

**City of Bellevue Neighborhood Congestion Reduction Program  
148<sup>th</sup> Avenue NE and Main Street Transportation Analysis Report  
Contract Number 1850211.000  
August 2019**

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The engineering material and data contained in this report were prepared under the supervision and direction of the undersigned, whose seal as registered professional engineer is affixed below.



8/13/19

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**To:** Jun Suk An, PE, City of Bellevue  
**Cc:** Darcy Akers, City of Bellevue  
**From:** Jeremy Wheeler, PE, Concord Engineering  
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**Subject:** 148<sup>th</sup> Avenue SE and Main Street Intersection Spot Improvements

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## 1. Introduction

In November 2016, voters passed the Neighborhood Safety, Connectivity and Congestion Levy. This levy supplements existing safety, sidewalk, maintenance, intelligent transportation systems (ITS) and bicycle facilities programs, helping the City to address a backlog of important projects. It also supports a new Neighborhood Congestion Reduction program to focus on reducing motor vehicle congestion, making it easier for residents to travel to and from their neighborhoods. Levy funding pays for the planning, public outreach, design, and construction associated with selected projects.

This study seeks to identify alternatives to mitigate traffic congestion, delay, and queueing issues at the intersection of 148<sup>th</sup> Avenue NE and Main Street. At the conclusion of this study, the City will compare the costs and benefits of this study with other Neighborhood Congestion Reduction studies to determine which projects will move forward to design and construction.

This report presents the traffic analysis performed for the intersection of 148<sup>th</sup> Avenue SE and Main Street as well as two driveways that are part of the Kelsey Creek Shopping Center as shown in Figure 1. This intersection currently experiences significant congestion and queueing issues, especially for the southbound left turn movements during the PM peak hour. Field observations indicated that this movement had a large portion of vehicles entering the Kelsey Creek Shopping Center which would cause the queue spilling back from the driveway due to the tight turn radius at the driveway entrance. This study aims to identify solutions to improve traffic operation at the study intersection by mitigating access issues at the primary shopping center driveways.

This report starts with a brief introduction of the project background, followed by a description of the methods and assumptions that guide the traffic analysis. The report then provides a summary of the traffic analysis results for existing and baseline analysis. Following the baseline conditions analysis, two (2) alternatives were proposed and analyzed in the Alternatives Analysis section. The report concludes with a recommendation of proposed improvements to enhance traffic operations and safety at this study area, and closes with a summary of construction challenges and risks associated with the improvements.

Additionally, the City initiated public outreach for the spot improvement study by circulating a flyer to the local community in April 2019. The City also published a post on a social networking platform,

targeted at the neighborhood to provide information on the City preferred alternatives. A summary of the public comments and general City responses are provided in the appendices of this report.



**Figure 1. Study Area**

## 2. Methods and Assumptions

### 2.1 Analysis Scenarios

The traffic operations analysis includes the following scenarios:

- 2018 existing condition AM peak (7:45 AM to 8:45 AM) and PM peak (5:00 PM to 6:00 PM)
- 2035 baseline (no-build) condition AM peak and PM peak
- 2035 alternative conditions AM peak and PM peak (two alternatives)

## 2.2 Traffic Volumes

Traffic volumes for the existing conditions were collected on October 16, 2018, for both AM and PM peak periods. The City of Bellevue has developed the future year 2035 baseline traffic volumes using the Bellevue-Kirkland-Redmond (BKR) travel demand model with post-processing.

## 2.3 Modeling Tools

Synchro 10 software was used to perform the traffic operations analysis.

## 2.4 Signal Timing

Because cycle length and splits vary dynamically throughout the peak hours under the adaptive traffic control system (SCATS), historical averages of the splits from SCATS were used. The analysis performed in this study used historical SCATS average data collected on October 16<sup>th</sup>, 2018 (the detailed signal timing information is included in Appendix A of this report). Signal timing in the alternative models were optimized in order to maximize the reduction of overall intersection delay with the modified channelization.

## 2.5 Measures of Effectiveness (MOE)

Performance metrics to assess traffic conditions included:

- Average intersection delay (reported in seconds)
- Intersection level of service (LOS)

## 2.6 Design Standards and Considerations

Design of recommended improvements adheres to City, State, AASHTO, and other local applicable design standards and guidelines. The level of design for concepts is suitable for inclusion in the City's Transportation Improvement Program or Transportation Facilities Plan with planning level cost estimates, which capture inflation, contingencies, and other cost variability. The key design criteria can be found in Appendix B of this report.

# 3. Existing Conditions Analysis

## 3.1 Traffic Volumes

The AM and PM peak hour turning movement volumes for the existing 2018 conditions are shown in Figure 2. The complete two-hour traffic counts are included in Appendix C of this report.



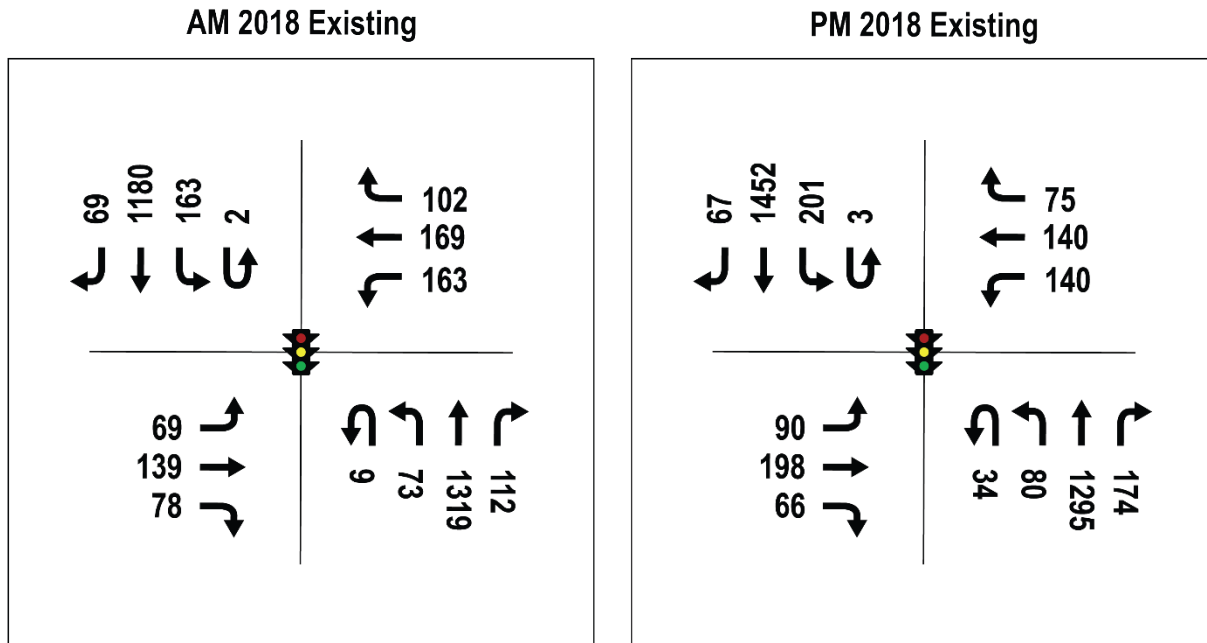


Figure 2. 2018 Existing AM & PM Peak Hour Turning Movement Volumes

### 3.2 Traffic Operations Analysis

The existing AM and PM peak hour delay and LOS Synchro results are shown in Table 1 where movements that experience LOS E or F are highlighted.

During the AM peak hour, the intersection operates at LOS D with an average control delay of 39 seconds. The movements that operate at LOS E are the eastbound through and right turn, westbound left turn, through and right turn, as well as northbound left turn movements. The southbound left turn movement operates at LOS F.

During the PM peak hour, the intersection operates at LOS C with an average control delay of 34 seconds. The movements that operate at LOS E or F are the same as that of the AM peak except for the eastbound through and right turn movements which operate at LOS F instead of LOS E.

The study intersection (148<sup>th</sup> Avenue SE & Main Street) is within the City of Bellevue Mobility Management Area (MMA) 9: East Bellevue. The MMA threshold for this area is 0.85 volume-to-capacity (V/C) ratio and a congestion allowance of 5. The congestion allowance is the maximum number of intersections within the MMA that are allowed to exceed the V/C ratio. The study intersection currently operates with V/C ratios of 0.85 and 0.82 in the AM and PM peak hours, respectively; therefore, the intersection currently performs within the MMA threshold.

**Table 1. Existing AM and PM Peak Hour Delay & LOS**

Scenario		Intersection	Eastbound			Westbound			Northbound			Southbound		
			L	T	R	L	T	R	L	T	R	L	T	R
<b>2018 Ex AM</b>	Delay*	39	42	75	56	73	67	38	3	90	19	1		
	LOS	D	D	E	E	E	E	D	A	F	B	A		
<b>2018 Ex PM</b>	Delay*	34	43	84	58	66	72	23	2	116	16	1		
	LOS	C	D	F	E	E	E	C	A	F	B	A		

\*The unit for Vehicle Delay is second/vehicle.

### 3.3 Collision Analysis

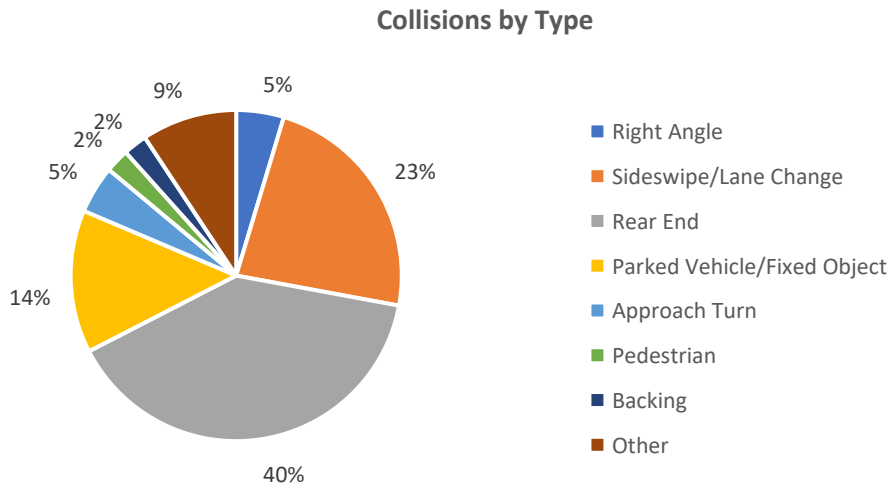
This collision analysis includes an evaluation of five-years of historical collision data collected from January 2014 to December 2018. The analysis area includes the study intersection and roadway segments on 148<sup>th</sup> Avenue SE and Main Street (shopping center property frontage) that are within 1,000 feet of the intersection.

#### 3.3.1 148<sup>th</sup> Avenue SE and Main Street Intersection

A total of 43 collisions were reported during the five-year period in the vicinity of the 148<sup>th</sup> Avenue SE and Main Street intersection. Table 2 and Figure 3 provide a summary of collisions by type. As noted, the two most frequent types of collisions reported were rear ends (40%) and sideswipe/lane change (23%). Table 3 and Figure 4 summarize the collision data by severity. The majority of collisions resulted in no injury (79%), a single collision resulted in a non-disabling injury and the remaining collisions resulted in possible injuries. There is one reported collision involving a pedestrian, which resulted in possible injury. That collision occurred in the south leg crosswalk where a pedestrian was struck by an eastbound right turning vehicle.

**Table 2. Collision Type Summary**

Collision Type	2014	2015	2016	2017	2018	Total
Right Angle	1	1				2
Sideswipe/Lane Change	1	2	1	2	4	10
Rear End	4	5	3	2	3	17
Parked Vehicle/Fixed Object		1	1	1	3	6
Approach Turn			1		1	2
Pedestrian		1				1
Backing			1			1
Other	1			1	2	4
<b>Total</b>	<b>7</b>	<b>10</b>	<b>7</b>	<b>6</b>	<b>13</b>	<b>43</b>

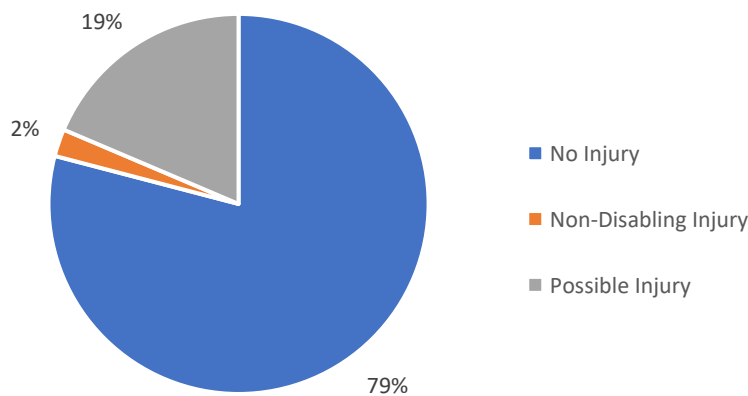


**Figure 3. Summary by Collision Type**

**Table 3. Collision Severity Summary**

Collision Severity	2014	2015	2016	2017	2018	Total
No Injury	3	6	7	6	12	<b>34</b>
Non-Disabling Injury					1	<b>1</b>
Possible Injury	4	4				<b>8</b>
<b>Total</b>	<b>7</b>	<b>10</b>	<b>7</b>	<b>6</b>	<b>13</b>	<b>43</b>

**Collisions by Severity**



**Figure 4. Summary by Collision Severity**

Table 4 provides a summary of the collisions by vehicle movement. The southbound approach had the highest frequency of reported collisions (21 out of 43 collisions). Furthermore, nearly two thirds of collisions involved a right turning vehicle (28 out of 43).

**Table 4. Collisions by Vehicle Movement**

Direction	Left Turn	Through	Right Turn	Total
Eastbound	1	2	2	5
Westbound	0	1	2	3
Southbound	1	7	13	21
Northbound	2	0	11	13
<b>Total</b>	<b>4</b>	<b>10</b>	<b>28</b>	<b>43</b>

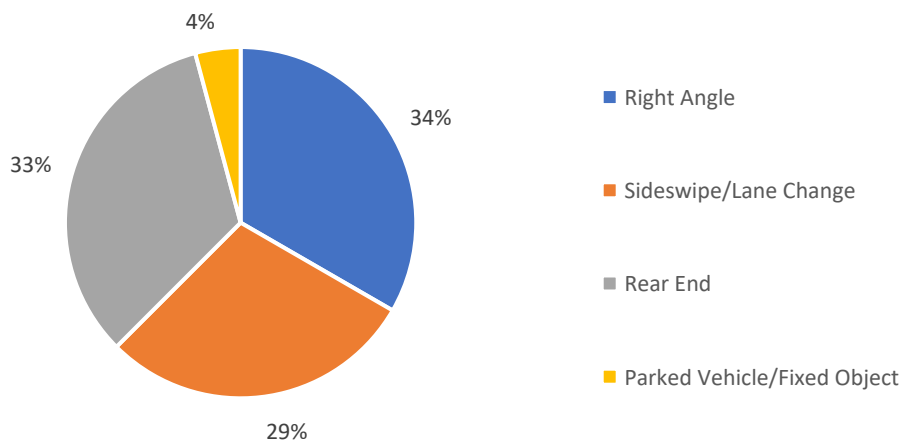
**3.3.2 148<sup>th</sup> Avenue SE Roadway Segment (1,000 feet south of Main Street)**

A total of 24 collisions were reported during the five-year period. Table 5 and Figure 5 provide summaries of the collisions by type. As noted, the two most frequent types of collisions reported were right-angles (33%) and rear ends (33%). Table 6 and Figure 6 provide summaries of the collisions by severity. The majority of collisions resulted in no injury (92%) with 4% of collisions resulting in non-disabling injuries and another 4% resulting in possible injuries. There were no reported collisions involving a pedestrian or bicyclist.

