INFORMATIONAL MEMORANDUM

TO: **Transportation & Infrastructure Committee**

FROM: **Jack Pace, DCD Director & Robin Tischmak, Acting Public Works Director**

BY: **Moira Bradshaw and Lynn Miranda**

CC: **Mayor Ekberg**

DATE: **November 7, 2017**

SUBJECT: **Update on Tukwila International Boulevard/Congress for New Urbanism Implementation Recommendations**

ISSUE

To continue moving forward on implementing the community's vision for the Tukwila International Boulevard (TIB) neighborhood and the Congress for New Urbanism's (CNU's) recommended short-term action, the City needs to review expected impacts and provide direction on a preferred rechannelization design for TIB.

BACKGROUND

In 2015 the City updated the goals and policies for the TIB District Element of the Comprehensive Plan, calling for transformation of the neighborhood into a walkable, safe, attractive destination with TIB as a "main street" versus a street serving regional through-traffic at higher speeds. The Congress for New Urbanism and the City held a community workshop in February 2017 to build upon and to identify specific actions towards placemaking and redevelopment efforts. In May, CNU issued a summary of the workshop and briefed the Council on the two major short-term actions that, if undertaken, would implement the community's vision:

- Change the street design to reduce through-lanes to two rather than four, allowing for on-street parking and bicycle lanes, and add more crosswalks (see Attachment A).
- Update the zoning code, including setbacks, building heights, and permitted land uses.

The City Council subsequently requested information on potential traffic impacts associated with the decrease in the number of vehicle-travel lanes on TIB. They also agreed with CNU's recommendation that the decision on the street's design should precede any changes in zoning, as street design has a direct impact on site plans for future redevelopment – developing a "main street" is not possible without the TIB rechannelization.

In August, DCD staff briefed the Planning Commission on preliminary zoning code revisions. In September, a six-month moratorium on new auto-oriented uses and hotels/motels in the TIB district was established. The moratorium allows the City time for the rechannelization and zoning code revisions to be prepared and adopted and to ensure that any future development proposed during this interim review period is consistent with the community's vision. Consultant contracts for traffic analysis and preliminary rechannelization design were also initiated in September.

DISCUSSION

The impacts associated with the removal of a northbound and southbound travel lane and the potential mitigation for the resulting shift in travel patterns are contained in the Fehr and Peers report (see Attachment B). The report focuses on traffic conditions during a two hour period of the day from 4-6 p.m. The morning peak has vehicular traffic volumes that are 40% less than the afternoon; therefore, traffic impacts may still be substantial but less than during the p.m. peak hours.

Significant Findings for the PM Peak Hours:

- At least 50% of existing traffic is pass through that does not stop and is not related to local businesses or residents. This pattern of travel behavior is more consistent with a regional roadway than a local arterial. Approximately 45% of existing trips do not start or end within one mile of TIB, with the largest number of these travelling between SeaTac and Central Seattle.

- Traffic diversion will occur on adjacent streets in the following order – 42 Avenue S., Military Road S., I-5, Des Moines Memorial Drive S., and 51 Avenue S./Macadam Road.

- With the rechannelization of TIB, if the existing volume of pass through travel (800 vehicles during the p.m. peak) were to shift to alternate routes, the TIB corridor could accommodate the growth in traffic from planned development in the district and operate with a similar quality of service as experienced today.

Mitigation of Off-site Impacts – Alternatives

- Typical traffic calming measures on side streets would not reduce speeds enough to be effective in preventing additional traffic on those streets.

- Alternatives to traffic calming are intersection diverters or short one way segments, which would be an inconvenience to residents, but could prevent cut-through traffic while maintaining as much connectivity as possible for local residents.

Rechannelization Alternatives and Cost Estimates

The City contracted with KPG to prepare preliminary rechannelization design alternatives for TIB and associated cost estimates. All three alternatives remove one travel lane in each direction and restripe each lane to include on-street parking and a bicycle lane (see Attachment C):

- Alternative 1 – Adds bulb-outs at mid-block pedestrian crossings ($1,130,000).

- Alternative 2 – Restriping only; no additional crosswalks or bulb-outs ($400,000).

- Alternative 3 – Adds crosswalks and bulb-outs at intersections to shorten the travel distance across TIB for pedestrians ($1,270,000).

RECOMMENDATION

The Committee forward their recommendation to the 1/22/2018 COW meeting. Staff recommends implementing *Alternative 2 – removing one travel lane in each direction and restriping each lane to include on-street parking and a bicycle lane* with a cost estimate of $400,000.

This alternative:

- Allows the City to continue the momentum gained from the CNU workshop and the City's commitment to the community's vision that calls for the transition of TIB from a street serving regional needs to more of a "main street" serving the local community.
- Provides other benefits, such as providing additional on-street parking for adjacent businesses along TIB and safe lanes for bicyclists.
- Allows staff to move forward on zoning changes that, when combined with the street redesign, will transform the built environment along TIB that brings buildings forward to the back of the sidewalk and creates a safer, more attractive, and walkable neighborhood that is transit supportive.
- Allows the City to invest minimal funds to test the rechannelization design. Once TIB is restriped, staff can evaluate traffic operations and, if needed, come back to the Council with suggested changes to the configuration to mitigate any unintended consequences.

NEXT STEPS

1. A 2018 budget amendment is required to move forward with implementing the rechannelization, and a CIP sheet for the project must be approved by Council. Staff will bring this to Finance Committee in 1st quarter 2018.
2. If rechannelization of TIB is approved, staff will continue developing zoning code revisions for the district per the current Comprehensive Plan and CNU direction.
3. Restriping of TIB could begin spring/summer 2018.

ATTACHMENTS

A. Excerpt from CNU Legacy Project Report, April 2017.
B. Tukwila International Boulevard Rechannelization Study, by Fehr & Peers, September 2017.
C. KPG Report of cost estimates

Attachment A

TUKWILA INTERNATIONAL BOULEVARD

IMPLEMENTATION

Short term steps for implementation include re-striping the Boulevard and amending the zoning.

RESTRIPING PLAN

The initial step in the TIB evolution is a restriping plan for the Boulevard. Traffic studies must be done in advance of the work, but a schematic plan was developed during the workshop, shown on the next pages.

Some parts of TIB have distances as great as 2,500' without a crosswalk. This distance provides a dangerous enviroment where residents cross midblock with no protection. To build a robust main street environment, pedestrians must be able to easily cross the street to access shops on the other side. In addition to crosswalks, new RRFBs are recommended.

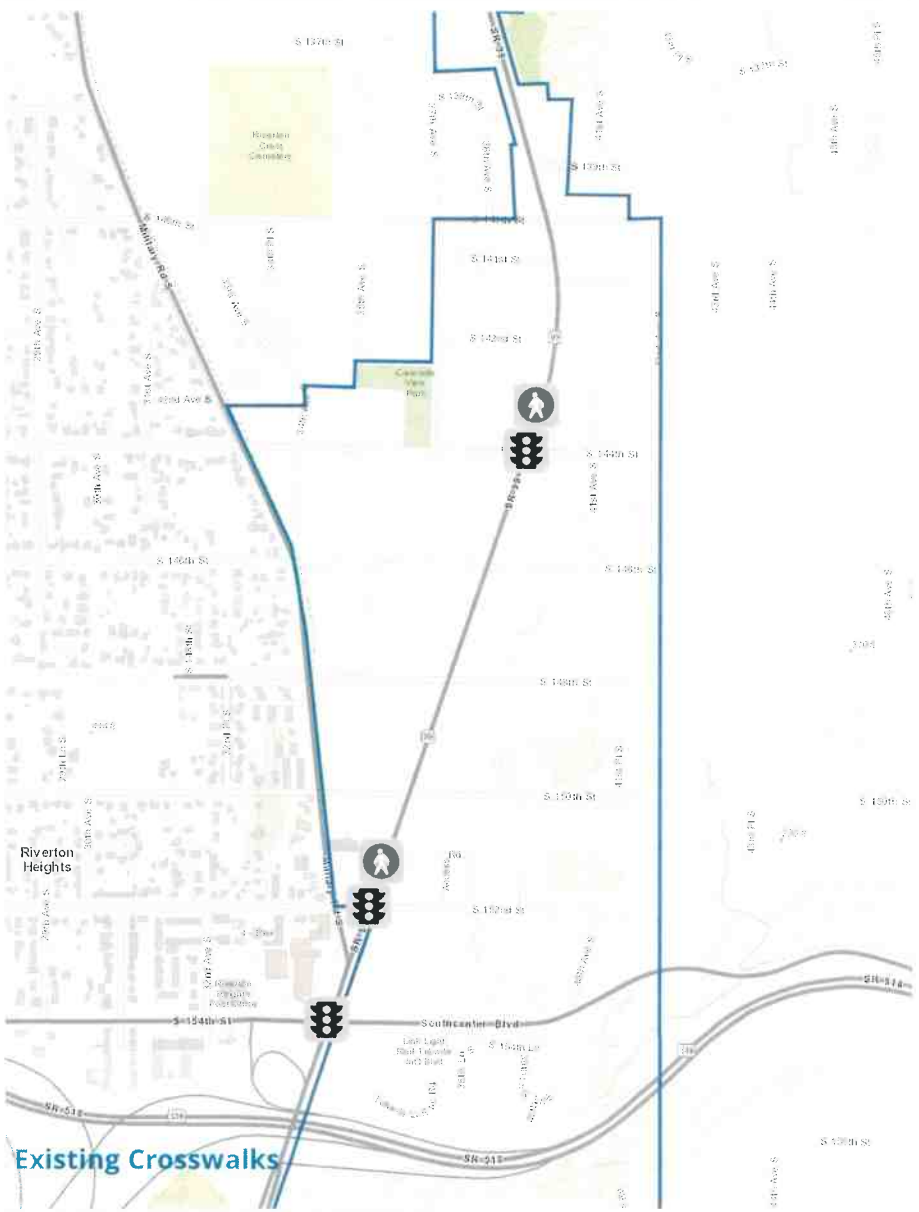
A RRFB is an amber-colored flashing light (LED) that is activated by a pedestrian before using a crosswalk. The purpose of an RRFB is to increase vehicle yielding at crosswalks. RRFBs are attached to pedestrian crossing warning signs, and are also accompanied by piano key crosswalks and advance yield makings. The beacons are usually solar powered, and flash using an irregular patten that is similar to emergency vehicle flashers on police vehicles.

KEY

Existing signal + crosswalk

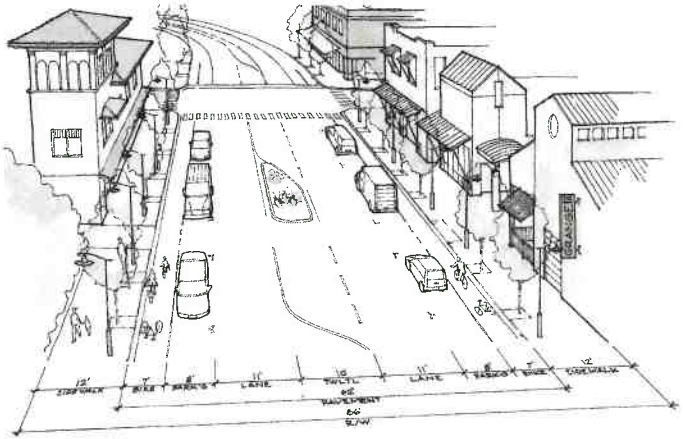
Existing RRFB

Image Credit: City of Bloomington, Indiana



(City of SeaTac, King County, BLM, ESRI, Garmin, USGS, EPA, USDA)

(© Microsoft, 2017)



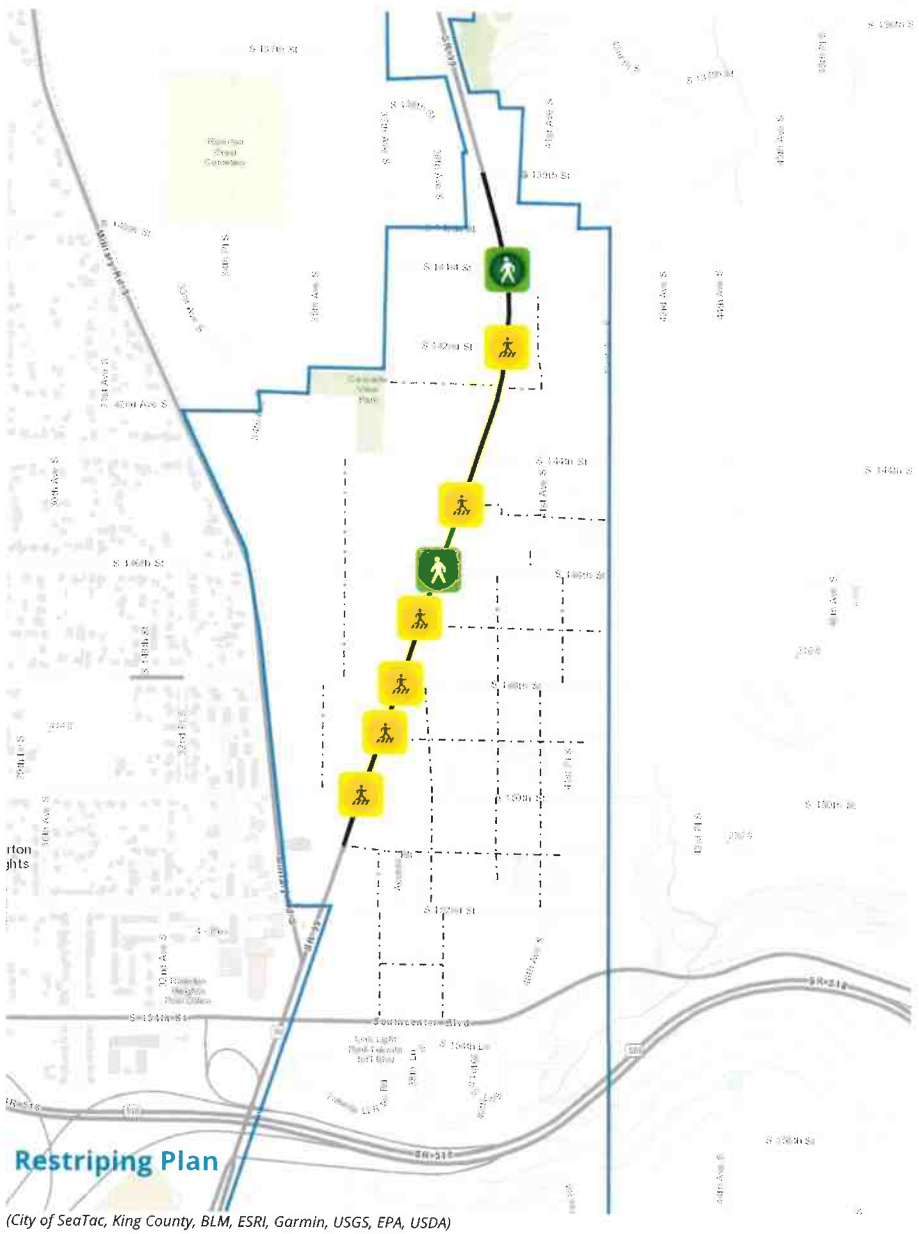
The plan to the right shows a change from 5 lanes to 3 lanes beginning with S. 139th Street in the north to S. 152nd Street at the southern end. The new street section is illustrated above, as compared to the existing conditions in the upper right image.

