

TECHNICAL MEMORANDUM

Date:	March 5, 2019	TG:	17001.00
To:	Min Luo, P.E., PTOE – City of Redmond		
From:	Ryan Peterson, P.E., PTOE – Transpo Group		
Subject:	Rose Hill West, Trip Generation Study		

This memorandum describes UCP Rose Hill's proposed Rose Hill West project. The scope of this analysis has been previously approved by City of Redmond staff and includes a review of traffic safety, trip generation estimates, pipeline and with-project traffic volumes, traffic operations at both NE 100th Street/132nd Avenue NE and site accesses, signal warrant analysis, and mitigation measures.

Project Description

The proposed project includes the construction of 24 single-family residential units located west of 138th Avenue NE and south of NE 100th Street. Two access points are proposed south of NE 100th Street. The project site is currently occupied by four single-family residential dwelling units. Figure 1 shows the project site and surrounding vicinity and Figure 2 shows the preliminary site plan. It is anticipated the development would be completed and occupied by 2019.



Figure 1. Site Vicinity

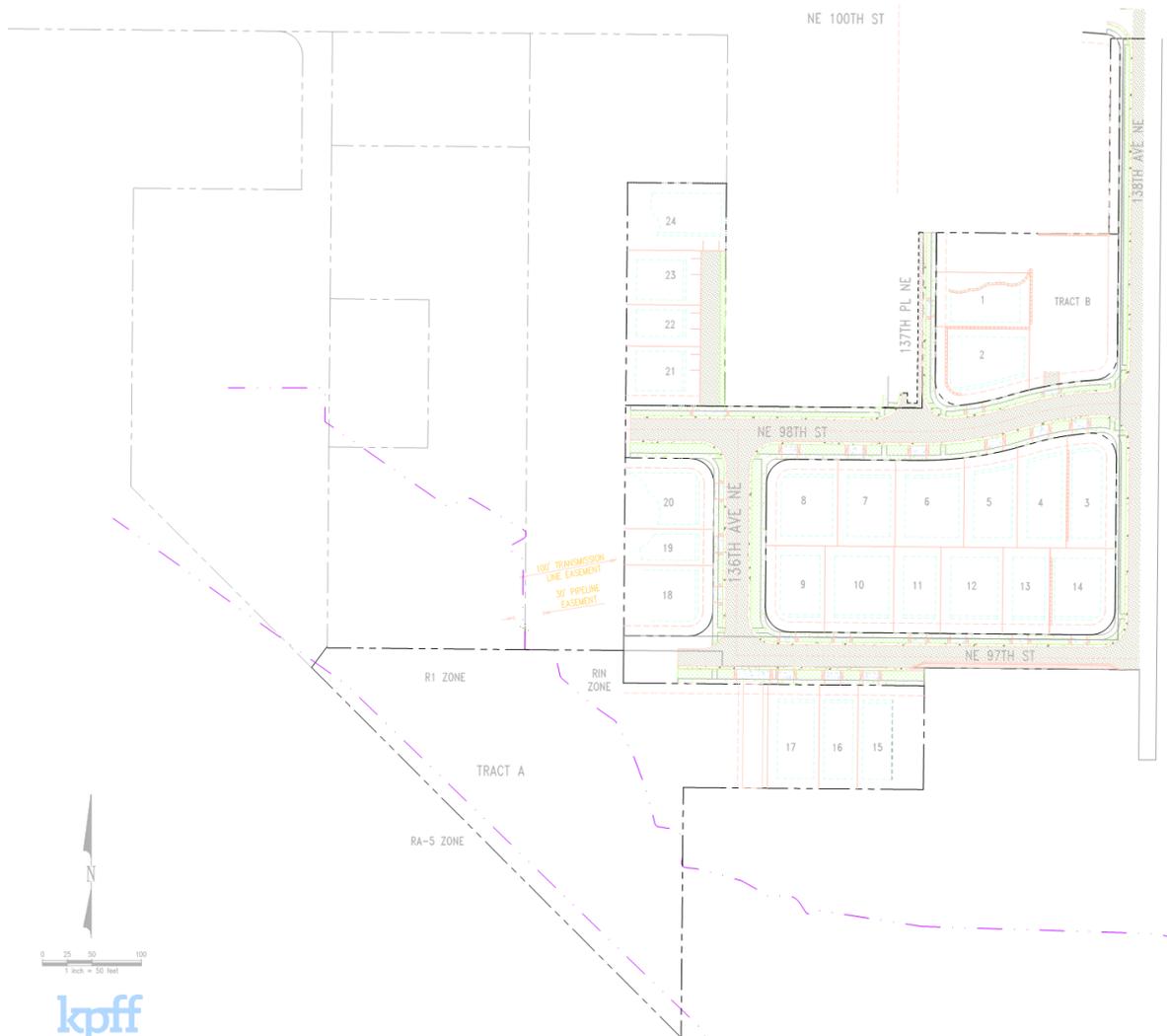


Figure 2. Preliminary Site Plan

Traffic Safety

Recent collision records were reviewed within the study area to identify existing traffic safety issues at the study intersection. The most recent five-year summary of accident data available from the WSDOT is for the period between January 1, 2013 and December 31, 2017. In addition to the intersection, collision data along roadways surrounding the study intersection was also reviewed. This information is summarized in Table 1.

Table 1. Five-Year Collision Summary – 2013-2017

Location	Traffic Control	Number of Collisions					Total	Annual Average	ADT ¹	Collisions per MEV ²
		2013	2014	2015	2016	2017				
<u>Intersection</u>										
1. 132nd Avenue NE/NE 100th Street	Unsignalized	2	2	1	3	4	12	2.40	15,550	0.42
<u>Roadway Segments</u>										
<i>132nd Avenue NE Corridor</i>										
NE 95th Street to NE 104th Street	-	1	1	1	3	3	9	1.80	-	-
<i>NE 100th Street Corridor</i>										
128th Avenue NE to 138th Avenue NE	-	0	0	0	1	2	3	0.60	-	-

1. ADT = Annual Daily Traffic. ADT estimated by applying a factor of 10 to the PM peak hour total entering vehicles at the intersection.

2. Million Entering Vehicles

A review of collisions was conducted for the study intersection and specified roadway segments. The study intersection and corresponding roadway segments each demonstrated annual averages of 3 collisions per year or less.

The collision rate is representative of the number of collisions per one million entering vehicles (MEV) at the study intersection. Intersections with a rate greater than 1.0 collision per MEV are typically identified for further investigation to determine whether an adverse condition exists. As shown in the table, the study intersection of 132nd Avenue NE/NE 100th Street has approximately 0.42 collisions per MEV and does not indicate any specific adverse safety condition.

Overall, the most common collisions in the study area were rear end and angle collisions, making up over half the total collisions. There were also noted to be a few collisions with fixed objects such as parked cars or trees. 65 percent of the collisions in the study area resulted only in property damage. No collisions resulted in a fatality. There were no bicycle collisions and no pedestrian collisions.

Trip Generation

The following table illustrates the anticipated number of net new daily, AM peak hour, and PM peak hour vehicle trips the proposed development would likely generate. These estimates were derived by applying the proposed and existing number of units to the daily and peak hour trip generation fitted curve equations for Land Use Code No. 210 ("Single-Family Detached Housing") published by the Institute of Transportation Engineers (ITE) in the *Trip Generation Manual* (10th Edition, 2017). Net new trips were calculated by subtracting trips generated by the existing residential units from trips generated by the proposed units.

Table 2. Estimated Weekday Vehicle Trip Generation¹

Land Use	Size	Daily Trips	AM Peak-Hour Trips			PM Peak-Hour Trips		
			In	Out	Total	In	Out	Total
Proposed Use								
Single-Family Detached Housing (LU #210)	24 DU	280	6	16	22	16	10	26
Existing Use								
Single-Family Detached Housing (LU #210)	4 DU	54	2	6	8	3	2	5
Net New Vehicle Trips		226	4	10	14	13	8	21

Notes: DU= dwelling unit
1. Trip generation based on ITE *Trip Generation* (10th Edition, 2017).

As illustrated above, the proposed development is anticipated to generate approximately 226 net new daily vehicle trips, with 14 new trips generated during the AM peak hour and 21 new trips generated during the PM peak hour.

Traffic Volumes

AM and PM peak period traffic counts were collected at NE 100th Street/132nd Avenue NE in October 2017. In addition, 12-hour vehicle volumes were collected in August 2018 on each approach of the NE 100th Street/132nd Avenue NE intersection. Detailed intersection traffic counts are provided in Attachment A.

Future horizon year (2019) without-project AM and PM peak hour traffic volumes were estimated at NE 100th Street/132nd Avenue NE by increasing existing through traffic by an annual growth rate of 2 percent and adding project trips from other developments in the project vicinity ("pipeline projects"). Anticipated traffic volumes from the following 8 developments were identified via City of Redmond's Project Viewer and were used to develop the future without-project traffic volumes:

- North Rose Hill Short Plat (6 lots)
- Willow Hill – Lot 9 (9 lots)
- Fu Short Plat (2 lots)
- Short Tom-Duplex (2 units)
- Benjamin Estates (14 lots)
- Gabarino Property (15 lots)
- Heather's Ridge (8 lots)
- Rose Hill Preliminary Plat (29 lots)

A total of 8 developments (either permitted or under construction) were identified in the site vicinity with sizes ranging from 2 units to 29 single family homes.

It should be noted that for the developments east of 132nd Avenue NE and north of NE 100th Street, it was assumed that half of the estimated trips travelling to/from the north would use NE 100th Street to access 132nd Avenue NE and half would use NE 104th Street to the north. As a conservative assumption, it was assumed approximately 9 single family homes located south of NE 100th Street could use 138th Avenue NE to access NE 100th Street and would act as through movements at the proposed project's site access locations.

Pipeline traffic and project-generated traffic were assigned to the roadway network based on separate AM and PM distributions. These distributions were based on existing counts at NE 100th Street/132nd Avenue NE, and are consistent with analysis completed for the Rose Hill Preliminary Plat adjacent to the project site. Previously conducted AM and PM peak period traffic counts from March 2016 (projected to 2019) at NE 100th Street/132nd Avenue NE are used in developing trip

distributions for the development. During the AM peak hour, 60 percent of traffic is distributed to and from the south via 132nd Avenue NE, 35 percent to and from the north via 132nd Avenue NE, and 5 percent to and from the west via NE 100th Street. The AM peak hour distribution is shown on Figure 3.

