Final Traffic and Safety Analysis
Fourth Plain Safety and Mobility Project

Prepared for

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1. INTRODUCTION

This memorandum documents existing (2021) and future (2040) baseline traffic and safety conditions and provides a traffic analysis of the proposed lane reconfiguration alternatives on Fourth Plain Boulevard from F Street to Andresen Road.

The project team conducted traffic analysis using traffic counts collected in July and September 2021, as well as prior counts collected in the corridor by the Washington Department of Transportation in 2019. Safety analysis was derived from existing plans and documents such as the 2018 *Transportation System Safety Analysis* (TSSA), the *Fourth Plain Pedestrian Safety and Access Implementation Strategy*, and the City of Vancouver's Safety Dashboard, as well as novel analysis conducted by the project team.

After an initial review of the baseline conditions, the project team developed two lane reconfiguration alternatives:

- Alternative 1: would remove one lane in each direction (eastbound/westbound) on Fourth Plain Blvd and one in each direction (northbound/southbound) on Fort Vancouver Way
- Alternative 4: would remove one lane in each direction (eastbound/westbound) on Fourth Plain Blvd and one in each direction (northbound/southbound) on Fort Vancouver Way

The project team then performed a traffic analysis of the proposed lane reconfigurations. The project team looked at modeled traffic in the year 2040 to understand how traffic is likely to be if there are no roadway changes in the corridor between now and 2040 (called a "No Build" or "baseline" scenario) and compared that to traffic if a travel lane were removed, testing Alternative 1 and Alternative 4 under several modelling assumptions to answer the following questions:

- What would traffic look like in 2040 if we removed a travel lane in each direction?
- Would the amount of traffic meet City standards for keeping traffic moving on Fourth Plain?
- How does traffic with a travel lane removed compare to keeping Fourth Plain the same as it is today?

The data from these traffic analyses answers whether a lane reconfiguration would affect traffic in a major way. This information also conveys lane reconfiguration tradeoffs with the public and stakeholders: whether potential impacts to traffic are worth the benefits of increased safety and mobility for all roadway users.

This traffic and safety information, in addition to prior plan recommendations, will inform the development of alternatives for different segments of the Fourth Plain Boulevard corridor to address safety concerns and multimodal improvements.

In addition to the maps in this report, mapped information can also be viewed online: https://parametrix.maps.arcgis.com/apps/webappviewer/index.html?id=b7b36cf945b048d2ac7ad6c63815000d#

2. TRAFFIC AND SAFETY SUMMARY

Given safety concerns along the corridor, Fourth Plain Boulevard has been the subject of multiple studies and planning efforts over the last decade. This effort, the Fourth Plain Safety and Mobility Project, builds on recent studies and provides additional traffic data collection and analysis. The new findings for traffic and safety are summarized below.

2.1 Current Traffic Volumes and Operations (2021)

Analysis of current traffic focused on existing conditions (2021). Current traffic volumes within the study area are typically highest on weekdays between 7 and 9 a.m. and between 4 and 6 p.m. This trend is expected to continue. The average peak hour for this study is 7:30 to 8:30 a.m. and 4 to 5 p.m. The turning movement volume data for this analysis was primarily collected in July 2021. Supplemental data was collected in September 2021. In addition, data for three intersections were collected by the Washington State Department of Transportation in June 2019. The intersection of Andresen Road and Fourth Plain Boulevard has the highest peak hour volume within the study area.

The Stapleton Road intersection at Fourth Plain Boulevard operates at a level of service (LOS) D during both AM and PM peak hours. Grand Boulevard at Fourth Plain operates at LOS D in the AM peak hour. The Andresen Road intersection at Fourth Plain Boulevard sees LOS E at the PM peak hour, showing the worst condition in the corridor. All other intersections within the study area operate at LOS A, B, or C, which is within the acceptable performance range.

2.2 Future Traffic Volumes and Operations (2040)

Future traffic volumes for the year 2040 were modeled under a no-build scenario, meaning no significant improvements or alterations to the corridor were included in the model. The no-build volumes serve as a baseline for analysis of potential roadway reconfigurations and other improvements to improve safety and mobility.

The 2040 no-build roadway network includes the 20 existing study intersections. The forecast turning movement volumes for the year 2040 were prepared by calculating the growth rate using modeling data for 2015 and 2040 from the Southwest Washington Regional Transportation Council (RTC). The AM traffic volume counts were increased by 0.77 percent annual growth rate, and PM traffic was increased by 0.50 percent annually.

Modeled future operations show a similar pattern to current conditions. The intersection of Fourth Plain Boulevard and Grand Boulevard and the intersection of Fourth Plain Boulevard and Stapleton Road will both experience LOS D in the AM and PM peak hours, while the PM peak at Andresen Road and Fourth Plain Boulevard will experience LOS E. All other study intersections along Fourth Plain Boulevard are expected to operate at LOS A, B, or C, which is in the acceptable range.

2.3 Alternative Build Conditions Traffic Volumes and Operations (2040)

The project team used RTC's regional travel model to test several traffic assumptions with a range of likely traffic outcomes for each lane reconfiguration alternative. From a technical standpoint, removing travel lanes from Fourth Plain would likely result in acceptable changes in traffic. When modeled with a

growth rate that assumes no traffic diversion, overall delay increases in the Alternative 1 build condition compared to future no build conditions. However, when modeled with a growth rate that assumes some traffic diversion, traffic operations perform similarly or slightly better than future no build conditions. Alternative 4 results in delay that is similar to No Build conditions, and average traffic speeds and driving time are also very similar to No Build.

2.4 Safety Analysis

Crash data was accessed through the City of Vancouver Safety Dashboard. The most recent 3 years of crash data were analyzed (2018 to 2020). Analysis focused on crashes involving people walking and biking within the study area. Of the total 309 crashes, 32 biking- or walking-involved crashes occurred during the 3-year period. There were 12 crashes that involved people biking, and 20 crashes that involved people walking. Crashes were dispersed throughout the corridor with very little clustering other than at the N Grand Boulevard intersection (5 crashes) and the NE Andresen Road intersection (4 crashes).

Of all the crashes, there was one fatal crash, and it involved a person walking. This crash consisted of a motorist driving under the influence of alcohol (DUI) who hit someone walking in a marked crosswalk at the Fort Vancouver Way intersection. Non-fatal injury crashes accounted for 25 of the people walking or biking involved crashes, while 6 crashes were property -damage-only.

A majority of crashes (27) occurred at an intersection or driveway. Additionally, most crashes (26) occurred during fair weather. The light conditions during biking- or walking-involved crashes was more evenly split with 18 crashes occurring during daylight and 14 crashes occurring during the dark, dawn, or dusk.

For crashes involving people walking, the majority of drivers were traveling straight (14) compared to 6 crashes where the driver was making a right turn. For biking-involved crashes, drivers were more likely to be conducting a turn. For example, the driver was traveling straight in 5 bicycle-related crashes compared to 7 bicycle-related crashes where the driver was making a right or left turn.

3. BACKGROUND AND STUDY AREA

The City of Vancouver initiated this study to develop lane reconfiguration and safety improvement recommendations for Fourth Plain Boulevard. The corridor has been identified as having significant safety concerns for all users, and especially for people walking, through prior work conducted by the City. This Fourth Plain Safety and Mobility Project vets potential changes to the corridor with the community and makes recommendations that will be advanced by the City through a repaving project on Fourth Plain Boulevard in 2023 and a separate safety project that will be implemented at and near the Fourth Plain interchange with Interstate 5 (I-5).

The study area for the project is Fourth Plain Boulevard from D Street to Andresen Street. Figure 1 shows the study area boundaries and major intersections in the corridor. In addition to the maps in this report, mapped information can also be viewed on the project's online map: https://parametrix.maps.arcgis.com/apps/webappviewer/index.html?id=b7b36cf945b048d2ac7ad6c63815000d#

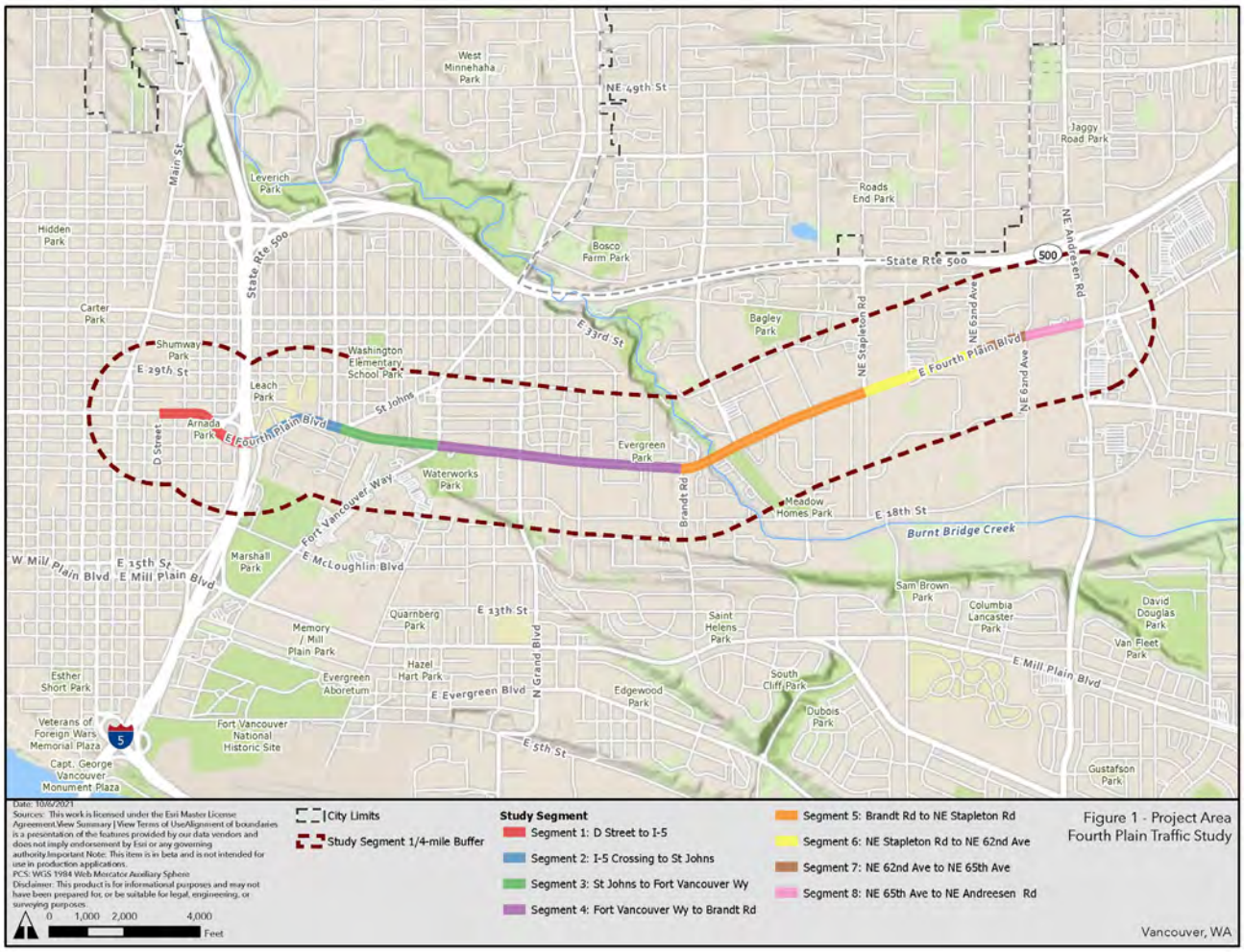

Figure 1. Study Area and Segments

3.1 Prior Planning Efforts

Given safety concerns along the corridor, Fourth Plain Boulevard has been the subject of multiple studies, planning efforts, and improvement initiatives over the last decade. A summary of past planning efforts, key findings, and recommendations are summarized in Table 1 below.

Table 1. Prior Efforts – Key Findings and Recommendations

Plan/Initiative	Key Findings	Recommendations
Fourth Plain Boulevard Repaving Project (TBD)	• City's pavement management section will be repaving entire length of Fourth Plain from the Port of Vancouver to Andresen in 2023.	• Consider coordinated safety and mobility improvements with the repaving project. Pavement group is postponing work to allow Fourth Plain Safety and Mobility Project to conclude.

Plan/Initiative	Key Findings	Recommendations
Vancouver Moves – City of Vancouver Transportation System Plan Update (2020 – 2022)	• Community members have identified Fourth Plain Boulevard as one of the key citywide corridors in need of multimodal improvements to create a more comfortable environment for people walking, cycling, accessing transit, and using mobility devices.	• Safety has been identified as the top transportation value to guide the development of TSP policies, goals, and draft solutions.
WSDOT City Safety Grant Program (2020)	• City submitted list of needs along the corridor with a focus on addressing serious collision and fatalities. • Focused on the segment of Fourth Plain Boulevard between F Street and Fort Vancouver Way – highest need segment. • Excluded I-5 interchange improvements for first phase.	• Consider lane reconfiguration along Fourth Plain to reduce serious injuries and fatalities. • Consider safety improvements at I-5 interchange in future phase. • WSDOT granted the City $800,000 for signal improvements and lane reconfiguration. The City has obligated road funds, but no capital expenditures have been made yet. • Consider as a source of funding for qualifying improvements from the Fourth Plain Safety and Mobility Project.
WSDOT SR 500 Safety Improvements (2018)	• In October 2018, WSDOT removed the traffic signals at the intersections of SR 500/Falk and SR 500/Stapleton and turned these movements into right-in/right-out only onto and off of SR-500. This project was implemented to improve corridor traffic safety. • After project implementation, proposed mitigations were developed including additional right turn storage at Andresen Road, southbound between SR 500 and Fourth Plain. City staff noted that the mitigation project on Andresen is currently being designed and that WSDOT may be evaluating a new bike/ped overcrossing on SR 500 at Stapleton.	• Consider the impending mitigation project on Andresen Road in the lane reconfiguration analysis, as well as the potential for a future bike/ped crossing at Stapleton which would increase cycling and walking network connectivity.
C-TRAN 2021-2026 Transit Development Plan	• Building on the success of existing Vine BRT service, the agency is considering a service extension on Fourth Plain. • C-TRAN is pursuing opportunities for Transit Signal Priority (TSP) along the existing Vine BRT corridor on Fourth Plain Boulevard.	• C-TRAN has recommended the East Fourth Plain BRT Extension as a capital improvement for 2026. The project will include planning, design, and construction of East Fourth Plain BRT between Vancouver Mall Transit Center and Mill Plain Transit Center.
City of Vancouver Transportation System Safety Analysis (TSSA) (2018)	• Portions of Fourth Plain had some of the highest fatalities and collision rates across the City. Between 2010-2016, three of the top 20 crash intersections are within the study area. ➢ Fourth Plain Boulevard and Andresen Rd ranked third in the City's safety performance index with 78 total crashes (3 fatal and serious, 6 ped/bike crashes). ➢ Fourth Plain Boulevard at Stapleton Rd tied for fifth place with 27 total crashes (2 fatal and serious, 3 ped/bike crashes).	• Construct refuge islands, shorten crossing distances with curb extensions, provide leading pedestrian indicator, upgrade some crossings to enhanced crossings (HAWK and RFFB signals). • Reduce driveway density. • Implement dedicated bicycling facilities; colored bike boxes at intersections. • Provide/improve left- and right-turn channelization at intersections and consider protected left-turn signal phasing, prohibiting

Plan/Initiative	Key Findings	Recommendations
	➢ Fourth Plain Boulevard at Burton Rd tied for eighth place with 24 total crashes (2 fatal and serious, 3 ped/bike crashes). • Fourth Plain Boulevard was identified as one of three candidates for safety treatments based on the combined performance measure score. • 5-lane cross sections such as Fourth Plain Boulevard had higher rates of pedestrian crashes (all severities).	right turn on red, adding a right turn signal, or removing turns. • Fourth Plain and NE Stapleton Road Project – Intersection safety improvements, install leading pedestrian interval phase at all approaches, restripe NB approach to reduce skew angle, etc. • Fourth Plain to Falk Road Project – Corridor safety improvements, reduce access points, reconfigure to 3-lane cross section, install leading pedestrian interval phase at all approaches, etc.
Fourth Plain Forward Pedestrian Safety and Access Implementation Strategy (2017)	• Speeding is an issue along the corridor, creating an unsafe environment for all users and especially school-age children, older adults, and people with mobility limitations. • Large, multi-lane intersections within the study area create an unsafe environment for people walking, bicycling, or using a mobility device. • Barriers to accessing BRT stops are significant, especially for school-age children and people with mobility limitations. The northwest neighborhood within the study area is hard to reach from the closest BRT station. • Other barriers include large commercial plots and Burnt Bridge Creek, which contributes to the wide separation between Vine BRT stations.	• Improve neighborhood access to Fourth Plain Boulevard, especially access to Vine BRT stops. • Implement new midblock crossing locations and safety enhancements at recommended locations. • Implement lighting best practices along the corridor. • Implement new pedestrian paths along recommended routes. • Conduct outreach and education to improve safe use of and compliance with existing HAWK signals along the corridor.
Fourth Plain Forward Action Plan (2015)	• Identified several safety hotspots of pedestrian-involved traffic accidents adjacent to the Vancouver VA Hospital, Vancouver Central Park, and Evergreen Park. • Existing sidewalks are narrow, lack buffers from the street, and are frequently interrupted by driveway curb cuts. • There are limited places to safely ride a bike, and many cyclists prefer to ride on the sidewalk.	• Install pedestrian-scale lighting. • Paint existing bike lanes green. • Install pedestrian refuge island east of Grand Blvd intersection. • Assess performance of existing HAWK beacons. • Develop a corridor-wide strategy to improve safety and multimodal access. • Implement the Fourth Plain International District concept, which includes the creation of a district manager or nonprofit organization (complete).
Fourth Plain Subarea Plan (2008)	• Identified four “pulse points” referring to the different land use/community characters along the corridor. Generally, the corridor transitions from “village” to “community center,” “employment focus,” and “regional destination” moving east from St. Johns Blvd to NE Andresen Rd. • The existing development of the corridor is conducive to high-speed automobile traffic • The corridor is a rich cultural and commercial center with many opportunities for improvement.	• Install street trees, pedestrian furniture, and other streetscaping improvements • Create continuous sidewalks and well-marked crosswalks throughout the corridor • Consider opportunities for high-capacity transit and use of a median where possible. • Install north-south bicycle routes along Grand Blvd, General Anderson Ave, NE 62nd, and NE Andresen Rd.

