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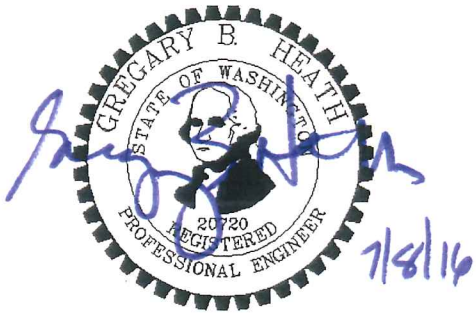
TRAFFIC IMPACT ANALYSIS

HEATH & ASSOCIATES, INC (JULY, 2016)

Site Planning
Civil Engineering
Project Management
Land Development Consulting

BUCKLEY RECYCLE ENUMCLAW
TRAFFIC IMPACT ANALYSIS

King County, WA



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July 2016

BUCKLEY RECYCLE ENUMCLAW
TRAFFIC IMPACT ANALYSIS

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BUCKLEY RECYCLE ENUMCLAW
TRAFFIC IMPACT ANALYSIS

I. INTRODUCTION

The main goals of this study focus on the assessment of existing roadway conditions and forecasts of newly generated project traffic. The first task includes the collection of general roadway information, road improvement information, entering sight distance data, and current delays. Forecasts of future traffic and dispersion patterns on the street system are then determined using established trip generation and distribution techniques. Next, future traffic delays are calculated and significant impacts, if any, are identified. As a final step, appropriate conclusions and mitigation measures are defined if needed.

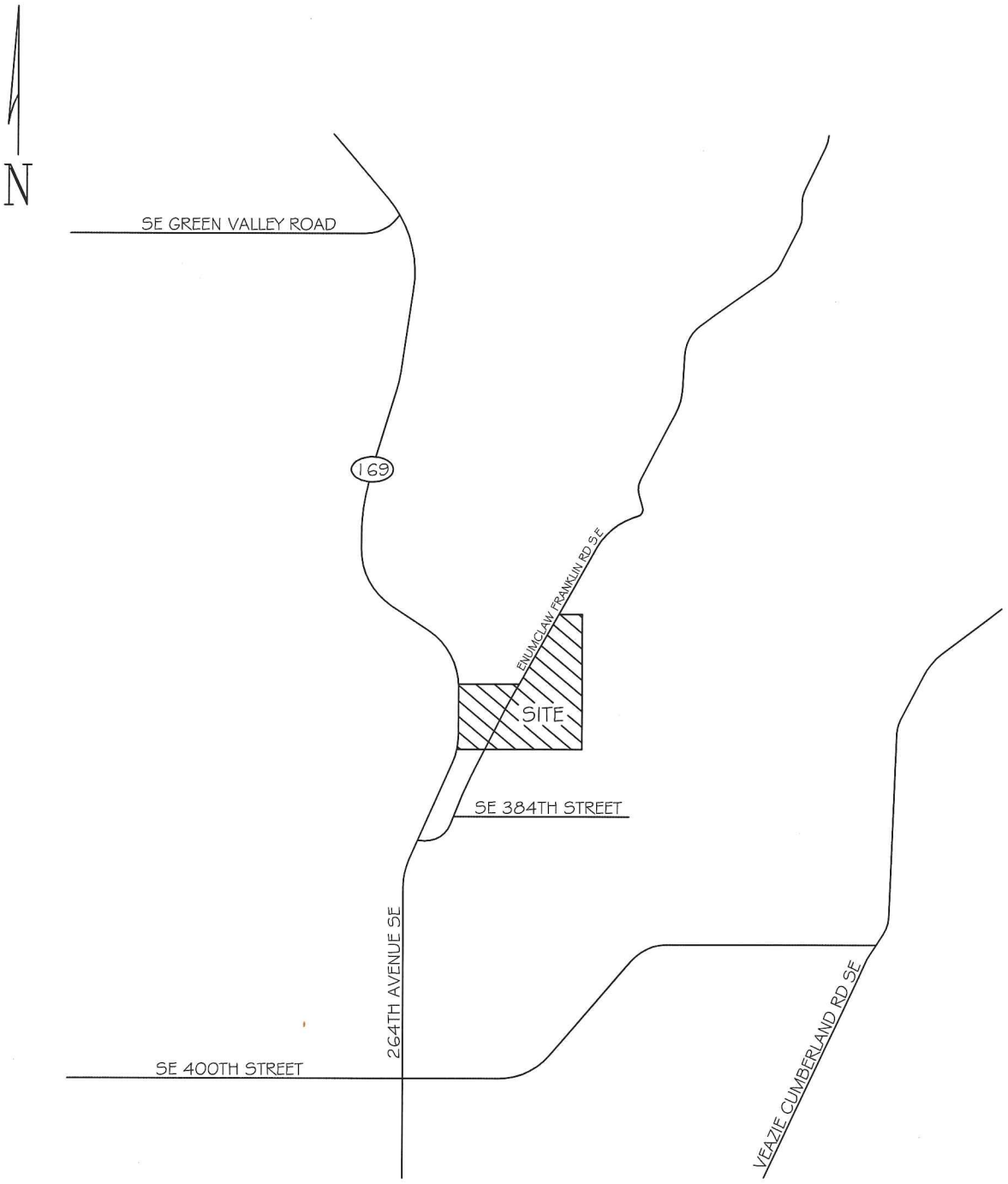
II. PROJECT DESCRIPTION

The proposed project will turn 102.9 acres of undeveloped land into a material processing facility in Unincorporated King County on parcel numbers 3621069-004, -013, -014. On site will be primarily a material holding area with provisions for an office trailer and equipment maintenance building. Plans are for the site to operate 7 AM to 5 PM seven days a week (with the opening time on Sundays being a bit later). The site has property on both sides of Enumclaw Franklin Road SE, just north of the SE 384th Street intersection. Surrounding the site is sparsely residential land uses. Buildout of the project is expected by 2018, which was used as a horizon analysis year. Figure 1 on the following page shows the general site location and surrounding arterial network. A site plan outlining the overall lot configuration and internal roadway is shown in Figure 2.

III. EXISTING CONDITIONS

A. Surrounding Roadway System

The site is primarily served by *Enumclaw Franklin Road SE,* which is a north-south, two lane collector arterial that will provide access to the project. The speed limit is posted at 45 mph. Paving is asphalt and lane widths are approximately 11 feet. Shoulders are grass/gravel and approximately 4 feet in width or wider. The roadway appears to meet the King County Road Design and Construction Standards for a low volume collector arterial. Some shoulder repair work might be required to accommodate the county requirement.



