



June 10, 2019

Bryan Degrosellier
Degrosellier Development and Construction
418 Date Street
Vancouver, WA 98661

Subject: Traffic analysis letter for NE 3rd Avenue cottage homes

Dear Mr. Degrosellier,

The purpose of this letter is to address the requirements of the City of Camas in support of your proposed 22 unit cottage development to be located at 2531 NE 3rd Avenue in Camas, Washington. This letter addresses the requirements of the City of Camas's "Transportation Impact Study Guidelines," the city prepared preapplication meeting notes and subsequent direction provided by city staff.

A preliminary site plan is provided in Appendix A. This letter addresses the impacts of both phase 1 and phase 2 although phase 2 is not proposed for development at this time.

The site is currently served by a driveway that directly accesses NE 3rd Avenue. The existing single family residential home will be demolished in favor of the proposed development. The existing access will be removed and the proposed development will be served by a 20 foot wide one-way road that will intersect NE Wedgewood Court as illustrated in the site plan.

The city's guidelines state that if a development generates 200 vehicle trips per day or more then a transportation impact study required. At 199 vehicle trips per day or less, a transportation impact study may be required.

The proposed development generates far less than 200 vehicle trips per day. Rather than requiring a full transportation impact study, city staff requested a limited transportation analysis in order to evaluate trip generation, trip distribution, sight distance at the NE 3rd Avenue/NE Wedgewood Court/NE 3rd Loop intersection and the need for an eastbound left turn lane at the intersection.

Trip Generation

The proposed development consist of a 22 unit cottage development to be constructed in two phases. The first phase will consist of 19 units and phase 2 will consist of up to 3 units. The trip generation of the proposed development is provided below in Table 1 and is based upon the fitted curve rates of the 10th Edition of the Institute of Transportation Engineers *Trip Generation Manual*. The Multifamily (Low Rise) land use was chosen to estimate the trip generation of the proposed development. This land use includes data for townhouses, which most closely resemble cottage development, which are comprised of a mix of homes with garages and without garages and smaller footprints than typical single family residential development. This assumption was confirmed with city staff prior to this analysis.

Table 1. Projected trip generation

ITE Land Use	Dwelling Units	Weekday						
		Average Daily Traffic	AM Peak Hour			PM Peak Hour		
			Total	Enter	Exit	Total	Enter	Exit
<i>Multifamily (Low Rise) #220</i>	22	125	11	2	9	15	9	6

Note: Fitted curve equations used, ITE Trip Generation Manual, 10th Edition

Trip Distribution

Trip distribution associated with the proposed development is based upon the existing weekday AM and PM peak hour traffic counts, engineering judgment and a review of the City of Camas transportation network. The anticipated trip distribution is illustrated in Appendix C.

Traffic Analysis

Turning movement counts were collected at the NE 3rd Avenue/NE Wedgewood Court/NE 3rd Loop intersection on Thursday, May 23, 2019 during both the weekday AM (7-9 AM) and PM (4-6 PM) peak hours. Traffic count data is provided in Appendix B. The existing traffic counts are also presented in Appendix C.

In order to more accurately predict the operations of the intersection with the approval of the proposed developments, the City of Camas provided information regarding in-process developments near the project site. In-process developments are those development projects that are approved yet not occupied. The full in-process traffic information is provided in Appendix D.

The existing traffic plus the in-process traffic were summed to develop “background traffic” figures which approximate traffic operations without considering the impacts of the proposed developments. Background traffic figures are presented in Appendix C.

In order to evaluate the need for a left turn lane at the NE 3rd Avenue/NE Wedgewood Court/NE 3rd Loop intersection, background traffic and site generated traffic were considered together as “total traffic” to approximate the intersection operations when the proposed development is occupied. Total traffic volumes are presented in Appendix C.

Left Turn Lane Warrants

The proposed development will result in additional traffic eastbound left turning traffic at the NE 3rd Avenue/NE Wedgewood Court/NE 3rd Loop intersection. The City of Camas requested an analysis of that intersection during the weekday AM and PM peak hours to determine if the intersection would meet left turn lane warrants as a result of the proposed developments. NE Wedgewood Court, while a dead end roadway, serves several residential units.

The City of Camas has two separate policies when evaluating the need for left turn lanes.

The “Transportation Impact Study Guidelines” states that “[l]eft turn storage lanes are required on all arterial and collector streets.”

NE 3rd Avenue is classified by the City of Camas as a principal arterial road¹.

Additionally, the guidelines state that “[l]eft turn lane requirements for different scenarios should utilize *A Policy on Geometric Design of Highways and Streets*, (AASHTO) 1990, page 791.”

While the city would prefer a left turn storage lane along all arterial roadways, it cannot necessarily require left turn lanes as part of all development as such a request may not be proportional nor meet technical requirements or guidance for such an improvement. The city has requested the analysis of left turn lane warrants in order to determine if a left turn lane is necessary to serve the proposed development.

The City traffic impact study guidelines state that “[l]eft turn lane requirements for different scenarios should utilize *A Policy on Geometric Design of Highways and Streets*, (AASHTO) 1990.” NE 3rd Avenue is a four lane arterial roadway. The 1990 AASHTO manual provides no left turn lane warrant methodology for four lane roadways. The AASHTO two lane roadway left turn lane warrant methodology is based upon the M.D. Harmelink warrant curves. While not adopted in the 1990 AASHTO manual, M.D. Harmelink did research and provide recommendations for when a left turn lane along a four lane roadway should be considered. City staff confirmed that this four lane methodology would be acceptable for use on this project. Based upon that methodology, an eastbound left turn lane is not warranted during total traffic conditions for either the weekday AM or PM peak hours. The figure supporting that determination can be found in Appendix E.

Additionally, as noted in the city's preapplication meeting notes, there is sufficient right of way and no frontage improvements are required. The city states that “NE 3rd Avenue is an existing 4-lane arterial with a 100-foot right-of-way (ROW) and improved frontage, therefore additional ROW will not be needed, nor are any frontage improvements required.”

Sight Distance

NE 3rd Avenue is posted with a speed of 40 MPH.

According to AASHTO's *A Policy on Geometric Design of Highways and Streets*, the preferred intersection sight distance for the NE 3rd Avenue/NE Wedgewood Court/NE 3rd Loop intersection is 445 feet.

A site visit was conducted on May 25, 2019 to observe the existing intersection sight distance at the intersection.

There is adequate intersection sight distance looking from NE Wedgewood Court to the east along NE 3rd Avenue with more than 445 feet of intersection sight distance available.

1 <http://www.cityofcamas.us/images/DOCS/MAPS/federalfunctionalclassificationmap2008.pdf>



Picture 1: Intersection sight distance from NE Wedgewood Court looking to the east along NE 3rd Avenue

There is adequate intersection sight distance looking from NE Wedgewood Court to the west along NE 3rd Avenue with more than 445 feet of intersection sight distance available. However, there are low hanging tree limbs on the northwest quadrant of the intersection that should be limbed up in order to ensure that sight distance does not grow to be a problem. These tree limbs appear to be within the public right-of-way.