In addition to the restriping, new pedestrian crosswalks and signals should be added. New RRFBs should be located at S. 141st Street and S. 146th Street. New crosswalks should be added at S. 142nd, S. 148th, S. 150th, and each new east | west street as they are developed over time as shown on the plan to the right.

To assure local traffic is managed well, provide additional development opportunities, and create a bicycle and pedestrian network, new streets should be added to provide multiple routes north/south and east/west.

KEY

- New crosswalk
- New RRFB
- Restriping area
- New streets



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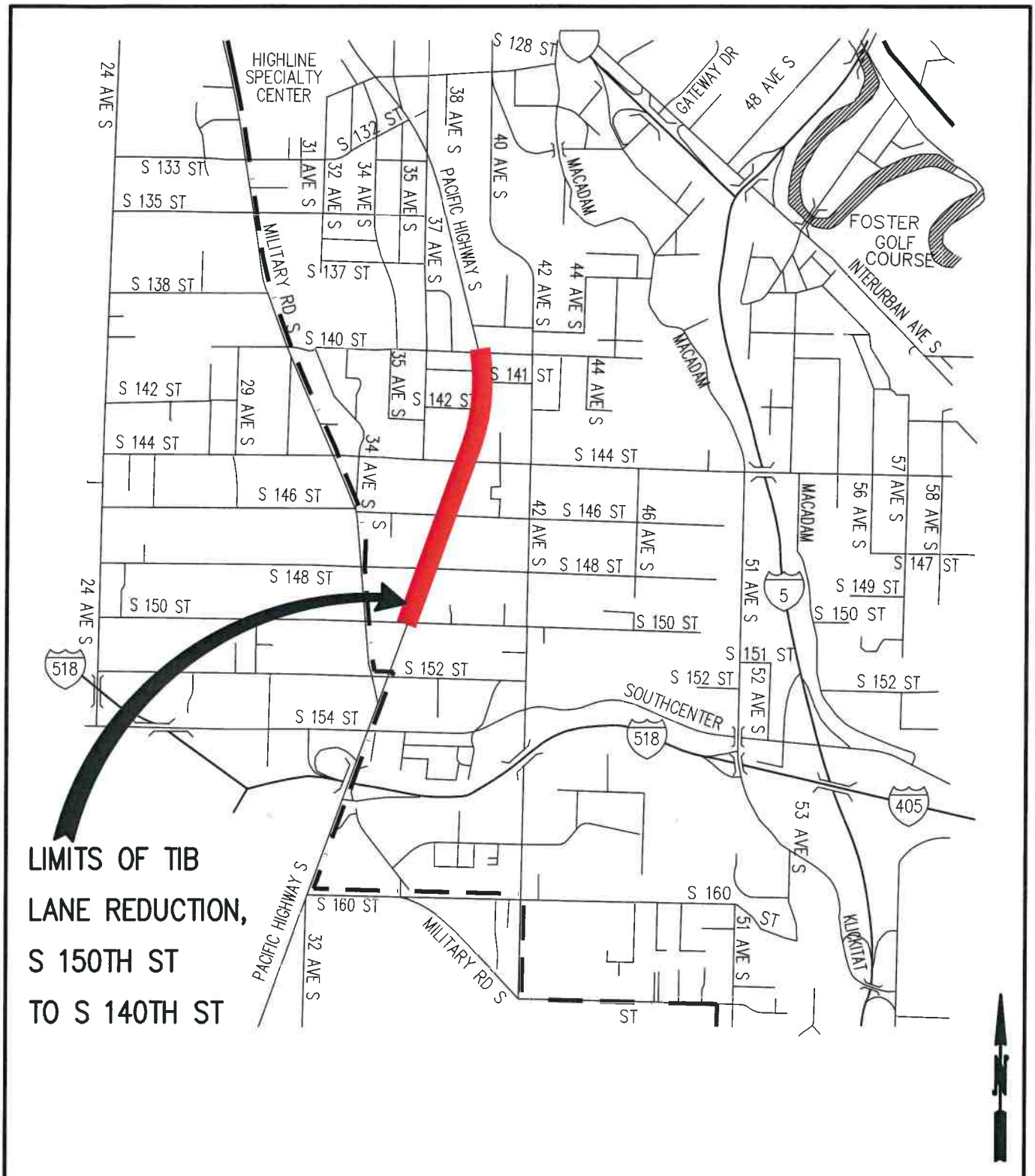

SEAL OF TUKWILA WASHINGTON 1908

Tukwila International Blvd
Road Diet
Vicinity Map

Attachment B

Tukwila International Boulevard Rechannelization Study

Prepared for:
City of Tukwila

September 2017

SE17-0561

FEHR & PEERS

Table of Contents

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Chapter 1. **Introduction**

The City of Tukwila is considering a rechannelization project on Tukwila International Boulevard (TIB) between S 144th Street and S 152nd Street. The current configuration of the ½ mile corridor is a 5-lane cross section with 2 northbound lanes, 2 southbound lanes, and a two-way left turn lane. The proposed project would remove a travel lane in each direction to allow for on-street parking and striped bicycle lanes. In addition, new mid-block pedestrian crossings could be constructed along the corridor and the rechannelization would decrease the required crossing distance and associated risk for pedestrians. The rechannelization is intended to increase the mobility and safety foster an attractive and inviting environment for all users of TIB.

The potential effects of reducing the number of travel lanes on TIB were first analyzed using microsimulation software to evaluate vehicular operations and second with the City's travel demand model to investigate potential traffic diversion. The microsimulation analysis focuses on the TIB corridor and reports changes in travel time, queuing, and intersection level of service (LOS) for existing and future conditions. The diversion analysis explores the alternative routes that drivers could use to avoid TIB and traffic calming measures the City could implement to reduce diversion onto residential streets.

This report is organized as follows:

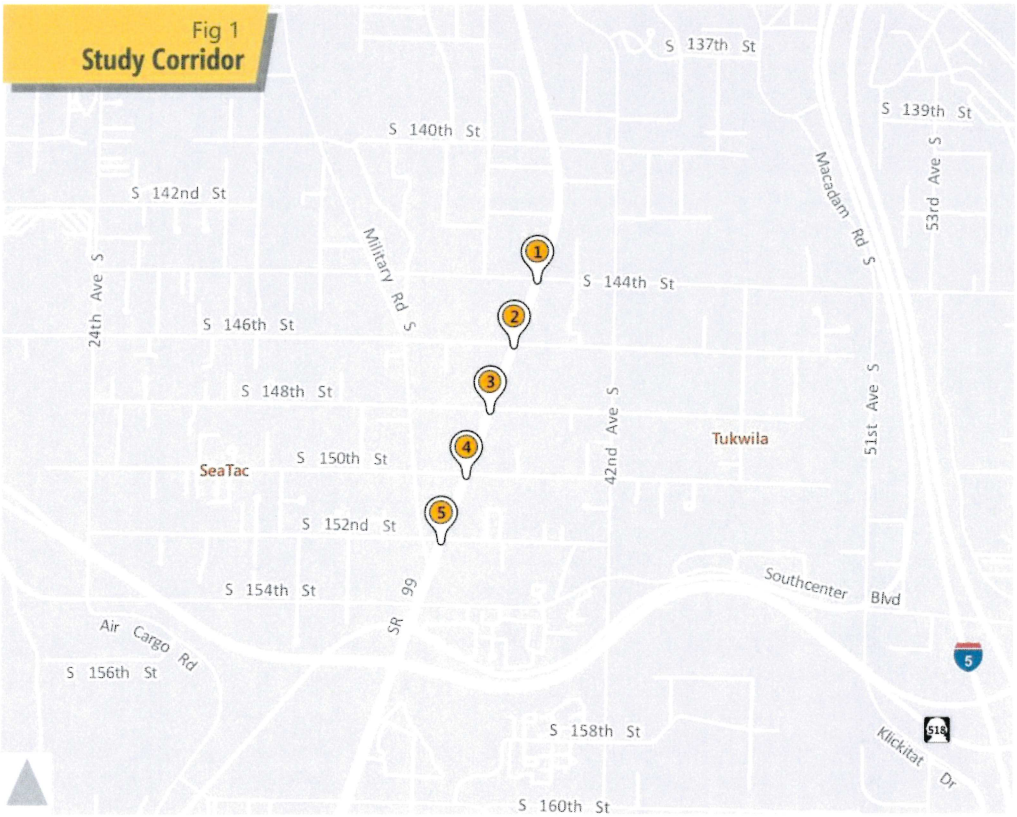
- *Chapter 1. Introduction*
- *Chapter 2. Existing Conditions:* This chapter documents existing conditions along the study section of the TIB corridor and includes vehicular volumes, travel times, field observations, and travel behavior data.
- *Chapter 3. Microsimulation Analysis:* This chapter discusses the development and validation of the microsimulation model and the analysis results for the project under both existing and future demand scenarios.
- *Chapter 4. Diversion Analysis:* This chapter provides an analysis of potential traffic diversion due to the project and a suite of traffic calming strategies that could be used by the City to mitigate impacts on residential streets.
- *Chapter 5. Conclusion:* This chapter summarizes the results from the microsimulation and diversion analyses and recommends further actions the City can pursue in support of the rechannelization project.

Chapter 2. **Existing Conditions**

Existing travel behavior data (intersection traffic counts, corridor travel time, and origin-distribution travel data) and corridor infrastructure data (lane geometries, pedestrian crossing locations, and traffic signal timings) were collected along the study corridor during May 2017. The study corridor, shown in **Figure 1**, includes the following intersections along Tukwila International Boulevard.

1. S 144th Street
2. S 146th Street
3. S 148th Street
4. S 150th Street
5. S 152nd Street

The intersections at S 144th Street and S 152nd Street are signalized while the other three intersections are side-street stop-controlled. There is one mid-block signalized crossing for pedestrians between S 150th Street and S 152nd Street that is activated with a push button.



The following information was not only used to understand current operating conditions along the TIB corridor, but also to calibrate and validate the microsimulation travel model. Since traffic volumes are higher during the evening peak hour than the morning peak hour, the data collection effort and subsequent analyses focused on the evening peak period. Traffic volumes collected during the City's Comprehensive Plan Update in 2010 show that the morning peak hour volumes on TIB are 40% lower than the evening peak hour volumes. The significantly lower volumes in the morning suggest that any impacts from the proposed rechannelization would be substantially less during the morning than in the evening.

2.1 Intersection Traffic Counts

Traffic counts at the five study intersections along the corridor were collected on May 15th during the PM peak period between 4:00 and 6:00 PM and included vehicular, pedestrian, and bicycle volumes. The peak hour at all intersections occurred between 4:15 and 5:15 PM. There were approximately 700 northbound vehicles and 900 southbound vehicles that travelled along Tukwila International Boulevard during the peak hour. The number of observed bicycle users was less than five at any of the approaches at all study intersections and the number of pedestrians crossing TIB at the unsignalized locations was also minimal. The traffic counts are included in Appendix A.

The 2017 traffic volumes at the two signalized intersections were compared with the intersection volumes collected for the Comprehensive Plan update. Since those counts were collected, volumes have increased by 10 to 15% in the study corridor with the majority of increases occurring on TIB (as opposed to the east-west streets crossing TIB). The cause of the increased volumes could be spillover from congested regional routes since limited land use development has occurred near the study corridor in the last decade.

2.2 Travel Times

Travel time data along the study corridor was collected using advanced sensors that track the unique identifiers of internet connected devices (cell phones, GPS devices, and Bluetooth electronics). A sensor was placed at each end of the corridor and using paired device IDs the travel time can be estimated for each device that travelled through the corridor.

A total of 81 southbound pairs and 60 northbound pairs were collected between 4:00 and 6:00 PM. 3 minutes was determined to be an appropriate threshold to separate vehicles that travelled through the corridor from those that stopped at a destination along TIB. Approximately 65% of southbound trips and 55% of northbound trips met this criteria for pass-through travel. **Table 1** summarizes the travel time data for these trips.

Table 1: Observed Travel Time Summary

Direction	Northbound	Southbound
Total Observed Pairs (Pass-through and Local)	60	81
Pass-through Observed Pairs (<3 minutes travel time)	34 (56%)	52 (64%)
Average Observed Travel Time (minutes)	1:45	1:45
Average Observed Travel Speed (mph)	18 mph	18 mph
Observed Travel Time Standard Deviation (minutes)	0:40	0:35

Source: Fehr & Peers.

The average travel time both northbound and southbound through the study corridor is approximately 1 minute 45 seconds which corresponds with an average travel speed of 18 mph. The fastest observed travel time was less than 1 minute in each direction with an average travel of approximately 40 mph northbound and 50 mph southbound. Vehicles that were able to travel through the corridor at this speed likely had green lights at both ends of the corridor and did not need to slow down. The traffic signals at S 144th Street and S 152nd Street are operated by the Cities of Tukwila and SeaTac and do not have coordinated timing plans. If the traffic signals were coordinated, higher vehicle speeds northbound and southbound on TIB throughout the study corridor could likely be achieved.