**Table 5. Collision Type Summary**

Collision Type	2014	2015	2016	2017	2018	Total
Right Angle	1		4	2	1	8
Sideswipe/Lane Change	2	2	3			7
Rear End	4	1	1	1	1	8
Parked Vehicle/Fixed Object			1			1
<b>Total</b>	<b>7</b>	<b>3</b>	<b>9</b>	<b>3</b>	<b>2</b>	<b>24</b>

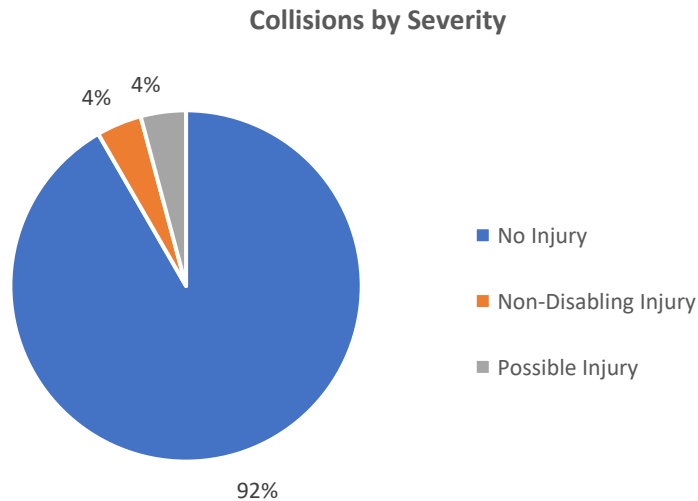
**Collisions by Type**



**Figure 5. Summary by Collision Type**

**Table 6. Collision Severity Summary**

Collision Severity	2014	2015	2016	2017	2018	Total
No Injury	7	3	7	3	2	22
Non-Disabling Injury			1			1
Possible Injury			1			1
<b>Total</b>	<b>7</b>	<b>3</b>	<b>9</b>	<b>3</b>	<b>2</b>	<b>24</b>



**Figure 6. Summary by Collision Severity**

Table 7 provides a summary of the collisions by vehicle movement. The northbound approach had the highest frequency of reported collisions (14 out of 24 collisions). Furthermore, almost all reported collisions involved a though vehicle (23 out of 24).

**Table 7. Collisions by Vehicle Movement**

Direction	Left Turn	Through	Right Turn	Subtotal
Eastbound	0	0	0	<b>0</b>
Westbound	0	7	1	<b>8</b>
Northbound	0	14	0	<b>14</b>
Southbound	0	2	0	<b>2</b>
<b>Total</b>	<b>0</b>	<b>23</b>	<b>1</b>	<b>24</b>

### 3.3.3 Midblock Segment on Main Street between 148<sup>th</sup> Avenue SE and 150<sup>th</sup> Place NE

A total of 22 collisions were reported during the five-year period. Table 8 and Figure 7 provide a summary of collisions by type. As noted, the two most frequent types of collisions reported were right-angles (64%) and rear ends (27%). 10 out of 14 right angle collisions involved a vehicle exiting from the north driveway. Table 9 and Figure 8 summarize the collision data by severity. The majority of collisions resulted in no injury (77%) and a single collision resulting in a non-disabling injury. The remaining collisions resulted in possible injuries. There was no reported collision involving a pedestrian or bicyclist.

**Table 8. Collision Type Summary**

Collision Type	2014	2015	2016	2017	2018	Total
Right Angle	4	4		4	2	<b>14</b>
Sideswipe/Lane Change	1	1				<b>2</b>
Rear End	2	2		1	1	<b>6</b>
<b>Total</b>	<b>7</b>	<b>7</b>	<b>0</b>	<b>5</b>	<b>3</b>	<b>22</b>



Collisions by Type

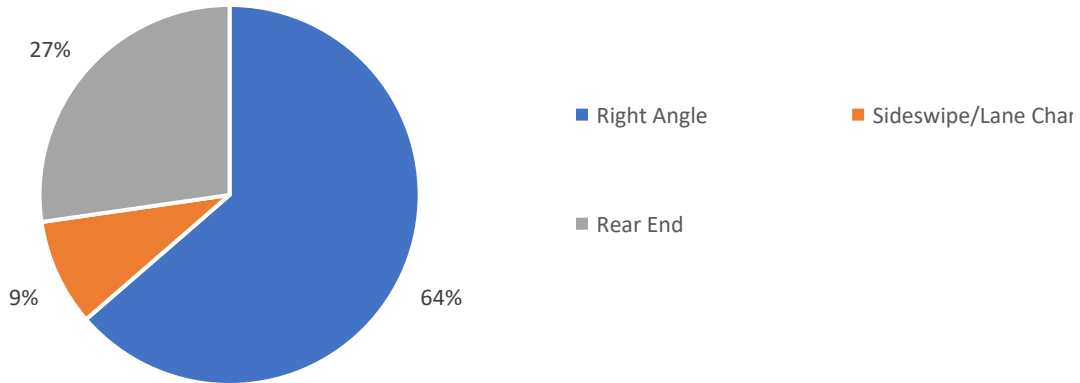


Figure 7. Summary by Collision Type

Table 9. Collision Severity Summary

Collision Severity	2014	2015	2016	2017	2018	Total
No Injury	6	5		3	3	17
Non-Disabling Injury	1					1
Possible Injury		2		2		4
<b>Total</b>	<b>7</b>	<b>7</b>	<b>0</b>	<b>5</b>	<b>3</b>	<b>22</b>

Collisions by Severity

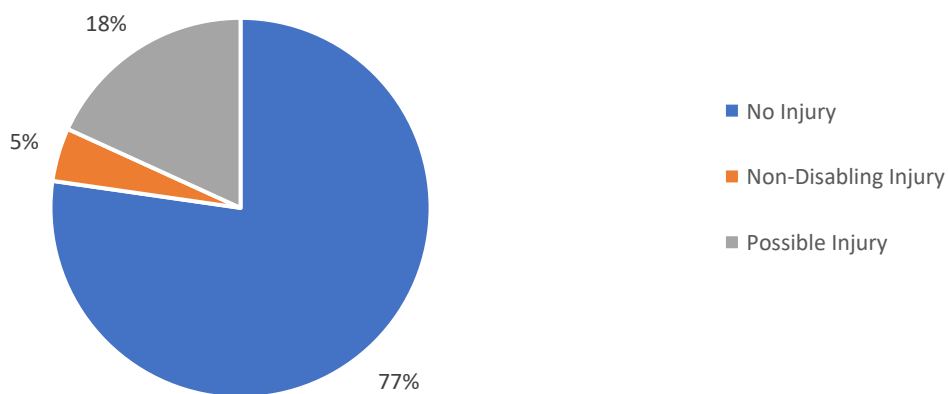


Figure 8. Summary by Collision Severity

Table 10 provides a summary of the collisions by vehicle movement. The northbound direction had the highest frequency of reported collisions (10 out of 22 collisions), which are most likely involved vehicles existing from the Kelsey Creek shopping center driveway on Main Street. Furthermore, almost all reported collisions involved a through movement vehicle (20 out of 22).

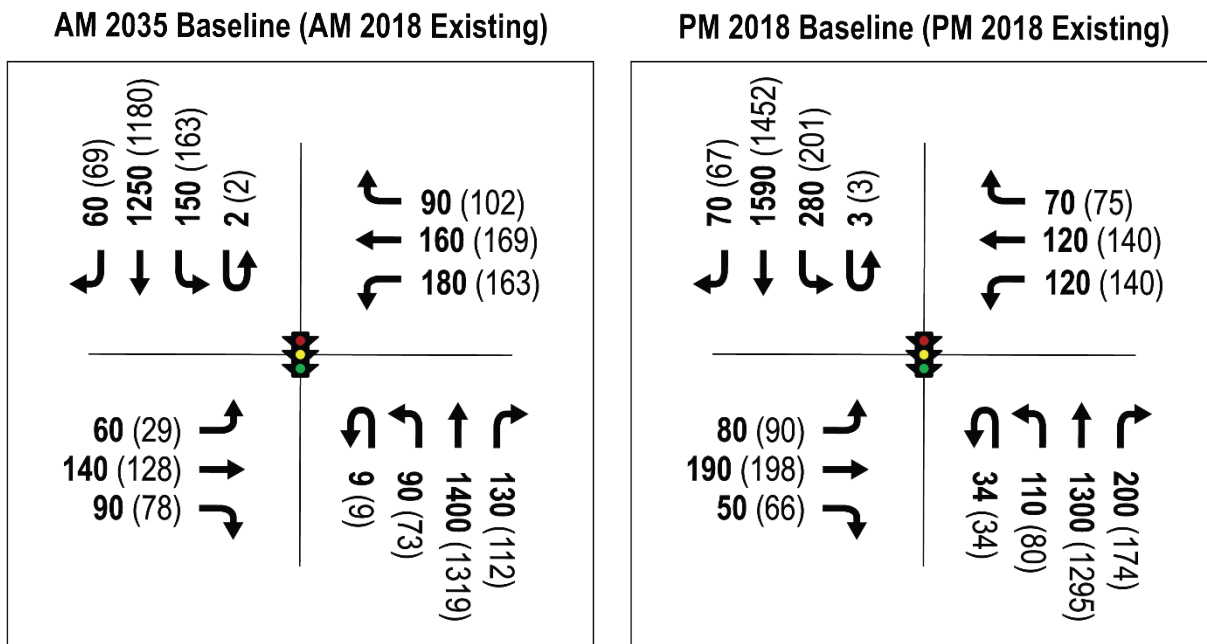
**Table 10. Collisions by Vehicle Movement**

Direction	Left Turn	Through	Right Turn	Subtotal
Eastbound	0	4	0	4
Westbound	0	4	0	4
Northbound	2	8	0	10
Southbound	0	4	0	4
<b>Total</b>	<b>2</b>	<b>20</b>	<b>0</b>	<b>22</b>

## 4. 2035 Baseline Analysis

### 4.1 2035 Baseline Volumes

The forecasted 2035 baseline traffic volumes for both the AM and PM peak hours are shown in Figure 9. For comparison purposes, the existing conditions traffic volumes for both the AM and PM peak hours are also included in the figure.



**Figure 9. 2035 Baseline AM & PM Peak Hour Turning Movement Volumes**

## 4.2 Baseline Traffic Operations

The 2035 baseline delay and LOS results for AM and PM peak hours are summarized in Table 11 and Table 12, respectively. With the increase in volumes, the intersection would experience increased delay, especially during the PM peak hour. During the AM peak hour, the intersection would continue to operate at LOS D with an average delay of 39 seconds. The movements operating at LOS E or F would remain the same as that of the 2018 Existing condition. During the PM peak hour, the intersection LOS would degrade from LOS C to LOS D with average vehicle delay increasing by 6 seconds. The northbound left turn movement LOS would degrade from E to F.

**Table 11. 2035 Baseline AM Peak Delay and LOS Results**

Scenario		Intersection	Eastbound			Westbound			Northbound			Southbound		
			L	T	R	L	T	R	L	T	R	L	T	R
2018 Ex	Delay*	39	42	75	56	73	67	38	3	90	19	1		
	LOS	D	D	E	E	E	E	D	A	F	B	A		
2035 Baseline	Delay*	39	39	79	65	63	69	42	3	88	17	1		
	LOS	D	D	E	E	E	E	D	A	F	B	A		

\*The unit for Vehicle Delay is second/vehicle.

**Table 12. 2035 Baseline PM Peak Delay and LOS Results**

Scenario		Intersection	Eastbound			Westbound			Northbound			Southbound		
			L	T	R	L	T	R	L	T	R	L	T	R
2018 Ex	Delay*	34	43	84	58	66	72	23	2	116	16	1		
	LOS	C	D	F	E	E	E	C	A	F	B	A		
2035 Baseline	Delay*	40	42	77	51	61	100	35	7	136	19	1		
	LOS	D	D	E	D	E	F	D	A	F	B	A		

\*The unit for Vehicle Delay is second/vehicle.

## 5. Alternatives Analysis

### 5.1 Alternative Descriptions

The movements at the study intersection with the highest delay and LOS of E and F are on the key routes for vehicles accessing the Kelsey Creek Center. For example, the primary route for vehicles accessing the Kelsey Creek Center from the north is the southbound left turn from 148<sup>th</sup> Ave NE to Main Street followed by a right turn into the Kelsey Creek Center. Similarly, vehicles leaving the Kelsey Creek Center bound for 148<sup>th</sup> Avenue SE south, will exit at the Main Street driveway and head west toward the study intersection where they will turn left onto 148<sup>th</sup> Avenue SE. The traffic generated from these movements to access Kelsey Creek Center has impact on other drivers traveling on Main Street to enter and exit the neighborhoods to the east and west of 148<sup>th</sup> Ave.

Alternatives involving modifications to the Kelsey Creek Center driveways were considered in order to relieve traffic congestion at the 148<sup>th</sup> Avenue SE and Main Street intersection. For example, modifying

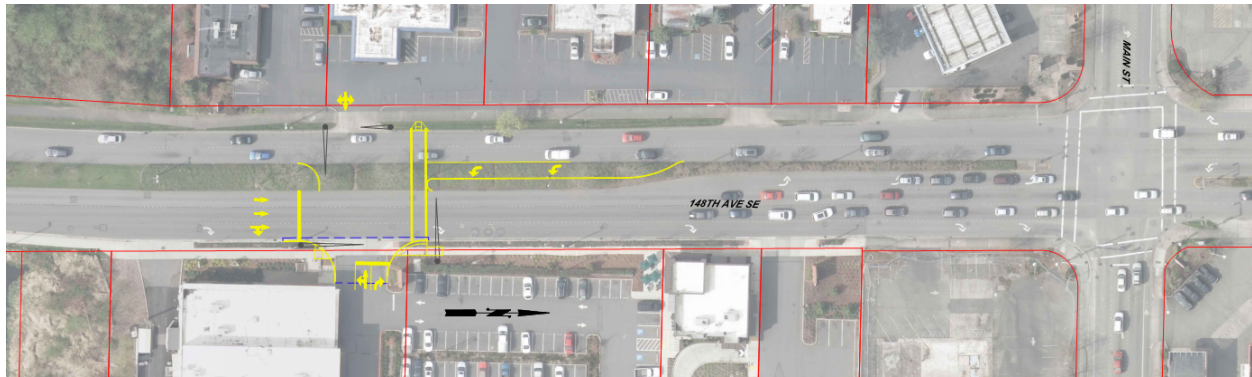
access at the 148<sup>th</sup> Avenue SE and Kelsey Creek Center driveway and allowing left turns in and out of the driveway would alleviate some of the congestion at the study intersection by reducing the volume demand at the southbound left turn and westbound left turn. Alternatives were developed to enhance access options and provide alternate routes for vehicles accessing the Kelsey Creek Center. The alternatives involve access and control changes to existing driveways rather than creating new access points. A detailed access modification study was conducted and is summarized in the following section of this report. Two access alternatives were considered at the existing 148<sup>th</sup> Avenue SE and Kelsey Creek Center driveway and are described as follows:

- **Alternative 1 – Limited Access Modification with Traffic Signal (Figure 10):** Modify Kelsey Creek Center driveway access to allow southbound left turns (ingress) and westbound left turns (egress). The Kelsey Creek Center driveway is aligned with another commercial property driveway on the west side of 148<sup>th</sup> Avenue SE. The following movements are restricted: westbound and eastbound through, eastbound left, and northbound left. This alternative would signalize the northbound, southbound, and westbound approaches and provide a pedestrian crossing on 148<sup>th</sup> Avenue SE on the north side of the driveways. The west driveway would remain stop controlled with right-in/right-out access.



*Figure 10. Limited access signal with southbound left turn lane and merge lane*

- **Alternative 2 – Full Access Modification with Traffic Signal (Figure 11):** Alternative 2 would fully signalize the new intersection, including the west driveway. The only restricted movement would be the northbound left turn. The east-west pedestrian crossing would remain on the north leg, similar to Alternative 1.



**Figure 11. Full access signal with southbound left turn lane**

Another access improvement alternative considered involved inserting a mini roundabout at the primary driveway on Main Street for the Kelsey Creek Center driveway. The Kelsey Creek Center Main Street driveway is offset from the driveway on the north side of the road and preliminary concepts of the alternative showed the geometry would not be feasible with the driveway offset. Relocating one or both of the driveways to align them would involve private property impacts that are beyond the scope of this project; therefore, this alternative was eliminated from further evaluation.

The impacts associated with each alternative are described in section 5.3 of this report.

