

MEMORANDUM

DATE: February 9, 2016

TO: Andy Chow
City of Redmond

FROM: Jeff Schramm
TENW

SUBJECT: Revised Phase 2 Traffic Impact Analysis
Quadrant Hawks Glen Residential – City of Redmond
TENW Project No. 5065

This memorandum summarizes the revised Phase 2 traffic analysis conducted for the proposed Quadrant Hawks Glen residential development; the revised analysis also address comments provided by the City dated October 2, 2015. The scope of the analysis was identified in your comments from the 30% review, dated August 5, 2015. The analysis is limited to updated trip generation, traffic volumes at 178th Avenue NE / NE 116th Street, LOS at that intersection, and sight distance evaluation.

Project Description

The site of the proposed Quadrant Hawks Glen residential project is located at 17656 NE 116th Street in Redmond, WA. The project would include the development of up to 27 single-family units. The existing site consists of one single family home, which would be removed with the proposed development. A preliminary site plan is included in **Attachment A**.

Vehicular access to the site would be provided via two new residential access points on 178th Avenue NE located north of NE 116th Street as shown in the **Attachment B** site plan.

Trip Generation

The weekday daily, AM and PM peak hour trip generation estimates for the proposed residential project were based on trip rates and equations published in the Institute of Transportation Engineers (ITE) *Trip Generation* manual, 9th edition for LUC 210 (Single-Family Detached Housing). The resulting weekday daily, AM and PM peak hour trips are summarized in **Table 1**. A detailed trip generation estimate is included in **Attachment C**.

Table 1
Quadrant Hawks Glen – Trip Generation Summary

Time Period	Net Trips Generated		
	In	Out	Total
Weekday Daily	123	124	247
Weekday AM Peak Hour	5	14	19
Weekday PM Peak Hour	16	10	26

As shown in **Table 1**, the Quadrant Hawks Glen residential development is estimated to generate 247 net new weekday daily trips with 19 net new trips occurring during the weekday AM peak hour (5 in, 14 out) and 26 net new trips during the weekday PM peak hour (16 in, 10 out).

Future Traffic Volumes

Existing weekday AM and PM peak hour traffic volumes at the 178th Avenue NE / NE 116th Street intersection were based on counts conducted by NDS on August 25, 2015; the existing count data is included in **Attachment D**.

The distribution of the project trips by vehicles generated by the proposed Quadrant Hawks Glen residential development was based on existing travel patterns in the area, and the recent turning movement count collected at the 178th Avenue NE / NE 116th Street intersection. The new peak hour project-generated trips were generally distributed to the vicinity street system as follows:

AM Peak Hour

- 50 percent to/from the east on NE 116th Street
- 50 percent to/from the west on NE 116th Street

PM Peak Hour

- 70 percent to/from the east on NE 116th Street
- 30 percent to/from the west on NE 116th Street

Future year 2018 Without-Project peak hour traffic volumes, which coincides with the anticipated year of project buildout, were estimated by applying a two percent annual growth rate to the existing traffic volumes based on direction from the City. The 2018 With-Project traffic volumes were determined by adding the trip assignment from the proposed development to the future 2018 Without-Project traffic volumes. The existing, project trip assignment, 2018 Without-Project, and 2018 With-Project peak hour traffic volumes are included in **Attachment E**.

Level of Service Analysis

Weekday AM and PM peak hour level of service (LOS) analyses were conducted at the intersection of 178th Avenue NE and NE 116th Street using the methodologies and procedures outlined in the 2010 *Highway Capacity Manual* (HCM 2010). LOS serves as an indicator of the quality of traffic flow and degree of congestion at an intersection or roadway segment. It is a measure of vehicle operating speed, travel time, travel delays, and driving comfort. The LOS methodology is described in **Attachment F**. The *Synchro Version 8* software package was used to determine LOS.

Table 2 summarizes the AM and PM peak hour LOS results at the 178th Avenue NE / NE 116th Street intersection. The detailed LOS calculation sheets are included in **Attachment F**.

Table 1
Quadrant Hawks Glen – Peak Hour LOS Summary

Study Intersection	2015 Existing		2018 Without-Project		2018 With-Project	
	LOS ¹	Delay ²	LOS ¹	Delay ²	LOS ¹	Delay ²
<u>AM Peak Hour</u>						
178 th Avenue NE / NE 116 th Street						
NB Shared Left-Thru-Right	B	11.5	B	11.8	B	12.0
EB Left-Turn	A	8.1	A	8.2	A	8.2
WB Left-Turn	A	0.0	A	0.0	A	0.0
SB Shared Left-Thru-Right	B	11.9	B	12.2	B	12.6
<u>PM Peak Hour</u>						
178 th Avenue NE / NE 116 th Street						
NB Shared Left-Thru-Right	B	13.1	B	13.6	B	13.7
EB Left-Turn	A	7.8	A	7.8	A	7.9
WB Left-Turn	A	8.3	A	8.3	A	8.3
SB Shared Left-Thru-Right	B	14.9	C	15.8	C	16.2

¹ LOS = Level of Service.² Delay refers to average control delay in seconds per vehicle

As shown in **Table 2**, all movements at the 178th Avenue NE / NE 116th Street intersection are expected to operate at LOS C during the AM and PM peak hours in the future without or with the proposed Quadrant Hawks Glen residential project.

Sight Distance

Existing intersection (entering) sight distance (ISD) and stopping sight distance (SSD) were evaluated in the field at the 178th Avenue NE / NE 116th Street intersection. The sight distance measurements were based on the standards outlined in the Redmond Zoning Code (RZC), *Appendix 2. Construction Specification and Design Standards for Streets and Access*.

Intersection (Entering) Sight Distance (ISD)

The RZC specifies the use of a driver's eye height of 3.5 feet and object height of 2.0 feet for ISD. Since no setback measurement was specified in the RZC, we believe the use of AASHTO standards are appropriate (14.5 feet back from the edge of travelled way). The RZC specifies use of a design speed 10 mph over the posted speed limit (35 mph posted on NE 116th Street). Therefore the design speed used was 45 mph for NE 116th Street.

Based on a 45 mph design speed on NE 116th Street, the recommended ISD from RZC Appendix 2 Table 9 is 500 feet. Looking to the east and west along NE 116th Street, the available ISD was observed to be in excess of 500 feet.

Stopping Sight Distance (SSD)

RZC standards specify use of a driver's eye height of 3.5 feet and an object height of 0.5 feet for SSD. For SSD on local public streets, the RZC specifies use of a design speed of 5 mph over the posted speed. Therefore, the design speed used was 40 mph.

Based on a 40 mph design speed on NE 116th Street, the recommended SSD from RZC Appendix 2 Table 6 is 305 feet. Based on our field observations, the available stopping sight distance on both approaches to 178th Avenue NE is in excess of 305 feet.

Sight Distance at New Plat Intersections on 178th Avenue NE

Both ESD and SSD for the two new plat intersections onto 178th Avenue NE meet minimum standards. A separate exhibit has been prepared to illustrate both ESD and SSD as shown in **Attachment G**.

If you have any questions, please feel free to contact me at (425) 250-0581 or schramm@tenw.com.

cc: Matt Perkins – Quadrant Homes
Brett Pudists – Blueline
Jeff Haynie, P.E. Principal TENW

Attachments: A. Vicinity Map
B. Preliminary Site Plan
C. Trip Generation Calculations
D. Existing Count Data
E. Traffic Volumes
F. LOS Calculations
G. Sight Distance at New Plat Intersections