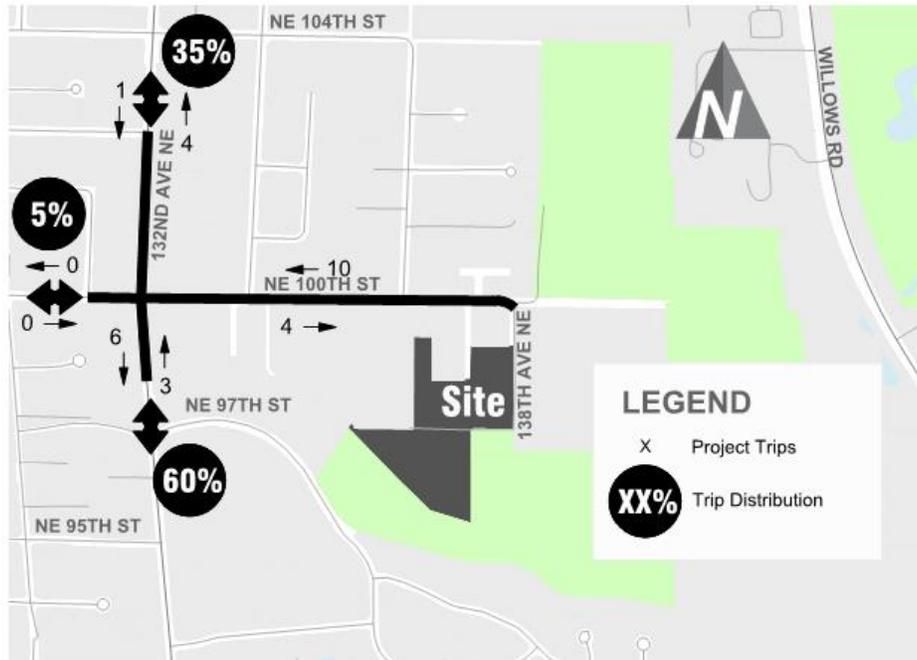


Figure 3. AM Peak Hour Distribution and Assignment

During the PM peak hour, 90 percent of the project trips are expected to access the site from the south while the remaining 10 percent would access from the north. The PM Peak hour distribution is shown on Figure 4.



Figure 4. PM Peak Hour Distribution and Assignment

Two site accesses on NE 100th Street, at 137th Place NE and 138th Avenue NE, were evaluated under future with-project conditions. It is anticipated that approximately 50 percent of the project generated trips would access the site from each of the two site accesses, respectively. Existing (2017) AM and PM peak hour volumes were rounded to the nearest 1 vehicle to account for daily traffic fluctuations from October 2017 counts. Future (2019) volumes were estimated using a 2 percent per year growth rate between the existing (2017) analysis year and the future (2019) analysis year. Existing (2017), future (2019) without-project, and future (2019) with-project traffic volumes are summarized in Figure 5.

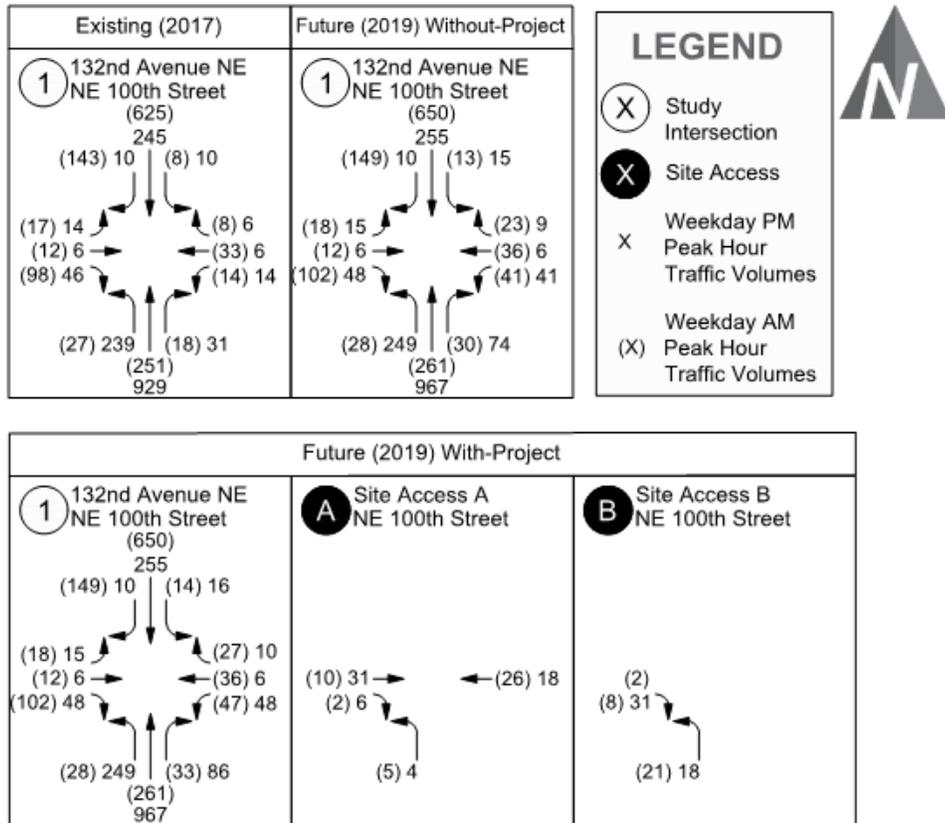


Figure 5. Existing (2017), Future (2019) Without-Project, and Future (2019) With-Project Peak Hour Traffic Volumes

Traffic Operations

Intersection level of service (LOS) for existing, future without-, and with-project conditions were evaluated at the 132nd Avenue NE/NE 100th Street intersection along with the site accesses using the *Synchro 9* software program based on procedures identified in the *Highway Capacity Manual* (HCM, 2010). All intersection parameters such as channelization and intersection control were consistent through all analysis scenarios. At side-street stop-controlled intersections, LOS is measured in average delay per vehicle during the peak hour of traffic and is reported for the worst operating movement of the intersection. Attachment B provides a detailed explanation of LOS criteria and definitions. Detailed LOS worksheets are provided in Attachment C.

Table 3. Estimated Weekday AM and PM Peak Hour Traffic Operations

Intersection	Existing (2017)			2019 Without-Project			2019 With-Project		
	LOS ¹	Delay ²	WM ³	LOS	Delay	WM	LOS	Delay	WM
<u>AM Peak Hour</u>									
1. 132nd Avenue NE/NE 100th Street	D	27	WB	E	44	WB	E	48	WB
A. 137th Place NE/Site Access A	-	-	-	-	-	-	A	9	NB
B. 138th Avenue NE/Site Access B	-	-	-	-	-	-	A	9	NB
<u>PM Peak Hour</u>									
1. 132nd Avenue NE/NE 100th Street	F	>180	WB	F	>180	WB	F	>180	WB
A. 137th Place NE/Site Access A	-	-	-	-	-	-	A	9	NB
B. 138th Avenue NE/Site Access B	-	-	-	-	-	-	A	9	NB

Note: WB = westbound approach, NB = northbound approach

1. Level of Service (A – F) as defined by the 2010 *Highway Capacity Manual* (HCM), Transportation Research Board.

2. Average delay per vehicle in seconds.

3. Worst movement reported for unsignalized intersections.

The City of Redmond operations standard is LOS D or better. As shown in Table 2, during the AM peak hour, 132nd Avenue NE/NE 100th Street operates at LOS D under existing conditions and LOS E under future without-project conditions. With the addition of project traffic, the 132nd Avenue NE/NE 100th Street intersection is anticipated to remain operating at LOS E with an increase in delay of approximately 4 seconds, and an increase in vehicle queue length of approximately 1 vehicle at the worst movement (westbound approach).

During the PM peak hour, the 132nd Avenue NE/NE 100th Street intersection is anticipated to operate at LOS F under all three analysis conditions. Under future with-project conditions, westbound queues are anticipated to experience an increase of about 2 vehicles compared to without-project conditions. Under both AM and PM peak hour periods, the site access intersections are anticipated to operate at LOS A with less than 10 seconds of delay. Maximum queues at the site accesses are anticipated to be no more than 1 vehicle.

Signal Warrant Analysis

A signal warrant¹ analysis was conducted for the 132nd Avenue NE/NE 100th Street intersection under with-project conditions. The following presents the data (geometry and traffic volumes) used to perform the signal warrant analysis of Warrants 1 through 3 and 7, as well as the findings.

Intersection Geometry and Traffic Volumes

The existing 132nd Avenue NE/NE 100th Street intersection is a 4-way intersection and is stop-controlled for the eastbound and westbound approaches. The future (2019) with-project weekday AM and PM peak hour traffic volumes at the intersection, as previously mentioned, are shown in Figure 5.

For Warrants 1 and 2, 12-hour vehicle counts were collected in August 2018 to provide a localized hourly distribution of traffic volumes by approach over the course of the 7 a.m. to 7 p.m. warrant time frame. Daily pipeline and project trips were then scaled using this localized hourly distribution and added to the 12-hour traffic counts (the northbound and southbound through movements of the 12-hour counts were grown at 2 percent for 3 years, mirroring the growth process previously described). This layering of daily pipeline and project trips added to post-growth rate 12-hour

¹ *Manual on Uniform Traffic Control Devices* (MUTCD), Federal Highways Administration (2009).

counts provides a conservative representation of future traffic volumes at the intersection because daily trip generation was assumed to occur within a 12-hour period.

Analysis for Warrant 3 did not include the use of the 12-hour traffic counts; rather the volumes used for warrant 3 were the same future (2019) with-project volumes used in the Synchro traffic operations analysis. Both AM and PM peak hours were analyzed. Average peak hour vehicle delays from the traffic operations analysis were input as well. The following sections provide a summary of the methodology for the signal warrants evaluated for the 132nd Avenue NE/NE 100th Street intersection (Warrants 1, 2, and 3).

Warrant 1 – Eight Hour Vehicular Volume

Warrant 1 consists of two conditions that independently assess whether a traffic signal is warranted based on traffic volumes. The first condition (Condition A) determines if traffic volumes at an intersection are consistently high enough throughout an average weekday to warrant the installation of a signal. The second condition (Condition B) is considered when Condition A is not met, and assesses whether traffic on the minor street experiences excessive delay due to high traffic volumes on the major street throughout an average weekday. These two conditions are combined such that fulfilling either of the two conditions would meet the warrant for installation of a signal.

Detailed volume threshold criteria are identified for these conditions in the warrant methodology, and if traffic volumes exceed these thresholds for 8 or more hours on an average weekday, the signal warrant is satisfied. Alternatively, if neither of Conditions A or B are met, the volume criteria for both conditions can be reduced to 80 percent of their values such that if both conditions are then met, then installation of a traffic signal could be warranted.

Based on the future with-project traffic volumes shown in Attachment D, Warrant 1 would **not** be satisfied as documented in the traffic volume signal warrant worksheet also provided in Attachment D.

Warrant 2 – Four Hour Vehicular Volume

Signal Warrant 2 is applied where the volume of intersecting traffic is the primary reason for considering installation of a traffic signal. The warrant is satisfied by comparing the traffic volumes on the major street and minor street with a chart included in the MUTCD. If the major and minor street traffic volumes intersect above the MUTCD chart threshold for four or more one-hour periods, then the signal warrant would be satisfied.

Based on the future with-project traffic volumes shown in Attachment D, Warrant 2 would **not** be satisfied as documented in the traffic volume signal warrant worksheet provided in Attachment D.

Warrant 3 – Peak Hour

Signal Warrant 3 is applied when, for a minimum of one-hour of an average day, the minor-street traffic suffers undue delay when entering or crossing the major street. The warrant is satisfied by one of two categories are met:

- If all three of the following conditions exist for four consecutive 15-minute periods:
 - The total stopped time delay by traffic on one of the minor street approaches controlled by a stop sign exceeds 4 vehicle hours for a one lane road; and
 - The volume on the same minor street approach (one direction only) exceeds 100 vehicles per hour for one moving lane; and
 - The total entering volume serviced for during the hour equals or exceeds 800 vehicles per hour for four or more approaches.

- Comparing the traffic volumes on the major street and minor street with a chart included in the MUTCD. If the major street traffic volume and the highest minor street approach volume intersect above the MUTCD chart threshold for four or more one-hour periods, then the signal warrant would be satisfied.