#### 5.1.1 Kelsey Creek Center Access Modification

To evaluate how traffic volumes would be changed at the study intersection under the alternative configurations, traffic data was collected at the Kelsey Creek Center and the study intersection including origin-destination (O-D) pairs to document the routes and corresponding volumes for traffic accessing the Kelsey Creek Center. The volume data for the following O-D pairs were collected on December 12, 2018:

- **O-D Pair A:** Vehicles making a southbound left turn at 148<sup>th</sup> Avenue SE and Main Street and then turning right into the north Kelsey Creek Center driveway
- **O-D Pair B:** Vehicles travelling eastbound through 148<sup>th</sup> Avenue SE and Main Street and then right turning into the north Kelsey Creek Center driveway
- **O-D Pair C:** Vehicles making a northbound left turn at the north Kelsey Creek Center driveway and then making westbound left turn at 148<sup>th</sup> Avenue SE and Main Street
- **O-D Pair D:** Vehicles exiting from the south Kelsey Creek Center driveway and making a northbound U-turn at 148<sup>th</sup> Avenue SE and Main Street

The traffic volume collected at the Kelsey Creek Center driveways are provided in Appendix E and the O-D pair volume data are provided in Appendix F. Table 13 provides a summary of traffic changes to the study area.

**Table 13. Traffic Diversion Summary**

O-D Pair Index	Impacts to 148 <sup>th</sup> Avenue SE & Main Street Intersection	Impacts to North Kelsey Creek Center Driveway	Impacts to South Kelsey Creek Center Driveway
A	Reduction in number of SBL vehicles and increase in SBT vehicles	Reduction in number of EBR vehicles	Increase in number of SBL vehicles
B	Reduction in number of EBT vehicles and increase in number of EBR vehicles	Reduction in EBR vehicles	Increase in number of SBL vehicles
C	Reduction in number of WBL vehicles	Reduction in number of NBL vehicles	Increase in number of WBL vehicles
D	Reduction in number of NBU vehicles	None	Reduction in number of WBR vehicles and Increase in number of WBL vehicles

The 2035 adjusted baseline volumes at 148<sup>th</sup> Avenue SE and Main Street for both AM and PM peak hours were developed with the following assumptions:

- Adjusted driveway volumes (AM and PM peak hours) were based on the percentage of vehicles at each driveway making the observed vehicular movements during the PM peak hour data collection period
- 70% of vehicles using affected movements are diverted to the south driveway (148<sup>th</sup> Avenue SE) from the north driveway (Main Street). This estimated percentage was developed based on the existing Kelsey Creek Center parking supply and configuration.
  - For drivers accessing the Kelsey Creek Center from the north and west, 70% are predicted to change their travel pattern from entering the north driveway (SBL vehicles on 148<sup>th</sup> Avenue SE and Main Street or EBT vehicles on 148<sup>th</sup> Avenue SE and Main Street) to entering the south driveway. This would reduce the southbound left turns and eastbound through movements at the intersection. The reduced volume would be reassigned to southbound through and eastbound right turn movements.
  - For drivers exiting the Kelsey Creek Center and bound for 148<sup>th</sup> Avenue SE, 70% would change their travel pattern from using the north driveway (left on Main Street and westbound left turn at the study intersection) to making a southbound left turn at the south (148<sup>th</sup> Avenue SE) driveway.
- Volumes at the intersection of 148<sup>th</sup> Avenue SE and Main Street were adjusted to reflect the estimated changes in travel patterns.

Figure 12 illustrates the estimated adjusted traffic volumes for select movements resulting from the modified access and control at the south Kelsey Creek Center driveway (148<sup>th</sup> Avenue SE). Figure 13 provides a comparison of 2035 baseline volumes and 2035 Future Alternative volumes for the intersection of 148<sup>th</sup> Avenue SE and Main Street. With the modified access proposed at the 148<sup>th</sup> Avenue SE and Kelsey Creek Center driveway in each alternative, and the corresponding estimated turn

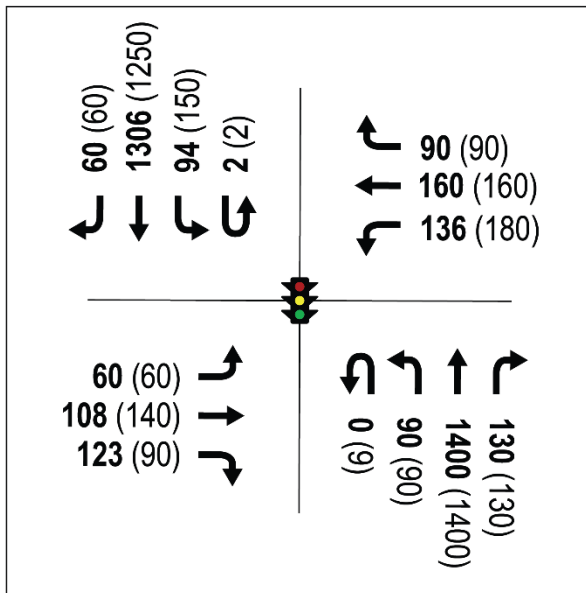


movement volumes, the appropriate access control was also evaluated. The three volume-based signal warrants were evaluated at this driveway access due to the large volume of traffic on 148<sup>th</sup> Avenue SE. Signal warrants would be met at the modified driveway access (for both alternatives) based on the predicted traffic diversion and are documented in Appendix F of this report.



Figure 12. 2035 Traffic Diversion with Signalized South Driveway

AM 2035 Baseline Adjusted (AM 2035 Baseline)



PM 2035 Baseline Adjusted (PM 2035 Baseline)

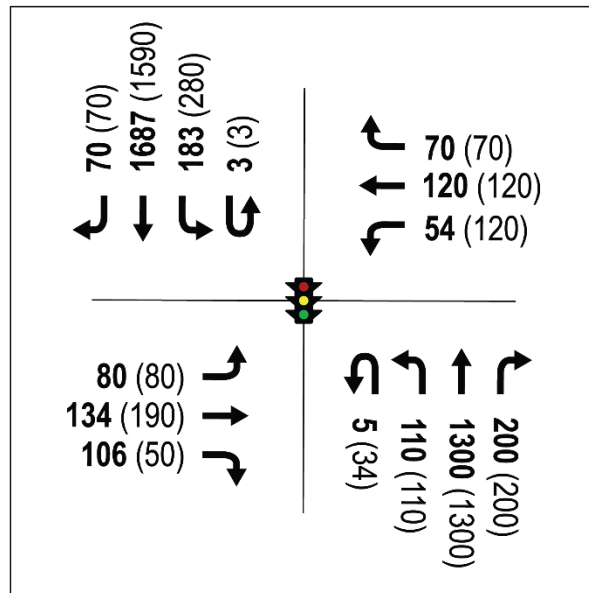


Figure 13. 148<sup>th</sup> Avenue SE & Main Street 2035 Baseline and 2035 Future Alternative Volume

### 5.1.2 Alternative 1

Alternative 1 will signalize the northbound, southbound, and westbound approaches to provide full access to and from the Kelsey Creek Center driveway. The southbound through movement will have a continuous green time except during pedestrian crossings at the north leg of the intersection which will allow the southbound through vehicles to proceed while vehicles are making a westbound left turn exiting from the Kelsey Creek Center driveway. This will require an addition of a southbound merge lane for westbound left turns from Kelsey Creek Center. This type of configuration has been used elsewhere in the City (i.e. SE 8<sup>th</sup> St and 112<sup>th</sup> Avenue SE). This alternative also provides a southbound left turn pocket entering the shopping center on 148<sup>th</sup> Ave NE and restrict northbound left turn movements.

The addition of the southbound merge lane would require significant modifications to the existing raised median including impacts to existing street trees and street lighting in the median. The displaced lights would require the installation of new lights at the roadside on both sides of 148<sup>th</sup> Avenue SE. Significant paving would be required for the southbound merge lane creating additional impervious surface area and triggering additional stormwater treatment improvements. Furthermore, the configuration of the intersection may require modification in the future if the property directly west of the Kelsey Creek Center driveway redevelops.

### 5.1.3 Alternative 2

Alternative 2 would signalize all approaches of the intersection to also include the property directly west of the Kelsey Creek Center driveway. Similar to Alternative 1, a southbound left turn lane will be added although northbound left turns would remain restricted. This alternative will accommodate future growth if the property directly west of the Kelsey Creek Center driveway redevelops with the full access

signal. In addition, the new southbound left turn lane will have the same impact to median illumination and trees as that of Alternative 1. However, the southbound merge lane shown in Alternative 1 would not be necessary since the westbound left turns signal phasing would not be concurrent with the southbound movement.

### 5.3 Alternatives Analysis

#### 5.3.1 Traffic Analysis Results

Table 14 and Table 15 provides a summary of the alternative delay and LOS results for the AM and PM peak hours for the intersection of 148<sup>th</sup> Avenue SE and Main Street. Table 16 and Table 17 provides a summary of the alternative delay and LOS results for the AM and PM peak hours for the intersection of 148<sup>th</sup> Avenue SE and South Kelsey Creek Center Driveway.

Traffic operations at 148<sup>th</sup> Avenue SE and Main Street under Alternative 1 and Alternative 2 are the same because the volumes are the same between these two alternatives. As a result of the traffic volume diversion, comparing to the 2035 baseline condition, the intersection LOS would improve from D to C with 5 seconds and 7 seconds delay reduction for AM and PM peak hour, respectively. Furthermore, all movements would operate at LOS E or better for both AM and PM peak hours.

Traffic operations at the South Kelsey Creek Center Driveway and 148<sup>th</sup> Avenue SE under Alternative 1 and Alternative 2 are similar. The intersection would operate at LOS A for both AM and PM peak hours for each alternative. The 95<sup>th</sup> percentile queue lengths at the 148<sup>th</sup> Avenue SE and Kelsey Creek Center driveway are provided in Table 18.

**Table 14. 148<sup>th</sup> Avenue SE & Main Street AM Peak Delay and LOS Results**

Scenario		Intersection	Eastbound			Westbound			Northbound			Southbound		
			L	T	R	L	T	R	L	T	R	L	T	R
<b>2018 Ex</b>	Delay*	39	42	75	56	73	67	38	3	90	19	1		
	LOS	D	D	E	E	E	E	D	A	F	B	A		
<b>2035 Baseline</b>	Delay*	39	39	79	65	63	69	42	3	88	17	1		
	LOS	D	D	E	E	E	E	D	A	F	B	A		
<b>2035 Alt 1</b>	Delay*	34	45	71	70	69	67	31	2	79	21	2		
	LOS	C	D	E	E	E	E	C	A	E	C	A		
<b>2035 Alt 2</b>	Delay*	34	45	71	70	69	67	31	2	79	21	2		
	LOS	C	D	E	E	E	E	C	A	E	C	A		

\*The unit for Vehicle Delay is second/vehicle.

**Table 15. 148<sup>th</sup> Avenue SE & Main Street PM Peak Delay and LOS Results**

Scenario		Intersection	Eastbound			Westbound			Northbound			Southbound		
			L	T	R	L	T	R	L	T	R	L	T	R
2018 Ex	Delay*	34	43	84		58	66		72	23	2	116	16	1
	LOS	C	D	F		E	E		E	C	A	F	B	A
2035 Baseline	Delay*	40	42	77		51	61		100	35	7	136	19	1
	LOS	D	D	E		D	E		F	D	A	F	B	A
2035 Alt 1	Delay*	33	49	73		47	67		68	32	5	76	19	1
	LOS	C	D	E		D	E		E	C	A	E	B	A
2035 Alt 2	Delay*	33	49	73		47	67		68	32	5	76	19	1
	LOS	C	D	E		D	E		E	C	A	E	B	A

\*The unit for Vehicle Delay is second/vehicle.

**Table 16. 148<sup>th</sup> Avenue SE & South Kelsey Creek Center Driveway AM Peak Delay and LOS Results**

Scenario		Intersection	Eastbound			Westbound			Northbound			Southbound		
			L	T	R	L	T	R	L	T	R	L	T	R
2035 Alt 1	Delay*	9	-	-	0	52	-	0	-	16	3	21	1	
	LOS	A	-	-	A	D	-	A	-	B	A	C	A	
2035 Alt 2	Delay*	9	7			39		12	-	13	3	25	2	
	LOS	A	A			D	B	-	B	A	C	A		

\*The unit for Vehicle Delay is second/vehicle.

**Table 17. 148<sup>th</sup> Avenue SE & South Kelsey Creek Center Driveway PM Peak Delay and LOS Results**

Scenario		Intersection	Eastbound			Westbound			Northbound			Southbound		
			L	T	R	L	T	R	L	T	R	L	T	R
2035 Alt 1	Delay*	7	-	-	0	60	-	0	-	9	3	32	1	
	LOS	A	-	-	A	E	-	A	-	A	A	C	A	
2035 Alt 2	Delay*	8	6			36		13	-	10	3	27	2	
	LOS	A	A			D	B	-	B	A	C	A		

**Table 18. 2035 Future Alternative Kelsey Creek Center Driveway 95th Percentile Queue Length (feet)**

Alternative	Peak Hour	WB Left/Through	WB Right
Alternative 1	AM	75	0
	PM	80	0
Alternative 2	AM	80	30
	PM	125	40

**5.2.2 Multi Modal Level of Service (MMLOS) Evaluation**

Policy TR-40 in the Bellevue Comprehensive Plan states that the City should establish multimodal level of service standards. In April 2017, the Bellevue Transportation Commission recommended multimodal metrics, standards, and guidelines to evaluate the performance of vehicle, pedestrian, bicycle, and transit modes. Table 19 provides a summary of the MMLOS impacts across the 2035 Baseline and three alternatives as compared to the 2018 existing condition.

**Table 19. Project MMLOS Evaluation**

Mode	No Build	Alternative 1	Alternative 2
Vehicle	Does Not Improve	Improves	Improves
Transit	Does Not Improve	Improves	Improves
Bike	Does Not Improve		
Pedestrian	Does Not Improve	Improves	Improves

**Vehicle Mode**

Under MMLOS guidelines, vehicle LOS is evaluated based on the intersection volume to capacity (V/C) ratio. Table 20 provides a summary of the intersection V/C Ratio. For the 2035 baseline, vehicle LOS will be negatively impacted due to increase in the V/C ratio. Vehicle LOS will improve under each alternative due to a decrease in the intersection V/C ratio. The V/C ratios would remain in compliance with the threshold under both alternatives.

**Table 20. 148<sup>th</sup> Avenue SE & Main St Intersection V/C ratio**

Scenario	AM	PM
2018 Existing	0.85	0.82
2035 Baseline	0.88	0.86
2035 Alternative 1	0.82	0.85
2035 Alternative 2	0.82	0.85

**Transit Mode**

King county metro route 245 travels eastbound and westbound through the study intersection on Main Street and has a stop pair on the west leg of the intersection.

Comparing the three alternatives to the existing condition, transit speed LOS in the AM peak hour under the future No Build scenario would be improved in the westbound direction and adversely impacted in the eastbound direction. In the PM peak hour under the same scenario, transit speed LOS would improve for both directions. Under Alternative 1 and Alternative 2, transit speed LOS would improve in the eastbound direction during the AM and PM peaks and in the westbound direction in the AM. The westbound PM trips would see little change. The alternatives do not include transit stop modifications, and therefore, the LOS of the existing stop amenities would remain unchanged under all three alternatives.

**Bicycle and Pedestrian Mode**

Bicycle LOS will remain the same under the 2035 Baseline and both alternatives because existing bicycle facilities will be maintained. Pedestrian LOS will improve under both Alternative 1 and Alternative 2 due to the addition of a new pedestrian crossing on 148<sup>th</sup> Avenue SE at the South Kelsey Creek Center driveway.

**5.3 Alternatives Comparison**

A summary of the alternative comparison is presented in Table 20.

