City of Bellevue Neighborhood Congestion Reduction Program
148th Avenue NE and Lake Hills Boulevard Transportation Analysis Report
Contract Number 1850211.000
August 2019

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.

8/18/19

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Date:	August 18, 2019
To:	Jun Suk An, PE, City of Bellevue
Cc:	Darcy Akers, City of Bellevue
From:	Jeremy Wheeler, PE, Concord Engineering
	Justin Matthews, PE, KPFF
Subject:	148th Avenue SE and Lake Hills Boulevard Intersection Improvements

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 148th Avenue SE and Lake Hills Boulevard Intersection. 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 148th Avenue SE and Lake Hills Boulevard (Figure 1), which currently experiences congestion, especially for the east and west legs during the AM and PM peak hours. 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, three (3) 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 intersection and closes with a summary of construction challenges and risks associated with the improvements.

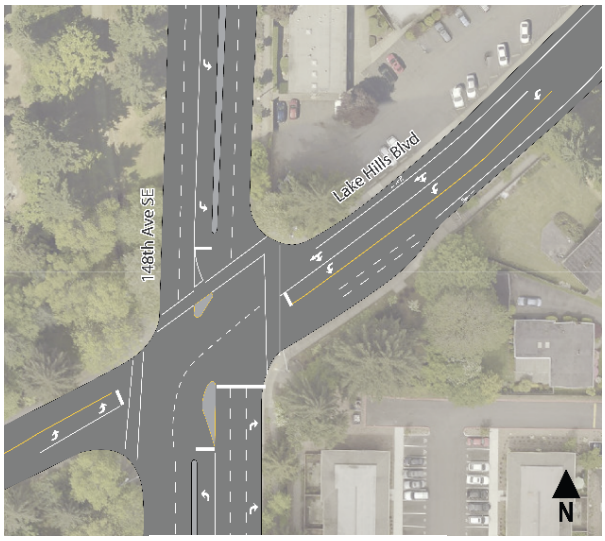


Figure 1. Study Area

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 Appendix F of this report.

2. Methods and Assumptions

2.1 Analysis Scenarios

The traffic operations analysis includes the following scenarios:

- 2018 existing condition AM peak (8:00 AM to 9:00 AM) and PM peak (5:00 PM to 6:00 PM)
- 2035 baseline (no-build) condition AM peak and PM peak
- 2035 alternative condition AM peak and PM peak (three 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 16th, 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.

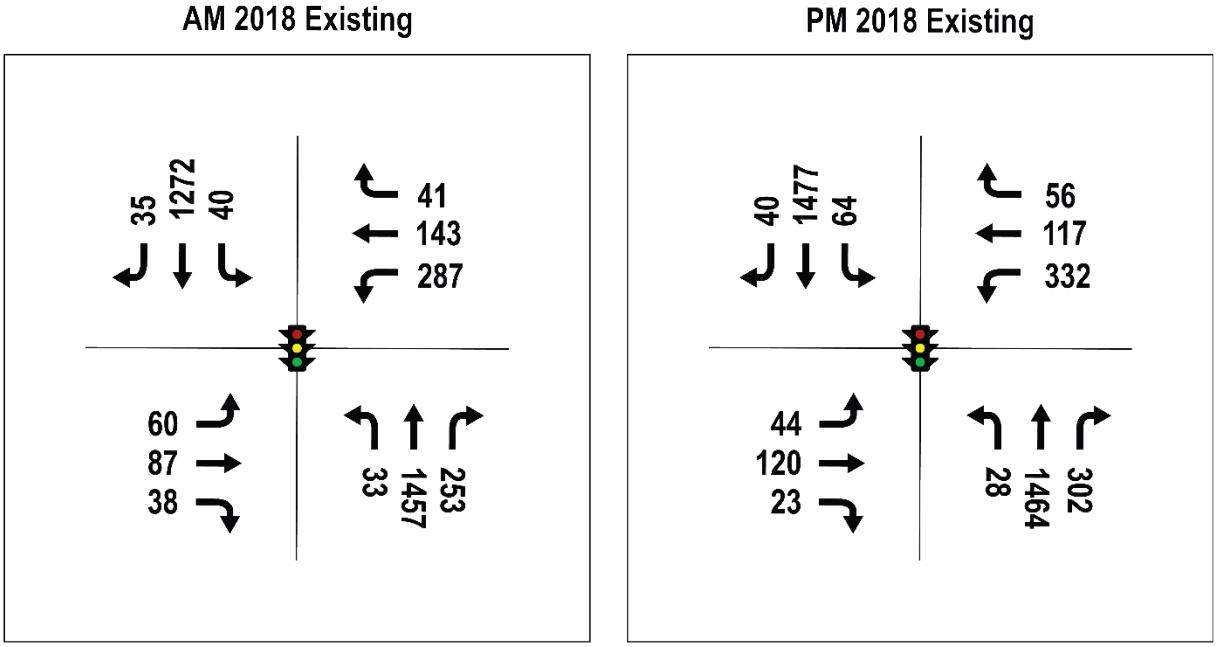


Figure 2. 2018 Existing AM and PM Peak Hour Turning Movement Volumes

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 or F are the northbound and southbound left turn movements, and the eastbound and westbound left turn and through movements.

During the PM peak hour, the intersection operates at LOS C, but with a shorter average control delay (31 seconds) than that of the AM peak (39 seconds). The movements that operate at LOS E or F are the same as that of the AM peak.

Overall, the eastbound and westbound movements currently experience relatively high delay because the current roadway geometry and channelization constraints force the eastbound and westbound movements to operate with split phasing, which reduces the capacity of the eastbound and westbound approaches.

The study intersection (148th Avenue SE and Lake Hills Boulevard) 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 0.92 and 0.90 in the AM and PM peak hours, respectively; therefore, the intersection performance currently exceeds the MMA threshold.

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

Scenario		Intersection	Eastbound			Westbound			Northbound			Southbound		
			L	T	R	L	T	R	L	T	R	L	T	R
2018 Ex AM	Delay*	39	72	133		91	86		81	39	2	60	14	
	LOS	D	E	F		F	F		F	B	A	E	B	
2018 Ex PM	Delay*	31	67	137		99	94		95	21	3	56	8	
	LOS	C	E	F		F	F		F	C	A	E	A	

*The unit for Vehicle Delay is second/vehicle.

3.3 Collision Analysis

This collision analysis evaluated 5-year historical collision data collected from January 2014 to December 2018 within the vicinity of the study intersection. A total of 19 collisions were reported during the five-year period. 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 (42%) and right-angles (32%). Table 3 and Figure 4 summarize the collision data by severity. The majority of collisions resulted in no injury (74%) and the rest of collisions resulted in possible injury. There were no reported collisions involving a pedestrian or bicyclist.

Table 2. Collision Type Summary

Collision Type	2014	2015	2016	2017	2018	Total
Right Angle		2	1	1	2	**6**
Sideswipe/Lane Change	1				1	**2**
Rear End	1	2	2	1	2	**8**
Head On		1				**1**
Approach Turn					1	**1**
Other			1			**1**
Total	**2**	**5**	**4**	**2**	**6**	**19**

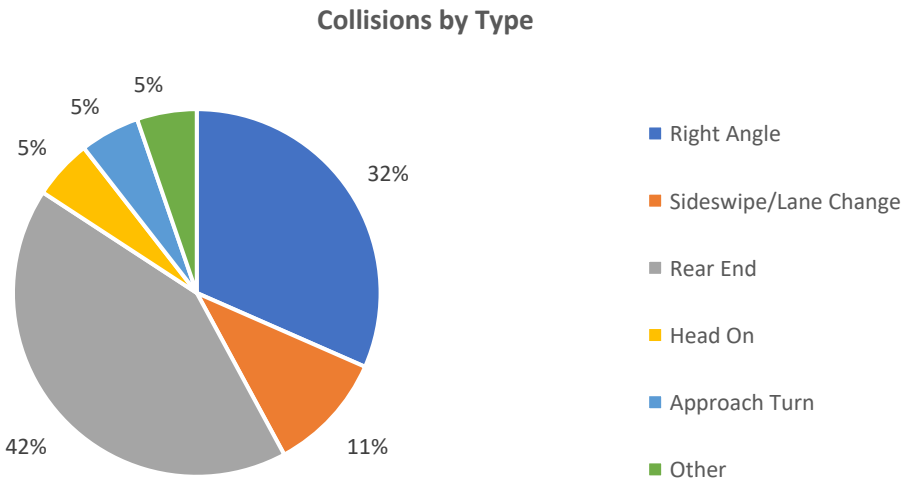


Figure 3. Summary by Collision Type

Table 3. Collision Severity Summary

Collision Severity	2014	2015	2016	2017	2018	Total
No Injury	2	3	2	2	5	**14**
Possible Injury		2	2		1	**5**
Total	**2**	**5**	**4**	**2**	**6**	**19**