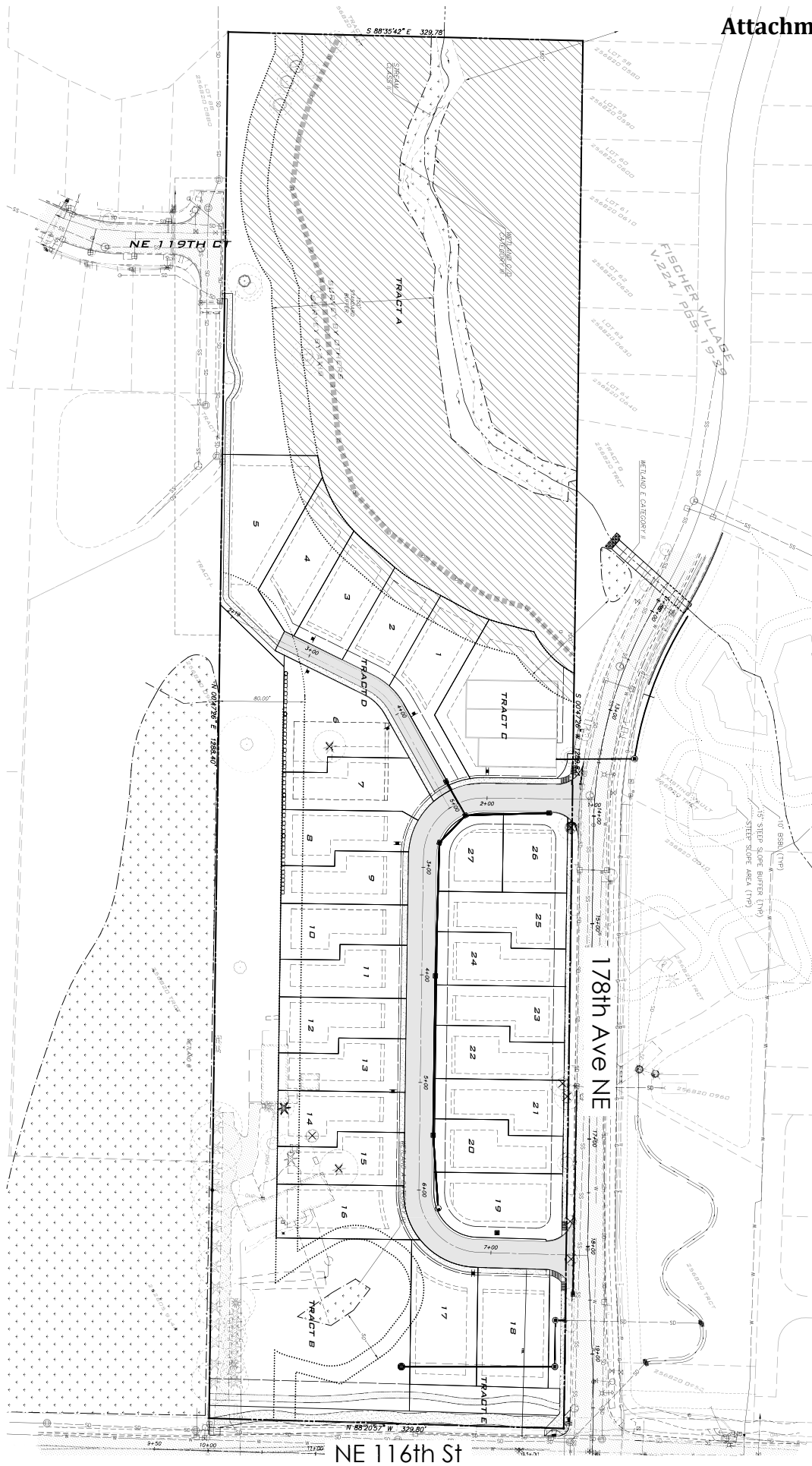
ATTACHMENT A

Vicinity Map

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NOT TO SCALE

ATTACHMENT B

Preliminary Site Plan



ATTACHMENT C

Trip Generation Calculations

**Quadrant - Hawks Glen
Trip Generation Summary**

Land Use	Size ¹	ITE LUC ²	Directional Split		Trip Rate	Trips Generated		
			In	Out		In	Out	Total
Daily								
Proposed Use:								
Single-Family	27 DU	210	50%	50%	9.52	128	129	257
Less Existing Use:								
Single-Family	1 DU	210	50%	50%	9.52	-5	-5	-10
NET NEW DAILY TRIP GENERATION =						123	124	247
AM Peak Hour								
Proposed Use:								
Single-Family	27 DU	210	25%	75%	0.75	5	15	20
Less Existing Use:								
Single-Family	1 DU	210	25%	75%	0.75	0	-1	-1
NET NEW AM PEAK HOUR TRIP GENERATION =						5	14	19
PM Peak Hour								
Proposed Use:								
Single-Family	27 DU	210	63%	37%	1.00	17	10	27
Less Existing Use:								
Single-Family	1 DU	210	63%	37%	1.00	-1	0	-1
NET NEW PM PEAK HOUR TRIP GENERATION =						16	10	26

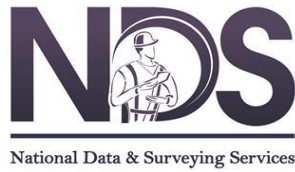
Notes:

1. DU = Dwelling Units.
2. Institute of Transportation Engineers (ITE) *Trip Generation* manual 9th edition land use code.

ATTACHMENT D

Existing Count Data

Peak Hour Summary

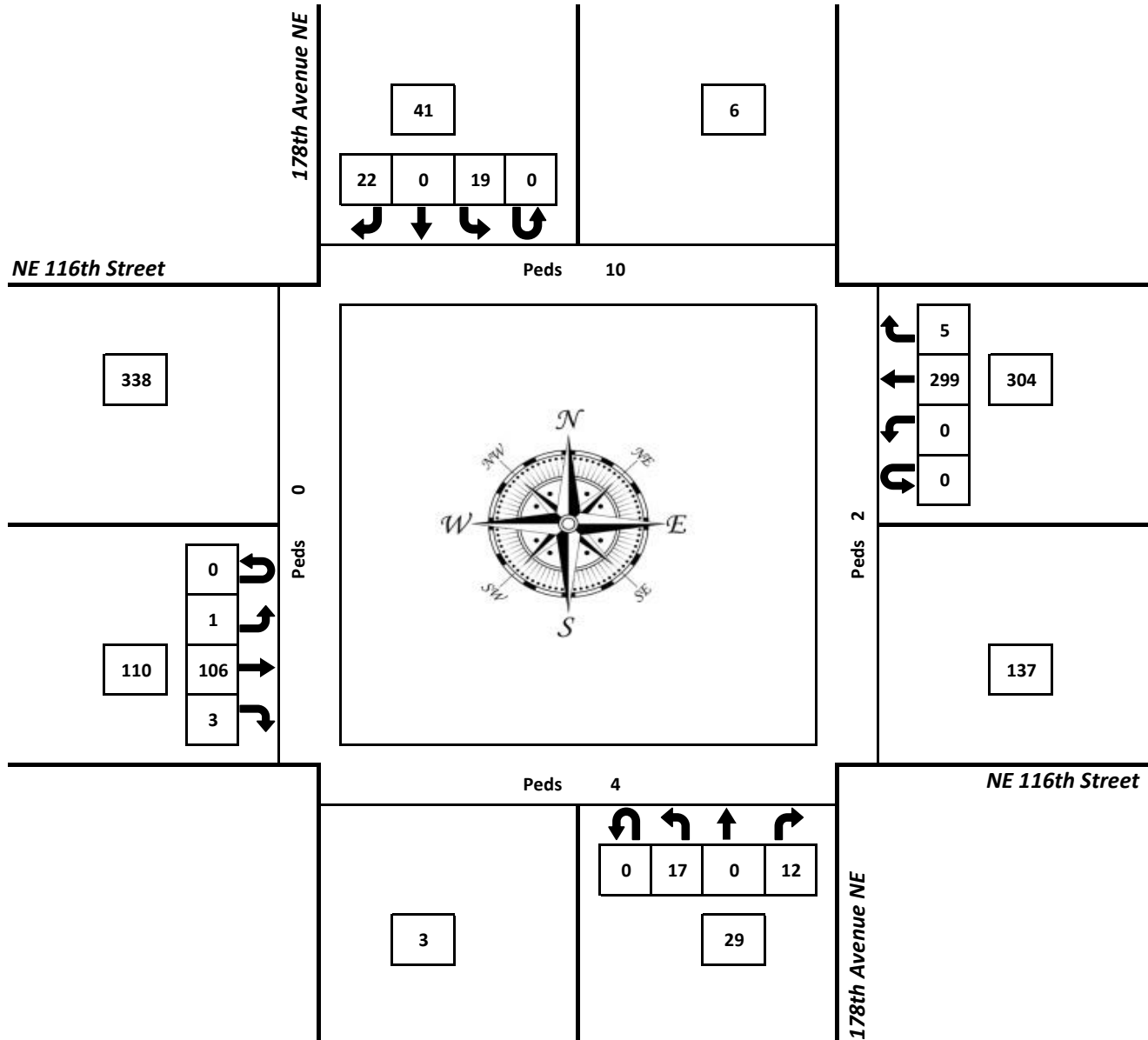


Site ID: 15-2034-001

178th Avenue NE & NE 116th Street

08:00 AM to 09:00 AM

Tuesday, August 25, 2015



Approach	PHF	HV%	Volume
EB	0.86	9.1%	110
WB	0.88	4.3%	304
NB	0.81	0.0%	29
SB	0.85	0.0%	41
Intersection	0.88	4.8%	484