It should be considered that MUTCD notes that this particular signal warrant “shall only be applied in unusual cases such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time” (MUTCD, 2009). It is unclear as to whether the intersection of 132nd Avenue NE/NE 100th Street meets this criterion. Regardless, based on the future with-project traffic volumes shown in Attachment D, Warrant 3 would **not** be satisfied as documented in the traffic volume signal warrant worksheet provided in Attachment D.

Warrant 7 – Crash Experience

Signal warrant 7 is applied when collision experience at an intersection may be a potential cause for installation of a signal. The warrant considers collisions that may be corrected with the addition of a traffic signal and is met when five or more collisions are reported within a 12-month period. In 2017, four collisions occurred at the 132nd Avenue NE/NE 100th Street intersection. This was taken into account under the signal warrant analysis inputs. Warrant 7 would **not** be satisfied as documented in the signal warrant worksheet provided in Attachment D.

When considering additional trips generated from potential future residential units in the area, signal warrant 7C (80% Volumes for Warrants 1A, 1B or 4) is met when over 150 net new trips are added to the intersection, or approximately 160 total single-family dwelling units. Traffic from approximately 120 additional residential units outside of the proposed project would be necessary to satisfy a signal warrant at the intersection.

Mitigation

Mitigation measures limited to the payment of transportation impact fees have been identified to reduce potential transportation-related project impacts. All site accesses operate at LOS C or better under existing and future AM and PM peak hour conditions. The 132nd Avenue NE/NE 100th Street intersection operates at LOS E with the addition of project traffic during the AM peak hour. This intersection operates at LOS F during the PM peak hour with or without the project. Signal warrants are not met at the 132nd Avenue NE/NE 100th Street intersection.

Transportation Impact Fees

The project would be required to pay the City’s Transportation Impact Fee. Per the City of Redmond Impact Fee², the single-family dwelling unit fee is \$7,008.68 per unit, resulting in an impact fee of approximately \$168,208 for the 24-unit project. This fee is a preliminary calculation and the final impact fee would be calculated by the City of Redmond at the time of building permit issuance.

² City of Redmond Impact Fees Schedule, January 2019.

Attachment A: Traffic Counts



Prepared for: **City of Kirkland**
Traffic Count Consultants, Inc.

Phone: (253) 926-6009 FAX: (253) 922-7211 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: 132nd Ave NE & NE 100th St
Location: Kirkland, Washington

Date of Count: Wed 10/04/2017
Checked By: Jess

Time Interval Ending at	From North on (SB) 132nd Ave NE				From South on (NB) 132nd Ave NE				From East on (WB) NE 100th St				From West on (EB) NE 100th St				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
6:15 A	0	1	32	2	0	1	9	2	0	1	1	0	0	0	0	2	51
6:30 A	1	1	32	3	2	2	14	0	0	3	0	1	0	1	0	3	60
6:45 A	1	2	57	2	0	4	35	0	1	4	2	0	0	0	1	19	126
7:00 A	2	2	85	1	1	8	47	2	1	3	3	1	1	0	0	19	171
7:15 A	3	3	123	3	1	6	18	0	0	7	0	0	0	2	0	22	184
7:30 A	3	3	147	2	4	5	43	2	1	5	3	4	1	2	0	29	245
7:45 A	2	3	162	2	4	5	55	7	0	8	2	2	1	1	0	34	281
8:00 A	6	2	178	10	2	8	67	4	1	3	5	1	3	1	1	41	321
8:15 A	3	2	165	46	3	10	50	4	1	2	6	1	0	3	1	24	314
8:30 A	8	3	160	49	5	5	46	7	0	6	12	0	0	5	4	16	313
8:45 A	2	1	122	38	3	4	88	3	1	3	10	6	0	8	6	17	306
9:00 A	5	0	112	8	4	13	88	1	0	0	3	2	1	3	0	21	251

Total Survey	36	23	1375	166	29	71	560	32	6	45	47	18	7	26	13	247	2623
--------------	----	----	------	-----	----	----	-----	----	---	----	----	----	---	----	----	-----	------

Peak Hour: 7:45 AM to 8:45 AM																	
Total	19	8	625	143	13	27	251	18	3	14	33	8	3	17	12	98	1254
Approach	776				296				55				127				1254
%HV	2.4%				4.4%				5.5%				2.4%				3.0%
PHF	0.91				0.78				0.72				0.74				0.98

PHF %HV

Check	EB	0.74	2.4%
In: 1254	WB	0.72	5.5%
Out: 1254	NB	0.78	4.4%
T Int:	SB	0.91	2.4%
	T Int:	0.98	3.0%

1284 1.0 PHF Peak Hour Volume

Conditions:



Prepared for: **City of Kirkland**

Traffic Count Consultants, Inc.

Phone: (253) 926-6009 FAX: (253) 922-7211 E-Mail: Team@TC2inc.com

WBE/DBE

Intersection: 132nd Ave NE & NE 100th St

Date of Count: Wed 10/04/2017

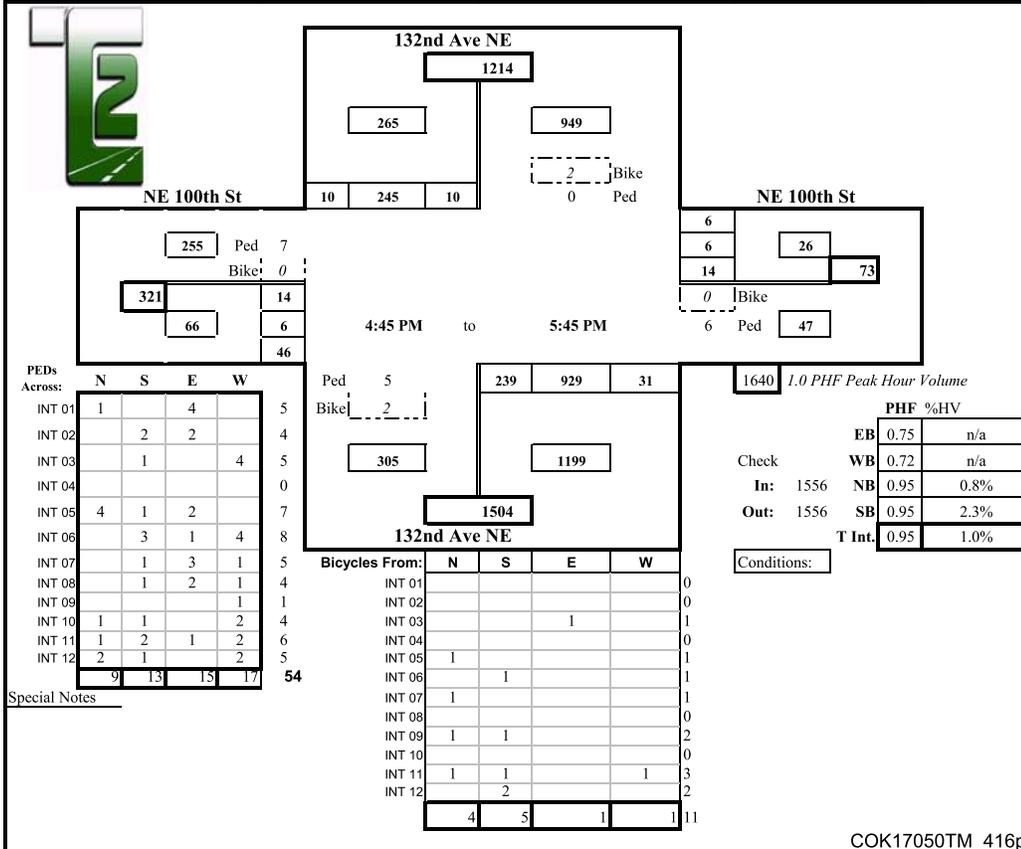
Location: Kirkland, Washington

Checked By: Jess

Time Interval Ending at	From North on (SB) 132nd Ave NE				From South on (NB) 132nd Ave NE				From East on (WB) NE 100th St				From West on (EB) NE 100th St				Interval Total
	T	L	S	R	T	L	S	R	T	L	S	R	T	L	S	R	
3:45 P	0	0	56	2	5	36	152	8	0	5	1	3	0	5	0	12	280
4:00 P	2	1	65	4	3	56	164	7	1	7	3	1	0	1	2	7	318
4:15 P	1	2	71	7	4	51	173	9	0	5	3	1	0	2	1	11	336
4:30 P	1	1	65	5	3	66	201	9	0	1	2	0	1	4	1	12	367
4:45 P	1	0	76	3	1	75	193	10	0	0	0	4	0	2	0	10	373
5:00 P	2	2	63	4	1	65	221	10	0	6	0	1	0	2	1	13	388
5:15 P	1	1	59	2	4	53	231	3	0	3	0	1	0	5	1	16	375
5:30 P	2	1	67	2	1	61	244	9	0	2	4	3	0	4	2	11	410
5:45 P	1	6	56	2	3	60	233	9	0	3	2	1	0	3	2	6	383
6:00 P	2	2	58	3	1	74	199	18	0	2	2	3	0	3	0	18	382
6:15 P	0	2	68	4	2	49	225	13	0	3	1	2	0	4	1	9	381
6:30 P	1	3	51	6	1	52	206	16	0	5	0	2	1	4	1	9	355

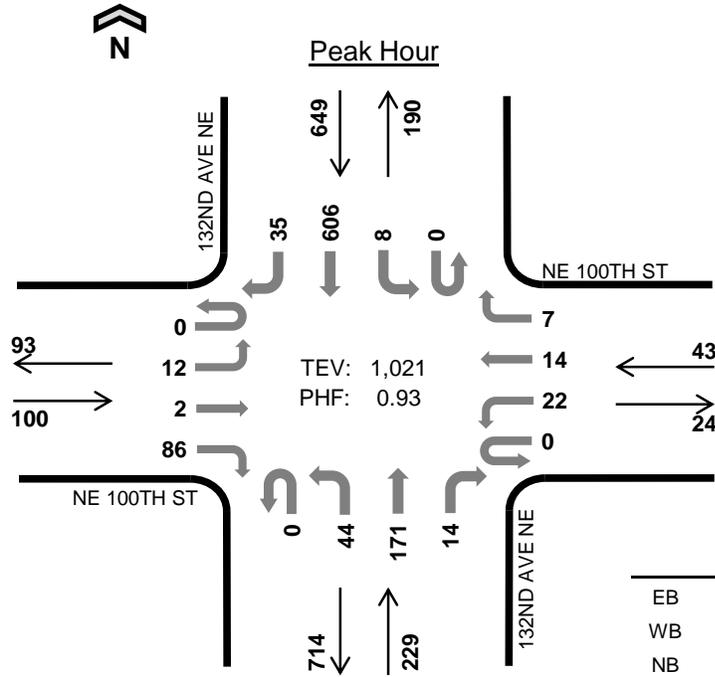
Total Survey	14	21	755	44	29	698	2442	121	1	42	18	22	2	39	12	134	4348
--------------	----	----	-----	----	----	-----	------	-----	---	----	----	----	---	----	----	-----	------

Peak Hour: 4:45 PM to 5:45 PM																	
Total	6	10	245	10	9	239	929	31	0	14	6	6	0	14	6	46	1556
Approach	265				1199				26				66				1556
%HV	2.3%				0.8%				n/a				n/a				1.0%
PHF	0.95				0.95				0.72				0.75				0.95