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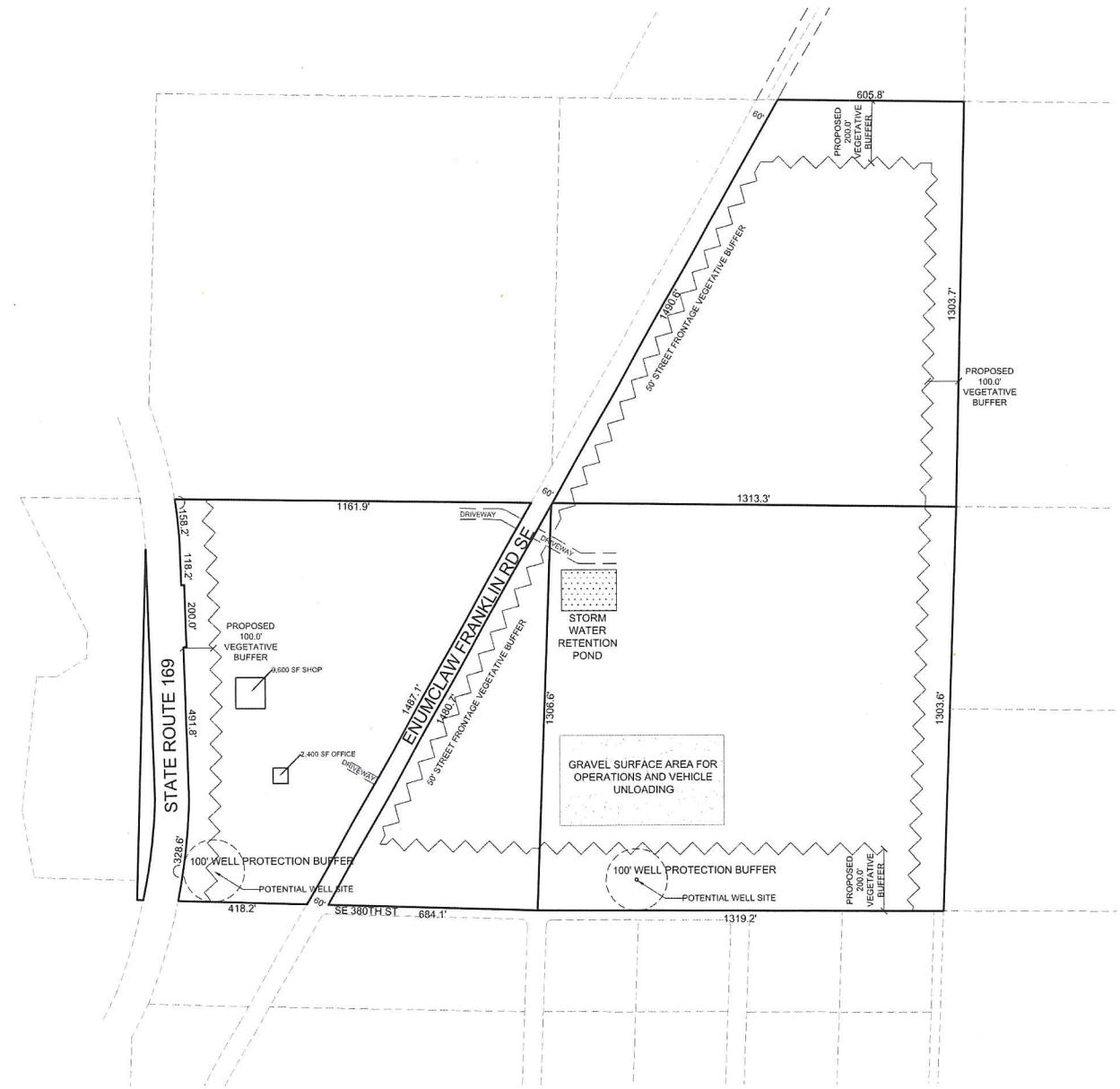
VICINITY MAP & ROADWAY SYSTEM

FIGURE 1



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SITE PLAN

FIGURE 2

B. Existing Peak Hour Volumes

Field data for this study was collected in June of 2016. The traffic count was taken during the evening peak period between the hours of 4 PM and 6 PM. This specific peak period is targeted for analysis purposes since it generally represents a worst case scenario for commercial developments with respect to traffic congestion. This busiest time of the day is primarily due to the common 8 AM to 5 PM work schedule and the greater number of recreation and shopping trips associated with the early evening period. Drivers often travel home after work at approximately the same time of day, typically between 5 PM and 6 PM, which translates to a natural peak in intersection and arterial traffic loads. Figure 3, on the following page, shows the evening peak hour count taken at the intersection of Enumclaw Franklin Road SE & SE 384th Street. Count data can be found in the appendix.

C. Level of Service

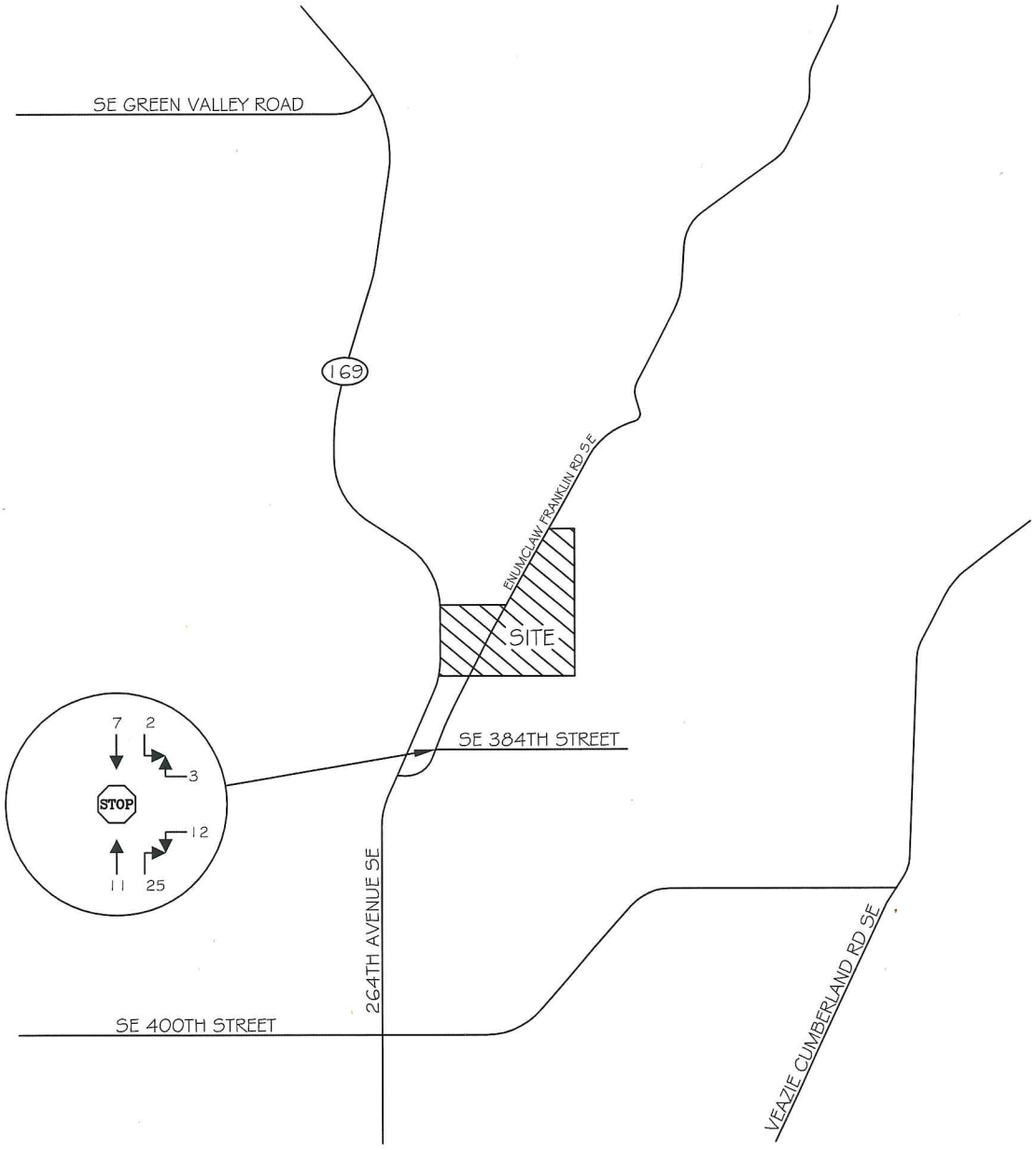
Existing peak hour delays were determined through the use of the *Highway Capacity Manual*. Capacity analysis is used to determine level of service (LOS) which is an established measure of congestion for transportation facilities. LOS is defined for a variety of facilities including intersections, freeways, arterials, etc. A complete definition of level of service and related criteria can be found in the HCM.