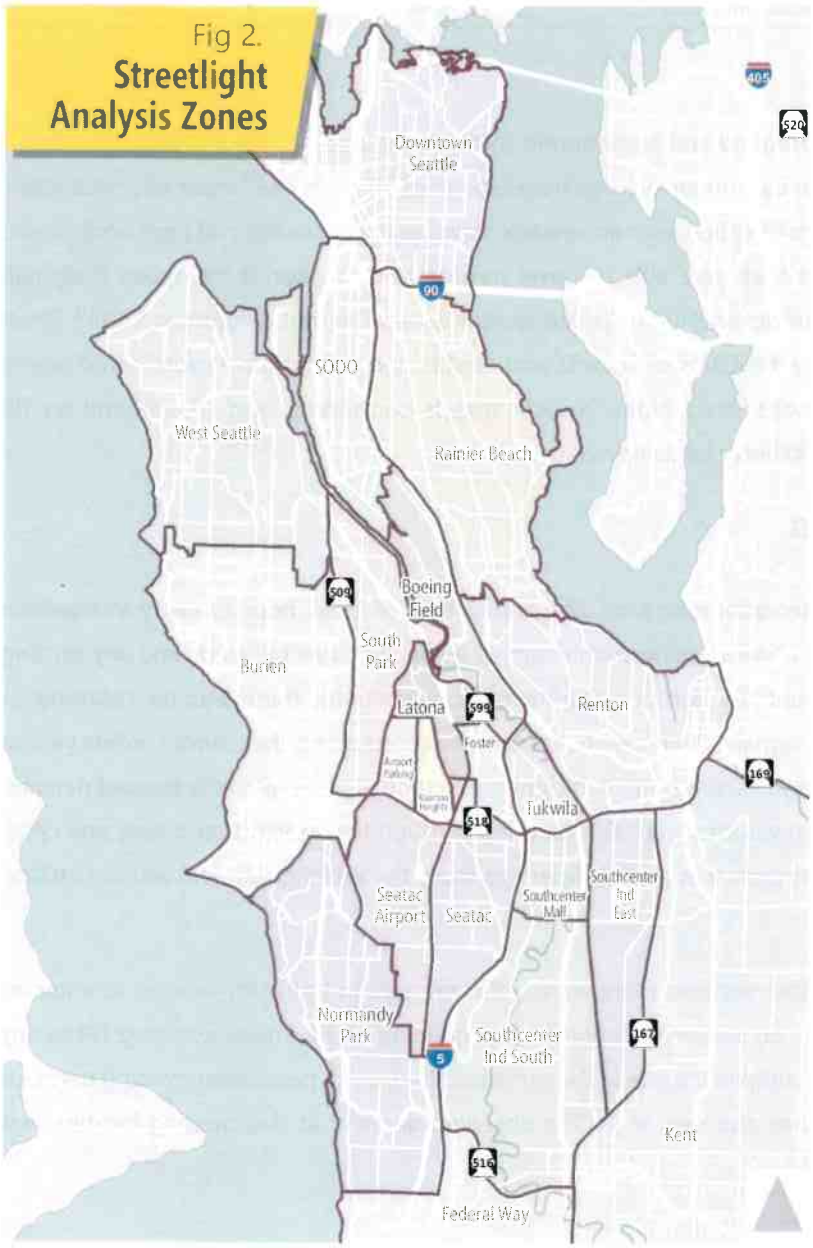
2.3 Field Observations

Fehr & Peers conducted field observations on May 30th during the PM peak hour to verify intersection geometry, traffic signal timing and phasing, pedestrian volumes, vehicular travel behavior, and any existing congestion and queuing throughout the corridor. During our observations, there was no recurring or sustained congestion at any of the signalized or unsignalized intersections along the corridor. While vehicle queues were present at the traffic signals, there was sufficient green time to serve all of the queued demand at each of the approaches and most vehicles were able to travel through the intersection during one cycle. The available storage in the turn pockets was also sufficient to store the existing demand without spilling back into the through lanes.

At the side-street stop-controlled intersections there were sufficient gaps in traffic for vehicles to enter on to and exit from TIB. There was also no sustained congestion or queuing at the driveways along TIB to any of the local businesses. The vehicle compliance rate at the signalized mid-block pedestrian crossing between S 150th Street and S 152nd Street was also very high. The observed demand at this crossing location was approximately 40 pedestrians per hour.

2.4 Travel Behavior Data

Origin-distribution (OD) data for vehicles travelling on TIB through the study corridor was collected from Streetlight travel behavior data. Streetlight aggregates and normalizes travel behavior data from a wide variety of internet connected devices (cell phones, GPS devices, connected cars, fitness trackers, and commercial fleet management systems) to generate an OD matrix that represents average travel conditions within a study area.



A custom zone system was developed for this project which is shown in **Figure 2**. The zone system uses smaller zones closer to the study corridor and larger, more aggregate zones further away.

The Streetlight data provides a summary of average travel patterns from data collected between April 2016 and March 2017, the most recent months available. The data was filtered to personal (not commercial) vehicle trips occurring on a Tuesday, Wednesday, or Thursday between 3:00 and 6:00 PM. Only vehicle trips which travelled on TIB within the study corridor were recorded and analyzed.

The Streetlight OD data was used to characterize the origin and destination location of travelers on TIB as well as to estimate the percentage of pass-through trips during the

PM peak period. The analysis zones were aggregated by approximate distance from the study corridor to calculate how far away driver's origins and destinations are. The results are shown in **Table 2**.

Table 2: Origin and Destination Distance from TIB

Distance from Study Corridor	Trip Origins	Trip Destinations
< 1 mile	33%	25%
< 5 miles	26%	31%
< 10 miles	17%	16%
< 20 miles	10%	16%
> 20 miles	13%	13%

Source: Fehr & Peers.

According to the Streetlight data only 60% of the driver's origins or destinations are within 5 miles of the study corridor. For 40% of drivers on TIB, their origin or destination is more than 5 miles from the study corridor and for almost 15% of drivers, their trip starts or ends more than 20 miles away. This pattern of travel behavior is more consistent with a regional roadway than a local arterial.

The percentage of pass-through trips was estimated by calculating the number of trips that do not start or end within one mile of the study corridor. Approximately 45% of trips fall into this category, with the largest trip pairs occurring between SeaTac and Central Seattle. The Streetlight data and travel time data suggest that approximately 50% of the travel through the study corridor on TIB is pass-through and that 40% of trips start or end more than five miles from the study corridor.

Chapter 3. Microsimulation Analysis

A microsimulation model of the TIB study corridor was developed using PTV's Vissim software (version 9.00-06). For congested and oversaturated conditions, a microsimulation analysis is preferable to a static analysis (using Synchro software for example) because microsimulation better captures the interaction of closely spaced intersections along a corridor. The primary metrics used to evaluate the proposed rechannelization project are changes in travel time, vehicular queuing, and intersection LOS along the study corridor.

The following four scenarios were evaluated using the microsimulation model:

- 2017 Existing
- 2030 Baseline
- 2017 with Project
- 2030 with Project

When reporting results from Vissim, 10 different simulation runs with different random seeds are used. Each simulation run includes a 15 minute loading period and four 15-minute analysis periods. Detailed LOS and queuing results for each scenario are included in Appendix B.

3.1 Existing Scenario

The existing conditions PM peak hour model was calibrated and validated using the collected travel data described in the Existing Conditions chapter. The model also included the transit stops and scheduled arrivals for King County Metro Routes 124 and 128 which have 15 minute and 30 minute headways respectively. Intersection geometries and signal timings at each of the study intersections were confirmed during field observations and the vehicular and pedestrian volumes at each study location were taken directly from the observed counts. However, the westbound approach at S 144th Street was closed due to construction activity when counts were collected, so the missing turning movements were estimated from the available 2010 count data and increased based on the observed growth rate at adjacent intersections along TIB.

The microsimulation model was calibrated to match existing travel volumes, travel times, and observed queues. The model is considered validated when each of these metrics are within an acceptable range of the observed values.

Table 3 shows the intersection LOS results calculated using the HCM 2010 methodology and the percent demand served at each of the study intersections. For signalized intersections, the LOS grade is determined using the average control delay for the entire intersection while at side-street stop-controlled locations the average control delay for the worst movement is used. The percent demand served is calculated using the observed hourly demand at each location and the number of vehicles that were served in the microsimulation model. Acceptable values are greater than 95%. As shown in the table, the model is serving 100% of the demand at each study intersection.

Table 3: 2017 Existing – Intersection LOS and Demand served

Study Intersection	Intersection Control	LOS / Average Control Delay (sec)	Percent Served / Demand (veh)
1. TIB / S 144th St	Signal	D / 40	100% / 2,282
2. TIB / S 146th St	Side-street stop	C / 21	100% / 1,846
3. TIB / S 148th St	Side-street stop	C / 17	100% / 1,709
4. TIB / S 150th St	Side-street stop	C / 17	100% / 1,762
5. TIB / S 152nd St	Signal	C / 30	100% / 2,030

Source: Fehr & Peers.

Table 4 shows a comparison of corridor travel time and average speed calculated from the microsimulation model with observed data. The model's estimate are within an acceptable range of 15% of the observed values. The average travel speed through the corridor is less than 20 mph.

Table 4: 2017 Existing – Corridor Travel Time

Direction	Observed (minutes) / Average Speed (mph)	Modeled (minutes) / Average Speed (mph)	Percent Difference
Northbound	1:45 / 18 mph	01:55 / 18 mph	9%
Southbound	1:45 / 18 mph	01:50 / 19 mph	5%

Source: Fehr & Peers.

Table 5 shows the average and maximum northbound and southbound queue lengths at the two signalized intersections along TIB. Theses calculated values from the microsimulation model are measured in vehicles and are consistent with observed conditions. The average queue lengths during the PM peak hour at all four approaches is not greater than five vehicles.

Table 5: 2017 Existing – Intersection Queuing

Intersection	Northbound: Average / Maximum Queue Lengths (veh)	Southbound: Average / Maximum Queue Lengths (veh)
1. TIB / S 144th St	2 vehicles / 9 vehicles	5 vehicles / 17 vehicles
5. TIB / S 152nd St	2 vehicles / 10 vehicles	3 vehicles / 14 vehicles

Source: Fehr & Peers.

Based on the comparison of results from the microsimulation model with collected data and observed conditions, the model is considered validated to existing conditions.

3.2 Future Baseline

Travel conditions along the study corridor were evaluated for future 2030 conditions using the City's travel demand model to forecast changes in traffic demand volumes. The land use in the City's model near the study corridor was updated based on adjustments provided by City staff. The updated land use forecast includes approximately 800 new housing units and 700 new jobs by 2030. Compared with the 2010 estimates in the model, these represent a 40% increase in residential land use and a 55% increase an employment along the study corridor.

The resulting 2030 intersection forecasts are between 20% and 25% higher than the 2017 existing counts. The northbound and southbound volumes on TIB through the corridor increase by approximately 200 vehicles per hour in each direction. The study corridor geometry and signal timing data in the 2030 Baseline scenario are consistent with the existing conditions model.

Table 6 summarizes the intersection LOS and demand served for the 2030 Baseline scenario. As shown in the table, all intersections operate at LOS D or better and 100% of the vehicular demand is served at the signalized intersections. Compared with existing conditions, average intersection delay increased by approximately five seconds per vehicle at the two signalized intersections.

Table 7 shows the corridor travel time and average speed estimates calculated from the microsimulation model. Compared with the existing conditions model, travel times increase by approximately five seconds in each direction with no significant change in average travel speed.

Table 8 shows the average and maximum northbound and southbound queue lengths at the two signalized intersections along TIB. Compared with existing conditions, the average queue lengths increased by one to two vehicles while the maximum queue increased by at most five vehicles.

Table 6: 2030 Baseline – Intersection LOS and Demand served

Study Intersection	Intersection Control	LOS / Average Control Delay (sec)	Percent Served / Demand (veh)
1. TIB / S 144th St	Signal	D / 44	100% / 2,690
2. TIB / S 146th St	Side-street stop	D / 26	99% / 2,240
3. TIB / S 148th St	Side-street stop	C / 24	99% / 2,140
4. TIB / S 150th St	Side-street stop	D / 26	99% / 2,160
5. TIB / S 152nd St	Signal	D / 36	100% / 2,520

Source: Fehr & Peers.

Table 7: 2030 Baseline – Corridor Travel Time

Direction	Travel Time (minutes) / Average Speed (mph)
Northbound	02:00 / 18 mph
Southbound	01:55 / 18 mph

Source: Fehr & Peers.

Table 8: 2030 Baseline – Intersection Queuing

Intersection	Northbound: Average / Maximum Queue Lengths (veh)	Southbound: Average / Maximum Queue Lengths (veh)
1. TIB / S 144th St	3 vehicles / 13 vehicles	6 vehicles / 20 vehicles
5. TIB / S 152nd St	3 vehicles / 12 vehicles	5 vehicles / 19 vehicles

Source: Fehr & Peers.

The results for the 2030 Baseline scenario show that there is sufficient capacity along the study corridor to accommodate increased growth while maintaining the same operating conditions that exist currently. Vehicular delay, corridor travel time, and queue lengths are all relatively consistent with the results from the 2017 Existing scenario.

3.3 Project Scenarios

The proposed rechannelization along TIB removes one travel lane in each direction and adds bicycle lanes and on-street parking while preserving the two-way left turn lane for accessing businesses along the corridor. Three additional signalized mid-block pedestrian crossings, similar to the existing crossing

between S 150th Street and S 152nd Street, are also proposed. This rechannelization was evaluated under both 2017 and 2030 demand conditions.

Table 9 shows the resulting intersection LOS and demand served at each study intersection for the rechannelization scenario using 2017 and 2030 demand volumes. Under both scenarios, the delay significantly increases at S 144th Street and the demand served falls to approximately 85% with 2030 demand. The total southbound demand at S 144th Street increases to 1,100 vehicles in the 2030 forecast and this demand greatly exceeds the capacity of single traffic lane, which is assumed to be approximately 600 vehicles per hour. While only two intersections operate at LOS F in the 2017 scenario, four of the five are overcapacity and operate with LOS F conditions in the 2030 scenario.

Table 9: 2017 and 2030 Project – Intersection LOS and Demand Served

Study Intersection	2017: LOS / Average Delay (sec)	2017: Pct. Served / Demand (veh)	2030: LOS / Average Delay (sec)	2030: Pct. Served / Demand (veh)
1. TIB / S 144th St	F / >150	90% / 2,282	F / >150	83% / 2,690
2. TIB / S 146th St	D / 25	90% / 1,846	F / >120	82% / 2,240
3. TIB / S 148th St	C / 23	91% / 1,709	F / >120	84% / 2,140
4. TIB / S 150th St	F / 53	92% / 1,762	F / >120	84% / 2,160
5. TIB / S 152nd St	D / 42	95% / 2,030	E / 75	86% / 2,520

Source: Fehr & Peers.

Table 10 shows the travel time results on TIB between S 144th Street and S 152nd Street for the 2017 and 2030 demand scenarios. In the 2017 scenario, travel times only increase by 20 to 30 seconds with the average speed decreasing by 1 to 2 mph compared with existing conditions. These results show that once vehicles enter the study corridor, vehicular travel speeds are similar to existing conditions. However, the excessive southbound delay experienced by drivers before entering the corridor (more than 8 minutes) is not included in these travel times. Under the 2030 conditions, the travel time for southbound vehicles within the study corridor more than doubles and drivers experience more than 10 minutes of additional delay before even entering the corridor.

Table 10: 2017 and 2030 Project – Corridor Travel Time

Direction	2017: Travel Time (min.) / Speed (mph)	2030: Travel Time (min.) / Speed (mph)
Northbound	02:15 / 16 mph	04:35 / 8 mph
Southbound	02:05 / 17 mph	02:50 / 12 mph

Source: Fehr & Peers.

Table 11 shows the average and maximum queue lengths for the northbound and southbound approaches at the two signalized intersections. Southbound queues longer than 50 vehicles at S 144th Street extend past S 140th Street and northbound queues longer than 20 vehicles at S 152nd Street will spillback into the intersection at Southcenter Boulevard. Consistent with the results shown in the previous tables, the rechannelization has a significant impact on southbound travelers on TIB. Under both 2017 and 2030 scenarios, the average southbound queue at S 144th Street (during the entire PM peak hour) is longer than 50 vehicles. In the 2017 scenario, the maximum northbound queue at S 152nd will spill back into the intersection at Southcenter Boulevard. By 2030, the average queue length would also spillback to this intersection. Within the study corridor on TIB, average vehicles queues are approximately 10 vehicles long in 2017 but are four to seven times longer by 2030. The maximum southbound queue at S 152nd Street extends almost the entire length of the study corridor on TIB in the 2030 scenario.