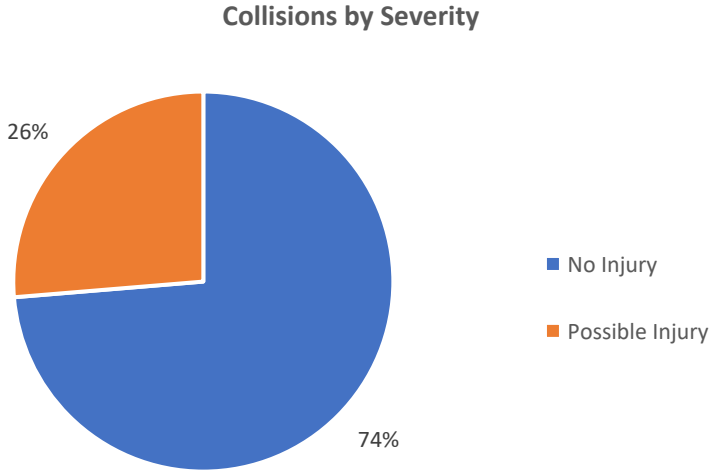


Figure 4. Summary by Collision Severity

Table 4 provides a summary of the collisions by vehicle movement. The northbound approach had the highest frequency of reported collisions (11 out of 19 collisions). Furthermore, approximately 69% of reported collisions involved a through vehicle.

Table 4. Collisions by Vehicle Movement

Direction	Left Turn	Through	Right Turn	Subtotal
Eastbound	0	0	1	**1**
Westbound	0	1	2	**3**
Southbound	0	4	0	**4**
Northbound	0	11	0	**11**
Total	**0**	**16**	**3**	**19**

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 5. For comparison purposes, the existing conditions traffic volumes for both the AM and PM peak hours are also included in the figure.

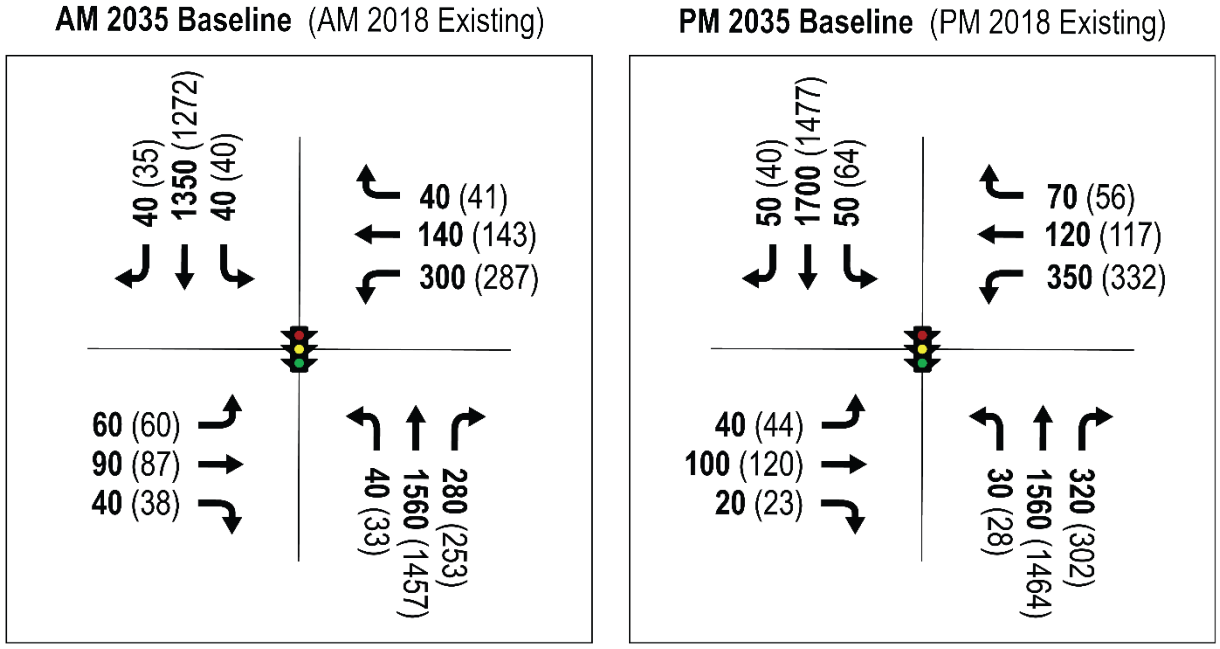


Figure 5. 2035 Baseline AM and PM Peak Hour Turning Movement Volumes

4.2 Baseline Traffic Operations

The 2035 baseline delay and LOS results for AM and PM peak hours are summarized in Table 5 and Table 6, respectively. With the increase in volumes, the intersection would experience increased delay during both AM and PM peak hours. During the AM peak hour, the intersection would continue to operate at LOS D, but with an additional 8 seconds of average control delay and the northbound through movement degrading from LOS D to LOS E. During the PM peak hour, the intersection LOS would continue to operate at LOS C with an additional 5 seconds of average control delay and no additional movements would degrade to LOS E or F.

Table 5. 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	72	133		91	86		81	39	2	60	14	
	LOS	D	E	F		F	F		F	D	A	E	B	
2035 Baseline	Delay*	47	72	142		92	86		88	59	3	58	15	
	LOS	D	E	F		F	F		F	E	A	E	B	

*The unit for Vehicle Delay is second/vehicle.

Table 6. 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*	31	67	137		99	94		95	21	3	56	8	
	LOS	C	E	F		F	F		F	C	A	E	A	
2035 Baseline	Delay*	36	66	109		103	94		93	26	3	58	21	
	LOS	C	E	F		F	F		F	C	A	E	C	

*The unit for Vehicle Delay is second/vehicle.

5. Alternatives Analysis

5.1 Alternative Descriptions

Three (3) alternatives were considered at the intersection of 148th Avenue SE and Lake Hills Boulevard:

- **Alternative 1:** Convert westbound shared through/left/right lane to through/right lane and operate east and west left turn movements as protected lead/lag phasing
- **Alternative 2A:** Add an additional left turn lane to westbound approach and operate eastbound and westbound left turn movements as protected lead/lag phasing
- **Alternative 2B:** Same configuration as the Alternative 2 but operate eastbound and westbound left turn movements as protected lead/lead phasing

A roundabout was also considered but disqualified from further analysis based on the forecasted volumes (which would require a two-lane roundabout), the volume imbalance at the intersection, and the substantial amount of right-of-way that the roundabout would require. The impacts and costs of a roundabout were considered substantially beyond the scope of this Levy program that focuses on near to mid-term projects; therefore, traffic modeling of the roundabout option was not advanced.

The conceptual drawings and preliminary cost estimates for each alternative are included in Appendix D and E of this report, respectively. The impacts associated with each alternative are described in the following sections.

5.1.1 Alternative 1

The Alternative 1 conceptual design is depicted in Figure 6. Alternative 1 would convert the westbound shared through/left/right turn lane to a shared through/right turn lane. This alternative would require minor pavement marking revisions and traffic signal modifications.

Figure 6. Alternative 1 Configuration

5.1.2 Alternative 2A and 2B

Alternative 2A and 2B have the same project footprint and channelization, but with different signal phasing. The conceptual design is depicted in Figure 7. These alternatives would require widening the east leg of Lake Hills Boulevard to accommodate an additional 250-foot long westbound left turn lane and allow the eastbound and westbound left turn movements to occur concurrently. It is recommended to widen Lake Hills Boulevard to the south, requiring encroachment into approximately three residential properties. The north curb line would be held in the existing location for two reasons. First, it would provide adequate space to operate eastbound and westbound left turn movements concurrently without reconstructing the west leg of the intersection. Secondly, there would be no impact to the north side parking lot. This parking lot in its current configuration does not meet the latest Bellevue parking code requirements and therefore any encroachment into that property could result in a significant reduction in available parking spots and substantial impacts to the businesses.