The methodology for determining the LOS at unsignalized intersections strives to determine the potential capacities for the various vehicle movements and ultimately determines the average total delay for each movement. *Potential Capacity* represents the number of additional vehicles that could effectively utilize a particular movement, which is essentially the equivalent of the difference between the movement capacity and the existing movement volume. *Total delay* is described as the elapsed time from when a vehicle stops at the end of a queue until the vehicle departs from the stop line. *Average total delay* is simply the mean total delay over the entire stream. A number of factors influence potential capacity and total delay including the availability/usefulness of gaps.

The range for intersection level of service is LOS A to LOS F with the former indicating the best operating conditions with low control delays and the latter indicating the worst conditions with heavy control delays. Existing LOS is shown below in Table 1. This analysis involved the Synchro program which is based on the 2010 Highway Capacity Manual. Refer to the HCM for unsignalized intersection analysis procedures.

TABLE 1
Existing Level of Service
Delays given in seconds per vehicle

Intersection	*Control*	*Approach*	*LOS*	*Delay*
Enumclaw Franklin/384th	Stop	Westbound	A	8.7
		Southbound LT	A	7.3



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EXISTING PM PEAK HOUR VOLUMES

FIGURE 3

D. Pedestrian and Bicycle Traffic

Observations for pedestrian and bicycle activity were made in the vicinity of the project during site visits. Given the nature of the area, there is currently little to no pedestrian traffic. No conflicts between motorist and non-motorist traffic are expected.

E. Public Transit

A review of the Metro Transit regional bus schedule indicates that transit service is not provided directly to the project. Material processing facilities would not be uses typically associated with any transit use.

F. Sight Distance at Project Access

The proposed site will have two entrance driveways across from each other onto Enumclaw Franklin Road SE. Assessments of the driveways were made to establish whether sufficient entering sight distance is available. AASHTO Green Book standards require a minimum entering sight distance of 500 feet for the 45 mph speed limit on Enumclaw Franklin Road SE. Based on established standards and field notes, sight distance appears to be acceptable at the project driveways. The road has only minor vertical curvature along the project frontage. No other sight distance hindrances are present.

IV. FUTURE TRAFFIC DEMAND

A. Trip Generation

Trip generation is used to determine the magnitude of project impacts on the surrounding street system. Typically, the Institute of Transportation Engineer's publication *Trip Generation*, 9th Edition would be used. With the proposed material processing facility use on site, there is not a good land use fit found in ITE data.

To determine suitable trip generation rates, a trip generation count was performed at a similar Buckley Recycle Enumclaw in King County. The access count was performed at 28225 W Valley Highway in Auburn, Washington. This center is in use and functions as the proposed material processing facility is expected to. The count was performed from 3 PM to 5:15 PM in order to capture all PM peak traffic with the material processing facility closing at 5 PM.

Table 2, reports the findings of the access study showing the average PM peak hour trips a Buckley Recycle Enumclaw can be expected to support. Daily traffic volumes (AWDT) were determined based on discussions with owner as to the number of transactions that occur on an average day. Large trucks are expected to make up roughly 20 percent of project traffic.

TABLE 2
Project Trip Generation

Time Period	*Volume*
AWDT (est)	164 vpd
PM Peak Enter	10 vph
PM Peak Exit	12 vph
PM Peak Total	22 vph

B. Trip Distribution and Assignment

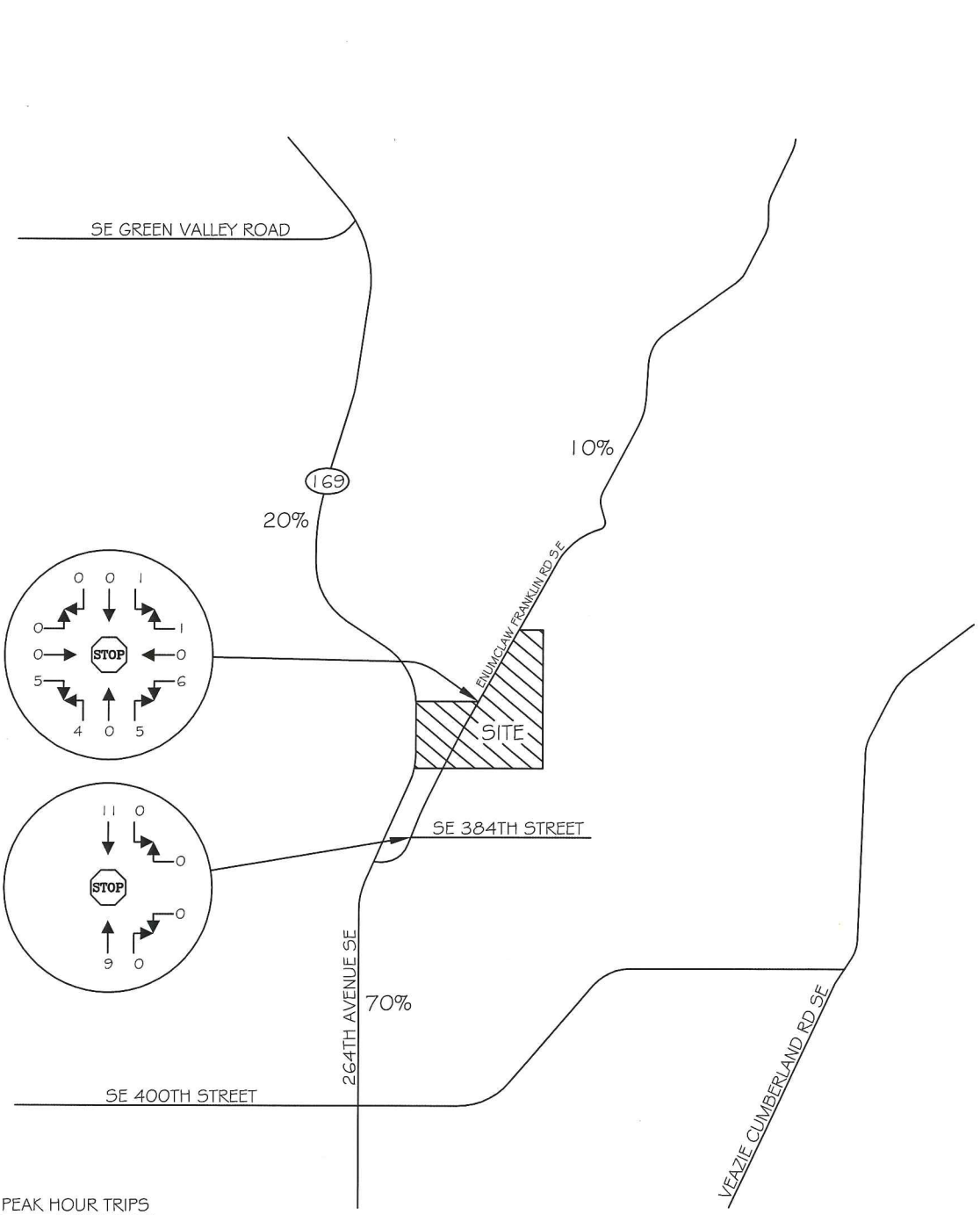
Trip distribution describes the process by which project generated trips are dispersed on the street network surrounding the site. Site generated trips are expected to follow the trip pattern shown in Figure 4. This figure reflects work-based and home-based trips taken by project traffic during the PM peak hour. Distribution percentages are roughly based on the roadway network configuration and major nearby residential areas.

C. Roadway Improvements

A review of the latest King County Capital Improvement Program shows that no roadway improvement projects are planned in the immediate vicinity of the site.