Table 11: 2017 and 2030 Project – Intersection Queuing

Intersection	2017 NB: Avg. / Max Queue Lengths	2017 SB: Avg. / Max Queue Lengths	2030 NB: Avg. / Max Queue Lengths	2030 SB: Avg. / Max Queue Lengths
1. TIB / S 144th St	5 veh / 24 veh	>50 veh / >50 veh	38 veh / 60 veh	>50 veh / >50 veh
5. TIB / S 152nd St	6 veh / >20 veh	12 veh / 36 veh	>20 veh / >20 veh	79 veh / 104 veh

Source: Fehr & Peers.

3.4 Demand Sensitivity Tests

Fehr & Peers performed additional sensitivity tests to determine the volume of traffic that would need to shift to an alternative route for the performance on TIB in the 2030 Project scenario to be similar to performance in the 2017 Existing scenario.

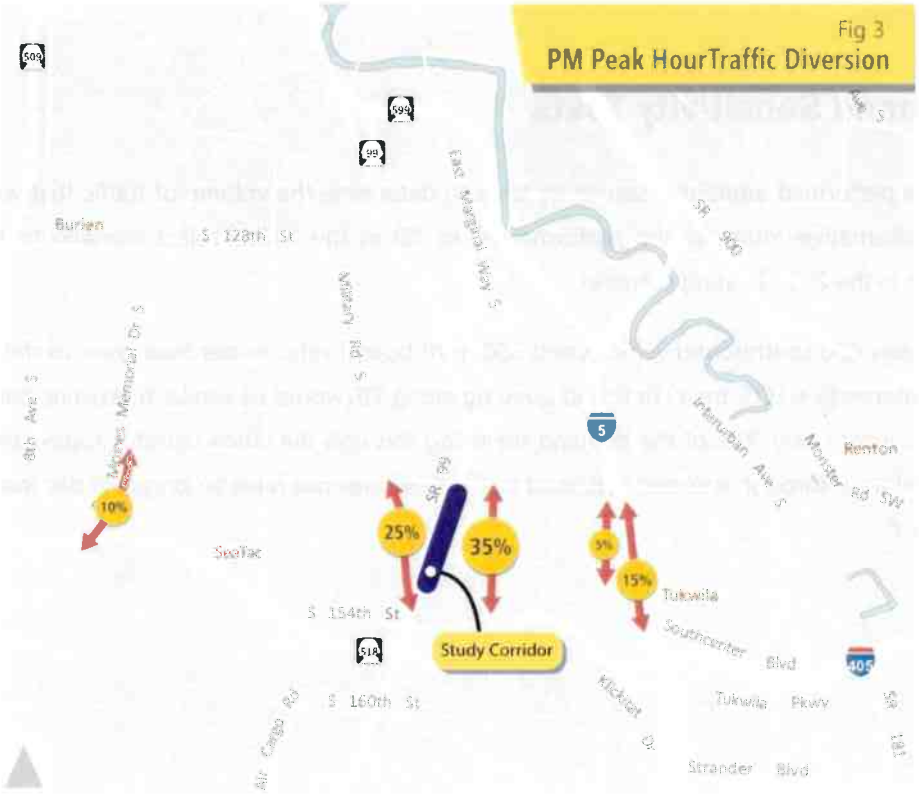
If approximately 450 southbound vehicles and 350 northbound vehicles per hour were to shift to alternate routes, the intersection LOS, travel time and queuing along TIB would be similar to existing conditions. This volume is approximately 50% of the demand travelling through the study corridor today, and represents the estimated pass-through volume: non-local traffic that does not have an origin or destination near the study corridor.

Chapter 4. **Diversion Analysis**

The results from the microsimulation analysis show that under both 2017 and 2030 demand scenarios, TIB will be overcapacity with the rechannelization, especially in the southbound direction. With this excessive delay, even under existing conditions, drivers will likely divert to alternate routes including 42nd Avenue S, Military Road S, and Interstate 5 (I-5). Of particular concern to the City is the potential for parallel residential streets (42nd Avenue S and 51st Avenue S) to see significant increases in traffic due to the rechannelization. Based on the available 2010 counts, the daily volumes on these nearby residential streets are 75 to 85% lower than the daily volumes on TIB.

4.1 Traffic Diversion

The City's travel demand model was used to assess what facilities traffic is likely to divert to in response to the increased congestion along TIB after the rechannelization. The results were estimated from the 2030 model scenario since regional facilities are likely to be more congested in the future and this would result in more drivers choosing to divert from TIB to local streets, rather than choose the congested I-5 route, for example. **Figure 3** shows which parallel facilities drivers chose as alternatives to TIB.



The results from the model show that a majority of trips avoiding congestion on TIB (approximately 65%) choose to divert to streets within the City of Tukwila. Specifically, the results indicate the following distribution to the main north-south streets in the area:

- Military Road S (25%)
- 42nd Avenue S (35%)
- Macadam Road/51st Avenue S (5%)

Approximately 10% of diverted trips used Des Moines Memorial Drive S via S 133rd Street and 15% of diverted trips used I-5 via State Route 599. The remaining 10% of diverted trips use a combination of SR 509, 1st Avenue S, 8th Avenue S, or 24th Avenue S.

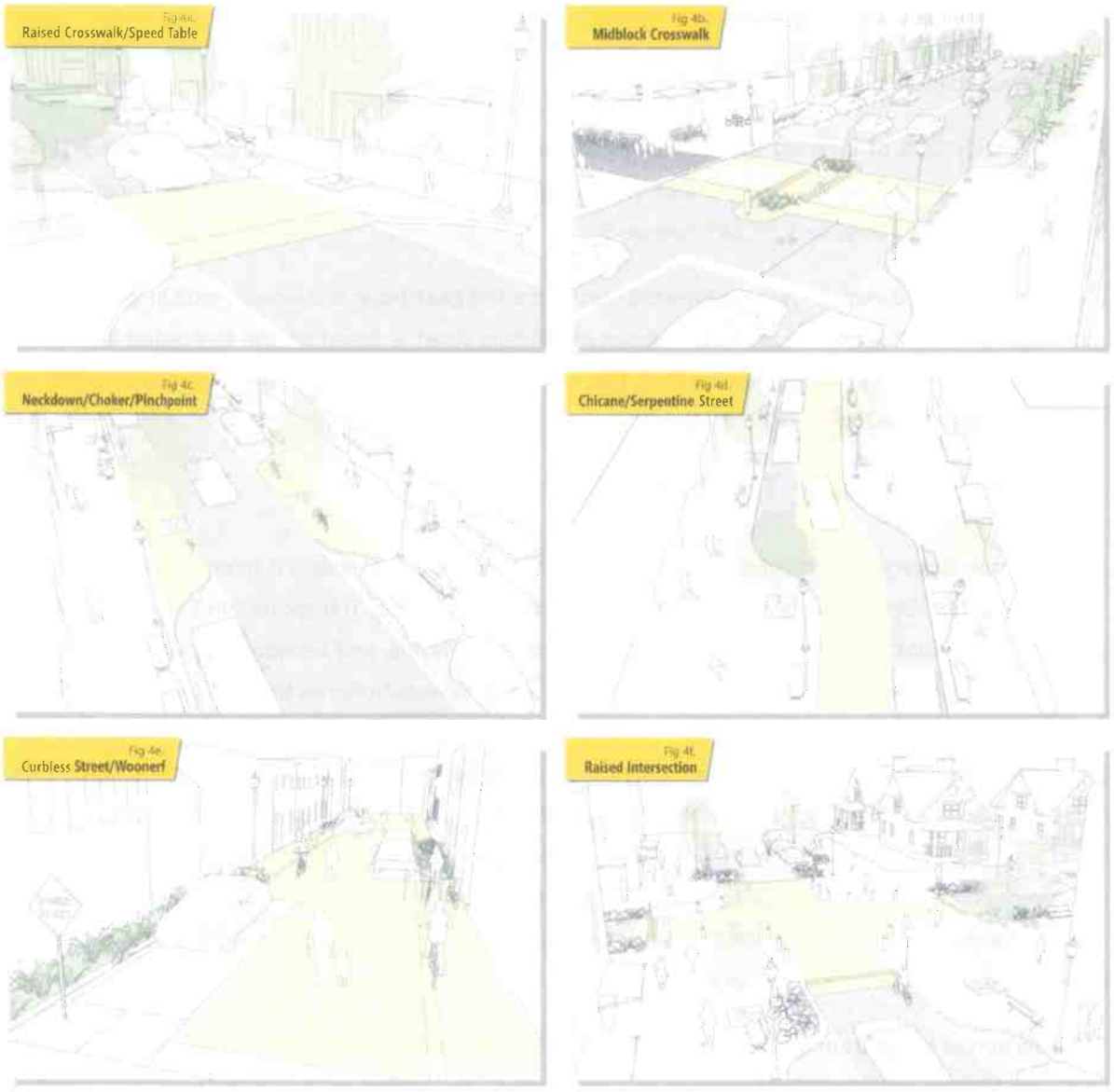
If approximately 800 vehicle trips are diverted during the PM peak hour, this would result in an increase of 280 vehicles on 42nd Avenue S and 200 vehicles on Military Road S. Based on the forecasted intersection volumes from the City's Comprehensive Plan, this would increase the traffic on 42nd Avenue S by 40% and on Military Road S by 30% in 2030.

4.2 Traffic Calming Toolbox

One common strategy to combat diversion of regional traffic onto local streets is to employ traffic calming. The *Urban Street Design Guide* from the National Association of City Transportation Engineers (NACTO) provides a blueprint for designing streets that are safer, more livable, and economically vibrant. The guide provides strategies for how cities can reduce vehicular travel speeds/volumes through physical changes to a roadway or psychological changes to how drivers perceive a roadway. The 6 images in **Figure 4** from NACTO's guide show some of the commonly used strategies for calming traffic on urban streets. These approaches work by introducing vertical or horizontal deflections into the roadway, narrowing a vehicle's travel way, or increasing the likelihood of vehicles yielding to pedestrians and bicyclists on the street. The effectiveness of these strategies in reducing vehicle speeds range from approximately 5-15%. The percentage reduction in traffic volumes due to the implementation of these traffic calming measures would be less than the percent reduction in travel speeds.

The diversion of traffic from the rechannelization of TIB onto parallel roadways could be partially mitigated using any of these traffic calming strategies to decrease the travel speeds on the nearby roadways. However, since drivers would be saving over 5 minutes of travel time compared with travelling through the TIB corridor, the traffic calming measures would need to decrease the average travel speed by over 50% on 42nd Avenue S and Military Road S to remove the travel time advantages of these facilities. The current speed limits of the roads are 30mph and 35mph, respectively. The combinations of measures that would be required to reduce the travel speed to 15mph for 8 blocks would likely be impractical on a minor

arterial/collector street. In general, the common traffic calming measures shown in Figure 4 are designed to encourage vehicles to travel at the posted speed limit rather than to dramatically reduce speeds to a level less than is typically seen on a residential street.



To significantly discourage traffic diverting from TIB, more significant countermeasures would be required, likely in addition to some of the traffic calming strategies documented above. Strategies cities use to explicitly deter cut through traffic involve the prohibition of certain traffic movements at key locations along the corridor. Two different approaches that would prohibit northbound and southbound through trips would be intersection diverters or short one-way travel segments. The implementation of these mitigations

could be less expensive than other traffic calming treatments since the installations would be limited to key intersections or segments of Military Road or 42nd Avenue S near the vicinity of S 144th Street. Special consideration would need to be provided for transit vehicles to ensure that existing or planned traffic routes could still be accommodated. Some cities have had limited success with signage that restricts movements for all vehicles except bicycles and buses, but regular enforcement is required for this strategy to be successful.

An example of a current pilot study in Bellevue is shown in **Figure 5** where there are time of day restrictions in place on a collector arterial street (not dissimilar to 42nd Avenue S) to deter traffic from Downtown Bellevue traveling through a residential area and encouraging traffic to stay on regional routes like Bellevue Way or 112th Avenue SE. Like in Tukwila, the degree of diversion is partially dependent on traffic congestion on the adjacent freeway (I-405 in this case).

Chapter 5. **Conclusion**

The rechannelization of Tukwila International Boulevard between S 144th Street and S 152nd Street to remove one northbound and southbound travel lane and to install bicycle lanes and on-street parking would result in significant congestion for southbound vehicles entering the corridor under both 2017 and 2030 demand scenarios. The existing demand for vehicles travelling through the entire study corridor on TIB exceeds 700 vehicles in both directions during the PM peak hour. This demand is forecasted to increase by over 20% by 2030 due to new residential and commercial development near the study corridor. Removing a travel lane in each direction results in overcapacity conditions, especially for southbound drivers at S 144th Street. Delay, travel times, and vehicular queuing increase substantially in both 2017 and 2030 scenarios and would likely result in drivers choosing parallel routes as alternatives to TIB.

The travel time data and Streetlight OD data provide information on travel behavior for drivers currently using TIB. An analysis of the data suggests that at least 50% of existing travel on the roadway is pass-through trips. These trips represent non-local travel: trips that pass through the corridor without stopping or those not related to nearby residential or commercial land uses. Popular origins and destinations are SeaTac and Central Seattle. Since 2010, the traffic volumes on TIB have increased by 10% to 15% despite limited land use development near the study corridor. The increases in traffic volumes are likely due to spillover from congested regional routes as drivers seek less congested alternatives. If the existing volume of pass-through travel, approximately 800 vehicle trips during the PM peak hour, were to shift to alternative routes, the TIB corridor could accommodate the growth in traffic from planned development with the rechannelization and operate with a similar quality of service to that experienced today.

The traffic calming measures that would need to be implemented to prevent traffic from diverting onto 42nd Avenue S and Military Road S after the rechannelization of Tukwila International Boulevard would need to reduce vehicle speeds by at least 50%, compared with posted speed limits. This is beyond the range of effectiveness of most common traffic calming treatments and would require average travel speeds of 15mph on these facilities which would significantly impact local residents who live along these streets.

Alternatives to traffic calming measures are physical barriers or turn restrictions that prevent vehicles from using these parallel routes as alternatives to TIB: intersection diverters or short one-way segments. The most effective locations for installation of these preventative measures would likely be in the vicinity of S 144th Street. While these barriers occupy a small area, they are still an inconvenience for residents who are accustomed to traversing the area on Military Road or 42nd Avenue S.