The proposed roadway widening section includes replacing the existing planter and sidewalk with a 4-foot planter and 6-foot sidewalk. Not only does the planter match the existing roadway section, the planter allows space for luminaire replacement. To decrease the widening footprint the two outside westbound Lake Hills Blvd lanes will be reduced to 10.5', the inside westbound lane and eastbound lane

will remain at 11’ due to bus operations and anticipation of a traffic curb installed between westbound and eastbound traffic.

A sidewalk easement or right-of-way acquisition would be needed from four (4) residential properties to construct the new sidewalk and planter. The existing bus pull-out would be converted to an in-lane bus stop at the same location.

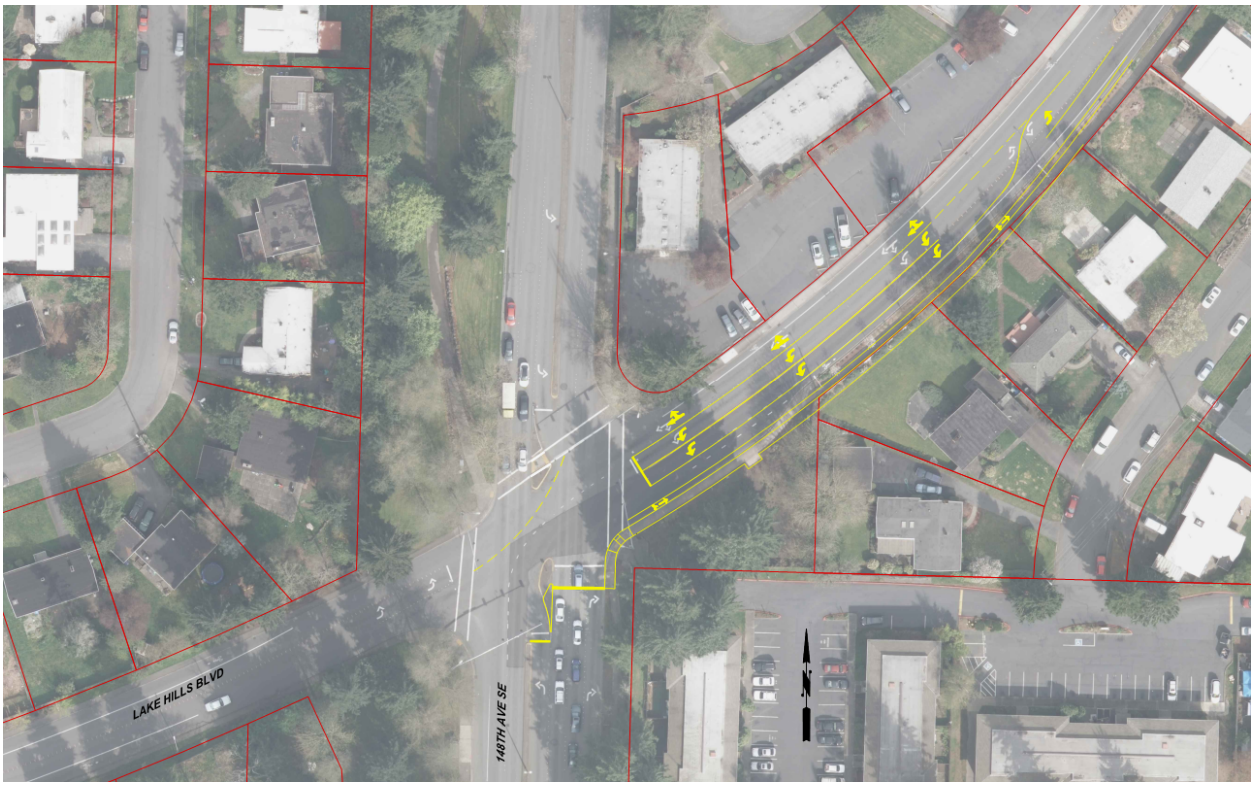


Figure 7. Alternative 2A and 2B configuration

5.2 Alternatives Analysis

5.2.1 Traffic Analysis Results

Table 7 and Table 8 provide a summary of the alternative delay and LOS results for the AM and PM peak hours, respectively.

Alternative 1 would increase the overall intersection delay by 16 and 9 seconds for the AM and PM peak hours, respectively. The AM peak hour intersection LOS would degrade from LOS D to E and PM peak hour LOS would remain the same as the baseline condition. Furthermore, the westbound left turn movement would operate significantly worse compared to the Baseline as a result of the modified westbound approach channelization.

The Synchro model results demonstrate that an additional westbound left turn lane would provide traffic operational benefits. Alternative 2A and 2B would provide similar benefits to the traffic operation over the 2035 baseline for both AM and PM peak hours due to the shared project footprint and channelization.

During the AM peak hour, the intersection would continue to operate at LOS D, but average intersection control delay would decrease by 7 and 8 seconds for Alternative 2A and 2B, respectively. All of the eastbound and westbound movements would operate at LOS E. During the PM peak hour, the intersection would continue to operate at LOS C with a delay reduction of 5 and 6 seconds for Alternative 2A and 2B respectively. All of the eastbound and westbound movements LOS would improve to LOS E or better.

Overall, Alternative 2B with the eastbound and westbound left turn operating as lead/lead phasing provide slightly more benefits than that of the Alternative 2A with the eastbound and westbound left turn operating with lead/lag phasing.

Table 7. 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	72	133		91	86		81	39	2	60	14	
	LOS	D	E	F		F	F		F	D	A	E	B	
2035 Baseline	Delay*	47	72	142		92	86		88	59	3	58	15	
	LOS	D	E	F		F	F		F	E	A	E	B	
2035 Alt 1	Delay*	63	51	68		113	77		75	92	4	56	28	
	LOS	E	D	E		F	E		E	F	A	E	C	
2035 Alt 2A	Delay*	40	60	74		70	78		73	48	4	60	19	
	LOS	D	E	E		E	E		E	D	A	E	B	
2035 Alt 2B	Delay*	39	74	74		70	59		73	48	4	60	19	
	LOS	D	E	E		E	E		E	D	A	E	B	

*The unit for Vehicle Delay is second/vehicle.

Table 8. 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*	31	67	137		99	94		95	21	3	56	8	
	LOS	C	E	F		F	F		F	C	A	E	A	
2035 Baseline	Delay*	36	66	109		103	94		93	26	3	58	21	
	LOS	C	E	F		F	F		F	C	A	E	C	
2035 Alt 1	Delay*	45	57	71		217	62		82	28	22	59	27	
	LOS	D	E	E		F	E		F	C	A	E	C	
2035 Alt 2A	Delay*	31	58	71		73	65		83	23	2	58	24	
	LOS	C	E	E		E	E		F	C	A	E	C	
2035 Alt 2B	Delay*	30	76	71		73	50		83	24	2	58	24	
	LOS	C	E	E		E	D		F	C	A	E	C	

*The unit for Vehicle Delay is second/vehicle.

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 9 provides a summary of the MMLOS impacts across the 2035 Baseline and three alternatives as compared to the 2018 existing condition.

Table 9. Project MMLOS Evaluation

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

Vehicle Mode

Under MMLOS guidelines, vehicle LOS is evaluated based on the intersection volume to capacity (V/C) ratio. Table 10 provides a summary of the intersection V/C Ratio based on the Synchro model HCM report. The v/c ratio is higher in the 2035 baseline conditions, as expected, due to the increase in volumes at the intersection under future conditions. The Alternative 1 condition further increases the v/c ratio because this option does not properly address the congestion at this intersection. As expected, the v/c decreases with Alternatives 2A and 2B. Both alternatives would potentially maintain conditions at the current or better v/c ratio in 2035. However, the results show that the MMA threshold would still be slightly exceeded.

Table 10. Intersection V/C ratio

Scenario	AM	PM
2018 Existing	0.92	0.90
2035 Baseline	0.97	0.95
2035 Alt 1	1.02	1.00
2035 Alt 2A	0.91	0.88
2035 Alt 2B	0.89	0.88

Transit Mode

King County Metro Route 226 travels through this intersection making a northbound right turn and a westbound left turn.

Transit speed LOS will be negatively impacted as a result of the vehicle delay increase in the 2035 Baseline if no improvements are made. Under alternative 1, transit speed LOS would be degraded due to increase in delay for the westbound left turn movement. Under alternatives 2A and 2B, transit speed LOS would improve as a result of the reduction in vehicle delay for the bus movements. Furthermore, there is also no impact to transit stop LOS as existing transit stop amenities will be maintained or relocated under all alternatives.