Count Period: 07:00 AM to 09:00 AM

Total Vehicle Summary

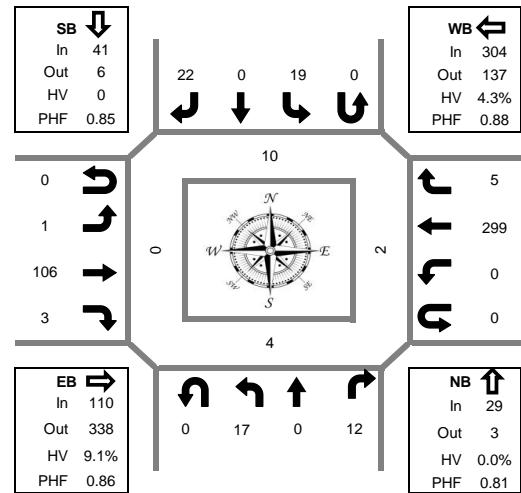


Site ID: 15-2034-001

178th Avenue NE & NE 116th Street

Tuesday, August 25, 2015

07:00 AM to 09:00 AM


Peak Hour Summary
 08:00 AM to 09:00 AM

15-Minute Interval Summary

07:00 AM to 09:00 AM

Interval Start Time	Eastbound NE 116th Street				Westbound NE 116th Street				Northbound 178th Avenue NE				Southbound 178th Avenue NE				Interval Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
7:00 AM	0	0	21	0	0	0	40	3	0	3	0	3	0	2	0	1	73
7:15 AM	0	0	29	0	0	0	35	0	0	1	0	0	0	6	0	1	72
7:30 AM	0	0	30	0	0	1	50	1	0	1	0	3	0	4	0	4	94
7:45 AM	0	0	23	0	0	2	70	1	0	7	0	6	0	5	0	3	117
8:00 AM	0	1	20	0	0	0	75	1	0	1	0	3	0	2	0	6	109
8:15 AM	0	0	24	2	0	0	70	1	0	6	0	1	0	6	0	5	115
8:30 AM	0	0	32	0	0	0	70	1	0	6	0	3	0	5	0	5	122
8:45 AM	0	0	30	1	0	0	84	2	0	4	0	5	0	6	0	6	138
Total Survey	0	1	209	3	0	3	494	10	0	29	0	24	0	36	0	31	840

Pedestrians & Bicycles In Crosswalk (By Location)				
West	East	South	North	
0	1	0	0	
0	0	1	0	
0	0	0	0	
0	0	1	2	
0	0	0	3	
0	0	3	5	
0	0	1	0	
0	2	0	2	
0	3	6	12	

Peak Hour Summary

08:00 AM to 09:00 AM

By Approach	Eastbound NE 116th Street				Westbound NE 116th Street				Northbound 178th Avenue NE				Southbound 178th Avenue NE				Total
	IN	OUT	Total	HV	IN	OUT	Total	HV	IN	OUT	Total	HV	IN	OUT	Total	HV	
Volume	110	338	448	10	304	137	441	13	29	3	32	0	41	6	47	0	484
HV %	9.1%				4.3%				0.0%				0.0%				4.8%
PHF	0.86				0.88				0.81				0.85				0.88

Pedestrians & Bicycles In Crosswalk (By Location)				
West	East	South	North	
0	2	4	10	

By Movement	Eastbound NE 116th Street				Westbound NE 116th Street				Northbound 178th Avenue NE				Southbound 178th Avenue NE				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Volume	0	1	106	3	0	0	299	5	0	17	0	12	0	19	0	22	484
HV %	NA	0.0%	9.4%	0.0%	NA	0.0%	4.3%	0.0%	NA	0.0%	0.0%	0.0%	NA	0.0%	0.0%	0.0%	4.8%
PHF	NA	0.25	0.83	0.38	NA		0.89	0.63	NA	0.71		0.60	NA	0.95	0.00	1.83	0.88

Rolling Hour Summary

07:00 AM to 09:00 AM

Interval Start Time	Eastbound NE 116th Street				Westbound NE 116th Street				Northbound 178th Avenue NE				Southbound 178th Avenue NE				Interval Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
7:00 AM	0	0	103	0	0	3	195	5	0	12	0	12	0	17	0	9	356
7:15 AM	0	1	102	0	0	3	230	3	0	10	0	12	0	17	0	14	392
7:30 AM	0	1	97	2	0	3	265	4	0	15	0	13	0	17	0	18	435
7:45 AM	0	1	99	2	0	2	285	4	0	20	0	13	0	18	0	19	463
8:00 AM	0	1	106	3	0	0	299	5	0	17	0	12	0	19	0	22	484

Pedestrians & Bicycles In Crosswalk (By Location)				
West	East	South	North	
0	1	2	2	
0	0	2	5	
0	0	4	10	
0	0	5	10	
0	2	4	10	

Heavy Vehicle Summary

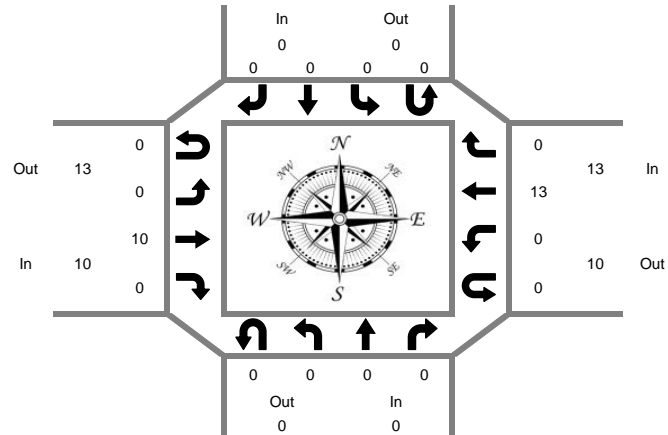


Site ID: 15-2034-001

178th Avenue NE & NE 116th Street

Tuesday, August 25, 2015

07:00 AM to 09:00 AM



Peak Hour Summary

08:00 AM to 09:00 AM

15-Minute Interval Summary

07:00 AM to 09:00 AM

Interval Start Time	Eastbound NE 116th Street					Westbound NE 116th Street					Northbound 178th Avenue NE					Southbound 178th Avenue NE					Interval Total
	U-Turn	Left	Thru	Right	Total	U-Turn	Left	Thru	Right	Total	U-Turn	Left	Thru	Right	Total	U-Turn	Left	Thru	Right	Total	
7:00 AM	0	0	1	0	1	0	0	5	0	5	0	0	0	0	0	0	0	0	0	0	6
7:15 AM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:30 AM	0	0	5	0	5	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	6
7:45 AM	0	0	1	0	1	0	1	2	0	3	0	1	0	0	1	0	0	0	0	0	5
8:00 AM	0	0	3	0	3	0	0	7	0	7	0	0	0	0	0	0	0	0	0	0	10
8:15 AM	0	0	1	0	1	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0	4
8:30 AM	0	0	3	0	3	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	5
8:45 AM	0	0	3	0	3	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	4
Total Survey	0	0	18	0	18	0	1	21	0	22	0	1	0	0	1	0	0	0	0	0	41

Peak Hour Summary

08:00 AM to 09:00 AM

By Approach	Eastbound NE 116th Street					Westbound NE 116th Street					Northbound 178th Avenue NE					Southbound 178th Avenue NE					Total
	IN	OUT	Total			IN	OUT	Total			IN	OUT	Total			IN	OUT	Total			
Volume	10	13	23			13	10	23			0	0	0			0	0	0			23

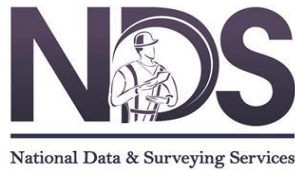
By Movement	Eastbound NE 116th Street					Westbound NE 116th Street					Northbound 178th Avenue NE					Southbound 178th Avenue NE					Total
	U-Turn	Left	Thru	Right	Total	U-Turn	Left	Thru	Right	Total	U-Turn	Left	Thru	Right	Total	U-Turn	Left	Thru	Right	Total	
Volume	0	0	10	0	10	0	0	13	0	13	0	0	0	0	0	0	0	0	0	0	46

Rolling Hour Summary

07:00 AM to 09:00 AM

Interval Start Time	Eastbound NE 116th Street					Westbound NE 116th Street					Northbound 178th Avenue NE					Southbound 178th Avenue NE					Interval Total
	U-Turn	Left	Thru	Right	Total	U-Turn	Left	Thru	Right	Total	U-Turn	Left	Thru	Right	Total	U-Turn	Left	Thru	Right	Total	
7:00 AM	0	0	8	0	8	0	1	8	0	9	0	1	0	0	1	0	0	0	0	0	18
7:15 AM	0	0	10	0	10	0	1	10	0	11	0	1	0	0	1	0	0	0	0	0	22
7:30 AM	0	0	10	0	10	0	1	13	0	14	0	1	0	0	1	0	0	0	0	0	25
7:45 AM	0	0	8	0	8	0	1	14	0	15	0	1	0	0	1	0	0	0	0	0	24
8:00 AM	0	0	10	0	10	0	0	13	0	13	0	0	0	0	0	0	0	0	0	0	23