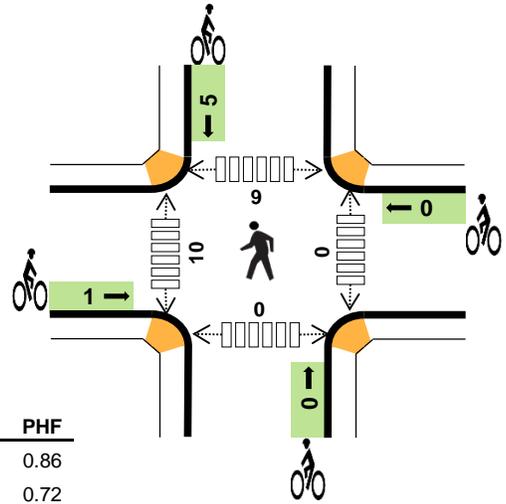


**132ND AVE NE
NE 100TH ST**



TEV: 1,021
PHF: 0.93

Date: Wed, Aug 01, 2018
Count Period: 7:00 AM to 11:00 AM
Peak Hour: 8:15 AM to 9:15 AM



	HV %:	PHF
EB	0.0%	0.86
WB	2.3%	0.72
NB	0.9%	0.81
SB	0.9%	0.94
TOTAL	0.9%	0.93

Four-Hour Count Summaries

Interval Start	NE 100TH ST				NE 100TH ST				132ND AVE NE				132ND AVE NE				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		
8:15 AM	0	5	0	24	0	4	2	1	0	7	35	4	0	2	154	8	246	0
8:30 AM	0	1	1	27	0	6	3	3	0	8	33	0	0	0	158	5	245	0
8:45 AM	0	3	0	14	0	7	6	2	0	15	52	4	0	3	160	9	275	0
9:00 AM	0	3	1	21	0	5	3	1	0	14	51	6	0	3	134	13	255	1,021
Peak Hour	0	12	2	86	0	22	14	7	0	44	171	14	0	8	606	35	1,021	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
8:15 AM	0	0	1	1	2	1	0	0	1	2	0	1	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	3	5	0	8
8:45 AM	0	1	1	2	4	0	0	0	4	4	0	1	1	0	2
9:00 AM	0	0	0	3	3	0	0	0	0	0	0	5	3	0	8
Peak Hour	0	1	2	6	9	1	0	0	5	6	0	10	9	0	19

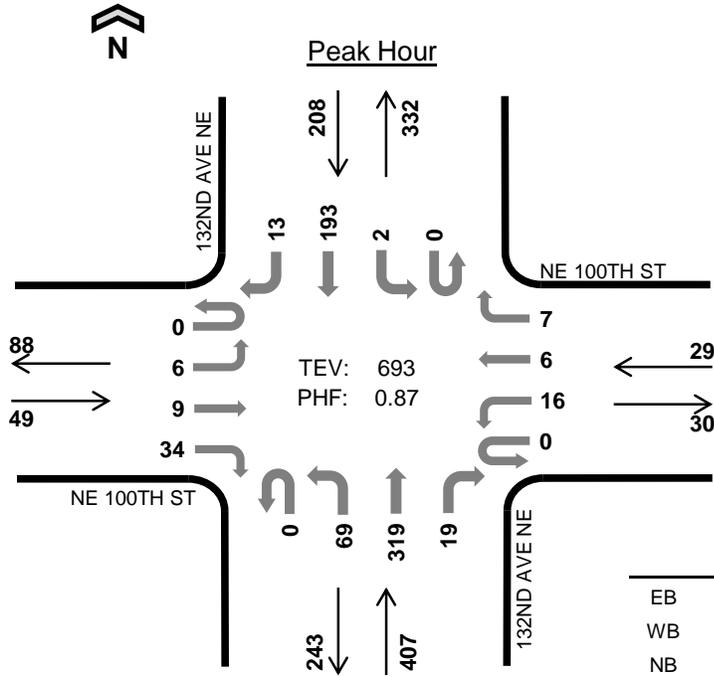
Four-Hour Count Summaries																		
Interval Start	NE 100TH ST				NE 100TH ST				132ND AVE NE				132ND AVE NE				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	1	0	13	0	2	4	1	0	5	20	0	0	1	76	1	124	0
7:15 AM	0	1	0	15	0	3	3	2	0	4	26	1	0	5	108	9	177	0
7:30 AM	0	0	0	24	0	10	3	3	0	6	35	2	0	6	101	3	193	0
7:45 AM	0	0	1	24	0	6	3	0	0	5	45	2	0	4	153	4	247	741
8:00 AM	0	0	0	19	0	5	1	0	0	4	37	2	0	0	127	7	202	819
8:15 AM	0	5	0	24	0	4	2	1	0	7	35	4	0	2	154	8	246	888
8:30 AM	0	1	1	27	0	6	3	3	0	8	33	0	0	0	158	5	245	940
8:45 AM	0	3	0	14	0	7	6	2	0	15	52	4	0	3	160	9	275	968
9:00 AM	0	3	1	21	0	5	3	1	0	14	51	6	0	3	134	13	255	1,021
9:15 AM	0	3	0	13	0	2	3	0	0	7	40	3	0	3	113	6	193	968
9:30 AM	0	2	4	21	0	6	7	2	0	15	37	5	0	0	107	9	215	938
9:45 AM	0	2	0	19	0	4	4	2	0	8	29	3	0	0	98	5	174	837
10:00 AM	0	2	1	19	0	7	4	4	0	17	35	4	0	3	78	6	180	762
10:15 AM	0	6	1	17	0	2	2	0	0	10	41	4	0	0	93	0	176	745
10:30 AM	0	3	1	15	0	9	3	3	0	11	41	2	0	3	63	6	160	690
10:45 AM	0	2	0	8	0	4	2	1	0	7	46	3	0	0	49	6	128	644
Count Total	0	34	10	293	0	82	53	25	0	143	603	45	0	33	1,772	97	3,190	0
Peak Hour	0	12	2	86	0	22	14	7	0	44	171	14	0	8	606	35	1,021	0

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

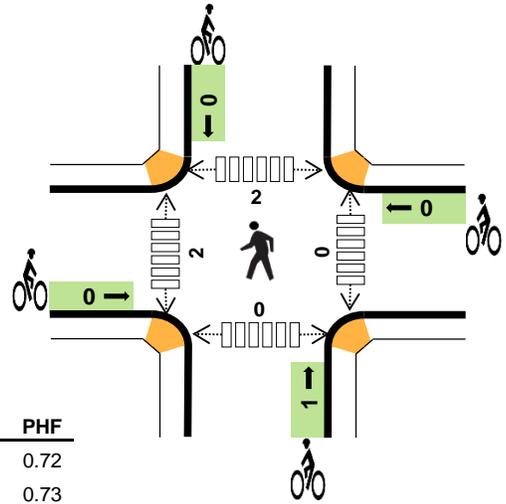
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0
7:15 AM	0	0	6	2	8	3	0	0	0	3	0	2	1	0	3
7:30 AM	0	0	2	1	3	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	3	1	4	0	0	0	1	1	0	3	2	0	5
8:00 AM	0	0	3	1	4	0	0	0	0	0	0	0	2	0	2
8:15 AM	0	0	1	1	2	1	0	0	1	2	0	1	0	0	1
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	3	5	0	8
8:45 AM	0	1	1	2	4	0	0	0	4	4	0	1	1	0	2
9:00 AM	0	0	0	3	3	0	0	0	0	0	0	5	3	0	8
9:15 AM	0	0	1	1	2	1	0	0	0	1	0	1	0	0	1
9:30 AM	0	0	3	2	5	1	0	0	0	1	0	0	3	0	3
9:45 AM	1	1	3	5	10	0	0	0	0	0	0	5	4	0	9
10:00 AM	1	0	3	2	6	0	0	0	0	0	0	0	0	0	0
10:15 AM	1	0	3	2	6	1	0	0	0	1	0	0	1	0	1
10:30 AM	1	0	1	3	5	1	0	0	0	1	0	0	1	0	1
10:45 AM	0	0	1	2	3	0	0	0	1	1	0	0	0	0	0
Count Total	4	2	31	28	65	9	0	0	7	16	0	21	23	0	44
Peak Hour	0	1	2	6	9	1	0	0	5	6	0	10	9	0	19



132ND AVE NE NE 100TH ST



Date: Wed, Aug 01, 2018
Count Period: 11:00 AM to 3:00 PM
Peak Hour: 2:00 PM to 3:00 PM



	HV %:	PHF
EB	2.0%	0.72
WB	0.0%	0.73
NB	1.2%	0.82
SB	2.9%	0.93
TOTAL	1.7%	0.87

Four-Hour Count Summaries

Interval Start	NE 100TH ST				NE 100TH ST				132ND AVE NE				132ND AVE NE				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		
2:00 PM	0	0	3	11	0	3	2	2	0	13	65	6	0	1	43	4	153	0
2:15 PM	0	0	3	4	0	5	3	1	0	20	76	6	0	0	48	1	167	0
2:30 PM	0	4	2	5	0	6	1	3	0	21	73	3	0	0	53	3	174	0
2:45 PM	0	2	1	14	0	2	0	1	0	15	105	4	0	1	49	5	199	693
Peak Hour	0	6	9	34	0	16	6	7	0	69	319	19	0	2	193	13	693	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
2:00 PM	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	1	1	2	0	0	1	0	1	0	0	2	0	2
2:30 PM	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0
2:45 PM	1	0	3	1	5	0	0	0	0	0	0	2	0	0	2
Peak Hour	1	0	5	6	12	0	0	1	0	1	0	2	2	0	4

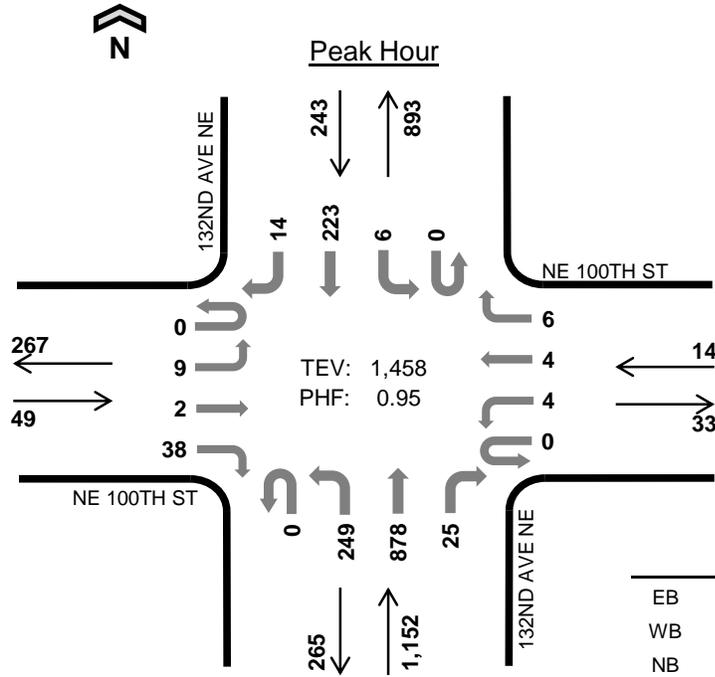
Four-Hour Count Summaries																		
Interval Start	NE 100TH ST				NE 100TH ST				132ND AVE NE				132ND AVE NE				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
11:00 AM	0	3	0	13	0	2	1	0	0	13	48	1	0	0	49	3	133	0
11:15 AM	0	0	0	11	0	4	1	0	0	11	43	4	0	0	58	7	139	0
11:30 AM	0	2	0	10	0	1	2	0	0	13	53	4	0	0	45	2	132	0
11:45 AM	0	1	3	17	0	7	6	0	0	9	48	2	0	3	58	9	163	567
12:00 PM	0	5	2	16	0	4	2	1	0	14	34	4	0	1	60	4	147	581
12:15 PM	0	1	0	8	0	8	0	2	0	14	60	7	0	1	53	3	157	599
12:30 PM	0	3	1	6	0	3	3	2	0	14	63	3	0	1	68	5	172	639
12:45 PM	0	3	1	10	0	2	0	0	0	16	56	8	0	0	54	5	155	631
1:00 PM	0	3	0	5	0	3	1	2	0	17	52	8	0	1	50	4	146	630
1:15 PM	0	3	2	10	0	8	1	1	0	17	68	6	0	0	51	4	171	644
1:30 PM	0	1	0	17	0	5	0	3	0	16	53	4	0	0	37	7	143	615
1:45 PM	0	4	1	11	0	3	3	0	0	15	51	4	0	1	44	2	139	599
2:00 PM	0	0	3	11	0	3	2	2	0	13	65	6	0	1	43	4	153	606
2:15 PM	0	0	3	4	0	5	3	1	0	20	76	6	0	0	48	1	167	602
2:30 PM	0	4	2	5	0	6	1	3	0	21	73	3	0	0	53	3	174	633
2:45 PM	0	2	1	14	0	2	0	1	0	15	105	4	0	1	49	5	199	693
Count Total	0	35	19	168	0	66	26	18	0	238	948	74	0	10	820	68	2,490	0
Peak Hour	0	6	9	34	0	16	6	7	0	69	319	19	0	2	193	13	693	0