D. Peak Hour Volumes With and Without the Project

For forecasting purposes, future traffic volumes for the 2018 buildout year were targeted for analysis. Baseline 2018 PM peak hour volumes without the project were derived by applying a 3 percent growth rate per year to the existing volumes of Figure 3. Data from the 2015 Annual Traffic Report from WSDOT shows SR-169 in the area has seen around a 2.3 percent growth rate per year over the past four years. Future 2018 PM peak volumes without project traffic are shown in Figure 5, while future 2018 volumes with the project are shown on Figure 6.



NEW PM PEAK HOUR TRIPS
INBOUND: 10 VPH
OUTBOUND: 12 VPH

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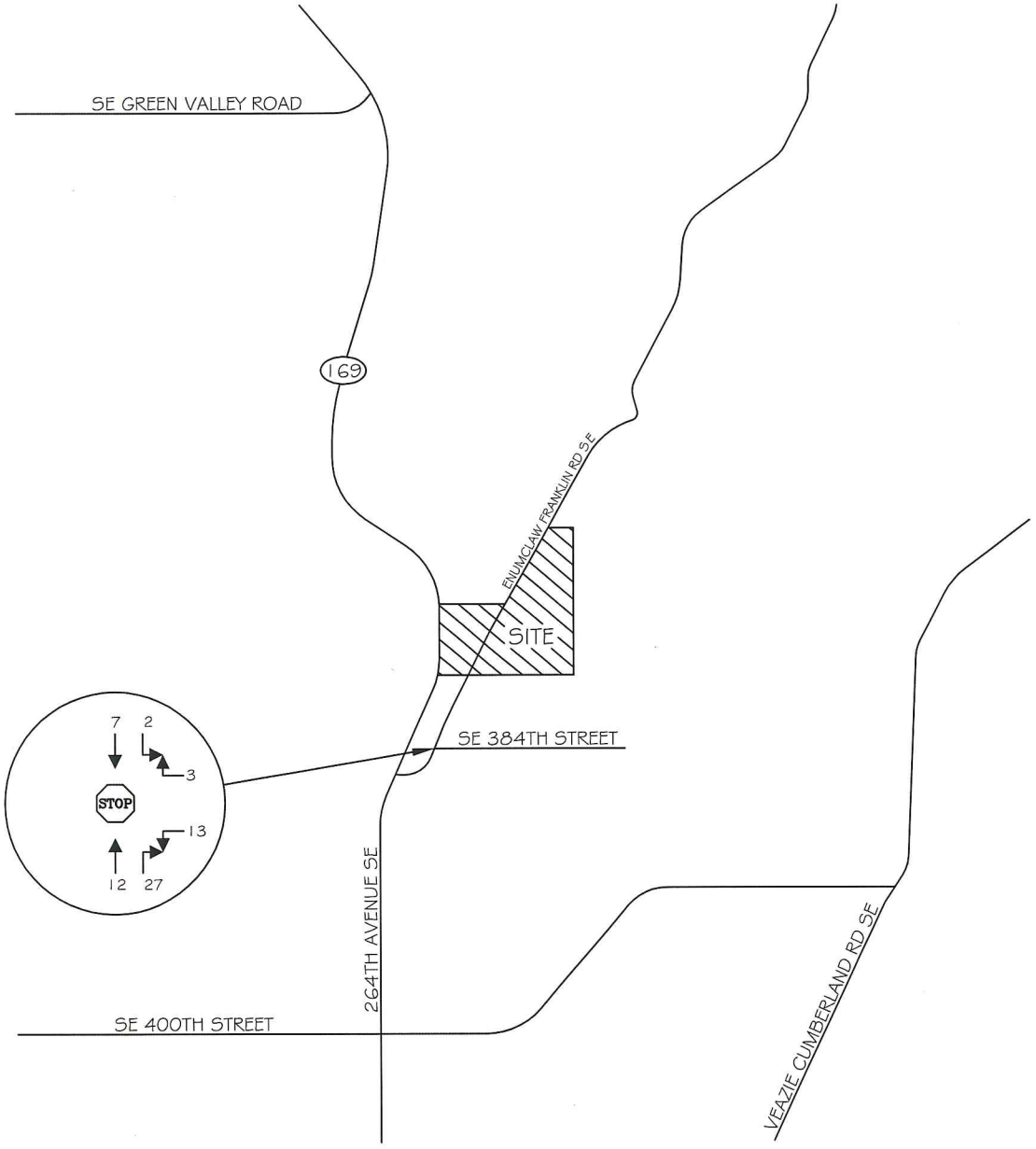
TRIP DISTRIBUTION & ASSIGNMENT

FIGURE 4



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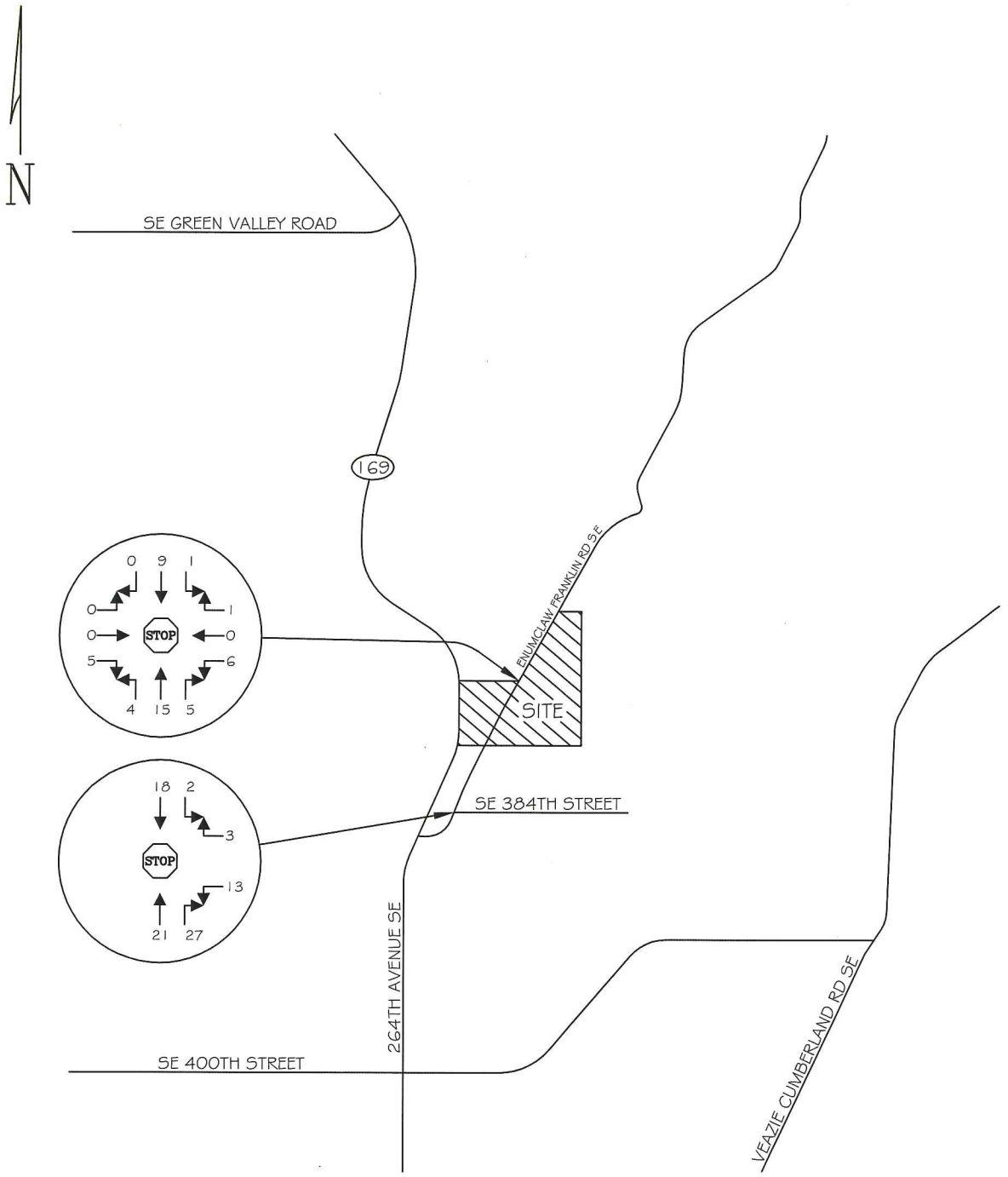
2018 PM PEAK HOUR VOLUMES WITHOUT PROJECT

FIGURE 5



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2018 PM PEAK HOUR VOLUMES WITH PROJECT

FIGURE 6

E. Future Level of Service

A level of service analysis was made of the future peak hour volumes without and with project generated trips. The results are summarized below in Table 3.