Peak Hour Summary

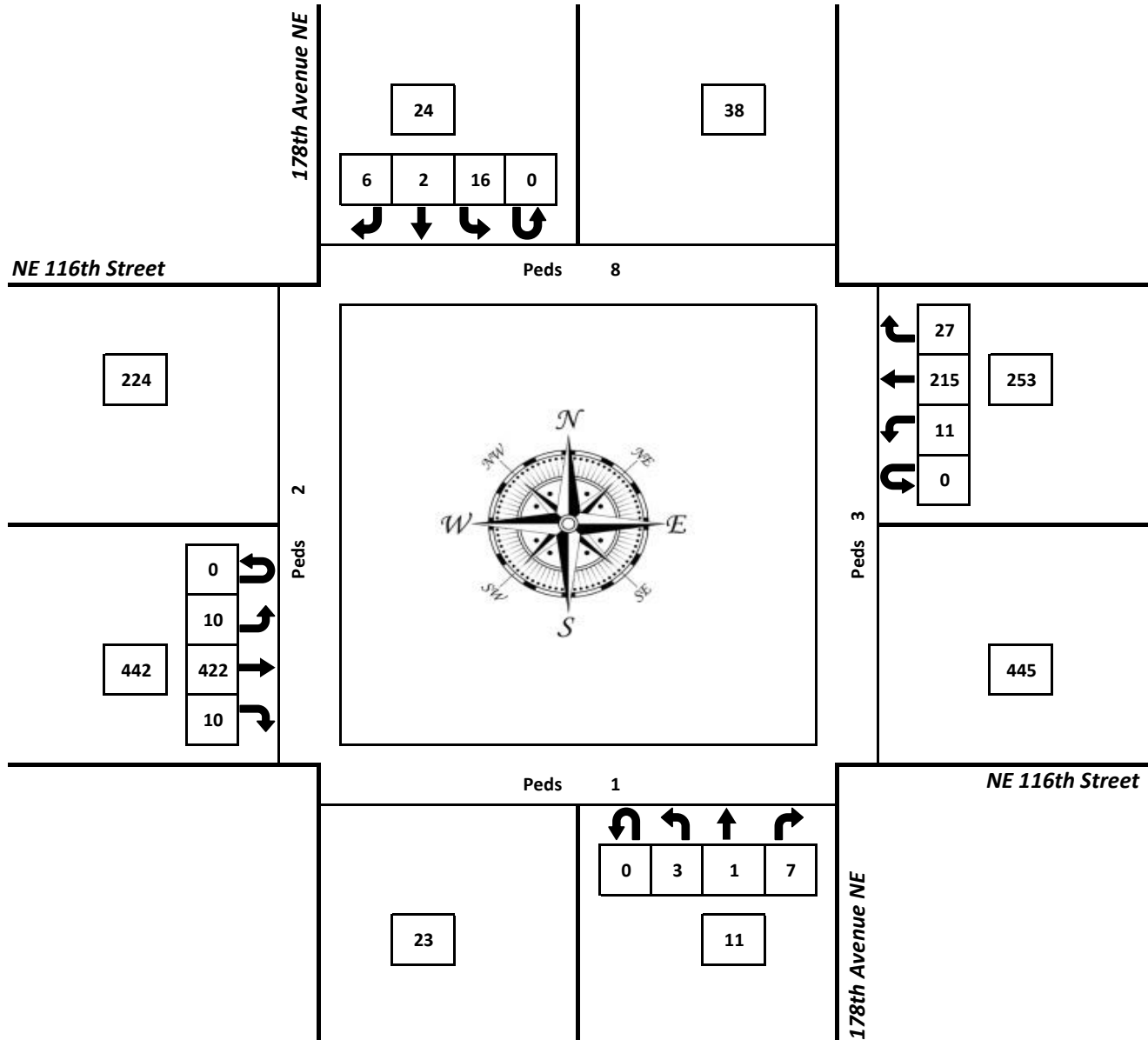


Site ID: 15-2034-001

178th Avenue NE & NE 116th Street

04:30 PM to 05:30 PM

Tuesday, August 25, 2015



Approach	PHF	HV%	Volume
EB	0.97	2.9%	442
WB	0.93	0.8%	253
NB	0.39	9.1%	11
SB	0.67	0.0%	24
Intersection	0.98	2.2%	730

Count Period: 04:00 PM to 06:00 PM

Total Vehicle Summary

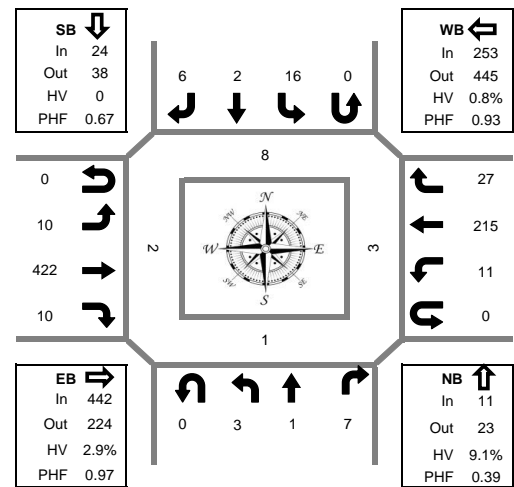


Site ID: 15-2034-001

178th Avenue NE & NE 116th Street

Tuesday, August 25, 2015

04:00 PM to 06:00 PM


Peak Hour Summary
 04:30 PM to 05:30 PM

15-Minute Interval Summary

04:00 PM to 06:00 PM

Interval Start Time	Eastbound NE 116th Street				Westbound NE 116th Street				Northbound 178th Avenue NE				Southbound 178th Avenue NE				Interval Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
4:00 PM	0	2	83	4	0	5	44	5	0	2	0	5	0	0	1	3	154
4:15 PM	0	5	81	4	0	1	60	7	0	2	0	1	0	1	0	3	165
4:30 PM	0	1	107	2	0	2	57	7	0	0	0	1	0	4	0	1	182
4:45 PM	0	4	107	3	0	2	60	5	0	1	0	1	0	3	0	1	187
5:00 PM	0	2	100	2	0	3	55	10	0	2	0	5	0	5	0	1	185
5:15 PM	0	3	108	3	0	4	43	5	0	0	1	0	0	4	2	3	176
5:30 PM	0	4	106	4	0	2	38	6	0	3	1	1	0	3	1	2	171
5:45 PM	0	1	106	8	0	3	49	3	0	2	0	1	0	3	0	3	179
Total Survey	0	22	798	30	0	22	406	48	0	12	2	15	0	23	4	17	1399

Pedestrians & Bicycles In Crosswalk (By Location)			
West	East	South	North
0	0	0	0
0	0	1	0
0	0	0	2
0	1	0	1
0	0	0	5
2	2	1	0
0	0	0	2
0	1	4	0
2	4	6	10

Peak Hour Summary

04:30 PM to 05:30 PM

By Approach	Eastbound NE 116th Street				Westbound NE 116th Street				Northbound 178th Avenue NE				Southbound 178th Avenue NE				Total
	IN	OUT	Total	HV	IN	OUT	Total	HV	IN	OUT	Total	HV	IN	OUT	Total	HV	
Volume	442	224	666	13	253	445	698	2	11	23	34	1	24	38	62	0	730
HV %	2.9%				0.8%				9.1%				0.0%				2.2%
PHF	0.97				0.93				0.39				0.67				0.98

Pedestrians & Bicycles In Crosswalk (By Location)			
West	East	South	North
2	3	1	8

By Movement	Eastbound NE 116th Street				Westbound NE 116th Street				Northbound 178th Avenue NE				Southbound 178th Avenue NE				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Volume	0	10	422	10	0	11	215	27	0	3	1	7	0	16	2	6	730
HV %	NA	0.0%	3.1%	0.0%	NA	9.1%	0.5%	0.0%	NA	0.0%	100.0%	0.0%	NA	0.0%	0.0%	0.0%	2.2%
PHF	NA	0.63	0.98	0.83	NA	0.69	0.90	0.68	NA	0.38	0.25	0.35	NA	0.80	0.25	0.50	0.98

Rolling Hour Summary

04:00 PM to 06:00 PM

Interval Start Time	Eastbound NE 116th Street				Westbound NE 116th Street				Northbound 178th Avenue NE				Southbound 178th Avenue NE				Interval Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
4:00 PM	0	12	378	13	0	10	221	24	0	5	0	8	0	8	1	8	688
4:15 PM	0	12	395	11	0	8	232	29	0	5	0	8	0	13	0	6	719
4:30 PM	0	10	422	10	0	11	215	27	0	3	1	7	0	16	2	6	730
4:45 PM	0	13	421	12	0	11	196	26	0	6	2	7	0	15	3	7	719
5:00 PM	0	10	420	17	0	12	185	24	0	7	2	7	0	15	3	9	711

Pedestrians & Bicycles In Crosswalk (By Location)			
West	East	South	North
0	1	1	3
0	1	1	8
2	3	1	8
2	3	1	8
2	3	5	7