**Table 20. Alternatives Analysis Comparison**

2035 Baseline	Alternative 1 – Limited Access Signal at South Kelsey Creek Center Driveway	Alternative 2 – Full Access Signal at South Kelsey Creek Center Driveway
<b>Traffic Operations</b>		
AM LOS: D AM V/C: 0.88 PM LOS: D PM V/C: 0.86 Significant delay and operating near capacity	AM LOS: C AM V/C: 0.82 PM LOS: C PM V/C: 0.85 Improved operations with traffic volumes diversion	AM LOS: C AM V/C: 0.82 PM LOS: C PM V/C: 0.85 Improved operations with traffic volumes diversion
<b>Traffic Safety</b>		
Collision rates are anticipated to be unchanged or higher with increased volume	Right angle collision rates on Main Street at the north driveway may be reduced with traffic being diverted to the south driveway. All other study locations are anticipated to be unchanged.	Right angle collision rates on Main Street at the north driveway may be reduced with traffic being diverted to the south driveway. All other study locations are anticipated to be unchanged.
<b>Multi-Modal Impacts</b>		
Higher transit speeds for westbound AM and PM, eastbound PM; lower transit speed for eastbound AM	Higher transit speeds for eastbound AM and PM and westbound AM. Little change for westbound PM transit speeds.	Higher transit speeds for eastbound AM and PM and westbound AM. Little change for westbound PM transit speeds.
Same level of transit amenities	Same level of transit amenities	Same level of transit amenities
No change to existing pedestrian and bicycle conditions	New pedestrian crossing across 148 <sup>th</sup> Avenue SE  No change to existing bicycle conditions	New pedestrian crossing across 148 <sup>th</sup> Avenue SE  No change to existing bicycle conditions

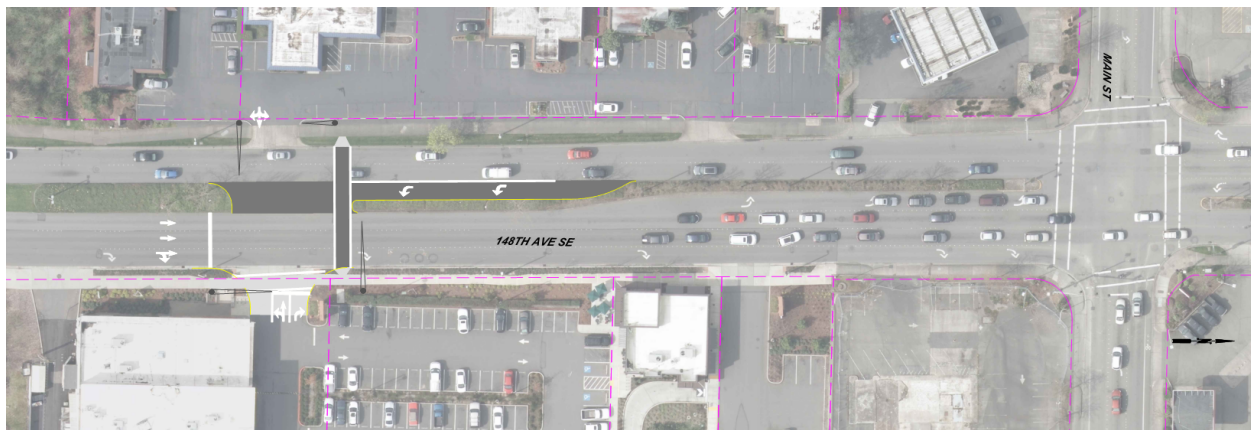


**Table 20 [Continued]. Alternatives Analysis Comparison**

2035 Baseline	Alternative 1 – Limited Access Signal at South Kelsey Creek Center Driveway	Alternative 2 – Full Access Signal at South Kelsey Creek Center Driveway
<b>Right-of-Way</b>		
None	Minimal sidewalk easement or ROW acquisition	Minimal sidewalk easement or ROW acquisition
<b>Stormwater Impacts</b>		
None	New impervious area would trigger the need for new water quality treatment facilities	Minimal to none
<b>Utility Impacts</b>		
None	Luminaire relocation	Luminaire relocation
<b>Environmental Impacts</b>		
None	Minimal impacts – street tree removal	Minimal impacts – street tree removal
<b>Construction Costs</b>		
None	\$2,100,000	\$2,384,000

## 6. Recommendation

Alternative 2 (as shown in Figure 14), the addition of a full access signal on 148<sup>th</sup> Avenue SE at the South Kelsey Creek Center driveway, is recommended because it provides similar traffic operations benefits with a lower cost compared to Alternative 1. The proposed concept plan for Alternative 2 is attached in Appendix G and the cost estimate for Alternative 2 is attached in Appendix H.



**Figure 14. Recommended Alternative Conceptual Drawing**

## **7. Construction Challenges and Risks**

The roadway work needed for this project is not complicated. Locating signal and illumination poles near the existing back of sidewalk and property entrances presents the most significant design project risk due to the likelihood of underground utility lines that are not known at this stage of design. This risk can be mitigated with a project survey during the design phase. The stormwater system appears to be unaffected by the roadway work with existing collection and conveyance infrastructure remaining in place without additional work. Traffic queueing into the Kelsey Creek Center property due to the driveway signalization is a potential property risk.

## **Appendix A – SCATS Historical Average Signal Timing Card**



## **Appendix B – Key Design Criteria**



**City of Bellevue**  
**Transportation Department**  
**Design Standards Documentation**

**CIP No.** PW-R-184

**Created Date:** 4/26/2019

**Project Name and Description**

**Approval Date:** \_\_\_\_\_

Bellevue Way SE HOV Lane

**Last Revised Date:** 5/22/2019

**Project Funding and Design Standards**

- City funds only - Use City of Bellevue Design Manual local funding
- Outside funding - Use WSDOT Local Agency Guidelines (LAG) Manual
- Potential for future outside funding - Use WSDOT Local Agency Guidelines (LAG) Manual

**Speed & Terrain Designations**

- 35 Design Speed
- 35 Posted Speed
- Level AASHTO Terrain

**WSDOT STATE AID ENGINEER REVIEW/APPROVAL?**

YES \_\_\_\_\_ NO \_\_\_\_\_

**FHWA Controlling Design Criteria**

Design Speed	1
Lane Width	2
Shoulder Width	3
Bridge Width	4
Structural Capacity	5
Horizontal Alignment	6
Vertical Alignment	7
Grade	8
Stopping Sight Distance	9
Cross Slope	10
Superelevation	11
Vertical Clearance	12
Horizontal Clearance	13

**Roadway Classifications**

Bellevue Comp Plan	AASHTO	Federal Functional	RCW (WSDOT)
Major Arterial	<input checked="" type="checkbox"/> Principal Arterial	<input checked="" type="checkbox"/> Principal Arterial	<input type="checkbox"/> State Route
Minor Arterial	<input type="checkbox"/> Minor Arterial	<input type="checkbox"/> Minor Arterial	<input checked="" type="checkbox"/> Major Arterial
Collector Arterial	<input type="checkbox"/> Collector	<input type="checkbox"/> Collector	<input type="checkbox"/> Secondary Arterial
Local Street	<input type="checkbox"/> Local Street	<input type="checkbox"/> Local Street	<input type="checkbox"/> Access Street

**Project Type (See LAG 42.4)**

New Construction	
Re-Construction	<input checked="" type="checkbox"/>
3R	
2R	
Bridge Rehabilitation	
Trails	
Pedestrian Facility	
Other	



CIP No. \_\_\_\_\_

Approval Date: \_\_\_\_\_

**Project Name and Description**

Last Revised Date: \_\_\_\_\_

Bellevue Spot Improvements-Study Area-3, 148th AVE NE & Main St - Key Design Criteria

COB ID	Design Element	Standard	Source	Existing/Proposed Condition	Design Exception?	LAG Design Deviation?	LAG Criteria (NALE = Not a LAG Element)	Comments, also refer to WSDOT Design Manual Chapter 1100
1	LANE WIDTH	10-14 FT	AASHTO Geometric Design 4.3, Bellevue TDM Design Standard 3	11' lanes			NALE	WSDOT Chapter 1231.
2	No. of Lanes			2 lanes in Existing condition and a southbound left turn lane is added in the Proposed condition.			NALE	
3	Bike Lane Width (ft)	Min 5' wide	COB TDM 14	N/A			NALE	
4	Parking Bay Width (ft)	Meet table 1	COB TDM 3D	N/A			NALE	
5	Drainage Type: Vertical Curb, Curb & Gutter (ft), other	Curb and Gutter use on all public streets	COB TDM 11	Curb and Gutter			NALE	
6	Planting Strip (ft)	4 FT Min	COB TDM 3B	N/A			NALE	
7	Sidewalk Width (ft)	6 FT Min	COB TDM 14	N/A			NALE	
8	Medians		COB TDM 8	Existing median allowed for the addition of bike lanes. Proposed lane addition would require narrowing planter strip on each side of roadway by 1 FT to allow for new bike lanes (not proposed in this concept)				
9	Pavement Type	10 IN HMA	COB TDM RC-100-1	10 IN HMA			NALE	Check Geotechnical Report for additional requirements.
10	Bus Route, stops, shelters, pads	N/A		N/A			NALE	
11	DESIGN SPEED	35 MPH		35 MPH			NALE	
12	Posted speed	Existing Ordinance is 35 MPH on 148th Ave NE		Proposed: 35 MPH at the design location on 148th Ave NE to match the Existing.			NALE	
13	CROSS SLOPE	2% Lane	WSDOT DM 1250.02	2% Lane			NALE	
14	Design Vehicle	AASHTO SU-30	COB TDM 9	Meets standard			NALE	Check Truck and Bus Routes
15	Thru Lane Alignments Across Intersection	6 FT	WSDOT DM 1310.02(3)	N/A			NALE	
16	Left turn lane offset across intersection	6 FT	WSDOT DM 1310.02(3)	N/A			NALE	
17	Intersection Skew Angle	85 to 95 degrees	COB TDM 9C	Existing intersection alignment is not modified.			NALE	AASHTO, city design manual.
18	Corner Radii	Meet design vehicle turn movements	COB TDM 9	Meets standard			NALE	
19	Minimum Curb Return (ft)	25 FT	COB TDM 9C	Proposed curb radius at the east part of the intersection is 25 FT and meets standard.			NALE	
20	Taper	300 FT Min	WSDOT DM 1310.03(4)	N/A			NALE	
21	Spacing	150 FT to nearest intersection 100 FT from other driveways	COB TDM 5I COB TDM 5H	Match Existing driveway locations			NALE	city design manual & AASHTO

**Appendix C – Two Hour AM & PM Peak Turning Movement Counts**

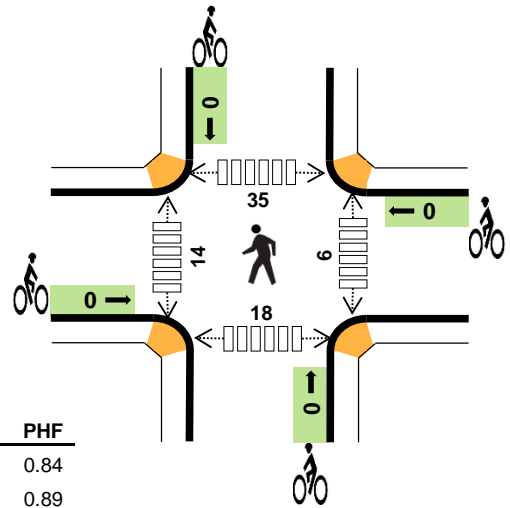
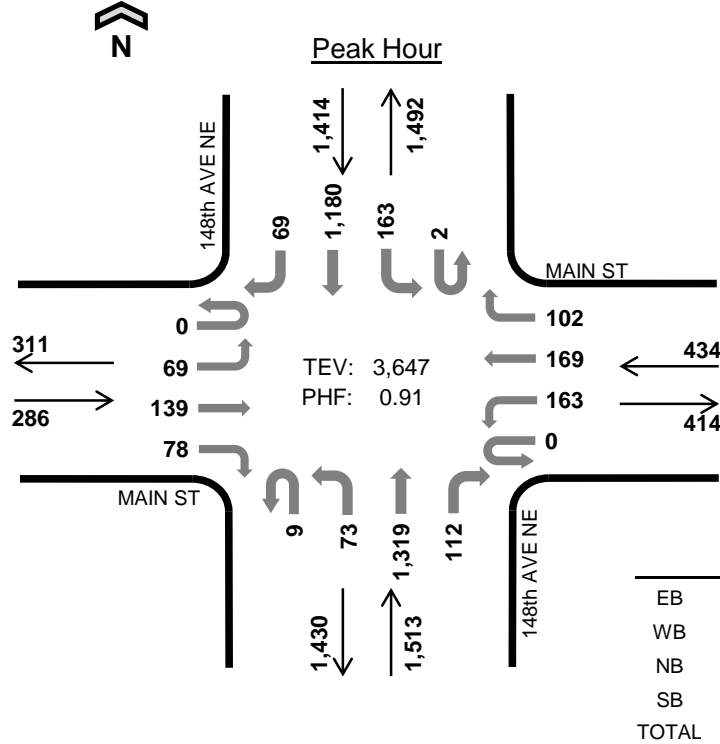


### 148th AVE NE MAIN ST

Date: Tue, Oct 16, 2018

Count Period: 7:30 AM to 9:30 AM

Peak Hour: 7:45 AM to 8:45 AM



	HV %:	PHF
EB	3.1%	0.84
WB	2.5%	0.89
NB	1.8%	0.89
SB	2.3%	0.91
TOTAL	2.2%	0.91

#### Two-Hour Count Summaries

Interval Start	MAIN ST Eastbound				MAIN ST Westbound				148th AVE NE Northbound				148th AVE NE Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:30 AM	0	22	41	25	0	36	58	24	6	22	296	34	0	20	191	15	790	0
<b>7:45 AM</b>	<b>0</b>	<b>21</b>	<b>37</b>	<b>26</b>	<b>0</b>	<b>37</b>	<b>61</b>	<b>24</b>	<b>3</b>	<b>23</b>	<b>363</b>	<b>35</b>	<b>1</b>	<b>36</b>	<b>304</b>	<b>34</b>	<b>1,005</b>	0
8:00 AM	0	18	43	24	0	44	24	24	1	18	328	32	0	47	322	13	938	0
8:15 AM	0	19	29	15	0	44	39	30	3	19	277	17	0	45	327	15	879	3,612
8:30 AM	0	11	30	13	0	38	45	24	2	13	351	28	1	35	227	7	825	3,647
8:45 AM	0	16	38	10	0	42	27	38	2	7	383	37	0	43	307	8	958	3,600
9:00 AM	0	7	24	10	0	38	39	28	4	9	402	24	4	19	276	9	893	3,555
9:15 AM	0	16	30	8	0	27	24	22	1	11	333	29	0	30	265	9	805	3,481
Count Total	0	130	272	131	0	306	317	214	22	122	2,733	236	6	275	2,219	110	7,093	0
<b>Peak Hour</b>	<b>0</b>	<b>69</b>	<b>139</b>	<b>78</b>	<b>0</b>	<b>163</b>	<b>169</b>	<b>102</b>	<b>9</b>	<b>73</b>	<b>1,319</b>	<b>112</b>	<b>2</b>	<b>163</b>	<b>1,180</b>	<b>69</b>	<b>3,647</b>	<b>0</b>

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
7:30 AM	1	3	8	8	20	0	2	0	0	2	1	3	8	8	20
<b>7:45 AM</b>	<b>3</b>	<b>1</b>	<b>6</b>	<b>8</b>	<b>18</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>5</b>	<b>16</b>	<b>9</b>	<b>31</b>
8:00 AM	2	4	4	9	19	0	0	0	0	0	2	3	9	5	19
8:15 AM	1	2	9	11	23	0	0	0	0	0	1	3	4	1	9
8:30 AM	3	4	8	5	20	0	0	0	0	0	2	3	6	3	14
8:45 AM	3	9	8	9	29	0	0	0	0	0	1	2	16	9	28
9:00 AM	0	5	8	6	19	0	1	0	0	1	1	4	5	4	14
9:15 AM	2	1	8	11	22	0	0	0	0	0	6	2	11	3	22
Count Total	15	29	59	67	170	0	3	0	0	3	15	25	75	42	157
<b>Peak Hour</b>	<b>9</b>	<b>11</b>	<b>27</b>	<b>33</b>	<b>80</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>14</b>	<b>35</b>	<b>18</b>	<b>73</b>