Picture 2: Intersection sight distance from NE Wedgewood Court looking to the west along NE 3rd Avenue

Conclusion

This letter adequately addresses the requirements of the City of Camas. It is recommended that low hanging tree limbs that appear to be in the public right-of-way be limbed up to avoid future sight distance problems at the NE 3rd Avenue/NE Wedgewood Court/NE 3rd Loop intersection. Should you have any questions, feel free to contact me at 503-317-4559 or by email at rick@greenlightengineering.com.

Sincerely,

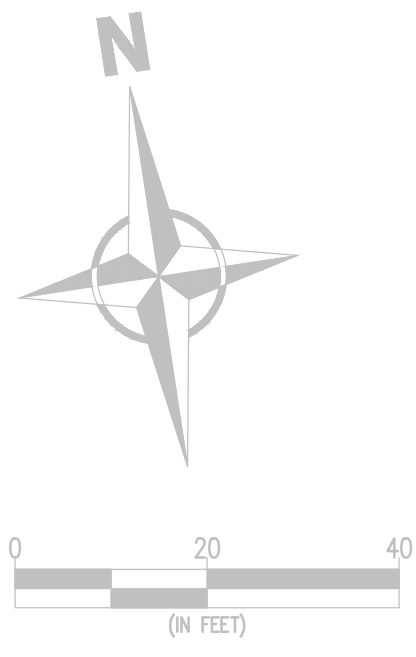
Rick Nys

Rick Nys, P.E.
Principal Traffic Engineer



Appendix A

Preliminary Site Plan



PARKING SPACES REQ'D: 38 Units
PARKING SPACES PROVIDED: 47 (W/ UBER/LYFT SPOTS)

SWITCHBACK PATH TO TOP OF PROPERTY

EXISTING STRUCTURES TO BE REMOVED

DORMER

RETAINING WALL

DORMER

COVERED PARKING STRUCTURE
8 units @ 8.5'

ONE WAY

DORMER

UBER/LYFT

20'-0"

GATHERING STRUCTURE

20'-0"

20'-0"

18'-0"

20'-0"

GATHERING STRUCTURE

20'-0"

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119'-2"

COVERED PARKING STRUCTURE
8 units @ 8.5'

PHASE 2

COMMON HOUSE

GATHERING STRUCTURE

DORMER

STORM TRACT

STORM TRACT

ARBOR/ARCH PEDESTRIAN ENTRY

EXISTING STRUCTURES TO BE REMOVED

DORMER

RETAINING WALL

DORMER

EXISTING STRUCTURES TO BE REMOVED

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RETAINING WALL

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ONE WAY

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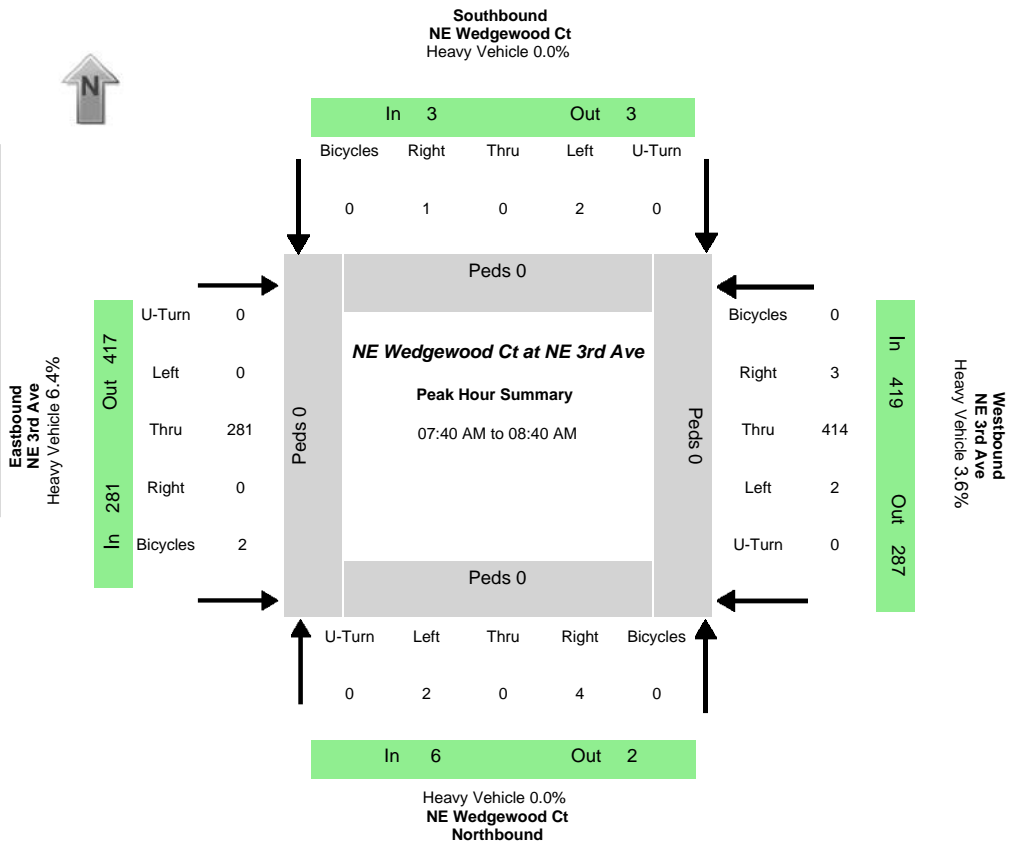
CAMAS - 3RD AVE GARDEN HOUSES
SITE PLAN CONCEPT
NOVEMBER 26, 2018

Appendix B

Traffic Counts

Data Provided by K-D-N.com 503-594-4224

N/S street	NE Wedgewood Ct
E/W street	NE 3rd Ave
City, State	Camas WA
Site Notes	
Location	45.58846 - -122.381525
Start Date	Wednesday, May 22, 2019
Start Time	07:00:00 AM
Weather	
Study ID #	
Peak Hour Start	07:40:00 AM
Peak 15 Min Start	07:50:00 AM
PHF (15-Min Int)	0.92



