Western Washington University
Whatcom Community College
LEGEND
Route 331 Stops
Route 331 (GOLD Line)
Transit Station
Railroad
Park or Open Space
Water Bodies
MILES
0
0.5
1

Green and Blue Line

Attachment B – Stop Amenities

Stop Amenity Matrix.xlsx

Appendix B Land Use Policy Review

Land Use Policy Review
WTA Rapid Transit Corridor Study

WTA On Call | July 2023

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Introduction

This analysis is focused on conducting a comprehensive review of land use policies in the City of Bellingham. The aim is to provide recommendations for policy changes or new policies that will facilitate the implementation of rapid transit or bus rapid transit (BRT) within the study corridors. As part of the review, zoning regulations and other relevant codes in the study corridors will be examined to identify land use that supports rapid transit. This analysis will inform recommendations for changes that can be made to enable transit-supportive land use, such as mixed-use and higher densities. In addition, this study will assess the future land use plans along the corridor and offer guidance on how they can be modified to better support the implementation of rapid transit.

Best Practices

The best practices explored below are recommended by the Twin Cities Metro Council and the Puget Sound Regional Council. Best practices from these two regional councils are included to provide an upper and lower bound for recommended residential and employment densities.

When housing, employment, and other compatible uses are concentrated adjacent to transit, it becomes more efficient in serving the community. Two measures are taken to address this in the 2040 Transportation Policy Plan (TPP): 1) Future residential development density; and 2) Ridership-generating activity planning, such as employment centers, education, retail, and recreational purposes. Exhibit 1 shows the average minimum residential density required to support rapid transit networks per the Twin Cities Metro Council. The Puget Sound Regional Council recommends a lower residential density (seven to eight housing units per gross acre), or a **cumulative 17 activity units** (residents and jobs) within a ¼ mile of bus rapid transit.

Exhibit 1. Rapid Transit Average Minimum Residential Density Requirements (dwelling units per acre)

Right-of-Way Type	Transit Type	Geography	Urban Center	Urban	Suburban	Suburban Edge / Emerging Suburban Edge
Fixed or Dedicated Transit Way	Dedicated BRT	Half Mile Radius	50	25	20	15
Highway Transitway	Highway BRT	Half Mile Radius	25	12	10	8
Shared Rights-of-Way	Arterial BRT	Quarter Mile Radius			15	
	Local Bus Routes on High Frequency Network	Quarter Mile Radius Along Route			10	

Source: Metro Council, 2018

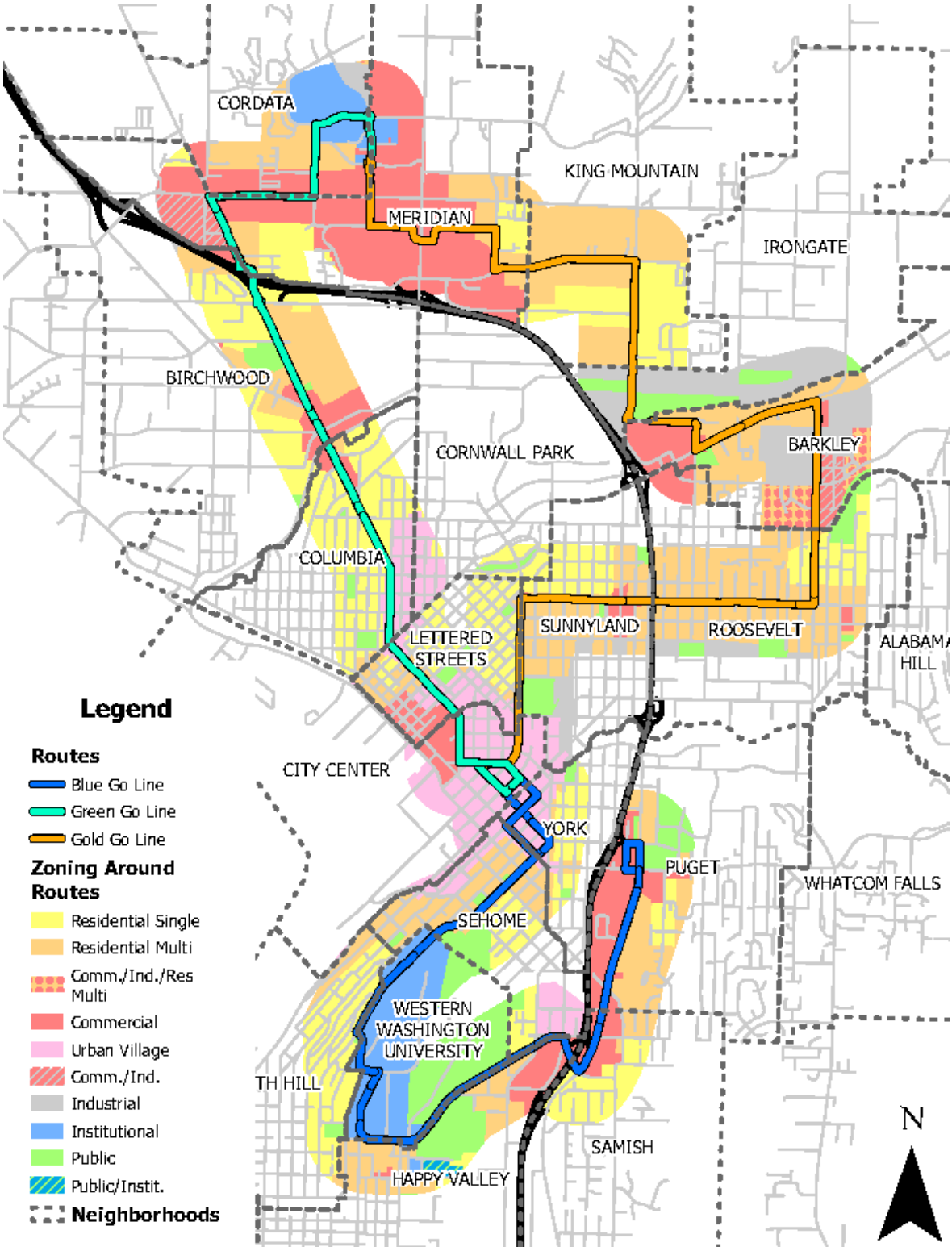
Average minimum residential density establishes the minimum density required to support rapid transit. Target density, on the other hand, is a recommended density level that best supports transit, and communities are encouraged to explore opportunities to guide land uses toward these higher densities. Target residential densities are much higher than the average minimum residential density shown in Exhibit 1. Exhibit 2 shows the target residential density recommended to support rapid transit networks, and these target densities will be compared with the residential density allowed by the Bellingham Municipal Code. The target residential densities recommended by the Twin Cities Regional Council exceed the residential density and activity unit density recommended by the Puget Sound Regional Council and will be used as the reference point in this analysis. The urban center and urban classifications are the most applicable to the context of the study within the City of Bellingham. The shared right of way type Arterial BRT is the best match for the rapid transit routes discussed in this analysis.

Exhibit 2. Rapid Transit Target Residential Densities (dwelling units per acre)

Right-of-Way Type	Transit Type	Geography	Urban Center	Urban	Suburban	Suburban Edge / Emerging Suburban Edge
Fixed or Dedicated Transit Way	Dedicated BRT	Half Mile Radius	75–150+	50-100+	40-75+	40-75+
Highway Transitway	Highway BRT	Half Mile Radius	40-75+	25-50+	20-40+	20-40+
Shared Rights-of-Way	Arterial BRT	Quarter Mile Radius	20-60+	20-60+	20-60+	20-60+
	Local Bus Routes on High Frequency Network	Quarter Mile Radius Along Route	15-60+	15-60+	15-60+	15-60+

Source: Metro Council, 2018

Exhibit 3. City of Bellingham Future Land Use Map



Source: City of Bellingham, 2020

Rapid Transit Corridor Analysis

Below is a context map showing the Gold Line (Route 331), Green Line (Route 232), and Blue Line (100-series following the path of route 190) within the City of Bellingham. The analysis will consider the Green and Blue lines as a single rapid transit route alternative to potentially invest in, weighed against the Gold Route. Each route is measured against policy, planning, and demographic conditions, and given a numeric score ranging from one to three based on the routes compatibility with the variable being measured. These scores will be cumulatively presented in a summary table at the conclusion of the analysis, where the Green and Blue lines score will be averaged. See Exhibit 3 for a City of Bellingham land use map providing context for the analysis and Exhibit 4 for the rapid transit corridor base map.

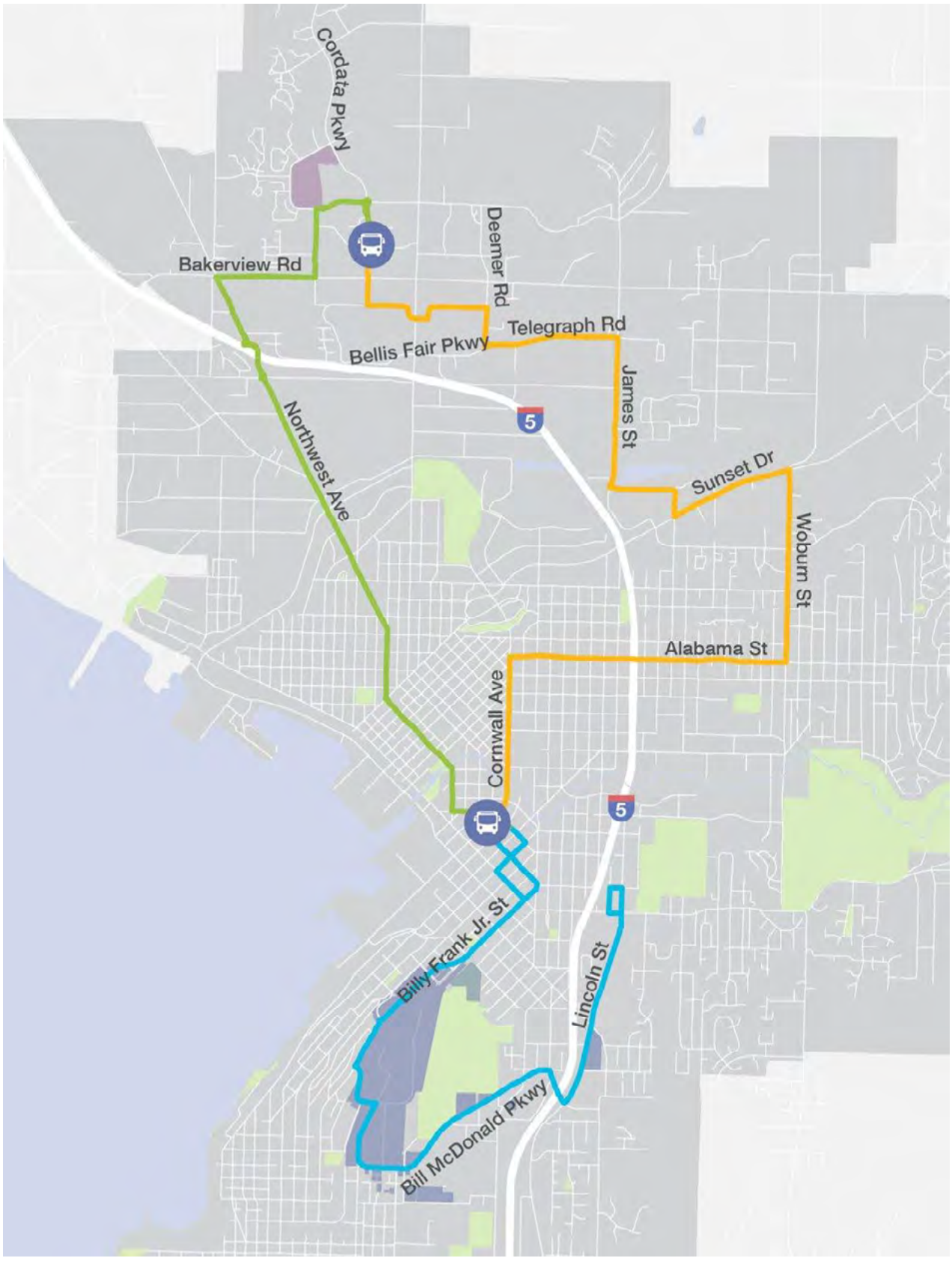
The Gold Line runs north from Bellingham Station (within the Downtown District Urban Village) on Cornwall St, east on Alabama St through Residential Multi zoning, north on Woburn St through a cross section of Residential Single, Residential Multi, Commercial, and Industrial zoning. After passing through Barkley Village (an emerging mixed-use activity center) the route continues west on E Sunset Dr, which is surrounded by primarily Residential Middle and Commercial zoning, and north on James St through Residential Single and Multi-zoning. The final stretch runs west on Telegraph Rd through Residential Multi and Commercial zoning, around E Bellis Fair Parkway (adjacent to the Bellis Fair Mall), ending at Cordata Station below Whatcom Community College which is zoned for Institutional uses. This area is not a designated urban village but as a center of activity, is a major regional destination.

The Green Line runs north from Bellingham Station (within the Downtown District Urban Village) on Prospect St and then northwest on Dupont St which transitions into the Fountain District Commercial Core. The route continues north on Elm St which remains within the Fountain District Urban Village, and then northwest on Northwest Ave through a cross section of Residential Single zoning, Commercial, and Residential Multi, before turning east on Bakerview Rd which is surrounded by Commercial zoning before ending at Cordata Station.

The Blue Line circles the Downtown District Urban Village before running southwest on Billy Frank Jr St through Residential Multi zoning before it transitions in High St which is in the middle of Western Washington Universities (WWU) campus zoned for Institutional use. The route continues on Highland Dr which is split between Residential Single zoning on the west side of Highland Dr and WWU to the east. The route continues south on W College Way and Bill McDonald Parkway, which separates WWU to the north, from Residential Multi zoning to the south. As Bill McDonald Parkway approaches S Samish Way, the zoning transitions to Commercial (a portion of which is in the Samish Urban Village) before it crosses I-5 and turns north on Lincoln St where it remains in Commercial zoning. The area around Lakeway/Lincoln is not a designated urban village but as a center of activity, is a major community destination.

It is noted that the existing population and employment densities are generally lower than recommended for BRT transit support land uses. Based on an understanding of a target of 17 activity units per acre, as noted from the PSRC data, the areas surrounding the corridor are between 10 and 16 activity units per acre except downtown where the density is 30 activity units per acre. Following the analysis presented in this memorandum, recommendations are made related to policies and increasing density. WTA should work with the City as they prepare their Comprehensive Plan to provide input on transit supportive densities and consideration of transit overlay areas to support rapid transit projects.