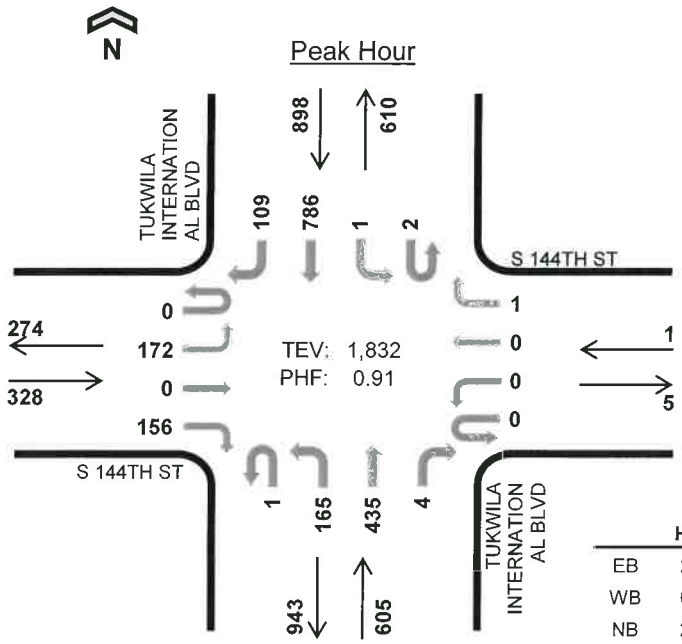
If the proposed rechannelization is pursued, the City could further investigate the optimal design and placement of these devices which would prevent cut-through traffic while maintaining as much connectivity

as possible for local residents as well as students travelling to Foster High School or Thorndyke Elementary School. As part of a larger outreach program to promote this project, the City could also consider a temporary installation of the lane conversion on TIB to bicycle lanes and traffic calming devices on nearby streets to demonstrate to the local community how the project would be implemented and its potential benefits to all users. This "tactical urbanism" approach would also allow the City to quickly assess traffic operations conditions before and after implementation of the project.

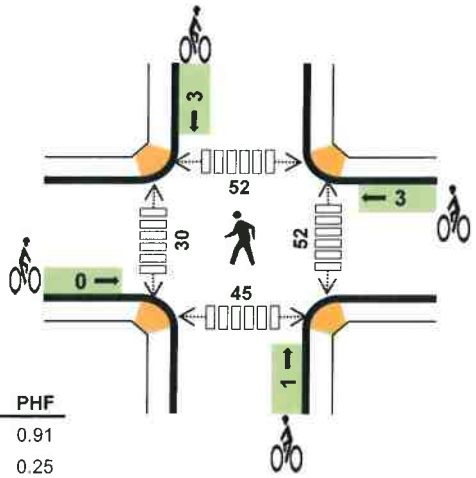
The proposed rechannelization of TIB would necessitate a change in usage and perception for this facility. While the route today serves a high percentage of regional pass-through traffic, the reduction in vehicular capacity would likely limit the facility's usage to local residents and employees. Even with the existing travel demand, a significant volume of trips would shift to alternate parallel routes to avoid the increased congestion along TIB. However, the removal of two travel lanes would allow for the installation of bicycle lanes and on-street parking which would contribute to a more amenable environment for all users.

Appendix A:
Traffic Counts

TUKWILA INTERNATIONAL BLVD
S 144TH ST



Date: Thu, May 18, 2017
Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:15 PM to 5:15 PM



	HV %:	PHF
EB	2.4%	0.91
WB	0.0%	0.25
NB	2.0%	0.93
SB	1.8%	0.89
TOTAL	2.0%	0.91

Two-Hour Count Summaries

Interval Start	S 144TH ST Eastbound				S 144TH ST Westbound				TUKWILA INTERNATIONAL BLVD Northbound				TUKWILA INTERNATIONAL BLVD Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	33	0	46	0	0	1	2	0	39	91	2	1	0	176	24	415	0
4:15 PM	**0**	**47**	**0**	**40**	**0**	**0**	**0**	**0**	**0**	**45**	**117**	**0**	**1**	**0**	**225**	**26**	**501**	0
4:30 PM	**0**	**29**	**0**	**39**	**0**	**0**	**0**	**0**	**0**	**43**	**89**	**0**	**0**	**1**	**199**	**28**	**428**	0
4:45 PM	**0**	**41**	**0**	**42**	**0**	**0**	**0**	**0**	**0**	**41**	**107**	**4**	**0**	**0**	**179**	**24**	**438**	1,782
5:00 PM	**0**	**55**	**0**	**35**	**0**	**0**	**0**	**1**	**1**	**36**	**122**	**0**	**1**	**0**	**183**	**31**	**465**	**1,832**
5:15 PM	0	35	0	47	0	1	1	1	0	45	100	0	0	0	169	24	423	1,754
5:30 PM	0	22	1	42	0	1	1	0	1	37	93	1	0	0	182	19	400	1,726
5:45 PM	0	41	0	45	0	0	0	0	0	46	111	0	0	0	147	30	420	1,708
Count Total	0	303	1	336	0	2	3	4	2	332	830	7	3	1	1,460	206	3,490	0
Peak Hour	**0**	**172**	**0**	**156**	**0**	**0**	**0**	**1**	**1**	**165**	**435**	**4**	**2**	**1**	**786**	**109**	**1,832**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	1	0	4	3	*8*	0	0	0	0	*0*	16	7	17	20	*60*
4:15 PM	**2**	**0**	**2**	**7**	***11***	**0**	**1**	**0**	**2**	***3***	**8**	**8**	**5**	**13**	*34*
4:30 PM	**2**	**0**	**2**	**5**	*9*	**0**	**0**	**0**	**1**	*1*	**17**	**10**	**7**	**10**	*44*
4:45 PM	**3**	**0**	**3**	**2**	*8*	**0**	**0**	**0**	**0**	*0*	**11**	**4**	**20**	**19**	*54*
5:00 PM	**1**	**0**	**5**	**2**	*8*	**0**	**2**	**1**	**0**	*3*	**16**	**8**	**20**	**3**	***47***
5:15 PM	0	0	2	3	*5*	0	0	0	0	*0*	6	4	9	7	*26*
5:30 PM	1	0	1	4	*6*	0	1	0	0	*1*	4	8	24	9	*45*
5:45 PM	1	0	7	3	*11*	0	0	0	0	*0*	14	7	32	15	*68*
Count Total	11	0	26	29	*66*	0	4	1	3	*8*	92	56	134	96	*378*
Peak Hour	**8**	**0**	**12**	**16**	***36***	**0**	**3**	**1**	**3**	***7***	**52**	**30**	**52**	**45**	***179***

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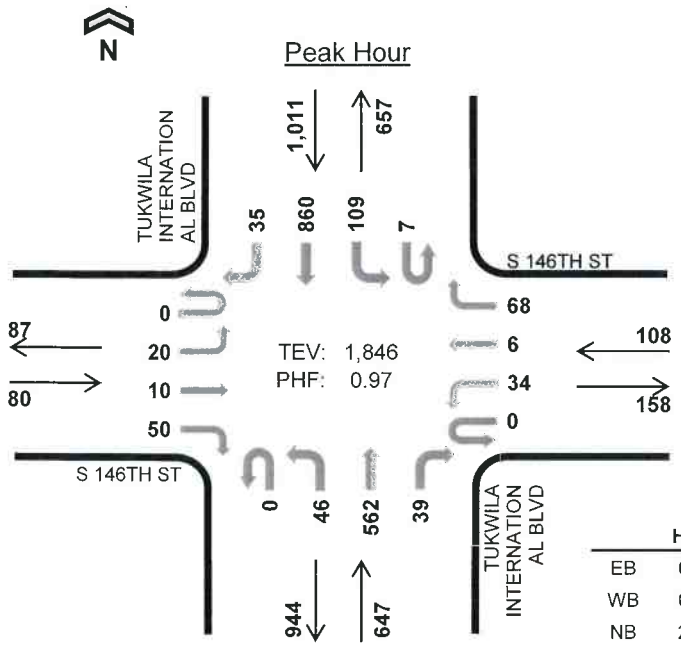
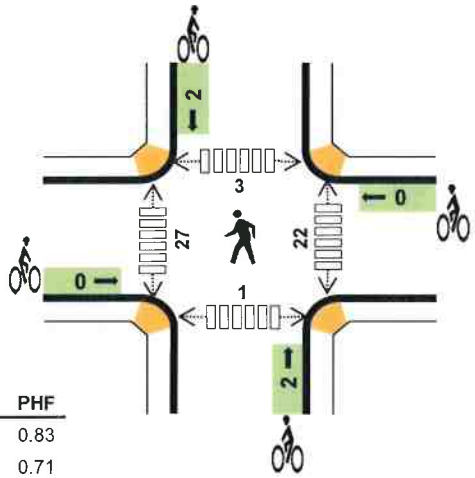
TUKWILA INTERNATIONAL BLVD
S 146TH ST



Date: Thu, May 18, 2017
Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:15 PM to 5:15 PM



	HV %:	PHF
EB	0.0%	0.83
WB	0.0%	0.71
NB	2.0%	0.92
SB	2.0%	0.93
TOTAL	1.8%	0.97

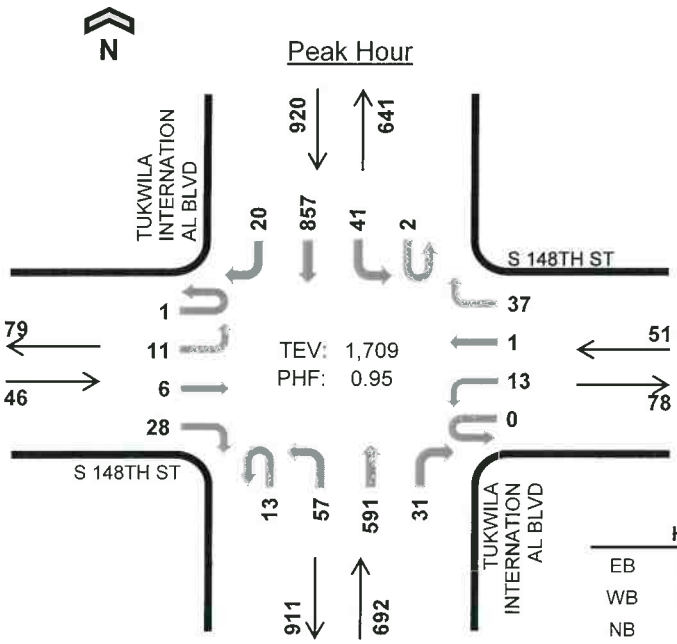
Two-Hour Count Summaries

Interval Start	S 146TH ST Eastbound				S 146TH ST Westbound				TUKWILA INTERNATIONAL BLVD Northbound				TUKWILA INTERNATIONAL BLVD Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	4	4	11	0	5	5	17	0	13	129	11	0	25	207	7	438	0
4:15 PM	**0**	**8**	**1**	**15**	**0**	**8**	**1**	**9**	**0**	**13**	**152**	**11**	**4**	**31**	**211**	**10**	**474**	0
4:30 PM	**0**	**4**	**3**	**11**	**0**	**9**	**3**	**16**	**0**	**8**	**118**	**8**	**1**	**24**	**237**	**9**	**451**	0
4:45 PM	**0**	**3**	**3**	**17**	**0**	**9**	**2**	**13**	**0**	**9**	**149**	**10**	**0**	**27**	**197**	**8**	**447**	1,810
5:00 PM	**0**	**5**	**3**	**7**	**0**	**8**	**0**	**30**	**0**	**16**	**143**	**10**	**2**	**27**	**215**	**8**	**474**	**1,846**
5:15 PM	0	2	6	11	0	7	3	22	0	11	148	13	0	31	190	9	453	1,825
5:30 PM	0	4	3	17	0	2	7	16	0	9	155	10	0	37	191	10	461	1,835
5:45 PM	0	2	3	9	0	6	7	25	0	13	165	6	1	36	161	8	442	1,830
Count Total	0	32	26	98	0	54	28	148	0	92	1,159	79	8	238	1,609	69	3,640	0
Peak Hour	**0**	**20**	**10**	**50**	**0**	**34**	**6**	**68**	**0**	**46**	**562**	**39**	**7**	**109**	**860**	**35**	**1,846**	**0**

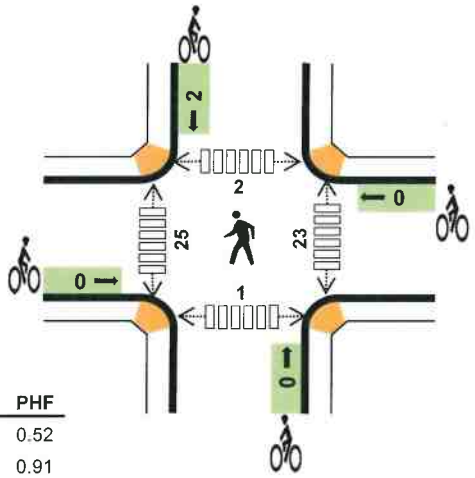
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	0	0	4	2	*6*	0	0	2	0	*2*	5	11	3	1	*20*
4:15 PM	**0**	**0**	**3**	**7**	***10***	**0**	**0**	**0**	**2**	**2**	**3**	**5**	**1**	**1**	*10*
4:30 PM	**0**	**0**	**2**	**5**	***7***	**0**	**0**	**0**	**0**	***0***	**7**	**10**	**0**	**0**	*17*
4:45 PM	**0**	**0**	**4**	**6**	***10***	**0**	**0**	**0**	**0**	***0***	**6**	**7**	**2**	**0**	*15*
5:00 PM	**0**	**0**	**4**	**2**	***6***	**0**	**0**	**2**	**0**	**2**	**6**	**5**	**0**	**0**	***11***
5:15 PM	0	0	2	4	*6*	0	0	2	0	*2*	6	6	0	1	*13*
5:30 PM	0	0	1	5	*6*	0	0	0	1	*1*	3	5	1	1	*10*
5:45 PM	0	0	7	3	*10*	0	0	0	0	*0*	2	11	0	0	*13*
Count Total	0	0	27	34	*61*	0	0	6	3	*9*	38	60	7	4	*109*
Peak Hour	**0**	**0**	**13**	**20**	***33***	**0**	**0**	**2**	**2**	***4***	**22**	**27**	**3**	**1**	***53***

TUKWILA INTERNATIONAL BLVD
S 148TH ST



Date: Thu, May 18, 2017
Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:15 PM to 5:15 PM