Plan/Initiative	Key Findings	Recommendations
	• The Kyocera site presents a significant opportunity to add quality commercial and retail development to the corridor.	• Install east-west (parallel) bicycle routes along E 29th St, Plomondon St (incomplete connection), E 18th St, and NE 25th/Burton Rd.

BRT = bus rapid transit; HAWK = high-intensity activated crosswalk beacon; RFFB = rectangular rapid-flashing beacons ; TSP = transit signal priority; WSDOT = Washington State Department of Transportation; VA = Veterans Administration

3.2 General Study Area Conditions

3.2.1 Segment 1: D Street to I-5

The typical cross section in Segment 1 consists of four lanes: two westbound lanes, one eastbound lane, and a center turn lane. The travel lanes range in width from 11 to 13 feet.

The lane configuration changes after the F Street intersection with two travel lanes going both directions as Fourth Plain Boulevard transitions over I-5. There is one signalized intersection in the segment, and the rest are unsignalized intersections. Every intersection is a three-legged intersection (T intersection).

Sidewalks are present on both sides of the street through this segment and are approximately 5 feet wide. The north sidewalk trails farther back to a residential area as Fourth Plain Boulevard goes over I-5.

There is one C-TRAN bus stop that provides access to C-TRAN line 6, which is Fourth Plain Boulevard and D Street. It is located near the Arnada Park entrance.

There are no dedicated bicycle facilities through this segment.

Figure 2 shows the typical cross section. Figure 3 shows the roadway elements of this segment, including transit routes and stops, bike facilities, signals, crossings, and sidewalks.

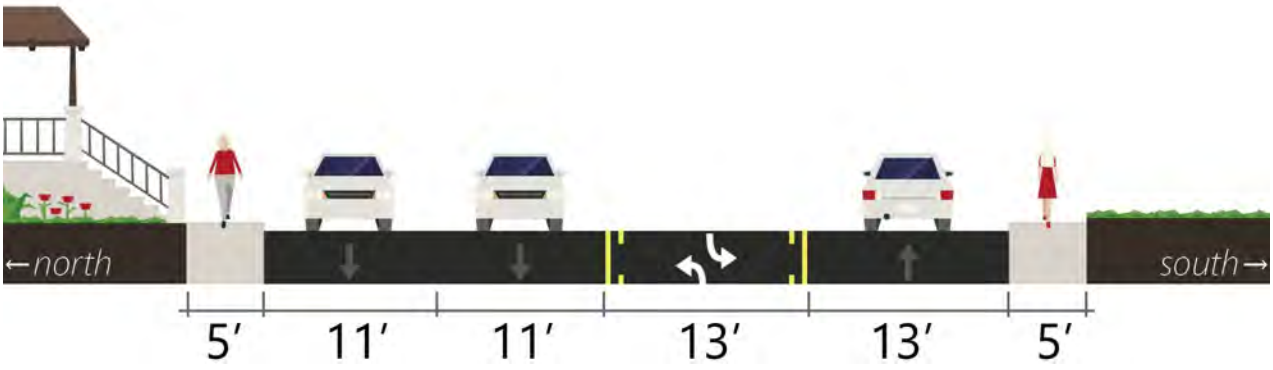

Figure 2. Segment 1 Existing Cross Section

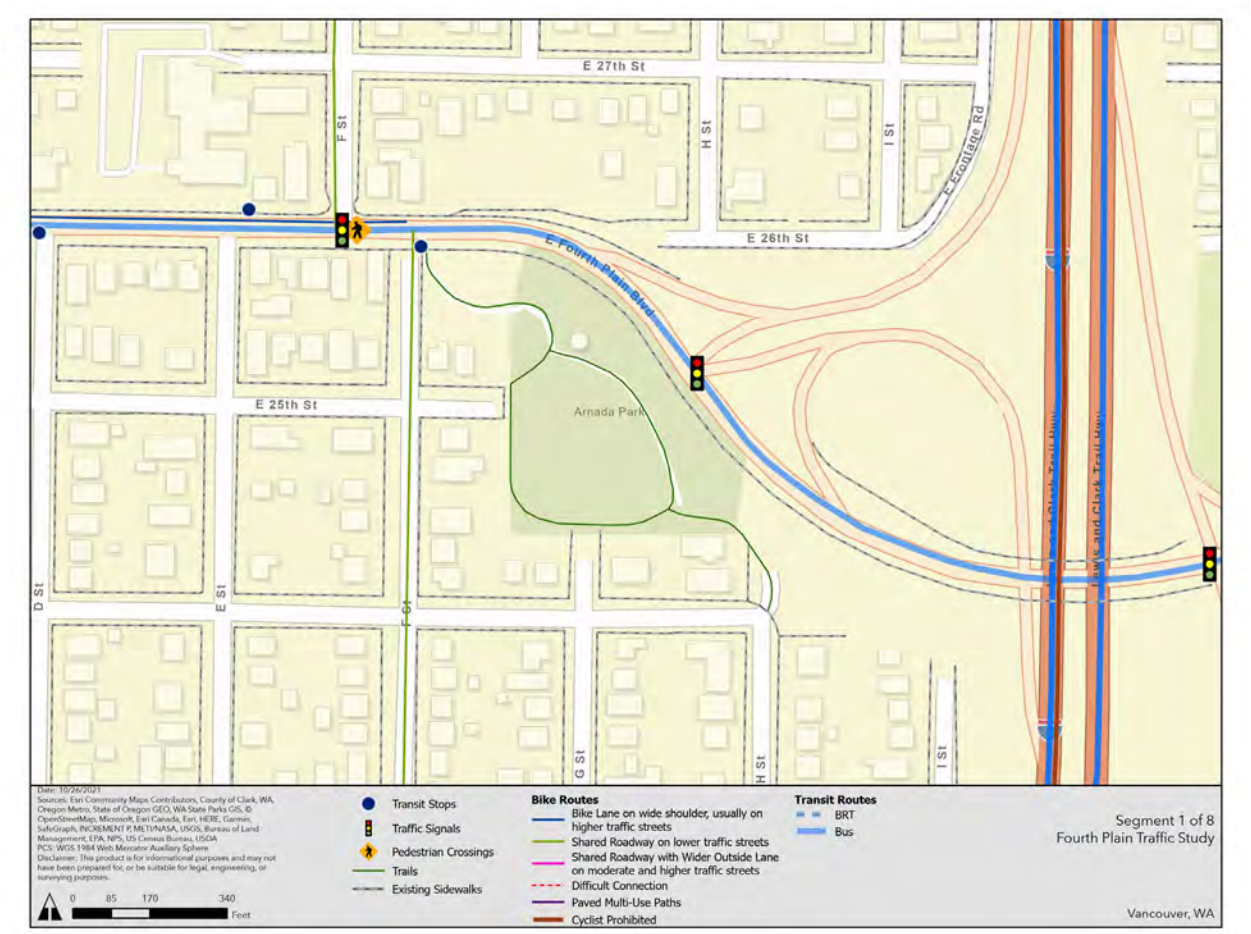

Figure 3. Segment 1 Roadway Elements

Photograph 1. St. Luke's Episcopal Church and Homes on Fourth Plain Boulevard East of D Street

Land uses through this segment primarily consist of low-density residential, churches, and parks. The largest land use is St. Luke's Episcopal Church located on the north side of Fourth Plain Boulevard, west of the F Street intersection (Photograph 1). Single-family homes and low-density residential units exist along the north and south sides of Fourth Plain Boulevard. The east end of the segment includes Arnada Park.

3.2.2 Segment 2: I-5 Crossing to St. Johns Boulevard

The cross section through this east-west segment over I-5 consists of five travel lanes: three eastbound and two westbound. The travel lanes range in width from 12' to 13 feet. Figure 4 displays the cross section over the highway.

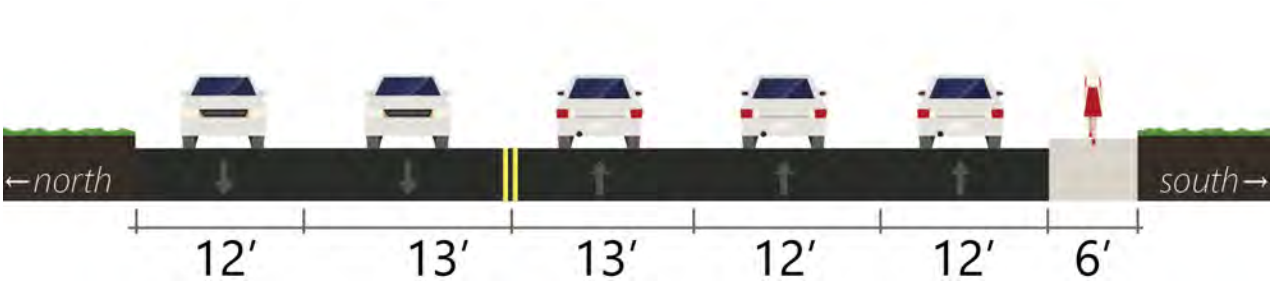

Figure 4. Segment 2 Existing Cross Section

The lane configuration of five travel lanes transitions to four travel lanes on the east side of I-5. A center left-turn lane begins near the Vancouver Barracks Post Cemetery entrance and extends east for St. Johns Boulevard. Intersections are signalized at the exits to I-5 and the St. Johns Boulevard intersection. Intersections at O Street and P Street are unsignalized three-legged intersections.

Photograph 2. Fourth Plain Boulevard east of Exit from I-5

There is a 6-foot-wide sidewalk on the south side of Fourth Plain Boulevard over I-5, with a pedestrian crossing at the northbound I-5 off ramp (Photograph 2). The east sidewalk continues until the entrance to the Vancouver Barracks Post Cemetery. From the cemetery to St. Johns Boulevard, there are 6-foot-wide sidewalks present on both sides of the street. The C-TRAN line 6 passes through the segment, but there is no bus stop in this segment. There are no dedicated bicycle facilities through this segment.

Figure 5 shows the roadway elements including transit routes and stops, bike facilities, signals, crossings, and sidewalks.

Land uses through this segment consist of medical, multifamily residential, and a cemetery. The largest land use through this segment is the Vancouver Veterans Administration (VA) Hospital located on the south side of Fourth Plain Boulevard. The second-largest land use is the Vancouver Barracks Post Cemetery located on the north side of Fourth Plain Boulevard. There is a mixture of high-density and low-density multifamily apartment complexes and houses along the north side of Fourth Plain Boulevard. There is limited commercial land use with two businesses present: a county office and a dog grooming salon. The west end of the segment is anchored by Arnada Park, located west of the I-5 exit.

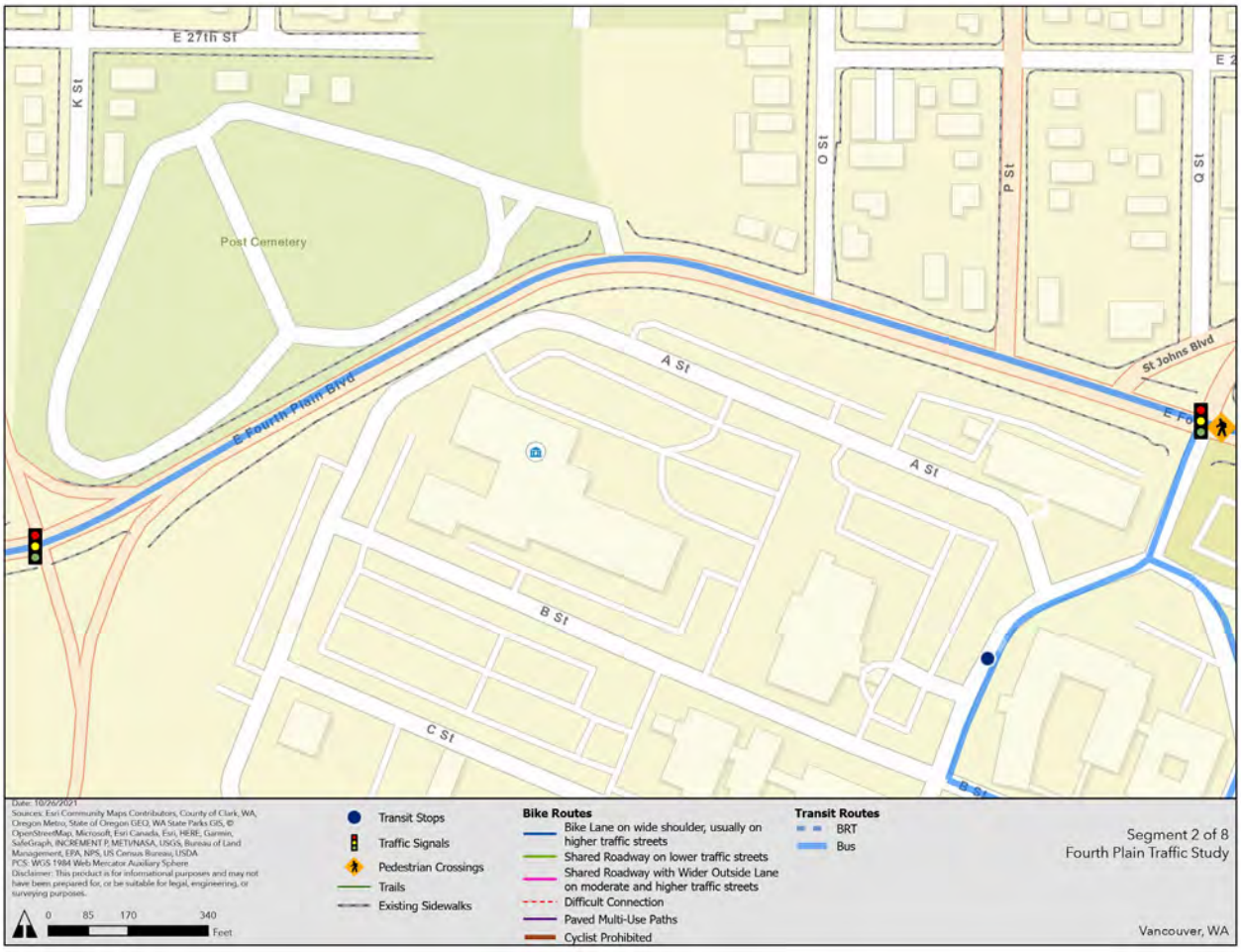

Figure 5. Segment 2 Roadway Elements

3.2.3 Segment 3: St. Johns Boulevard to Fort Vancouver Way

The typical cross section through this east-west segment consists of four travel lanes: two in each direction. The travel lanes are 11’ to 12’ feet wide. The planting strip width ranges from 0’ to 12’ feet throughout the segment. Figure 6 displays the typical cross section through this segment.