Exhibit 4. Rapid Transit Corridor Base Map

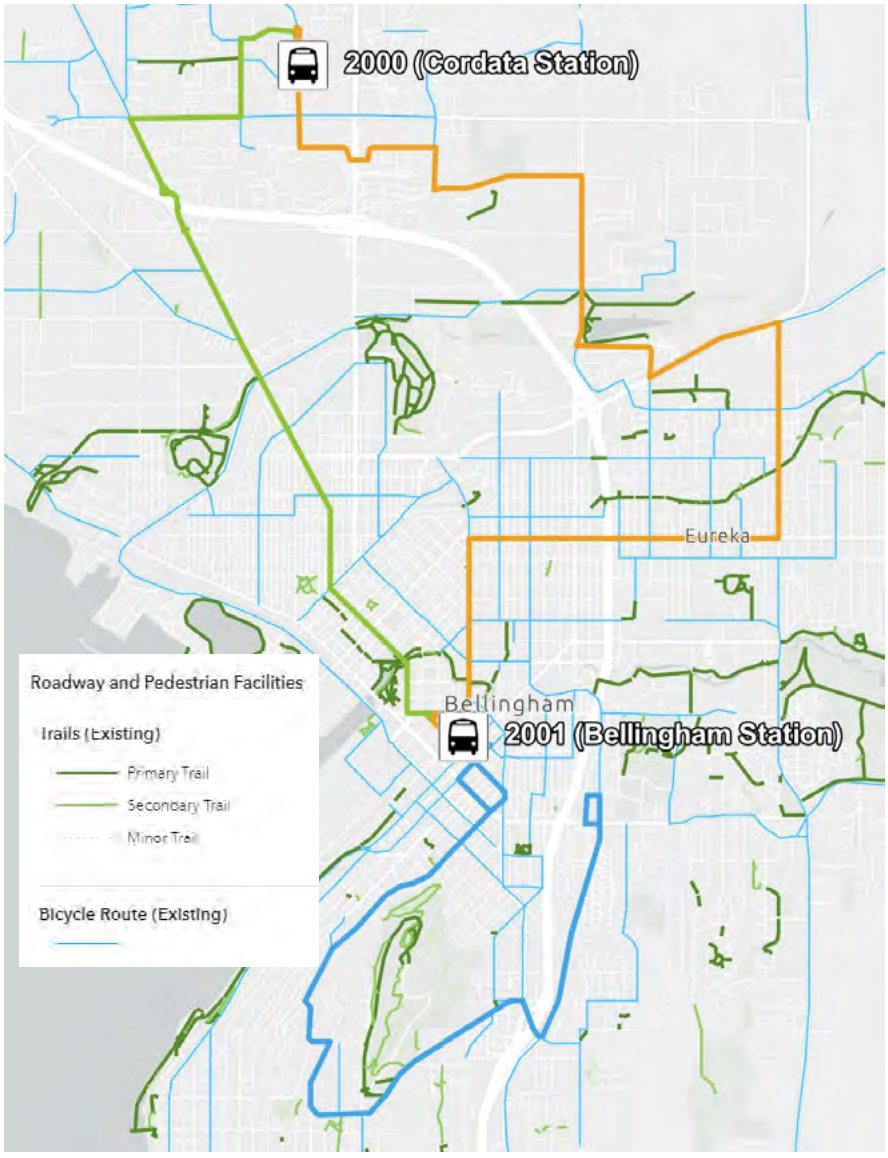


Source: Transpo Group, 2023

Roadway and Pedestrian Facilities - Trails and Bicycle Network

The Gold Route is the route most integrated with the existing trail and bicycle network. The integration is important since rapid transit often does not serve neighborhood streets, and so last mile solutions are essential to make this investment effective. The Blue Route is the second most integrated route with the trail and bicycle network, providing north south bicycle connections, but challenged by the edge conditions caused by I-5. The Green Route is the most disconnected. Contributing factors include a change in the grid as the route turns north on Elm St and the presence of I-5. See Exhibit 5.

Exhibit 5. Roadway and Pedestrian Facilities - Trails and Bicycle Network



Source: Transpo Group, 2023

Trail and Bicycle Network Compatibility with Rapid Transit

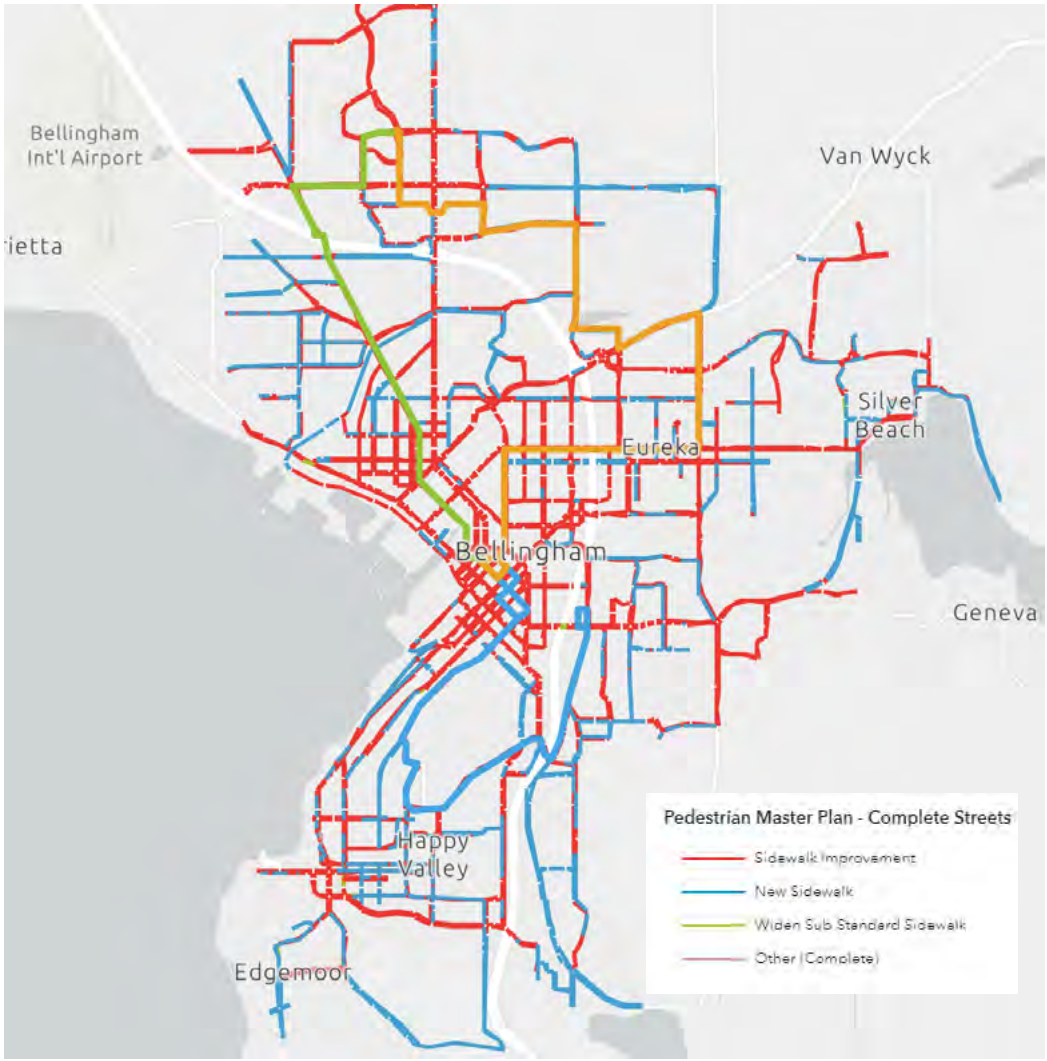
Rapid Transit Route	Least Compatible	More Compatible	Most Compatible
The Gold Route			3
The Green Route	1		
The Blue Route		2	

Source: BERK, 2023

Roadway and Pedestrian Facilities - Pedestrian Master Plan

The Gold Route is the most integrated route with the existing pedestrian master plan on the whole. This network integration is important to provide first/last mile connections to the rapid transit line, making the multi-modal network more robust. The Green Route is the second most integrated route with the pedestrian master plan, providing robust sidewalk improvements, but challenged by the edge conditions caused by I-5 moving north. The Blue Route is the most disconnected. Contributing factors include the sheer size of the Western Washington University campus (which has its own internal circulation network), and steep topography in the neighborhood west of WWU. See Exhibit 6.

Exhibit 6. Roadway and Pedestrian Facilities - Pedestrian Master Plan



Source: Transpo Group, 2023

Pedestrian Network Compatibility with Rapid Transit

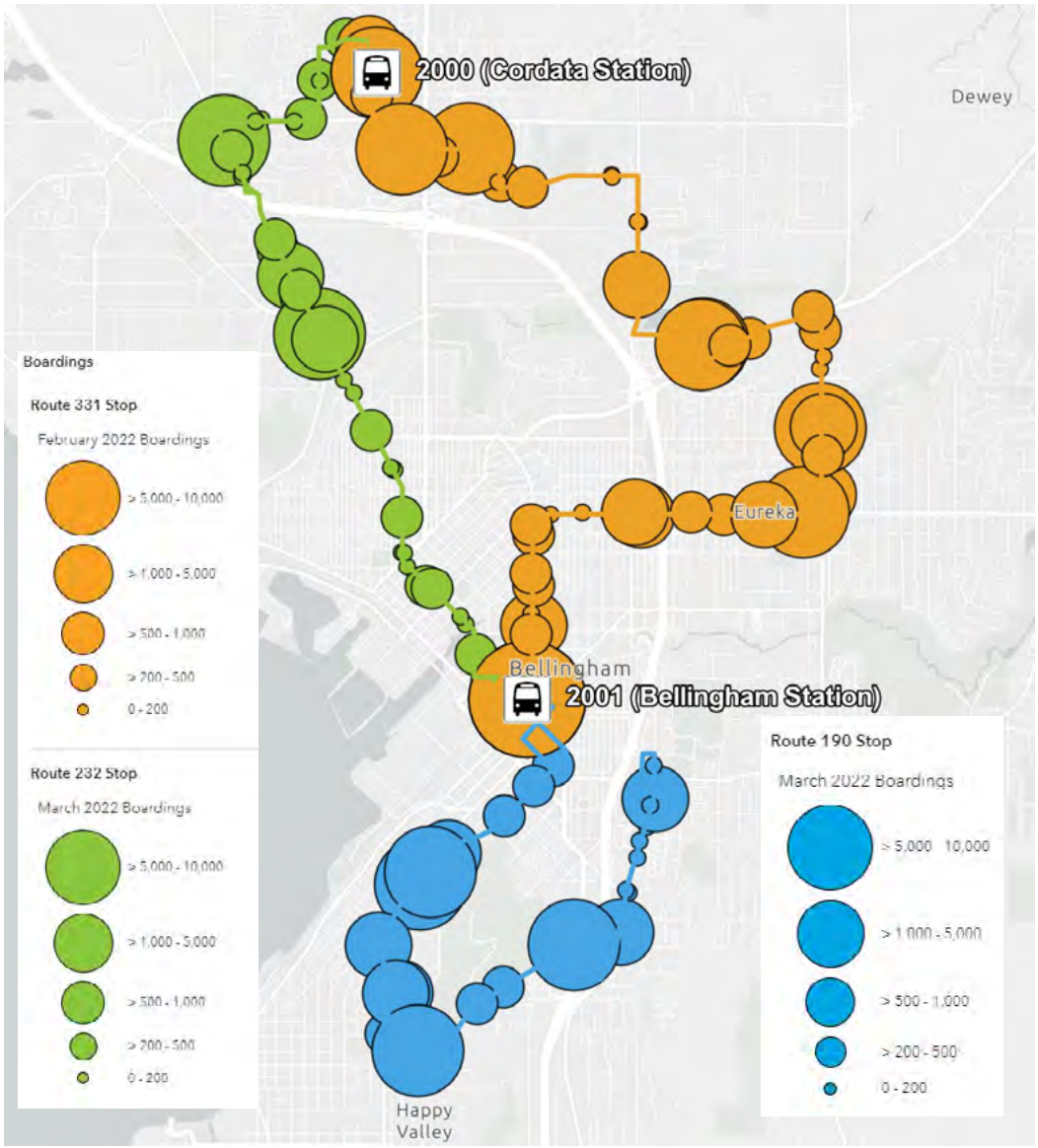
Rapid Transit Route	Least Compatible	More Compatible	Most Compatible
The Gold Route			3
The Green Route		2	
The Blue Route	1		

Source: BERK, 2023

Boardings By Bus Route

The Blue Route has the highest number of boardings conneting through, and around Western Washington University's campus and to the off-campus housing within the Samish Way Urban Village. The Gold Route has the second highest number of boardings, connecting Cordata Station to Bellingham Station through a relatively dense network of neighborhoods zoned for Residential Multi use. The Green Route has the fewest boardings, navigating through low density Residential Single zoning. See Exhibit 7.

Exhibit 7. Boardings By Bus Route



Source: Transpo Group, 2023

Boardings Compatibility with Rapid Transit

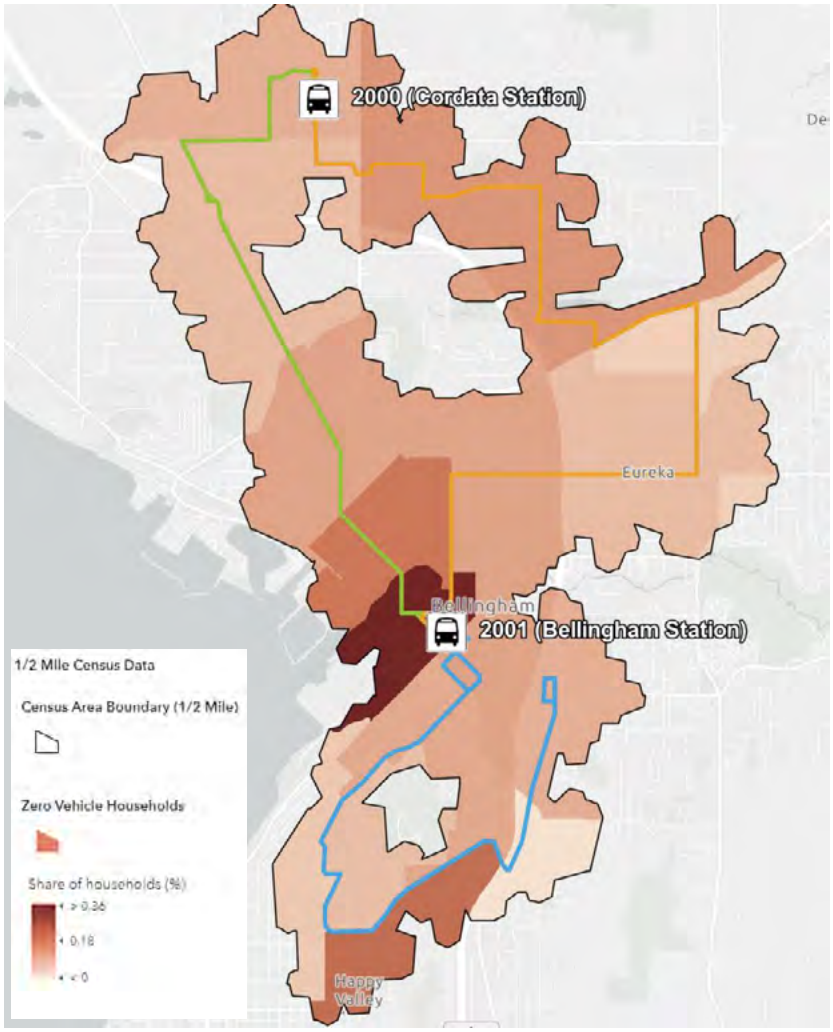
Rapid Transit Route	Least Compatible	More Compatible	Most Compatible
The Gold Route		2	
The Green Route	1		
The Blue Route			3

Source: BERK, 2023

Share of Zero Vehicle Households

The Green Route serves the largest share of zero vehicle households. Households adjacent to Downtown may be less likely to have a dedicated vehicle and may use non-motorized modes of transit. The Gold Route serves the second largest share of zero vehicle households but serves a larger proportion of Residential Multi zoning. The Blue Route serves the smallest share of zero vehicle households. The South Hill, Happy Valley, and Sehome neighborhoods are all zoned for Residential Single uses, which typically have a higher proportion of vehicles per household. It is noted that students are not factored into the zero vehicle household data, which accounts for a large portion of the Blue route riders. See Exhibit 8.