TABLE 3
Future 2018 Level of Service
Delays given in seconds per vehicle

			Without Project		With Project	
Intersection	*Control*	*Geometry*	*LOS*	*Delay*	*LOS*	*Delay*
Enumclaw Rd/384th	Stop	Westbound	A	8.8	A	8.9
		Southbound LT	A	7.3	A	7.3
Enumclaw Rd/Ent.	Stop	Eastbound	-	-	A	8.5
		Westbound	-	-	A	8.9
		Northbound LT	-	-	A	7.4
		Southbound LT	-	-	A	7.4

As shown in Table 3, delays will be mild at LOS A with the area supporting minimal traffic.

E. Left Turn Warrant Analysis

Left turn lanes are a means of providing necessary storage space for left turning vehicles at intersections. For a two-lane or four-lane highway with no left turn storage, delays are often created by vehicles waiting to complete the desired left turn movement. These turning vehicles typically block the heavier through movement, thereby causing some disruption to traffic flow and subsequent congestion. Methods have been developed by various agencies to determine under what circumstances a left turn lane would be needed. For this impact study, procedures described by WSDOT Design Manual (Figure 1310-15a) were used to ascertain storage requirements on Enumclaw Franklin Road SE at the project entrances based on 2018 PM peak hour volumes with project traffic. The results of this assessment indicate that a left turn lane *would not be warranted*. Refer to the appendix for input values and the WSDOT left turn warrant chart.

F. Right Turn Warrants

Investigations of right turn warrants were conducted to assess whether right turn channelization would be needed at the project entrances on Enumclaw Franklin Road SE. The warrant procedure involves using the WSDOT nomograph, Figure 1310-11, which utilizes right turn volumes and approach traffic. It was determined that a right turn taper or right turn lane is *not warranted* for consideration at the entrances. See the appendix for the attached nomograph and input volumes.

V. CONCLUSIONS AND MITIGATION

The Buckley Recycle Enumclaw project will turn 102.9 acres of undeveloped land into a material processing facility in Unincorporated King County. On site will be primarily a material holding area with provisions for an office trailer and equipment maintenance building. Plans are for the site to operate 7 AM to 5 PM seven days a week with the opening time on Sundays reduced.

This project is expected to be a mild generator of new trips in the area with an estimated 22 PM peak hour trips destined to and from the site based on a trip generation study performed at the Buckley Recycle Enumclaw in operation in the City of Auburn. The daily traffic is estimated at 164 trips for the project.

Mild volumes are currently supported in the area along Enumclaw Franklin Road SE. Existing LOS results show LOS A delays at the Enumclaw Franklin Road SE & SE 384th Street intersection and delays at the buildout year of 2018 will remain at LOS A without or with project traffic. A left turn warrant analysis found no left turn is needed at the project entrances. A right turn warrant analysis also found a right turn lane or radius is not needed. Overall, the project is not expected to have any impact on the local roadway system.

Per the KCRDCS the shoulders are required to be gravel and four feet in width. Some minor repair might be needed along the frontage to accommodate this requirement.

Based on the findings of this report, no additional mitigation is required for increases in traffic associated with the Buckley Recycle Enumclaw project.

BUCKLEY RECYCLE ENUMCLAW
TRAFFIC IMPACT ANALYSIS

APPENDIX

LEVEL OF SERVICE

The following are excerpts from the *2010 Highway Capacity Manual - Transportation Research Board Special Report 209.*

Quality of service requires quantitative measures to characterize operational conditions within a traffic stream. Level of service (LOS) is a quality measure describing operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience.

Six LOS are defined for each type of facility that has analysis procedures available. Letters designate each level, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each level of service represents a range of operating conditions and the driver's perception of those conditions.

Level-of-Service definitions

The following definitions generally define the various levels of service for arterials.

Level of service A represents primarily free-flow operations at average travel speeds, usually about 90 percent of the free-flow speed for the arterial classification. Vehicles are seldom impeded in their ability to maneuver in the traffic stream. Delay at signalized intersections is minimal.

Level of service B represents reasonably unimpeded operations at average travel speeds, usually about 70 percent of the free-flow speed for the arterial classification. The ability to maneuver in the traffic stream is only slightly restricted and delays are not bothersome.

Level of service C represents stable operations; however, ability to maneuver and change lanes in midblock locations may be more restricted than in LOS B, and longer queues, adverse signal coordination, or both may contribute to lower average travel speeds of about 50 percent of the average free-flow speed for the arterial classification.

Level of service D borders on a range in which small increases in flow may cause substantial increases in approach delay and hence decreases in arterial speed. LOS D may be due to adverse signal progression, inappropriate signal timing, high volumes, or some combination of these. Average travel speeds are about 40 percent of free-flow speed.

Level of service E is characterized by significant delays and average travel speeds of one-third the free-flow speed or less. Such operations are caused by some combination of adverse progression, high signal density, high volumes, extensive delays at critical intersections, and inappropriate signal timing.

Level of service F characterizes arterial flow at extremely low speeds, from less than one-third to one-quarter of the free-flow speed. Intersection congestion is likely at critical signalized locations, with long delays and extensive queuing.

These definitions are general and conceptual in nature, and they apply primarily to uninterrupted flow. Levels of service for interrupted flow facilities vary widely in terms of both the user's perception of service quality and the operational variables used to describe them.

For each type of facility, levels of service are defined based on one or more operational parameters that best describe operating quality for the subject facility type. While the concept of level of service attempts to address a wide range of operating conditions, limitations on data collection and availability make it impractical to treat the full range of operational parameters for every type of facility. The parameters selected to define levels of service for each facility type are called "measures of effectiveness" or "MOE's", and represent available measures that best describe the quality of operation on the subject facility type.

Each level of service represents a range of conditions, as defined by a range in the parameters given. Thus, a level of service is not a discrete condition, but rather a range of conditions for which boundaries are established.

The following tables describe levels of service for signalized and unsignalized intersections. Level of service for signalized intersections is defined in terms of average control delay. Delay is a measure of driver discomfort, frustration, fuel consumption and lost travel time, as well as time from movements at slower speeds and stops on intersection approaches as vehicles move up in queue position or slow down upstream of an intersection. Level of service for unsignalized intersections is determined by the computed or measured control delay and is determined for each minor movement.

Signalized Intersections - Level of Service

Level of Service	Control Delay per Vehicle (sec)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

Unsignalized Intersections - Level of Service

Level of Service	Average Total Delay per Vehicle (sec)
A	≤10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	>50

As described in the 2000 Highway Capacity Manual, level of service breakpoints for all-way stop controlled (AWSC) intersections are somewhat different than the criteria used for signalized intersections. The primary reason for this difference is that drivers expect different levels of performance from distinct kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an AWSC intersection. Thus a higher level of control delay is acceptable at a signalized intersection for the same level of service.