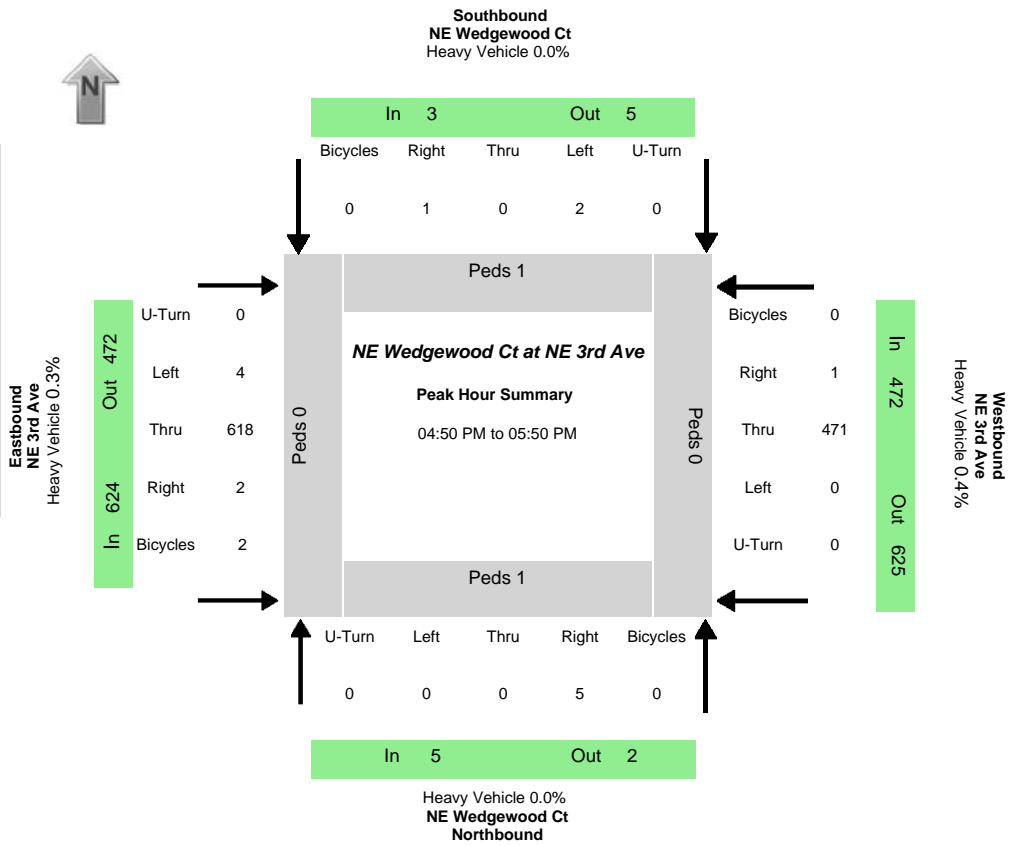
Peak-Hour Volumes (PHV)																							
Northbound				Southbound				Eastbound				Westbound				Entering				Leaving			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
2	0	4	0	2	0	1	0	0	281	0	0	2	414	3	0	6	3	281	419	2	3	417	287
Percent Heavy Vehicles																							
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	6.4%	0.0%	0.0%	0.0%	3.6%	0.0%	0.0%	0.0%	0.0%	6.4%	3.6%	0.0%	0.0%	3.6%	6.3%

PHV - Bicycles														PHV - Pedestrians							
Northbound				Southbound				Eastbound				Westbound				in Crosswalk					
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	NB	SB	EB	WB	Sum
0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2	0	0	0	0	0

All Vehicle Volumes																			
Time	Northbound NE Wedgewood Ct				Southbound NE Wedgewood Ct				Eastbound NE 3rd Ave				Westbound NE 3rd Ave				15 Min Sum	1 HR Sum	
	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn			
07:00:00 AM	0	0	0	0	0	0	0	0	0	20	0	0	0	0	21	0	0		
07:05:00 AM	0	0	0	0	0	0	0	0	0	5	0	0	0	0	24	0	0		
07:10:00 AM	0	0	0	0	0	0	0	0	0	14	0	0	0	0	29	0	0	113	
07:15:00 AM	0	0	0	0	0	0	0	0	0	16	1	0	0	0	24	0	0	113	
07:20:00 AM	0	0	0	0	0	0	1	0	0	15	0	0	0	0	16	0	0	116	
07:25:00 AM	1	0	1	0	0	0	1	0	0	12	0	0	0	0	30	0	0	118	
07:30:00 AM	1	0	0	0	0	0	0	0	0	8	0	0	0	0	21	0	0	107	
07:35:00 AM	0	0	0	0	0	0	0	0	0	16	0	0	0	0	36	0	0	127	
07:40:00 AM	0	0	1	0	0	0	0	0	0	15	0	0	0	0	44	0	0	142	
07:45:00 AM	0	0	0	0	0	0	0	0	0	31	0	0	0	0	30	0	0	173	
07:50:00 AM	0	0	1	0	0	0	0	0	0	24	0	0	0	0	39	0	0	185	
07:55:00 AM	0	0	0	0	0	0	0	0	0	31	0	0	0	0	34	0	0	190	563
08:00:00 AM	0	0	0	0	0	0	0	0	0	24	0	0	1	1	39	0	0	193	586
08:05:00 AM	0	0	1	0	1	0	0	0	0	25	0	0	0	0	30	2	0	188	616
08:10:00 AM	0	0	0	0	0	0	0	0	0	26	0	0	0	0	34	0	0	183	633
08:15:00 AM	2	0	0	0	0	0	0	0	0	20	0	0	0	0	21	0	0	162	635
08:20:00 AM	0	0	1	0	0	0	0	0	0	22	0	0	0	0	33	0	0	159	659
08:25:00 AM	0	0	0	0	0	0	0	0	0	18	0	0	0	0	34	1	0	152	667
08:30:00 AM	0	0	0	0	1	0	1	0	0	21	0	0	1	1	39	0	0	172	700
08:35:00 AM	0	0	0	0	0	0	0	0	0	24	0	0	0	0	37	0	0	177	709
08:40:00 AM	0	0	0	0	0	0	0	0	0	25	0	0	1	1	25	0	0	175	700
08:45:00 AM	0	0	0	0	0	0	0	0	0	25	0	0	0	0	36	0	0	173	700
08:50:00 AM	0	0	0	0	0	0	0	0	0	26	0	0	0	0	30	0	0	168	692
08:55:00 AM	0	0	0	0	0	0	0	1	1	35	0	0	0	0	26	0	0	179	689

Data Provided by K-D-N.com 503-594-4224

N/S street	NE Wedgewood Ct
E/W street	NE 3rd Ave
City, State	Camas WA
Site Notes	
Location	45.58846 - -122.381525
Start Date	Wednesday, May 22, 2019
Start Time	04:00:00 PM
Weather	
Study ID #	
Peak Hour Start	04:50:00 PM
Peak 15 Min Start	04:50:00 PM
PHF (15-Min Int)	0.93



Peak-Hour Volumes (PHV)																							
Northbound				Southbound				Eastbound				Westbound				Entering				Leaving			
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	NB	SB	EB	WB	NB	SB	EB	WB
0	0	5	0	2	0	1	0	4	618	2	0	0	471	1	0	5	3	624	472	2	5	472	625
Percent Heavy Vehicles																							
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.3%	0.4%	0.0%	0.0%	0.4%	0.3%

PHV - Bicycles														PHV - Pedestrians							
Northbound				Southbound				Eastbound				Westbound				in Crosswalk					
Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Sum	NB	SB	EB	WB	Sum
0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	2	1	1	0	0	2