Exhibit 8. Share of Zero Vehicle Households



Source: Transpo Group, 2023

Zero Vehicle Households Compatibility with Rapid Transit

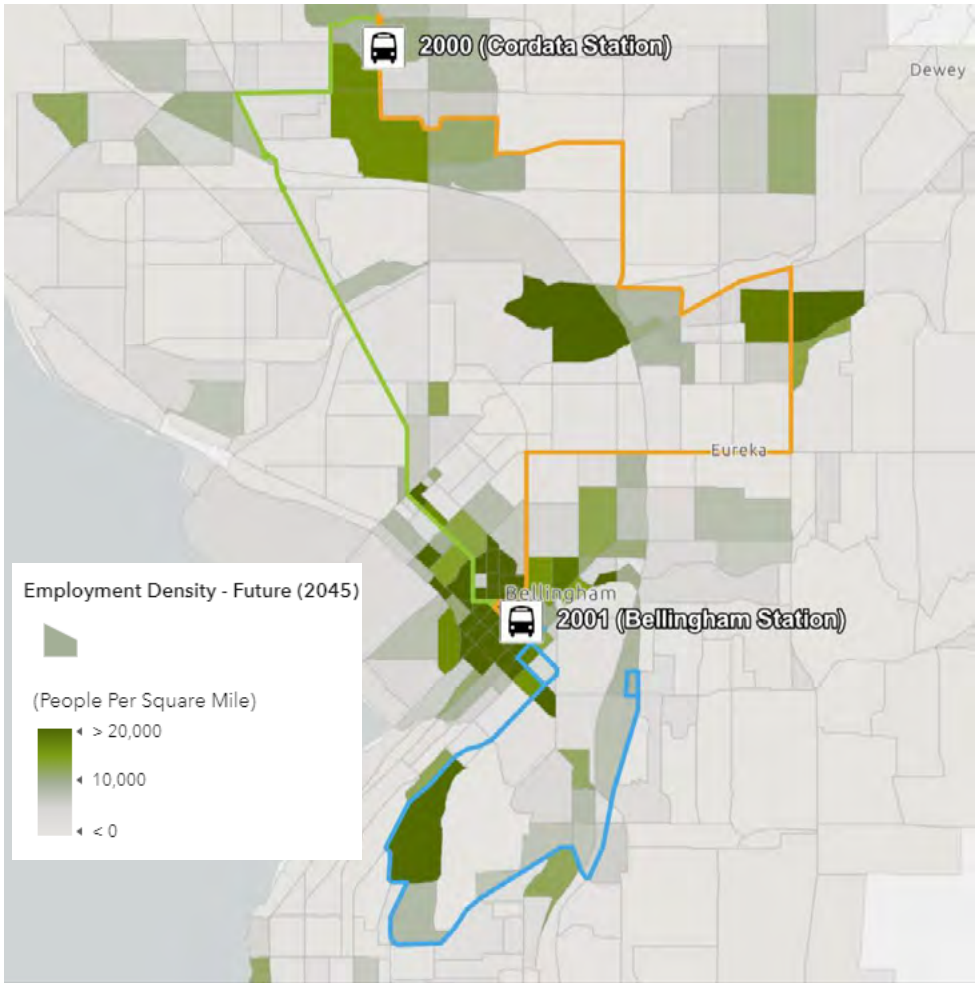
Rapid Transit Route	Least Compatible	More Compatible	Most Compatible
The Gold Route		2	
The Green Route			3
The Blue Route	1		

Source: BERK, 2023

2045 Employment Density

The Gold Route serves the greatest projected employment density by 2045. This route serves the Downtown District, Barkley Urban Village, and the Bellis Fair Mall, all of which are dense employment centers. The Green Route serves the second greatest future employment density, connecting Bellis Fair Mall to the Downtown District. The Blue Route serves the least amount of future employment density, connecting the Downtown District to the Samish Urban Village adjacent to I-5. Western Washington University is an employment hub but may have flat growth over the planning horizon due to dropping enrollment rates per the WWU Office of Institutional Effectiveness. See Exhibit 9. Research has shown that implementing mixed land use development patterns within activity centers can lead to favorable outcomes, such as a reduction in vehicle miles traveled, lower rates of automobile ownership, and an increase in active modes of transportation like walking, biking, and transit usage.

Exhibit 9. 2045 Employment Density



Source: Transpo Group, 2023

Employment Density Compatibility with Rapid Transit

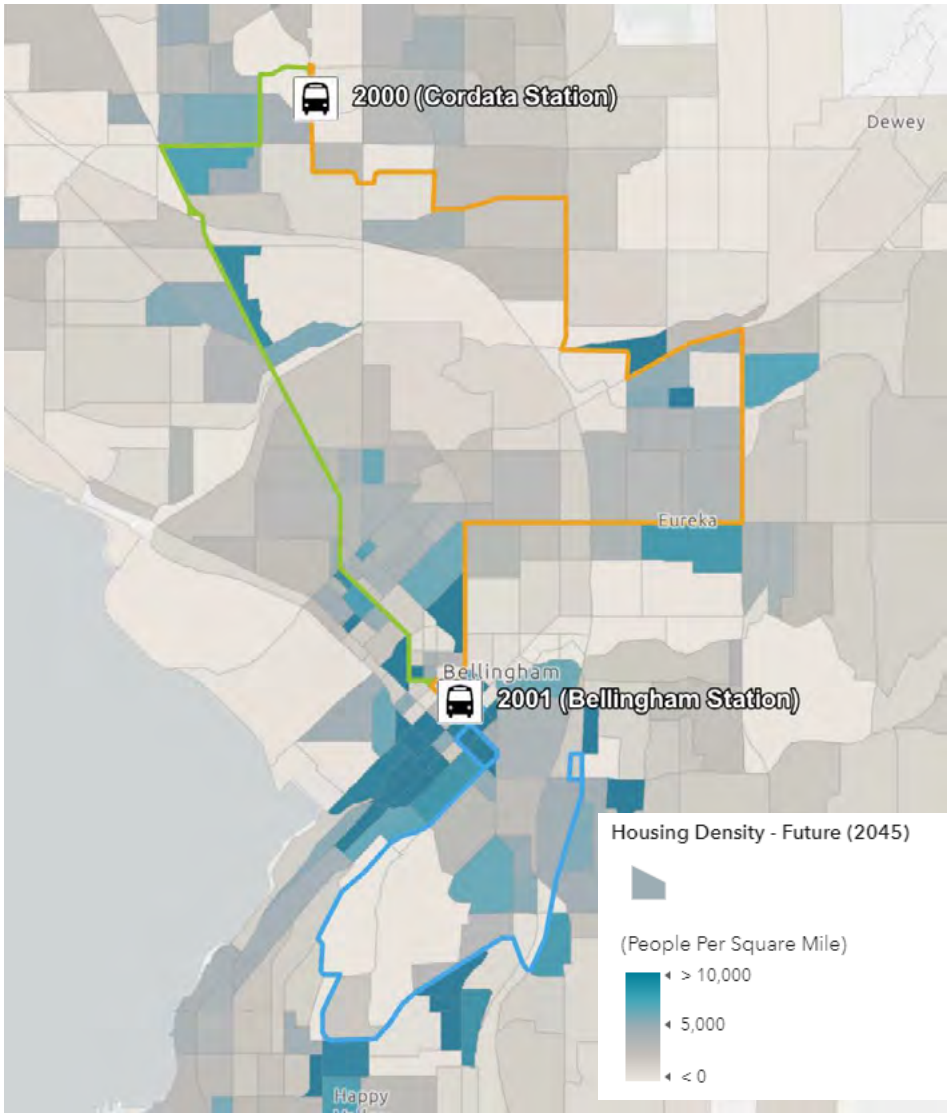
Rapid Transit Route	Least Compatible	More Compatible	Most Compatible
The Gold Route			3
The Green Route		2	
The Blue Route	1		

Source: BERK, 2023

2045 Housing Density

The Blue Route is adjacent to the greatest projected housing density by 2045. The Gold Route serves the second greatest future housing density, due to the large amounts of Residential Multi zoning along Alabama St, and the presence of Urban Village boundaries that the route serves. The Green Route serves the least amount of future housing density as there are large expanses of Residential Single zoning between the two station areas. See Exhibit 10.

Exhibit 10. 2045 Housing Density



Source: Transpo Group, 2023

Housing Density Compatibility with Rapid Transit

Rapid Transit Route	Least Compatible	More Compatible	Most Compatible
The Gold Route		2	
The Green Route	1		
The Blue Route			3

Source: BERK, 2023

Summary Analysis

The Gold Route has the highest level of network integration with the existing trail and bicycle facilities as well as the pedestrian master plan. This route also records the largest number of boardings per February 2022 data and serves the highest density of future employment, forecasted in 2045. The geometry of the route connects institutional (Whatcom Community College), commercial (Bellis Fair Mall, Barkley Urban Village, and the Downtown District Urban Village), and residential hubs within the City of Bellingham, and is the preferred based on this specific review of land use context. See Exhibit 11.

The Blue and Green Routes are being considered as a single route for rapid transit investment. **The Green Route** serves the largest proportion of zero vehicle households due to the route serving neighborhoods that are near Bellingham's downtown core. The route is limited due to the disconnected urban fabric, which can be attributed to large uses like the Bellingham Golf and Country Club, and hard infrastructural edges like I-5. **The Blue Route** serves the highest future housing density, forecasted in 2045, but serves the smallest proportion of zero vehicle households, lowest future employment density, and is least integrated with the pedestrian master plan. This route provides students, staff, and employees of Western Washington University critical connections to Bellingham Station, and the Samish Way Urban Village. When averaged, the Blue and Green line do not perform as highly as the Gold line, and thus is not recommended for future rapid transit investment. See Exhibit 11.

Exhibit 11. Summary of Findings

Network Compatibility	The Gold Route	Blue and Green Route Average Score
Trails and Bicycle Facilities	3	1.5
Pedestrian Master Plan Integration	3	1.5
Boardings	2	2
Zero Vehicle Households	2	2
Future Employment Density	3	1.5
Future Housing Density	2	2
Outcome	**15**	**10.5**

Source: BERK, 2023

Policy Alignment

This section of the report provides information on the Whatcom County and City of Bellingham planning framework, including goals and policies that support rapid transit. WTA should work with the city as they update their Comprehensive Plan on refining the transit supportive policies.

Whatcom Countywide Planning Policies

The Whatcom Countywide Planning Policies were adopted in 1993 and most recently updated in 2021. Exhibit 12 illustrates alignment and policy compatibility with the countywide policies and goals.

Exhibit 12. Whatcom Countywide Planning Policies and Goals

Policy / Goal	Alignment
Countywide Transportation Facilities and Strategies: 3. To encourage use of single occupant vehicle alternatives and development of pedestrian scale neighborhoods, high density residential development shall be encouraged in urban growth areas with particular attention to those locations within cities and in close proximity to arterials and main transit routes.	Increasing residential density adjacent to Rapid Transit networks will encourage the use of non-drive alone modes alternatives.
4. Cities are particularly encouraged to support transit and pedestrian friendly mixed-use developments within their UGAs to help achieve the goals supported in these policies.	Investment in future Rapid Transit networks will support future pedestrian friendly mixed-use developments.
Siting of Public Facilities: 3. Public facilities that generate substantial travel demand should be sited along or near major transportation and public transit corridors, where available.	This is consistent with the routing for the Green, Gold, and Blue lines and Bellingham and Cordata station locations within the City of Bellingham.

Source: Whatcom County, BERK, 2023

Bellingham Comprehensive Plan Policies

The Bellingham Comprehensive Plan was adopted in 2016. Exhibit 13, Exhibit 14, and Exhibit 15 illustrate alignment and policy compatibility with Land Use, Multimodal Transportation and Community Design policies and goals.

Exhibit 13. Bellingham Land Use Policies and Goals

Policy / Goal	Alignment
Policy LU-18 Develop new plans and update existing plans as needed to reflect the unique nature of each urban village. The plans should consider the elements identified in Policy LU-11, as well as the following: ▪ Land uses and adaptive performance-based development standards to encourage compatible new development and greater flexibility in design, particularly when the development context is well defined; ▪ An appropriate mix of commercial, office and residential uses; ▪ Parking requirements, including the potential for parking maximums and/or reduced parking requirements, and design standards that support multi-modal transportation options;	The Green, Gold, and Blue lines are routed through and round Urban Villages with reduced parking requirements that support multi-modal transit options.

Policy LU-19 Consider developing integrated transportation-land use plans along Whatcom Transportation Authority's (WTA) GO Lines connecting urban villages where appropriate. The planning process should consider the following (see Transportation Chapter): ▪ A mix of land uses and higher densities within each corridor, resulting in transit oriented development; ▪ Design standards that support the multi-modal nature of the corridors; ▪ Efforts to increase the effectiveness of public transportation along the corridors	The existing route for the Gold, Green, and Blue line connects downtown Bellingham with employment, residential, and institutional centers throughout the city.
Policy LU-22 Avoid auto-oriented strip commercial development. Where such areas already exist, prohibit linear expansion, and encourage redevelopment into more compact, mixed use nodes of activity, especially along WTA transit routes.	The urban village overlays encourage dense, mixed-use development, and are served by the Green, Gold, and Blue lines.

Source: City of Bellingham, BERK, 2023

Exhibit 14. Bellingham Multimodal Transportation Policies and Goals

Policy / Goal	Alignment
GOAL T-1 Limit urban sprawl by linking land use and transportation planning.	The Green, Gold, and Blue lines serve neighborhoods in Bellingham with the greatest future employment and housing density.
Policy T-2 Balance land use efficiency with transportation safety and mobility by prioritizing street connectivity within the City limits, mobility for people and goods, and high occupancy vehicles over single-occupancy vehicles (SOVs). Implementation strategies include: ▪ Continue to work with WTA to strategically employ transit as a key high occupancy mode of transportation between the City's employment, education, parks and recreation, shopping, and entertainment centers and residential concentrations in Whatcom County;	The Green, Gold, and Blue lines are integrated with the existing trail and bicycle network, as well as the pedestrian master plan, developing a cohesive multi-modal transit network.
Policy T-3 Encourage higher-density transit-oriented development (TOD) along certain WTA high-frequency transit routes ("GO Lines") connecting urban villages.	Increasing residential density along the Green, Gold, and Blue routes will more effectively support a rapid transit network.
Policy T-10 Work closely with WTA to support the WTA Strategic Plan, ensure that City and WTA policies are consistent, and prioritize transportation improvements that support transit ridership for neighborhood residents.	Each line navigates through neighborhoods with Residential Single and Residential Multi zoning. Improvements are prioritized for routes with the most boardings, and highest potential to serve future concentrations of housing and employment density.