Note: Four-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
11:00 AM	0	0	1	0	1	0	0	1	1	2	0	3	0	0	3
11:15 AM	1	0	1	5	7	0	0	0	0	0	0	0	2	0	2
11:30 AM	0	0	2	2	4	0	1	0	0	1	0	1	5	0	6
11:45 AM	1	1	2	2	6	0	0	0	1	1	0	0	0	0	0
12:00 PM	1	0	1	1	3	1	0	0	0	1	0	3	3	0	6
12:15 PM	0	1	2	1	4	0	0	0	0	0	0	0	1	0	1
12:30 PM	1	1	0	4	6	0	0	0	0	0	0	5	4	0	9
12:45 PM	0	0	4	1	5	0	0	0	0	0	0	2	0	0	2
1:00 PM	1	0	2	6	9	0	0	0	0	0	0	0	0	0	0
1:15 PM	1	2	5	1	9	0	0	0	1	1	0	1	0	0	1
1:30 PM	0	1	1	1	3	0	1	0	0	1	0	3	2	0	5
1:45 PM	1	0	2	0	3	0	0	0	0	0	0	0	2	0	2
2:00 PM	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0
2:15 PM	0	0	1	1	2	0	0	1	0	1	0	0	2	0	2
2:30 PM	0	0	1	1	2	0	0	0	0	0	0	0	0	0	0
2:45 PM	1	0	3	1	5	0	0	0	0	0	0	2	0	0	2
Count Total	8	6	28	30	72	1	2	2	3	8	0	20	21	0	41
Peak Hour	1	0	5	6	12	0	0	1	0	1	0	2	2	0	4

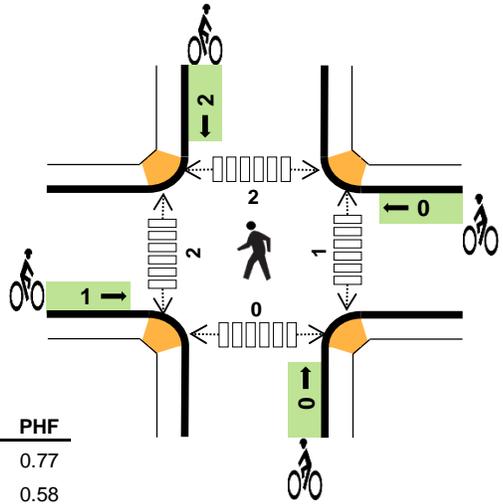


**132ND AVE NE
NE 100TH ST**



Date: Wed, Aug 01, 2018
 Count Period: 3:00 PM to 7:00 PM
 Peak Hour: 4:15 PM to 5:15 PM

	HV %:	PHF
EB	2.0%	0.77
WB	0.0%	0.58
NB	1.0%	0.94
SB	1.6%	0.86
TOTAL	1.1%	0.95



Four-Hour Count Summaries

Interval Start	NE 100TH ST				NE 100TH ST				132ND AVE NE				132ND AVE NE				15-min Total	Rolling One Hour
	Eastbound		Westbound		Northbound		Southbound		UT	LT	TH	RT	UT	LT	TH	RT		
4:15 PM	0	2	0	13	0	3	0	1	0	86	215	4	0	0	54	3	381	0
4:30 PM	0	3	0	5	0	1	0	2	0	63	196	9	0	2	53	2	336	0
4:45 PM	0	3	2	11	0	0	4	2	0	53	232	5	0	2	63	6	383	0
5:00 PM	0	1	0	9	0	0	0	1	0	47	235	7	0	2	53	3	358	1,458
Peak Hour	0	9	2	38	0	4	4	6	0	249	878	25	0	6	223	14	1,458	0

Note: For all three-hour count summary, see next page.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:15 PM	1	0	4	2	7	1	0	0	1	2	0	0	0	0	0
4:30 PM	0	0	1	0	1	0	0	0	1	1	0	1	1	0	2
4:45 PM	0	0	2	1	3	0	0	0	0	0	0	1	0	0	1
5:00 PM	0	0	4	1	5	0	0	0	0	0	1	0	1	0	2
Peak Hour	1	0	11	4	16	1	0	0	2	3	1	2	2	0	5

Four-Hour Count Summaries																		
Interval Start	NE 100TH ST				NE 100TH ST				132ND AVE NE				132ND AVE NE				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		
3:00 PM	0	2	0	12	0	3	2	1	0	40	94	3	0	2	49	1	209	0
3:15 PM	0	3	0	11	0	5	2	3	0	26	145	8	0	0	38	6	247	0
3:30 PM	0	5	0	13	0	5	0	1	0	34	161	8	0	2	46	4	279	0
3:45 PM	0	1	0	7	0	1	2	3	0	47	152	7	0	3	46	0	269	1,004
4:00 PM	0	2	0	11	0	0	2	3	0	63	171	10	0	1	60	1	324	1,119
4:15 PM	0	2	0	13	0	3	0	1	0	86	215	4	0	0	54	3	381	1,253
4:30 PM	0	3	0	5	0	1	0	2	0	63	196	9	0	2	53	2	336	1,310
4:45 PM	0	3	2	11	0	0	4	2	0	53	232	5	0	2	63	6	383	1,424
5:00 PM	0	1	0	9	0	0	0	1	0	47	235	7	0	2	53	3	358	1,458
5:15 PM	0	5	3	15	0	1	1	1	0	51	131	10	0	2	58	3	281	1,358
5:30 PM	0	2	2	12	0	3	2	3	0	44	217	5	0	3	59	3	355	1,377
5:45 PM	0	3	1	11	0	2	2	1	0	55	237	11	0	5	59	0	387	1,381
6:00 PM	0	5	0	10	0	4	4	2	0	49	214	11	0	3	59	5	366	1,389
6:15 PM	0	0	2	5	0	2	0	0	0	50	189	14	0	5	43	8	318	1,426
6:30 PM	0	2	3	9	0	4	3	0	0	42	164	7	0	3	25	1	263	1,334
6:45 PM	0	1	1	5	0	2	1	5	0	44	124	16	0	1	41	5	246	1,193
Count Total	0	40	14	159	0	36	25	29	0	794	2,877	135	0	36	806	51	5,002	0
Peak Hour	0	9	2	38	0	4	4	6	0	249	878	25	0	6	223	14	1,458	0

Note: Four-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
3:00 PM	2	0	1	2	5	0	0	0	0	0	0	2	0	0	2
3:15 PM	0	0	3	2	5	0	0	1	0	1	0	0	0	0	0
3:30 PM	0	0	0	0	0	2	0	0	1	3	0	0	0	0	0
3:45 PM	0	0	4	1	5	0	0	0	0	0	0	1	0	0	1
4:00 PM	0	0	4	1	5	0	0	0	0	0	0	1	0	0	1
4:15 PM	1	0	4	2	7	1	0	0	1	2	0	0	0	0	0
4:30 PM	0	0	1	0	1	0	0	0	1	1	0	1	1	0	2
4:45 PM	0	0	2	1	3	0	0	0	0	0	0	1	0	0	1
5:00 PM	0	0	4	1	5	0	0	0	0	0	1	0	1	0	2
5:15 PM	0	0	2	1	3	0	0	2	0	2	0	1	1	0	2
5:30 PM	1	1	0	2	4	0	0	2	0	2	0	0	0	0	0
5:45 PM	0	0	1	1	2	0	0	1	0	1	1	0	0	0	1
6:00 PM	0	0	1	0	1	0	0	5	0	5	0	0	1	0	1
6:15 PM	0	0	2	1	3	0	1	1	0	2	0	0	3	0	3
6:30 PM	0	0	1	0	1	0	0	1	0	1	0	0	3	0	3
6:45 PM	0	0	1	1	2	0	0	0	0	0	0	0	2	0	2
Count Total	4	1	31	16	52	3	1	13	3	20	2	7	12	0	21
Peak Hour	1	0	11	4	16	1	0	0	2	3	1	2	2	0	5

Attachment B: LOS Definitions

Highway Capacity Manual, 2000

Signalized intersection level of service (LOS) is defined in terms of the average total vehicle delay of all movements through an intersection. Vehicle delay is a method of quantifying several intangible factors, including driver discomfort, frustration, and lost travel time. Specifically, LOS criteria are stated in terms of average delay per vehicle during a specified time period (for example, the PM peak hour). Vehicle delay is a complex measure based on many variables, including signal phasing (i.e., progression of movements through the intersection), signal cycle length, and traffic volumes with respect to intersection capacity. Table 1 shows LOS criteria for signalized intersections, as described in the *Highway Capacity Manual* (Transportation Research Board, Special Report 209, 2000).

Table 1. Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (sec/veh)	General Description (Signalized Intersections)
A	≤10	Free Flow
B	>10 - 20	Stable Flow (slight delays)
C	>20 - 35	Stable flow (acceptable delays)
D	>35 - 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 - 80	Unstable flow (intolerable delay)
F	>80	Forced flow (jammed)

Source: *Highway Capacity Manual*, Transportation Research Board, Special Report 209, 2000.

Unsignalized intersection LOS criteria can be further reduced into two intersection types: all-way stop-controlled and two-way stop-controlled. All-way, stop-controlled intersection LOS is expressed in terms of the average vehicle delay of all of the movements, much like that of a signalized intersection. Two-way, stop-controlled intersection LOS is defined in terms of the average vehicle delay of an individual movement(s). This is because the performance of a two-way, stop-controlled intersection is more closely reflected in terms of its individual movements, rather than its performance overall. For this reason, LOS for a two-way, stop-controlled intersection is defined in terms of its individual movements. With this in mind, total average vehicle delay (i.e., average delay of all movements) for a two-way, stop-controlled intersection should be viewed with discretion. Table 2 shows LOS criteria for unsignalized intersections (both all-way and two-way, stop-controlled).

Table 2. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (sec/veh)
A	0 - 10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: *Highway Capacity Manual*, Transportation Research Board, Special Report 209, 2000.