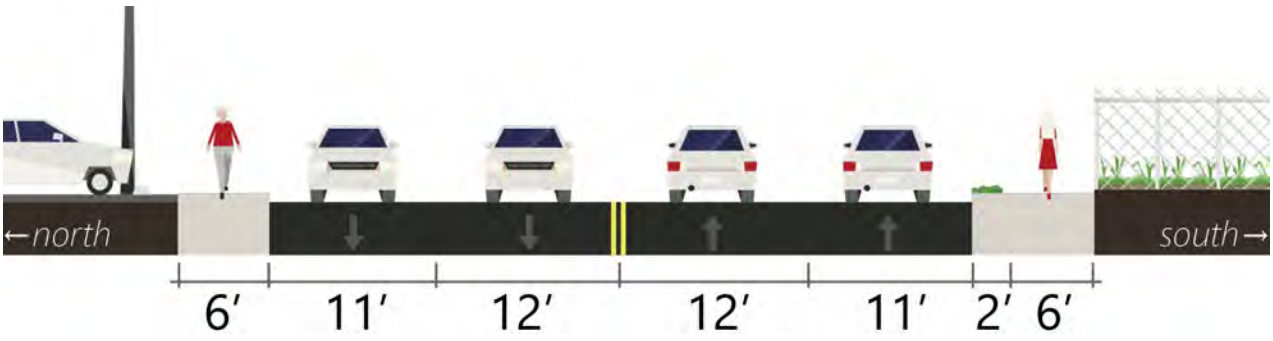

Figure 6. Segment 3 Existing Cross Section

The lane configuration varies at intersections and includes center left-turn lanes at the St. Johns Boulevard intersection and Fort Vancouver Way intersections. There is also a dedicated right-turn lane at the Fourth Vancouver Way intersection. Intersections are signalized through the segment, except for the unsignalized intersection at T Street, which is a three-legged intersection.

Sidewalks are present on both sides of the street through this segment and are approximately 6 feet wide. There is an enhanced midblock pedestrian crossing east of T Street across from the T Street Apartments consisting of a continental-style marked crosswalk and pedestrian hybrid beacon. A red signal beacon and signage are also present to alert drivers of pedestrians. See Photograph 3.

This crossing serves the C-TRAN bus stop (Stop ID: 725) and provides access to C-TRAN line 6. There are two additional transit stops throughout the segment located east of the St. Johns Boulevard intersection and west of the Fort Vancouver Way intersection.

Photograph 3. Enhanced Crossing on Fourth Plain west of T Street

There are no dedicated bicycle facilities through this segment. Figure 7 shows existing roadway elements including transit routes and stops, bike facilities, signals, crossings, and sidewalks.

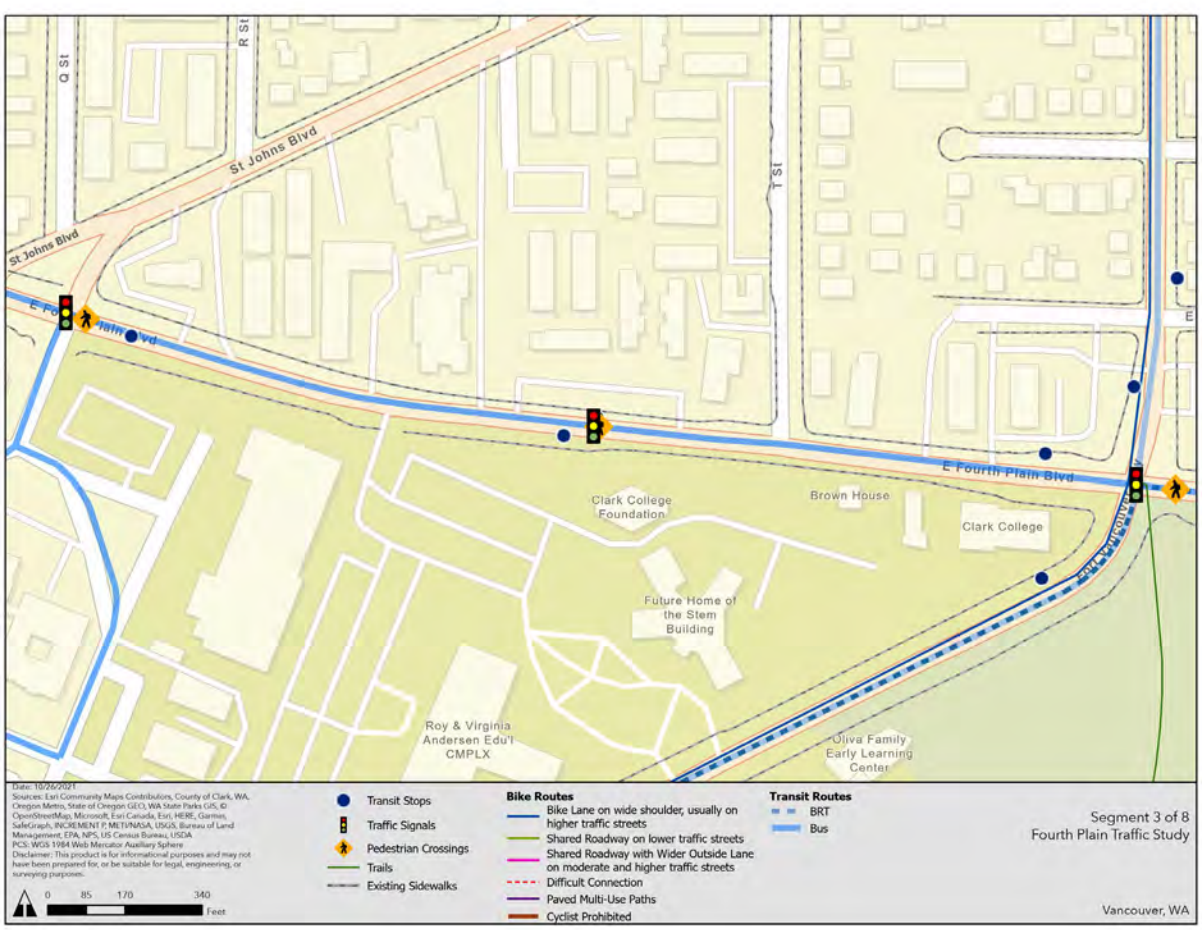

Figure 7. Segment 3 Roadway Elements

Land uses through this segment primarily consist of medical and multifamily residential. The Vancouver VA Hospital is located on the south side of Fourth Plain Boulevard; the hospital anchors the west end of the segment. Several multifamily apartment complexes exist along the north side of Fourth Plain Boulevard. Businesses along the segment are mostly limited to two small businesses: an auto repair shop and a hair salon. There are also two restaurants (large chains) at the intersection at Fort Vancouver Way. The east end of the segment is anchored by Vancouver Central Park, located east of Fort Vancouver Way.

3.2.4 Segment 4: Fort Vancouver Way to Brandt Road

The typical cross section through this segment consists of five lanes: two in each direction and a center turn lane. The travel lanes are 11 feet wide, including a 5-foot roadway shoulder on each side of the street throughout most of the segment. Figure 8 displays the typical cross section through this segment.

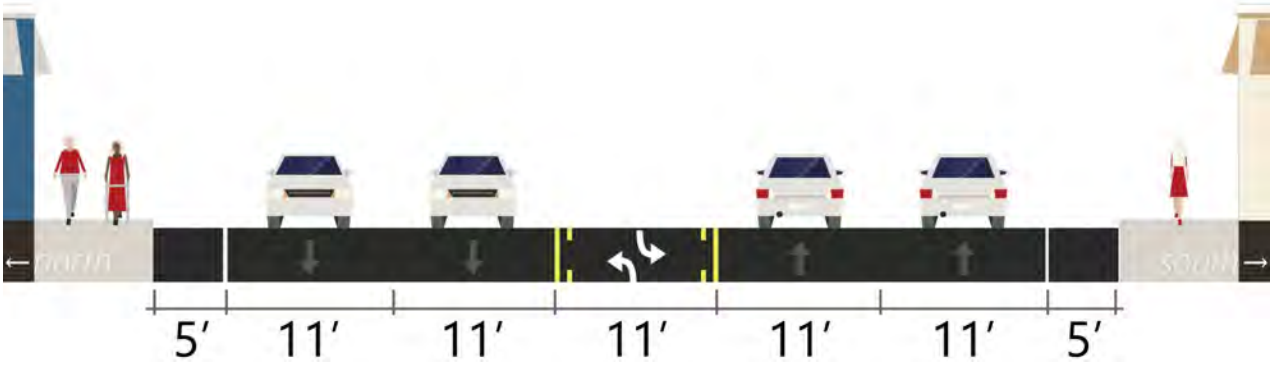

Figure 8. Segment 4 Existing Cross Section

The lane configuration starts narrower on the west end then widens slightly at Grand Boulevard. It stays consistent throughout this segment. The wider cross section is due to the marked 5-foot roadway shoulder on both sides of Fourth Plain Boulevard starting on Grand Boulevard to the end of this segment. Although it is not a marked bike lane, this shoulder space effectively functions as a bike lane in this segment. There are signalized intersections through the segment, except at E Reserve Street, Z Street, Watson Street, Laurel Place, Wilson Avenue, and Algona Drive, which all are unsignalized three-legged intersections.

Sidewalks are present on both sides of the street through this segment and are 8 feet wide. At the west, where the cross section is narrower, the sidewalk on the north side is 6 feet and 8 feet on the south side. There are four enhanced midblock pedestrian crossings on Fourth Plain Boulevard and Z Street, Fourth Plain and Fairmont Street, Fourth Plain and Neals Lane, and Fourth Plain and Todd Road/Rossiter Lane. These crossings all have continental-style marked crosswalks and a pedestrian hybrid beacon that flashes red to alert drivers. The enhanced crossings on Z Street and Fairmount Street have a pedestrian refuge island.

The enhanced crossing on Z Street serves the C-TRAN bus stops (Fourth Plain and Z Street eastbound and westbound) and provides access to C-TRAN line 6 (Photograph 4). The enhanced crossing on Todd Road serves The Vine, Vancouver's first bus rapid transit system with two bus stops (Fourth Plain and Z Street eastbound and westbound). There is one additional transit stop for line 6 at Fourth Plain and Ft. Vancouver Way. There are four other transit stops for The Vine at Fourth Plain and Ft. Vancouver Way and Grand Boulevard, both westbound and eastbound.

Photograph 4. Enhanced Crossing with Pedestrian Refuge Island on Fourth Plain and Z Street

There are no dedicated bicycle facilities through this segment; however, wide shoulders can effectively function as bike lanes where they are present. Figure 9 shows existing roadway elements including transit routes and stops, bike facilities, signals, crossings, and sidewalks.

Figure 9. Segment 4 Roadway Elements

Land uses through this segment primarily consist of commercial, single-family residential, multifamily residential, and parks. This segment is largely commercial and has many businesses on both sides of

Fourth Plain Boulevard. There are many local restaurants and bakeries like Pho Hong Phat, El Antojo, Thai Little Home, Dulce Tentacion, Veracruz Taqueria and Bakery, and Mi Casa Pupuseria y Mexican Restaurant. Also, many restaurant and coffee chains like Subway, Starbucks, and Domino's Pizza throughout the segment. This commercial segment has many auto repair shops, home improvement stores, and tax preparation services that serve Spanish speakers. There are several single-family homes and many multifamily apartment complexes on the south side of Fourth Plain Boulevard towards the east end of the segment. There are two parks; the first is Vancouver Central Park located on the southeast side of Fourth Plain and Fort Vancouver, which anchors the east end of the segment. The second is Evergreen Park located west of the enhanced crossing on Fourth Plain and Todd Rd/Rossiter Ln.

3.2.5 Segment 5: Brandt Road to NE Stapleton Road

The typical cross section through this segment consists of five lanes: two in each direction and a center turn lane. The travel lanes are 11 feet wide and the center turn lane is 12' feet wide. Figure 10 below displays the typical cross section through this segment.

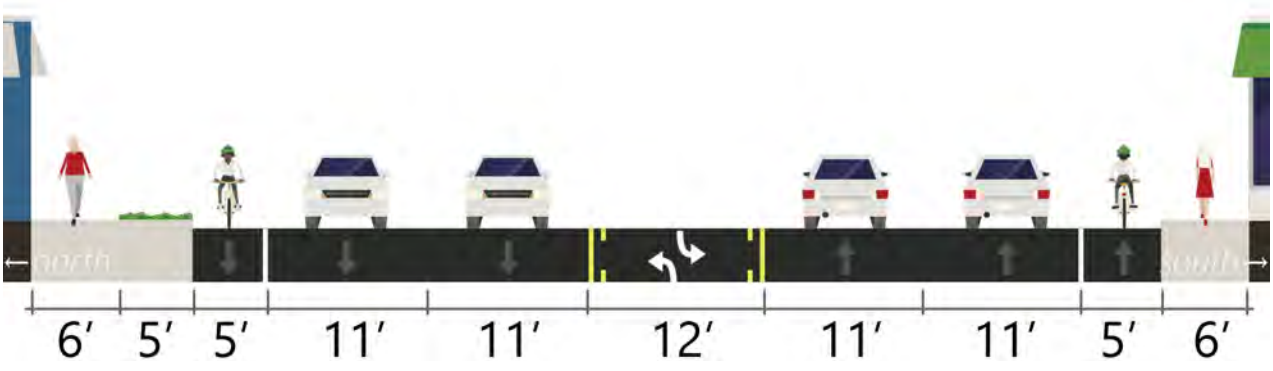

Figure 10. Segment 5 Existing Cross Section

The lane configuration is consistent throughout the segment and varies where there are pullouts for buses. There is also a dedicated right-turn lane at the General Anderson Avenue intersection. There are signalized intersections through the segment, except at Algona Drive, Dogwood Boulevard, and Carlson Road; all are unsignalized three-legged intersections.

Sidewalks are present on both sides of the street through this segment and are 6 feet wide along most of the segment. The sidewalk expands where there are bus stops.

The Vine passes through this segment with three bus stops at General Anderson Avenue, eastbound and westbound, and Stapleton Road westbound.

There are different types of bikeways in this segment. Marked sharrows[1] are present on the roadway from Algona Drive to Falk Road, and striped bus lanes from Wintler Drive to Stapleton Road.

[1] "Sharrows" are markings indicating that cars and bikes should share the lane.

Photograph 5. Dedicated Bike Lanes and The Vine Bus Shelters West of General Anderson Avenue

Figure 11 shows existing roadway elements including transit routes and stops, bike facilities, signals, crossings, and sidewalks.

Figure 11. Segment 5 Roadway Elements

Land uses through this segment consist of commercial, light industrial, and multifamily residential. The Vancouver Market Center is located on the north side of Fourth Plain Boulevard and anchors the east end of the segment. There are many national restaurants and fast-food chains along the segment. Also, there are small businesses that range from restaurants and auto repair shops to travel agencies. This segment also includes light industrial land use. The City of Vancouver Operations Center and Utilities Department and the Vancouver School District Transportation offices are located on the south side of Fourth Plain Boulevard. There are multifamily apartment complexes on the southwest end of the segment. The Fourth Plain Commons will be built in this section with potential redevelopment on the City owned properties around General Anderson Road.

3.2.6 Segment 6: NE Stapleton Road to NE 62nd Avenue

The typical cross section through this segment consists of five lanes: two in each direction and a center turn lane. Each travel lane is approximately 11 feet wide. Figure 12 displays the typical cross section through this segment.