Heavy Vehicle Summary

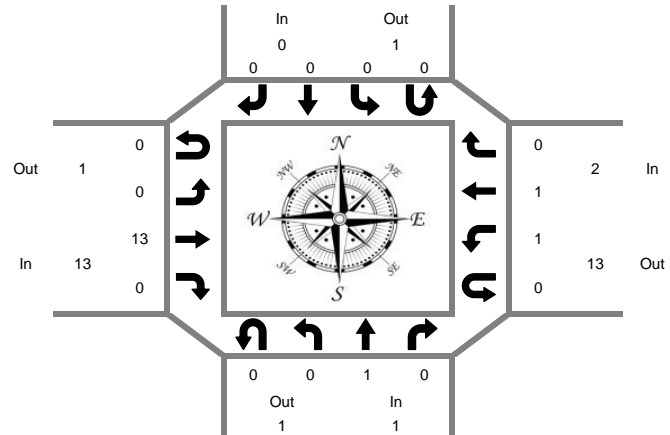


Site ID: 15-2034-001

178th Avenue NE & NE 116th Street

Tuesday, August 25, 2015

04:00 PM to 06:00 PM



Peak Hour Summary

04:30 PM to 05:30 PM

15-Minute Interval Summary

04:00 PM to 06:00 PM

Interval Start Time	Eastbound NE 116th Street					Westbound NE 116th Street					Northbound 178th Avenue NE					Southbound 178th Avenue NE					Interval Total
	U-Turn	Left	Thru	Right	Total	U-Turn	Left	Thru	Right	Total	U-Turn	Left	Thru	Right	Total	U-Turn	Left	Thru	Right	Total	
4:00 PM	0	0	6	0	6	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	7
4:15 PM	0	0	6	0	6	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	6
4:30 PM	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
4:45 PM	0	0	2	0	2	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	3
5:00 PM	0	0	7	0	7	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	8
5:15 PM	0	0	2	0	2	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	3
5:30 PM	0	0	5	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
5:45 PM	0	0	7	0	7	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	8
Total Survey	0	0	37	0	37	0	1	3	0	4	0	0	1	0	1	0	1	0	0	0	42

Peak Hour Summary

04:30 PM to 05:30 PM

By Approach	Eastbound NE 116th Street					Westbound NE 116th Street					Northbound 178th Avenue NE					Southbound 178th Avenue NE					Total
	IN	OUT	Total			IN	OUT	Total			IN	OUT	Total			IN	OUT	Total			
Volume	13	1	14			2	13	15			1	1	2			0	1	1			16

By Movement	Eastbound NE 116th Street					Westbound NE 116th Street					Northbound 178th Avenue NE					Southbound 178th Avenue NE					Total
	U-Turn	Left	Thru	Right	Total	U-Turn	Left	Thru	Right	Total	U-Turn	Left	Thru	Right	Total	U-Turn	Left	Thru	Right	Total	
Volume	0	0	13	0	13	0	1	1	0	2	0	0	1	0	1	0	0	0	0	0	32

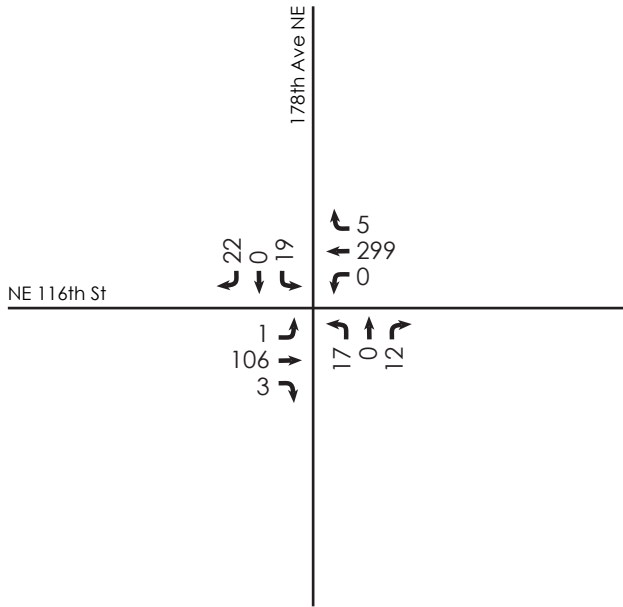
Rolling Hour Summary

04:00 PM to 06:00 PM

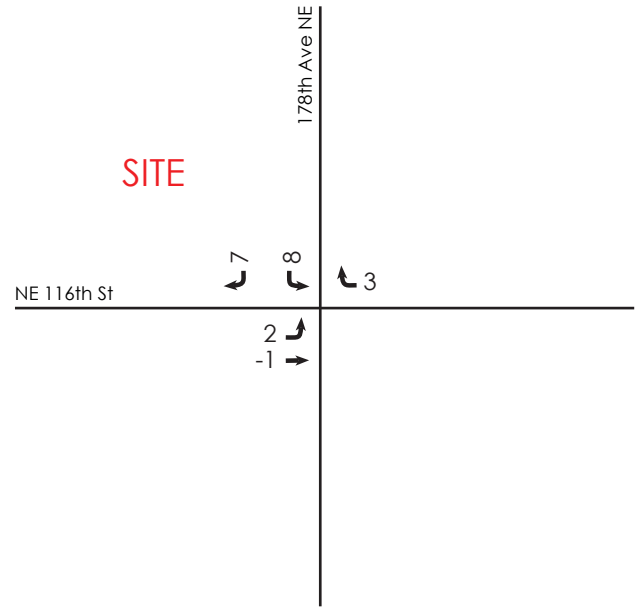
Interval Start Time	Eastbound NE 116th Street					Westbound NE 116th Street					Northbound 178th Avenue NE					Southbound 178th Avenue NE					Interval Total
	U-Turn	Left	Thru	Right	Total	U-Turn	Left	Thru	Right	Total	U-Turn	Left	Thru	Right	Total	U-Turn	Left	Thru	Right	Total	
4:00 PM	0	0	16	0	16	0	0	2	0	2	0	0	0	0	0	0	1	0	0	0	18
4:15 PM	0	0	17	0	17	0	1	1	0	2	0	0	0	0	0	0	1	0	0	0	19
4:30 PM	0	0	13	0	13	0	1	1	0	2	0	0	1	0	1	0	0	0	0	0	16
4:45 PM	0	0	16	0	16	0	1	1	0	2	0	0	1	0	1	0	0	0	0	0	19
5:00 PM	0	0	21	0	21	0	1	1	0	2	0	0	1	0	1	0	0	0	0	0	24