Bike and Pedestrian Mode

Bike and pedestrian LOS will remain the same under the 2035 Baseline and all three alternatives because the existing bike and pedestrian facilities types will be maintained under all alternatives.

5.3 Alternatives Comparison

A summary of the alternative comparison is presented in Table 11.

Table 11. Alternatives Analysis Comparison

2035 Baseline	Alternative 1 – Modified WB Channelization; Lead/Lag for EBL & WBL	Alternative 2A – Additional WB Left Turn Lane; Lead/Lag for EBL & WBL	Alternative 2B – Additional WB Left Turn Lane; Lead/Lead for EBL & WBL
Traffic Operations			
AM LOS: D AM V/C: 0.97 PM LOS: E PM V/C: 0.95 Significant delay and operating near capacity	AM LOS: D AM V/C: 1.02 PM LOS: E PM V/C: 1.00 Significant delay and operating over capacity	AM LOS: D AM V/C: 0.91 PM LOS: D PM V/C: 0.88 Improved operations by adding dual left turn lanes	AM LOS: D AM V/C: 0.89 PM LOS: D PM V/C: 0.88 Improved operations by adding dual left turn lanes
Traffic Safety			
Collision rates are anticipated to be unchanged or higher	Collision rates are anticipated to be unchanged or higher	Reduced congestion may reduce collision frequency	Reduced congestion may reduce collision frequency
Multi-Modal Impacts			
Lower transit speeds due to increased intersection delay Same level of transit amenities No change to existing pedestrian and bicycle conditions	Lower transit speeds due to increased intersection delay Same level of transit amenities No change to existing pedestrian and bicycle conditions	Higher transit speeds due to decreased intersection delay and in-lane bus stop on west leg Same level of transit amenities No change to existing pedestrian and bicycle conditions	Higher transit speeds due to decreased intersection delay and in-lane bus stop on west leg Same level of transit amenities No change to existing pedestrian and bicycle conditions
Right-of-Way			
None	None	Sidewalk easement or ROW acquisition	Sidewalk easement or ROW acquisition
Stormwater Impacts			
None	None	Minimal. New catch basins but no new WQ or flow control facilities	Minimal. New catch basins but no new WQ or flow control facilities
Utility Impacts			
None	None	Luminaire relocation	Luminaire relocation
Environmental Impacts			
None	None	Minimal	Minimal
Construction Costs			
None	Minimal	$1,300,000	$1,300,000

6. Recommendation

Alternatives 2A and 2B would both provide significant improvements in traffic operations over existing conditions if deployed in the near term and would potentially preserve conditions at this intersection in 2035 at a v/c ratio that is equal to, or slightly less than, today's conditions despite the increase in traffic.

The physical design for Alternative 2A and 2B are identical. The difference will be in how the traffic signal is programmed. The skew of the intersection will need to be considered when preparing the final design and traffic signal timing. Turning radii will be evaluated to determine if the intersection can be safely operated with concurrent left turns.

The final decision on whether this intersection will operate under the 2A or 2B conditions will be determined in the final design stage of this project.

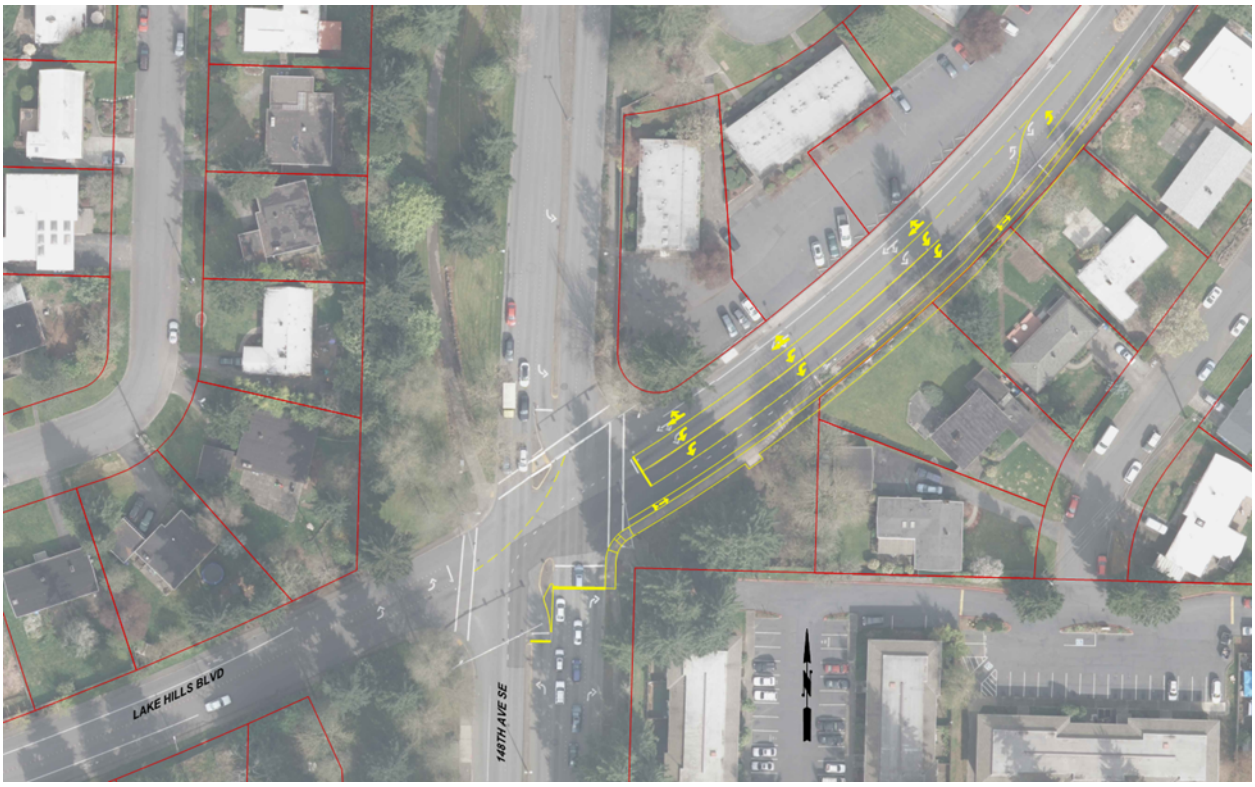


Figure 8. Recommended Alternative – Additional Westbound Left Turn Lane with Lead/Lag Operation for Westbound and Eastbound Left Turn

7. Construction Challenges and Risks

The roadway work for this alternative would have a relatively low level of complexity and associated risks. The storm drainage system appears to be easily expanded to add two new catch basins in the relocated curb line and to also add solid lids to the existing catch basin structures currently on the street. In addition, the relocation of an illumination pole and signal modification appears to be

straightforward. The illumination system is currently owned and operated by Puget Sound Energy. The City may want to install their own luminaires with underground conduit instead of relocating the existing overhead system. That decision should be discussed in final design. The existing mast arm on the traffic signal pole at the northwest corner may be long enough to add a new left turn arrow traffic signal head and itis assumed that the traffic signal pole foundation is able to handle the additional load; however, these assumptions would need to be confirmed in design development.

The primary risk for this project is the right-of-way acquisition from four residential properties. The process to acquire the easements or right-of-way would require additional time and costs. It is also challenging to forecast the final costs of these acquisitions in the future real estate market.