Time	Northbound NE Wedgewood Ct				Southbound NE Wedgewood Ct				Eastbound NE 3rd Ave				Westbound NE 3rd Ave				15 Min Sum	1 HR Sum	
	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn	Left	Thru	Right	Uturn			
04:00:00 PM	0	0	1	0	0	0	0	0	0	49	0	0	0	0	34	0	0		
04:05:00 PM	0	0	0	0	0	0	0	0	0	44	0	0	0	0	35	0	0		
04:10:00 PM	0	0	0	0	0	0	0	0	0	50	0	0	0	0	40	0	0	253	
04:15:00 PM	0	0	1	0	0	0	0	0	0	44	0	0	0	1	25	0	0	240	
04:20:00 PM	1	0	1	0	0	0	0	0	0	41	0	0	0	0	34	0	0	238	
04:25:00 PM	0	0	0	0	0	0	0	0	0	30	0	0	0	1	32	0	0	211	
04:30:00 PM	0	0	0	0	0	0	0	0	0	43	0	0	0	0	34	0	0	217	
04:35:00 PM	0	0	2	0	0	0	0	0	0	42	0	0	0	0	45	0	0	229	
04:40:00 PM	0	0	0	0	0	0	0	0	0	36	0	0	0	0	48	0	0	250	
04:45:00 PM	0	0	0	0	0	0	0	0	1	41	0	0	0	3	34	0	0	252	
04:50:00 PM	0	0	2	0	0	0	0	0	1	58	0	0	0	0	47	0	0	271	
04:55:00 PM	0	0	0	0	0	0	0	0	0	50	1	0	0	0	47	0	0	285	999
05:00:00 PM	0	0	1	0	0	0	0	0	0	52	0	0	0	0	39	0	0	298	1007
05:05:00 PM	0	0	0	0	0	0	0	0	0	53	0	0	0	0	41	0	0	284	1022
05:10:00 PM	0	0	0	0	0	0	0	0	0	49	0	0	0	0	41	0	0	276	1022
05:15:00 PM	0	0	1	0	0	0	0	0	2	52	0	0	0	0	40	0	0	279	1046
05:20:00 PM	0	0	0	0	1	0	0	0	0	53	0	0	0	0	39	0	0	278	1062
05:25:00 PM	0	0	0	0	0	0	1	0	1	49	0	0	0	0	38	0	0	277	1088
05:30:00 PM	0	0	0	0	1	0	0	0	0	49	0	0	0	0	40	0	0	272	1101
05:35:00 PM	0	0	0	0	0	0	0	0	0	40	0	0	0	0	32	1	0	252	1085
05:40:00 PM	0	0	0	0	0	0	0	0	0	59	1	0	0	0	35	0	0	258	1096
05:45:00 PM	0	0	1	0	0	0	0	0	0	54	0	0	0	0	32	0	0	255	1104
05:50:00 PM	0	0	1	0	0	0	0	0	0	44	0	0	0	0	33	0	0	260	1074
05:55:00 PM	0	0	2	0	0	0	0	0	0	39	0	0	0	0	44	0	0	250	1061

Appendix C

Traffic Flow Figures

Weekday PM Peak Hour

102	2471
↓ ↓ ↓	← ← ←
4	5
618	9
2	005
↑ ↑ ↑	↗ ↘ ↙

Existing Traffic

000	0134
↓ ↓ ↓	← ← ←
0	5
107	9
0	000
↑ ↑ ↑	↗ ↘ ↙

In Process Traffic

102	1605
↓ ↓ ↓	← ← ←
4	5
725	9
2	005
↑ ↑ ↑	↗ ↘ ↙

Background Traffic

303	24	45%
↓ ↓ ↓	← ← ←	↔
5	0	
0	0	
0	9	
0	0	
0	0	
↑ ↑ ↑	↗ ↘ ↙	

Site Gen Traffic

405	25	605
↓ ↓ ↓	← ← ←	
9	5	
725	9	
2	0	
0	0	
0	0	
↑ ↑ ↑	↗ ↘ ↙	

Total Traffic

Weekday AM Peak Hour

102	3414
↓ ↓ ↓	← ← ←
0	2
251	9
0	204
↑ ↑ ↑	↗ ↘ ↙

Existing Traffic

000	084
↓ ↓ ↓	← ← ←
0	5
135	9
0	000
↑ ↑ ↑	↗ ↘ ↙

In Process Traffic

102	3498
↓ ↓ ↓	← ← ←
0	2
416	9
0	204
↑ ↑ ↑	↗ ↘ ↙

Background Traffic

504	21	45%
↓ ↓ ↓	← ← ←	↔
1	0	
0	0	
0	9	
0	0	
0	0	
↑ ↑ ↑	↗ ↘ ↙	

Site Gen Traffic

606	24	498
↓ ↓ ↓	← ← ←	
1	4	
416	9	
0	0	
0	0	
0	0	
↑ ↑ ↑	↗ ↘ ↙	

Total Traffic

Appendix D

In-process Developments



LEGEND
 100/128 A.M./P.M. Peak Hour
 Traffic Volumes
 10% Peak Hour Trip Distribution