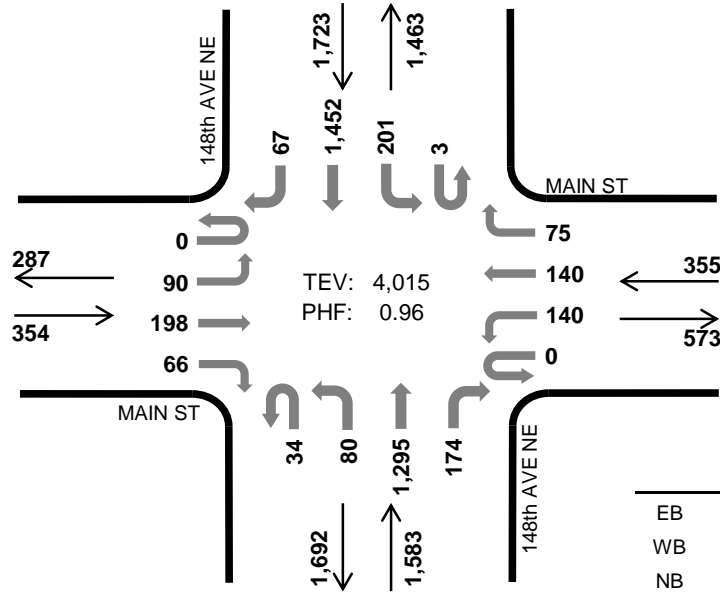


### 148th AVE NE MAIN ST

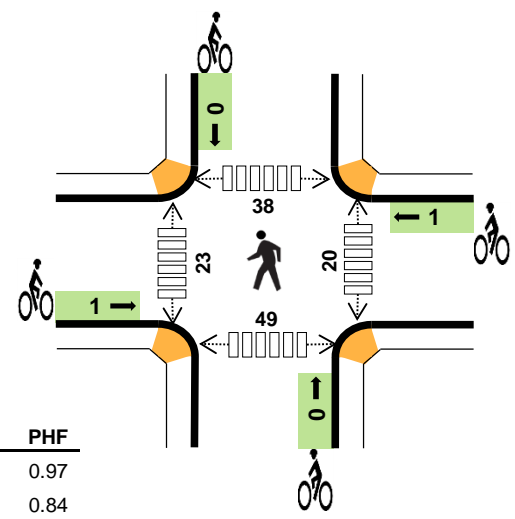
Date: Tue, Oct 16, 2018

Count Period: 4:00 PM to 6:00 PM

Peak Hour: 5:00 PM to 6:00 PM



	HV %:	PHF
EB	2.0%	0.97
WB	2.0%	0.84
NB	0.8%	0.97
SB	0.5%	0.98
TOTAL	0.9%	0.96



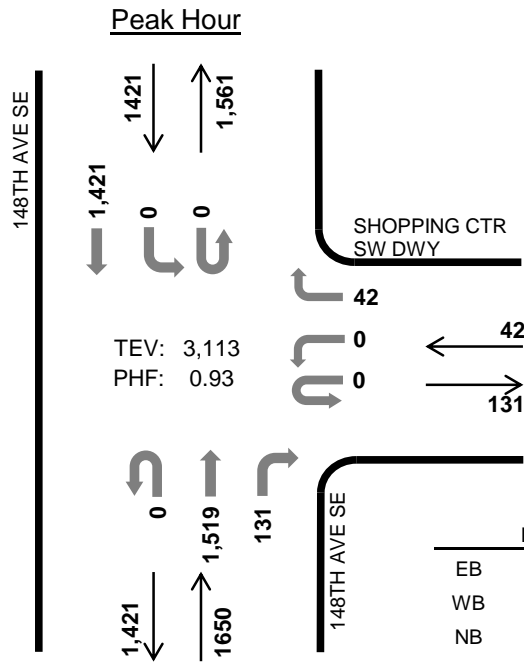
#### Two-Hour Count Summaries

Interval Start	MAIN ST Eastbound				MAIN ST Westbound				148th AVE NE Northbound				148th AVE NE 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	13	43	10	0	48	37	31	10	18	268	39	0	43	355	10	925	0
4:15 PM	0	14	45	13	0	42	37	25	5	11	300	29	2	46	397	11	977	0
4:30 PM	0	13	44	16	0	34	30	19	9	20	296	36	0	50	385	12	964	0
4:45 PM	0	13	51	15	0	36	48	28	6	26	312	46	1	36	355	14	987	3,853
<b>5:00 PM</b>	<b>0</b>	<b>19</b>	<b>58</b>	<b>12</b>	<b>0</b>	<b>32</b>	<b>34</b>	<b>19</b>	<b>10</b>	<b>23</b>	<b>306</b>	<b>33</b>	<b>1</b>	<b>44</b>	<b>371</b>	<b>17</b>	<b>979</b>	<b>3,907</b>
5:15 PM	0	22	39	24	0	40	26	20	7	19	326	43	1	45	348	17	977	3,907
<b>5:30 PM</b>	<b>0</b>	<b>21</b>	<b>54</b>	<b>16</b>	<b>0</b>	<b>38</b>	<b>46</b>	<b>22</b>	<b>9</b>	<b>18</b>	<b>330</b>	<b>50</b>	<b>0</b>	<b>60</b>	<b>362</b>	<b>17</b>	<b>1,043</b>	<b>3,986</b>
5:45 PM	0	28	47	14	0	30	34	14	8	20	333	48	1	52	371	16	1,016	4,015
Count Total	0	143	381	120	0	300	292	178	64	155	2,471	324	6	376	2,944	114	7,868	0
Peak Hour	0	90	198	66	0	140	140	75	34	80	1,295	174	3	201	1,452	67	4,015	0

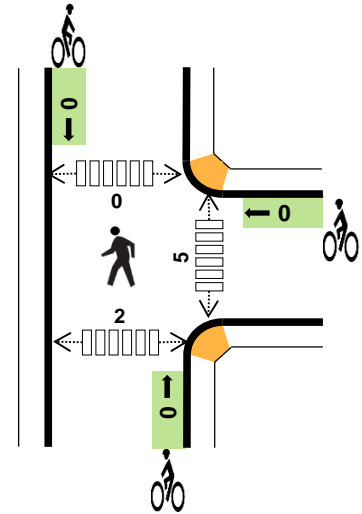
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

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	5	5	9	8	27	0	0	0	0	0	2	6	10	5	23
4:15 PM	4	0	2	4	10	1	0	0	0	1	4	7	4	8	23
4:30 PM	1	2	2	1	6	1	1	0	0	2	8	5	11	10	34
4:45 PM	2	1	2	6	11	0	0	0	0	0	4	1	8	9	22
<b>5:00 PM</b>	<b>2</b>	<b>2</b>	<b>4</b>	<b>4</b>	<b>12</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>5</b>	<b>27</b>	<b>22</b>	<b>60</b>
5:15 PM	3	2	5	2	12	0	1	0	0	1	8	8	3	10	29
<b>5:30 PM</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>5</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>4</b>	<b>9</b>	<b>7</b>	<b>15</b>	<b>35</b>
5:45 PM	1	2	2	1	6	0	0	0	0	0	2	1	1	2	6
Count Total	19	15	28	27	89	3	2	0	0	5	38	42	71	81	232
Peak Hour	7	7	13	8	35	1	1	0	0	2	20	23	38	49	130

# 148TH AVE SE SHOPPING CTR SW DWY



Date: Tue, Oct 16, 2018  
Count Period: 7:30 AM to 9:30 AM  
Peak Hour: 8:00 AM to 9:00 AM



	HV %:	PHF
EB	-	-
WB	4.8%	0.88
NB	1.8%	0.88
SB	2.4%	0.88
TOTAL	2.1%	0.93

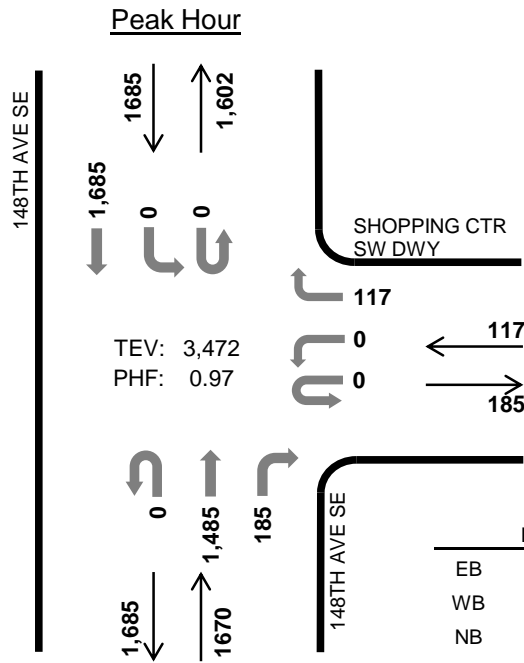
## Two-Hour Count Summaries

Interval Start	0				SHOPPING CTR SW DWY				148TH AVE SE				148TH AVE SE				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:30 AM	0	0	0	0	0	0	0	11	0	0	382	14	0	0	258	0	665	0
7:45 AM	0	0	0	0	0	0	0	9	0	0	394	14	0	0	362	0	779	0
8:00 AM	0	0	0	0	0	0	0	12	0	0	372	29	0	0	402	0	815	0
8:15 AM	0	0	0	0	0	0	0	12	0	0	321	20	0	0	380	0	733	2,992
8:30 AM	0	0	0	0	0	0	0	8	0	0	391	49	0	0	282	0	730	3,057
8:45 AM	0	0	0	0	0	0	0	10	0	0	435	33	0	0	357	0	835	3,113
9:00 AM	0	0	0	0	0	0	0	7	0	0	431	35	0	0	323	0	796	3,094
9:15 AM	0	0	0	0	0	0	0	11	0	0	388	29	0	0	302	0	730	3,091
Count Total	0	0	0	0	0	0	0	80	0	0	3,114	223	0	0	2,666	0	6,083	0
Peak Hour	0	0	0	0	0	0	0	42	0	0	1,519	131	0	0	1,421	0	3,113	0

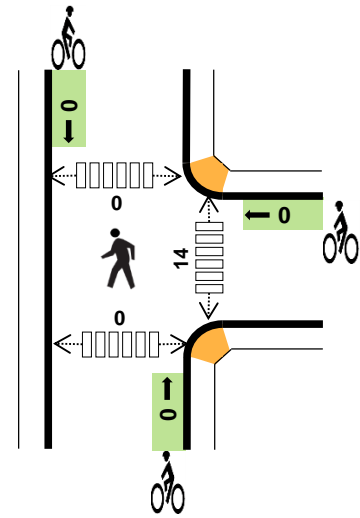
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:30 AM	0	0	9	9	18	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	5	7	12	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	4	8	12	0	0	0	0	0	1	2	0	2	5
8:15 AM	0	1	9	11	21	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	1	6	5	12	0	0	0	0	0	3	1	0	0	4
8:45 AM	0	0	10	10	20	0	0	0	0	0	1	0	0	0	1
9:00 AM	0	0	8	5	13	0	0	0	0	0	1	0	0	0	1
9:15 AM	0	1	7	7	15	0	0	0	0	0	1	1	0	1	3
Count Total	0	3	58	62	123	0	0	0	0	0	7	4	0	3	14
Peak Hr	0	2	29	34	65	0	0	0	0	0	5	3	0	2	10

# 148TH AVE SE SHOPPING CTR SW DWY



Date: Tue, Oct 16, 2018  
Count Period: 4:00 PM to 6:00 PM  
Peak Hour: 5:00 PM to 6:00 PM



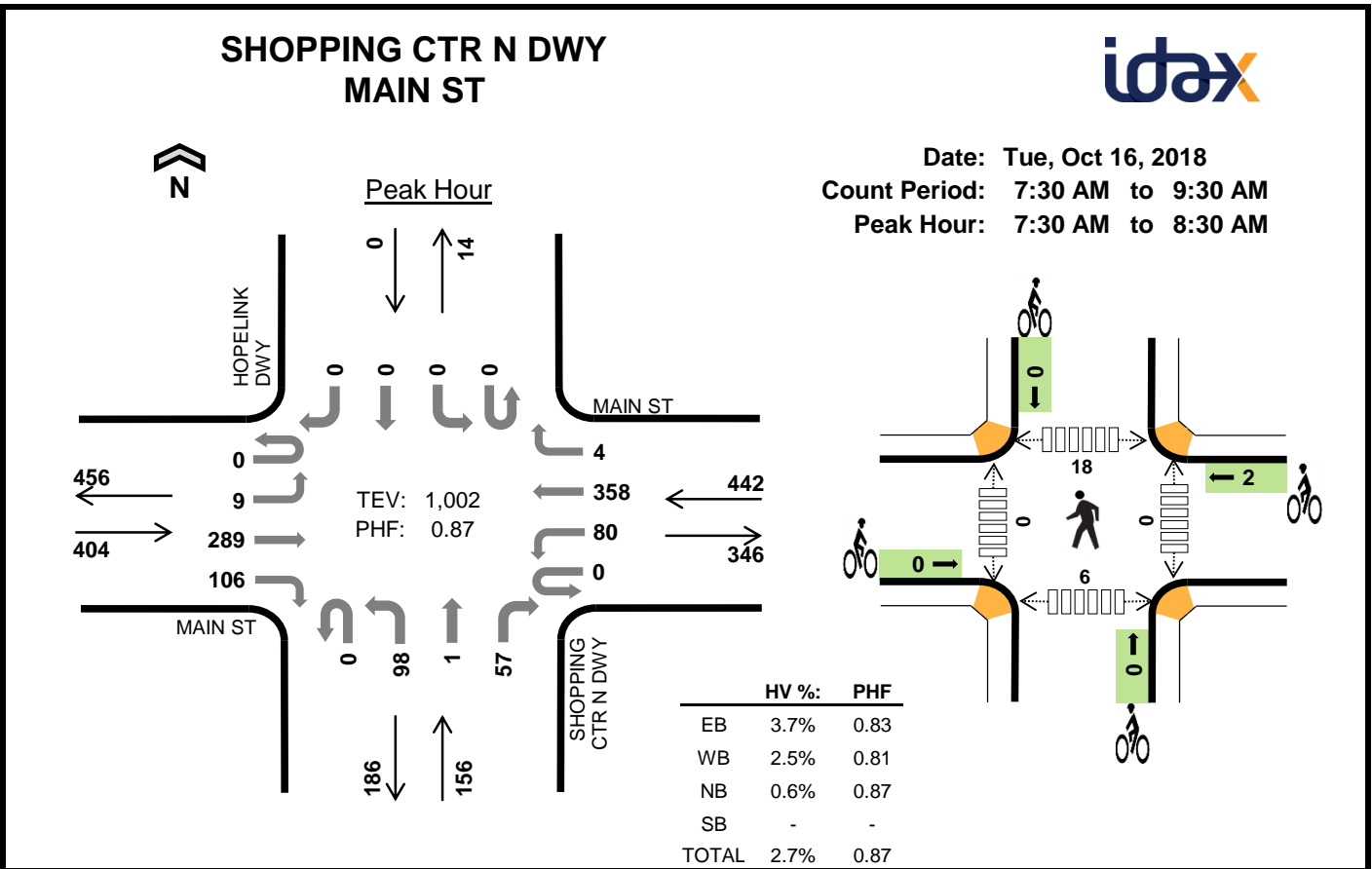
	HV %:	PHF
EB	-	-
WB	0.9%	0.79
NB	0.9%	0.94
SB	0.7%	0.99
TOTAL	0.8%	0.97