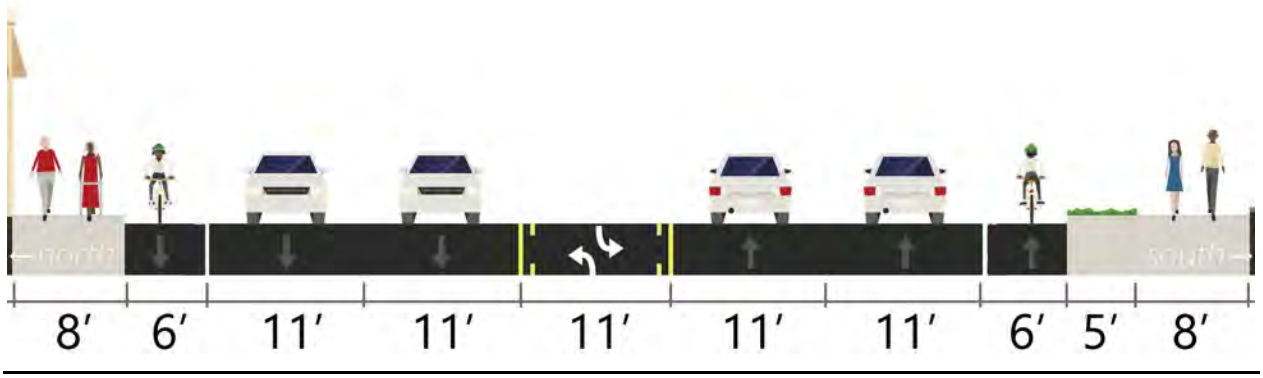

Figure 12. Segment 6 Existing Cross Section

The lane configuration varies at intersections and includes a dedicated right-turn lane at the 57th Avenue intersection. All intersections are signalized throughout the segment.

Sidewalks are present on both sides of the street through this segment and are 8 feet wide. The south sidewalk meanders, with the planting strip acting as a buffer, so the sidewalk does not abut the road. There is an enhanced crossing in front of Grocery Outlet, which consists of a continental-style marked crosswalk and a pedestrian

Photograph 6. Enhanced Crossing and The Vine Bus Shelters across from Grocery Outlet

refuge island (Photograph 6).

This crossing serves The Vine bus stops of 57th Avenue, eastbound and westbound. There is an additional transit stop on this segment located at Stapleton Road eastbound.

There are dedicated bike lanes on both sides that are approximately 6 feet wide. The eastbound bike lane is present throughout the segment and the westbound bike lane starts west of the 57th Avenue intersection and continues to the 62nd Avenue intersection (Figure 13).

Figure 13. Segment 6 Roadway Elements

Land uses through this segment primarily consist of commercial, office and industrial. The largest land use in this segment is the manufacturer Kyocera International, Inc., located on the south side of Fourth Plain Boulevard. Several businesses exist along the north side of Fourth Plain Boulevard. Grocery stores such as Grocery Outlet, Sorya Asian Market, and Mercado Latino are prevalent along the segment. There are small restaurants, tattoo shops, auto repair shops, and insurance agencies throughout the segment.

3.2.7 Segment 7: NE 62nd Avenue to NE 65th Avenue

The typical cross section through this east-west segment consists of four travel lanes: two in each direction. Each travel lane is approximately 12 feet wide. Figure 14 displays the typical cross section through this segment.

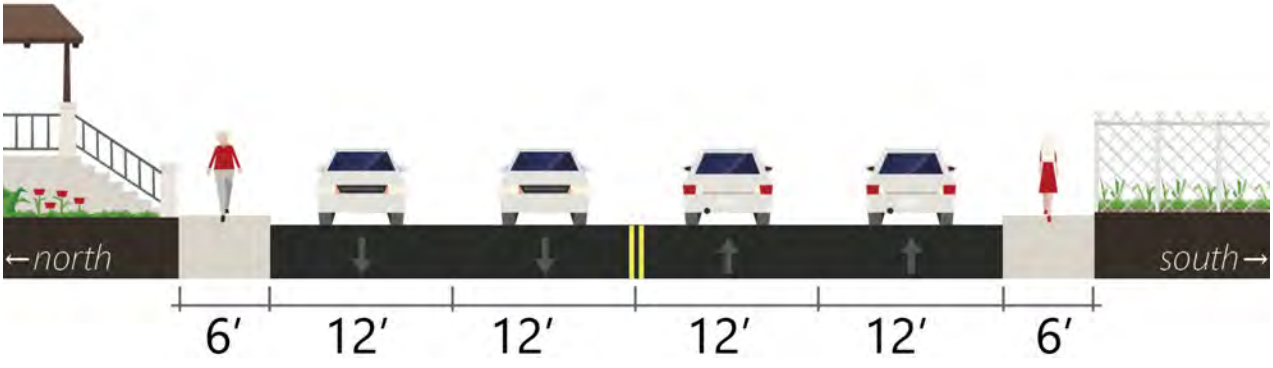

Figure 14. Segment 7 Existing Cross Section

The lane configuration varies at intersections and includes a center left-turn lane at the 65th Avenue intersection. There are two signalized intersections in this segment (Figure 15). Sidewalks are present on both sides of the street through this segment and are approximately 6 feet wide. There is one bus stop that serves The Vine on 65th Avenue westbound. There are no dedicated bicycle facilities through this segment.

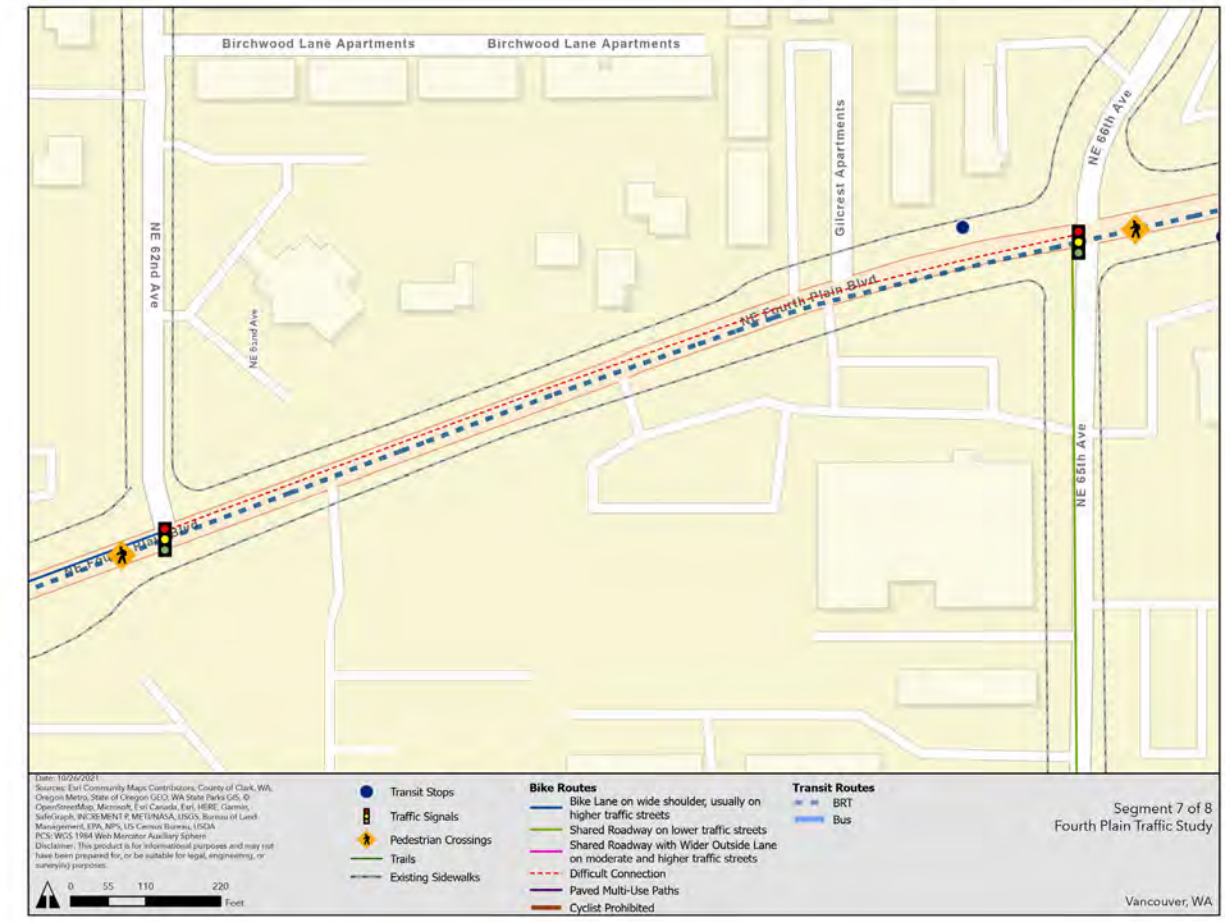

Figure 15. Segment 7 Roadway Elements

Land uses through this segment primarily consist of multifamily residential, light industrial, and commercial. There are multifamily apartment complexes and single-family homes along the north side of Fourth Plain Boulevard (Photograph 7). There is industrial land use on the south side of Fourth Plain Boulevard with many industrial buildings and a Goodwill Donation Express.

Photograph 7. Multifamily Apartment Complex and Goodwill Parking Lot west of 65th Avenue

Businesses along the segment are limited to a credit union and import sales and services. Both are at the east end of the segment on the north side.

3.2.8 Segment 8: NE 65th Avenue to NE Andresen Road

The typical cross section through this east-west segment widens back out and consists of five travel lanes: two in each direction and a center turn lane. Each travel lane is approximately 12 feet wide with a 14-foot-wide center lane. Figure 16 below displays the typical cross section through this segment.

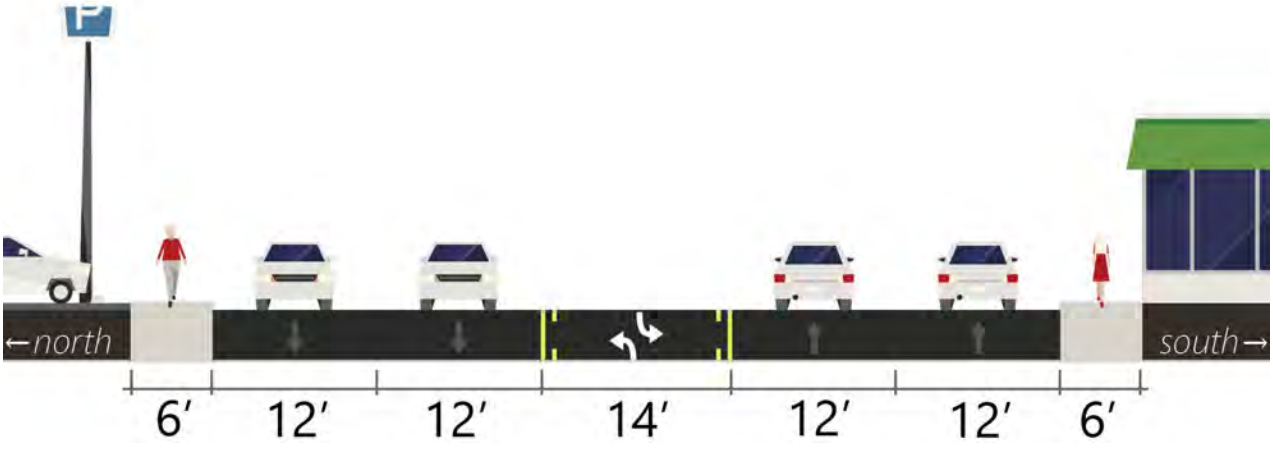

Figure 16. Segment 8 Existing Cross Section

The lane configuration varies at intersections, and at the Andresen Road intersection, it transitions to include two center left-turn lanes. There are two signalized intersections in this segment.

Sidewalks are present on both sides of the street through this segment and are 6 feet wide along most of the segment. The sidewalk expands where there are bus stops.

Two bus stops serve The Vine on this segment: 65th Avenue eastbound and Andresen Road westbound (Figure 17).

There are no dedicated bicycle facilities through this segment.

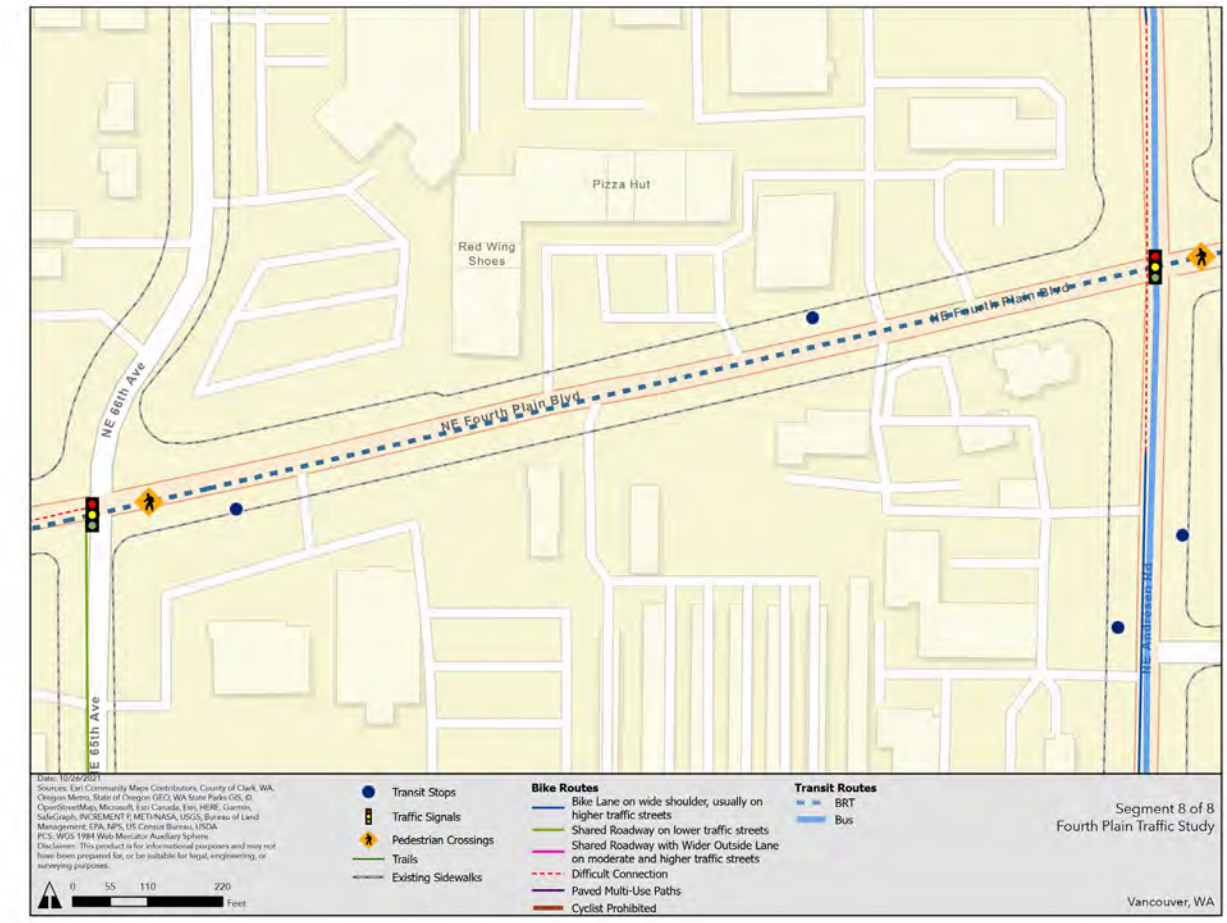

Figure 17. Segment 8 Roadway Elements

Land use through this segment is all commercial. Businesses on the north side of Fourth Plain Boulevard include a car dealership, a shopping plaza with small businesses and a restaurant chain, a hair salon, and a window tinting service. Businesses on the south side include an auto parts store, beauty school, tobacco shop, self-storage facility, glass shop, and Mexican restaurant.

Photograph 8. The Vine Bus Shelter and Car Dealership east of 65th Avenue

4. TRAFFIC ANALYSIS

This section summarizes the traffic data sources and traffic analysis. The 3.5-mile segment of Fourth Plain Boulevard includes 20 signalized intersections:

- F street
- I-5 southbound
- I-5 northbound
- St. Johns Boulevard
- Fort Vancouver Way
- Grand Boulevard
- Fairmount Avenue
- Norris Road
- Neals Lane
- Todd Road
- Brandt Road
- Falk Road
- Wintler Drive
- Caples Avenue
- General Anderson Avenue
- Stapleton Road
- 57th Avenue
- 62nd Avenue
- 65th Avenue
- Andresen Road

4.1 Methods Summary

Data Collection and Analysis

One of the important elements of any traffic study is understanding existing traffic volumes and operations. For this study, the understanding was achieved through extensive raw data collection and review of data collected and maintained by the Washington Department of Transportation. IDAX helped Parametrix acquire data for this study.

The turning movement volume for this analysis was primarily collected in July 2021. Supplemental data was collected in September 2021. In addition, the data for three intersections was collected by the Washington State Department of Transportation in June 2019.