03 build-out 5-31-19

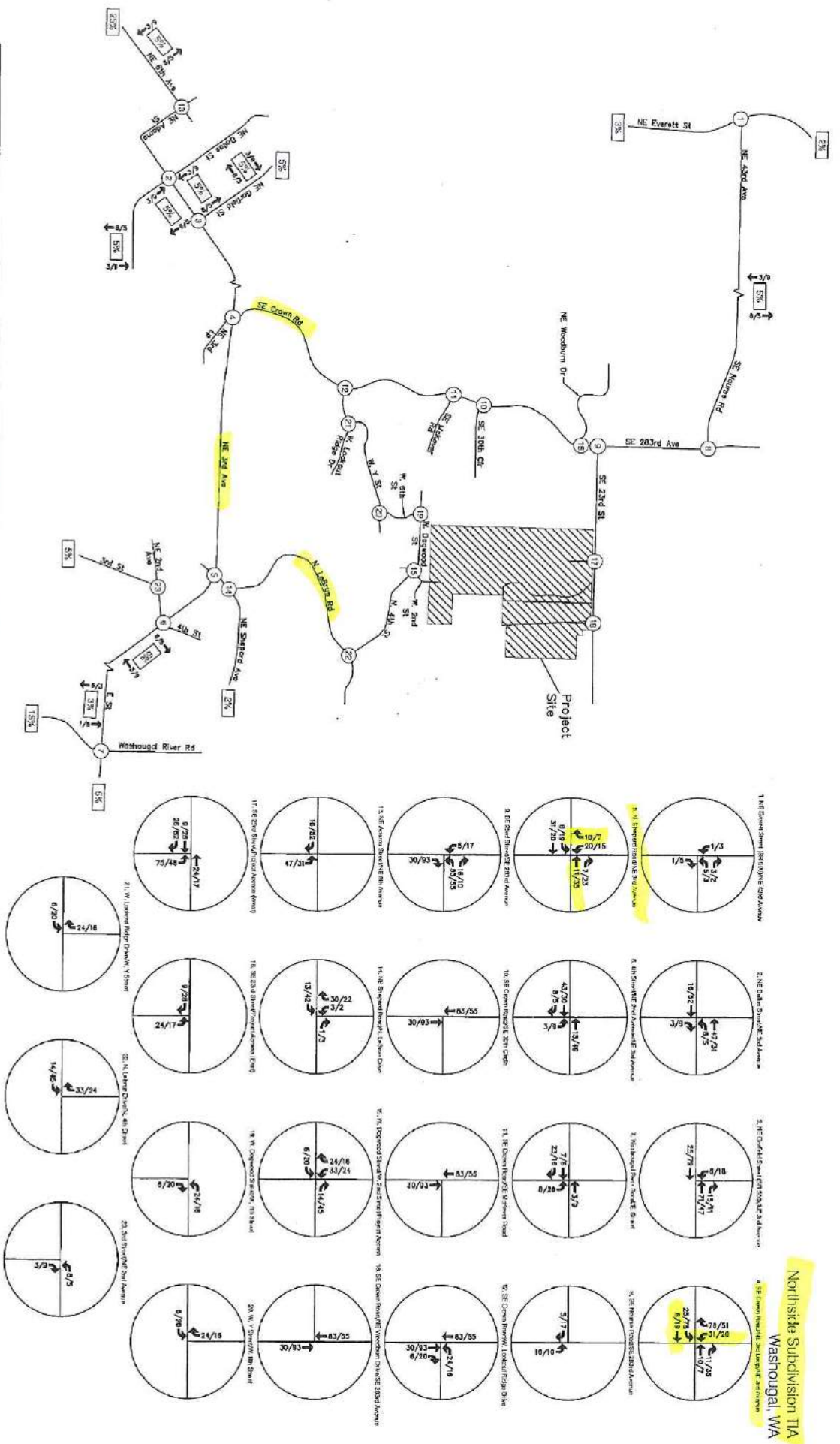


FIGURE 6
 Trip Distribution and Assignment
 Traffic Volumes

Figure 4 provides a summary of the existing turning-movement counts, which are rounded to the nearest five vehicles per hour for the weekday a.m. and p.m. peak hours, respectively. *Appendix "B" contains the traffic count worksheets used in this study.*

As shown in Figure 4, the study intersections operate acceptably during both study periods. *Appendix "C" contains the existing conditions traffic operations worksheets.*

DEVELOPMENT TRIP GENERATION

As discussed above, the proposed development includes 179 single family units, which is a reduction of 25 units compared to the plan approved in 2006. Trip generation estimates for the currently proposed development were generated based on information provided in the standard reference manual *Trip Generation, 9th Edition* published by the Institute of Transportation Engineers (ITE – Reference 3). In the 2006 TIA, rates from the 7th Edition of the *Trip Generation* manual were utilized, which are slightly higher than those from the 9th Edition. Table 1 compares the trip generation from the current site plan with that previously proposed.

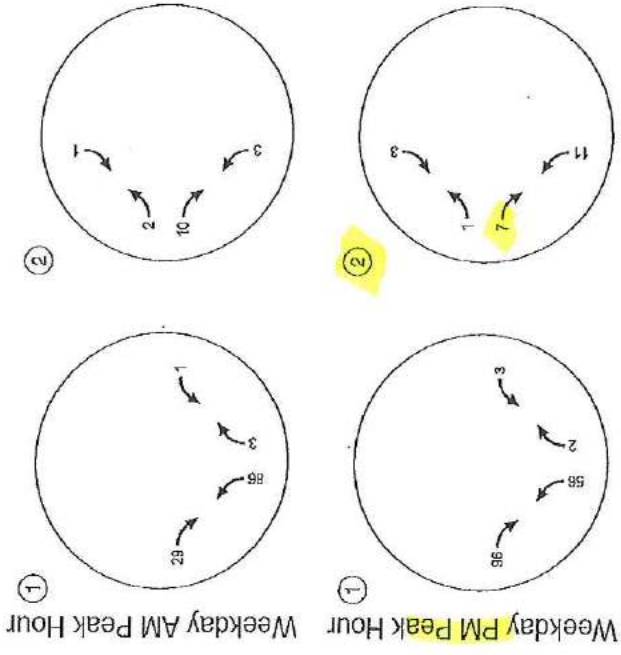
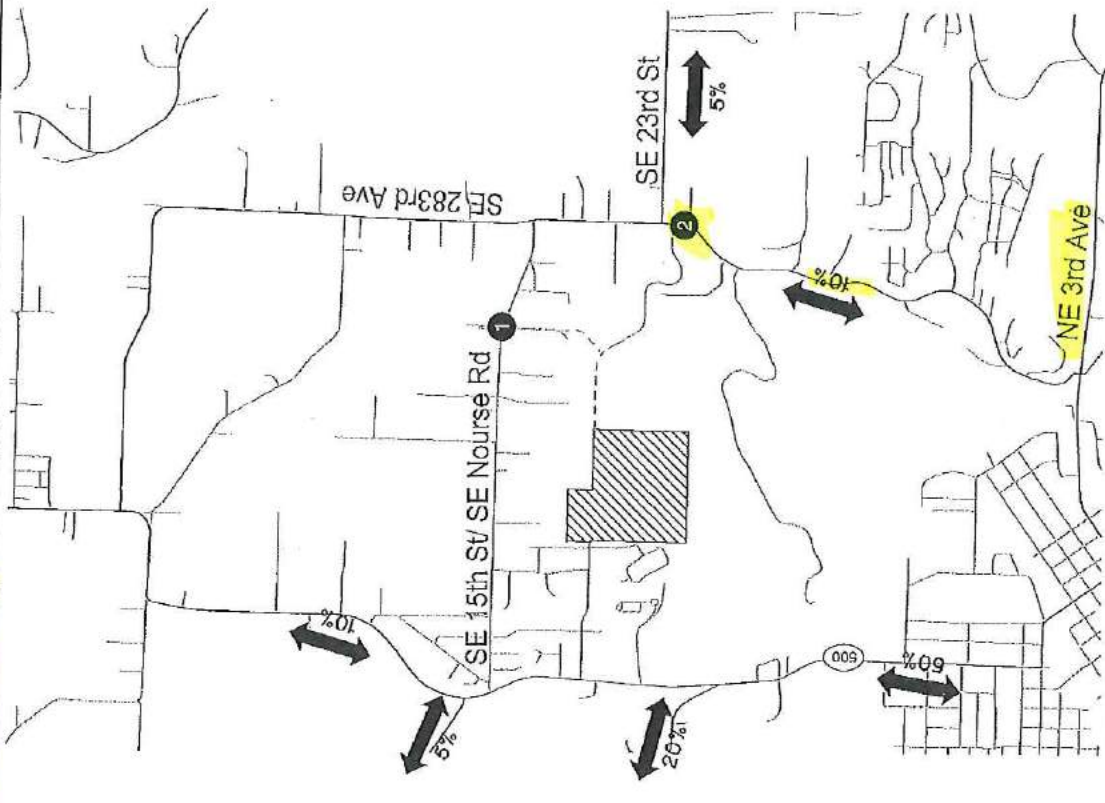
Table 1: Trip Generation Comparison

Scenario	ITE Code	Size	Daily	Weekday AM Peak Hour			Weekday PM Peak Hour		
				In	Out	Total	In	Out	Total
Current Site Plan	210	179 units	1,704	34	101	135	113	66	179
2006 TIA	210	204 units	2,004	38	114	152	128	75	203
Difference	-	-25 units	-300	-4	-13	-17	-15	-9	-24

As seen in the table, the current proposal results in 17 fewer trips during the a.m. peak hour and 24 fewer trips during the p.m. peak hour.