Source: City of Bellingham, BERK, 2023

Exhibit 15. Bellingham Community Design Policies and Goals

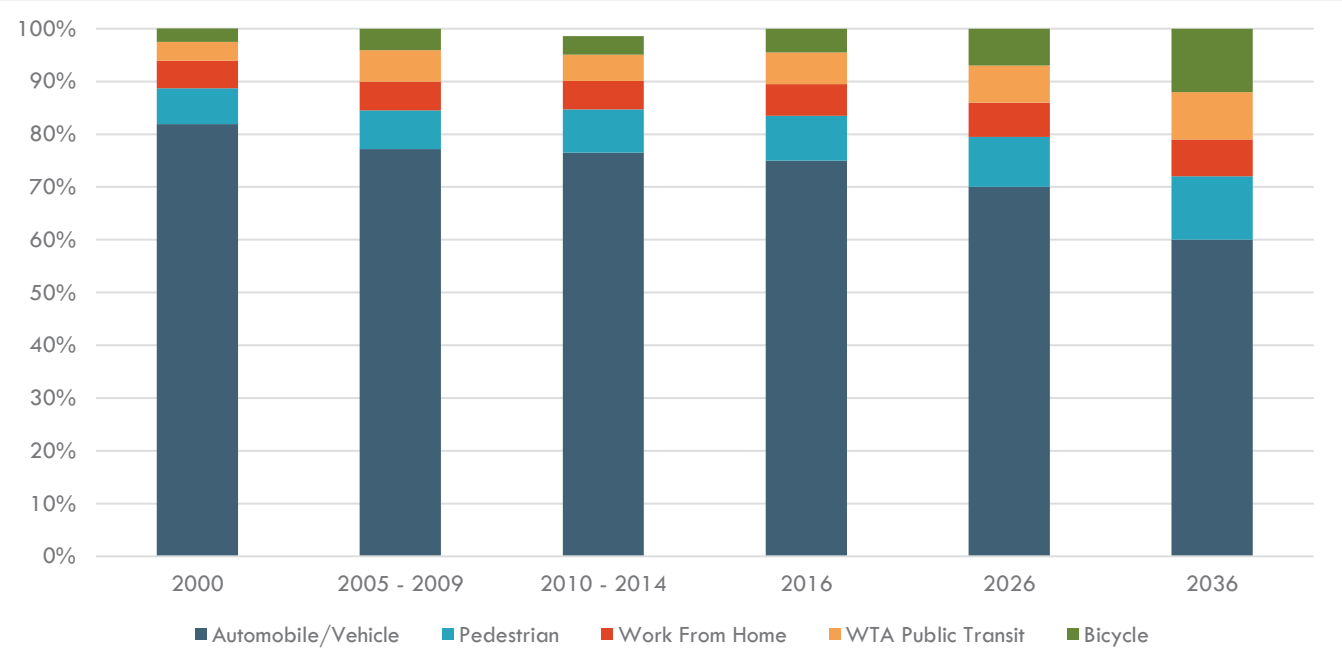
Policy / Goal	Alignment
GOAL CD-2 Express the City's distinct community identity and sense of place through improvements to the appearance of new development, commercial centers, urban villages, transit corridors and streetscapes.	Investment in future Rapid Transit networks
GOAL CD-4 Provide a well-designed, pedestrian friendly, and community-oriented environment.	Prioritizing multi-modal transit improvements will encourage and support a pedestrian friendly environment.

GOAL CD-5 Ensure that the design and development of urban villages and transit corridors convey a positive image of the district they are located within, contribute to the economic vitality and perception of the City, and improve visual and physical transitions into adjacent neighborhoods.	The Green, Gold, and Blue lines navigate transit corridors that connect Bellingham's urban villages, and integrate with city sponsored modal plans.
Policy CD-27 Continue to develop and implement plans, programs, and regulations that incentivize higher-density TOD along certain WTA rapid transit routes	Investment in future Rapid Transit networks will support future dense, pedestrian friendly, transit oriented developments.

Source: City of Bellingham, BERK, 2023

Bellingham's transportation mode shift goals are charted using historic data from 2000-2014 then setting long term goals for the planning horizon 2016-2036. In 2000, 82% of people used automobiles or vehicles to get to work, while 7% walked and 3% rode bicycles. By 2036, the percentage of people driving alone is forecasted to decrease to 50%, while the percentage of people walking, cycling, and using public transit is expected to increase to 12%, 12%, and 9% respectively. The impacts of the COVID-19 pandemic has increased the share of individuals working from home and transit ridership has generally plateaued, but increased investment in pedestrian, bicycle, and rapid transit, along with other measures such as transit oriented development, parking management, and transit demand management, may still influence mode shift away from automobile/vehicle dependency. See Exhibit 16 and Exhibit 17.

Exhibit 16. Historic (2000-2014) and Long-Term Transportation Mode Shift Goals (2016-2036)



Source: City of Bellingham, 2023

Exhibit 17. Travel Mode Share Trends (2000-2014) and Long-Term Mode Shift Goals (2016-2036)

Transport Mode to Work	2000	2005 - 2009	2010 - 2014	2016	2026	2036
Pedestrian	7%	7.3%	8.2%	8.5%	9.5%	12%
Bicycle	3%	4%	4%	5%	7%	12%

WTA Public Transit	4%	6%	5%	6%	7%	9%
Automobile/Vehicle	82%	77%	77%	75%	70%	60%
Single Occupant	70%	68%	70%	67%	61%	50%
Multi-occupant + Taxi	12%	9%	8%	9%	9%	10%
Work From Home	5%	6%	5%	6%	7%	7%
Bellingham/UGA Population	76,937	84,543	91,251	93,906	109,726	124,107

Source: City of Bellingham, 2023

Code Review

This section of the report provides information on the current land use planning framework in Bellingham, including adopted plans, existing uses, and future designations and zoning applied by the City of Bellingham. It also describes the regulatory compatibility with Rapid Transit. WTA should work with the City as they prepare their Comprehensive Plan to provide input on transit supportive densities and consideration relative to the Code and land use policies.

Title 20 – Land Use Development

The purpose of this title is to promote the health, safety, and general welfare of the citizens of Bellingham by coordinating and guiding both public and private development of land through a comprehensive land use plan. The regulations and standards in this title aim to promote high standards of development for living and commerce, ensuring a pleasant environment for the people of Bellingham. The comprehensive neighborhood plans are used as a basis for land use implementation, acknowledging the unique and diverse characteristics of each area, and avoiding a uniform treatment that would not conserve or encourage the peculiarities that distinguish Bellingham from other communities. This section will assess the existing code in relation to housing and employment density, as well as parking requirements that may hinder the adoption of multimodal alternatives to single occupancy vehicles.

20.06 – Zoning Classification System

Exhibit 18 lists different types of land use and their corresponding qualifiers. The City of Bellingham zoning classification system includes Residential Single and Multi, Commercial, Industrial, Institutional, Public, and Urban Village. Residential Single has five use qualifiers which are detached, cluster, cluster detached, cluster attached, and planned. Residential Multi has three use qualifiers which are transition, multiple, and planned. Commercial has four use qualifiers which are waterfront, auto, neighborhood, and planned. Industrial has three use qualifiers which are light, heavy, and marine, while Institutional has three use qualifiers which are university, hospital, and Whatcom Community College (WCC). Public has nine use qualifiers which are agricultural, cemetery, governmental services, housing-public, housing-student, open space, parks, recreation, school, and utilities. Lastly, Urban Village has a use qualifier per location.

Exhibit 18. City of Bellingham Zoning Classification System

General Use Types	Use Qualifiers
Residential Single	▪ Detached, cluster, cluster detached, cluster attached, planned
Residential Multi	▪ Transition, multiple, planned
Commercial	▪ Waterfront, auto, neighborhood, planned
Industrial	▪ Light, heavy, marine, planned
Institutional	▪ University, hospital, Whatcom Community College (WCC)
Public	▪ Agricultural, cemetery, governmental services, housing-public, housing-student, open space, parks, recreation, school, utilities

Urban Village	▪ per location

Source: City of Bellingham, 2023

20.12 – General Standards

This subsection contains the complete text of parking regulations for all uses. Providing off-street parking with new development increases the fixed cost of development and reduces the net developable square footage of a parcel. Costs associated with meeting minimum parking requirements, especially in multifamily housing, may challenge building meaningfully affordable housing by adding fixed costs to construction. According to the Victoria Transit Policy Institute, "based on typical affordable housing development costs, one parking space per unit typically increases moderate-priced housing costs approximately 12%, and two parking spaces increases lower-priced housing costs by 25%." Reducing or eliminating parking requirements could substantially reduce the development costs of multifamily buildings, especially in locations that are well-served by public transportation. Reducing parking also encourages use of non-auto modes by discouraging auto ownership. Exhibit 19 establishes the City of Bellingham standard parking requirements for both inside and outside urban villages.

Exhibit 19. City of Bellingham Standard Parking Requirements

Use	Existing Parking Requirement
Residential	
Single-Family/Manufactured Home	Two parking spaces; single-family attached units shall provide one additional parking space for each bedroom over three. No more than two enclosed garage parking spaces per unit may count toward meeting parking requirement.
Duplex/Multifamily	a. One for each studio unit. b. One and one-half for each one- or two-bedroom unit. c. Two for each three-bedroom unit. d. Duplex with four or more bedrooms: one parking space per bedroom. No more than two parking spaces per unit may be located in an enclosed garage. e. Multifamily: one additional space for each bedroom, over three per unit. No more than two parking spaces per unit may be located in an enclosed garage. This provision shall not limit the number of parking spaces that may be provided in common areas in an enclosed under-building parking floor or structure.
Live/Work Unit	One parking space per live/work unit or one parking space per 500 square feet of gross floor area of all units in a project, whichever is greater.
Urban Village Residential – Fairhaven, Fountain District, and Samish Way*	Minimum of one parking space per studio, one-bedroom or two-bedroom dwelling unit. An additional 0.5 parking space per unit shall be provided for each bedroom over two per unit.
Urban Village Residential – Waterfront District*	0.5 space per studio unit. 0.75 space per 1-bedroom unit. 1.00 space per unit having 2 or more bedrooms.
Urban Village Residential – Downtown District*	0.5 space for each studio unit. 0.75 space for each 1-bedroom unit. 1.00 space for each 2- and 3-bedroom unit. 0.5 additional space for each bedroom over 3 per unit.

Commercial	
General Business, Personal Service Establishments	One for every 250 square feet of floor area open to the public.
Furniture and Large Appliance Store	Four plus one for every 500 square feet gross floor area.
Neighborhood and Community Shopping Centers and Food Markets	Five for each 1,000 square feet of gross floor area.
Offices (business and professional, including financial institutions, but not including doctor/dentist offices)	One for every 350 square feet of floor area.
Eating and Drinking Establishments, Dance Halls	One for every 75 square feet of floor area open to the public with a minimum of seven spaces.
Commercial Recreation	Four for each bowling lane, tennis or racquetball court, pool, or billiard table; or one for each miniature golf hole or in the case of a driving range for each tee area; or one for each 100 square feet of open recreational area. Where an eating and/or drinking facility is located within a main building used as a commercial recreation use, additional parking shall not be required.

Source: City of Bellingham, 2023

The following recommendations reduce the minimum parking requirements for single family dwellings, duplex, multifamily, live work, and units within urban village boundaries, Exhibit 20. As the code is currently written, the required parking standards are static, meaning that there is no range between the minimum and maximum required. To build flexibility and reduce the inclusion of redundant parking spaces, it is recommended that a standard minimum parking space per unit be established, with consideration made for unit sizes. This required parking reduction will allow greater residential density per use and encourage alternatives to single occupancy vehicles.

Exhibit 20. Recommended Changes to Parking Spaces Required Based on Residential Land Use

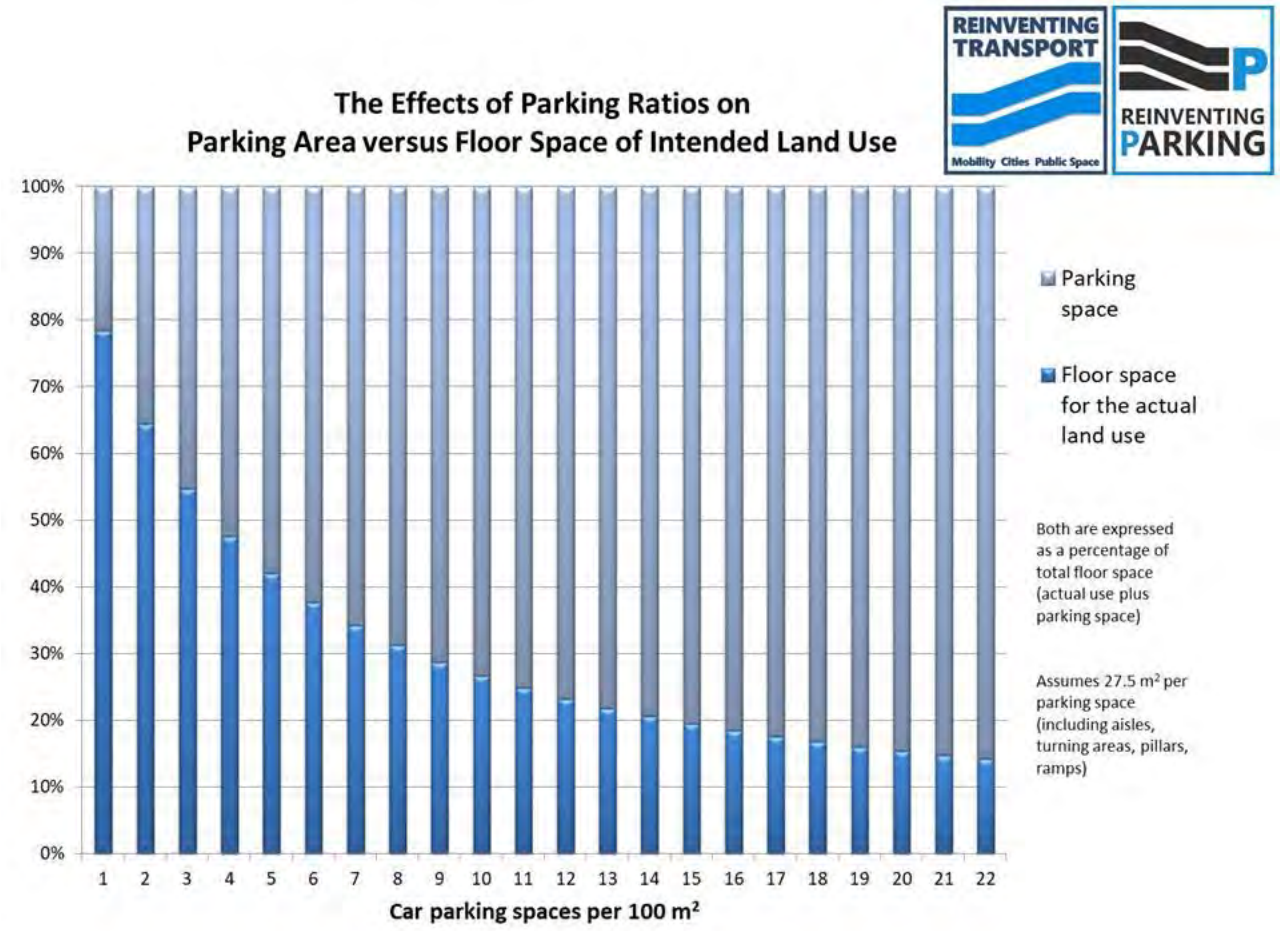
Use	Minimum	Maximum
Single-Family/Manufactured Home	1 per dwelling unit	2 per dwelling unit
Duplex/Multifamily	Studio: 0	Studio: 1
	1 bedroom: 1	1 bedroom: 1
	2 bedroom: 1	2 bedroom: 1.5
	3+ bedroom: 1	3+ bedroom: 1.5
Live/Work Unit	1 per dwelling unit	1 per dwelling unit
Urban Village Residential – Fairhaven, Fountain District, and Samish Way*	Studio: 0	Studio: 1
	1 bedroom: 1	1 bedroom: 1
Urban Village Residential – Waterfront District*	2 bedroom: 1	2 bedroom: 1.5
Urban Village Residential – Downtown District*	3+ bedroom: 1	3+ bedroom: 1.5

Source: BERK, 2023

Curb space management is critical to regulating the on-street parking supply for a city. Eliminating parking minimums for new development enables low-parking or zero-parking buildings where there is a

context appropriate market for them, see Exhibit 21. It makes small-scale infill development more feasible in walkable and transit friendly locations. transition to more multimodal transport.