AWSC Intersections - Level of Service

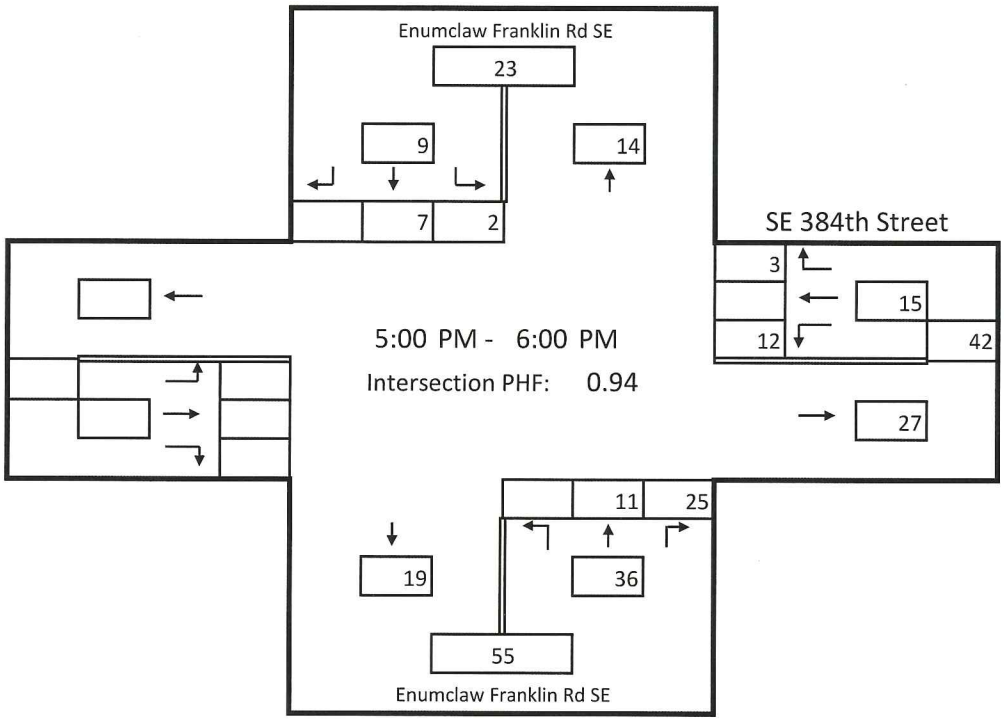
Level of Service	Average Total Delay per Vehicle (sec)
A	≤10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	>50

Heath & Associates, Inc.
2214 Tacoma Road
Puyallup, WA 98371

Project Name: **Buckley Recycle Enumclaw**
Intersection: Enumclaw Franklin Road SE & SE 384th Street
Jurisdiction: King County

Date of Count: 6/16/2016
Project Number: 3805

Time Period	Soutbound Enumclaw Franklin Rd SE				Westbound SE 384th Street				Northbound Enumclaw Franklin Rd SE				Eastbound				
	HV	R	T	L	HV	R	T	L	HV	R	T	L	HV	R	T	L	Total
4:00 PM	0		2	0	0	0		3	0	5	2						12
4:15 PM	0		0	1	0	0		2	0	3	3						9
4:30 PM	0		2	1	0	0		3	0	7	1						14
4:45 PM	0		0	0	0	2		3	0	4	2						11
5:00 PM	0		4	0	0	0		3	0	5	3						15
5:15 PM	0		2	0	0	2		2	0	6	2						14
5:30 PM	0		1	0	0	0		5	0	7	3						16
5:45 PM	0		0	2	0	1		2	0	7	3						15
Total	0	0	11	4	0	5	0	23	0	44	19	0	0	0	0	0	
Peak Hour	**5:00 PM to 6:00 PM**																
Peak Total	0	0	7	2	0	3	0	12	0	25	11	0	0	0	0	0	
Heavy Veh.	0.0%				0.0%				0.0%								
PHF	0.56				0.75				0.90								



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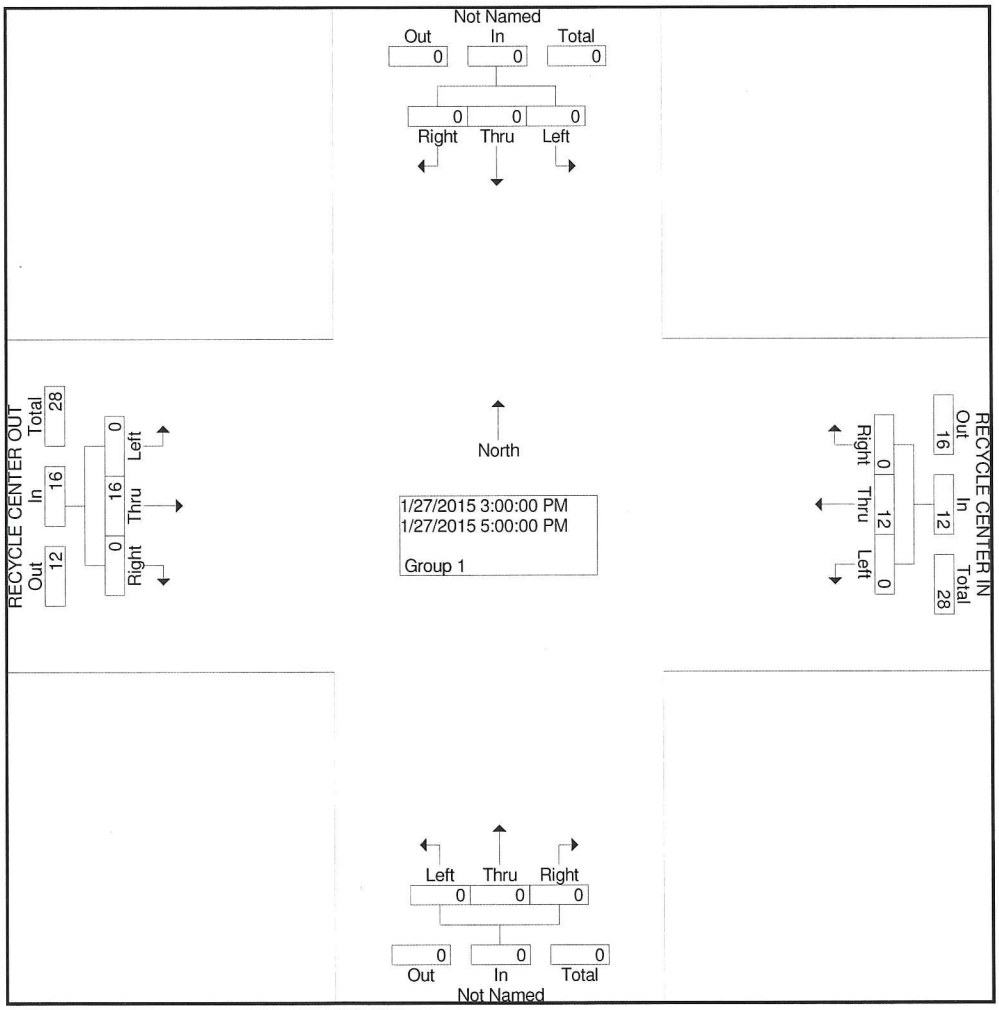
2214 Tacoma Road
Puyallup, WA 98371