Trip Distribution

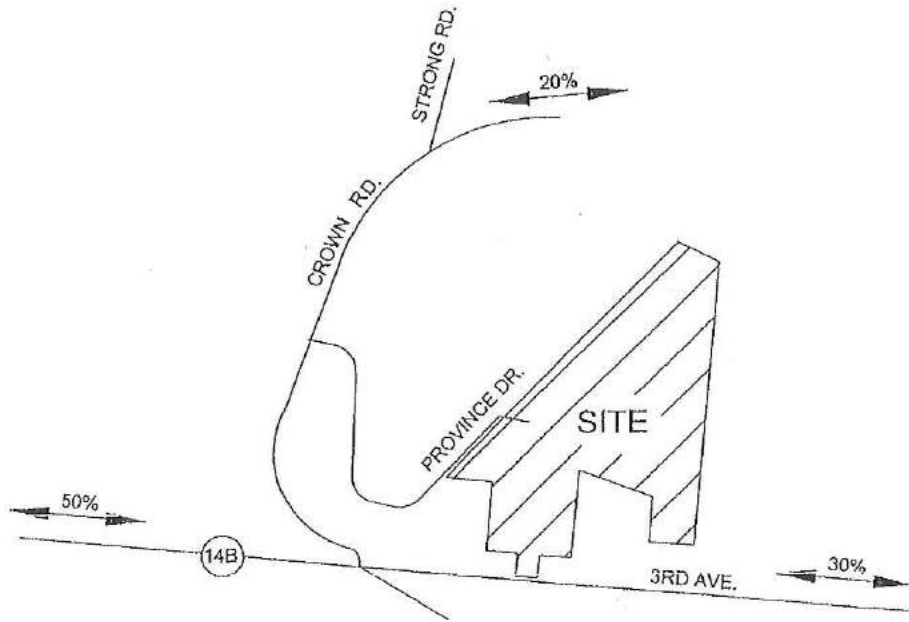
The distribution of site-generated trips onto the study area roadway system was estimated using the trip distribution pattern utilized in the 2006 TIA, accounting for the change in trip generation and new proposed access routes. The weekday a.m. and p.m. peak hour site trips shown in Table 1 were assigned to the roadway network based on the trip distribution pattern. Figure 5 shows the assignment of site-generated trips during the weekday a.m. and p.m. peak hours.