ATTACHMENT E

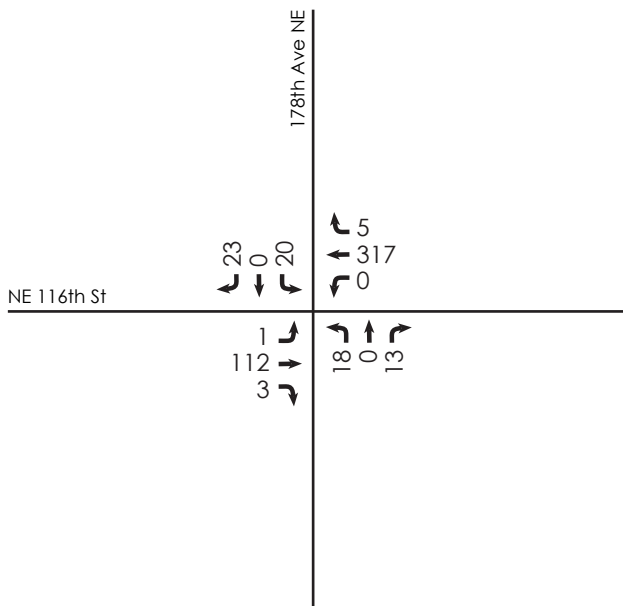
Traffic Volumes



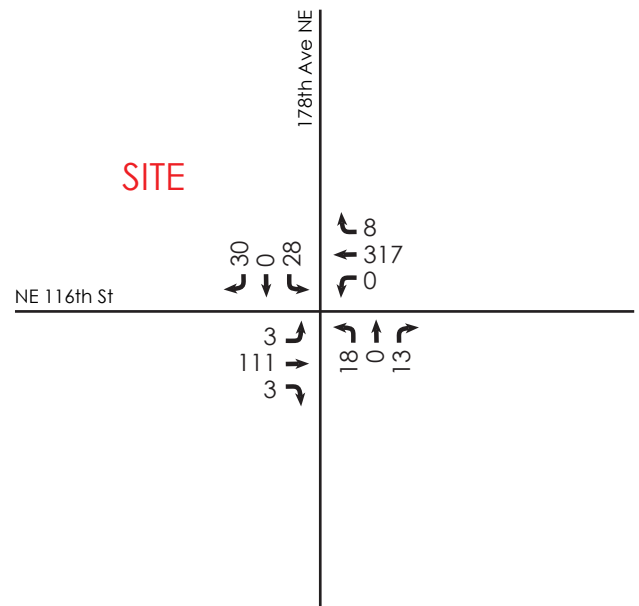
2015 Existing



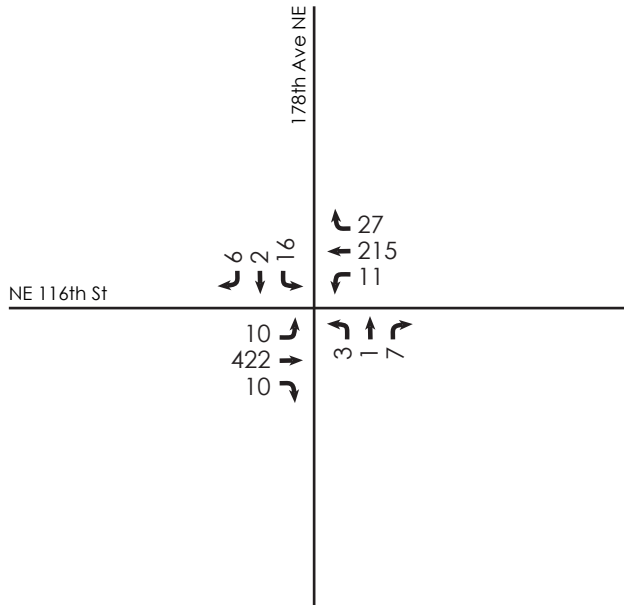
Net Project Trip Assignment



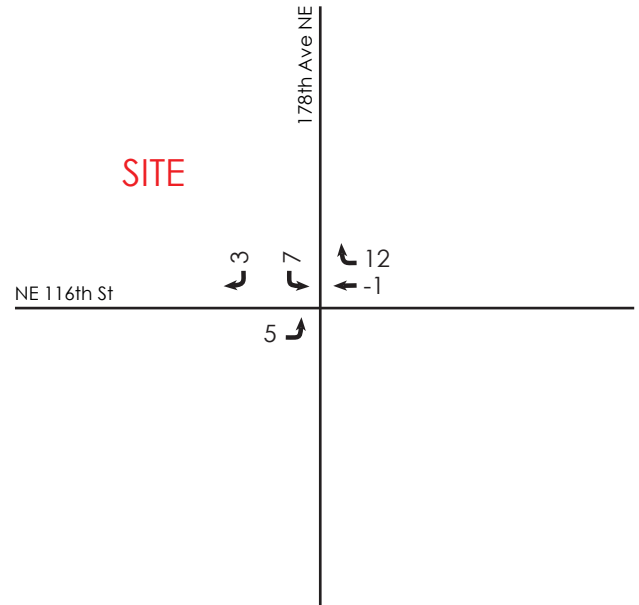
2018 Future Traffic Volumes
Without-Project



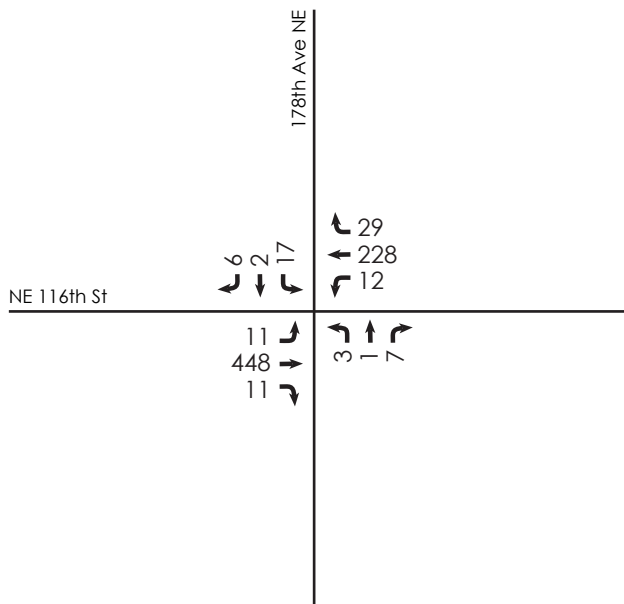
2018 Future Traffic Volumes
With-Project



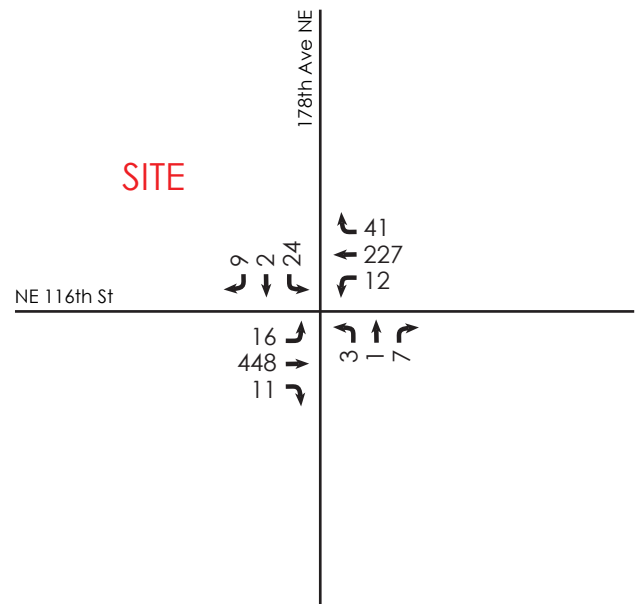
2015 Existing



Net Project Trip Assignment



2018 Future Traffic Volumes
Without-Project



2018 Future Traffic Volumes
With-Project

ATTACHMENT F

LOS Calculations

Level of Service Methodology

Level of service calculations for intersections were based on methodology and procedures outlined in the 2010 update of the *Highway Capacity Manual*, Special Report 209, Transportation Research Board (HCM 2010) using *Synchro 8.0* traffic analysis software.

LOS generally refers to the degree of congestion on a roadway or intersection. It is a measure of vehicle operating speed, travel time, travel delays, and driving comfort. A letter scale from A to F generally describes intersection LOS. At signalized intersections, LOS A represents free-flow conditions (motorists experience little or no delays), and LOS F represents forced-flow conditions where motorists experience an average delay in excess of 80 seconds per vehicle.

The LOS reported for signalized intersections represents the average control delay (sec/veh) and can be reported for the overall intersection, for each approach, and for each lane group (additional v/c ratio criteria apply to lane group LOS only).

The LOS reported at stop-controlled intersections is based on the average control delay and can be reported for each controlled minor approach, controlled minor lane group, and controlled major-street movement (and for the overall intersection at all-way stop controlled intersections. Additional v/c ratio criteria apply to lane group or movement LOS only).

Table A1 outlines the current HCM 2010 LOS criteria for signalized and stop-controlled intersections based on these methodologies.

Table A1
LOS Criteria for Signalized and Stop Controlled Intersections¹

SIGNALIZED INTERSECTIONS			STOP-CONTROLLED INTERSECTIONS		
Control Delay (sec/veh)	LOS by Volume-to Capacity (V/C) Ratio ²		Control Delay (sec/veh)	LOS by Volume-to Capacity (V/C) Ratio ³	
	≤ 1.0	> 1.0		≤ 1.0	> 1.0
≤ 10	A	F	≤ 10	A	F
> 10 to ≤ 20	B	F	> 10 to ≤ 15	B	F
> 20 to ≤ 35	C	F	> 15 to ≤ 25	C	F
> 35 to ≤ 55	D	F	> 25 to ≤ 35	D	F
> 55 to ≤ 80	E	F	> 35 to ≤ 50	E	F
> 80	F	F	> 50	F	F

¹ Source: HCM2010 Highway Capacity Manual, Transportation Research Board, 2010.

² For approach-based and intersection-wide assessments at signals, LOS is defined solely by control delay.



















³ For two-way stop controlled intersections, the LOS criteria apply to each lane on a given approach and to each approach on the minor street. LOS is not calculated for major-street approaches or for the intersection as a whole at two-way stop controlled intersections. For approach-based and intersection-wide assessments at all-way stop controlled intersections, LOS is solely defined by control delay.

2015 Existing

Lanes, Volumes, Timings

1: 178th Avenue NE & NE 116th Street

9/17/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	106	3	0	299	5	17	0	12	19	0	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	145		0	145		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		592			663			465			387	
Travel Time (s)		11.5			12.9			12.7			10.6	
Confl. Peds. (#/hr)	10		4	4		10	4		4	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	9%	9%	9%	4%	4%	4%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

HCM 2010 TWSC

1: 178th Avenue NE & NE 116th Street



















9/17/2015

Intersection												
Int Delay, s/veh		1.7										
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	1	106	3	0	299	5	17	0	12	19	0	22
Conflicting Peds, #/hr	10	0	4	4	0	10	4	0	4	10	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	145	-	-	145	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	9	9	9	4	4	4	0	0	0	0	0	0
Mvmt Flow	1	120	3	0	340	6	19	0	14	22	0	25
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	355	0	0	128	0	0	493	483	136	488	483	363
Stage 1	-	-	-	-	-	-	128	128	-	353	353	-
Stage 2	-	-	-	-	-	-	365	355	-	135	130	-
Critical Hdwy	4.19	-	-	4.14	-	-	7.1	6.5	6.2	7.1	6.5	6.2
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	2.281	-	-	2.236	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1166	-	-	1446	-	-	490	486	918	493	486	686
Stage 1	-	-	-	-	-	-	881	794	-	668	634	-
Stage 2	-	-	-	-	-	-	658	633	-	873	792	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1156	-	-	1434	-	-	466	480	907	477	480	675
Mov Cap-2 Maneuver	-	-	-	-	-	-	466	480	-	477	480	-
Stage 1	-	-	-	-	-	-	877	791	-	662	629	-
Stage 2	-	-	-	-	-	-	628	628	-	852	789	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0			11.5			11.9		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	583	1156	-	-	1434	-	-	566				
HCM Lane V/C Ratio	0.057	0.001	-	-	-	-	-	0.082				
HCM Control Delay (s)	11.5	8.1	-	-	0	-	-	11.9				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.3				