Exhibit 21. Parking Area Versus Floor Space Ratio



Source: Reinventing Transport, 2019

20.30 – Residential Single Development

The Residential Single (RS) general use type is intended to provide low-density environments for families desiring to live in neighborhoods with individual dwelling units or townhouses. The regulations are adopted to provide flexibility in the arrangement of a main building on a building site and to encourage compatible development of neighborhoods while conserving and enhancing the value of land and physical characteristics in RS areas.

The Residential Single (RS) general use type is generally not compatible with supporting Rapid Transit networks due to the limited residential density that can be achieved. RS is currently fund along the Green Route mainly along Northwest Avenue. It is recommended to limit the adjacency of RS zoning to existing and future rapid transit lines.

20.32 - Residential Multi Development

The residential multi (RM) general use type is intended to accommodate high concentrations of people and maintain a desirable living environment for the people within and adjacent to areas designated RM. The regulations within this section provide a minimum acceptable level of adequacy for a livable environment, while optional regulations offer design and site flexibility. The residential multi transition designation is intended for areas better suited for slightly higher population concentrations than residential single areas and serves as a transition between areas with differing permitted uses or densities, not located in environmentally sensitive areas. See Exhibit 22.

Exhibit 22. 20.32.040(A) Ranged Density Classifications

Range	Minimum Density	Maximum Density
Low Density	7,201 sf/unit **(6 units/acre)**	7,201 sf/unit **(6 units/acre)**
Medium Density	7,200 sf/unit **(6 units/acre)**	3,600 sf/unit **(12 units/acre)**
High Density	3,599 sf/unit **(12 units/acre)**	None

Source: City of Bellingham, 2023

The existing minimum and maximum densities are below the average minimum densities established in Exhibit 1 as desired for rapid transit. The recommended increases in the Residential Multi zoning to align with the target residential densities established in Exhibit 2, for an urban context adjacent to Arterial BRT. The recommendation are staggered to reflect levels ranging from low to high density. Exhibit 2 reflects a target density of 20 to 60 units per acre near rapid transit. Exhibit 23 recommends low density residential uses range from 7,201 square feet per unit (6 units per acre) to 4,000 square feet per unit (11 units per acre) gently increasing the density in the low-density range to not be out of context with the existing zoning. The recommendation for the low density land use allows for better stagger and transition between residential zones. Medium density residential uses range from 3,500 square feet per unit (12 units per acre) to 1,450 square feet per unit (30 units per acre) such that the upper end of the density falls within the range for target residential densities. High density residential uses must be at least 1,450 square feet per unit (30 units per acre) with no maximum, providing developers the opportunity to build more efficient, high-density development adjacent to BRT. It is noted that the City does have an infill toolkit that allows for more compact homes that can fill in areas; however, these do not necessarily result in the higher density targeted for transit and they do not apply in single-family zones like those that area along Northwest Avenue.

Exhibit 23. Recommended Changes to Ranged Density Classifications

Range	Minimum Density	Maximum Density
Low Density	7,201 sf/unit **(6 units/acre)**	4,000 sf/unit **(11 units/acre)**
Medium Density	3,500 sf/unit **(12 units/acre)**	1,450 sf/unit **(30 units/acre)**
High Density	1,450 sf/unit **(30 units/acre)**	None

Source: BERK, 2023

20.33 – Commercial

The commercial use type is designed to fit different business and service facilities based on location and proximity to transportation. The city aims to approve commercial uses that align with city goals, policies, standards, and the comprehensive plan. New developments may be altered or conditioned to ensure compatibility with surrounding areas and to mitigate direct impacts of the proposal.

Commercial zoning is specific to individual neighborhood plans, but as it is generally applied within the City of Bellingham, commercial development is zoned to be within context of adjacent Residential Single zones and two to three story residential structures. The Neighborhood Commercial zone accommodates a high residential density (87 units/acre) and exceeds the target residential density outlined in Exhibit 2. The maximum height allowance for both Planned Commercial and Neighborhood Commercial may be a limiting factor in accommodating dense future employment and housing centers.

Exhibit 24. 20.33.040 Commercial Development Standards

Development Standards	Planned Commercial	Neighborhood Commercial
Maximum Density	Retail buildings shall comply with floor area restrictions contained in the applicable neighborhood zoning table.	Retail buildings shall comply with floor area restrictions contained in the applicable neighborhood zoning table. Apartments shall not exceed one unit for every 500 square feet of total site area. **(87 units/acre)**
Maximum Height	Three stories, not exceeding 40', when within 100 feet of a residential single zone boundary line.	Three stories, not exceeding 40'.

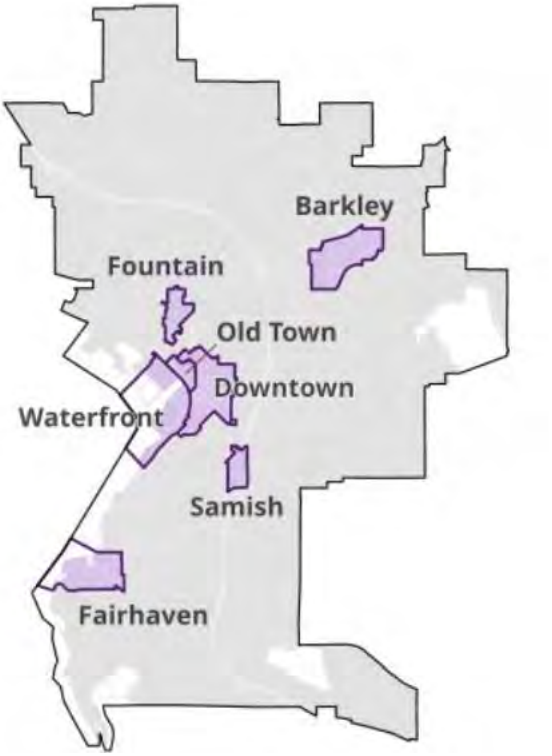
Source: City of Bellingham, 2023

The relationship between employment density and destination planning is significant because the transportation system plays a critical role in shaping and responding to the patterns of employment density within the City of Bellingham. In areas with high employment density, there is typically a higher demand for transportation services, and therefore more multi-modal transportation options are needed to accommodate the volume of cBRommuters. Conversely, uses that undermine the effectiveness of rapid transit (commercial and industrial uses with no ground floor activation/visual transparency) should be avoided along planned rapid transit corridors.

20.37 – Urban Village

The urban village designation aims to implement comprehensive plan goals and policies by directing future growth within compact urban centers while preserving the character of existing residential neighborhoods. This designation accommodates a mix of land uses including residential, commercial, light industrial, public, and institutional. The ultimate mix of land uses and infrastructure requirements are established in a master plan, developed by the city or property owners working with the city. The master plan is implemented through development and design standards and regulations adopted within this chapter. See Exhibit 25.

Exhibit 25. City of Bellingham Urban Villages



Source: City of Bellingham, 2023

**Old Town and Barkley have been identified as future urban villages and are not included in the analysis. Fairhaven is not served by the Gold, Green, or Blue line and has been omitted from the analysis.*

The table below illustrates the standard development regulations for the Samish Way Urban Village. This urban village is served by the Blue Go Line and is located southeast of Western Washington University's campus. See Exhibit 26. To align with the target residential densities to best support transit shown in Exhibit 2, it is recommended to encourage residential densities between 20-60 dwelling units per acre. The Residential Multi zoning permits the minimum target density, while the Infill Housing zone achieves a maximum density within the recommended target range. Increasing the maximum height permitted for Residential Multi, and Infill Housing would allow greater densities and achieve more dwelling units per acre.

Exhibit 26. 20.37.130(A) Standard Development Regulations for the Samish Way Urban Village

Development Standards	Commercial Core	Commercial Approach	Commercial Transition 1	Commercial Transition 2	Infill Housing	Residential Single	Residential Multi
Maximum Density	None	None	None	None	1,000 sf/unit **(43.5 units/acre)**	5,000 sf/unit **(9 units/acre)**	2,000 sf/unit **(22 units/acre)**
Maximum Height	75 feet	75 feet	45 feet	55 feet	35 feet	35 feet	35 – 45 feet depending on density

Maximum Floor Area Ratio	2.5 – 4.5	2.5 – 4.5	2.5 – 3.5	2.5 – 3.5	.6 - .75 depending on typology	N/A	N/A

Source: City of Bellingham, 2023

The table below illustrates the standard development regulations for the Fountain District Urban Village. This urban village is served by Route 232 (Green) and is located north of Downtown Bellingham. See Exhibit 27. The maximum density permitted by the Infill Housing zone should be increased to achieve the same maximum residential density that it does within the Samish Way Urban Village. It currently achieves the minimum target residential density for Arterial BRT service within an urban center per Exhibit 2.

Exhibit 27. 20.37.230 Development Standards for the Fountain District Urban Village

Development Standards	Commercial Core	Commercial Transition	Infill Housing	Residential Single
Maximum Density	None	None	2,500 sf/unit **(22 units/acre)**	5,000 sf/unit **(9 units/acre)**
Maximum Height	45 feet	35 feet	35 feet	35 feet
Maximum Floor Area Ratio	2.5 – 4.5	CT 1: 1.5 FAR CT 2: 0.6 FAR	.6 - .75 depending on typology	N/A

Source: City of Bellingham, 2023

The table below illustrates the standard development regulations for the Downtown District Urban Village. See Exhibit 28. Residential transition areas (RT1 and RT2) have different maximum density requirements within the Downtown District Urban Village. Nonresidential uses located in residential transition areas are considered "mixed uses" for purposes of applying design review standards and procedures. The Downtown District Urban Village does not have maximum density standards for development within the Residential Transition 1 (RT1) zone and carries a uniform maximum density of 29 units per acre within the Residential Transition 2 (RT2) zone. The RT2 designation's maximum density falls within the range of the target residential densities shown in Exhibit 2. The maximum height limit is a constraint in increasing the residential density within this urban village.

Exhibit 28. 20.37.530 Standard Development Regulations for the Downtown District Urban Village

Development Standards	Commercial Core and Commercial Transition	Infill Housing	Residential Single	Residential Multi
Maximum Density	None	RT1: None RT2: 1,500 sq.ft. per unit **(29 units/acre)**	RT1: None RT2: 1,500 sq.ft. per unit **(29 units/acre)**	RT1: None RT2: 1,500 sq.ft. per unit **(29 units/acre)**
Maximum Height	CC: None CT: 65'	35 feet	35 feet	35 – 45 feet depending on density

Source: City of Bellingham, 2023

Appendix C WTA Ridership Forecasts for Candidate BRT Alignments

transpogroup
WHAT TRANSPORTATION CAN BE.

MEMORANDUM

Date:	March 2, 2023	**TG:**	21322.01
To:	Tim Wilder and Michael Harpool – WTA		
From:	Scott Le Vine and John Lewis – Transpo Group		
cc:	Stef Herzstein and John Duesing – Transpo Group		
Subject:	WTA Ridership Forecasts for Candidate BRT Alignments		

As part of the Rapid Transit Corridors study, Transpo Group (TG) reviewed the ridership forecasts prepared by WTA for two candidate Bus Rapid Transit (BRT) alignments (known as the "Gold" and "Green/Blue" alignments).

The information presented in this memorandum is based on discussions with WTA's Michael Harpool and Tim Wilder that took place on 1/18/23 and 2/7/23, as well as spreadsheets containing summary inputs and outputs of the forecasting analysis that were shared by WTA on 12/1/22, 1/31/23, 2/5/23, and 2/7/23.

The purpose of generating the ridership forecasts for the two alignments is to provide input to be considered by WTA (along with other information) in the selection of a preferred alignment for Rapid Transit.

Alignments and Operations

The alignments and transit-service operations specified for the two "Gold" and "Green/Blue" alignments are shown on Figures 1 and 2. Service was specified to run on weekdays as well as Saturdays and Sundays according to a service pattern specified by WTA.

It is noteworthy that the Green/Blue alignment was specified to operate 112 revenue service hours on weekdays, compared to 85 for the Gold alignment (with Green/Blue also having similarly more revenue service hours on Saturdays and Sundays.)