Highway Capacity Manual 2010

Signalized intersection level of service (LOS) is defined in terms of a weighted average control delay for the entire intersection. Control delay quantifies the increase in travel time that a vehicle experiences due to the traffic signal control as well as provides a surrogate measure for driver discomfort and fuel consumption. Signalized intersection LOS is stated in terms of average control delay per vehicle (in seconds) during a specified time period (e.g., weekday PM peak hour). Control delay is a complex measure based on many variables, including signal phasing and coordination (i.e., progression of movements through the intersection and along the corridor), signal cycle length, and traffic volumes with respect to intersection capacity and resulting queues. Table 1 summarizes the LOS criteria for signalized intersections, as described in the *Highway Capacity Manual 2010* (Transportation Research Board, 2010).

Table 1. Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)	General Description
A	≤10	Free Flow
B	>10 – 20	Stable Flow (slight delays)
C	>20 – 35	Stable flow (acceptable delays)
D	>35 – 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 – 80	Unstable flow (intolerable delay)
F ¹	>80	Forced flow (congested and queues fail to clear)

Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.

1. If the volume-to-capacity (v/c) ratio for a lane group exceeds 1.0 LOS F is assigned to the individual lane group. LOS for overall approach or intersection is determined solely by the control delay.

Unsignalized intersection LOS criteria can be further reduced into two intersection types: all-way stop and two-way stop control. All-way stop control intersection LOS is expressed in terms of the weighted average control delay of the overall intersection or by approach. Two-way stop-controlled intersection LOS is defined in terms of the average control delay for each minor-street movement (or shared movement) as well as major-street left-turns. This approach is because major-street through vehicles are assumed to experience zero delay, a weighted average of all movements results in very low overall average delay, and this calculated low delay could mask deficiencies of minor movements. Table 2 shows LOS criteria for unsignalized intersections.

Table 2. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)
A	0 – 10
B	>10 – 15
C	>15 – 25
D	>25 – 35
E	>35 – 50
F ¹	>50

Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.

1. If the volume-to-capacity (v/c) ratio exceeds 1.0, LOS F is assigned an individual lane group for all unsignalized intersections, or minor street approach at two-way stop-controlled intersections. Overall intersection LOS is determined solely by control delay.

Attachment C: LOS Worksheets



HCM 2010 TWSC
1: NE 100th St & 132nd Ave NE

Rose Hill West
Existing Weekday AM Peak Hour

Intersection												
Int Delay, s/veh	3.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Vol, veh/h	17	12	98	14	33	8	27	251	18	8	625	143
Future Vol, veh/h	17	12	98	14	33	8	27	251	18	8	625	143
Conflicting Peds, #/hr	4	0	4	8	0	8	4	0	8	8	0	4
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	200
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	6	6	6	4	4	4	2	2	2
Mvmt Flow	17	12	100	14	34	8	28	256	18	8	638	146

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1007	996	650	1046	986	281	642	0	0	282	0	0
Stage 1	658	658	-	328	328	-	-	-	-	-	-	-
Stage 2	349	338	-	718	658	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.16	6.56	6.26	4.14	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.16	5.56	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.16	5.56	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.554	4.054	3.354	2.236	-	-	2.218	-	-
Pot Cap-1 Maneuver	219	244	469	203	244	748	933	-	-	1280	-	-
Stage 1	453	461	-	676	640	-	-	-	-	-	-	-
Stage 2	667	641	-	414	455	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	183	230	464	145	230	737	926	-	-	1270	-	-
Mov Cap-2 Maneuver	183	230	-	145	230	-	-	-	-	-	-	-
Stage 1	435	454	-	647	612	-	-	-	-	-	-	-
Stage 2	596	613	-	310	448	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	20.8		27		0.8		0.1	
HCM LOS	C		D					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	926	-	-	356	219	1270	-	-
HCM Lane V/C Ratio	0.03	-	-	0.364	0.256	0.006	-	-
HCM Control Delay (s)	9	0	-	20.8	27	7.9	0	-
HCM Lane LOS	A	A	-	C	D	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.6	1	0	-	-

HCM 2010 TWSC
1: NE 100th St & 132nd Ave NE

Rose Hill West
Existing Weekday PM Peak Hour

Intersection												
Int Delay, s/veh	7.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Vol, veh/h	14	6	46	14	6	6	239	929	31	10	245	10
Future Vol, veh/h	14	6	46	14	6	6	239	929	31	10	245	10
Conflicting Peds, #/hr	15	0	8	0	0	7	8	0	0	7	0	15
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	200
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	96	96	96	96	96	96	96	96	96	96
Heavy Vehicles, %	0	0	0	8	8	8	3	3	3	2	2	2
Mvmt Flow	15	6	48	15	6	6	249	968	32	10	255	10

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1794	1796	278	1800	1780	1006	270	0	0	1007	0	0
Stage 1	291	291	-	1489	1489	-	-	-	-	-	-	-
Stage 2	1503	1505	-	311	291	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.18	6.58	6.28	4.13	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.18	5.58	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.18	5.58	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.572	4.072	3.372	2.227	-	-	2.218	-	-
Pot Cap-1 Maneuver	63	81	766	60	79	285	1288	-	-	688	-	-
Stage 1	721	675	-	150	182	-	-	-	-	-	-	-
Stage 2	153	186	-	687	661	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	35	44	749	32	42	279	1278	-	-	678	-	-
Mov Cap-2 Maneuver	35	44	-	32	42	-	-	-	-	-	-	-
Stage 1	397	654	-	83	101	-	-	-	-	-	-	-
Stage 2	77	103	-	621	640	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	81.1		180.6		1.7		0.4	
HCM LOS	F		F					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1278	-	-	110	43	678	-	-
HCM Lane V/C Ratio	0.195	-	-	0.625	0.63	0.015	-	-
HCM Control Delay (s)	8.5	0	-	81.1	180.6	10.4	0	-
HCM Lane LOS	A	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0.7	-	-	3.1	2.3	0	-	-

HCM 2010 TWSC
1: NE 100th St & 132nd Ave NE

Rose Hill West
Future (2019) Without-Project Weekday AM Peak Hour

Intersection												
Int Delay, s/veh	5.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Vol, veh/h	18	12	102	41	36	23	28	261	30	13	650	149
Future Vol, veh/h	18	12	102	41	36	23	28	261	30	13	650	149
Conflicting Peds, #/hr	4	0	4	8	0	8	4	0	8	8	0	4
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	200
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	6	6	6	4	4	4	2	2	2
Mvmt Flow	18	12	104	42	37	23	29	266	31	13	663	152

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1071	1056	675	1103	1041	298	667	0	0	305	0	0
Stage 1	694	694	-	347	347	-	-	-	-	-	-	-
Stage 2	377	362	-	756	694	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.16	6.56	6.26	4.14	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.16	5.56	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.16	5.56	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.554	4.054	3.354	2.236	-	-	2.218	-	-
Pot Cap-1 Maneuver	198	225	454	185	226	732	913	-	-	1256	-	-
Stage 1	433	444	-	661	628	-	-	-	-	-	-	-
Stage 2	644	625	-	394	438	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	157	210	449	128	211	721	906	-	-	1246	-	-
Mov Cap-2 Maneuver	157	210	-	128	211	-	-	-	-	-	-	-
Stage 1	415	433	-	631	600	-	-	-	-	-	-	-
Stage 2	558	597	-	286	428	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	23.1		43.6		0.8		0.1	
HCM LOS	C		E					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	906	-	-	331	191	1246	-
HCM Lane V/C Ratio	0.032	-	-	0.407	0.534	0.011	-
HCM Control Delay (s)	9.1	0	-	23.1	43.6	7.9	0
HCM Lane LOS	A	A	-	C	E	A	A
HCM 95th %tile Q(veh)	0.1	-	-	1.9	2.8	0	-

Intersection												
Int Delay, s/veh	36.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Vol, veh/h	15	6	48	41	6	9	249	967	74	15	255	10
Future Vol, veh/h	15	6	48	41	6	9	249	967	74	15	255	10
Conflicting Peds, #/hr	7	0	12	11	0	6	12	0	11	6	0	7
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	200
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	1	1	1	2	2	2
Mvmt Flow	16	6	51	43	6	9	262	1018	78	16	268	11

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1908	1943	292	1932	1904	1075	280	0	0	1107	0	0
Stage 1	312	312	-	1592	1592	-	-	-	-	-	-	-
Stage 2	1596	1631	-	340	312	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.11	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.209	-	-	2.218	-	-
Pot Cap-1 Maneuver	53	66	752	50	70	269	1288	-	-	631	-	-
Stage 1	703	661	-	136	169	-	-	-	-	-	-	-
Stage 2	136	161	-	679	661	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	24	29	735	~ 22	31	264	1273	-	-	627	-	-
Mov Cap-2 Maneuver	24	29	-	~ 22	31	-	-	-	-	-	-	-
Stage 1	321	634	-	62	77	-	-	-	-	-	-	-
Stage 2	55	74	-	600	634	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	180.4	\$ 853.9	1.7	0.6
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1273	-	-	77	27	627	-
HCM Lane V/C Ratio	0.206	-	-	0.943	2.183	0.025	-
HCM Control Delay (s)	8.6	0	-	180.4	\$ 853.9	10.9	0
HCM Lane LOS	A	A	-	F	F	B	A
HCM 95th %tile Q(veh)	0.8	-	-	5	7.1	0.1	-

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 2010 TWSC
1: 132nd Ave NE & NE 100th St

Rose Hill West
Future (2019) With-Project Weekday AM Peak Hour

Intersection												
Int Delay, s/veh	6.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Vol, veh/h	18	12	102	47	36	27	28	261	33	14	650	149
Future Vol, veh/h	18	12	102	47	36	27	28	261	33	14	650	149
Conflicting Peds, #/hr	4	0	4	8	0	8	4	0	8	8	0	4
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	200
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	98	98	98	98	98	98	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	6	6	6	4	4	4	2	2	2
Mvmt Flow	18	12	104	48	37	28	29	266	34	14	663	152

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1076	1061	675	1106	1044	299	667	0	0	308	0	0
Stage 1	696	696	-	348	348	-	-	-	-	-	-	-
Stage 2	380	365	-	758	696	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.16	6.56	6.26	4.14	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.16	5.56	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.16	5.56	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.554	4.054	3.354	2.236	-	-	2.218	-	-
Pot Cap-1 Maneuver	197	224	454	184	225	731	913	-	-	1253	-	-
Stage 1	432	443	-	660	627	-	-	-	-	-	-	-
Stage 2	642	623	-	393	437	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	155	208	449	127	209	720	906	-	-	1243	-	-
Mov Cap-2 Maneuver	155	208	-	127	209	-	-	-	-	-	-	-
Stage 1	414	432	-	629	598	-	-	-	-	-	-	-
Stage 2	553	594	-	285	426	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	23.3		48.1		0.8		0.1	
HCM LOS	C		E					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	906	-	-	329	190	1243	-
HCM Lane V/C Ratio	0.032	-	-	0.409	0.591	0.011	-
HCM Control Delay (s)	9.1	0	-	23.3	48.1	7.9	0
HCM Lane LOS	A	A	-	C	E	A	A
HCM 95th %tile Q(veh)	0.1	-	-	1.9	3.2	0	-