## Two-Hour Count Summaries

Interval Start	0				SHOPPING CTR SW DWY				148TH AVE SE				148TH AVE SE				15-min Total	Rolling One Hour
	Eastbound		Westbound		Northbound		Southbound		UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	0	0	0	0	0	20	0	0	308	46	0	0	437	0	811	0
4:15 PM	0	0	0	0	0	0	0	17	0	0	339	41	0	0	455	0	852	0
4:30 PM	0	0	0	0	0	0	0	24	0	0	353	54	0	0	452	0	883	0
4:45 PM	0	0	0	0	0	0	0	29	0	0	367	45	0	0	415	0	856	3,402
<b>5:00 PM</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>30</b>	<b>0</b>	<b>0</b>	<b>346</b>	<b>42</b>	<b>0</b>	<b>0</b>	<b>417</b>	<b>0</b>	<b>835</b>	<b>3,426</b>
5:15 PM	0	0	0	0	0	0	0	26	0	0	373	51	0	0	416	0	866	3,440
5:30 PM	0	0	0	0	0	0	0	37	0	0	370	46	0	0	426	0	879	3,436
<b>5:45 PM</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>24</b>	<b>0</b>	<b>0</b>	<b>396</b>	<b>46</b>	<b>0</b>	<b>0</b>	<b>426</b>	<b>0</b>	<b>892</b>	<b>3,472</b>
Count Total	0	0	0	0	0	0	0	207	0	0	2,852	371	0	0	3,444	0	6,874	0
Peak Hour	0	0	0	0	0	0	0	117	0	0	1,485	185	0	0	1,685	0	3,472	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	8	7	15	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	2	3	5	0	0	0	0	0	2	0	0	0	2
4:30 PM	0	0	2	1	3	0	0	0	0	0	7	0	0	0	7
4:45 PM	0	0	2	8	10	0	0	0	0	0	1	0	0	0	1
<b>5:00 PM</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>5</b>	<b>9</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>
5:15 PM	0	0	4	4	8	0	0	0	0	0	5	0	0	0	5
5:30 PM	0	0	4	1	5	0	0	0	0	0	5	0	0	0	5
<b>5:45 PM</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>
Count Total	0	1	29	31	61	0	0	0	0	0	24	0	0	0	24
Peak Hr	0	1	15	12	28	0	0	0	0	0	14	0	0	0	14



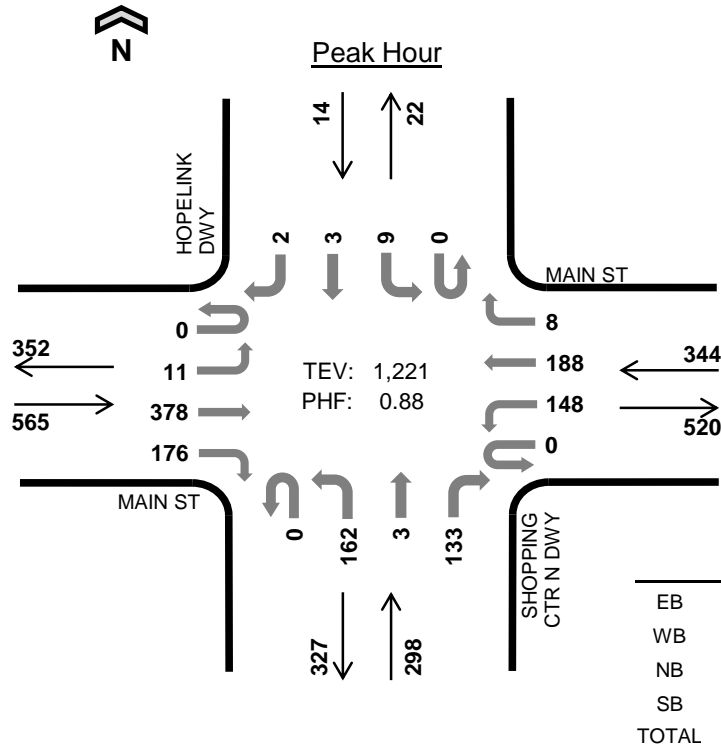
**Two-Hour Count Summaries**

Interval Start	MAIN ST Eastbound				MAIN ST Westbound				SHOPPING CTR N DWY Northbound				HOPELINK DWY Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:30 AM	0	1	71	16	0	12	82	0	0	28	0	12	0	0	0	0	222	0
7:45 AM	0	2	80	28	0	23	113	0	0	26	0	15	0	0	0	0	287	0
8:00 AM	0	4	81	36	0	22	61	1	0	17	0	13	0	0	0	0	235	0
8:15 AM	0	2	57	26	0	23	102	3	0	27	1	17	0	0	0	0	258	1,002
8:30 AM	0	1	73	16	0	14	70	6	0	27	0	12	0	1	0	0	220	1,000
8:45 AM	0	6	85	26	0	21	81	3	0	33	0	19	0	0	0	0	274	987
9:00 AM	0	6	46	16	0	19	53	3	0	36	0	14	0	0	0	1	194	946
9:15 AM	0	4	53	29	0	17	43	0	0	24	0	15	0	0	1	0	186	874
Count Total	0	26	546	193	0	151	605	16	0	218	1	117	0	1	1	1	1,876	0
Peak Hour	0	9	289	106	0	80	358	4	0	98	1	57	0	0	0	0	1,002	0

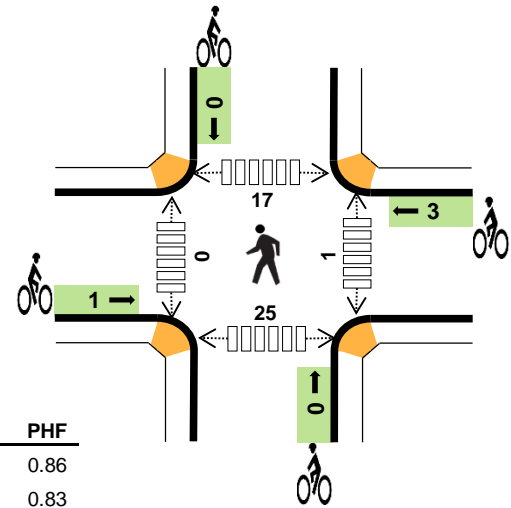
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:30 AM	2	2	1	0	5	0	2	0	0	2	0	0	9	3	12
7:45 AM	5	1	0	0	6	0	0	0	0	0	0	0	5	3	8
8:00 AM	5	4	0	0	9	0	0	0	0	0	0	0	4	0	4
8:15 AM	3	4	0	0	7	0	0	0	0	0	0	0	0	0	0
8:30 AM	5	3	1	0	9	0	1	0	0	1	0	0	0	1	1
8:45 AM	5	8	1	0	14	0	0	0	0	0	0	0	1	0	1
9:00 AM	2	4	1	0	7	0	1	0	0	1	0	2	1	1	4
9:15 AM	4	1	1	1	7	0	0	0	0	0	0	0	2	2	4
Count Total	31	27	5	1	64	0	4	0	0	4	0	2	22	10	34
Peak Hour	15	11	1	0	27	0	2	0	0	2	0	0	18	6	24

## SHOPPING CTR N DWY MAIN ST



Date: Tue, Oct 16, 2018  
Count Period: 4:00 PM to 6:00 PM  
Peak Hour: 5:00 PM to 6:00 PM



	HV %:	PHF
EB	1.2%	0.86
WB	2.0%	0.83
NB	0.3%	0.91
SB	7.1%	0.50
TOTAL	1.3%	0.88

### Two-Hour Count Summaries

Interval Start	MAIN ST				MAIN ST				SHOPPING CTR N DWY				HOPELINK DWY				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	4	86	32	0	20	59	4	0	38	1	41	0	3	0	2	290	0
4:15 PM	0	1	74	40	0	35	46	0	0	46	0	28	0	1	0	1	272	0
4:30 PM	0	4	74	49	0	25	48	0	0	35	1	22	0	1	0	1	260	0
4:45 PM	0	2	93	36	0	27	61	4	0	48	0	26	0	3	0	1	301	1,123
<b>5:00 PM</b>	<b>0</b>	<b>0</b>	<b>100</b>	<b>35</b>	<b>0</b>	<b>29</b>	<b>47</b>	<b>1</b>	<b>0</b>	<b>36</b>	<b>1</b>	<b>27</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>278</b>	<b>1,111</b>
5:15 PM	0	1	77	41	0	47	41	4	0	49	0	27	0	6	0	1	294	1,133
<b>5:30 PM</b>	<b>0</b>	<b>6</b>	<b>95</b>	<b>64</b>	<b>0</b>	<b>36</b>	<b>66</b>	<b>2</b>	<b>0</b>	<b>39</b>	<b>2</b>	<b>35</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>346</b>	<b>1,219</b>
5:45 PM	0	4	106	36	0	36	34	1	0	38	0	44	0	2	1	1	303	1,221
Count Total	0	22	705	333	0	255	402	16	0	329	5	250	0	17	3	7	2,344	0
<b>Peak Hour</b>	<b>0</b>	<b>11</b>	<b>378</b>	<b>176</b>	<b>0</b>	<b>148</b>	<b>188</b>	<b>8</b>	<b>0</b>	<b>162</b>	<b>3</b>	<b>133</b>	<b>0</b>	<b>9</b>	<b>3</b>	<b>2</b>	<b>1,221</b>	<b>0</b>

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	4	5	0	1	10	0	0	0	0	0	2	0	10	1	13
4:15 PM	3	1	0	0	4	2	0	0	0	2	0	0	4	4	8
4:30 PM	1	2	1	0	4	2	3	0	0	5	0	0	3	5	8
4:45 PM	1	2	0	0	3	0	0	0	0	0	0	0	2	6	8
<b>5:00 PM</b>	<b>2</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>8</b>	<b>11</b>	<b>20</b>
5:15 PM	2	1	0	0	3	0	3	0	0	3	0	0	2	0	2
<b>5:30 PM</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>	<b>7</b>
5:45 PM	1	3	1	1	6	0	0	0	0	0	0	0	3	11	14
Count Total	16	17	2	2	37	5	6	0	0	11	3	0	36	41	80
<b>Peak Hour</b>	<b>7</b>	<b>7</b>	<b>1</b>	<b>1</b>	<b>16</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>1</b>	<b>0</b>	<b>17</b>	<b>25</b>	<b>43</b>



**Appendix D – 148<sup>th</sup> Ave SE and Kelsey Creek Center Driveway Tube Counts**

Location: 148TH AVE SE S/O MAIN ST  
 Date Range: 12/11/2018 - 12/17/2018  
 Site Code: 01

Time	Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday			Monday			Mid-Week Average					
	12/11/2018			12/12/2018			12/13/2018			12/14/2018			12/15/2018			12/16/2018			12/17/2018			Mid-Week Average					
	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total
12:00 AM	68	63	131	75	79	154	64	75	139	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	69	72	141
1:00 AM	33	28	61	42	51	93	40	41	81	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	38	40	78
2:00 AM	22	36	58	25	37	62	33	34	67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27	36	62
3:00 AM	43	29	72	33	33	66	40	38	78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39	33	72
4:00 AM	115	51	166	119	38	157	108	48	156	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	114	46	160
5:00 AM	292	171	463	286	182	468	284	176	460	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	287	176	464
6:00 AM	650	439	1,089	679	392	1,071	664	426	1,090	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	664	419	1,083
7:00 AM	1,321	881	2,202	1,240	893	2,133	1,250	864	2,114	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,270	879	2,150
8:00 AM	1,403	1,183	2,586	1,494	1,058	2,552	1,442	1,142	2,584	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,446	1,128	2,574
9:00 AM	1,570	984	2,554	1,563	1,035	2,598	1,597	988	2,585	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,577	1,002	2,579
10:00 AM	1,364	823	2,187	1,105	911	2,016	1,350	883	2,233	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,273	872	2,145
11:00 AM	1,220	849	2,069	1,029	909	1,938	1,252	989	2,241	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,167	916	2,083
12:00 PM	1,097	1,036	2,133	1,028	1,027	2,055	991	980	1,971	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,039	1,014	2,053
1:00 PM	924	1,159	2,083	989	1,127	2,116	940	1,197	2,137	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	951	1,161	2,112
2:00 PM	954	1,316	2,270	1,057	1,335	2,392	957	1,385	2,342	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	989	1,345	2,335
3:00 PM	1,298	1,465	2,763	1,201	1,614	2,815	1,179	1,429	2,608	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,226	1,503	2,729
4:00 PM	1,401	1,391	2,792	1,388	1,571	2,959	1,387	1,552	2,939	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,392	1,505	2,897
5:00 PM	1,423	1,593	3,016	1,360	1,529	2,889	1,415	1,683	3,098	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,399	1,602	3,001
6:00 PM	1,163	1,566	2,729	1,194	1,445	2,639	1,222	1,566	2,788	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,193	1,526	2,719
7:00 PM	745	995	1,740	701	986	1,687	778	1,078	1,856	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	741	1,020	1,761
8:00 PM	484	767	1,251	530	791	1,321	551	826	1,377	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	522	795	1,316
9:00 PM	351	578	929	381	563	944	398	606	1,004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	377	582	959
10:00 PM	227	355	582	249	320	569	218	381	599	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	231	352	583
11:00 PM	110	169	279	125	171	296	137	196	333	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	124	179	303
<b>Total</b>	<b>18,278</b>	<b>17,927</b>	<b>36,205</b>	<b>17,893</b>	<b>18,097</b>	<b>35,990</b>	<b>18,297</b>	<b>18,583</b>	<b>36,880</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>18,156</b>	<b>18,202</b>	<b>36,358</b>
<b>Percent</b>	<b>50%</b>	<b>50%</b>	-	<b>50%</b>	<b>50%</b>	-	<b>50%</b>	<b>50%</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>50%</b>	<b>50%</b>	-

1. Mid-week average includes data between Tuesday and Thursday.

Location: S DWY E/O 148TH AVE SE  
 Date Range: 12/11/2018 - 12/17/2018  
 Site Code: 02

Time	Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday			Monday			Mid-Week Average					
	12/11/2018			12/12/2018			12/13/2018			12/14/2018			12/15/2018			12/16/2018			12/17/2018								
	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total
12:00 AM	3	3	6	5	4	9	0	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	6
1:00 AM	2	0	2	2	2	4	0	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	3
2:00 AM	0	1	1	0	1	1	2	5	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	3
3:00 AM	7	1	8	2	0	2	4	2	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	1	5
4:00 AM	10	2	12	9	0	9	9	0	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	1	10
5:00 AM	31	4	35	23	3	26	28	10	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27	6	33
6:00 AM	48	25	73	49	22	71	56	18	74	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	51	22	73
7:00 AM	86	29	115	65	31	96	76	42	118	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76	34	110
8:00 AM	106	25	131	125	29	154	126	43	169	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	119	32	151
9:00 AM	133	43	176	130	48	178	138	34	172	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	134	42	175
10:00 AM	112	56	168	134	68	202	134	46	180	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	127	57	183
11:00 AM	124	73	197	125	94	219	135	82	217	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	128	83	211
12:00 PM	129	97	226	146	108	254	155	93	248	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	143	99	243
1:00 PM	119	106	225	165	109	274	101	127	228	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	128	114	242
2:00 PM	131	102	233	133	93	226	112	103	215	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	125	99	225
3:00 PM	126	86	212	131	79	210	110	81	191	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	122	82	204
4:00 PM	119	73	192	170	64	234	143	83	226	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	144	73	217
5:00 PM	155	124	279	134	117	251	145	95	240	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	145	112	257
6:00 PM	154	118	272	142	101	243	130	87	217	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	142	102	244
7:00 PM	84	121	205	90	133	223	103	88	191	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	92	114	206
8:00 PM	65	56	121	58	60	118	59	54	113	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	61	57	117
9:00 PM	34	35	69	28	30	58	32	30	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	31	32	63
10:00 PM	17	22	39	24	13	37	16	13	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19	16	35
11:00 PM	9	3	12	14	9	23	16	11	27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	8	21
<b>Total</b>	<b>1,804</b>	<b>1,205</b>	<b>3,009</b>	<b>1,904</b>	<b>1,218</b>	<b>3,122</b>	<b>1,830</b>	<b>1,152</b>	<b>2,982</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>1,846</b>	<b>1,192</b>	<b>3,038</b>
<b>Percent</b>	<b>60%</b>	<b>40%</b>	-	<b>61%</b>	<b>39%</b>	-	<b>61%</b>	<b>39%</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>61%</b>	<b>39%</b>	-

1. Mid-week average includes data between Tuesday and Thursday.

Location: N DWY E/O 148TH AVE SE  
 Date Range: 12/11/2018 - 12/17/2018  
 Site Code: 03