Appendix A – SCATS Historical Average Signal Timing Card

148th Ave SE and Lake Hills Blvd

HISTORICAL SCATS AVERAGE - Oct 16th, 2018

Stage	Phases	AM	PM
A	2 & 6	72	73
B	2 & 5	15	17
C	3	17	19
D	4	30	29
E	1 & 6	11	12

Cycle Length 145 150

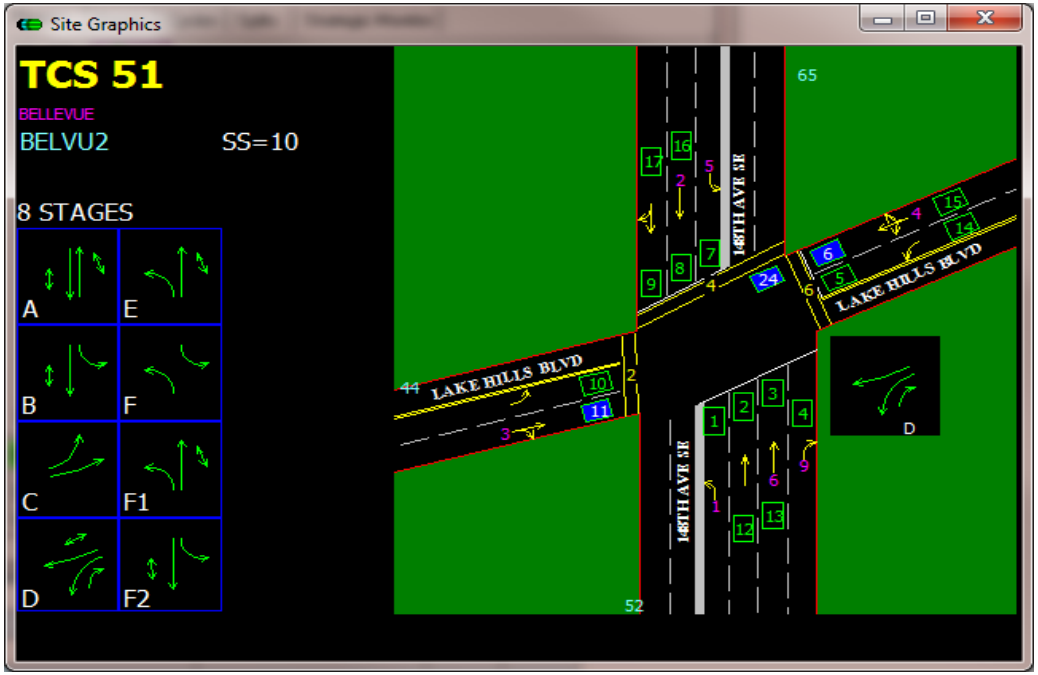
Offsets

Reference point is from End of A

References to end of A stage at 148th/Main St

AM peak = 75 second

PM peak = 70 second



Walk times

	1	2	3	4	5	6	7	8
Delay	0	0	0	0	0	0	0	0
Walk time	0	7.0	0	5.0	0	7.0	0	0
Clearance 1	0	16	0	22	0	18	0	0

Appendix B – Key Design Criteria

City of Bellevue

Transportation Department
Design Standards Documentation

CIP No. _____ **Created Date:** 4/26/2019

Project Name and Description **Approval Date:** _____

_____ **Last Revised Date:** 5/20/2019

Project Funding and Design Standards

X	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

Project Type (See LAG 42.4)

New Construction	
Re-Construction	X
3R	
2R	
Bridge Rehabilitation	
Trails	
Pedestrian Facility	
Other	

Roadway Classifications

Bellevue Comp Plan		AASHTO		Federal Functional		RCW (WSDOT)	
Major Arterial	X	Principal Arterial	X	Principal Arterial	X	State Route	
Minor Arterial		Minor Arterial		Minor Arterial		Major Arterial	X
Collector Arterial		Collector		Collector		Secondary Arterial	
Local Street		Local Street		Local Street		Access Street	

City of Bellevue Design Documentation

Created Date: 04-26-2019

CIP No.

Approval Date:

Project Name and Description

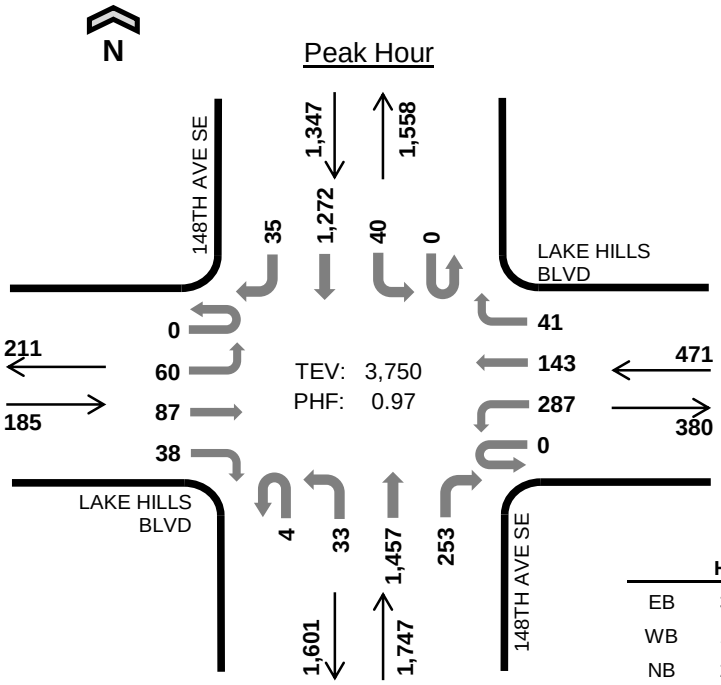
Last Revised Date: 5-10-19

Bellevue Spot Improvements-Study Area-2, 148th AVE SE & Lake Hills Blvd - Key Design Criteria

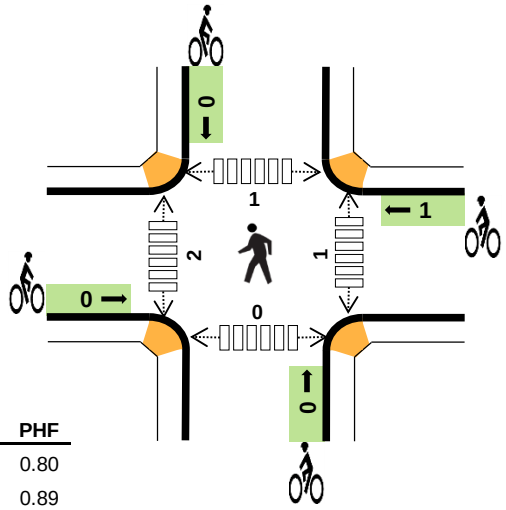
COB ID	Design Element	Standard	Source	Existing/Proposed Condition	Design Exception?	LAG Design Deviation?	LAG Criteria (NALE = Not a LAG Element)	Comments, also refer to WSDOT Design Manual Chapter 1100
1	LANE WIDTH	10-14 FT	AASHTO Geometric Design 4.3, Bellevue TDM Design Standard 3	11' lanes			NALE	WSDOT Chapter 1231
2	No. of Lanes			3 lanes in Existing condition and a westbound left turn is added in the Proposed condition.			NALE	
3	Bike Lane Width (ft)	Min 5' wide	COB TDM 14	5 feet Proposed bike lane matching the width of the Existing bike lane			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	The project requires widening of the existing roadway. The existing planting strip and sidewalk is removed and 6FT sidewalk without planting strip is proposed to minimize property impacts.			NALE	
7	Sidewalk Width (ft)	6 FT Min	COB TDM 14	The project requires widening of the existing roadway. The existing sidewalk is removed and relocated to accommodate the additional turn lane.			NALE	
8	Medians		COB TDM 8	N/A				
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	11 FT wide by 10 FT deep	King County Metro Transit Facilities Guidelines	11 FT wide by 11 FT deep to match exisiting bus shelter condition			NALE	
11	DESIGN SPEED	35 MPH		35 MPH			NALE	
12	Posted speed	Existing Ordinance is 35 MPH on Lake Hills Blvd.		Proposed: 35 MPH at the design location on Lake Hills Blvd to match 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)	Match existing condition for through movement			NALE	
16	Left turn lane offset across intersection	6 FT	WSDOT DM 1310.02(3)	0 FT alignment is on a curve			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 southeast corner of the intersectioin is 25 FT and meets standard as current bus route does not turn from 148th Ave SE to Lake Hills Blvd			NALE	
20	Taper	220 FT Min	WSDOT DM 1310.03(4)	Meets standard			NALE	

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

148TH AVE SE
LAKE HILLS BLVD



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	3.2%	0.80
WB	1.7%	0.89
NB	2.2%	0.86
SB	2.2%	0.89
TOTAL	2.2%	0.97