	HV %:	PHF
EB	0.0%	0.52
WB	0.0%	0.91
NB	2.2%	0.95
SB	1.5%	0.95
TOTAL	1.7%	0.95

Two-Hour Count Summaries

Interval Start	S 148TH ST Eastbound				S 148TH ST Westbound				TUKWILA INTERNATIONAL BLVD Northbound				TUKWILA INTERNATIONAL BLVD Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	5	3	6	0	3	1	8	5	13	130	4	0	15	204	6	403	0
4:15 PM	**0**	**2**	**0**	**5**	**0**	**5**	**0**	**8**	**1**	**10**	**164**	**6**	**0**	**13**	**208**	**5**	**427**	0
4:30 PM	**1**	**3**	**0**	**5**	**0**	**2**	**1**	**9**	**4**	**19**	**119**	**8**	**0**	**12**	**224**	**6**	**413**	0
4:45 PM	**0**	**2**	**2**	**4**	**0**	**3**	**0**	**11**	**3**	**13**	**154**	**9**	**1**	**10**	**205**	**4**	**421**	1,664
5:00 PM	**0**	**4**	**4**	**14**	**0**	**3**	**0**	**9**	**5**	**15**	**154**	**8**	**1**	**6**	**220**	**5**	**448**	**1,709**
5:15 PM	0	3	0	12	0	1	5	10	1	13	157	5	0	14	194	8	423	1,705
5:30 PM	0	6	2	12	0	4	0	11	2	7	154	6	0	7	197	7	415	1,707
5:45 PM	0	2	2	8	0	1	1	11	3	14	156	11	0	16	154	4	383	1,669
Count Total	1	27	13	66	0	22	8	77	24	104	1,188	57	2	93	1,606	45	3,333	0
Peak Hour	**1**	**11**	**6**	**28**	**0**	**13**	**1**	**37**	**13**	**57**	**591**	**31**	**2**	**41**	**857**	**20**	**1,709**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	0	0	5	2	7	0	0	0	1	*1*	3	6	0	1	*10*
4:15 PM	**0**	**0**	**3**	**5**	***8***	**0**	**0**	**0**	**0**	***0***	**6**	**8**	**1**	**0**	*15*
4:30 PM	**0**	**0**	**5**	**4**	***9***	**0**	**0**	**0**	**1**	***1***	**8**	**8**	**0**	**0**	*16*
4:45 PM	**0**	**0**	**3**	**3**	***6***	**0**	**0**	**0**	**1**	***1***	**4**	**3**	**1**	**0**	*8*
5:00 PM	**0**	**0**	**4**	**2**	***6***	**0**	**0**	**0**	**0**	***0***	**5**	**6**	**0**	**1**	***12***
5:15 PM	0	0	3	4	*7*	0	0	2	0	*2*	5	6	0	0	*11*
5:30 PM	0	0	2	5	*7*	0	0	0	3	*3*	3	8	0	0	*11*
5:45 PM	0	0	7	3	*10*	0	0	0	0	*0*	5	2	0	0	*7*
Count Total	0	0	32	28	*60*	0	0	2	6	*8*	39	47	2	2	*90*
Peak Hour	**0**	**0**	**15**	**14**	***29***	**0**	**0**	**0**	**2**	***2***	**23**	**25**	**2**	**1**	***51***

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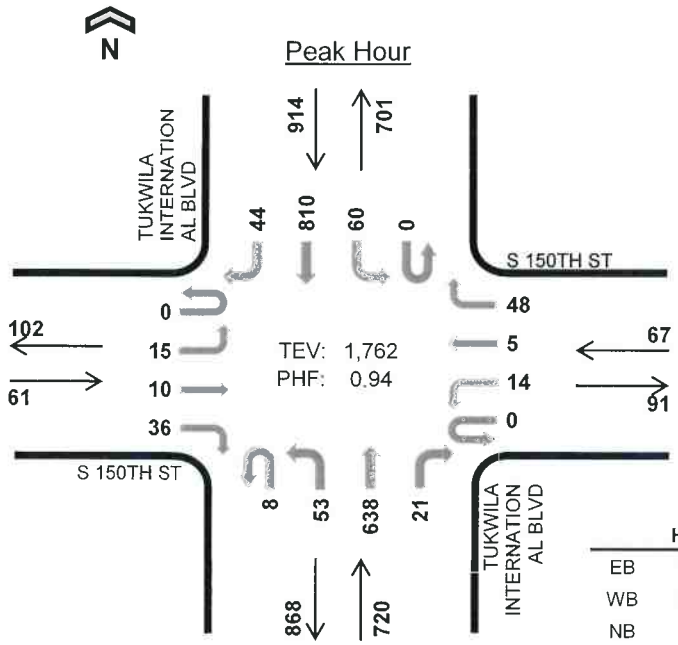
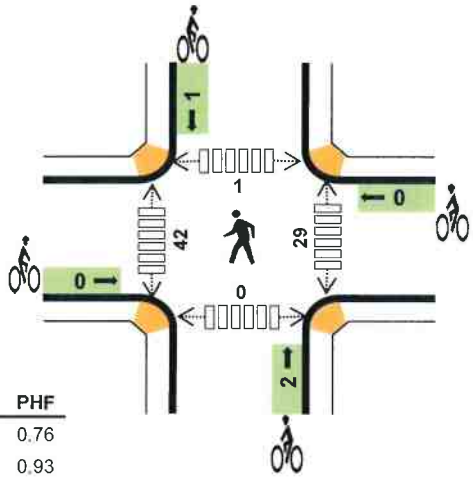
TUKWILA INTERNATIONAL BLVD
S 150TH ST



Date: Thu, May 18, 2017
Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:15 PM to 5:15 PM



	HV %:	PHF
EB	0.0%	0.76
WB	0.0%	0.93
NB	1.7%	0.93
SB	2.1%	0.95
TOTAL	1.8%	0.94

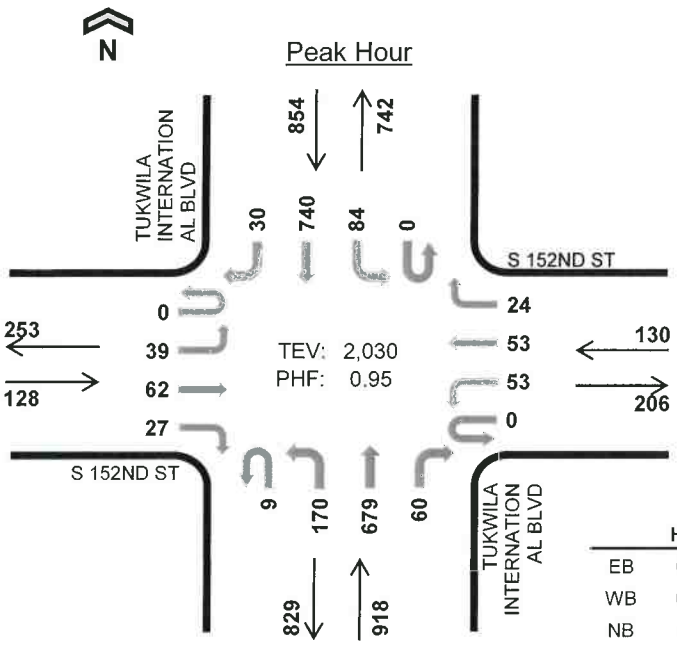
Two-Hour Count Summaries

Interval Start	S 150TH ST Eastbound				S 150TH ST Westbound				TUKWILA INTERNATIONAL BLVD Northbound				TUKWILA INTERNATIONAL BLVD Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	1	1	6	0	3	1	6	1	10	140	4	0	11	208	5	397	0
4:15 PM	**0**	**4**	**4**	**6**	**0**	**3**	**1**	**12**	**1**	**17**	**171**	**4**	**0**	**11**	**197**	**9**	**440**	0
4:30 PM	**0**	**4**	**3**	**8**	**0**	**5**	**2**	**11**	**1**	**13**	**136**	**4**	**0**	**16**	**200**	**12**	**415**	0
4:45 PM	**0**	**2**	**0**	**10**	**0**	**2**	**1**	**13**	**5**	**8**	**162**	**6**	**0**	**14**	**203**	**12**	**438**	1,690
5:00 PM	**0**	**5**	**3**	**12**	**0**	**4**	**1**	**12**	**1**	**15**	**169**	**7**	**0**	**19**	**210**	**11**	**469**	**1,762**
5:15 PM	0	4	4	7	0	3	2	8	1	20	159	7	0	18	179	11	423	1,745
5:30 PM	0	6	1	4	0	2	0	5	4	17	148	3	0	15	183	8	396	1,726
5:45 PM	0	6	3	10	0	6	1	7	2	16	164	2	0	13	155	5	390	1,678
Count Total	0	32	19	63	0	28	9	74	16	116	1,249	37	0	117	1,535	73	3,368	0
Peak Hour	**0**	**15**	**10**	**36**	**0**	**14**	**5**	**48**	**8**	**53**	**638**	**21**	**0**	**60**	**810**	**44**	**1,762**	**0**

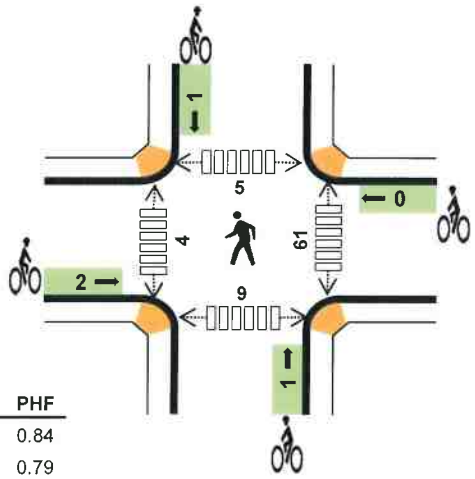
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	0	0	5	1	*6*	0	0	0	1	*1*	19	12	0	0	*31*
4:15 PM	**0**	**0**	**2**	**7**	***9***	**0**	**0**	**0**	**0**	***0***	**7**	**11**	**0**	**0**	*18*
4:30 PM	**0**	**0**	**3**	**2**	***5***	**0**	**0**	**0**	**0**	***0***	**6**	**16**	**0**	**0**	*22*
4:45 PM	**0**	**0**	**3**	**9**	***12***	**0**	**0**	**0**	**1**	***1***	**5**	**7**	**0**	**0**	*12*
5:00 PM	**0**	**0**	**4**	**1**	***5***	**0**	**0**	**2**	**0**	***2***	**11**	**8**	**1**	**0**	***20***
5:15 PM	0	0	2	5	*7*	0	0	1	0	*1*	4	10	0	1	*15*
5:30 PM	0	0	1	6	*7*	1	0	0	2	*3*	5	11	0	0	*16*
5:45 PM	0	0	8	3	*11*	0	0	0	0	*0*	0	12	0	0	*12*
Count Total	0	0	28	34	*62*	1	0	3	4	*8*	57	87	1	1	*146*
Peak Hour	**0**	**0**	**12**	**19**	***31***	**0**	**0**	**2**	**1**	***3***	**29**	**42**	**1**	**0**	**72**

TUKWILA INTERNATIONAL BLVD
S 152ND ST



Date: Thu, May 18, 2017
Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:15 PM to 5:15 PM



	HV %:	PHF
EB	0.0%	0.84
WB	0.8%	0.79
NB	1.5%	0.91
SB	1.9%	0.95
TOTAL	1.5%	0.95

Two-Hour Count Summaries

Interval Start	S 152ND ST Eastbound				S 152ND ST Westbound				TUKWILA INTERNATIONAL BLVD Northbound				TUKWILA INTERNATIONAL BLVD Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	10	20	7	0	11	15	6	1	40	134	10	1	19	184	16	474	0
4:15 PM	**0**	**13**	**16**	**9**	**0**	**10**	**12**	**4**	**2**	**36**	**200**	**14**	**0**	**14**	**181**	**12**	**523**	0
4:30 PM	**0**	**6**	**14**	**1**	**0**	**11**	**12**	**8**	**3**	**41**	**137**	**16**	**0**	**20**	**180**	**5**	**454**	0
4:45 PM	**0**	**11**	**16**	**10**	**0**	**15**	**19**	**7**	**1**	**48**	**165**	**12**	**0**	**21**	**186**	**10**	**521**	1,972
5:00 PM	**0**	**9**	**16**	**7**	**0**	**17**	**10**	**5**	**3**	**45**	**177**	**18**	**0**	**29**	**193**	**3**	**532**	**2,030**
5:15 PM	0	10	11	5	0	17	17	9	3	51	155	7	0	29	164	5	483	1,990
5:30 PM	0	4	7	2	0	12	19	8	2	44	169	8	0	17	161	12	465	2,001
5:45 PM	0	17	11	3	0	7	11	6	1	43	157	14	0	22	146	7	445	1,925
Count Total	0	80	111	44	0	100	115	53	16	348	1,294	99	1	171	1,395	70	3,897	0
Peak Hour	**0**	**39**	**62**	**27**	**0**	**53**	**53**	**24**	**9**	**170**	**679**	**60**	**0**	**84**	**740**	**30**	**2,030**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	0	0	4	1	*5*	0	0	0	0	*0*	11	4	2	6	*23*
4:15 PM	**0**	**0**	**4**	**6**	***10***	**0**	**0**	**1**	**0**	***1***	**22**	**0**	**0**	**1**	*23*
4:30 PM	**0**	**0**	**3**	**2**	***5***	**1**	**0**	**0**	**0**	***1***	**17**	**3**	**4**	**2**	*26*
4:45 PM	**0**	**1**	**3**	**7**	***11***	**0**	**0**	**0**	**1**	***1***	**11**	**1**	**1**	**2**	*15*
5:00 PM	**0**	**0**	**4**	**1**	***5***	**1**	**0**	**0**	**0**	***1***	**11**	**0**	**0**	**4**	***15***
5:15 PM	0	0	2	5	*7*	0	0	1	0	*1*	13	3	3	8	*27*
5:30 PM	0	0	3	4	*7*	0	0	0	0	*0*	19	1	0	4	*24*
5:45 PM	0	0	5	3	*8*	0	0	0	2	*2*	17	1	2	3	*23*
Count Total	0	1	28	29	*58*	2	0	2	3	*7*	121	13	12	30	*176*
Peak Hour	**0**	**1**	**14**	**16**	***31***	**2**	**0**	**1**	**1**	***4***	**61**	**4**	**5**	**9**	***79***

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Appendix B:
Vissim Worksheets

Vissim Post-Processor | **Tukwila International Blvd Road Diet**
Average Results from 20 Runs | **2017 No Build**
Volume and Delay by Movement | **PM Peak Hour**

Intersection 1 **Tukwila International Blvd/S 144th St** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	166	167	101%	69	10	E
	Through	405	415	102%	27	5	C
	Right Turn	63	63	99%	11	4	B
	Subtotal	634	644	102%	36	4	D
SB	Left Turn	92	88	95%	67	11	E
	Through	763	766	100%	37	4	D
	Right Turn	109	107	98%	24	4	C
	Subtotal	964	960	100%	38	3	D
EB	Left Turn	122	126	103%	57	9	E
	Through	146	155	106%	41	7	D
	Right Turn	101	100	99%	26	8	C
	Subtotal	369	380	103%	42	7	D
WB	Left Turn	78	80	103%	62	12	E
	Through	198	197	100%	49	6	D
	Right Turn	39	37	96%	32	9	C
	Subtotal	315	315	100%	50	6	D
Total		2,282	2,300	101%	40	2	D