HCM 2010 TWSC
2: Site Access A & NE 100th St

Rose Hill West
Future (2019) With-Project Weekday AM Peak Hour

Intersection						
Int Delay, s/veh	1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	10	2	0	26	5	0
Future Vol, veh/h	10	2	0	26	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	2	0	28	5	0
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	13	0	40	12
Stage 1	-	-	-	-	12	-
Stage 2	-	-	-	-	28	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1606	-	972	1069
Stage 1	-	-	-	-	1011	-
Stage 2	-	-	-	-	995	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1606	-	972	1069
Mov Cap-2 Maneuver	-	-	-	-	972	-
Stage 1	-	-	-	-	1011	-
Stage 2	-	-	-	-	995	-
Approach	EB	WB	NB			
HCM Control Delay, s	0	0	8.7			
HCM LOS						A
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	972	-	-	1606	-	
HCM Lane V/C Ratio	0.006	-	-	-	-	
HCM Control Delay (s)	8.7	-	-	0	-	
HCM Lane LOS	A	-	-	A	-	
HCM 95th %tile Q(veh)	0	-	-	0	-	

HCM 2010 TWSC
3: Site Access B & NE 100th St

Rose Hill West
Future (2019) With-Project Weekday AM Peak Hour

Intersection						
Int Delay, s/veh	5.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	2	8	0	5	21	0
Future Vol, veh/h	2	8	0	5	21	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	9	0	5	23	0
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	11	0	12	7
Stage 1	-	-	-	-	7	-
Stage 2	-	-	-	-	5	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1608	-	1008	1075
Stage 1	-	-	-	-	1016	-
Stage 2	-	-	-	-	1018	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1608	-	1008	1075
Mov Cap-2 Maneuver	-	-	-	-	1008	-
Stage 1	-	-	-	-	1016	-
Stage 2	-	-	-	-	1018	-
Approach	EB	WB	NB			
HCM Control Delay, s	0	0	8.7			
HCM LOS					A	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	1008	-	-	1608	-	
HCM Lane V/C Ratio	0.023	-	-	-	-	
HCM Control Delay (s)	8.7	-	-	0	-	
HCM Lane LOS	A	-	-	A	-	
HCM 95th %tile Q(veh)	0.1	-	-	0	-	

HCM 2010 TWSC
1: 132nd Ave NE & NE 100th St

Rose Hill West
Future (2019) With-Project Weekday PM Peak Hour

Intersection												
Int Delay, s/veh	50.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	↕
Traffic Vol, veh/h	15	6	48	48	6	10	249	967	86	16	255	10
Future Vol, veh/h	15	6	48	48	6	10	249	967	86	16	255	10
Conflicting Peds, #/hr	7	0	12	11	0	6	12	0	11	6	0	7
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	200
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	1	1	1	2	2	2
Mvmt Flow	16	6	51	51	6	11	262	1018	91	17	268	11

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	1917	1958	292	1941	1912	1081	280	0	0	1119	0	0
Stage 1	314	314	-	1598	1598	-	-	-	-	-	-	-
Stage 2	1603	1644	-	343	314	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.11	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.209	-	-	2.218	-	-
Pot Cap-1 Maneuver	52	64	752	~ 50	69	267	1288	-	-	624	-	-
Stage 1	701	660	-	135	167	-	-	-	-	-	-	-
Stage 2	134	159	-	676	660	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	23	27	735	~ 21	29	262	1273	-	-	620	-	-
Mov Cap-2 Maneuver	23	27	-	~ 21	29	-	-	-	-	-	-	-
Stage 1	312	632	-	60	74	-	-	-	-	-	-	-
Stage 2	53	71	-	596	632	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	201.8		\$ 1096		1.6		0.6	
HCM LOS	F		F					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1273	-	-	73	25	620	-	-
HCM Lane V/C Ratio	0.206	-	-	0.995	2.695	0.027	-	-
HCM Control Delay (s)	8.6	0	-	201.8	\$ 1096	11	0	-
HCM Lane LOS	A	A	-	F	F	B	A	-
HCM 95th %tile Q(veh)	0.8	-	-	5.2	8.3	0.1	-	-

Notes			
~: Volume exceeds capacity	\$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

HCM 2010 TWSC
2: Site Access A & NE 100th St

Rose Hill West
Future (2019) With-Project Weekday PM Peak Hour

Intersection						
Int Delay, s/veh	0.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	31	6	0	18	4	0
Future Vol, veh/h	31	6	0	18	4	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	34	7	0	20	4	0

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	40	0	57
Stage 1	-	-	-	-	37
Stage 2	-	-	-	-	20
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1570	-	950
Stage 1	-	-	-	-	985
Stage 2	-	-	-	-	1003
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1570	-	950
Mov Cap-2 Maneuver	-	-	-	-	950
Stage 1	-	-	-	-	985
Stage 2	-	-	-	-	1003

Approach	EB	WB	NB
HCM Control Delay, s	0	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	950	-	-	1570	-
HCM Lane V/C Ratio	0.005	-	-	-	-
HCM Control Delay (s)	8.8	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0	-	-	0	-

HCM 2010 TWSC
3: Site Access B & NE 100th St

Rose Hill West
Future (2019) With-Project Weekday PM Peak Hour

Intersection						
Int Delay, s/veh	3.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	31	0	0	18	0
Future Vol, veh/h	0	31	0	0	18	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	34	0	0	20	0
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	34	0	18	17
Stage 1	-	-	-	-	17	-
Stage 2	-	-	-	-	1	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1578	-	1000	1062
Stage 1	-	-	-	-	1006	-
Stage 2	-	-	-	-	1022	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1578	-	1000	1062
Mov Cap-2 Maneuver	-	-	-	-	1000	-
Stage 1	-	-	-	-	1006	-
Stage 2	-	-	-	-	1022	-
Approach	EB	WB	NB			
HCM Control Delay, s	0	0	8.7			
HCM LOS						A
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	1000	-	-	1578	-	
HCM Lane V/C Ratio	0.02	-	-	-	-	
HCM Control Delay (s)	8.7	-	-	0	-	
HCM Lane LOS	A	-	-	A	-	
HCM 95th %tile Q(veh)	0.1	-	-	0	-	

Attachment D: Signal Warrants

Warrants Summary												
Information												
Analyst	Transpo		Intersection	132nd Ave NE/NE 100th St								
Agency/Co	Transpo Group		Jurisdiction	Redmond								
Date Performed	9/19/2018		Units	U.S. Customary								
Project ID	Rose Hill West		Time Period Analyzed	July 2018 Midweek Counts								
East/West Street	NE 100th Street		North/South Street	132nd Avenue NE								
File Name	Signal Warrant_March 2019.xhy		Major Street	North-South								
Project Description <i>Rose Hill West</i>												
General									Roadway Network			
Major Street Speed (mph)	35	<input type="checkbox"/>	Population < 10,000			Two Major Routes				<input type="checkbox"/>		
Nearest Signal (ft)	2700	<input type="checkbox"/>	Coordinated Signal System			Weekend Count				<input type="checkbox"/>		
Crashes (per year)	4	<input type="checkbox"/>	Adequate Trials of Alternatives			5-yr Growth Factor				2		
Geometry and Traffic	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N	0	1	0	0	1	0	0	1	0	0	1	1
Lane usage	LTR			LTR			LTR			LTR		
Vehicle Volume Averages (vph)	9	3	52	36	8	8	99	376	55	10	289	18
Peds (ped/h) / Gaps (gaps/h)	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--
Delay (s/veh) / (veh-hr)	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--
Warrant 1: Eight-Hour Vehicular Volume												<input type="checkbox"/>
1 A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--												<input type="checkbox"/>
1 B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--												<input type="checkbox"/>
1 (80%) Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)												<input type="checkbox"/>
Warrant 2: Four-Hour Vehicular Volume												<input type="checkbox"/>
2 A. Four-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)												<input type="checkbox"/>
Warrant 3: Peak Hour												<input type="checkbox"/>
3 A. Peak-Hour Conditions (Minor delay --and-- minor volume --and-- total volume) --or--												<input type="checkbox"/>
3 B. Peak- Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)												<input type="checkbox"/>
Warrant 4: Pedestrian Volume												<input type="checkbox"/>
4 A. Four Hour Volumes --or--												<input type="checkbox"/>
4 B. One-Hour Volumes												<input type="checkbox"/>
Warrant 5: School Crossing												<input type="checkbox"/>
5. Student Volumes --and--												<input type="checkbox"/>
5. Gaps Same Period												<input type="checkbox"/>
Warrant 6: Coordinated Signal System												<input type="checkbox"/>
6. Degree of Platooning (Predominant direction or both directions)												<input type="checkbox"/>
Warrant 7: Crash Experience												<input type="checkbox"/>
7 A. Adequate trials of alternatives, observance and enforcement failed --and--												<input type="checkbox"/>
7 B. Reported crashes susceptible to correction by signal (12-month period) --and--												<input type="checkbox"/>

7 C. (80%) Volumes for Warrants 1A, 1B --or-- 4 are satisfied	<input type="checkbox"/>
Warrant 8: Roadway Network	<input type="checkbox"/>
8 A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2 or 3) --or--	<input type="checkbox"/>
8 B. Weekend Volume (Five hours total)	<input type="checkbox"/>
Warrant 9: Grade Crossing	<input type="checkbox"/>
9 A. Grade Crossing within 140 ft --and--	<input type="checkbox"/>
9 B. Peak-Hour Vehicular Volumes	<input type="checkbox"/>

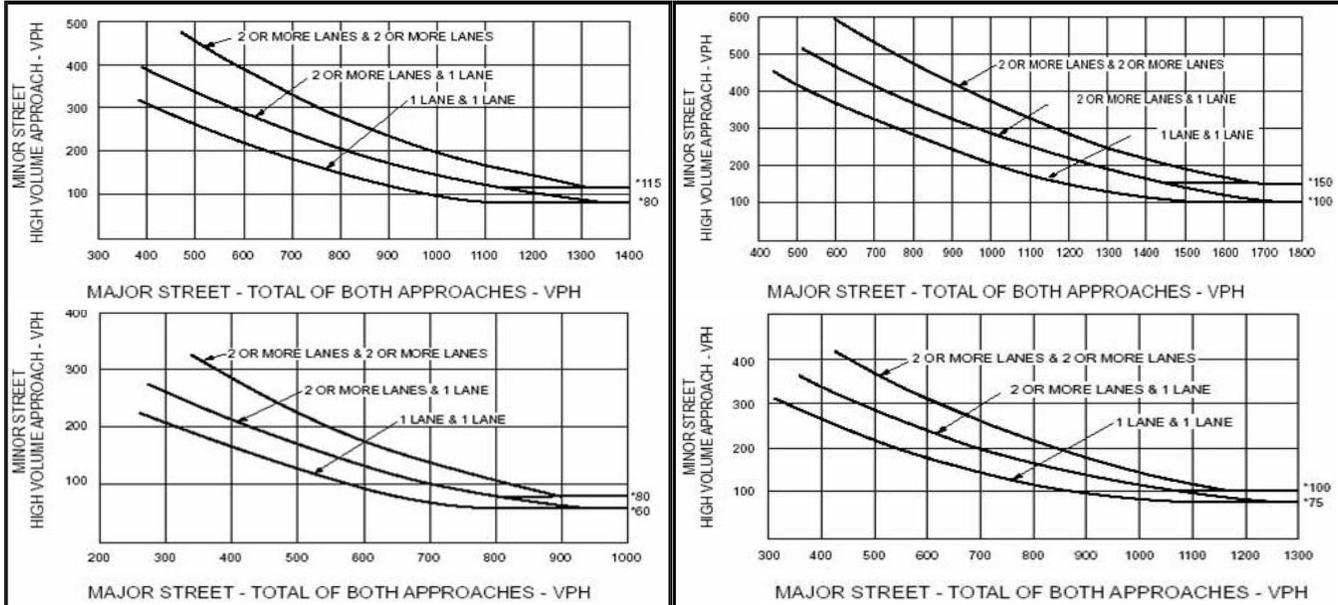
Warrants Volume			
Information			
Analyst	Transpo	Intersection	132nd Ave NE/NE 100th St
Agency/Co	Transpo Group	Jurisdiction	Redmond
Date Performed	9/19/2018	Units	U.S. Customary
Project ID	Rose Hill West	Time Period Analyzed	July 2018 Midweek Counts
East/West Street	NE 100th Street	North/South Street	132nd Avenue NE
File Name	Signal Warrant_March 2019.xhy	Major Street	North-South
Project Description <i>Rose Hill West</i>			