Two-Hour Count Summaries

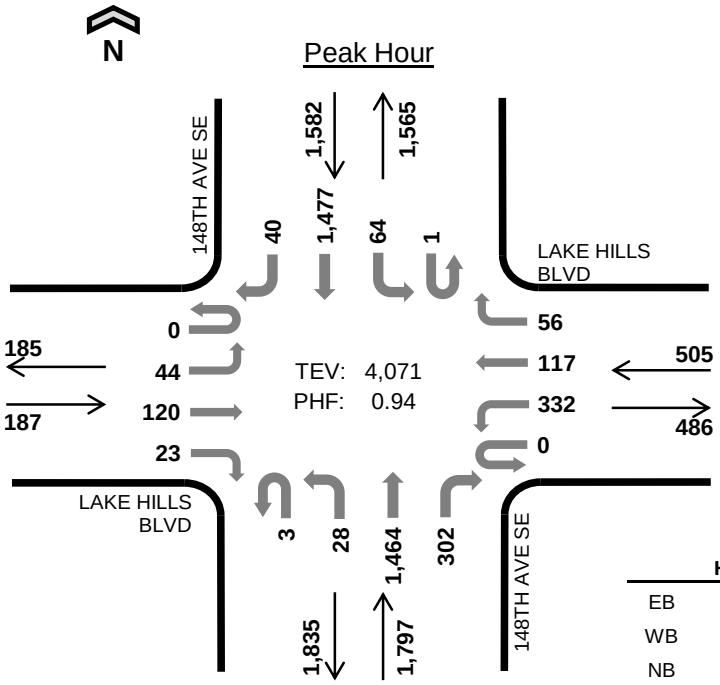
Interval Start	LAKE HILLS BLVD Eastbound				LAKE HILLS BLVD Westbound				148TH AVE SE Northbound				148TH AVE SE Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:30 AM	0	13	12	7	0	52	43	20	1	7	385	74	0	6	251	5	876	0
7:45 AM	0	11	20	6	0	69	60	9	0	4	365	60	0	12	306	3	925	0
8:00 AM	**0**	**12**	**18**	**10**	**0**	**68**	**31**	**8**	**1**	**9**	**356**	**74**	**0**	**9**	**360**	**7**	**963**	0
8:15 AM	**0**	**11**	**21**	**7**	**0**	**65**	**48**	**12**	**1**	**6**	**302**	**52**	**0**	**14**	**354**	**11**	**904**	3,668
8:30 AM	**0**	**22**	**24**	**12**	**0**	**88**	**33**	**11**	**2**	**10**	**371**	**57**	**0**	**10**	**270**	**8**	**918**	3,710
8:45 AM	**0**	**15**	**24**	**9**	**0**	**66**	**31**	**10**	**0**	**8**	**428**	**70**	**0**	**7**	**288**	**9**	**965**	**3,750**
9:00 AM	0	10	15	2	0	58	26	13	0	3	402	75	0	8	298	8	918	3,705
9:15 AM	0	14	12	7	0	53	28	15	0	2	411	60	0	6	311	7	926	3,727
Count Total	0	108	146	60	0	519	300	98	5	49	3,020	522	0	72	2,438	58	7,395	0
Peak Hour	**0**	**60**	**87**	**38**	**0**	**287**	**143**	**41**	**4**	**33**	**1,457**	**253**	**0**	**40**	**1,272**	**35**	**3,750**	**0**

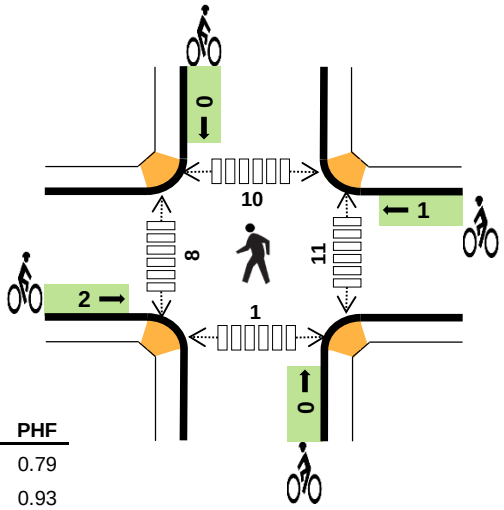
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

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	2	10	10	*22*	0	0	0	0	*0*	4	0	2	0	*6*
7:45 AM	1	2	7	6	*16*	0	0	0	0	*0*	1	0	3	0	*4*
8:00 AM	**1**	**0**	**8**	**8**	***17***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**0**	*1*
8:15 AM	**1**	**3**	**13**	**9**	***26***	**0**	**1**	**0**	**0**	***1***	**1**	**0**	**0**	**0**	*1*
8:30 AM	**3**	**0**	**8**	**7**	***18***	**0**	**0**	**0**	**0**	***0***	**0**	**2**	**0**	**0**	*2*
8:45 AM	**1**	**5**	**10**	**5**	***21***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
9:00 AM	0	0	8	6	*14*	0	1	0	0	*1*	2	2	3	0	*7*
9:15 AM	0	1	11	7	*19*	0	0	0	0	*0*	2	0	0	0	*2*
Count Total	7	13	75	58	*153*	0	2	0	0	*2*	10	4	9	0	*23*
Peak Hour	**6**	**8**	**39**	**29**	***82***	**0**	**1**	**0**	**0**	***1***	**1**	**2**	**1**	**0**	***4***

148TH AVE SE
LAKE HILLS BLVD

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	0.0%	0.79
WB	1.8%	0.93
NB	1.3%	0.92
SB	0.8%	0.96
TOTAL	1.1%	0.94