Trip Distribution and Assignment
 Camas, Washington
 Figure 5



NOT TO SCALE

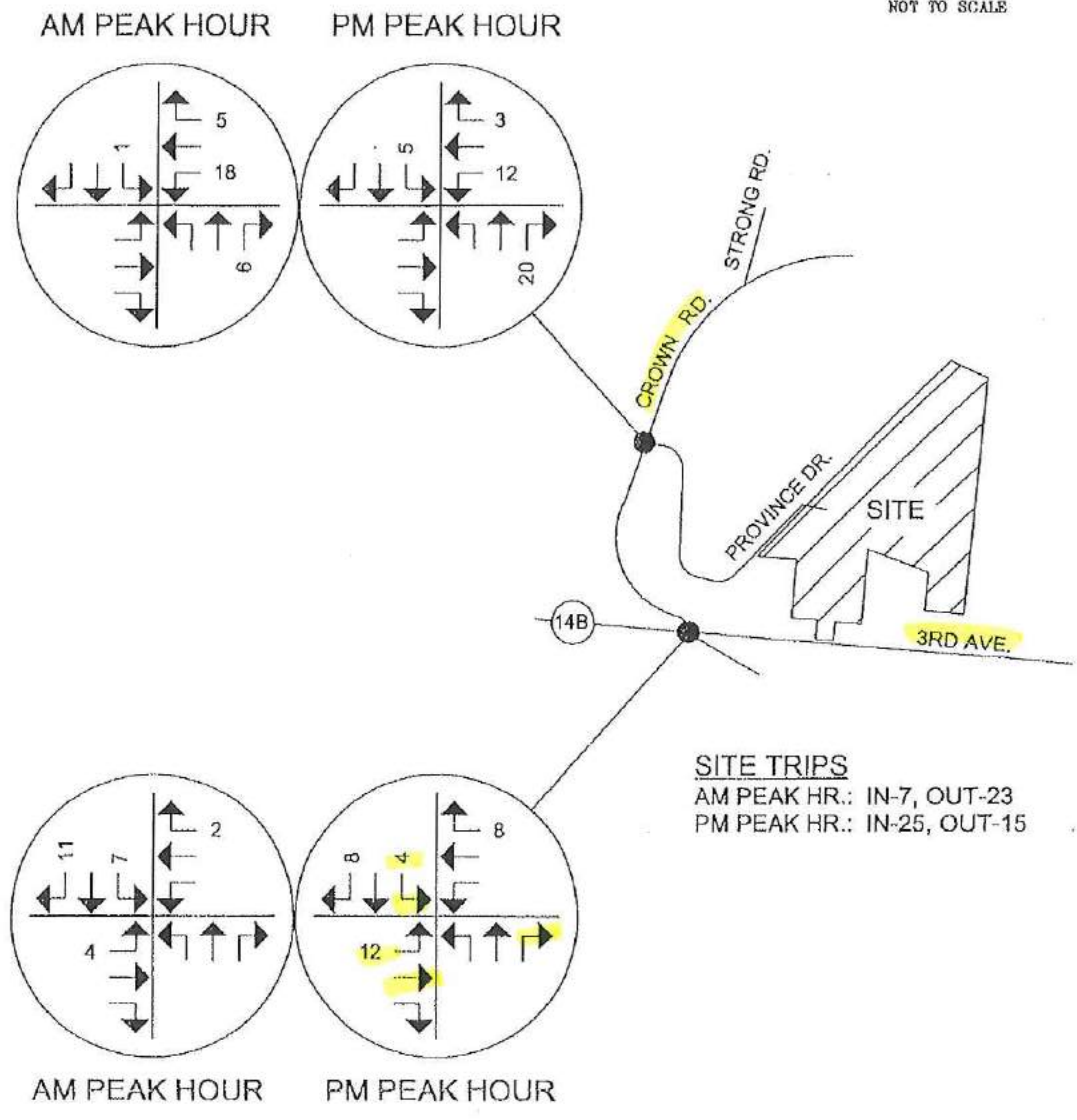


0% build-out 5-31-19

PROVINCE ESTATES

FIGURE 6
SITE TRAFFIC DISTRIBUTION

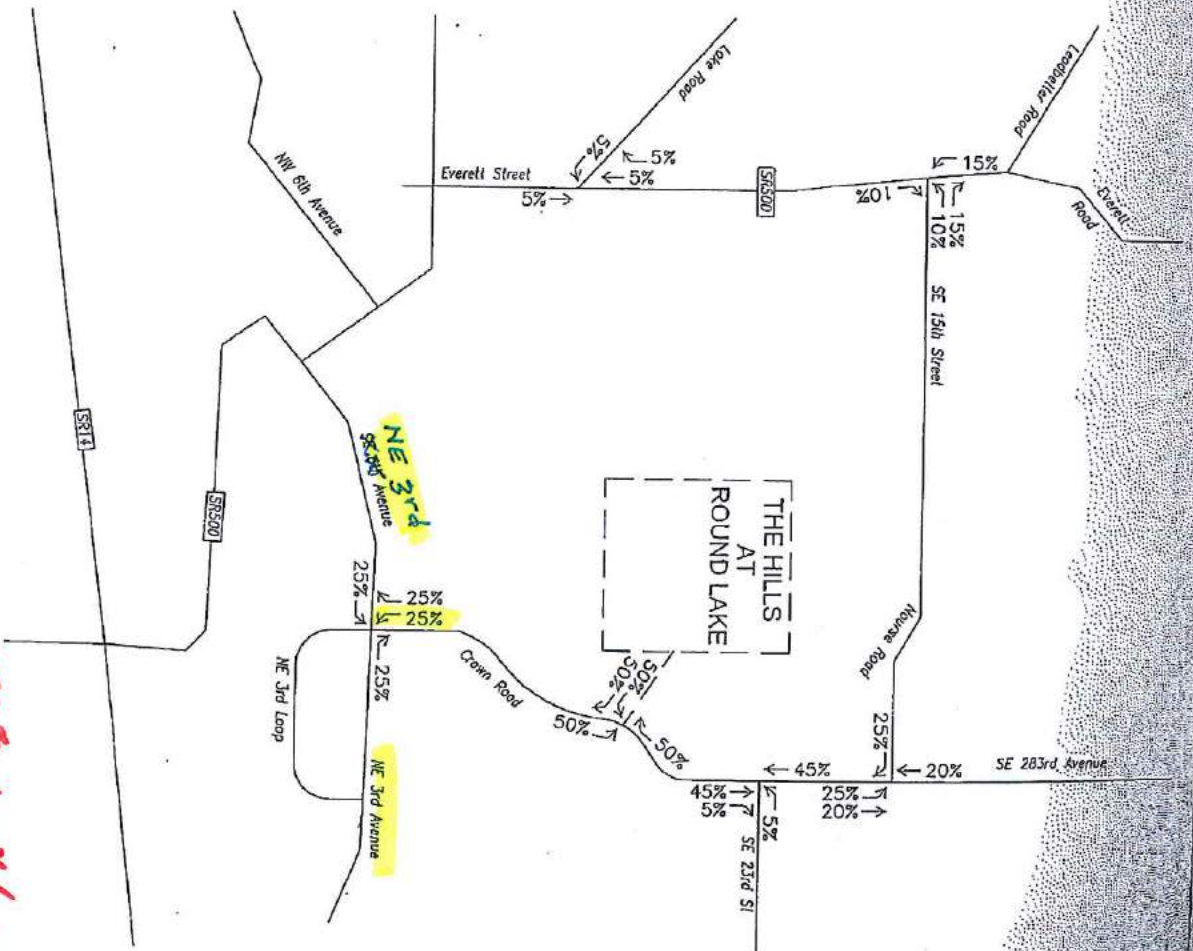
KELLY ENGINEERING
316 E. Fourth Plain, A-5, Vancouver, WA 98663
Phone: 360-696-6059 Fax: 360-735-1126



PROVINCE ESTATES

FIGURE 7
SITE TRAFFIC ASSIGNMENT

KELLY ENGINEERING
 316 E. Fourth Plain, A-2, Vancouver, WA 98663
 Phone: 360-696-6059 Fax: 360-735-1126

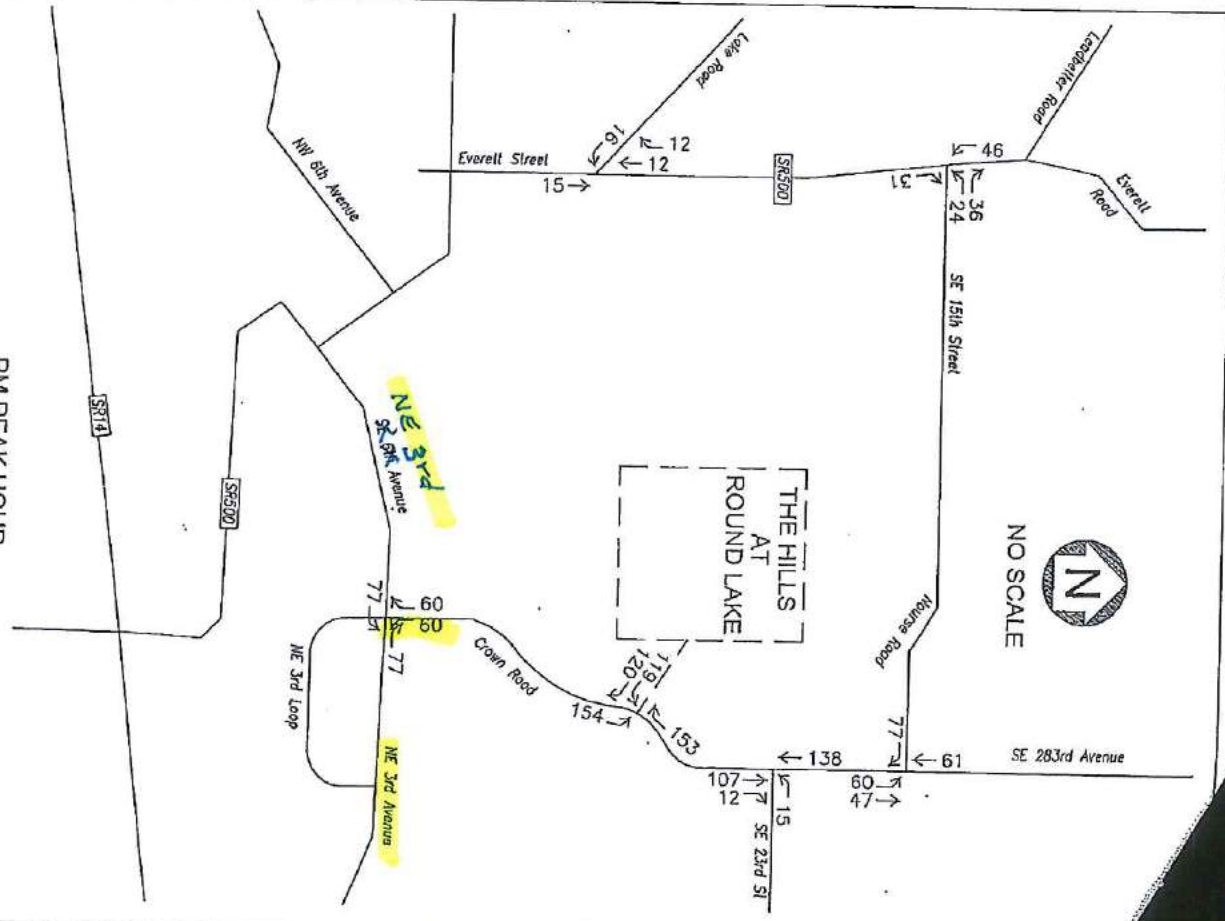
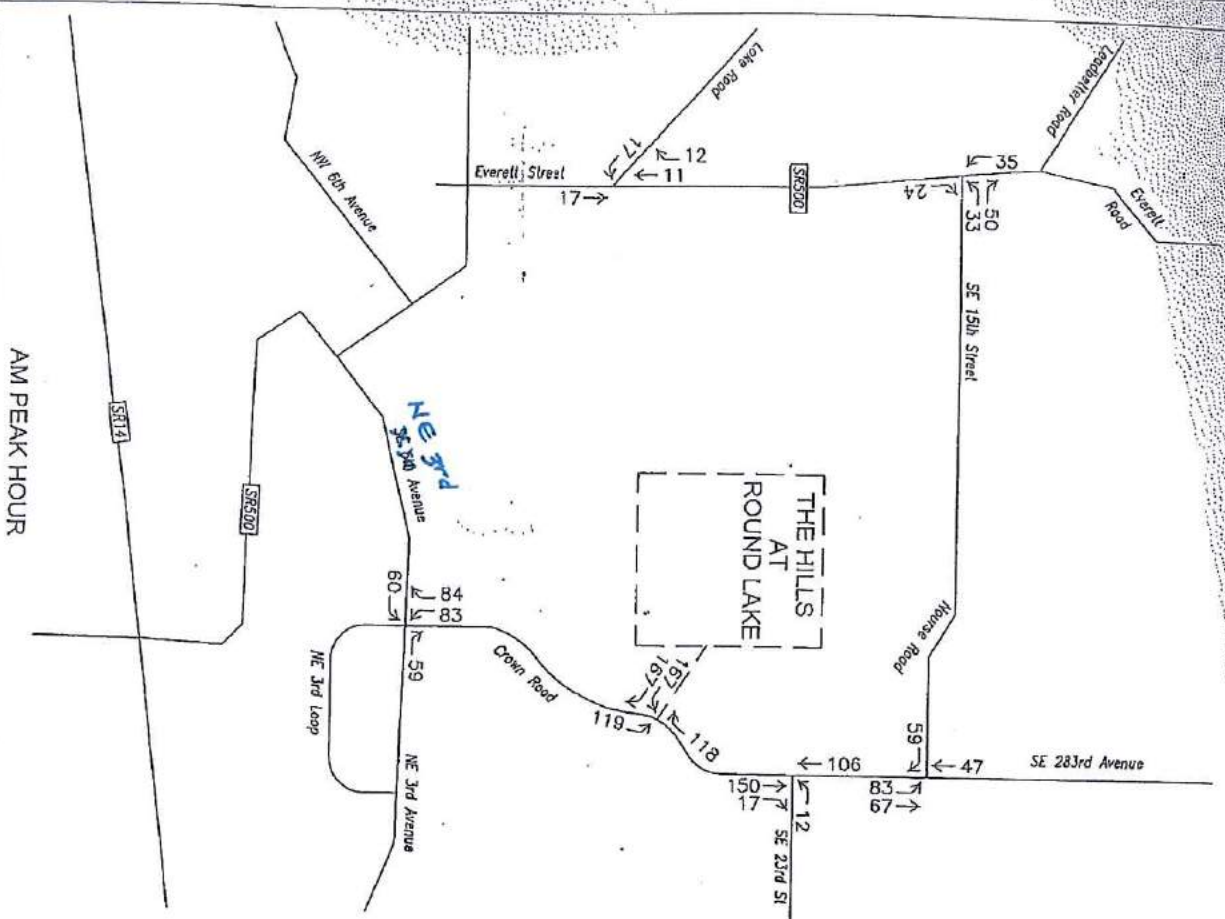