Warrant 1

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

Warrant 2

Warrant 3



Volume Summary

Major Street Lanes 2+		Minor Street Lanes 1		Speed		35		Population		10000+	
Hours	Major Volume	Minor Volume	Total Volume	1A (100%)	1A (80%)	1B (100%)	1B (80%)	2 (100%)	3A (100%)	3B (100%)	
07-08	666	81	808	No	No	No	No	No	No	No	
08-09	892	96	1054	No	No	No	Yes	No	No	No	
09-10	759	90	910	No	No	No	Yes	No	No	No	
10-11	564	76	697	No	No	No	No	No	No	No	
11-12	516	61	615	No	No	No	No	No	No	No	
12-13	584	57	684	No	No	No	No	No	No	No	
13-14	546	58	649	No	No	No	No	No	No	No	
14-15	654	50	750	No	No	No	No	No	No	No	
15-16	984	55	1093	No	No	No	No	No	No	No	
16-17	1441	55	1549	No	No	No	No	No	No	No	
17-18	1385	65	1503	No	No	No	Yes	No	No	No	
18-19	1195	59	1298	No	No	No	No	No	No	No	
Totals	10186	803	11610	0	0	0	3	0	0	0	

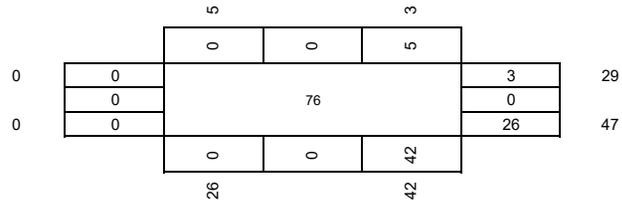
132nd Avenue NE/NE 100th Street

August 1, 2018 Weekday Hourly Volumes

Time	EB				WB				NB				SB				All Approaches	Percent of total
	LT	Th	RT	Approach	LT	Th	RT	Approach	LT	Th	RT	Approach	LT	Th	RT	Approach		
7:00 AM	2	1	76	79	21	13	6	40	20	126	5	151	16	438	17	471	741	6.94%
8:00 AM	9	1	84	94	22	12	6	40	34	157	10	201	5	599	29	633	968	9.06%
9:00 AM	10	5	74	89	17	17	5	39	44	157	17	218	6	452	33	491	837	7.84%
10:00 AM	13	3	59	75	22	11	8	41	45	163	13	221	6	283	18	307	644	6.03%
11:00 AM	6	3	51	60	14	10	0	24	46	192	11	249	3	210	21	234	567	5.31%
12:00 PM	12	4	40	56	17	5	5	27	58	213	22	293	3	235	17	255	631	5.91%
1:00 PM	11	3	43	57	19	5	6	30	65	224	22	311	2	182	17	201	599	5.61%
2:00 PM	6	9	34	49	16	6	7	29	69	319	19	407	2	193	13	208	693	6.49%
3:00 PM	11	0	43	54	14	6	8	28	147	552	26	725	7	179	11	197	1,004	9.40%
4:00 PM	10	2	40	52	4	6	8	18	265	814	28	1,107	5	230	12	247	1,424	13.33%
5:00 PM	11	6	47	64	6	5	6	17	197	820	33	1,050	12	229	9	250	1,381	12.93%
6:00 PM	8	6	29	43	12	8	7	27	185	691	48	924	12	168	19	199	1,193	11.17%
Total	109	43	620	772	184	104	72	360	1,175	4,428	254	5,857	79	3,398	216	3,693	10,682	100%

132nd Avenue NE/NE 100th Street

PM Peak Hour Pipeline Project Volumes



Hourly Volume Distribution¹

Time		EB				WB				NB				SB			
		LT	Th	RT	Approach	LT	Th	RT	Approach	LT	Th	RT	Approach	LT	Th	RT	Approach
7:00 AM	6.94%	0	0	0	0	14	0	2	16	0	0	22	22	3	0	0	3
8:00 AM	9.06%	0	0	0	0	18	0	2	20	0	0	29	29	3	0	0	3
9:00 AM	7.84%	0	0	0	0	15	0	2	17	0	0	25	25	3	0	0	3
10:00 AM	6.03%	0	0	0	0	12	0	1	13	0	0	19	19	2	0	0	2
11:00 AM	5.31%	0	0	0	0	10	0	1	11	0	0	17	17	2	0	0	2
12:00 PM	5.91%	0	0	0	0	12	0	1	13	0	0	19	19	2	0	0	2
1:00 PM	5.61%	0	0	0	0	11	0	1	12	0	0	18	18	2	0	0	2
2:00 PM	6.49%	0	0	0	0	13	0	1	14	0	0	20	20	2	0	0	2
3:00 PM	9.40%	0	0	0	0	18	0	2	20	0	0	30	30	4	0	0	4
4:00 PM	13.33%	0	0	0	0	26	0	3	29	0	0	42	42	5	0	0	5
5:00 PM	12.93%	0	0	0	0	25	0	3	28	0	0	41	41	5	0	0	5
6:00 PM	11.17%	0	0	0	0	22	0	3	25	0	0	35	35	4	0	0	4
Total	100.00%	0	0	0	0	196	0	22	218	0	0	317	317	37	0	0	37

1) Hourly distribution is based on April 2016 hourly counts.

132nd Avenue NE/NE 100th Street

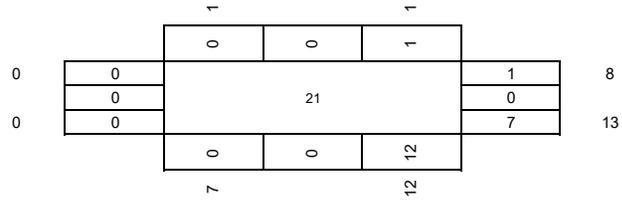
Future 2019 Without-Project Hourly Volumes
Includes Annual Growth Rate and Pipeline Volumes

2%	Annual Growth Rate
2018	Counts Year
2019	Future Analysis Year

Time	EB				WB				NB				SB			
	LT	Th	RT	Approach	LT	Th	RT	Approach	LT	Th	RT	Approach	LT	Th	RT	Approach
7:00 AM	2	1	78	81	35	13	8	56	20	129	27	176	19	447	17	483
8:00 AM	9	1	86	96	40	12	8	60	35	160	39	234	8	611	30	649
9:00 AM	10	5	75	90	32	17	7	56	45	160	42	247	9	461	34	504
10:00 AM	13	3	60	76	34	11	9	54	46	166	32	244	8	289	18	315
11:00 AM	6	3	52	61	24	10	1	35	47	196	28	271	5	214	21	240
12:00 PM	12	4	41	57	29	5	6	40	59	217	41	317	5	240	17	262
1:00 PM	11	3	44	58	30	5	7	42	66	228	40	334	4	186	17	207
2:00 PM	6	9	35	50	29	6	8	43	70	325	39	434	4	197	13	214
3:00 PM	11	0	44	55	32	6	10	48	150	563	57	770	11	183	11	205
4:00 PM	10	2	41	53	30	6	11	47	270	830	71	1,171	10	235	12	257
5:00 PM	11	6	48	65	31	5	9	45	201	836	75	1,112	17	234	9	260
6:00 PM	8	6	30	44	34	8	10	52	189	705	84	978	16	171	19	206
Total	109	43	634	786	380	104	94	578	1,198	4,515	575	6,288	116	3,468	218	3,802

132nd Avenue NE/NE 100th Street

PM Peak Hour Project Trips



Hourly Volume Distribution¹

Time		EB				WB				NB				SB			
		LT	Th	RT	Approach	LT	Th	RT	Approach	LT	Th	RT	Approach	LT	Th	RT	Approach
7:00 AM	6.94%	0	0	0	0	4	0	1	5	0	0	6	6	1	0	0	1
8:00 AM	9.06%	0	0	0	0	5	0	1	6	0	0	8	8	1	0	0	1
9:00 AM	7.84%	0	0	0	0	4	0	1	5	0	0	7	7	1	0	0	1
10:00 AM	6.03%	0	0	0	0	3	0	0	3	0	0	5	5	0	0	0	0
11:00 AM	5.31%	0	0	0	0	3	0	0	3	0	0	5	5	0	0	0	0
12:00 PM	5.91%	0	0	0	0	3	0	0	3	0	0	5	5	0	0	0	0
1:00 PM	5.61%	0	0	0	0	3	0	0	3	0	0	5	5	0	0	0	0
2:00 PM	6.49%	0	0	0	0	3	0	0	3	0	0	6	6	0	0	0	0
3:00 PM	9.40%	0	0	0	0	5	0	1	6	0	0	8	8	1	0	0	1
4:00 PM	13.33%	0	0	0	0	7	0	1	8	0	0	12	12	1	0	0	1
5:00 PM	12.93%	0	0	0	0	7	0	1	8	0	0	12	12	1	0	0	1
6:00 PM	11.17%	0	0	0	0	6	0	1	7	0	0	10	10	1	0	0	1
Total	100.00%	0	0	0	0	53	0	7	60	0	0	89	89	7	0	0	7

1) Hourly distribution is based on April 2016 hourly counts.

132nd Avenue NE/NE 100th Street

Future 2019 With-Project Hourly Volumes

Includes Future Without-Project and Project Trip Hourly Volumes

Time	EB				WB				NB				SB			
	LT	Th	RT	Approach	LT	Th	RT	Approach	LT	Th	RT	Approach	LT	Th	RT	Approach
7:00 AM	2	1	78	81	39	13	9	61	20	129	33	182	20	447	17	484
8:00 AM	9	1	86	96	45	12	9	66	35	160	47	242	9	611	30	650
9:00 AM	10	5	75	90	36	17	8	61	45	160	49	254	10	461	34	505
10:00 AM	13	3	60	76	37	11	9	57	46	166	37	249	8	289	18	315
11:00 AM	6	3	52	61	27	10	1	38	47	196	33	276	5	214	21	240
12:00 PM	12	4	41	57	32	5	6	43	59	217	46	322	5	240	17	262
1:00 PM	11	3	44	58	33	5	7	45	66	228	45	339	4	186	17	207
2:00 PM	6	9	35	50	32	6	8	46	70	325	45	440	4	197	13	214
3:00 PM	11	0	44	55	37	6	11	54	150	563	65	778	12	183	11	206
4:00 PM	10	2	41	53	37	6	12	55	270	830	83	1,183	11	235	12	258
5:00 PM	11	6	48	65	38	5	10	53	201	836	87	1,124	18	234	9	261
6:00 PM	8	6	30	44	40	8	11	59	189	705	94	988	17	171	19	207
Total	109	43	634	786	433	104	101	638	1,198	4,515	664	6,377	123	3,468	218	3,809