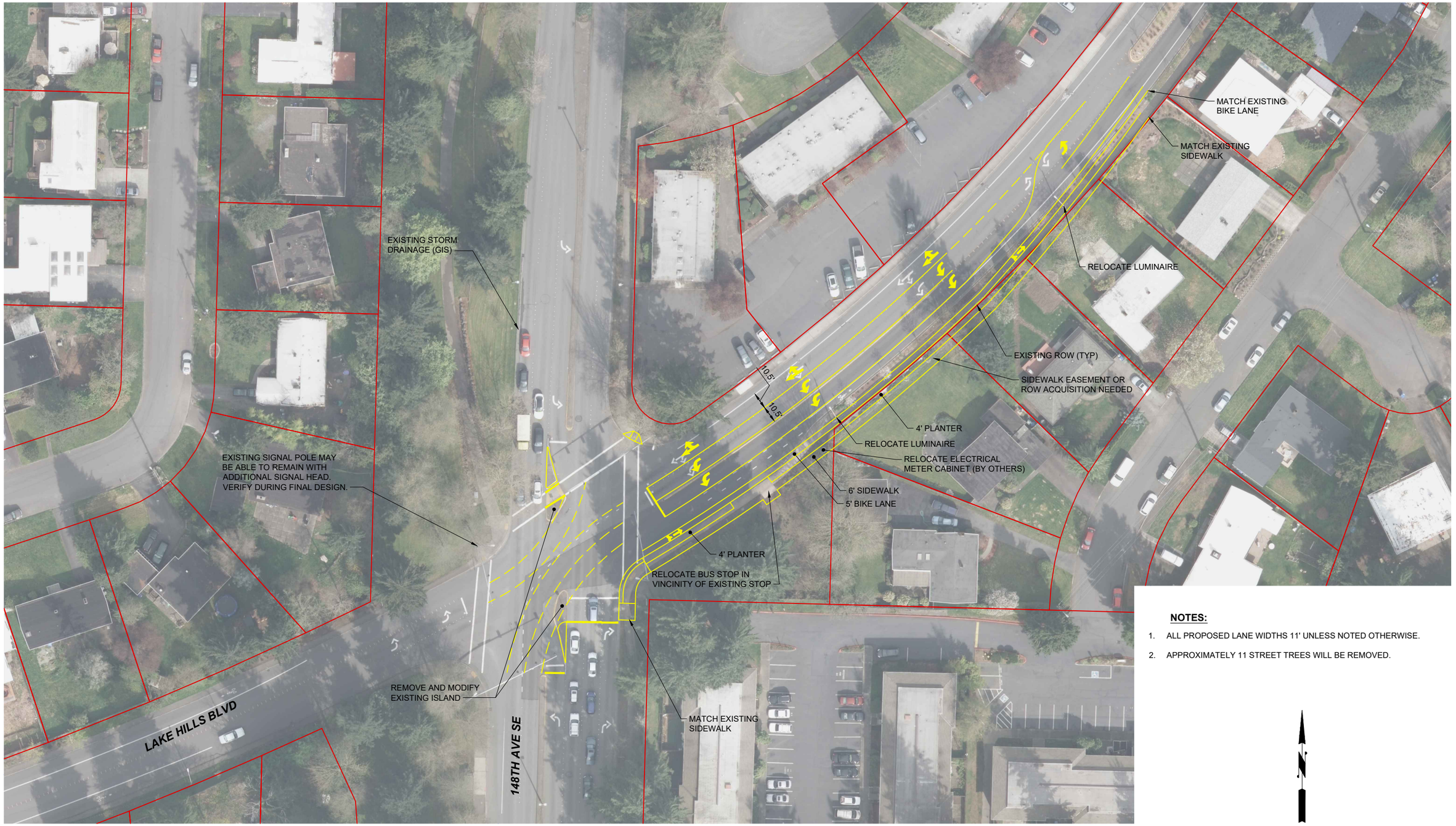
Two-Hour Count Summaries

Interval Start	LAKE HILLS BLVD Eastbound				LAKE HILLS BLVD Westbound				148TH AVE SE Northbound				148TH AVE SE 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	11	32	9	0	60	26	13	5	7	315	85	0	13	370	13	959	0
4:15 PM	0	10	26	4	0	92	32	14	0	9	340	78	0	17	393	3	1,018	0
4:30 PM	0	13	20	6	0	93	26	16	4	11	341	84	0	7	377	7	1,005	0
4:45 PM	0	23	28	4	0	78	32	14	5	16	333	85	0	10	372	2	1,002	3,984
5:00 PM	**0**	**8**	**28**	**13**	**0**	**84**	**26**	**9**	**1**	**8**	**337**	**55**	**1**	**10**	**363**	**9**	**952**	3,977
5:15 PM	**0**	**12**	**42**	**5**	**0**	**80**	**29**	**12**	**1**	**6**	**378**	**68**	**0**	**21**	**355**	**7**	**1,016**	3,975
5:30 PM	**0**	**14**	**21**	**3**	**0**	**83**	**28**	**18**	**1**	**6**	**368**	**79**	**0**	**16**	**369**	**17**	**1,023**	3,993
5:45 PM	**0**	**10**	**29**	**2**	**0**	**85**	**34**	**17**	**0**	**8**	**381**	**100**	**0**	**17**	**390**	**7**	**1,080**	**4,071**
Count Total	0	101	226	46	0	655	233	113	17	71	2,793	634	1	111	2,989	65	8,055	0
Peak Hour	**0**	**44**	**120**	**23**	**0**	**332**	**117**	**56**	**3**	**28**	**1,464**	**302**	**1**	**64**	**1,477**	**40**	**4,071**	**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	3	9	8	*20*	0	0	0	0	*0*	5	6	6	0	*17*
4:15 PM	0	1	6	3	*10*	0	0	1	0	*1*	2	3	1	0	*6*
4:30 PM	0	3	3	2	*8*	1	0	1	0	*2*	4	8	2	0	*14*
4:45 PM	0	2	2	6	*10*	2	0	0	0	*2*	3	3	5	0	*11*
5:00 PM	**0**	**2**	**8**	**4**	***14***	**0**	**1**	**0**	**0**	***1***	**2**	**0**	**4**	**0**	*6*
5:15 PM	**0**	**0**	**6**	**4**	***10***	**0**	**0**	**0**	**0**	***0***	**0**	**5**	**0**	**0**	*5*
5:30 PM	**0**	**5**	**5**	**2**	***12***	**0**	**0**	**0**	**0**	***0***	**3**	**3**	**3**	**0**	*9*
5:45 PM	**0**	**2**	**5**	**2**	***9***	**2**	**0**	**0**	**0**	***2***	**6**	**0**	**3**	**1**	***10***
Count Total	0	18	44	31	*93*	5	1	2	0	*8*	25	28	24	1	*78*
Peak Hour	**0**	**9**	**24**	**12**	***45***	**2**	**1**	**0**	**0**	***3***	**11**	**8**	**10**	**1**	***30***

Appendix D – Conceptual Alternative Drawings



NOTES:

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

N

0 15 30 60
1 inch = 30 feet

10% DESIGN - NOT FOR CONSTRUCTION

NO.	DATE	BY	APPR.	REVISIONS

Approved By

TRANSPORTATION DESIGN MANAGER DATE

PROJECT MANAGER DATE

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

City of Bellevue
Transportation Department

kpff

BELLEVUE SPOT IMPROVEMENTS

STUDY AREA 2
148TH AVE SE & LAKE HILLS BLVD
ALTERNATIVE 2

SHT _____ OF 2

Aug 15, 2019 - 7:15am jpahe

Z:\180000-180099\180075 COB TO3-148th Spot Improvements\CADD\Design\Study Area 2\Study Area 2 - Lake Hills Blvd and 148th Ave SE Intersection.dwg

Appendix E – Preliminary Cost Estimates

OPINION OF PROBABLE COST - SUMMARY
PROJECT: 140th and 148th Spot Improvements -Study Area 2 -148th and Lake Hills Blvd

CIP NO.
DATE: 08/20/19

I. RIGHT OF WAY ACQUISITION & EASEMENT AND REIMBURSEMENT COSTS				$ 190,000.00
II. CONSTRUCTION				
1. Grading/Drainage				
2. Structures				
3. Surfacing/Paving				
4. Roadside Development				
5. Traffic Services & Safety				
	$ 373,400			
6. Miscellaneous Items Not Yet Estimated				
20.0% of (Lines 1 through 5) @ 5% Level	*$74,680*		**$ 448,080**	
7. Allowance for 5%-Level Accuracy				
30.0% of (Lines 1 through 6)	*$ 134,424.00*			
8. Mobilization, Survey, Potholing				
15% of (Line 1 through 6)	*$ 67,212.00*			
9. Maintenance of Traffic				
15% of (Line 1 through 6)	*$ 67,212.00*		**$ 716,928.0**	
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)	*$ 107,539.20*			
13. Construction Contingency				
10.0% of (Lines 1 through 10)	*$ 71,692.80*			**$ 896,160.00**
III. DESIGN ENGINEERING AND CITY COSTS				
1. Design Engineering (Consultant Contract)				
15.0% of (CONSTRUCTION cost not incl contingency)	*$ 123,670.08*			
2. Agency Administration				
10.0% of (CONSTRUCTION cost not incl contingency)	*$ 82,446.72*			
3. Alignment Survey				
2.0% of (CONSTRUCTION cost not incl contingency)	*$ 16,489.34*			
TOTAL ESTIMATED COST				**$ 1,308,800.00**

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.

kpff
1601 Fifth Avenue, Suite 1600
Seattle, WA 98101
206.622.5822

Preliminary Engineer's Estimate of Probable Cost

Client: City of Bellevue
Project: 140th and 148th Spot Improvements
Title: Study Area 2- 148th & Lake Hills Blvd
By: **JRE**
Date: **8/20/2019**

Study Area 2

ITEM NO.	STD ITEM NO.	ITEM	QTY	UNIT	UNIT PRICE	TOTAL COST	% OF CONST
		ROADWAY					
	25	CLEARING AND GRUBBING	0.10	Acre	$60,000	$5,831.96	1.6%
	310	ROADWAY EXCAVATION INCL. HAUL	159	CY	$40.00	$6,363.96	1.7%
	5120	CRUSHED SURFACING TOP COURSE	62	TON	$50.00	$3,090.94	0.8%
	5767	HMA CL 1/2" PG 58H-22	415	TON	$200.00	$83,040.19	22.2%
	6700	CEMENT CONC. TRAFFIC CURB AND GUTTER	491	LF	$35.00	$17,185.00	4.6%
	7055	CEMENT CONC. SIDEWALK	396	SY	$60.00	$23,740.00	6.4%
	7058	CEMENT CONC. CURB RAMP TYPE	3	EA	$2,000.00	$6,000.00	1.6%
	SP	FENCING	285	LF	$40.00	$11,400.00	3.1%
		PLANING BITUMINOUS PAVEMENT	2077	SY	$3.00	$6,230.33	1.7%
		DRAINAGE/UTILITIES					
	3541	SCHEDULE A STORM SEWER PIPE 12 IN. DIAM.	50	LF	$50.00	$2,500.00	0.7%
	3091	CATCH BASIN TYPE 1	2	EA	$2,000.00	$4,000.00	1.1%
	3105	CATCH BASIN TYPE 2 48 IN. DIAM.	0	EA	$3,000.00	$0.00	0.0%
	3767	PVC SANITARY SEWER PIPE 8 IN. DIAM.	0	LF	$45.00	$0.00	0.0%
		STRUCTURE				$0.00	0.0%
	SP	GRAVITY BLOCK WALL	0	SF	$120.00	$0.00	0.0%
	SP	CONCRETE STAIRWAY	0	LS	$3,000.00	$0.00	0.0%
		ENVIRONMENT					
		EROSION/WATER POLLUTION CONTROL	1	LS	$10,000.00	$10,000.00	2.7%
		SWPPP PREPARATION AND MAINTENANCE	1	LS	$2,000.00	$2,000.00	0.5%
		SPCC PLAN	1	LS	$2,000.00	$2,000.00	0.5%
		TRAFFIC AND ILLUMINATION					0.0%
		PERMANENT SIGNING AND STRIPING	1	LS	$5,000.00	$5,000.00	1.3%
		TRAFFIC SIGNAL MODIFICATIONS	1	LS	$150,000.00	$150,000.00	40.2%
		ILLUMINATION	1	LS	$20,000.00	$20,000.00	5.4%
		LANDSCAPING					
		LANDSCAPE RESTORATION	1	LS	$10,000.00	$15,000.00	4.0%
		Subtotal				**$373,400.00**	

RIGHT-OF-WAY (For Ref, incl on page 1 summary)				
SIDEWALK EASEMENT/ACQUISITION	*1922*	*SF*	*$75.00*	*$144,150.00*
TCE	*8505*	*SF/MONTH*	*$5.00*	*$42,525.00*

Appendix F – Public Comments and Responses

Question/Comment: Currently, the proposed alternative mentions widening the westbound approach from 2 lanes to 3 lanes, with all 3 lanes can contain left-turn traffic. But such proposal does not mention whether the southbound of the intersection would also be widen to add one more receiving lane (in order to contain all the left-turn traffic). I would assume so, but would like to hear your confirmation.