Time	Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday			Monday			Mid-Week Average					
	12/11/2018			12/12/2018			12/13/2018			12/14/2018			12/15/2018			12/16/2018			12/17/2018			Mid-Week Average					
	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total
12:00 AM	0	1	1	0	0	0	1	0	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	1
1:00 AM	0	1	1	0	3	3	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1
2:00 AM	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
3:00 AM	0	1	1	0	0	0	1	0	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	1
4:00 AM	23	2	25	18	0	18	16	1	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19	1	20
5:00 AM	33	3	36	36	15	51	37	7	44	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	8	44
6:00 AM	45	30	75	48	29	77	48	30	78	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	47	30	77
7:00 AM	63	45	108	60	38	98	57	44	101	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60	42	102
8:00 AM	58	25	83	66	27	93	58	30	88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	61	27	88
9:00 AM	57	33	90	66	31	97	46	35	81	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56	33	89
10:00 AM	64	43	107	45	35	80	39	34	73	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	49	37	87
11:00 AM	58	38	96	53	37	90	44	30	74	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	52	35	87
12:00 PM	36	49	85	50	44	94	43	58	101	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43	50	93
1:00 PM	35	48	83	44	57	101	39	55	94	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39	53	93
2:00 PM	34	41	75	38	51	89	30	36	66	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	34	43	77
3:00 PM	40	38	78	40	42	82	34	49	83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	38	43	81
4:00 PM	38	27	65	46	36	82	42	30	72	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	42	31	73
5:00 PM	48	38	86	38	40	78	28	34	62	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	38	37	75
6:00 PM	43	47	90	38	44	82	39	49	88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40	47	87
7:00 PM	25	42	67	27	46	73	27	55	82	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	26	48	74
8:00 PM	19	39	58	21	29	50	30	41	71	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23	36	60
9:00 PM	15	17	32	18	25	43	22	20	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	21	39
10:00 PM	6	13	19	7	5	12	4	8	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	9	14
11:00 PM	0	1	1	0	2	2	2	1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2
<b>Total</b>	<b>740</b>	<b>622</b>	<b>1,362</b>	<b>759</b>	<b>636</b>	<b>1,395</b>	<b>687</b>	<b>647</b>	<b>1,334</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>729</b>	<b>635</b>	<b>1,364</b>
<b>Percent</b>	<b>54%</b>	<b>46%</b>	-	<b>54%</b>	<b>46%</b>	-	<b>51%</b>	<b>49%</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>53%</b>	<b>47%</b>	-

1. Mid-week average includes data between Tuesday and Thursday.

Location: NE DWY S/O MAIN ST  
 Date Range: 12/11/2018 - 12/17/2018  
 Site Code: 04

Time	Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday			Monday			Mid-Week Average		
	12/11/2018			12/12/2018			12/13/2018			12/14/2018			12/15/2018			12/16/2018			12/17/2018					
	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total
12:00 AM	17	3	20	13	6	19	16	0	16	-	-	-	-	-	-	-	-	-	-	-	-	15	3	18
1:00 AM	2	0	2	6	2	8	1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	3	1	4
2:00 AM	3	1	4	0	0	0	1	2	3	-	-	-	-	-	-	-	-	-	-	-	-	1	1	2
3:00 AM	3	4	7	0	2	2	0	2	2	-	-	-	-	-	-	-	-	-	-	-	-	1	3	4
4:00 AM	1	15	16	2	8	10	1	10	11	-	-	-	-	-	-	-	-	-	-	-	-	1	11	12
5:00 AM	26	36	62	31	45	76	23	39	62	-	-	-	-	-	-	-	-	-	-	-	-	27	40	67
6:00 AM	94	67	161	86	87	173	85	75	160	-	-	-	-	-	-	-	-	-	-	-	-	88	76	165
7:00 AM	118	113	231	131	126	257	141	105	246	-	-	-	-	-	-	-	-	-	-	-	-	130	115	245
8:00 AM	168	198	366	179	205	384	159	186	345	-	-	-	-	-	-	-	-	-	-	-	-	169	196	365
9:00 AM	220	165	385	224	174	398	212	176	388	-	-	-	-	-	-	-	-	-	-	-	-	219	172	390
10:00 AM	202	170	372	254	222	476	232	215	447	-	-	-	-	-	-	-	-	-	-	-	-	229	202	432
11:00 AM	238	238	476	287	209	496	224	244	468	-	-	-	-	-	-	-	-	-	-	-	-	250	230	480
12:00 PM	284	243	527	289	236	525	324	252	576	-	-	-	-	-	-	-	-	-	-	-	-	299	244	543
1:00 PM	267	249	516	265	248	513	264	229	493	-	-	-	-	-	-	-	-	-	-	-	-	265	242	507
2:00 PM	258	224	482	270	231	501	253	223	476	-	-	-	-	-	-	-	-	-	-	-	-	260	226	486
3:00 PM	208	206	414	253	273	526	199	219	418	-	-	-	-	-	-	-	-	-	-	-	-	220	233	453
4:00 PM	212	249	461	281	281	562	249	282	531	-	-	-	-	-	-	-	-	-	-	-	-	247	271	518
5:00 PM	265	286	551	292	315	607	271	249	520	-	-	-	-	-	-	-	-	-	-	-	-	276	283	559
6:00 PM	284	298	582	299	327	626	272	248	520	-	-	-	-	-	-	-	-	-	-	-	-	285	291	576
7:00 PM	283	228	511	310	243	553	305	236	541	-	-	-	-	-	-	-	-	-	-	-	-	299	236	535
8:00 PM	278	166	444	273	183	456	251	163	414	-	-	-	-	-	-	-	-	-	-	-	-	267	171	438
9:00 PM	183	111	294	187	98	285	191	114	305	-	-	-	-	-	-	-	-	-	-	-	-	187	108	295
10:00 PM	149	56	205	134	45	179	113	53	166	-	-	-	-	-	-	-	-	-	-	-	-	132	51	183
11:00 PM	54	18	72	73	24	97	78	20	98	-	-	-	-	-	-	-	-	-	-	-	-	68	21	89
<b>Total</b>	<b>3,817</b>	<b>3,344</b>	<b>7,161</b>	<b>4,139</b>	<b>3,590</b>	<b>7,729</b>	<b>3,865</b>	<b>3,343</b>	<b>7,208</b>	-	-	-	-	-	-	-	-	-	-	-	-	<b>3,940</b>	<b>3,426</b>	<b>7,366</b>
<b>Percent</b>	<b>53%</b>	<b>47%</b>	-	<b>54%</b>	<b>46%</b>	-	<b>54%</b>	<b>46%</b>	-	-	-	-	-	-	-	-	-	-	-	-	-	<b>53%</b>	<b>47%</b>	-

1. Mid-week average includes data between Tuesday and Thursday.

## **Appendix E – Kelsey Creek Center Driveway O-D Vehicle Tracking**

PROJECT NAME: BELLEVUE KELSEY CREEK CENTER DWY COUNTS  
DATE: 12/15/18  
SITE: KELSEY CREEK CENTER



TIME	SB LEFTS THAT TURN INTO N DWY	EB THRS THAT TURN INTO N DWY	NB U-TURN	VEHICLES THAT EXIT N DWY WB AND TURN LEFT @ INTERSECTION
4:00	27	16	5	23
4:15	26	14	6	36
4:30	32	19	2	18
4:45	16	11	5	24
5:00	25	17	8	21
5:15	42	22	5	13
5:30	39	14	14	30
5:45	23	21	13	21

**Appendix F – 148<sup>th</sup> Ave SE & South Kelsey Creek Center Signal Warrant**



# Traffic Signal Warrant Summary Worksheet

The Worksheet(s) attached are provided as an attachment to the  
Bellevue Transportation On-Call Task Order 3 project for:

Intersection: 148th Ave SE & S Kelsey Creek Center Driveway  
County: King County  
City: Bellevue

Major Street: 148th Ave SE  
Street Classification: Principal Arterial  
Critical Approach Speed: 35 mph  
Lanes: 2 lanes each direction

Minor Street: S Kelsey Creek Center Driveway  
Street Classification: Driveway  
Critical Approach Speed: 10 mph  
Lanes: 2 lane WB

**Analysis based on EXISTING adjusted volume data**

Date	Day of The Week	Time Interval
12/13/2018	Thursday	11:00 AM - 6:00 PM

Warrant Evaluation Summary	Warrant Met:
Warrant 1: Eight-Hour Volume	Yes
Warrant 2: Four-Hour Volume	Yes
Warrant 3: Peak Hour Volume	Yes

# Warrant 1: Eight-Hour Vehicular Volume

8-Hour Vehicular Volume			
Hour		Major Street	Highest Minor Street Approach
11:00 AM	12:00 PM	2,239	163
12:00 PM	1:00 PM	1,977	177
1:00 PM	2:00 PM	2,154	173
2:00 PM	3:00 PM	2,354	158
3:00 PM	4:00 PM	2,646	140
4:00 PM	5:00 PM	2,977	131
5:00 PM	6:00 PM	3,135	187
6:00 PM	7:00 PM	2,833	173

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume									
Number of lanes for moving traffic on each approach		Vehicles per hour on major street				Vehicles per hour on higher-volume minor-street approach (one direction only)			
		(total of both approaches)							
Major Street	Minor Street	100% <sup>a</sup>	80% <sup>b</sup>	70% <sup>c</sup>	56% <sup>d</sup>	100% <sup>a</sup>	80% <sup>b</sup>	70% <sup>c</sup>	56% <sup>d</sup>
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112
Condition B—Interruption of Continuous Traffic									
Number of lanes for moving traffic on each approach		Vehicles per hour on major street				Vehicles per hour on higher-volume minor-street approach (one direction only)			
		(total of both approaches)							
Major Street	Minor Street	100% <sup>a</sup>	80% <sup>b</sup>	70% <sup>c</sup>	56% <sup>d</sup>	100% <sup>a</sup>	80% <sup>b</sup>	70% <sup>c</sup>	56% <sup>d</sup>
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

<sup>a</sup> Basic minimum hourly volume

<sup>b</sup> Used for combination of Conditions A and B after adequate trial of other remedial measures

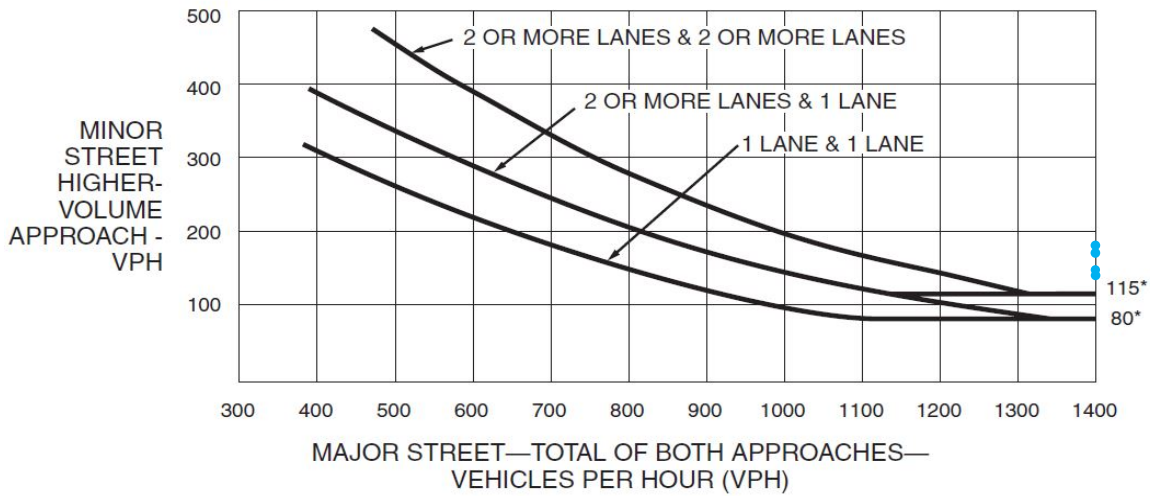
<sup>c</sup> May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

<sup>d</sup> May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

## Warrant 2: Four-Hour Vehicular Volume

4-Hour Vehicular Volume			
Hour		Major Street	Highest Minor Street Approach
3:00 PM	4:00 PM	2,646	140
4:00 PM	5:00 PM	2,977	131
5:00 PM	6:00 PM	3,135	187
6:00 PM	7:00 PM	2,833	173

**Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume**



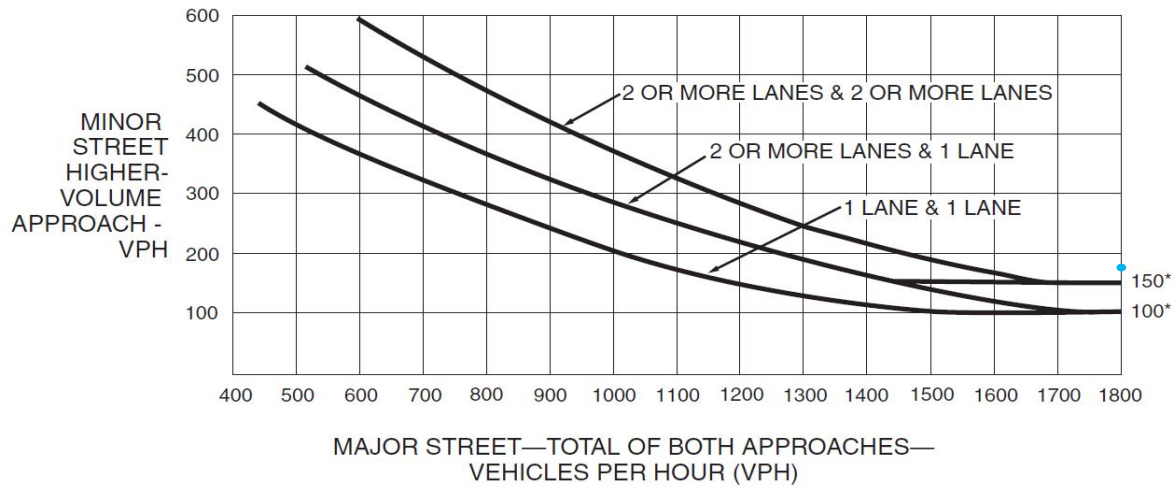
\*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

\*Volume for major street exceeds maximum axis value

# Warrant 3: Peak Hour Volume

Hour Vehicular Volume		
Hour	Major Street	Highest Minor Street Approach
5:00 PM - 6:00 PM	3,135	187

Figure 4C-3. Warrant 3, Peak Hour



\*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

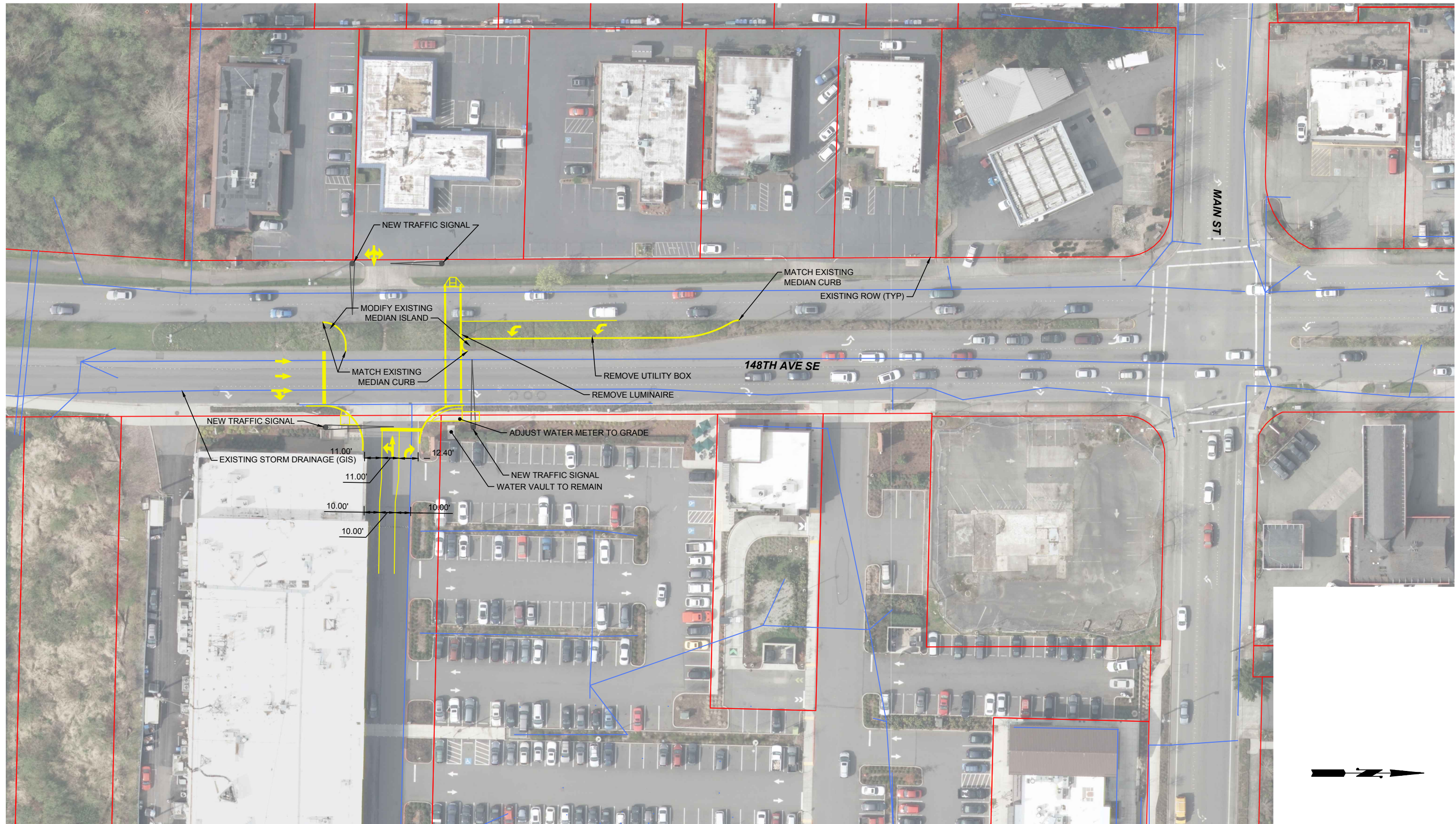
\*Volume for major street exceeds maximum axis value