In addition to adding the new BRT service, the analysis also incorporated the related realignment of Routes 105 (Fairhaven via Samish Way) and 197 (Lincoln /Lakeway), and elimination of the following routes:

- Route 107
- Route 108
- Route 196
- Route 105S
- Route 190S
- Route 331 (only eliminated when running the Gold BRT route)
- Routes 190/232 (only eliminated when running the Green/Blue BRT route)

WTA - RTS Forecasts Route Service Summary

Route: Gold - 331 — Bus Rapid Transit (BRT)

Route Service Summary			
Weekday Route Properties		**Service Hours**	
Round Trip Length (mi.)	14.5	Weekday	05:15 AM to 10:39 PM
Stops Served	55	Saturday	06:30 AM to 10:39 PM
Avg. Stop Spacing (ft.)	1,339	Sunday	06:30 AM to 08:09 PM

Route Operations Settings	
Service Hour Cost	$161.0
Service Mile Cost	--
Minimum Layover (%)	0.0%
Vehicle Capacity (Seats)	50

2040 Weekday Demographics (0.25 mi.)	
People | per sq. mi.	15,893 | 4,971.3
Jobs | per sq. mi.	23,029 | 7,203.4
Minority	23.9%
Low Income	25.2%
Seniors and Minors	27.1%
One-Vehicle or Less	44.8%

Route Service Detail by Time Period (No interlined Routes) — Annualize

Time Period	Service Span (Hours)	Revenue Service Trips (One Way)	Headway (Minutes)	Round Trip Travel Time (Minutes)	Speed (MPH)	Vehicles	Average Layover	Revenue Service Hours	Revenue Service Miles	Route Cost
AM Peak	3.0	24	13	60.0	14.5	5	7.7%	13.0	174.0	$2,093.0
Off-Peak	6.0	72	10	65.9	13.2	6	5.7%	41.9	520.3	$6,752.3
PM Peak	3.0	34	9	69.8	12.4	6	2.8%	20.4	244.6	$3,276.4
Night	5.4	19	31	60.0	14.4	2	3.2%	9.8	137.0	$1,580.5
Total Weekday	17.4	149	13	63.9	13.3	6	4.8%	85.1	1,075.8	$13,702.2
Saturday	16.2	91	21	60.0	14.4	3	4.8%	47.8	657.3	$7,691.8
Sunday	13.7	47	34	60.0	14.5	2	11.8%	26.6	339.9	$4,288.0

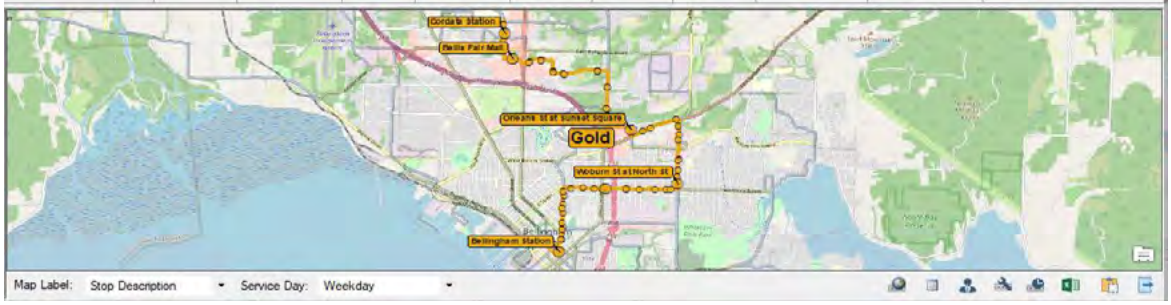


Figure 1: Alignment and operational inputs for "Gold" corridor

WTA - RTS Forecasts Route Service Summary

Route: Green/Blue — Bus Rapid Transit (BRT)

Route Service Summary			
Weekday Route Properties		**Service Hours**	
Round Trip Length (mi.)	19.0	Weekday	05:15 AM to 10:52 PM
Stops Served	78	Saturday	06:30 AM to 10:52 PM
Avg. Stop Spacing (ft.)	1,251	Sunday	06:30 AM to 08:22 PM

Route Operations Settings	
Service Hour Cost	$161.0
Service Mile Cost	--
Minimum Layover (%)	0.0%
Vehicle Capacity (Seats)	50

2040 Weekday Demographics (0.25 mi.)	
People | per sq. mi.	29,876 | 7,124.3
Jobs | per sq. mi.	24,560 | 5,856.6
Minority	18.9%
Low Income	31.3%
Seniors and Minors	19.0%
One-Vehicle or Less	52.0%

Route Service Detail by Time Period (No interlined Routes) — Annualize

Time Period	Service Span (Hours)	Revenue Service Trips (One Way)	Headway (Minutes)	Round Trip Travel Time (Minutes)	Speed (MPH)	Vehicles	Average Layover	Revenue Service Hours	Revenue Service Miles	Route Cost
AM Peak	3.0	24	13	83.5	13.6	7	7.7%	18.1	227.8	$2,912.7
Off-Peak	6.0	72	10	86.7	13.1	7	3.3%	53.8	682.5	$8,668.2
PM Peak	3.0	34	9	89.8	12.7	7	0.0%	25.3	321.7	$4,069.1
Night	5.6	19	31	84.8	13.4	3	8.6%	14.7	180.0	$2,366.0
Total Weekday	17.6	149	13	86.2	13.1	7	4.8%	111.9	1,412.0	$18,016.0
Saturday	16.4	91	21	83.5	13.6	4	0.0%	63.4	862.5	$10,200.0
Sunday	13.9	47	34	83.5	13.6	3	17.6%	39.8	445.7	$6,401.3

Figure 2: Alignment and operational inputs for "Green/Blue" corridor

Ridership Forecasting Software and Approach

The ridership forecasts were generated using TBEST (Transit Boardings Estimation and Simulation Tool) software[1], which is open-access software published by the Florida Dept of Transportation. While the software was developed with a focus on Florida, it is designed to also be applicable to analyze transit systems across the country.

WTA staff advised TG that WTA has successfully applied TBEST software on numerous prior studies and is proficient in applying it to generate ridership forecasts.

In brief, TBEST performs a regression analysis separately for each bus stop, which forecasts the number of boardings at the stop on the basis of equations that include:

- Variables describing population and employment within the bus stop's immediate vicinity
- Accessibility to population and employment at other bus stops (i.e. possible 'destination' stops)
- Bus route type
- Competition between bus routes

WTA indicated that it used TBEST's default coefficients in the ridership modeling equations, which is advisable in the absence of local data to support modifications to coefficient values.

TBEST is sensitive to the heightened attractiveness to potential riders of BRT treatments relative to traditional local bus services. There are a range of BRT-style treatments, and TBEST allows the analyst to specify which aspects of BRT treatments are to be included in a given application. WTA staff provided TG the BRT characteristics specifications shown on Figure 3, which are reasonable as an initial assessment of ridership potential in our judgment.

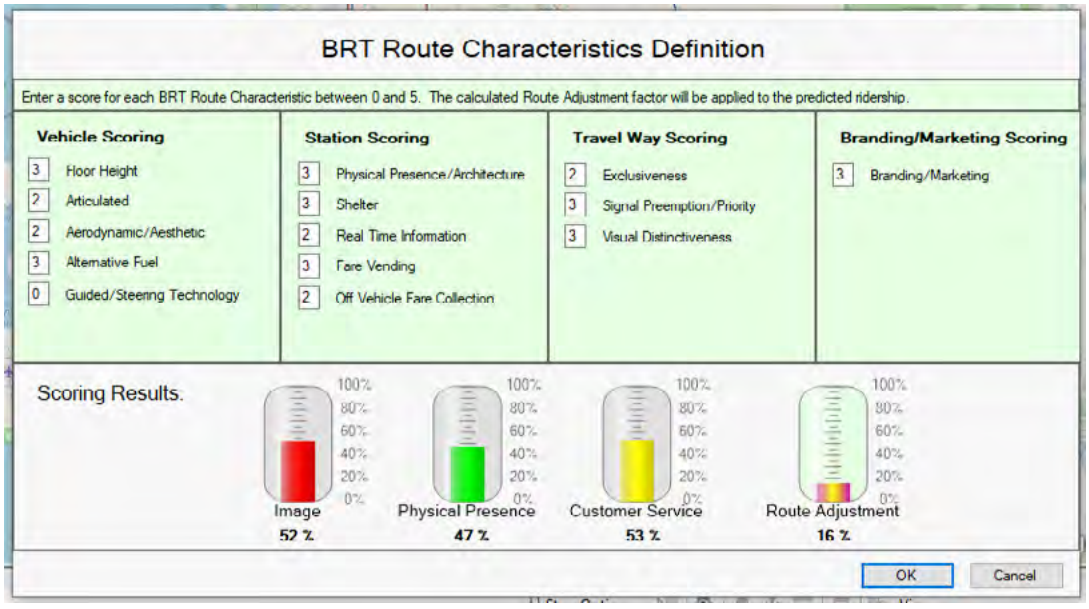


Figure 3: Specification of BRT treatments

[1] www.tbest.org

Finally, WTA ran both year 2019 and year 2040 analyses, with the year 2040 analyses containing population and employment by TAZ per the local MPO's baseline land use projections.

Ridership Forecast Results

Both of the BRT candidate alignments were run in TBEST by WTA staff, in multiple iterations of transit-service supply and TAZ-level population/employment inputs (year 2019 and 2040) based on discussions between WTA and TG staff.

The ridership forecast results that are presented below are from running one scenario of the Gold BRT line and one scenario of the Green/Blue BRT line (in each case along with related service changes on other bus routes). Specifically, the Gold BRT line involves eliminating Route 331 and the Green/Blue BRT line involves eliminating Routes 190 and 232.

The topline findings from WTA's ridership forecasting are:

- In year 2040, the WTA bus system would provide a total of 7.7M annual passenger-boardings if the Gold BRT route is implemented, versus 6.7M if the Green/Blue route is implemented.
- The Green/Blue BRT route would provide more annual boardings than the Gold BRT route (1.3M vs 730K). However, the Gold BRT route's greater potential to contribute to overall ridership on WTA services is due to the Green/Blue replacing Routes 190 and 232, which have more ridership than Route 331 which the Gold BRT route would replace.
- With the Gold BRT route implemented, WTA would be providing a total of 238K revenue-hours of bus service annually, which would generate boardings at an average rate of 32.2 boardings/hour. The corresponding values for the Green/Blue BRT route are 221K revenue-hours, and 30.1 boardings/hour. Thus, implementing the Gold BRT route would involve WTA providing more bus service hours, and each service hour would on average be more productive than with the Green/Blue BRT.

The ridership forecast analysis performed assumes the ability to implement BRT along both the Gold and Green/Blue. Additional evaluation is being conducted to review the feasibility of implementing such service along these corridors.

Findings and Recommendations

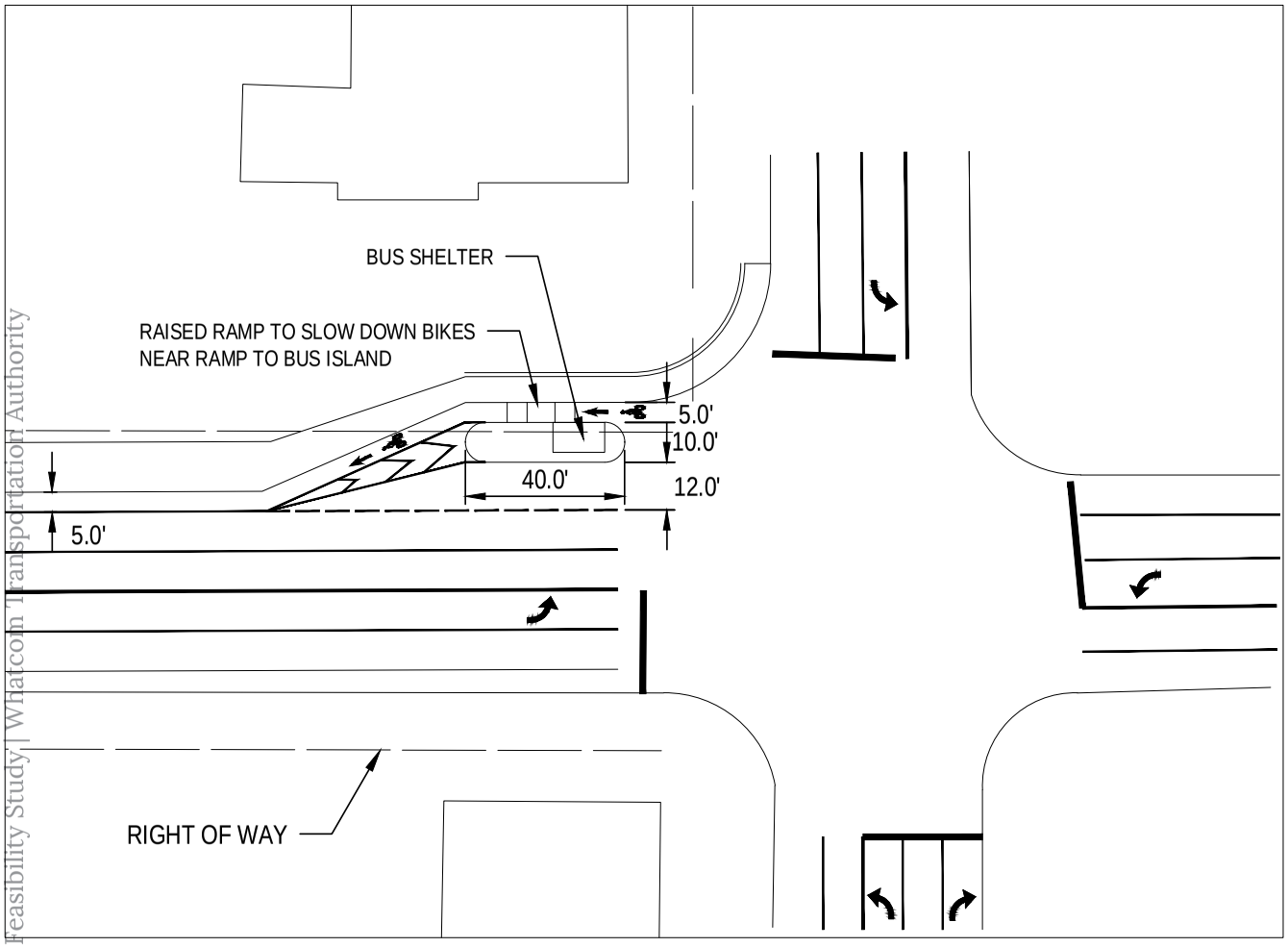
Based on the information provided to TG by WTA, we believe that the ridership forecasting approach undertaken by WTA is appropriate for the purpose of identifying the relative ridership potential of the two candidate BRT corridors (Gold and Green/Blue). The ridership forecasts show that the Gold BRT route has greater potential to increase systemwide bus ridership than the Green/Blue Route; assuming it is feasible to implement BRT along the corridors.

There are conceptually different types of ridership forecasting models and TBEST does not directly simulate the choice of travelers to choose between bus and the competing automobile travel mode through a "mode choice" model (typically a logit model form). If and when WTA elects to pursue federal funding for BRT through the Federal Transit Administration, it would be advisable for WTA to prepare ridership forecasts using FTA's "STOPS" software package, which is based on a mode-choice modeling framework and FTA staff consider the "gold standard" of modeling approaches.

Appendix

The TBEST output data tables provided by WTA on 2/7/23 in the MS Excel spreadsheet titled Ridership Forecasts_v2.xlsx. are Appendix material containing the detailed results summarized in this memorandum. Materials provided upon request.