> ***Response:*** *The proposed configuration would actually be two left turn lanes and a shared through-right. Below is a zoomed in picture of that westbound approach or here is a link to a larger pdf version of the graphic - https://transportation.bellevuewa.gov/UserFiles/Servers/Server_4779004/File/Transportation/Levy/LEVY-148thLkHillsBlvdMapGraphic.pdf*
>
> *One of the benefits of this change is we can change the operation of the traffic signal. Right now it is split so all of westbound goes and then all of eastbound goes. By eliminating the shared left-thru lane, we can now run the through traffic together or the left turns together like a more typical intersection. This improves efficiency in addition to the added capacity.*
>
> *We apologize for the confusion! The arrows on the picture in the flyer were small.*

Question/Comment: My suggestion would be to still widen the westbound approach from two lanes to three lanes, but change the configuration so that the left-most lane is a left-turn lane, the middle lane is a through/left-turn lane, and the right lane is a right-turn-only lane. This will allow drivers to turn right whenever it's safe (green or red light, when there are no pedestrians present), and won't impede drivers who just need to go straight or who want to turn left. Since drivers who want to go straight or turn left both have to wait for a green light anyway, they can all move at the same time. Drivers who want to go straight also move a bit faster than those who need to slow down a bit to turn left, so I don't think this will slow down traffic.

> ***Response:*** *Your suggestion to configure the road to have a separate right turn lane onto 148th Ave would definitely benefit the right turn movement. However, the left turn and through volumes are much larger than the right turn volume, which is why we ultimately chose this configuration. One of the main benefits to the configuration we are proposing is that we can "unsplit" the intersection. Right now, we have to run the intersection so all westbound gets the green and then all eastbound because there is a shared left turn/through lane. By reconfiguring the approach so there is no longer a shared left/through lane, we can run the left turns or through movement together like a typical intersection. We are proposing that the westbound left and through would run together and then once the westbound left turn has been served, the eastbound and westbound*

through would run together (if there are eastbound lefts, then afterwards the eastbound through and left would be served). This change in operations would actually provide some additional green time for the new through-right lane, which would help a little with your concern. Of course, a separate right turn pocket would be ideal, but widening even more would significantly increase the impact to adjacent properties.

Question/Comment: Concerning the intersection named above, specifically turning left from 148th northbound onto west Lk Hills Blvd. The turn light during the evening commute is absolutely too short. Anytime I have been the 4th car in line, the light is yellow before I get to the front of the line. It is green for less than 10 seconds. Any car after the 3rd in line is basically committing a violation. One major problem is the cars coming from Lk Hills Blvd turning south onto 148th. Inevitably, there are people "pushing" the yellow to the point they are not even half-way across when our light turns green. That takes away our time to turn left. 3 maybe 4 cars is the most we can get thru our light. This is absolutely, unacceptable. Something needs to be done. Especially, when the opposite turn (southbound 148th to eastbound Lk Hills Blvd) gets so much more time to turn left. I estimate at least 15 to 20 seconds (and yes, I've timed it sitting there waiting). Please send your traffic experts to this turn during the commute hours; you'll see how frustrating it is to have to sit thru 2 lights, just because you think the 148th street traffic is more important to get home than the rest of us.

Also to note: can you please explain why eastbound Lk Hills Blvd approaching 148th has a dedicated left turn lane and the straight and right hand turns have to share a lane. This lacks common sense. Right hand turns are allowed after stopping. But inevitably, we get stuck behind cars going straight. Since cars going straight can only go on a green light, doesn't it make sense that left and straight are in one lane, thus freeing up the people who want to turn right? Common sense.

Response: *The signal operations along the 148th Ave SE corridor are optimized to provide safe and efficient travel and progression through the corridor. 148th Ave SE is the major roadway and Lake Hills Blvd is the side street based on roadway classification (major arterial and collector arterial, respectively) and demand (148th Ave SE carries over 40,000 vehicles per day at this location and Lake Hills Blvd. carries less than 8,000). At the intersection, the operations are optimized to minimize the overall delay of the intersection. The traffic volumes at the intersection are served by balancing the splits (time allocated to each signal phase) to meet the demand. Therefore, the critical movements (which typically have higher demand) are allocated more green time than the less critical movements (which typically have less demand). Current traffic data shows that during the PM Peak hour the southbound left turn has over twice the demand as compared to the northbound left turn (64 vehicles as compared to 28). Also, for the eastbound approach, the right turn movement has about one-quarter of the demand as compared to the left and through movements combined (38 as compared to 60 for left turns and 87 for through movements). Combining the eastbound left turn and through movements into one lane would increase vehicle queuing on the eastbound approach, and would block eastbound traffic including right turners.*

In addition, most traffic signals within the City of Bellevue (including this signal) operate

with adaptive traffic control, which means that cycle lengths and splits are adjusted in real time to adapt current traffic conditions.

Question/Comment: 148th and Lake Hills Blvd. is impacted by too-long green lights (north south) and the lack of synched left turns (not safe for Lake Hills Blvd. but certainly feasible and desirable on 148th). Additional left turn capacity westbound on Lake Hills appears to radically overbuild this intersection. The character of our neighborhood is being paved over for the sake of commuter and cut-through traffic which my family and neighbors oppose. Shorter light cycles will keep more folks moving, create less racing to "stale" green lights and reduce impatience which shows itself in the growing trend of cars running red lights.

Response:

I understand the frustration that 148th Avenue receives more green time than side street movements, but it does often have twice the volume of the side street. Once you turn onto 148th Avenue or any major corridor to head to your next destination, you are now part of the "through" traffic and benefiting from the coordination. One of the reasons we are reviewing these intersections is because we have received feedback from residents about the impact to the neighborhoods. It is like a funnel and even if we shift green time from one movement to another, the overall amount of green time – or the width of the funnel - remains the same so only so much volume can pass through. That is why we are looking at medium to small sized projects that could help reduce congestion.

Question/Comment: Sounds good, but what are the planned "traffic signal timing modifications"? Would that allow both eastbound and westbound traffic to turn left simultaneously? That would be a big improvement. By the way, you noted that the westbound right lane can turn right, but if you go look at the intersection, you will see on the pavement just before the intersection is a painted arrow showing that the right lane can only go left or straight. But people turn right anyway, and I don't see why not.

Response: *In regards to the traffic signal modifications - Yes, the modifications would be to "un-split" the intersection so the eastbound and westbound left turns or the throughs could run together which as you noted, would improve operation in addition to the added lane. In regards to the westbound right turn– although it is not shown in the existing pavement markings, the right turn is allowed. I believe the pavement marking is trying to emphasize that a left turn is allowed in that lane (which is not typical) but I understand the confusion, so we will further review the existing markings.*

Question/Comment: The 2nd separate turn lane on Lake Hills Blvd would be wonderful. Having a right turn lane onto northbound 148th would be ideal, but 2 dedicated left turn lanes would be wonderful.

Response: *The westbound approach will be widened to have two left-turn lanes and one through/right lane. Yes, having another separate right turn lane onto northbound 148th Ave SE would be ideal, but the left turn and through volumes are larger than the right*

turn volume. Our goal was to provide the most benefit overall and consider other factors such as minimizing impacts to adjacent properties (acquiring right of way).