Figure 18 shows the intersections that data was collected for:

- F street, I-5 southbound, I-5 northbound, Fairmount Avenue, Norris Road, Neals Lane, Todd Road, Brandt Road, Wintler Drive, Caples Avenue, 57th Avenue, 62nd Avenue, 65th Avenue – collected by IDAX in July 2021.
- St. Johns Boulevard, Fort Vancouver Way, General Anderson Avenue, Andresen Road – collected by IDAX in September 2021.

- Grand Boulevard, Falk Road, Stapleton Road – Collected by the Washington State Department of Transportation in June 2019.

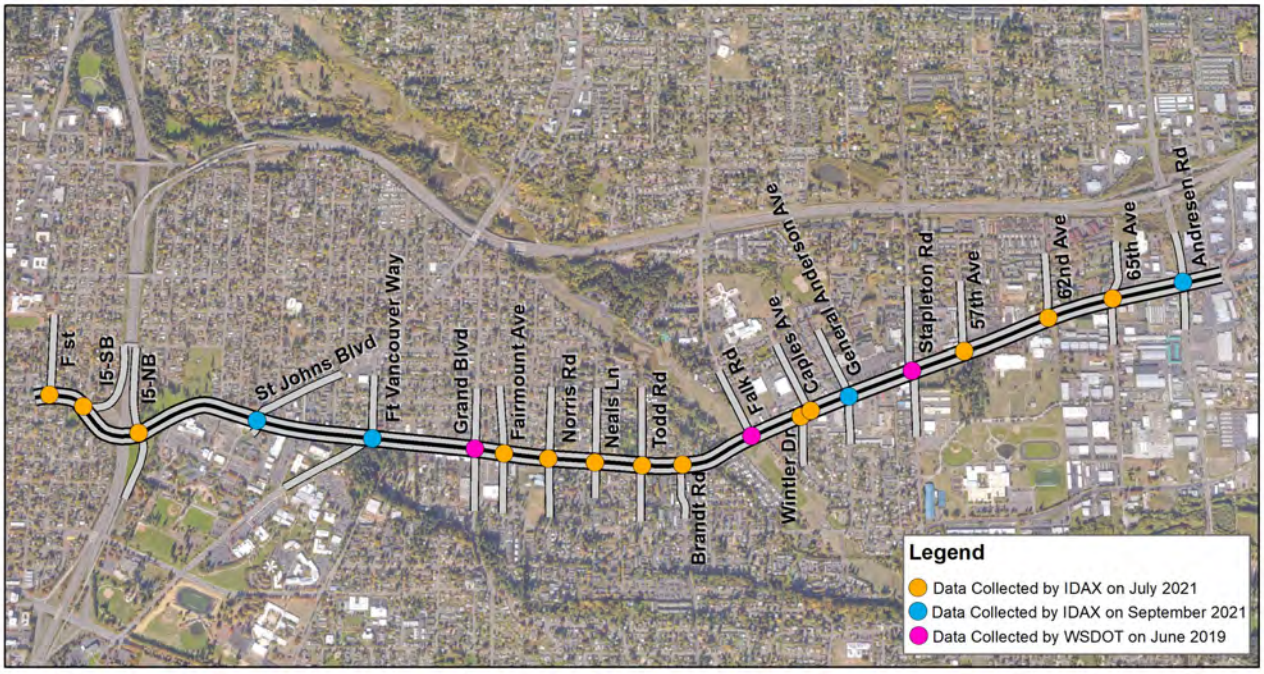

Figure 18. Data Collection Stations

The traffic analysis focused on existing conditions (2021) and projected the year 2040 conditions. Current traffic volumes within the study area are typically highest on weekdays between 7 and 9 a.m. and between 4 and 6 p.m. This trend is expected to continue. The average peak hour for this study is 7:30 to 8:30 a.m. and 4 to 5 p.m. The detailed calculations are provided in Table I in Appendix A.

The 2019 data was converted to 2021 by using the growth rate calculated from RTC modeling link volume data. This data includes 2015 AM/PM and 2040 AM/PM link volume for the Fourth Plain Boulevard eastbound and westbound directions. As Table 2 in Appendix A shows, the average total annual growth rate on this corridor is 0.77 percent and 0.50 percent during AM and PM, respectively. These rates have been used to adjust the 2019 traffic counts to 2021 conditions. Additionally, these growth rates are being used to forecast future year analysis volumes.

Traffic operations during the AM and PM peak hours were analyzed for the 2021 existing year. The operations analysis for the study intersections used the software program Synchro (version 11) for all the signalized intersections on this corridor. Synchro is a software application for optimizing traffic signal timing and performing intersection capacity analysis. The software optimizes traffic signal splits, offsets, and cycle lengths for individual intersections, an arterial, or a complete network. Synchro supports the Highway Capacity Manual's (HCM) 6th Edition (2010) for signalized intersections, unsignalized intersections, and roundabouts.

Build Condition Traffic Analysis Methods

Diversion

The project team used modeling tools to evaluate how traffic might change on Fourth Plain Blvd, as well as how traffic might change on nearby roads and highways, if a travel lane were removed along a portion or all of Fourth Plain Blvd. The team tested several higher and lower traffic assumptions to get a range of likely traffic outcomes for each lane reconfiguration alternative. To do this, the team used RTC's regional travel model to understand the effects of this traffic diversion for each of the alternatives. Traffic volume plots from RTC were analyzed to determine the difference in traffic volumes on each roadway link between the future no-build conditions and future lane reconfiguration build conditions. For example, with Alternative 1, one test was modeled under conservative assumptions using volumes calculated with the No Build (NB) RTC growth rate, which assumed that traffic volumes would not divert onto other roadways and the same volume of future traffic will use the corridor after the lane reconfiguration is implemented – a "worst case" scenario. Another model used the RTC growth rate but assumed a reduced traffic volume that reflects the change in volumes from people changing their driving behavior and assumes diversion onto SR 500, 18th Street, or Mill Plain Blvd.

For the most part, changes in traffic on other roads and highways near Fourth Plain were fairly minor. However, there would be less overall driving in the corridor under the lane reconfiguration scenarios. This is because people may change their behavior when a travel lane is removed. People may change the time of day they travel or the *way* they travel, such as using the bus or riding a bike instead of driving. People may change their destination - for example, they may go to a different grocery store, or they may choose not to make the trip at all (though this is the least likely).

These models show that some drivers may use SR-500, 18th Street, or Mill Plain Blvd instead of Fourth Plain Blvd if a travel lane was removed. Some traffic may divert to SR 500, which is a state highway with ample capacity, intended to carry high volumes of through traffic. Some diversion occurs onto Mill Plain Blvd, but this roadway has plenty of capacity to absorb an increase in traffic volume. If diversion were to occur on nearby streets, the City could implement changes to traffic signal timing or other traffic calming to address diversion. The City has already invested in some traffic calming measures on Mill Plain, which could be expanded.

Lane Reconfiguration Alternatives

The project team analyzed several lane reconfiguration ideas, two of which are shown below. **Alternative 1** below would remove a travel lane in each direction between F Street and Andresen in most of the corridor. **Alternative 4** removes a travel lane in both directions for most of the corridor, but keeps both travel lanes westbound between Andresen and Stapleton and eastbound between 65th and Andresen. This addresses potential traffic issues shown in modeling under Alternative 1. Both alternatives would maintain left turns throughout the Fourth Plain corridor.

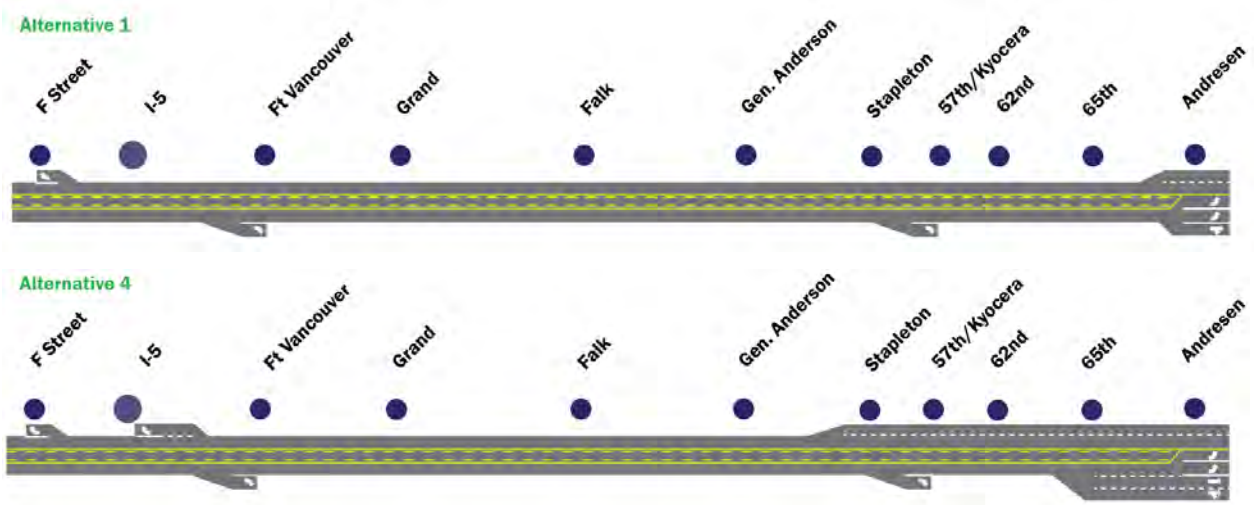

Figure 19. Lane Reconfiguration Alternatives

4.2 Existing Baseline Conditions (2021)

Figure 20 summarizes 2021 AM and PM peak hour traffic volumes along Fourth Plain Boulevard intersections. The intersection of Andresen Road and Fourth Plain Boulevard has the highest peak hour volumes. The detailed turning movement counts are included in Appendix B. The City's mobility standards are based on PM peak hour travel speed, rather than v/c or LOS. Travel speeds will be modeled for future conditions but were not modeled for existing and future no build conditions.

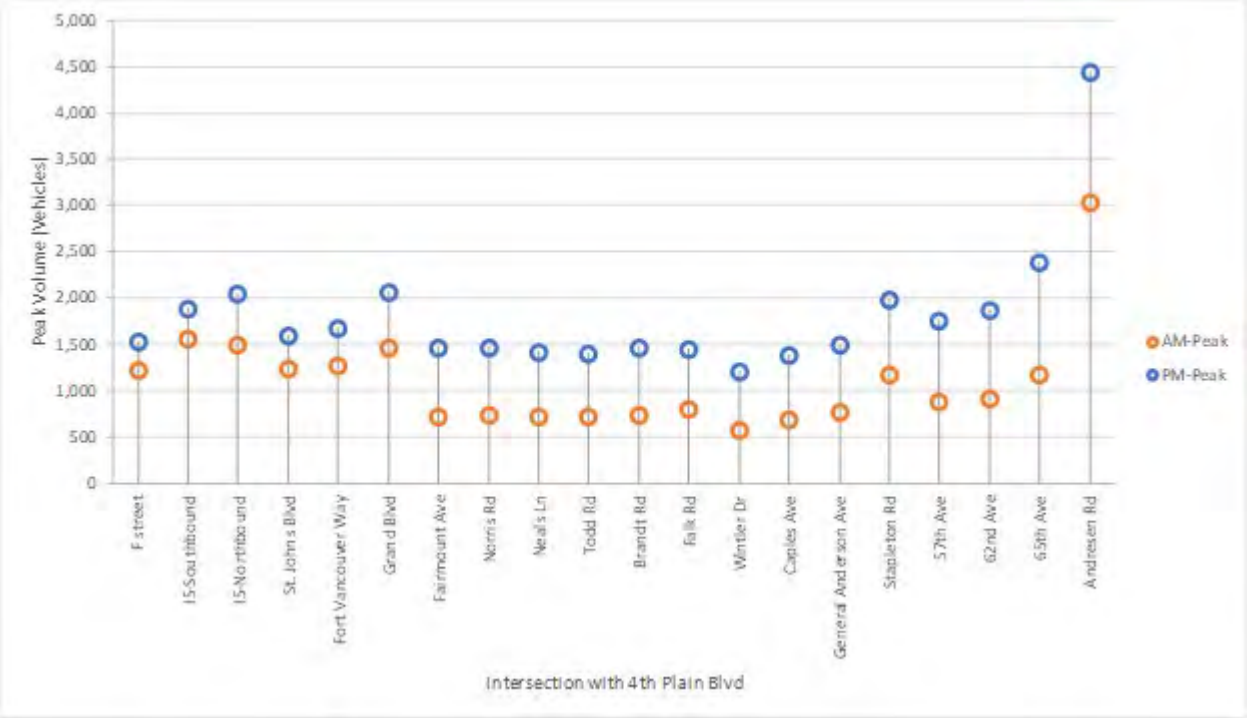

Figure 20. 2021 AM/PM Peak Hour Volumes

The intersection delay column in Table 2 shows the average total delay for the signalized intersection. Intersections are graded LOS A through F, calculated by taking a weighted average of all total delays. LOS considers how long people driving have to wait at intersections on a scale from "A" (free flow) to "F" (gridlock). LOS D or E is usually considered acceptable amounts of delay during peak travel times (morning and evening rush hour).

Table 2. Signalized Intersection Level of Service

Control Delay Per Vehicle(s)	Level of Service
≤ 10	A
10 to 20	B
20 to 35	C
35 to 55	D
55 to 80	E
> 80	F

Source: Highway Capacity Manual, Sixth Edition: A Guide for Multimodal Mobility Analysis

As shown in Table 3, the Fairmount Avenue intersection at Fourth Plain Blvd operates at LOS F during the PM peak hour, experiencing the worst LOS in the corridor. The Grand Boulevard intersection operates at LOS E during AM peak hour, with the highest delay in the corridor. The Neals Lane intersection operates at LOS E during the PM peak hour. The Todd Road intersection and Andresen Road intersection operate at LOS D, with Todd Road experiencing LOS D during the PM peak hour and Andresen Road during both the AM and PM peak hours. All other intersections within the study area operate at LOS A, B, or C, which is within the acceptable performance range. Synchro output reports are provided in Appendix B.

Table 3. 2021 Existing Condition AM/PM Level of Service and Delay

Intersection with Fourth Plain Blvd	AM Peak Hour		PM Peak Hour	
	LOS	Delay (sec/veh)*	LOS	Delay (sec/veh)*
F street	A	5	A	4
I-5 Southbound	B	13	B	11
I-5 Northbound	C	25	C	29
St. Johns Blvd	B	15	C	25
Fort Vancouver Way	C	23	C	27
Grand Blvd	**E**	**58**	C	33
Fairmount Ave	B	13	**F**	**56**
Norris Rd	A	6	A	8
Neals Ln	B	15	**E**	**38**
Todd Rd	B	15	**D**	**27**
Brandt Rd	A	5	A	5

Intersection with Fourth Plain Blvd	AM Peak Hour		PM Peak Hour	
	LOS	Delay (sec/veh)*	LOS	Delay (sec/veh)*
Falk Rd	B	10	A	7
Wintler Dr	A	3	A	3
Caples Ave	A	4	A	7
Gen. Anderson Ave	B	10	B	19
Stapleton Rd	C	33	C	29
57th Ave	A	4	A	6
62nd Ave	A	8	A	9
65th Ave	B	15	C	21
Andresen Rd	**D**	**38**	**D**	**44**

Note: Delay is rounded to the nearest second.

LOS = level of service; sec/veh = seconds per vehicle

4.3 Future Baseline Conditions (2040)

The no-build roadway network includes 20 study intersections, all of which currently exist. The forecast turning movement volumes for the year 2040 were prepared by calculating the growth rate using RTC modeling data for 2015 and 2040. Future volumes are estimated by applying these total annual growth rates (0.77 percent for AM traffic volumes and 0.50 percent for PM volumes), over 19 years. The summary of turning movement counts for the 2040 no-build condition is shown in Appendix B.

As Table 4 shows, the overall delay generally decreases in the future no-build condition. Grand Boulevard during the AM peak hour has the worst delay on the corridor.