File Name : 3586b
Site Code : 00003586
Start Date : 1/27/2015
Page No : 1

Groups Printed- Group 1

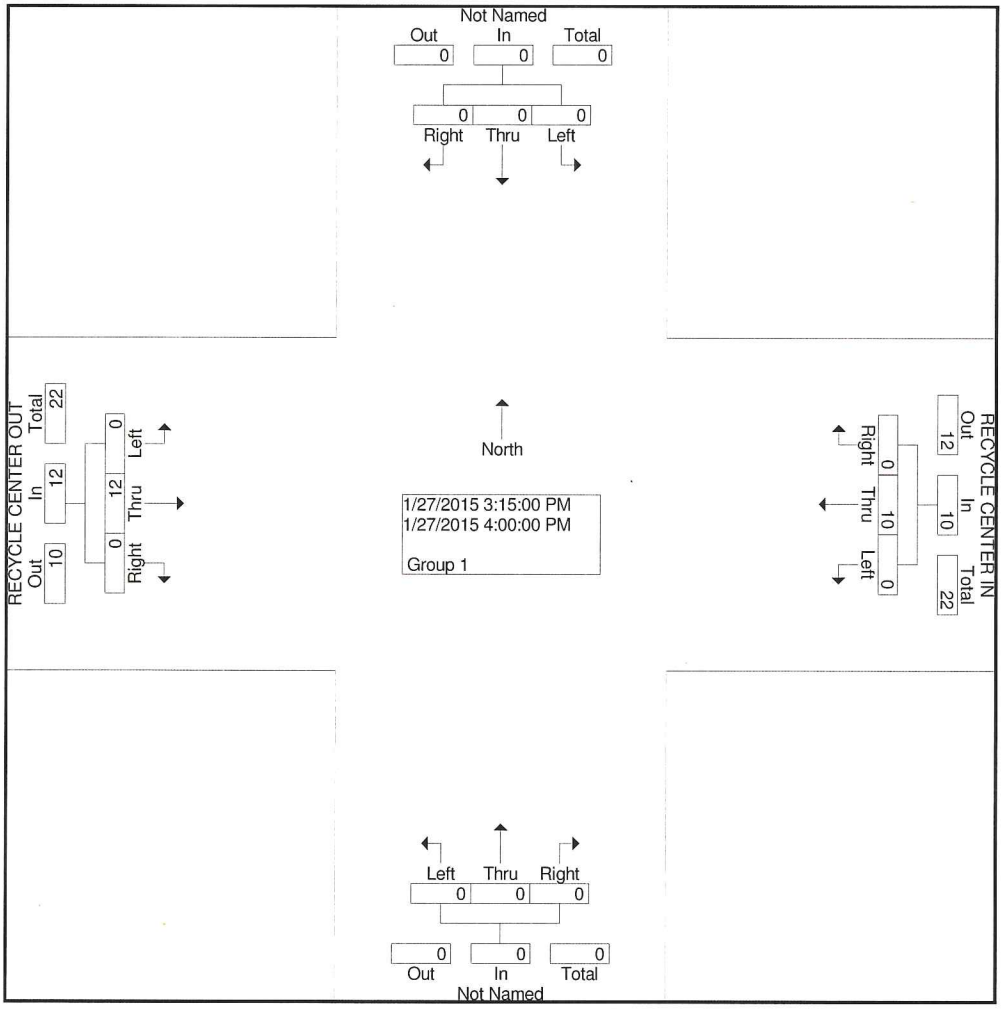
	Southbound			RECYCLE CENTER IN Westbound			Northbound			RECYCLE CENTER OUT Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
03:00 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
03:15 PM	0	0	0	0	2	0	0	0	0	0	4	0	6
03:30 PM	0	0	0	0	4	0	0	0	0	0	1	0	5
03:45 PM	0	0	0	0	3	0	0	0	0	0	4	0	7
Total	0	0	0	0	10	0	0	0	0	0	9	0	19
04:00 PM	0	0	0	0	1	0	0	0	0	0	3	0	4
*** BREAK ***													
04:30 PM	0	0	0	0	1	0	0	0	0	0	0	0	1
*** BREAK ***													
Total	0	0	0	0	2	0	0	0	0	0	3	0	5
05:00 PM	0	0	0	0	0	0	0	0	0	0	4	0	4
Grand Total	0	0	0	0	12	0	0	0	0	0	16	0	28
Apprch %	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	
Total %	0.0	0.0	0.0	0.0	42.9	0.0	0.0	0.0	0.0	0.0	57.1	0.0	



Heath & Associates, Inc.
2214 Tacoma Road
Puyallup, WA 98371

File Name : 3586b
Site Code : 00003586
Start Date : 1/27/2015
Page No : 2

	Southbound				RECYCLE CENTER IN Westbound				Northbound				RECYCLE CENTER OUT Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour From 03:00 PM to 05:00 PM - Peak 1 of 1																	
Intersection 03:15 PM																	
Volume	0	0	0	0	0	10	0	10	0	0	0	0	0	12	0	12	22
Percent	0.0	0.0	0.0		0.0	100.0	0.0		0.0	0.0	0.0		0.0	100.0	0.0		
03:45 Volume	0	0	0	0	0	3	0	3	0	0	0	0	0	4	0	4	7
Peak Factor																	0.786
High Int.	2:45:00 PM				03:30 PM				2:45:00 PM				03:15 PM				
Volume	0	0	0	0	0	4	0	4	0	0	0	0	0	4	0	4	
Peak Factor								0.625								0.750	



STATE OF WASHINGTON - DEPARTMENT OF TRANSPORTATION
T R I P S S Y S T E M
ANNUAL TRAFFIC REPORT

STATE ROUTE	STATE ROUTE MILEPOST	LOCATION	COUPLET	FUNCT CLASS	TRUCK PERCENTAGES SNGL	DBL	TRIPLE	TOTAL	AVERAGE DAILY TRAFFIC VOLUME 2012 UNITS	2013 UNITS	2014 UNITS	2015 UNITS
167	016.28	AFTER RAMP 15TH ST NW		1					115000*	114000	116000	121000*
167	017.93	AT S 277TH ST		1					102000*	101000	102000	107000*
167	018.45	AFTER RAMP S 277TH ST		1					121000*	119000	121000	126000*
167	019.60	AT SR 516 BRIDGE		1					96000*	95000	96000	100000*
167	020.14	AFTER RAMP SR 516		1					108000*	106000	108000	112000*
167	021.31	AT 84TH AVE SE BRIDGE		1					94000*	93000	94000	98000*
167	021.78	AFTER RAMP N CENTRAL AVE		1					117000*	116000	118000	122000*
167	022.40	AT S 212 ST		1					101000*	100000	102000	105000*
167	023.70	AT PTR LOCATION P6		1	03	03		06	119000*	117000*	119000*	123000+
167	024.42	AT S 180TH ST		1					99000*	98000	99000	104000*
167	025.04	AFTER RAMP SW 43RD ST		1					120000*	118000	120000	124000*
167	026.28	AT SR 405		1					86000*	85000	87000	90000
167	026.40	AFTER RAMP SR 405*SR 405		1					50000*	49000	50000	52000
167	027.16	BEFORE JCT SR 900 WYE CONN		1					39000*	38000	39000	37000*
167	027.28	BEFORE JCT SR 900 CO2NDST (COUPLET)		1					39000*	38000	39000	39000*
		STATE ROUTE NO 169 MAINLINE SR 164 TO SR 405/RENTON										
169	000.00	AFTER JCT SR 164*BEG ROUTE		1					7300*	7200*	7300	7500*
169	000.98	BEFORE JCT SE 427TH ST		1					8100*	8000*	8100	8300
169	001.67	AFTER JCT SE 416TH ST		1					7800*	8000*	8100	8300
169	007.63	BEFORE JCT LAWSON ST		1					6700*	6700	6800	7000
169	007.63	AFTER JCT LAWSON ST		1					8300*	8300	8400	8700
169	010.69	BEFORE JCT SE 280TH ST		1					11000*	11000	11000	12000
169	010.95	AFTER JCT SE 276TH ST		1					16000*	16000	17000	18000
169	011.44	BEFORE JCT SR 516*KENT KANGLEY RD		1					18000*	19000	19000	20000*
169	011.44	AFTER JCT SR 516*KENT KANGLEY RD		1					18000*	19000*	19000	20000*
169	013.14	AFTER JCT 231ST AVE SE		1					21000*	21000	22000	24000*
169	013.86	AFTER JCT WITTE RD		1					34000*	34000	35000	37000*