Appendix D Toolbox of Conceptual Improvements

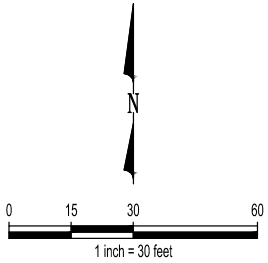


Bus islands remove conflict points and bike/bus weaving within a shared space. Adding a bus island would:

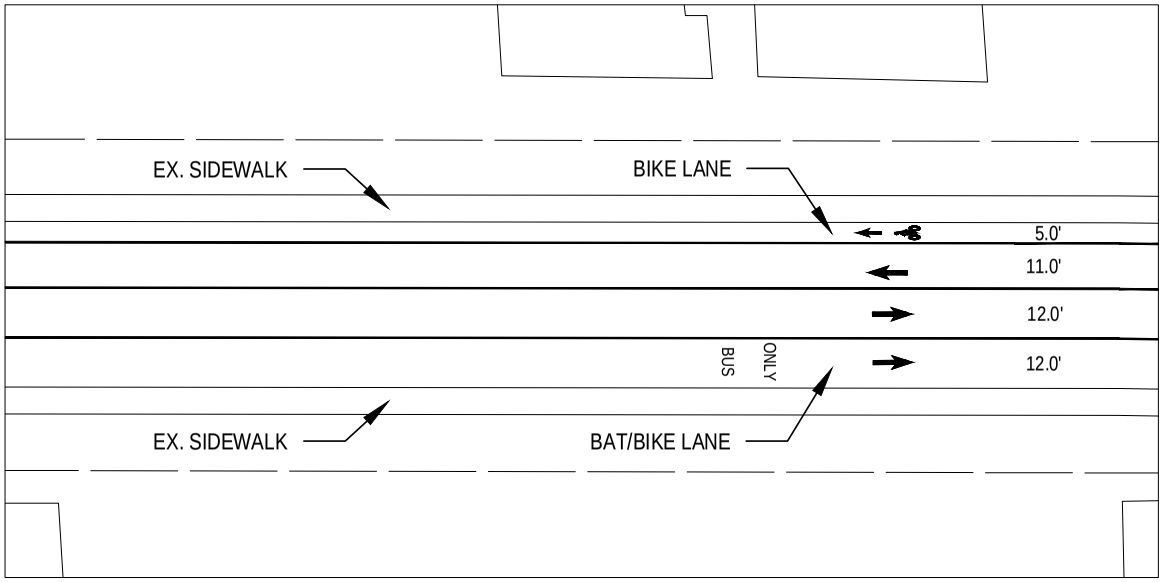
- Creates a better transit user experience due to removed conflict points
- Improve bike operations
- Increase transit reliability

While this can be desirable, the tradeoffs of this treatment may include:

- Right-of-way acquisition
- Moderate capitol project costs



BUS ISLAND WITH FARSIDE STOP



Restriping existing roadways to have an inbound BAT/Bike lane while removing a double left turn center lane would:

- Minimizes construction and road closures
- Allow for future bus rapid transit capabilities
- Have a lower cost compared to widening

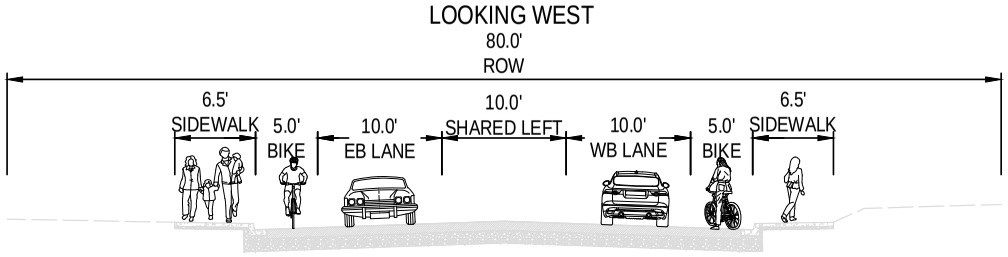
While this can be desirable, the tradeoffs of this configuration include:

- Removal of separated bike facilities
- Potential for general traffic travel time increases

0 15 30 60

1 inch = 30 feet

N



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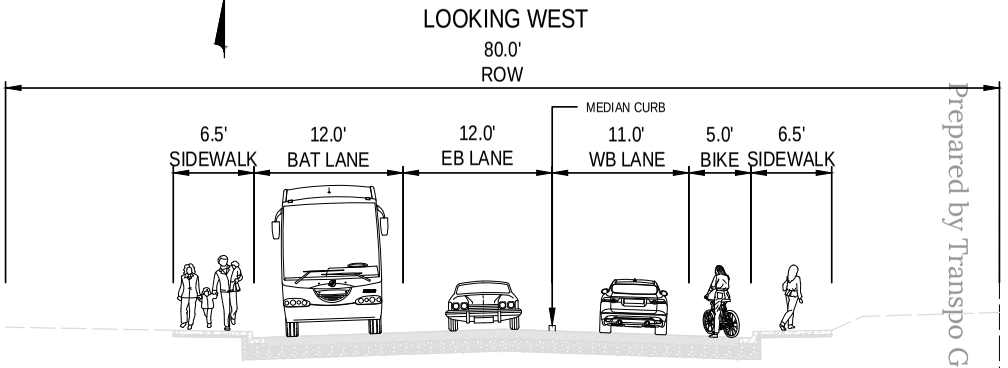
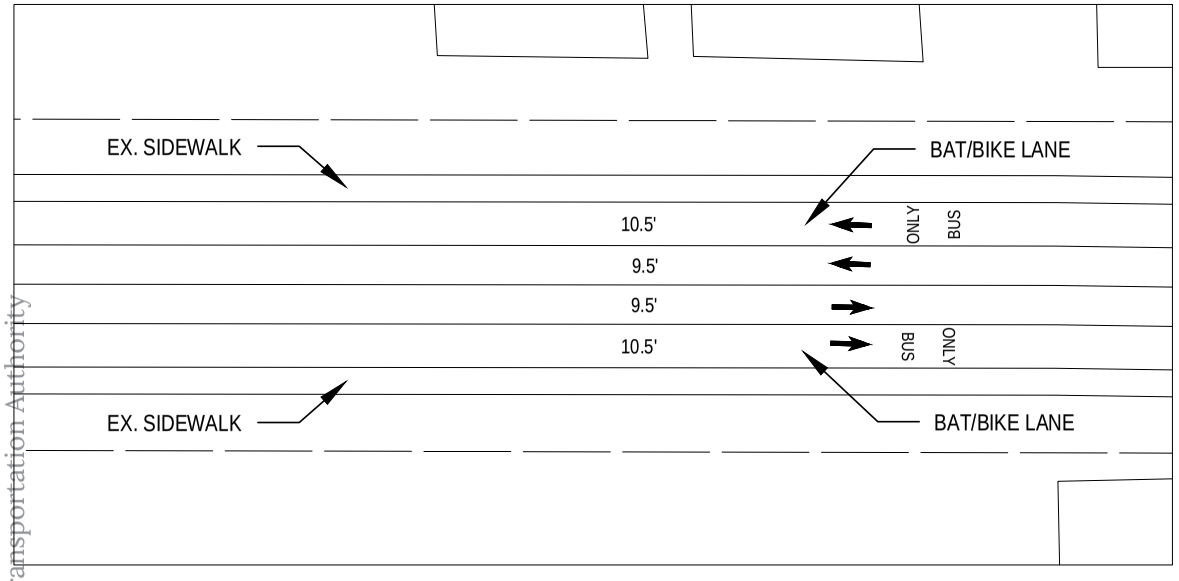


PROPOSED

ARTERIAL TREATMENT

SINGLE BAT LANE CONVERSION WITHOUT WIDENING

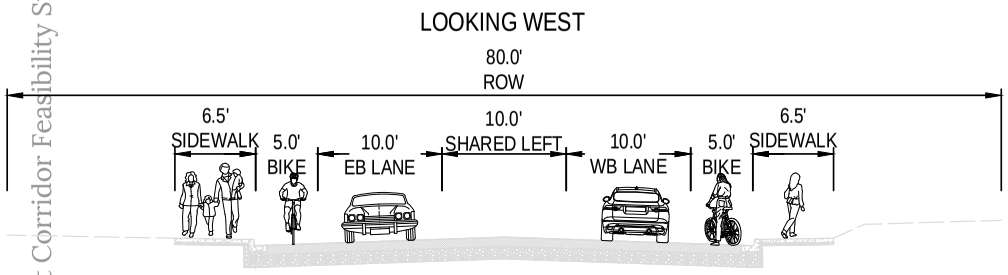


Restriping the existing roadway to have a BAT/Bike lane on both sides and removing a shared left turn center lane would:

- Minimizes construction and road closures
- Allow for future bus rapid transit capabilities on both sides of the roadway
- Have a lower cost compared to widening
- Remove left turn conflicts with opposing traffic with the addition of a median curb

While this can be desirable, the tradeoffs of this configuration include:

- Narrow BAT lane widths
- Potential bus and bike conflicts
- Challenging left turns against traffic
- Narrow general purpose lanes



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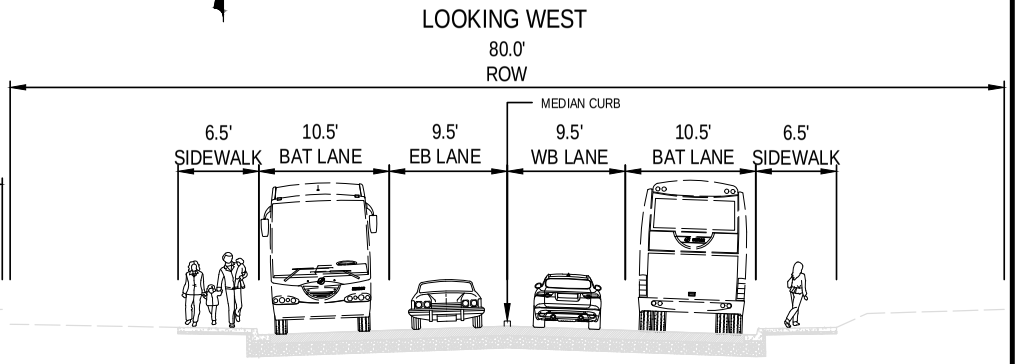
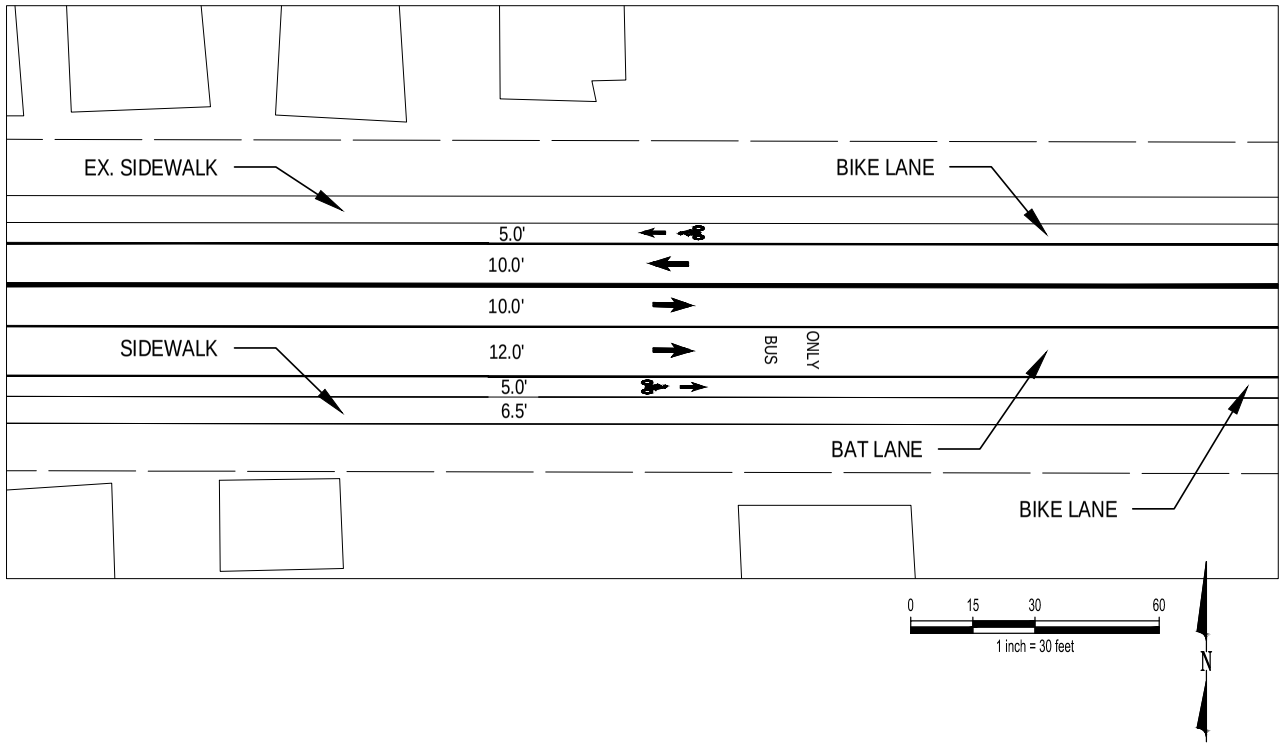


PROPOSED

ARTERIAL TREATMENT

INBOUND/OUTBOUND BAT LANE CONVERSION WITHOUT WIDENING

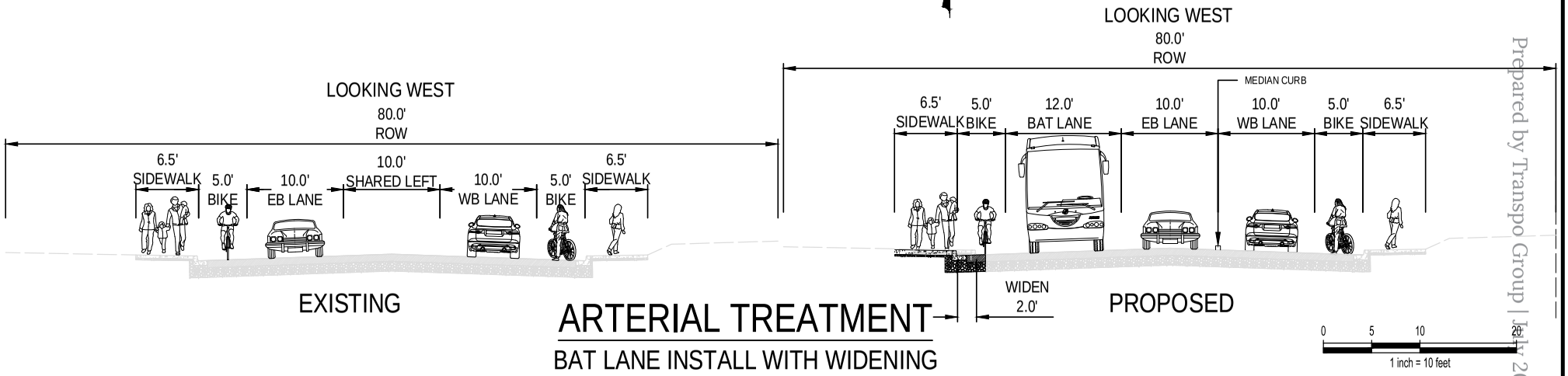


Restriping and widening the existing roadway to have a BAT and bike lane and removing a shared left turn center lane would:

- Allow for future bus rapid transit capabilities
- Remove left turn conflicts with opposing traffic with the addition of a median curb
- Improves transit speed and reliability