Table 4. 2040 No-Build Condition AM/PM Level of Service and Delay

Intersection with Fourth Plain Blvd	AM Peak Hour		PM Peak Hour	
	LOS	Delay (sec/veh)*	LOS	Delay (sec/veh)*
F street	A	4	A	4
I-5 Southbound	B	13	B	11
I-5 Northbound	C	24	C	28
St. Johns Blvd	B	14	C	22
Fort Vancouver Way	C	23	C	25
Grand Blvd	**E**	**61**	C	32
Fairmount Ave	B	13	**D**	**34**
Norris Rd	A	6	A	7
Neals Ln	B	14	**D**	**31**
Todd Rd	B	14	C	24
Brandt Rd	A	5	A	5
Falk Rd	B	10	A	8

Intersection with Fourth Plain Blvd	AM Peak Hour		PM Peak Hour	
	LOS	Delay (sec/veh)*	LOS	Delay (sec/veh)*
Wintler Dr	A	3	A	2
Caples Ave	A	4	A	7
Gen. Anderson Ave	A	9	B	18
Stapleton Rd	C	33	C	29
57th Ave	A	4	A	6
62nd Ave	A	8	A	9
65th Ave	B	13	B	19
Andresen Rd	**D**	**38**	**D**	**44**

Note: Delay is rounded to the nearest second.
LOS = level of service; sec/veh = seconds per vehicle

4.4 Alternative Build Conditions (2040)

The future Alternative 1 build scenario roadway network includes the 20 existing study intersections. The forecast turning movement volumes for the year 2040 were prepared by calculating the growth rate using RTC modeling data for 2015 and 2040. Future volumes are estimated by applying these total annual growth rates (0.77 percent for AM traffic volumes and 0.50 percent for PM volumes), over 19 years. The summary of turning movement counts for the 2040 alternative build condition is shown in Appendix B.

Table 5 shows that when modeled with a growth rate that assumes no traffic diversion, the overall delay increases in the Alternative 1 build condition compared to future no build conditions. However, when modeled with a growth rate that assumes some diversion, traffic operations perform similarly or slightly better than future no build conditions. Results from the more conservative model show Grand Blvd during AM peak hour and I-5 northbound and Neal Lane during PM peak hour have the worst delays on the corridor.

Table 5. 2040 Alternative 1 Build Condition AM/PM Level of Service and Delay

Intersection with Fourth Plain Blvd	Alternative 1: Volumes calculated with NB RTC growth rate - conservative				Alternative 1: Volumes calculated with RTC growth rate - reduced volume			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
F street	A	5	A	5	A	4	A	3
I-5 Southbound	B	12	B	11	B	13	B	11
I-5 Northbound	C	32	**F**	**98**	C	26	C	33
St. Johns Blvd	B	18	C	29	B	14	B	20
Fort Vancouver Way	C	24	C	30	C	23	C	24
Grand Blvd	**E**	**63**	**D**	**37**	**D**	**44**	C	34

Intersection with Fourth Plain Blvd	Alternative 1: Volumes calculated with NB RTC growth rate - conservative				Alternative 1: Volumes calculated with RTC growth rate - reduced volume			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Fairmount Ave	B	14	F	67	B	12	**D**	**25**
Norris Rd	A	6	A	9	A	6	A	6
Neals Ln	C	17	**F**	**53**	B	14	C	24
Todd Rd	C	16	E	40	B	13	C	21
Brandt Rd	A	6	A	8	A	4	A	6
Falk Rd	B	11	B	11	B	11	A	8
Wintler Dr	A	2	A	4	A	1	A	3
Caples Ave	A	4	B	13	A	4	A	9
Gen. Anderson Ave	A	9	B	14	A	7	B	12
Stapleton Rd	**D**	**35**	**D**	**36**	C	33	C	30
57th Ave	A	6	A	9	A	4	A	5
62nd Ave	A	8	B	16	A	7	B	11
65th Ave	B	17	C	32	B	16	C	23
Andresen Rd	**D**	**38**	**D**	**47**	**D**	**37**	**D**	**41**

Note: Delay is rounded to the nearest second and is measured in seconds per vehicle
LOS = level of service

The future Alternative 4 build scenario roadway network includes the 20 existing study intersections. The forecast turning movement volumes for the year 2040 were prepared by calculating the growth rate using RTC modeling data for 2015 and 2040. Future volumes are estimated by applying these total annual growth rates (0.77 percent for AM traffic volumes and 0.50 percent for PM volumes), over 19 years. The summary of turning movement counts for the 2040 alternative build condition is shown in Appendix B.

Table 6 shows that the overall delay decreases in the Alternative 4 build condition compared to future no build conditions. Grand Boulevard during the AM peak hour has the worst delay on the corridor.

Table 6. 2040 Alternative 4 Build Condition AM/PM Level of Service and Delay

Intersection with Fourth Plain Blvd	AM Peak Hour		PM Peak Hour	
	LOS	Delay (sec/veh)*	LOS	Delay (sec/veh)*
F street	A	4	A	4
I-5 Southbound	B	12	B	11
I-5 Northbound	C	23	C	25
St. Johns Blvd	B	14	C	22
Fort Vancouver Way	C	22	C	27

Intersection with Fourth Plain Blvd	AM Peak Hour		PM Peak Hour	
	LOS	Delay (sec/veh)*	LOS	Delay (sec/veh)*
Grand Blvd	**D**	**47**	C	33
Fairmount Ave	B	13	**D**	**34**
Norris Rd	A	4	A	6
Neals Ln	C	15	**D**	**30**
Todd Rd	B	13	**D**	**27**
Brandt Rd	A	4	A	5
Falk Rd	A	10	A	9
Wintler Dr	A	2	A	3
Caples Ave	A	5	B	10
Gen. Anderson Ave	A	8	B	12
Stapleton Rd	C	30	C	30
57th Ave	A	4	A	5
62nd Ave	A	7	A	6
65th Ave	B	14	C	23
Andresen Rd	**D**	**37**	**D**	**39**

Note: Delay is rounded to the nearest second.

LOS = level of service; sec/veh = seconds per vehicle

4.5 City Mobility Standards / PM Peak Travel Speed

The City's mobility standards are based on the average PM peak hour travel speed for a given facility, rather than v/c or LOS. According to the City's 2017 Concurrency Corridors Classification, the average PM peak hour travel speeds along Fourth Plain Boulevard are:

- **12 mph** from Mill Plain Blvd to I-5
- **10 mph** from I-5 to NE Andresen Road

Travel speeds were modeled for existing and future no-build conditions as well as the alternative build conditions using SimTraffic to assess PM peak hour travel speeds along the corridor and at each of the 20 study intersections. The traffic model found that under all conditions, peak hour travel speeds meet the City's adopted travel speed concurrency standards.

The table below shows how each alternative would perform in the year 2040 based on modeling. Existing conditions and "No Build" traffic condition for 2040 is provided as a point of comparison (the No Build assumes that the corridor stays the same as it is today). Additionally, the City has standards for how quickly people driving should be able to travel through the corridor. Generally, an average speed (both eastbound and westbound) of about 12 mph is the minimum standard.

Overall, a lane reconfiguration that removes a travel lane in each direction is likely to work well from a traffic standpoint.

Table 1. Corridor Traffic Performance

	Existing Conditions	2040 "No Build"	2040 Alternative 1	2040 Alternative 4
Description	The corridor today without any changes	Future traffic performance assuming the corridor stays the same as today	Remove one travel lane each direction from F Street to Andresen	Remove one travel lane EASTBOUND between F Street and 65th and WESTBOUND between Stapleton and F Street
Intersection Delay	Performs acceptably for the most part (most intersections between LOS "A" and "D")	Performs acceptably and fairly similar to Existing Conditions	Lots of delay at the I-5 northbound on-ramp, as well as a couple of unsignalized side streets	Very similar to "No Build"
Corridor average speed during AM peak hour (7:30 – 8:30)	Eastbound: 24 MPH Westbound: 24 MPH	Eastbound: 23 MPH Westbound: 23 MPH	Eastbound: 23 MPH Westbound: 22 MPH	Eastbound: 24 MPH Westbound: 23 MPH
Corridor average speed during PM peak hour (4:00 – 5:00)	Eastbound: 23 MPH Westbound: 22 MPH	Eastbound: 22 MPH Westbound: 21 MPH	Eastbound: 17 MPH Westbound: 16 MPH	Eastbound: 22 MPH Westbound: 21 MPH
Average time to drive through the corridor in the PM peak hour	Eastbound: ~10 minutes Westbound: ~9.5 minutes	Eastbound: ~9.5 minutes Westbound: ~10 minutes	Eastbound: ~12 minutes Westbound: ~13 minutes	Eastbound: ~9.5 minutes Westbound: ~10 minutes

Table 7 below summarizes the SimTraffic results for existing and future no-build scenarios as well as the alternative build conditions for PM peak hours at each of the 20 study intersections. As shown below, under the reduced volume assumption, Alternative 1 and Alternative 4 perform within the City's mobility standards.

Table 7. PM Peak Travel Speeds - SimTraffic Results

Intersection	Existing	Future No Build	Alt 1 NB Vol.	Alt 1 Red. Vol.	Alt 4
F St & 4th Plain Blvd	23	21	19	26	23
I-5 SB On-Off & 4th Plain Blvd	23	23	14	18	17
I-5 NB Off/I-5 NB on & 4th Plain Blvd	24	23	21	23	23
St Johns Blvd & 4th Plain Blvd	22	23	19	22	22
Ft Vancouver Way & 4th Plain Blvd	23	23	19	21	19
Grand Blvd & 4th Plain Blvd	20	18	17	21	20
Fairmount Ave & 4th Plain Blvd	25	24	22	24	24
Norris Rd & 4th Plain Blvd	22	20	21	23	24
Neals Ln & 4th Plain Blvd	26	26	25	26	26
Todd Rd/Rossiter Ln & 4th Plain Blvd	29	28	27	28	27
Brandt Rd & 4th Plain Blvd	23	23	20	24	23
4th Plain Blvd & Falk Rd	27	26	25	26	25
Wintler Dr & 4th Plain Blvd	26	24	18	27	26
Caples Ave & 4th Plain Blvd	23	22	15	23	21
General Anderson Rd & 4th Plain Blvd	14	14	**8**	14	14
NE Stapleton Rd & 4th Plain Blvd	18	16	**4**	17	16
NE Kyocera Rd/NE 57th Ave & 4th Plain Blvd	27	28	**5**	26	25
NE 62nd Ave & 4th Plain Blvd	30	29	**4**	29	30
NE 65th Ave/NE 66th Ave & 4th Plain Blvd	14	12	**4**	12	12
NE Andresen Rd & 4th Plain Blvd	18	16	**6**	11	14
Total Network Performance	23	22	**11**	22	22

Note: SimTraffic and Synchro results provided in Appendix B.

5. SAFETY ANALYSIS

5.1 Existing Safety Studies

Two safety studies relevant to the Fourth Plain Boulevard area have been completed in recent years. First, the *Fourth Plain Pedestrian Safety and Access Implementation Strategy* was completed in September 2017. This study investigated opportunities to improve access for people walking to and across the Fourth Plain Boulevard corridor. Second, the *Transportation System Safety Analysis* (TSSA) completed in November 2018 prepared a holistic look at crash patterns for the City of Vancouver.

The *Fourth Plain Pedestrian Safety and Access Implementation Strategy* encompassed an area similar to the current study except that it did not evaluate Fourth Plain Boulevard west of the I-5 crossing. The

study provided a series of recommendations to improve access for people walking and activity on the corridor. First, the study recommends three paths to better connect adjacent land uses to Fourth Plain Boulevard, especially adjacent to The Vine bus rapid transit:

- A midblock path connecting to Fourth Plain Boulevard between 57th Avenue and 62nd Avenue
- A path to formalize movements between Fourth Plain Boulevard and Fort Vancouver High School
- A path parallel to Fourth Plain Boulevard connecting to Clark College E 20th Street

Second, the study recommends improvements to existing pedestrian hybrid crossings on the Fourth Plain corridor:

- Standardize signage at pedestrian hybrid crossings
- Mark double white lines upstream of each crossing to discourage lane changes
- Add refuge islands at the Neals Lane and Rossiter Lane/Todd Road crossings

Third, the study recommends three new pedestrian hybrid crossings on the Fourth Plain corridor:

- Between Fort Vancouver Way and Z Street (with a pedestrian refuge island)
- Near Watson Avenue (with a pedestrian refuge island)
- At Laurel Place (no pedestrian refuge island)

Finally, the study makes general recommendations to narrow or consolidate driveways, convert intersection pedestrian ramps to directional ramps, remove fixed objects out of sidewalks, and improve lighting along the corridor.

The TSSA offered a networkwide analysis of safety conditions in the City of Vancouver using crash data from 2010 to 2016. The study reports that 4 percent of crashes involved people walking, 3 percent of crashes involved people biking, and that 9 percent of fatal or serious injury crashes report a driver that "did not grant right of way to the pedestrian." The percentage of crashes involving people walking and biking were higher than the statewide average.

The TSSA identifies the intersections with the highest safety performance index ranking in the City of Vancouver, three of which occur in the study area: Andresen Road, Stapleton Road, and Burton Road. The Stapleton Road intersection was used as a case study to identify improvements. The potential countermeasures identified include some pedestrian and bicycle treatments such as installing pedestrian count-down signal heads, implementing leading pedestrian intervals (where the pedestrian walk signal is active several seconds before a green light, allowing people walking greater visibility and more time to cross), and prohibiting northbound and southbound right-turn-on-red movements.

In addition to intersection analysis, the TSSA identifies four corridors for future improvements. One of these corridors is Fourth Plain Boulevard from Fort Vancouver Way to Falk Road. Countermeasures for biking and walking related crashes identified include reducing to a three-lane cross section with bike lanes and including leading pedestrian intervals at all signals.

Finally, the TSSA has general recommendations citywide to improve safety for people walking and biking. The recommendations include installing leading interval pedestrian phasing and evaluating opportunities to reduce cross sections.

5.2 Updated Corridor Safety Conditions

Crash data was accessed through the City of Vancouver Safety Dashboard. The most recent 3 years of crash data was analyzed (2018 to 2020).

A total of 309 crashes occurred on the corridor during the 3-year period. There was one fatal crash; It involved a person walking and is discussed in more detail below. Most crashes (76 percent) occurred at intersection or driveways. The most common crash types are rear-end crashes and crashes with vehicles colliding at angles. Rear-end crashes are often associated with congestion or inattentive people driving. Angle crashes commonly involve people driving and making right or left turns and can reflect poor access management, poor sight distance, or people driving and making risky decisions when there are few gaps in the traffic stream to complete a turn. The biggest crash cluster is at the NE Andresen Road intersection. Nearly 50 crashes occurred at this intersection with 20 of the crashes begin rear-end crashes.

Analysis focused on crashes involving people walking and biking. A total of 32 crashes involving people walking or biking occurred during the 3-year period. There were 12 crashes that involved people biking and 20 crashes that involved people walking. Crashes are dispersed throughout the corridor with little clustering other than at the N Grand Boulevard intersection and the NE Andresen Road intersection, which each experienced 5 crashes and 4 crashes, respectively.

Table 8. Crashes Involving People Walking and Biking Totals by Segment

					Injury Type				
	Segment	Total Crashes	Length (miles)	Crashes per Mile	Fatal	Non-fatal Injury	Property Damage Only	People Biking Involved	People Walking Involved
1	D Street to I-5	3	0.33	9.1	0	3	0	1	2
2	I-5 to St. Johns	0	0.40	0.0	0	0	0	0	0
3	St. Johns to Fort Vancouver Way	4	0.33	12.1	0	3	1	2	2
4	Fort Vancouver Way to Brandt Road	11	0.87	12.6	1	8	2	3	8
5	Brandt Road to NE Stapleton Road	4	0.70	5.7	0	3	1	2	2
6	NE Stapleton Rd to NE 62nd Ave	3	0.40	7.5	0	2	1	1	2
7	NE 62nd Ave to NE 65th Ave	2	0.20	10.0	0	1	1	2	0
8	NE 65th Ave to NE Andresen Rd	5	0.20	25.0	0	5	0	1	4
	Total	**32**			**1**	**25**	**6**	**12**	**20**

Of all the crashes that involved people walking and biking, there was one fatal crash. This was a DUI crash; the person driving hit someone walking in a marked crosswalk at the Fort Vancouver Way

intersection. The crash occurred during dark conditions. Non-fatal injury crashes accounted for 25 of the crashes involving people walking and biking, while 6 crashes were property-damage-only.

A majority of crashes (27) occurred at an intersection or driveway. Additionally, most crashes (26) occurred during fair weather. The light condition during crashes involving people walking or people biking was more evenly split with 18 crashes occurring during daylight and 14 crashes occurring during the dark, dawn, or dusk.