Lanes, Volumes, Timings

1: 178th Avenue NE & NE 116th Street

9/17/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	422	10	11	215	27	3	1	7	16	2	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	145		0	145		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		592			663			465			387	
Travel Time (s)		11.5			12.9			12.7			10.6	
Confl. Peds. (#/hr)	8		1	1		8	1		1	8		8
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	9%	9%	9%	0%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

HCM 2010 TWSC

1: 178th Avenue NE & NE 116th Street

9/17/2015



















Intersection												
Int Delay, s/veh		0.9										
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	10	422	10	11	215	27	3	1	7	16	2	6
Conflicting Peds, #/hr	8	0	1	1	0	8	1	0	1	8	0	8
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	145	-	-	145	-	-	-	-	-	-	-	-
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, %	3	3	3	1	1	1	9	9	9	0	0	0
Mvmt Flow	10	431	10	11	219	28	3	1	7	16	2	6
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	255	0	0	442	0	0	725	734	445	725	726	249
Stage 1	-	-	-	-	-	-	457	457	-	264	264	-
Stage 2	-	-	-	-	-	-	268	277	-	461	462	-
Critical Hdwy	4.13	-	-	4.11	-	-	7.19	6.59	6.29	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.19	5.59	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.19	5.59	-	6.1	5.5	-
Follow-up Hdwy	2.227	-	-	2.209	-	-	3.581	4.081	3.381	3.5	4	3.3
Pot Cap-1 Maneuver	1304	-	-	1123	-	-	332	339	599	343	354	795
Stage 1	-	-	-	-	-	-	570	556	-	746	694	-
Stage 2	-	-	-	-	-	-	722	669	-	584	568	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1295	-	-	1116	-	-	321	331	595	329	345	784
Mov Cap-2 Maneuver	-	-	-	-	-	-	321	331	-	329	345	-
Stage 1	-	-	-	-	-	-	565	551	-	735	683	-
Stage 2	-	-	-	-	-	-	702	658	-	568	563	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0.4			13.1			14.9		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	456	1295	-	-	1116	-	-	387				
HCM Lane V/C Ratio	0.025	0.008	-	-	0.01	-	-	0.063				
HCM Control Delay (s)	13.1	7.8	-	-	8.3	-	-	14.9				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.2				

2018 Without-Project

Lanes, Volumes, Timings

1: 178th Avenue NE & NE 116th Street

9/17/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1	112	3	0	317	5	18	0	13	20	0	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	145		0	145		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		592			663			465			387	
Travel Time (s)		11.5			12.9			12.7			10.6	
Confl. Peds. (#/hr)	10		4	4		10	4		4	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	9%	9%	9%	4%	4%	4%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

HCM 2010 TWSC

1: 178th Avenue NE & NE 116th Street



















9/17/2015

Intersection												
Int Delay, s/veh		1.8										
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	1	112	3	0	317	5	18	0	13	20	0	23
Conflicting Peds, #/hr	10	0	4	4	0	10	4	0	4	10	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	145	-	-	145	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	9	9	9	4	4	4	0	0	0	0	0	0
Mvmt Flow	1	127	3	0	360	6	20	0	15	23	0	26
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	376	0	0	135	0	0	521	511	143	516	510	383
Stage 1	-	-	-	-	-	-	135	135	-	373	373	-
Stage 2	-	-	-	-	-	-	386	376	-	143	137	-
Critical Hdwy	4.19	-	-	4.14	-	-	7.1	6.5	6.2	7.1	6.5	6.2
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	2.281	-	-	2.236	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1145	-	-	1437	-	-	469	469	910	473	469	669
Stage 1	-	-	-	-	-	-	873	789	-	652	622	-
Stage 2	-	-	-	-	-	-	641	620	-	865	787	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1135	-	-	1425	-	-	445	463	899	457	463	658
Mov Cap-2 Maneuver	-	-	-	-	-	-	445	463	-	457	463	-
Stage 1	-	-	-	-	-	-	869	786	-	646	617	-
Stage 2	-	-	-	-	-	-	610	615	-	843	784	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0			11.8			12.2		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	565	1135	-	-	1425	-	-	546				
HCM Lane V/C Ratio	0.062	0.001	-	-	-	-	-	0.089				
HCM Control Delay (s)	11.8	8.2	-	-	0	-	-	12.2				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.3				

Lanes, Volumes, Timings

1: 178th Avenue NE & NE 116th Street

9/17/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	11	448	11	12	228	29	3	1	7	17	2	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	145		0	145		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		592			663			465			387	
Travel Time (s)		11.5			12.9			12.7			10.6	
Confl. Peds. (#/hr)	8		1	1		8	1		1	8		8
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	9%	9%	9%	0%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

HCM 2010 TWSC

1: 178th Avenue NE & NE 116th Street

9/17/2015



















Intersection												
Int Delay, s/veh		1										
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	11	448	11	12	228	29	3	1	7	17	2	6
Conflicting Peds, #/hr	8	0	1	1	0	8	1	0	1	8	0	8
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	145	-	-	145	-	-	-	-	-	-	-	-
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, %	3	3	3	1	1	1	9	9	9	0	0	0
Mvmt Flow	11	457	11	12	233	30	3	1	7	17	2	6
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	270	0	0	469	0	0	770	781	472	770	772	263
Stage 1	-	-	-	-	-	-	486	486	-	280	280	-
Stage 2	-	-	-	-	-	-	284	295	-	490	492	-
Critical Hdwy	4.13	-	-	4.11	-	-	7.19	6.59	6.29	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.19	5.59	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.19	5.59	-	6.1	5.5	-
Follow-up Hdwy	2.227	-	-	2.209	-	-	3.581	4.081	3.381	3.5	4	3.3
Pot Cap-1 Maneuver	1288	-	-	1098	-	-	309	318	578	320	333	781
Stage 1	-	-	-	-	-	-	550	539	-	731	683	-
Stage 2	-	-	-	-	-	-	708	656	-	564	551	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1279	-	-	1091	-	-	298	309	574	306	324	771
Mov Cap-2 Maneuver	-	-	-	-	-	-	298	309	-	306	324	-
Stage 1	-	-	-	-	-	-	545	534	-	720	671	-
Stage 2	-	-	-	-	-	-	688	644	-	547	546	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0.4			13.6			15.8		
HCM LOS							B			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	431	1279	-	-	1091	-	-	360				
HCM Lane V/C Ratio	0.026	0.009	-	-	0.011	-	-	0.071				
HCM Control Delay (s)	13.6	7.8	-	-	8.3	-	-	15.8				
HCM Lane LOS	B	A	-	-	A	-	-	C				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.2				

2018 With-Project

Lanes, Volumes, Timings

1: 178th Avenue NE & NE 116th Street

9/17/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	3	111	3	0	317	8	18	0	13	28	0	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	145		0	145		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		592			663			465			387	
Travel Time (s)		11.5			12.9			12.7			10.6	
Confl. Peds. (#/hr)	10		4	4		10	4		4	10		10
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	9%	9%	9%	4%	4%	4%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

HCM 2010 TWSC

1: 178th Avenue NE & NE 116th Street



















9/17/2015

Intersection												
Int Delay, s/veh		2.1										
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	3	111	3	0	317	8	18	0	13	28	0	30
Conflicting Peds, #/hr	10	0	4	4	0	10	4	0	4	10	0	10
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	145	-	-	145	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	9	9	9	4	4	4	0	0	0	0	0	0
Mvmt Flow	3	126	3	0	360	9	20	0	15	32	0	34
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	379	0	0	134	0	0	531	518	142	521	515	385
Stage 1	-	-	-	-	-	-	139	139	-	375	375	-
Stage 2	-	-	-	-	-	-	392	379	-	146	140	-
Critical Hdwy	4.19	-	-	4.14	-	-	7.1	6.5	6.2	7.1	6.5	6.2
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	2.281	-	-	2.236	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1142	-	-	1438	-	-	462	465	911	469	466	667
Stage 1	-	-	-	-	-	-	869	785	-	650	621	-
Stage 2	-	-	-	-	-	-	637	618	-	861	785	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1132	-	-	1426	-	-	432	458	900	453	459	656
Mov Cap-2 Maneuver	-	-	-	-	-	-	432	458	-	453	459	-
Stage 1	-	-	-	-	-	-	864	780	-	643	616	-
Stage 2	-	-	-	-	-	-	599	613	-	838	780	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0			12			12.6		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	552	1132	-	-	1426	-	-	539				
HCM Lane V/C Ratio	0.064	0.003	-	-	-	-	-	0.122				
HCM Control Delay (s)	12	8.2	-	-	0	-	-	12.6				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.4				