While this can be desirable, the tradeoffs of this configuration include:

- Have a higher capital cost compared to restriping treatments



ARTERIAL TREATMENT

BAT LANE INSTALL WITH WIDENING

Restriping and widening the existing roadway to have a BAT and bike lane on the south side and maintaining a double left turn center lane would:

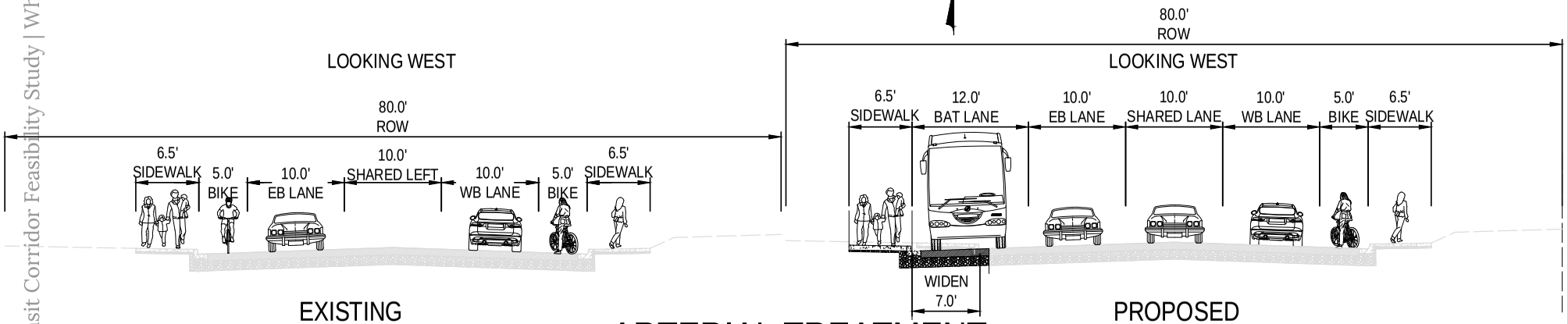
- Allow for future bus rapid transit capabilities
- Improves transit speed and reliability
- Maintains left turns, allowing residents to keep their current routes

While this can be desirable, the tradeoffs of this configuration include:

- Have a higher capital cost compared to restriping treatments
- Possible Right-of-Way acquisition

0 15 30 60
1 inch = 30 feet

N



ARTERIAL TREATMENT

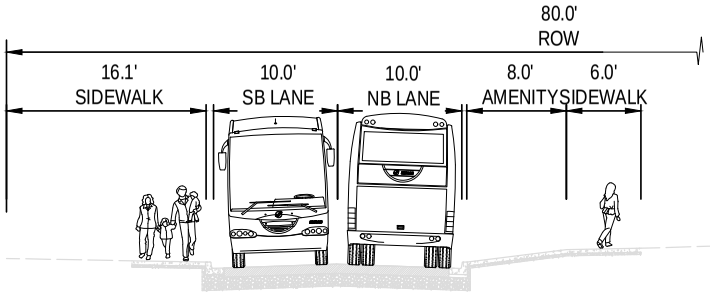
BAT/BIKE LANE INSTALL WITH SHARED LEFT CENTER LANE WITH WIDENING

0 5 10 20
1 inch = 10 feet

Widening the roadway by 4' to the East while adding parking pockets for college maintenance vehicles will:

- Allow north and south bound buses to operate concurrently
- Add designated parking areas for campus vehicles to park
- Require some regrading/seat wall treatments

Note: Buses typically cannot operate in a 10' lane when passing another oncoming bus.



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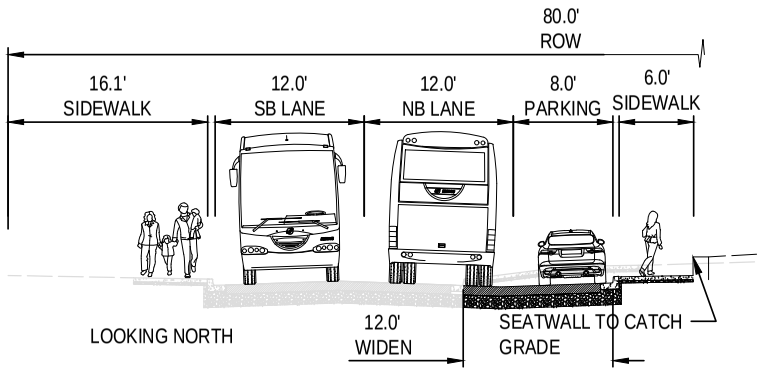
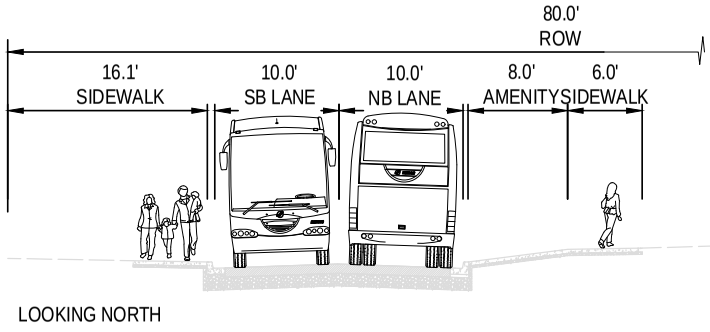


SECTION A



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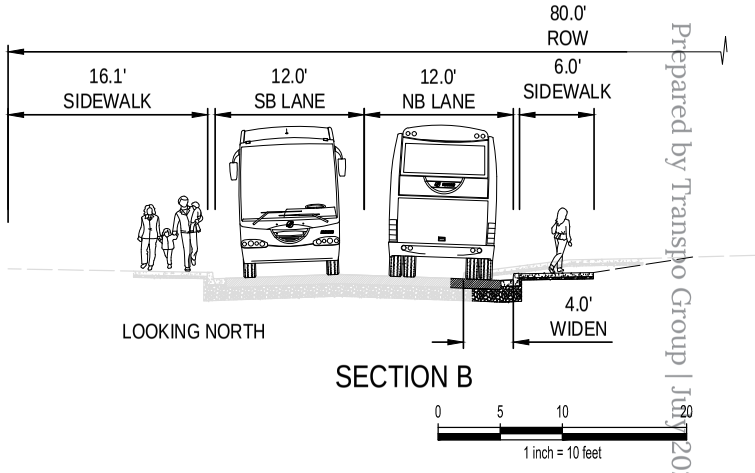
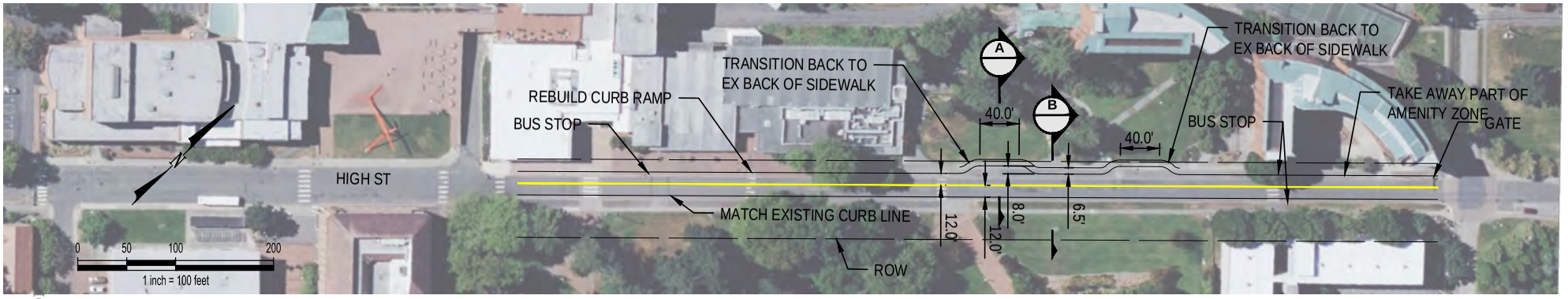


SECTION B

HIGH ST OPTION 1

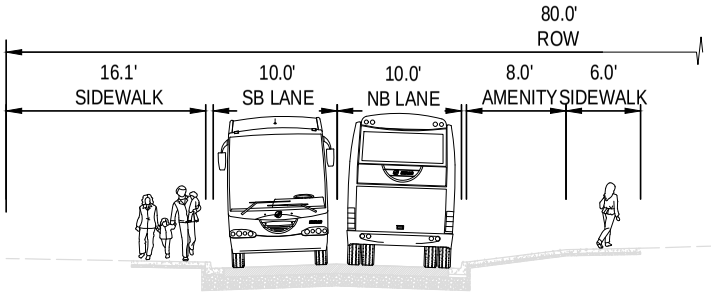
EAST WIDEN AND PARKING POCKET



Widening the roadway by 4' to the West while adding parking pockets for college maintenance vehicles will:

- Widen roadway so buses will have room to pass each other
- Adds designated parking areas for campus vehicles to park
- Will require some Right-Of-Way for the parking and sidewalk areas

Note: Buses typically cannot operate in a 10' lane when passing another oncoming bus.



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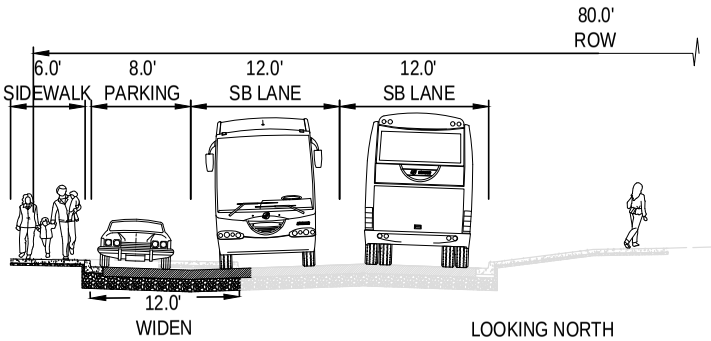

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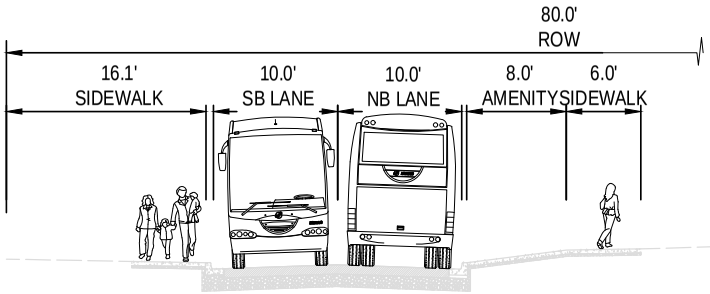

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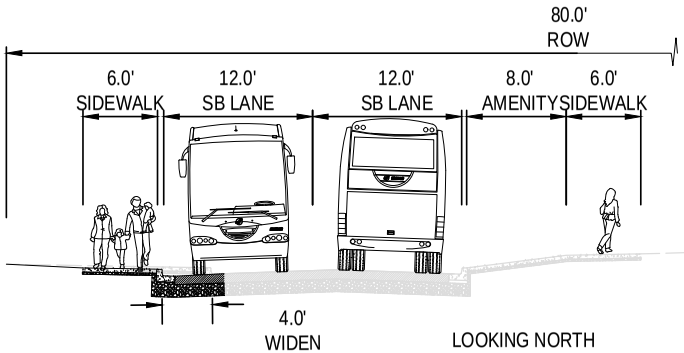
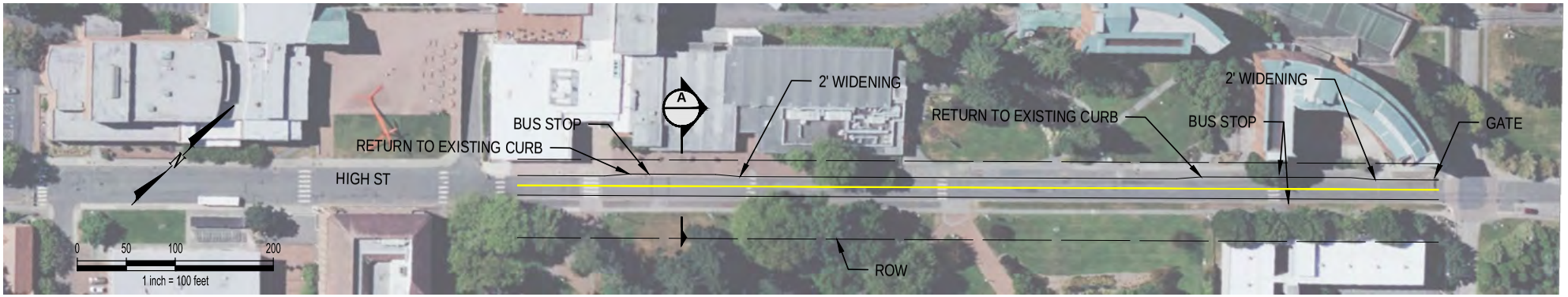


SECTION B

HIGH ST OPTION 2

WEST WIDEN AND PARKING POCKET

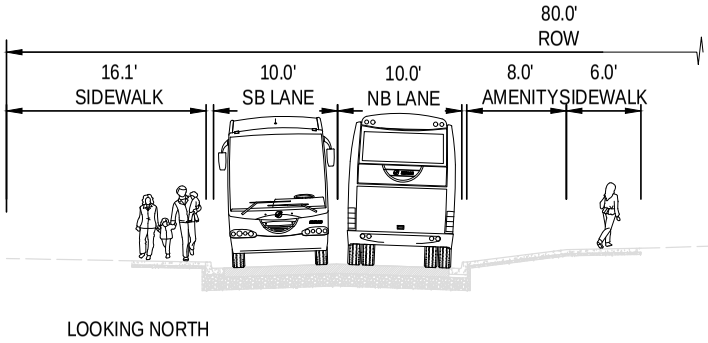
0 5 10 20
1 inch = 10 feet



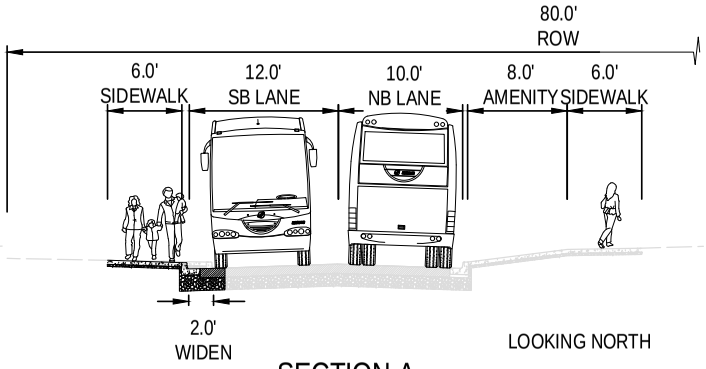
Spot widening the road to the west will:

- Allow inbound and outbound buses to both use the corridor concurrently
- Maintain existing sidewalks
- Be a low cost treatment

Note: Buses typically cannot operate in a 10' lane when passing another oncoming bus.



EXISTING



SECTION A

HIGH ST OPTION 3

WEST SPOT WIDENING

0 5 10 20
1 inch = 10 feet


WTA