For crashes involving people walking, the majority of people driving were traveling straight (14) compared to 6 crashes where the person driving was making a right turn. For crashes involving people biking, people driving were more likely to be conducting a turn. For example, the person driving was traveling straight in 5 crashes involving people biking compared to 7 crashes involving people biking where the person driving was making a right or left turn.

Crash data contained attributes describing contributing circumstances for people driving and people walking-. The contributing circumstance attributes include descriptions such as “did not grant right of way to nonmotorist," “failure to use crosswalk,” “inattention,” or “under the influence of alcohol.” These attributes can be used to understand behavioral characteristics among people driving and people walking and lead to discussion about how education and enforcement strategies can complement the engineering efforts to reduce crash frequencies and severities for vulnerable users. In 11 of the crashes involving people walking, only the person walking was assigned a contributing circumstance. In 5 of the crashes, the person driving was assigned a contributing circumstance. Both the person walking and person driving were assigned a contributing circumstance in 3 crashes and for 1 crash, neither was assigned a contributing circumstance. A more detailed look at the contributing circumstances for people driving and people walking is provided in Table 9 and Table 10.

Table 9. Contributing Circumstance of Person Walking in Crashes Involving Someone Walking

Contributing Circumstance of Person Walking	Crashes
None	6
Did Not Grant Right of Way to Vehicle	3
Failure to Use Crosswalk	3
Inattention	3
Under Influence of Alcohol	3
Apparently Emotional (Depressed, Angry, Disturbed, etc.)	1
Unknown Distraction	1
Total	**20**

Table 10. Contributing Circumstance of Person Driving in Crashes Involving Someone Walking

Contributing Circumstance of Person Driving	Crashes
None	12
Other	4

Contributing Circumstance of Person Driving	Crashes
Did not Grant Right of Way to Non Motorist	2
Unknown Distraction	1
Under the Influence of Alcohol	1
Total	**20**

A brief assessment of crashes involving people biking and walking is provided for each corridor segment. It should be noted that segments do not have uniform length, so higher crash frequencies for one segment do not always reflect greater risk than another segment.

5.2.1 Segment 1: D Street to I-5 Crossing

Segment 1 had three crashes involving people biking and walking. For the crash involving someone walking near D Street, a person driving and turning right did not yield the right of way to the person walking. The second crash involved someone walking being hit while in a crosswalk at F Street during dark conditions. Though the intersection is signalized, the person walking was crossing against the signal. The one crash involving someone biking occurred when someone driving stuck someone riding a bike east of F Street under rainy conditions. See Figure 21 for a map of crash locations.

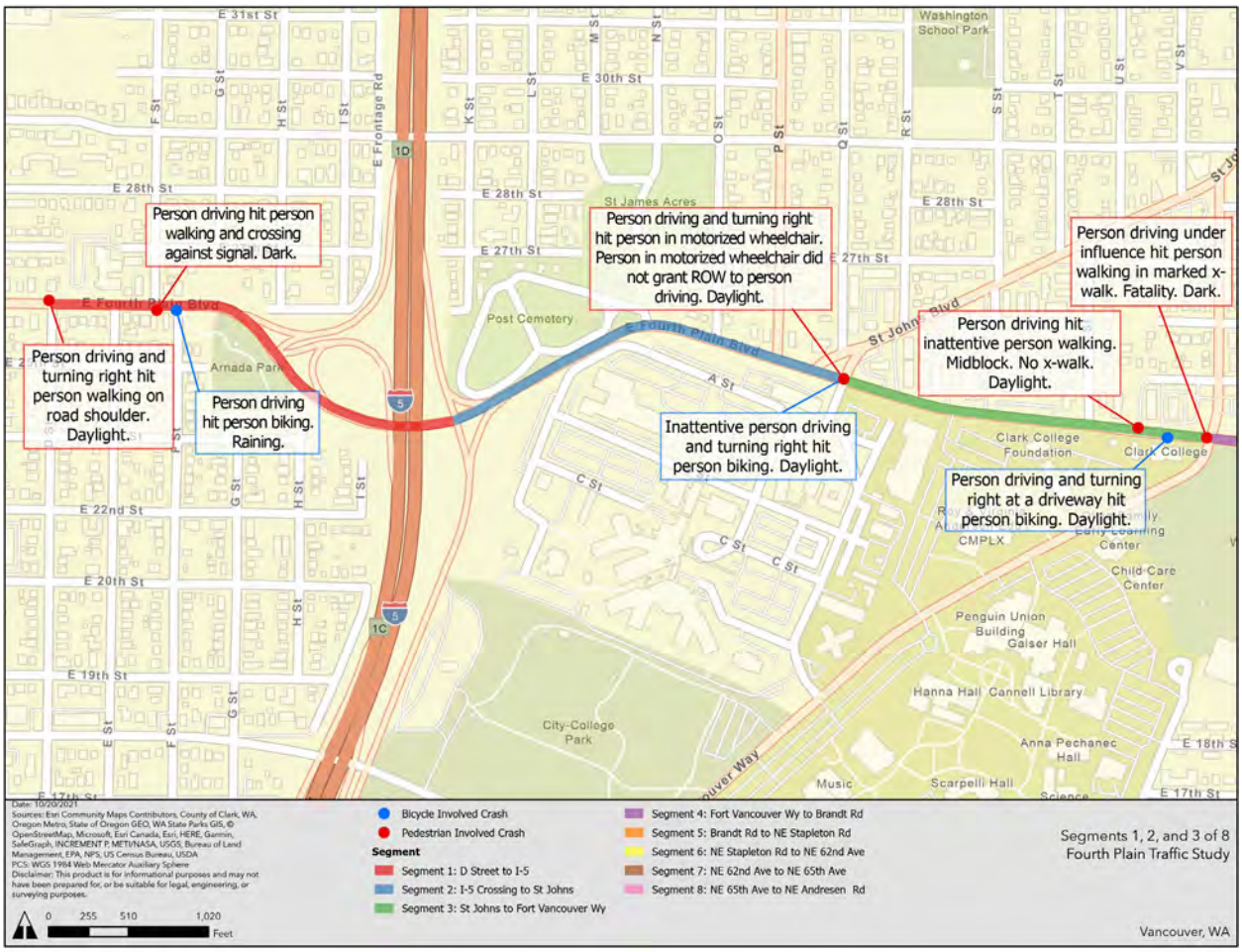

Figure 21. Segments 1 through 3 Crashes Involving People Walking and Biking

5.2.2 Segment 2: I-5 Crossing to St. Johns Boulevard

Segment 2 had no crashes involving people walking or biking in the 3-year period.

5.2.3 Segment 3: St. Johns Boulevard to Fort Vancouver Way

In Segment 3, there were four crashes that involved people walking and biking (two of each). Two of the crashes occurred at the St. Johns Boulevard intersection, and both involved people driving and making right turns. In one crash, an inattentive person driving struck someone riding a bike. In the other crash, an individual in a wheelchair was noted as not yielding right of way to a person driving. It is unknown whether either of these crashes were related to the unconventional southbound right-turn bypass lane at the intersection.

The other two Segment 3 crashes occurred on the eastern end of the segment. In the first crash, a person driving hit an inattentive person walking crossing midblock between T Street and Fort Vancouver Way. The crash occurred in daylight, and there is no crosswalk in the area. In the second crash, a person driving struck someone riding a bike while turning right at a driveway west of Fort Vancouver Way. This crash also occurred during daylight.

It should be noted that there are many key destinations that generate significant walking activity and crossings along the Fourth Plain corridor, especially between I-5 and Brandt Road (Segments 2-4). The Vancouver VA Hospital, Clark College, and Vancouver Central Park are on the south side of Fourth Plain Boulevard between I-5 and Z Street. Previous studies including the Fourth Plain Forward Action Plan and TSSA have found safety concerns for individuals crossing Fourth Plain Boulevard near the hospital. A pedestrian hybrid beacon was recently installed between St. Johns Boulevard and Fort Vancouver Way. The *Fourth Plain Pedestrian Safety and Access Implementation Strategy* recommends an additional hybrid beacon between Fort Vancouver Way and Z Street.

5.2.4 Segment 4: Fort Vancouver Way to Brandt Road

Segment 4 had the most crashes involving someone walking or biking. It also had the only fatality on the corridor. As mentioned previously, this was a DUI crash at Fort Vancouver Way where a person driving struck someone walking in the crosswalk in the dark. The high frequency of crashes is related to this segment being longer than most other segments. However, after normalizing for length, this segment still has the second-highest rate of crashes per mile. The high concentration of crashes involving someone biking or walking may be related to the concentration of small retail and food establishments. Segments west of this area have more residential development adjacent to the corridor.

Five of the crashes in this segment are clustered at the N Grand Boulevard intersection, and most of the data note non-compliance from people walking. In two crashes, people walking were crossing the intersection against the signal. One person was impaired, and both crashes occurred in the dark. In two other crashes, people walking were at or near the intersection but outside the crosswalk. One crash occurred in the dark. The final crash at the intersection involved a person riding a motorcycle and turning right and failing to yield right of way to someone walking in the crosswalk.

Within Segment 4, there were also three hit-and-run collisions with someone riding a bike. All were at intersections or driveways. One crash occurred at dusk, and the other two occurred during daylight.

Finally, just east of N Grand Boulevard, a person driving and turning right at a driveway struck someone walking and near Evergreen Park, a person driving struck an individual in a wheelchair crossing midblock outside a crosswalk. The wheelchair collision occurred at dusk. See Figure 22 for a map of crash locations.

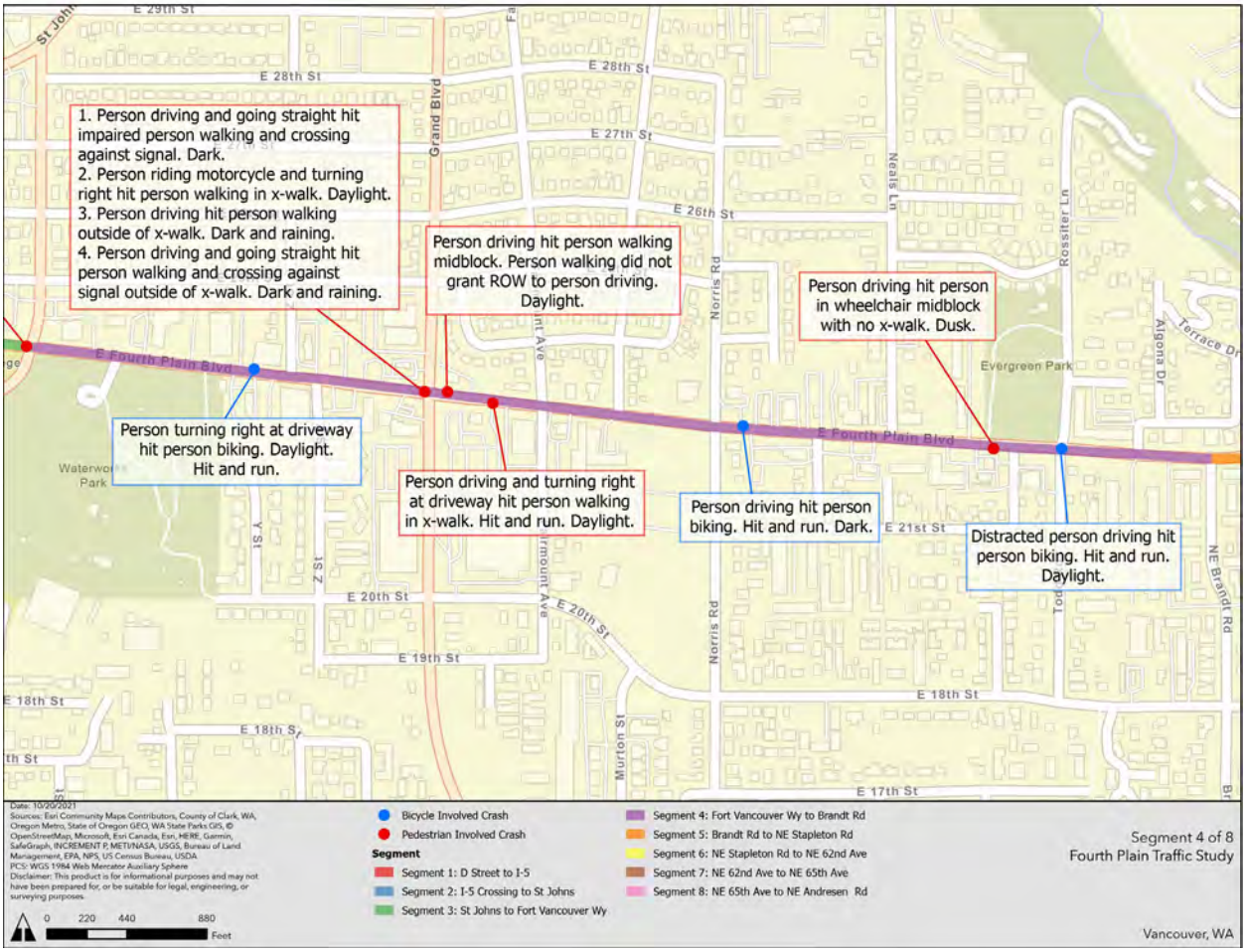

Figure 22. Segment 4 Crashes Involving People Walking and Biking

5.2.5 Segment 5: Brandt Road to NE Stapleton Road

The four crashes in Segment 5 are include crashes with two people riding a bike and two people walking. The first occurred at Algona Drive where an emotionally disturbed pedestrian was crossing the intersection diagonally. There is no marked crosswalk or traffic control device at this location. The second crash involving someone walking was a person driving striking someone walking crossing against the signal at General Anderson Avenue.

The first crash involving someone biking was a distracted individual driving and hitting someone riding a bike in daylight at the Falk Road intersection. The second was a left-turning person driving and striking someone riding a bike at the Caples Avenue signal. See Figure 23 for a map of crash locations.

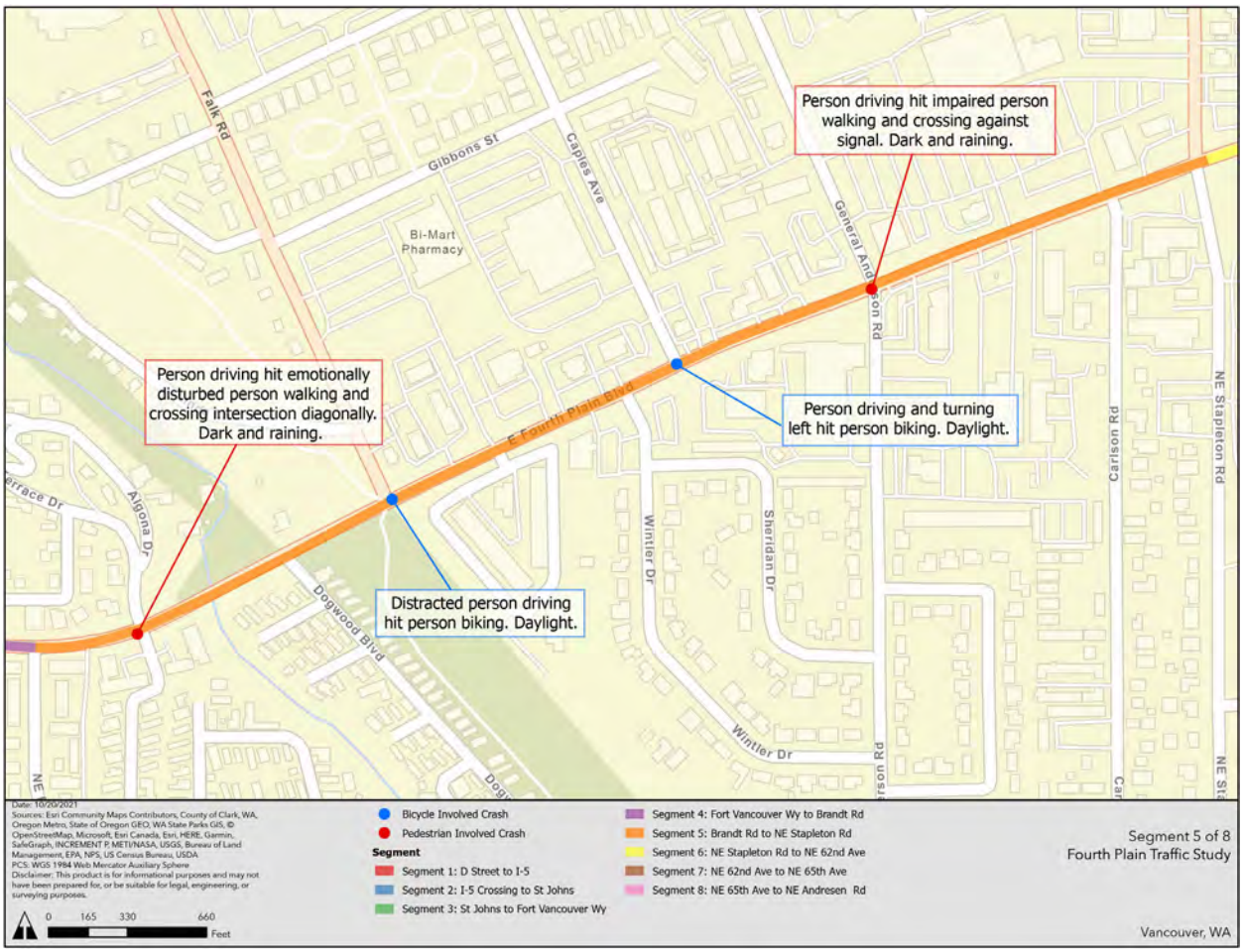

Figure 23. Segment 5 Crashes Involving People Walking and Biking Crashes

5.2.6 Segment 6: NE Stapleton Road to NE 62nd Avenue

Two crashes involving people walking are listed for Segment 6. Both occurred at driveways or intersections. First, a person driving and turning right at the NE 57th Avenue intersection hit someone walking in the crosswalk. Second, east of NE 57th Avenue, a person driving hit someone walking at a driveway. The one -crash involving someone biking was located just east of NE 57th Avenue; an individual driving and making a right turn at a driveway hit someone riding a bike. See Figure 24 for a map of crash locations.