Lanes, Volumes, Timings

1: 178th Avenue NE & NE 116th Street

9/17/2015

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	16	448	11	12	227	41	3	1	7	24	2	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	145		0	145		0	0		0	0		0
Storage Lanes	1		0	1		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Link Speed (mph)		35			35			25			25	
Link Distance (ft)		592			663			465			387	
Travel Time (s)		11.5			12.9			12.7			10.6	
Confl. Peds. (#/hr)	8		1	1		8	1		1	8		8
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Heavy Vehicles (%)	3%	3%	3%	1%	1%	1%	9%	9%	9%	0%	0%	0%
Shared Lane Traffic (%)												
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

HCM 2010 TWSC

1: 178th Avenue NE & NE 116th Street

9/17/2015

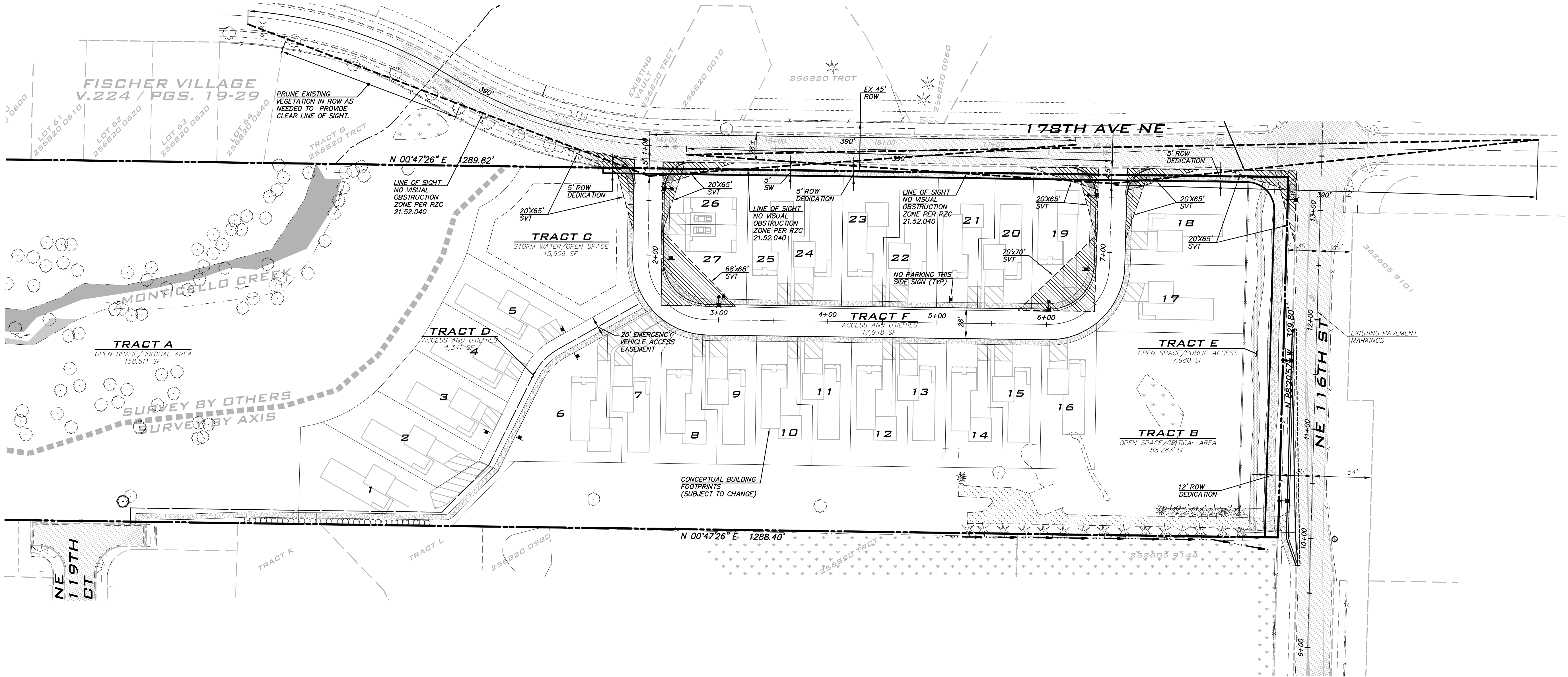
Intersection												
Int Delay, s/veh	1.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	16	448	11	12	227	41	3	1	7	24	2	9
Conflicting Peds, #/hr	8	0	1	1	0	8	1	0	1	8	0	8
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	145	-	-	145	-	-	-	-	-	-	-	-
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, %	3	3	3	1	1	1	9	9	9	0	0	0
Mvmt Flow	16	457	11	12	232	42	3	1	7	24	2	9
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	281	0	0	469	0	0	787	802	472	785	787	269
Stage 1	-	-	-	-	-	-	496	496	-	285	285	-
Stage 2	-	-	-	-	-	-	291	306	-	500	502	-
Critical Hdwy	4.13	-	-	4.11	-	-	7.19	6.59	6.29	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.19	5.59	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.19	5.59	-	6.1	5.5	-
Follow-up Hdwy	2.227	-	-	2.209	-	-	3.581	4.081	3.381	3.5	4	3.3
Pot Cap-1 Maneuver	1276	-	-	1098	-	-	301	309	578	313	326	775
Stage 1	-	-	-	-	-	-	543	534	-	727	679	-
Stage 2	-	-	-	-	-	-	702	649	-	557	545	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1267	-	-	1091	-	-	288	299	574	299	316	765
Mov Cap-2 Maneuver	-	-	-	-	-	-	288	299	-	299	316	-
Stage 1	-	-	-	-	-	-	536	527	-	713	667	-
Stage 2	-	-	-	-	-	-	679	638	-	538	538	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.3			0.4			13.7			16.2		
HCM LOS							B			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	424	1267	-	-	1091	-	-	356				
HCM Lane V/C Ratio	0.026	0.013	-	-	0.011	-	-	0.1				
HCM Control Delay (s)	13.7	7.9	-	-	8.3	-	-	16.2				
HCM Lane LOS	B	A	-	-	A	-	-	C				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.3				

ATTACHMENT G

Sight Distance at New Plat Intersections

NOTES

- EXISTING BUILDINGS AND HARDSCAPE TO BE REMOVED.
- OPEN CUTS TO 178TH AVE SHALL INCLUDE GRIND AND OVERLAY PER CITY OF REDMOND STANDARD PLAN SD 202.
- SITE TRIANGLES PER COR DETAIL 408.



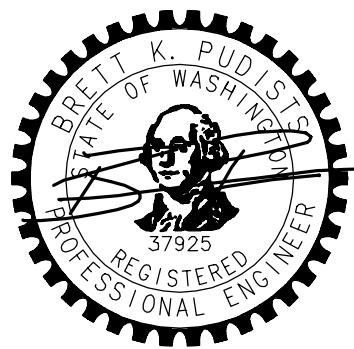
UNDERGROUND UTILITY NOTE

UNDERGROUND UTILITIES ARE SHOWN IN THE APPROXIMATE LOCATION. THERE IS NO GUARANTEE THAT ALL UTILITY LINES ARE SHOWN, OR THAT THE LOCATION, SIZE AND MATERIAL IS ACCURATE. THE CONTRACTOR SHALL UNCOVER ALL INDICATED PIPING WHERE CROSSING, INTERFERENCES, OR CONNECTIONS OCCUR PRIOR TO TRENCHING OR EXCAVATION FOR ANY PIPE OR STRUCTURES, TO DETERMINE ACTUAL LOCATIONS, SIZE AND MATERIAL. THE CONTRACTOR SHALL MAKE THE APPROPRIATE PROVISION FOR PROTECTION OF SAID FACILITIES. THE CONTRACTOR SHALL NOTIFY ONE CALL AT 8-1-1 (WASHINGTON811.COM) AND ARRANGE FOR FIELD LOCATION OF EXISTING FACILITIES BEFORE CONSTRUCTION.

SITE DISTANCE EXHIBIT

HAWKS GLEN
17656 NE 116TH ST
PARCEL #2526059067

CITY OF REDMOND WASHINGTON



2/10/16

JOB NUMBER:

14-332

SHEET NAME:

SV-01

SHT 6 OF 13

REVISIONS

NO	DATE	BY	DESCRIPTION
1	9/24/15	CD	REVISED STORM PER CITY COMMENTS
2	11/25/15	CD	REVISED SITE PER CITY COMMENTS - MAISED SITE
3	2/10/16	CD	

SCALE:

AS NOTED

PROJECT MANAGER:

BRETT PUDISTS, PE

PROJECT ENGINEER:

BRETT PUDISTS, PE

DESIGNER:

CHRIS DIETZ

ISSUE DATE:

2/10/2016

NO	DATE	BY	DESCRIPTION
1	9/24/15	CD	REVISED STORM PER CITY COMMENTS
2	11/25/15	CD	REVISED SITE PER CITY COMMENTS - MAISED SITE
3	2/10/16	CD	