AM AND PM PEAK HOUR

72% build-out 5-31-19

NOTES: Trip distribution based on existing traffic patterns, engineering judgement, and City of Camas/DKS Associates recommendations.

TRIP DISTRIBUTION
AM PEAK HOUR AND PM PEAK HOUR
THE HILLS AT ROUND LAKE



Appendix E

***Left Turn Lane Warrant Analysis
NE 3rd Avenue/NE Wedgewood Court/NE 3rd Loop***

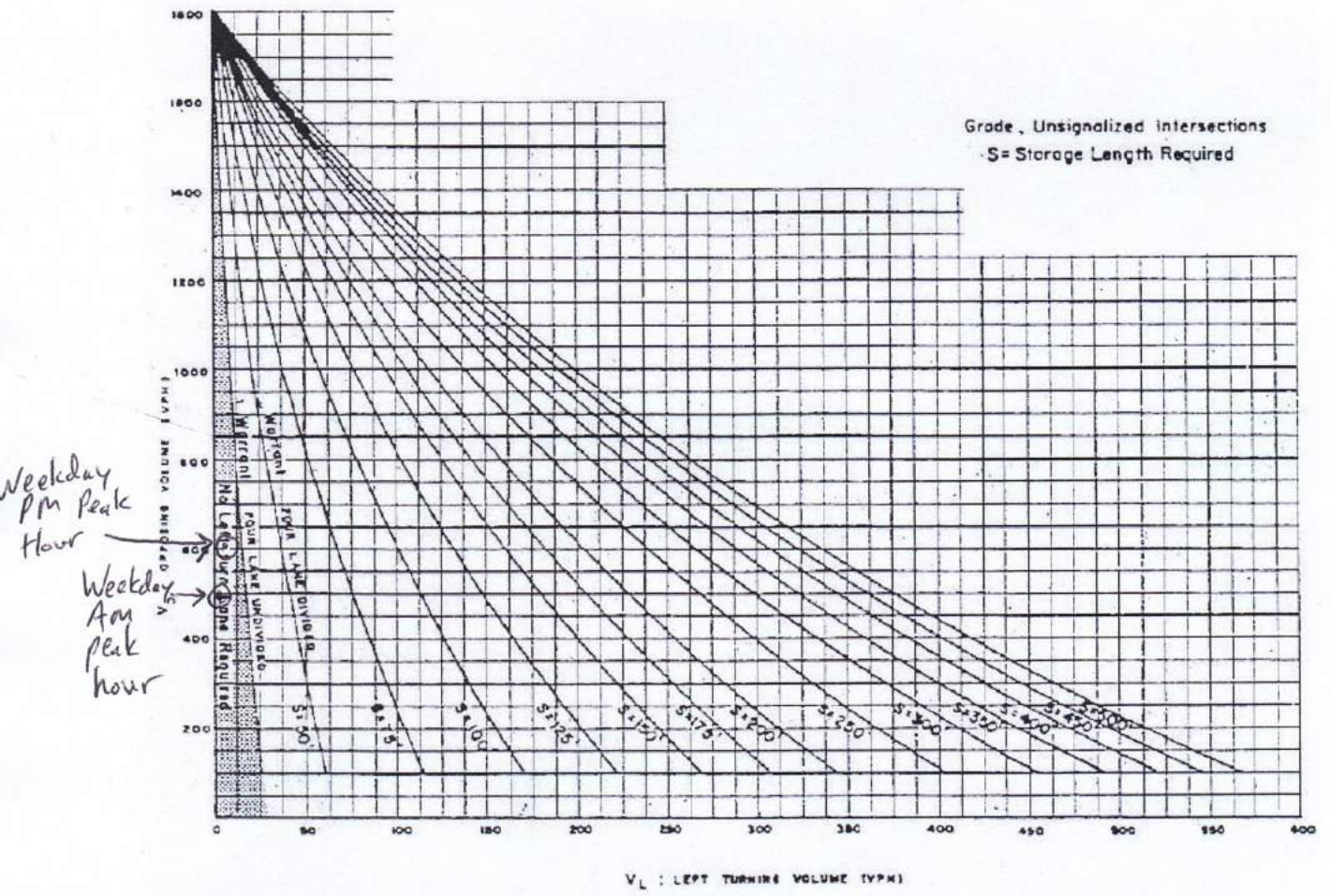


Figure 1. Warrant for left-turn storage lanes on four-lane highways.