## Appendix G – Alternative 2 (Recommended Alternative) Conceptual Drawing



Z:\1800001-1800999\1800975\08\T03-148th Spot Improvements\CADD\Design\Study Area 3\Study Area 3 - 148th Ave SE and Main St Intersecting.dwg

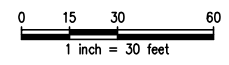
Jul 09, 2019 - 11:56am jesse



**10% DESIGN - NOT FOR CONSTRUCTION**

**NOTES:**

1. ALL PROPOSED LANE WIDTHS 11' UNLESS NOTED OTHERWISE.
2. APPROXIMATELY 6 STREET TREES WILL BE REMOVED.



NO.	DATE	BY	APPR.	REVISIONS

Approved By	
TRANSPORTATION DESIGN MANAGER	DATE
PROJECT MANAGER	DATE

**J. EWING** 5/15/19  
 DESIGNED BY : DATE  
**S. BULL** 5/15/19  
 DRAWN BY : DATE  
**J. MATTHEWS** 5/15/19  
 CHECKED BY : DATE



**BELLEVUE SPOT IMPROVEMENTS**

**STUDY AREA 3**  
**148TH AVE SE & MAIN ST**  
**FULL ACCESS SIGNAL- ALT 2**

SHT    OF   2



## Appendix H – Alternative 2 (Recommended Alternative) Cost Estimate

**OPINION OF PROBABLE COST - SUMMARY**  
**PROJECT: 140th and 148th Spot Improvements -Study Area 3 - Full Signal**

CIP NO.

8/15/2019

<b>I. RIGHT OF WAY ACQUISITION &amp; EASEMENT AND REIMBURSEMENT COSTS</b>		\$	108,000.00
<b>II. CONSTRUCTION</b>			
1. Grading/Drainage			
2. Structures			
3. Surfacing/Paving			
4. Roadside Development			
5. Traffic Services & Safety			
	\$ 759,500		
6. Miscellaneous Items Not Yet Estimated			
20.0% of (Lines 1 through 5) @ 5% Level	\$151,900	\$	911,400
7. Allowance for 5%-Level Accuracy			
30.0% of (Lines 1 through 6)	\$ 273,420.00		
8. Mobilization, Survey, Potholing			
15% of (Line 1 through 6)	\$ 136,710.00		
9. Maintenance of Traffic			
15% of (Line 1 through 6)	\$ 136,710.00	\$	1,458,240.0
10. Construction Work by Others at Owner's Expense			
Construction Work by Others	\$ -		
11. Agreements			
Utility Agreements, etc.	\$ -		
11B. Adjusted Cost for Construction Year			
N/A of (Total)	\$ -		
12. Construction Engineering			
15.0% of (Lines 1 through 10)	\$ 218,736.00		
13. Construction Contingency			
10.0% of (Lines 1 through 10)	\$ 145,824.00		
		\$	1,822,800.00
<b>III. DESIGN ENGINEERING AND CITY COSTS</b>			
1. Design Engineering (Consultant Contract)			
15.0% of (CONSTRUCTION cost not incl contingency)	\$ 251,546.40		
2. Agency Administration			
10.0% of (CONSTRUCTION cost not incl contingency)	\$ 167,697.60		
3. Alignment Survey			
2.0% of (CONSTRUCTION cost not incl contingency)	\$ 33,539.52		
<b>TOTAL ESTIMATED COST</b>		\$	2,383,600.00

Assumptions:

1. Estimate calculated in 2019 dollars.
2. Estimate is based on 10% Design

\*Items not estimated at 10% level assumed cost for these included in items 6 and 7.



**Preliminary Engineer's Estimate of Probable Cost**

Study Area 3							
ITEM NO.	STD ITEM NO.	ITEM	QTY	UNIT	UNIT PRICE	TOTAL COST	% OF CONST
<b>ROADWAY</b>							
	25	CLEARING AND GRUBBING	0.085	Acre	\$40,000	\$3,407.71	0.4%
	310	ROADWAY EXCAVATION INCL. HAUL	73	CY	\$40.00	\$2,924.28	0.4%
	5120	CRUSHED SURFACING TOP COURSE	81	TON	\$50.00	\$4,046.26	0.5%
	5767	HMA CL 1/2" PG 58H-22	344	TON	\$200.00	\$68,811.67	9.1%
	6700	CEMENT CONC. TRAFFIC CURB AND GUTTER	410	LF	\$35.00	\$14,350.00	1.9%
	7055	CEMENT CONC. SIDEWALK	168	SY	\$70.00	\$11,791.11	1.6%
	7058	CEMENT CONC. CURB RAMP TYPE	4	EA	\$2,000.00	\$8,000.00	1.1%
	SP	FENCING	0	LF	\$40.00	\$0.00	0.0%
		PLANING BITUMINOUS PAVEMENT	1033	SY	\$3.00	\$3,099.00	0.4%
<b>DRAINAGE/UTILITIES</b>							
	3541	SCHEDULE A STORM SEWER PIPE 12 IN. DIAM.	0	LF	\$45.00	\$0.00	0.0%
	3091	CATCH BASIN TYPE 1	2	EA	\$2,000.00	\$4,000.00	0.5%
	3105	CATCH BASIN TYPE 2 48 IN. DIAM.	0	EA	\$4,000.00	\$0.00	0.0%
	3767	PVC SANITARY SEWER PIPE 8 IN. DIAM.	0	LF	\$45.00	\$0.00	0.0%
<b>STRUCTURE</b>							
	SP	GRAVITY BLOCK WALL	0	SF	\$130.00	\$0.00	0.0%
	SP	CONCRETE STAIRWAY	0	LS	\$200.00	\$0.00	0.0%
<b>ENVIRONMENT</b>							
		EROSION/WATER POLLUTION CONTROL	0	LS	\$10,000.00	\$0.00	0.0%
		SWPPP PREPARATION AND MAINTENANCE	0	LS	\$2,000.00	\$0.00	0.0%
		SPCC PLAN	0	LS	\$2,000.00	\$0.00	0.0%
<b>TRAFFIC AND ILLUMINATION</b>							
		PERMANENT SIGNING AND STRIPING	1	LS	\$4,000.00	\$4,000.00	0.5%
		TRAFFIC SIGNAL	1	LS	\$600,000.00	\$600,000.00	79.0%
		ILLUMINATION	1	LS	\$30,000.00	\$30,000.00	3.9%
<b>LANDSCAPING</b>							
		LANDSCAPE RESTORATION	1	LS	\$5,000.00	\$5,000.00	0.7%
<b>Subtotal</b>						<b>\$759,500.00</b>	
<b>RIGHT-OF-WAY</b>							
		SIDEWALK EASEMENT/ACQUISITION	794	SF	\$75.00	\$59,550.00	
		TCE	9675	SF/MONTH	\$5.00	\$48,375.00	

## Appendix I – Public Comments and Responses

**Question/Comment:** If you are going to allow traffic turning in with a light then you should allow them to turn out onto southbound 148th also.

***Response:** Correct, this movement would be allowed. The graphic provided in the flyer did not show the entire intersection. Please use the link below to view larger image of this intersection:*

*[https://transportation.bellevuewa.gov/UserFiles/Servers/Server\\_4779004/File/Transportation/Levy/LEVY-148thMainStMapGraphic.pdf](https://transportation.bellevuewa.gov/UserFiles/Servers/Server_4779004/File/Transportation/Levy/LEVY-148thMainStMapGraphic.pdf)*

*From the Kelsey Creek Center, you are allowed to take a left to go southbound on 148<sup>th</sup> Ave SE, go straight, or take a right to go northbound on 148<sup>th</sup> Ave SE.*

**Question/Comment:** I received the study report in the mail and love the ideas to improve traffic flow! I lived in this neighborhood since 2011. One suggestion I have that has an exceedingly high benefit/cost ratio is to slightly move back (widen) the curb on the main entrance to the Kelsey Creek shopping center.

Right now this turn is very tight and it is very difficult to make the right turn from Main Street into the shopping center without hitting the rear right wheel on this sharp edge. This causes people to slow to a crawl entering in, which backs up traffic all the way into the 148th Ave / Main St intersection.

***Response:** We recognize that when this entrance was modified to accommodate to two exiting lanes (originally had just one exiting lane), the trade-off of that improvement was that the entering lane would be narrower. I used to live near here so I have seen how slow people turn.*

*In the discussions of how we could address this concern, we realized that although widening the driveway could help reduce people driving over the curb, it would not address concerns we've heard from the community of all the congestion caused the people trying to get in and out of this driveway. Therefore, we considered other treatments such as a compact roundabout at this driveway to improve flow at the driveway (but is was determined to not be a feasible option due to the roadway geometry and multiple driveways). We have then looked more broadly and saw that improving an access on 148th Avenue SE could reduce the volume at this driveway on Main Street. Based on an origin-destination study our consultant conducted, we anticipate many of the people who turn right in and left out of the Main Street driveway would now turn left in and out of the access off of 148th Avenue. The proposed project would indirectly alleviate some of the stress at that driveway.*

*We can then evaluate whether two lanes exiting this driveway on Main St is still needed. Could we revert back to one lane in/one lane out and have more space to make that turn or are there other modifications possible? This is something we would have to review with the property owners as part of the project to signalizing the 148th Avenue driveway.*

**Question/Comment:** My one hope is that the traffic signal at the south end of Kelsey Creek Shopping Center would only be used when a car needed to cross 148th and not be on a set timer. These changes seem like a good use of the funds. I hope the work will be done at night to minimize traffic congestion during the day.

***Response:** Thank you for the feedback, we appreciate your support. As follow up to your comment about the proposed traffic signal at the Kelsey Creek Shopping Center – yes, we would install sensors so it would only serve the driveway if there is someone there. It would also be synchronized with 148<sup>th</sup> Ave and Main St when traffic is heavy so that we minimize the impact to 148<sup>th</sup> Ave and do not interrupt traffic flow.*

**Question/Comment:** 148<sup>th</sup> & Main is definitely impacted by traffic to and from the rebuilt shopping center. Your plans for additional access from 148<sup>th</sup> may work, but again, the north-south left turns are out of synch and the north-south green lights run much too long, creating long queues (even overflowing into general traffic lanes), in the left turns and east-west. Ten minutes of field observation would quickly reveal this is most of your problem.

***Response:** Unsynchronized left turns – I understand what you are referring to, which is that at some locations, the left turn phases both come at the same time before the through movements whereas at other locations, one left turn direction comes up before and the other direction comes up after (we call this leading and lagging left turns). We do this to coordinate the traffic signals along a corridor and to have progression in both directions. This is something that is difficult to explain with just words; thus, I have attached a document that pulls some information and diagrams from the Federal Highway Administration’s Traffic Signal Timing Manual. Leading and lagging the left turns increases the bandwidth in the two different directions on a road so we may fully utilize the green time. Additionally, it doesn’t necessarily impact the amount of green time allotted to the left turn movement, just when the movement is served.*

*Higher Cycle Lengths – There is definitely a trade-off between longer and shorter cycle lengths. If they are too long, queues will build up for some movements and then those movements will need more time to clear or more space for the queue. On the other hand, if it is too short, then some movements would not have enough time to clear and again queues could build up. The City has an adaptive signal system that measures the real time traffic volumes and congestion and then calculates the most efficient cycle length and green times for each movement. However, we also do control certain things like how high the cycle length can go and the minimum amount of time for each movement. Investing in an adaptive signal system helps to use the existing roadways to the fullest extent possible but still only add so much capacity.*

**Question/Comment:** This intersection has been a mess ever since Wall-Mart moved in. DO NOT add a traffic light to 148th Street!!! That is the worst thing you can do! It would cause more congestion on 148th. Even if you made the new signal and the old signal both go red for north/south bound traffic at the same time, then left turning westbound traffic and right turning eastbound traffic would have to stop at the new signal and that traffic would back up into the existing intersection. Go back to the drawing board on this one! Or remove Wall-Mart!

**Response:** *In regards to concern about adding another traffic signal on 148th – I understand your concern about another traffic signal that could hold up traffic. However, the benefit of adding this new access point is that some of the westbound to southbound traffic at Main St would be diverted to this new traffic signal. Same goes for people would turn from southbound to eastbound to go into the shopping center. Reducing the turning volume at Main St frees up more time for the other directions and we would closely coordinate the new signal and existing signal at Main St to minimize queuing and stops. The traffic analysis showed the new traffic signal reduced delay for westbound traffic on Main St and improved overall operation.*

**Question/Comment:** Seems like the driveway and streetlight modification would help some.

**Response:** *We are currently in study phase and only have conceptual design developed. We do not know when this project would advance to full design and construction. All the projects identified in these congestion reduction studies will be compared to each other to be ranked and prioritized for funding this fall. If this project does advance to a full design, we will evaluate the lighting and ensure all standards and requirements are met.*

**Question/Comment:** Is that an overpass or added crosswalk across 148th?

**Response:** *It is an added crosswalk across 148<sup>th</sup> Ave SE.*

**Question/Comment:** Your proposal only seems to address the queuing problem on the Westbound(Kelsey) side of Main and 148th.

**Response:** *The benefit of adding this new access point is that some of the westbound to southbound traffic at Main St would be diverted to this new traffic signal. Same goes for people who would turn from southbound to eastbound to go into the shopping center. Reducing the turning volume at Main St frees up more time for the other directions and we would closely coordinate the new signal and existing signal at Main St to minimize queuing and stops. The traffic analysis showed the new traffic signal reduced delay for westbound traffic on Main St and improved overall operation.*

**Question/Comment:** The car backup(queuing) on Main St eastbound from 140th Ave to 148th Ave can be a solid steady line caused by increased volume of cars from the New high school and commuters. The shared though and southbound turn lane plus crosswalk light and bus stop can cause a car to miss several lights and opportunities to Turn right onto 148th, prolonging the Queuing and congestion.

It would be a tremendous improvement to have a dedicated right turn lane pocket southbound onto 148th with coordinated crosswalk light! I truly thought that was what the recent intersection improvement work was accomplishing a few years back. I guess that was done for traffic control cameras and pedestrian sidewalks and crossings.

***Response:** Unfortunately, our scope for this study did not include adding a right turn pocket. However, if the proposed project does get constructed, we will monitor the impact on the eastbound right turn to see if a right turn pocket is warranted. In our analysis and re-distribution, we assumed people who originally went through eastbound would now turn right so there was no additional "new" eastbound volume. However, if I understand you correctly, one of your concerns is that additional right turns would cause additional delay, which is generally true since right turns are slower and have to yield to people in the crosswalk. Also, we don't know if this could attract more people to use eastbound Main St. Our analysis still showed a slight improvement for eastbound, which I believe is because there is less time needed for westbound left signal so that time is given to other movements. However, that is a small benefit and as you suggested, a right turn pocket would help additionally.*