Intersection 2 **Tukwila International Blvd/S 146th St** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	46	44	96%	7	4	A
	Through	562	570	101%	1	0	A
	Right Turn	39	37	94%	2	2	A
	Subtotal	647	651	101%	1	0	A
SB	Left Turn	116	117	101%	5	1	A
	Through	860	868	101%	2	1	A
	Right Turn	35	32	92%	3	2	A
	Subtotal	1,011	1,018	101%	3	1	A
EB	Left Turn	20	19	96%	21	8	C
	Through	10	9	86%	19	11	C
	Right Turn	50	43	86%	10	1	A
	Subtotal	80	71	89%	14	2	B
WB	Left Turn	34	35	101%	16	3	C
	Through	6	5	90%	15	13	B
	Right Turn	68	67	98%	10	1	A
	Subtotal	108	107	99%	12	1	B
Total		1,846	1,846	100%	3	0	A

Vissim Post-Processor | **Tukwila International Blvd Road Diet**
Average Results from 20 Runs | **2017 No Build**
Volume and Delay by Movement | **PM Peak Hour**

Intersection 3 **Tukwila International Blvd/S 148th St** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	70	76	109%	5	2	A
	Through	591	599	101%	1	0	A
	Right Turn	31	29	92%	2	1	A
	Subtotal	692	704	102%	2	0	A
SB	Left Turn	43	46	107%	4	2	A
	Through	857	855	100%	1	1	A
	Right Turn	20	21	103%	2	1	A
	Subtotal	920	922	100%	1	1	A
EB	Left Turn	12	13	105%	17	12	C
	Through	6	5	82%	10	8	A
	Right Turn	28	25	88%	9	2	A
	Subtotal	46	42	91%	12	4	B
WB	Left Turn	13	11	85%	11	7	B
	Through	1	0	20%	0	0	A
	Right Turn	37	34	91%	10	2	A
	Subtotal	51	45	88%	11	3	B
Total		1,709	1,713	100%	2	0	A

Intersection 4 **Tukwila International Blvd/S 150th St** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	61	64	104%	9	3	A
	Through	638	651	102%	3	1	A
	Right Turn	21	20	96%	3	2	A
	Subtotal	720	735	102%	4	1	A
SB	Left Turn	60	60	100%	6	2	A
	Through	810	799	99%	1	0	A
	Right Turn	44	43	99%	2	1	A
	Subtotal	914	902	99%	1	0	A
EB	Left Turn	15	14	93%	12	8	B
	Through	10	9	85%	14	7	B
	Right Turn	36	34	93%	10	2	B
	Subtotal	61	56	92%	12	2	B
WB	Left Turn	14	16	111%	15	4	B
	Through	5	6	114%	17	17	C
	Right Turn	48	49	103%	10	2	B
	Subtotal	67	70	105%	12	2	B
Total		1,762	1,764	100%	3	0	A

Vissim Post-Processor | **Tukwila International Blvd Road Diet**
Average Results from 20 Runs | **2017 No Build**
Volume and Delay by Movement | **PM Peak Hour**

Intersection 5 **Tukwila International Blvd/S 152nd St** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	179	180	101%	54	4	D
	Through	679	696	103%	22	3	C
	Right Turn	60	59	98%	6	2	A
	Subtotal	918	936	102%	27	2	C
SB	Left Turn	84	79	93%	59	9	E
	Through	740	739	100%	26	4	C
	Right Turn	30	29	97%	26	11	C
	Subtotal	854	846	99%	29	4	C
EB	Left Turn	39	38	98%	43	11	D
	Through	62	69	110%	52	5	D
	Right Turn	27	31	114%	36	12	D
	Subtotal	128	138	108%	45	6	D
WB	Left Turn	53	55	104%	42	11	D
	Through	53	54	101%	45	10	D
	Right Turn	24	24	100%	13	8	B
	Subtotal	130	132	102%	39	7	D
Total		2,030	2,052	101%	30	2	C

Vissim Post-Processor
Average Results from 20 Runs
Volume and Delay by Movement

Tukwila International Blvd Road Diet
2017 Road Diet
PM Peak Hour

Intersection 1 **Tukwila International Blvd/S 144th St** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	166	169	102%	102	18	F
	Through	405	417	103%	42	6	D
	Right Turn	63	61	97%	28	8	C
	Subtotal	634	647	102%	57	9	E
SB	Left Turn	92	72	78%	964	68	F
	Through	763	569	75%	930	51	F
	Right Turn	109	77	70%	932	66	F
	Subtotal	964	718	74%	934	54	F
EB	Left Turn	122	130	106%	54	6	D
	Through	146	148	102%	44	6	D
	Right Turn	101	98	97%	32	8	C
	Subtotal	369	376	102%	44	4	D
WB	Left Turn	78	82	105%	62	7	E
	Through	198	196	99%	47	8	D
	Right Turn	39	35	90%	29	12	C
	Subtotal	315	312	99%	48	8	D
Total		2,282	2,053	90%	361	26	F

Intersection 2 **Tukwila International Blvd/S 146th St** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	46	45	98%	12	8	B
	Through	562	569	101%	7	5	A
	Right Turn	39	38	96%	6	4	A
	Subtotal	647	652	101%	7	5	A
SB	Left Turn	116	92	79%	7	2	A
	Through	860	705	82%	4	1	A
	Right Turn	35	25	73%	4	4	A
	Subtotal	1,011	822	81%	4	1	A
EB	Left Turn	20	19	93%	25	10	D
	Through	10	8	84%	16	8	C
	Right Turn	50	45	91%	17	5	C
	Subtotal	80	72	90%	19	6	C
WB	Left Turn	34	35	103%	21	7	C
	Through	6	5	83%	23	28	C
	Right Turn	68	68	100%	18	8	C
	Subtotal	108	108	100%	20	8	C
Total		1,846	1,654	90%	7	2	A

Vissim Post-Processor | **Tukwila International Blvd Road Diet**
Average Results from 20 Runs | **2017 Road Diet**
Volume and Delay by Movement | **PM Peak Hour**

Intersection 3 **Tukwila International Blvd/S 148th St** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	70	72	103%	9	3	A
	Through	591	600	102%	4	1	A
	Right Turn	31	28	89%	4	1	A
	Subtotal	692	700	101%	4	1	A
SB	Left Turn	43	39	90%	9	3	A
	Through	857	712	83%	3	1	A
	Right Turn	20	17	85%	4	2	A
	Subtotal	920	767	83%	3	1	A
EB	Left Turn	12	13	108%	23	12	C
	Through	6	6	103%	18	17	C
	Right Turn	28	27	95%	15	4	B
	Subtotal	46	46	100%	19	7	C
WB	Left Turn	13	11	84%	20	10	C
	Through	1	0	30%	1	4	A
	Right Turn	37	33	89%	12	2	B
	Subtotal	51	44	87%	13	3	B
Total		1,709	1,557	91%	4	1	A

Intersection 4 **Tukwila International Blvd/S 150th St** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	61	66	107%	15	6	B
	Through	638	645	101%	5	1	A
	Right Turn	21	20	96%	3	3	A
	Subtotal	720	731	102%	5	1	A
SB	Left Turn	60	51	84%	9	4	A
	Through	810	678	84%	9	12	A
	Right Turn	44	35	80%	7	8	A
	Subtotal	914	764	84%	9	12	A
EB	Left Turn	15	12	79%	35	39	D
	Through	10	9	89%	25	22	C
	Right Turn	36	35	98%	53	89	F
	Subtotal	61	56	92%	49	75	E
WB	Left Turn	14	16	114%	23	19	C
	Through	5	5	94%	19	20	C
	Right Turn	48	54	113%	16	5	C
	Subtotal	67	75	112%	19	7	C
Total		1,762	1,626	92%	9	8	A

Vissim Post-Processor | **Tukwila International Blvd Road Diet**
Average Results from 20 Runs | **2017 Road Diet**
Volume and Delay by Movement | **PM Peak Hour**

Intersection 5 **Tukwila International Blvd/S 152nd St** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	179	184	103%	55	5	D
	Through	679	690	102%	32	6	C
	Right Turn	60	61	101%	5	2	A
	Subtotal	918	935	102%	35	4	D
SB	Left Turn	84	71	85%	86	13	F
	Through	740	638	86%	47	11	D
	Right Turn	30	25	83%	48	27	D
	Subtotal	854	734	86%	50	11	D
EB	Left Turn	39	40	102%	48	5	D
	Through	62	67	108%	53	6	D
	Right Turn	27	28	104%	29	12	C
	Subtotal	128	135	105%	47	5	D
WB	Left Turn	53	53	99%	52	8	D
	Through	53	53	101%	40	11	D
	Right Turn	24	26	107%	18	11	B
	Subtotal	130	132	101%	42	6	D
Total		2,030	1,935	95%	42	5	D

Vissim Post-Processor | **Tukwila International Blvd Road Diet**
Average Results from 20 Runs | **2030 No Build**
Volume and Delay by Movement | **PM Peak Hour**

Intersection 1 **Tukwila International Blvd/S 144th St** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	170	166	98%	76	13	E
	Through	570	569	100%	30	5	C
	Right Turn	80	77	96%	17	6	B
	Subtotal	820	812	99%	38	4	D
SB	Left Turn	100	97	97%	77	6	E
	Through	890	899	101%	40	2	D
	Right Turn	110	108	98%	30	6	C
	Subtotal	1,100	1,104	100%	43	3	D
EB	Left Turn	120	123	103%	55	6	E
	Through	170	172	101%	46	10	D
	Right Turn	100	99	99%	33	8	C
	Subtotal	390	394	101%	45	6	D
WB	Left Turn	100	101	101%	72	14	E
	Through	220	221	101%	58	7	E
	Right Turn	60	55	92%	39	14	D
	Subtotal	380	377	99%	59	9	E
Total		2,690	2,687	100%	44	3	D

Intersection 2 **Tukwila International Blvd/S 146th St** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	50	47	95%	10	5	A
	Through	740	731	99%	1	0	A
	Right Turn	40	38	94%	2	1	A
	Subtotal	830	816	98%	2	0	A
SB	Left Turn	120	123	103%	7	2	A
	Through	1,030	1,038	101%	3	1	A
	Right Turn	50	50	100%	4	2	A
	Subtotal	1,200	1,211	101%	3	1	A
EB	Left Turn	30	27	89%	22	7	C
	Through	10	8	82%	18	6	C
	Right Turn	50	45	91%	11	2	B
	Subtotal	90	80	89%	16	3	C
WB	Left Turn	40	38	96%	20	5	C
	Through	10	9	94%	26	18	D
	Right Turn	70	67	96%	11	2	B
	Subtotal	120	115	96%	15	2	B
Total		2,240	2,222	99%	4	0	A

Vissim Post-Processor | **Tukwila International Blvd Road Diet**
Average Results from 20 Runs | **2030 No Build**
Volume and Delay by Movement | **PM Peak Hour**

Intersection 3 **Tukwila International Blvd/S 148th St** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	80	87	108%	6	2	A
	Through	770	762	99%	1	0	A
	Right Turn	40	38	94%	3	1	A
	Subtotal	890	886	100%	2	0	A
SB	Left Turn	40	43	109%	5	2	A
	Through	1,040	1,035	99%	1	0	A
	Right Turn	30	29	96%	2	1	A
	Subtotal	1,110	1,107	100%	1	0	A
EB	Left Turn	10	10	99%	24	10	C
	Through	10	8	81%	19	9	C
	Right Turn	40	41	103%	10	2	B
	Subtotal	60	59	99%	15	3	B
WB	Left Turn	30	27	91%	17	5	C
	Through	10	9	92%	14	6	B
	Right Turn	40	37	91%	11	4	B
	Subtotal	80	73	91%	15	4	B
Total		2,140	2,125	99%	2	0	A

Intersection 4 **Tukwila International Blvd/S 150th St** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	80	82	102%	10	4	B
	Through	820	814	99%	3	1	A
	Right Turn	20	20	100%	4	3	A
	Subtotal	920	916	100%	4	1	A
SB	Left Turn	60	63	104%	4	2	A
	Through	1,000	987	99%	1	0	A
	Right Turn	40	39	98%	2	1	A
	Subtotal	1,100	1,089	99%	1	0	A
EB	Left Turn	20	18	89%	22	10	C
	Through	10	10	102%	26	13	D
	Right Turn	40	35	88%	13	5	B
	Subtotal	70	63	90%	17	6	C
WB	Left Turn	10	10	102%	21	12	C
	Through	10	10	95%	22	17	C
	Right Turn	50	53	106%	10	2	B
	Subtotal	70	73	104%	13	2	B
Total		2,160	2,141	99%	3	0	A

Vissim Post-Processor | **Tukwila International Blvd Road Diet**
Average Results from 20 Runs | **2030 No Build**
Volume and Delay by Movement | **PM Peak Hour**

Intersection 5 **Tukwila International Blvd/S 152nd St** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	240	246	103%	70	12	E
	Through	850	841	99%	24	3	C
	Right Turn	70	70	101%	7	3	A
	Subtotal	1,160	1,158	100%	33	3	C
SB	Left Turn	90	89	99%	68	12	E
	Through	910	899	99%	34	3	C
	Right Turn	40	38	94%	31	12	C
	Subtotal	1,040	1,026	99%	37	4	D
EB	Left Turn	60	62	104%	50	10	D
	Through	70	75	108%	50	8	D
	Right Turn	30	34	112%	33	17	C
	Subtotal	160	171	107%	47	8	D
WB	Left Turn	70	68	97%	50	5	D
	Through	60	62	103%	48	8	D
	Right Turn	30	30	100%	14	5	B
	Subtotal	160	160	100%	44	4	D
Total		2,520	2,514	100%	36	3	D

Vissim Post-Processor | **Tukwila International Blvd Road Diet**
Average Results from 20 Runs | **2030 Road Diet**
Volume and Delay by Movement | **PM Peak Hour**

Intersection 1 **Tukwila International Blvd/S 144th St** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	170	161	95%	118	15	F
	Through	570	549	96%	58	11	E
	Right Turn	80	76	96%	40	7	D
	Subtotal	820	786	96%	68	11	E
SB	Left Turn	100	63	63%	1081	97	F
	Through	890	559	63%	1046	98	F
	Right Turn	110	67	61%	1026	95	F
	Subtotal	1,100	689	63%	1047	98	F
EB	Left Turn	120	117	98%	66	25	E
	Through	170	167	98%	80	49	E
	Right Turn	100	99	99%	68	55	E
	Subtotal	390	383	98%	71	40	E
WB	Left Turn	100	102	102%	65	14	E
	Through	220	221	100%	52	4	D
	Right Turn	60	53	89%	34	8	C
	Subtotal	380	375	99%	54	5	D
Total		2,690	2,233	83%	362	27	F

Intersection 2 **Tukwila International Blvd/S 146th St** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	50	48	96%	26	14	D
	Through	740	711	96%	26	19	D
	Right Turn	40	37	92%	24	16	C
	Subtotal	830	796	96%	26	18	D
SB	Left Turn	120	84	70%	41	25	E
	Through	1,030	746	72%	46	32	E
	Right Turn	50	33	66%	46	50	E
	Subtotal	1,200	863	72%	45	32	E
EB	Left Turn	30	25	82%	312	329	F
	Through	10	7	74%	241	338	F
	Right Turn	50	42	84%	380	369	F
	Subtotal	90	74	82%	344	342	F
WB	Left Turn	40	35	88%	208	164	F
	Through	10	9	86%	138	158	F
	Right Turn	70	60	86%	206	156	F
	Subtotal	120	104	86%	205	160	F
Total		2,240	1,836	82%	57	16	F