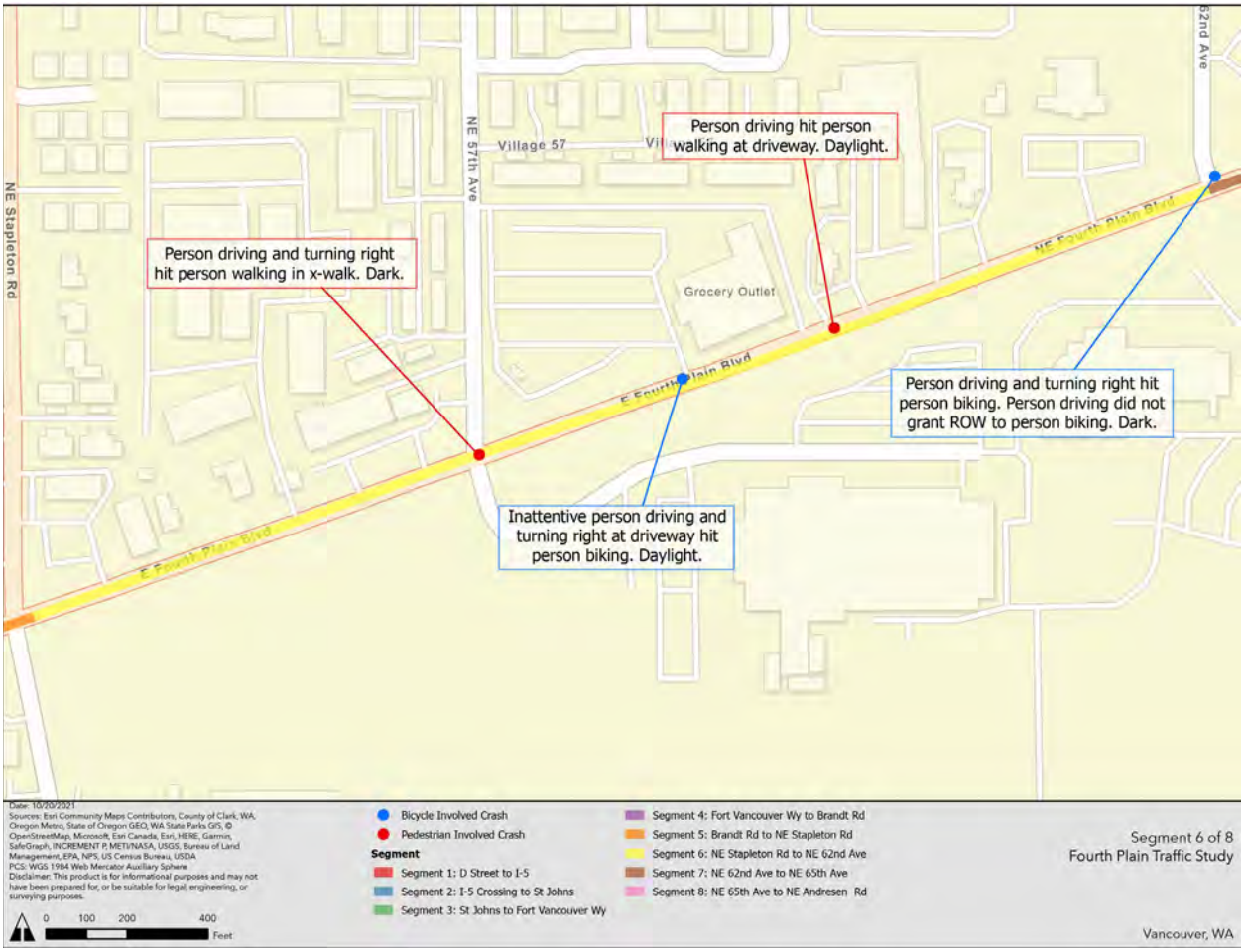

Figure 24. Segment 6 Crashes Involving People Walking and Biking Segment 7: NE 62nd Avenue to NE 65th Avenue

Segment 7 crashes include two people riding bikes; in each, a person driving and making a right turn at a driveway struck someone biking . One crash, at NE 62nd Avenue, occurred in the dark. The other, east of NE 62nd Avenue, occurred in the daytime.

5.2.7 Segment 8: NE 65th Avenue to NE Andresen Road

Segment 8 has the second highest frequency of crashes involving people biking and walking but the highest crash rate when normalizing for length. Much of this is due to the cluster of four crashes at the NE Andresen Road intersection. Three crashes involved people walking and one involved someone biking. Among the crashes involving people walking one person was impaired and crossing against the signal in the dark. The other two people were struck by people driving and failing to yield right of way. One occurred in the dark. The bicycle-involved crash at the intersection occurred in daylight. Lastly, at the NE 65th Avenue intersection, an individual in a motorized wheelchair was struck by a someone driving and going straight. See Figure 25 for a map of crash locations.

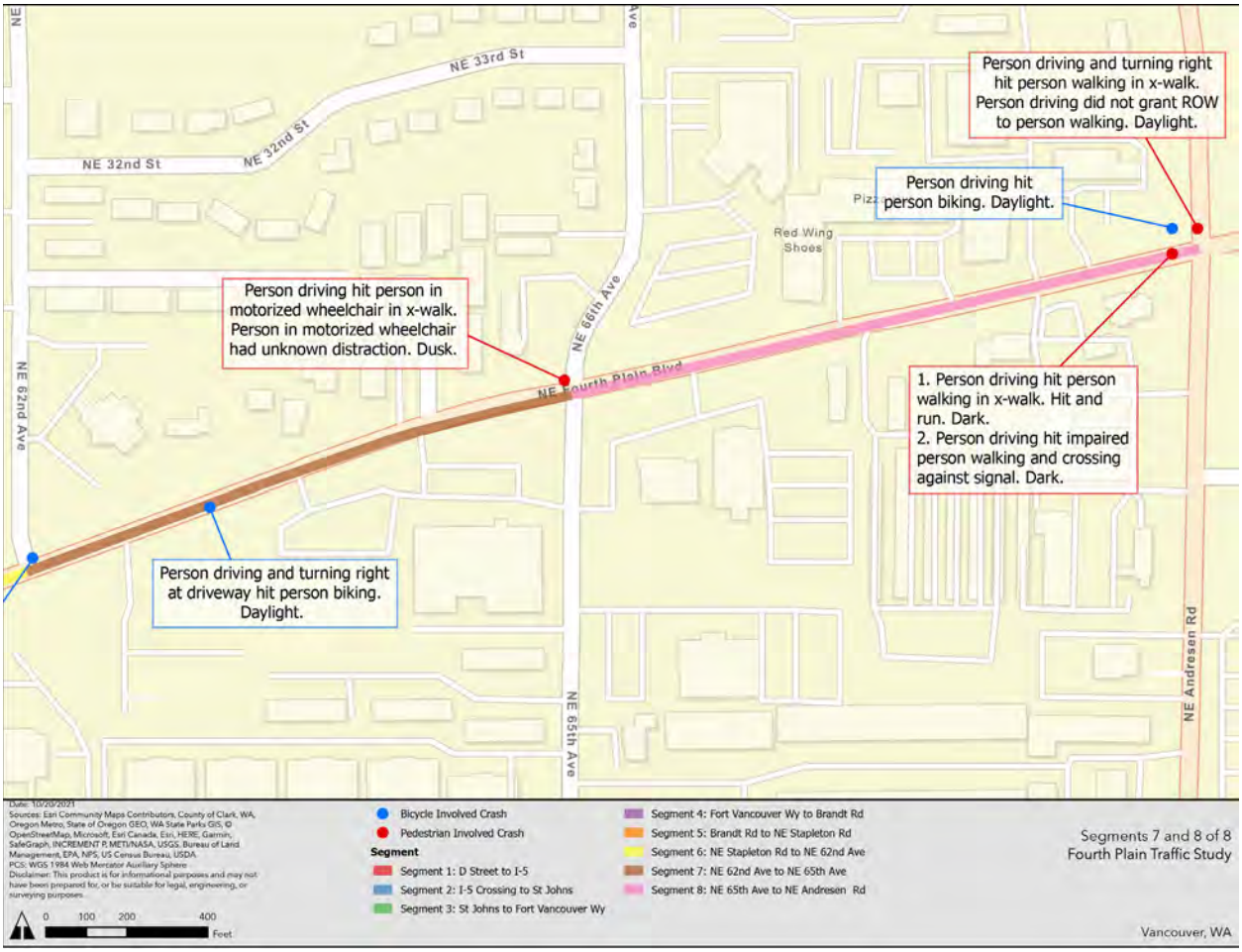

Figure 25. Segments 7 and 8 Crashes Involving People Walking and Biking

6. NEXT STEPS

This traffic and safety report serves as a basis for understanding present day, future "no build," and lane reconfiguration "build" conditions in the corridor. Results from this analysis will be used as a point of comparison for developing and evaluating future design options. The analysis of traffic volumes and operations reveals that traffic delay (as LOS) is generally not a major issue along the corridor, except at specific intersections during peak hours. This remains true under lane reconfiguration "build" scenarios, demonstrating that a lane reconfiguration would be a relevant and appropriate countermeasure.

Following review of this report, the project team will further refine the lane reconfiguration alternatives for different segments of the Fourth Plain corridor to address safety concerns and multimodal improvements. A lane reconfiguration opens up the possibility of using the extra roadway space for people walking, riding bikes, or for buses, and to increase safety for all users overall. The next phase of this project will include further conversation with the TMC, the public, and the corridor community about goals for these potential changes. The project team will discuss lane reconfiguration options with the community to understand how Fourth Plain can best serve everyone who lives, works, shops, recreates, goes to school, or otherwise uses the corridor.

APPENDIX A: PEAK HOUR ANALYSIS

1. AM Peak Hour Existing Condition
2. PM Peak Hour Existing Condition
3. Table: Intersection Peak Hour
4. Table: RTC Modeling Data and AM/PM Growth Rate

APPENDIX B: TRAFFIC ANALYSIS DATA

1. Traffic Analysis Data: 2021 Existing
2. Traffic Analysis Data: 2040 No Build

APPENDIX C: SYNCHRO REPORT

1. AM Existing
2. AM No Build
3. PM Existing
4. PM No Build

Table I. Intersection Peak Hour

Study Intersections with Fourth Plain Blvd	Weekday AM Peak Hour				Weekday PM Peak Hour			
	Count Date	Intersection Peak Hour	Corridor Peak Hour	PHF	Count Date	Intersection Peak Hour	Corridor Peak Hour	PHF
F street	Apr-19	7:00		-	Apr-19	4:00		-
I-5 SB	Jul-21	8:00		0.94	Jul-21	4:15		0.93
I-5 NB	Jul-21	8:00		0.86	Jul-21	4:30		0.93
St. Johns Blvd	Sep-21	7:15		0.87	Sep-21	4:00		0.94
Fort Vancouver Way	Sep-21	7:00		0.90	Sep-21	4:15		0.94
Grand Blvd	Jul-21	7:45		0.90	Jul-21	4:00		0.88
Fairmount Ave	Jul-21	8:00		0.93	Jul-21	4:00		0.90
Norris Rd	Jul-21	8:00		0.94	Jul-21	4:00		0.87
Neals Ln	Apr-19	7:00		-	Apr-19	4:00		-
Todd Rd	Jul-21	8:00	7:30	0.90	Jul-21	4:00	4:00	0.92
Brandt Rd	Jul-21	8:00		0.87	Jul-21	4:00		0.90
Falk Rd	Jul-21	7:45		0.87	Jul-21	4:00		0.90
Wintler Dr	Jul-21	7:45		0.89	Jul-21	4:00		0.89
Caples Ave.	Jul-21	7:45		0.91	Jul-21	4:00		0.88
General Anderson Ave	Sep-21	7:15		0.91	Sep-21	4:00		0.94
Stapleton Rd	Sep-19	7:00		-	Sep-19	4:00		-
57th Ave	Jul-21	7:15		0.92	Jul-21	4:00		0.93
62nd Ave	Jul-21	7:15		0.91	Jul-21	4:15		0.95
65th Ave	Jul-21	7:15		0.89	Jul-21	4:15		0.95
Andresen Rd	Sep-21	8:00		0.95	Sep-21	4:15		0.96

PHF = Peak hour factor

Table II. RTC Modeling Data and AM/PM Growth Rate

Location on Fourth Plain		AM – Link Volume				PM – Link Volume							
		2015		2040		2015		2040		AM Growth Rate		PM Growth Rate	
To	**From**	**EB**	**WB**	**EB**	**WB**	**EB**	**WB**	**EB**	**WB**	**EB**	**WB**	**EB**	**WB**
F St	I5 SB Ramp	320	445	563	781	499	597	709	753	2.29%	2.28%	1.41%	0.93%
I5 Sb Ramp	I5 NB Ramp	708	723	816	911	561	597	667	748	0.57%	0.93%	0.69%	0.91%
I5 Nb Ramp	St Johns Blvd	652	759	880	782	756	834	805	1015	1.21%	0.12%	0.25%	0.79%
St Johns Blvd	Fort Vancouver Way	551	683	449	752	650	654	687	703	-0.82%	0.39%	0.22%	0.29%
Fort Vancouver Way	Grand Blvd	358	804	457	966	709	601	807	701	0.98%	0.74%	0.52%	0.62%
Grand Blvd	Norris Rd	303	770	406	923	670	541	775	639	1.18%	0.73%	0.58%	0.67%
Norris Rd	Brandt Rd	369	687	460	857	610	589	727	683	0.89%	0.89%	0.70%	0.59%
Brandt Rd	Falk Rd	387	792	516	951	700	657	829	813	1.16%	0.73%	0.68%	0.86%
Falk Rd	Wintler Dr	340	637	417	710	538	519	576	593	0.82%	0.43%	0.27%	0.53%
Caples Ave	General Anderson Ave	286	576	375	600	456	444	477	450	1.09%	0.16%	0.18%	0.05%
General Anderson Ave	Stapleton Rd	414	781	561	942	748	730	866	864	1.22%	0.75%	0.59%	0.68%
Stapleton Rd	57th Ave	469	788	597	877	791	762	874	860	0.97%	0.43%	0.40%	0.49%
57th Ave	62nd Ave	335	588	408	633	594	583	614	606	0.79%	0.30%	0.13%	0.15%
62nd Ave	66th Ave	529	723	595	775	757	802	781	812	0.47%	0.28%	0.12%	0.05%
66th Ave	NE Andresen Rd	691	1100	792	1,228	1,190	1,109	1,258	1,186	0.55%	0.44%	0.22%	0.27%
E of NE Andresen Rd		332	631	406	763	621	783	677	920	0.81%	0.76%	0.35%	0.65%
Average by Direction										0.89%	0.65%	0.46%	0.53%
										Average AM Growth Rate		Average PM Growth Rate	
Total Corridor Average										0.77%		0.50%	

Appendix A

Traffic Analysis Data