Vissim Post-Processor | **Tukwila International Blvd Road Diet**
Average Results from 20 Runs | **2030 Road Diet**
Volume and Delay by Movement | **PM Peak Hour**

Intersection 3 **Tukwila International Blvd/S 148th St** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	80	78	97%	16	9	C
	Through	770	750	97%	9	12	A
	Right Turn	40	38	95%	10	13	A
	Subtotal	890	866	97%	10	12	A
SB	Left Turn	40	29	73%	44	20	E
	Through	1,040	760	73%	55	20	F
	Right Turn	30	21	71%	43	21	E
	Subtotal	1,110	811	73%	54	20	F
EB	Left Turn	10	6	59%	605	678	F
	Through	10	8	77%	556	625	F
	Right Turn	40	28	70%	958	662	F
	Subtotal	60	41	69%	925	666	F
WB	Left Turn	30	26	85%	57	13	F
	Through	10	10	96%	45	36	E
	Right Turn	40	36	90%	46	57	E
	Subtotal	80	71	89%	51	36	F
Total		2,140	1,789	84%	48	14	E

Intersection 4 **Tukwila International Blvd/S 150th St** **Side-street Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	80	78	97%	28	9	D
	Through	820	794	97%	6	2	A
	Right Turn	20	21	105%	4	3	A
	Subtotal	920	892	97%	8	2	A
SB	Left Turn	60	47	78%	40	10	E
	Through	1,000	730	73%	64	10	F
	Right Turn	40	28	70%	59	13	F
	Subtotal	1,100	804	73%	62	10	F
EB	Left Turn	20	16	78%	746	504	F
	Through	10	8	75%	911	554	F
	Right Turn	40	27	67%	1052	563	F
	Subtotal	70	50	71%	974	562	F
WB	Left Turn	10	11	112%	68	49	F
	Through	10	9	92%	48	49	E
	Right Turn	50	56	113%	31	17	D
	Subtotal	70	77	110%	41	23	E
Total		2,160	1,823	84%	58	16	F

Vissim Post-Processor | **Tukwila International Blvd Road Diet**
Average Results from 20 Runs | **2030 Road Diet**
Volume and Delay by Movement | **PM Peak Hour**

Intersection 5 **Tukwila International Blvd/S 152nd St** **Signal**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	240	227	94%	106	15	F
	Through	850	801	94%	81	18	F
	Right Turn	70	65	93%	64	21	E
	Subtotal	1,160	1,093	94%	85	15	F
SB	Left Turn	90	68	75%	102	18	F
	Through	910	660	72%	69	8	E
	Right Turn	40	29	72%	74	24	E
	Subtotal	1,040	756	73%	72	8	E
EB	Left Turn	60	61	101%	49	12	D
	Through	70	73	104%	52	7	D
	Right Turn	30	31	103%	31	9	C
	Subtotal	160	164	103%	48	8	D
WB	Left Turn	70	72	103%	57	9	E
	Through	60	61	101%	50	7	D
	Right Turn	30	33	109%	24	8	C
	Subtotal	160	165	103%	49	7	D
Total		2,520	2,178	86%	75	6	E

Attachment C

CITY OF TUKWILA - DEPARTMENT OF PUBLIC WORKS
Tukwila International Blvd Road Diet - S 152nd St to S 114th St
Option 1 - Road Diet with New RRFB Pedestrian Crossings at Mid-Block Medians
Preliminary Budget Estimate - November 2017

3 travel lanes with bike lanes and on-street parking
3 new midblock RRFB's at existing median locations
All new ramps are ADA compliant
Excludes ADA upgrades of existing ramps and PPB's throughout project limits

KPG

No.	Section No.	Item	Quantity	Unit	Unit Cost	Total Cost
ROADWAY						
1	1-04	Unexpected Site Changes	1	FA	$ 25,000.00	$ 25,000.00
2	1-07	Resolution of Utility Conflicts	1	FA	$ 10,000.00	$ 10,000.00
3	1-07	SPCC Plan	1	LS	$ 500.00	$ 500.00
4	1-09	Mobilization	1	LS	$ 70,000.00	$ 70,000.00
5	1-10	Project Temporary Traffic Control	1	LS	$ 50,000.00	$ 50,000.00
6	2-02	Removal of Structure and Obstruction	1	LS	$ 7,500.00	$ 7,500.00
7	2-03	Roadway Excavation Incl. Haul	1,100	SY	$ 25.00	$ 27,500.00
8	5-04	HMA Cl. 1/2" PG 64-22	150	TON	$ 200.00	$ 30,000.00
9	8-01	Erosion/Water Pollution Control	1	LS	$ 15,000.00	$ 15,000.00
10	8-04	Cement Conc. Traffic Curb and Gutter	600	LF	$ 40.00	$ 24,000.00
SIDEWALK						
11	8-14	Cement Conc. Sidewalk/Curb Ramp	900	SY	$ 75.00	$ 67,500.00
STORM SEWER						
12	7-05	Drainage modifications for bumpouts	8	EA	$ 5,000.00	$ 40,000.00
TRAFFIC CONTROL DEVICES						
13	8-09	Raised Pavement Marker Type 1	19	HUND	$ 400.00	$ 7,600.00
14	8-09	Raised Pavement Marker Type 2	14	HUND	$ 500.00	$ 7,000.00
15	8-20	Rapid Flash Rectangular Beacon (RRFB)	3	EA	$ 35,000.00	$ 105,000.00
16	8-20	Illumination Modifications	1	LS	$ 45,000.00	$ 45,000.00
17	8-20	Permanent Signing	1	LS	$ 10,000.00	$ 10,000.00
18	8-20	Signal Modifications	2	EA	$ 20,000.00	$ 40,000.00
19	8-22	Remove Pavement Markings	5,000	LF	$ 5.00	$ 25,000.00
20	8-22	Plastic Traffic Arrow	58	EA	$ 250.00	$ 14,500.00
21	8-22	Plastic Bike Sybmol	33	EA	$ 400.00	$ 13,200.00
22	8-22	Plastic Crosswalk Line	750	SF	$ 10.00	$ 7,500.00
23	8-22	Plastic Stop Line	400	LF	$ 20.00	$ 8,000.00
24	8-22	Wide Plastic Line	350	LF	$ 4.00	$ 1,400.00
25	8-22	Plastic Line, 4 Inch	16,000	LF	$ 1.00	$ 16,000.00
ROADSIDE DEVELOPMENT						
26	8-02	Median modifications	3	EA	$ 10,000.00	$ 30,000.00
27	8-02	Property Restoration	1	FA	$ 10,000.00	$ 10,000.00

Subtotal	$	710,000
Contingency (20%)	$	150,000
Total Estimated Construction Cost	**$**	**860,000**
Survey and Mapping	$	20,000
Public Outreach	$	15,000
Prepare Plans, Specs & Estimate	$	100,000
Permitting	$	5,000
Total Estimated Design Cost	**$**	**140,000**
Right of Way	**$**	**-**
Construction Management & Inspection	**$**	**130,000**
SCHEDULE A TOTAL ESTIMATED CONSTRUCTION COST	**$**	**1,130,000**

CITY OF TUKWILA - DEPARTMENT OF PUBLIC WORKS

Tukwila International Blvd Road Diet - S 152nd St to S 114th St

Option 2 - Road Diet only - no new pedestrian crossings

Preliminary Budget Estimate - November 2017

3 travel lanes with bike lanes and on-street parking

No new pedestrian crossings

No new curb ramps

Excludes ADA upgrades of existing ramps and PPB's throughout project limits

KPG

No.	Section No.	Item	Quantity	Unit	Unit Cost	Total Cost
ROADWAY						
1	1-04	Unexpected Site Changes	1	FA	$ 10,000.00	$ 10,000.00
2	1-07	Resolution of Utility Conflicts	1	FA	$ 5,000.00	$ 5,000.00
3	1-07	SPCC Plan	1	LS	$ 500.00	$ 500.00
4	1-09	Mobilization	1	LS	$ 25,000.00	$ 25,000.00
5	1-10	Project Temporary Traffic Control	1	LS	$ 30,000.00	$ 30,000.00
6	2-02	Removal of Structure and Obstruction	1	LS	$ 5,000.00	$ 5,000.00
7	2-03	Roadway Excavation Incl. Haul	0	SY	$ 25.00	$ -
8	5-04	HMA Cl. 1/2" PG 64-22	0	TON	$ 200.00	$ -
9	8-01	Erosion/Water Pollution Control	1	LS	$ 5,000.00	$ 5,000.00
10	8-04	Cement Conc. Traffic Curb and Gutter	0	LF	$ 40.00	$ -
SIDEWALK						
11	8-14	Cement Conc. Sidewalk/Curb Ramp	0	SY	$ 75.00	$ -
STORM SEWER						
12	7-05	Drainage modifications for bumpouts	0	EA	$ 5,000.00	$ -
TRAFFIC CONTROL DEVICES						
13	8-09	Raised Pavement Marker Type 1	19	HUND	$ 400.00	$ 7,600.00
14	8-09	Raised Pavement Marker Type 2	14	HUND	$ 500.00	$ 7,000.00
15	8-20	Rapid Flash Rectangular Beacon (RRFB)	0	EA	$ 35,000.00	$ -
16	8-20	Illumination Modifications	0	LS	$ 45,000.00	$ -
17	8-20	Permanent Signing	1	LS	$ 10,000.00	$ 10,000.00
18	8-20	Signal Modifications	2	EA	$ 20,000.00	$ 40,000.00
19	8-22	Remove Pavement Markings	5,000	LF	$ 5.00	$ 25,000.00
20	8-22	Plastic Traffic Arrow	58	EA	$ 250.00	$ 14,500.00
21	8-22	Plastic Bike Sybmol	33	EA	$ 400.00	$ 13,200.00
22	8-22	Plastic Crosswalk Line	750	SF	$ 10.00	$ 7,500.00
23	8-22	Plastic Stop Line	400	LF	$ 20.00	$ 8,000.00
24	8-22	Wide Plastic Line	350	LF	$ 4.00	$ 1,400.00
25	8-22	Plastic Line, 4 Inch	16,000	LF	$ 1.00	$ 16,000.00
ROADSIDE DEVELOPMENT						
26	8-02	Median modifications	0	EA	$ 10,000.00	$ -
27	8-02	Property Restoration	1	FA	$ 5,000.00	$ 5,000.00

Subtotal	$	240,000
Contingency (20%)	$	50,000
Total Estimated Construction Cost	**$**	**290,000**
Survey and Mapping	$	10,000
Public Outreach	$	15,000
Prepare Plans, Specs & Estimate	$	30,000
Permitting	$	5,000
Total Estimated Design Cost	**$**	**60,000**
Right of Way	**$**	**-**
Construction Management & Inspection	**$**	**50,000**
SCHEDULE A TOTAL ESTIMATED CONSTRUCTION COST	**$**	**400,000**

CITY OF TUKWILA - DEPARTMENT OF PUBLIC WORKS

Tukwila International Blvd Road Diet - S 152nd St to S 114th St

Option 3 - Road Diet with RRFB Pedestrian Crossings at Intersections

Preliminary Budget Estimate - November 2017

3 travel lanes with bike lanes and on-street parking

3 new RRFB's at 146th, 148th, 150th

All new ramps are ADA compliant

Excludes ADA upgrades of existing ramps and PPB's throughout project limits

No.	Section No.	Item	Quantity	Unit	Unit Cost	Total Cost
ROADWAY						
1	1-04	Unexpected Site Changes	1	FA	$ 25,000.00	$ 50,000.00
2	1-07	Resolution of Utility Conflicts	1	FA	$ 10,000.00	$ 10,000.00
3	1-07	SPCC Plan	1	LS	$ 500.00	$ 500.00
4	1-09	Mobilization	1	LS	$ 75,000.00	$ 75,000.00
5	1-10	Project Temporary Traffic Control	1	LS	$ 50,000.00	$ 50,000.00
6	2-02	Removal of Structure and Obstruction	1	LS	$ 7,500.00	$ 7,500.00
7	2-03	Roadway Excavation Incl. Haul	1,900	SY	$ 25.00	$ 47,500.00
8	5-04	HMA Cl. 1/2" PG 64-22	150	TON	$ 200.00	$ 30,000.00
9	8-01	Erosion/Water Pollution Control	1	LS	$ 15,000.00	$ 15,000.00
10	8-04	Cement Conc. Traffic Curb and Gutter	900	LF	$ 40.00	$ 36,000.00
SIDEWALK						
11	8-14	Cement Conc. Sidewalk/Curb Ramp	1,300	SY	$ 75.00	$ 97,500.00
STORM SEWER						
12	7-05	Drainage modifications for bumpouts	8	EA	$ 5,000.00	$ 40,000.00
TRAFFIC CONTROL DEVICES						
13	8-09	Raised Pavement Marker Type 1	19	HUND	$ 400.00	$ 7,600.00
14	8-09	Raised Pavement Marker Type 2	14	HUND	$ 500.00	$ 7,000.00
15	8-20	Rapid Flash Rectangular Beacon (RRFB)	3	EA	$ 35,000.00	$ 105,000.00
16	8-20	Illumination Modifications	1	LS	$ 40,000.00	$ 40,000.00
17	8-20	Permanent Signing	1	LS	$ 10,000.00	$ 10,000.00
18	8-20	Signal Modifications	2	EA	$ 20,000.00	$ 40,000.00
19	8-22	Remove Pavement Markings	5,000	LF	$ 5.00	$ 25,000.00
20	8-22	Plastic Traffic Arrow	58	EA	$ 250.00	$ 14,500.00
21	8-22	Plastic Bike Sybmol	33	EA	$ 400.00	$ 13,200.00
22	8-22	Plastic Crosswalk Line	750	SF	$ 10.00	$ 7,500.00
23	8-22	Plastic Stop Line	400	LF	$ 20.00	$ 8,000.00
24	8-22	Wide Plastic Line	350	LF	$ 4.00	$ 1,400.00
25	8-22	Plastic Line, 4 Inch	16,000	LF	$ 1.00	$ 16,000.00
ROADSIDE DEVELOPMENT						
26	8-02	Median modifications	0	EA	$ 10,000.00	$ -
27	8-02	Property Restoration	1	FA	$ 20,000.00	$ 20,000.00
					Subtotal	$ 780,000
					Contingency (20%)	$ 160,000
					Total Estimated Construction Cost	**$ 940,000**
					Survey and Mapping	$ 20,000
					Public Outreach	$ 15,000
					Prepare Plans, Specs & Estimate	$ 140,000
					Permitting	$ 5,000
					Total Estimated Design Cost	**$ 180,000**
					Right of Way	**$ -**
					Construction Management & Inspection	**$ 150,000**
					SCHEDULE A TOTAL ESTIMATED CONSTRUCTION COST	**$ 1,270,000**