2.3% Growth

* BASED ON ACTUAL COUNT
+ SOURCE OF TRUCK PERCENTAGES

Intersection	
Int Delay, s/veh	2.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	12	3	11	25	2	7
Future Vol, veh/h	12	3	11	25	2	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	75	75	90	90	56	56
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	16	4	12	28	4	13

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	46	26	0	0	40	0
Stage 1	26	-	-	-	-	-
Stage 2	20	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	969	1056	-	-	1583	-
Stage 1	1002	-	-	-	-	-
Stage 2	1008	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	966	1056	-	-	1583	-
Mov Cap-2 Maneuver	966	-	-	-	-	-
Stage 1	1002	-	-	-	-	-
Stage 2	1005	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.7	0	1.6
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	983	1583	-
HCM Lane V/C Ratio	-	-	0.02	0.002	-
HCM Control Delay (s)	-	-	8.7	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	2.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	13	3	12	27	2	7
Future Vol, veh/h	13	3	12	27	2	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	75	75	90	90	56	56
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	17	4	13	30	4	13

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	48	28	0	0	43	0
Stage 1	28	-	-	-	-	-
Stage 2	20	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	967	1053	-	-	1579	-
Stage 1	1000	-	-	-	-	-
Stage 2	1008	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	964	1053	-	-	1579	-
Mov Cap-2 Maneuver	964	-	-	-	-	-
Stage 1	1000	-	-	-	-	-
Stage 2	1005	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.8	0	1.6
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	980	1579	-
HCM Lane V/C Ratio	-	-	0.022	0.002	-
HCM Control Delay (s)	-	-	8.8	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	1.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	13	3	21	27	2	18
Future Vol, veh/h	13	3	21	27	2	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	75	75	90	90	56	56
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	17	4	23	30	4	32

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	77	38	0	0	53	0
Stage 1	38	-	-	-	-	-
Stage 2	39	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	931	1040	-	-	1566	-
Stage 1	990	-	-	-	-	-
Stage 2	989	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	928	1040	-	-	1566	-
Mov Cap-2 Maneuver	928	-	-	-	-	-
Stage 1	990	-	-	-	-	-
Stage 2	986	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.9	0	0.7
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	947	1566	-
HCM Lane V/C Ratio	-	-	0.023	0.002	-
HCM Control Delay (s)	-	-	8.9	7.3	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

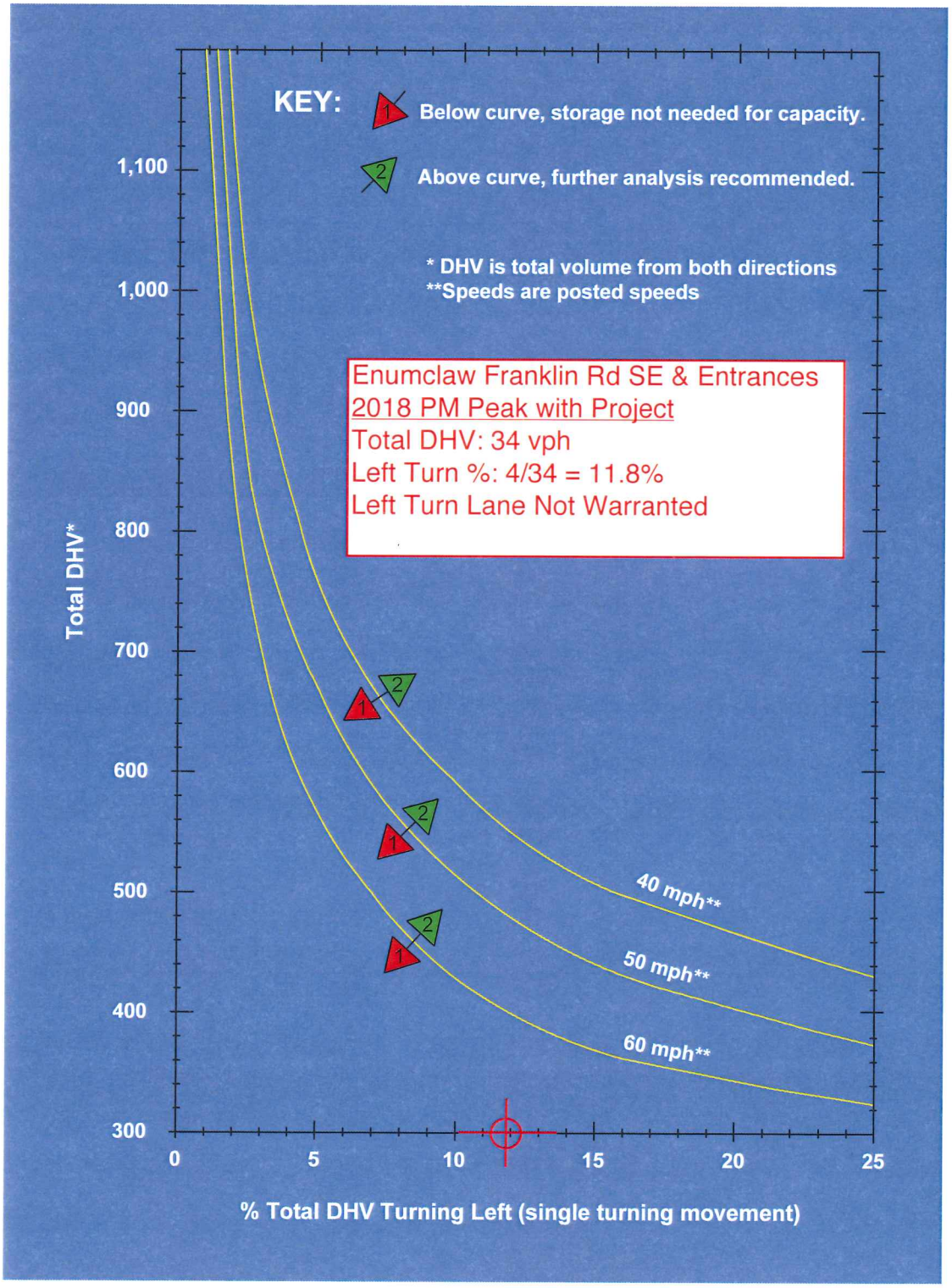
Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	0	0	5	6	0	1	4	15	5	1	9	0
Future Vol, veh/h	0	0	5	6	0	1	4	15	5	1	9	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	20	20	20	20	20	20	20	0	20	20	0	20
Mvmt Flow	0	0	6	7	0	1	4	17	6	1	10	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	41	43	10	43	40	19	10	0	0	22	0	0
Stage 1	12	12	-	28	28	-	-	-	-	-	-	-
Stage 2	29	31	-	15	12	-	-	-	-	-	-	-
Critical Hdwy	7.3	6.7	6.4	7.3	6.7	6.4	4.3	-	-	4.3	-	-
Critical Hdwy Stg 1	6.3	5.7	-	6.3	5.7	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.3	5.7	-	6.3	5.7	-	-	-	-	-	-	-
Follow-up Hdwy	3.68	4.18	3.48	3.68	4.18	3.48	2.38	-	-	2.38	-	-
Pot Cap-1 Maneuver	919	815	1021	916	818	1009	1500	-	-	1484	-	-
Stage 1	964	851	-	945	837	-	-	-	-	-	-	-
Stage 2	944	835	-	960	851	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	915	812	1021	908	815	1009	1500	-	-	1484	-	-
Mov Cap-2 Maneuver	915	812	-	908	815	-	-	-	-	-	-	-
Stage 1	961	850	-	942	834	-	-	-	-	-	-	-
Stage 2	940	832	-	954	850	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	8.5	8.9	1.2	0.7
HCM LOS	A	A		

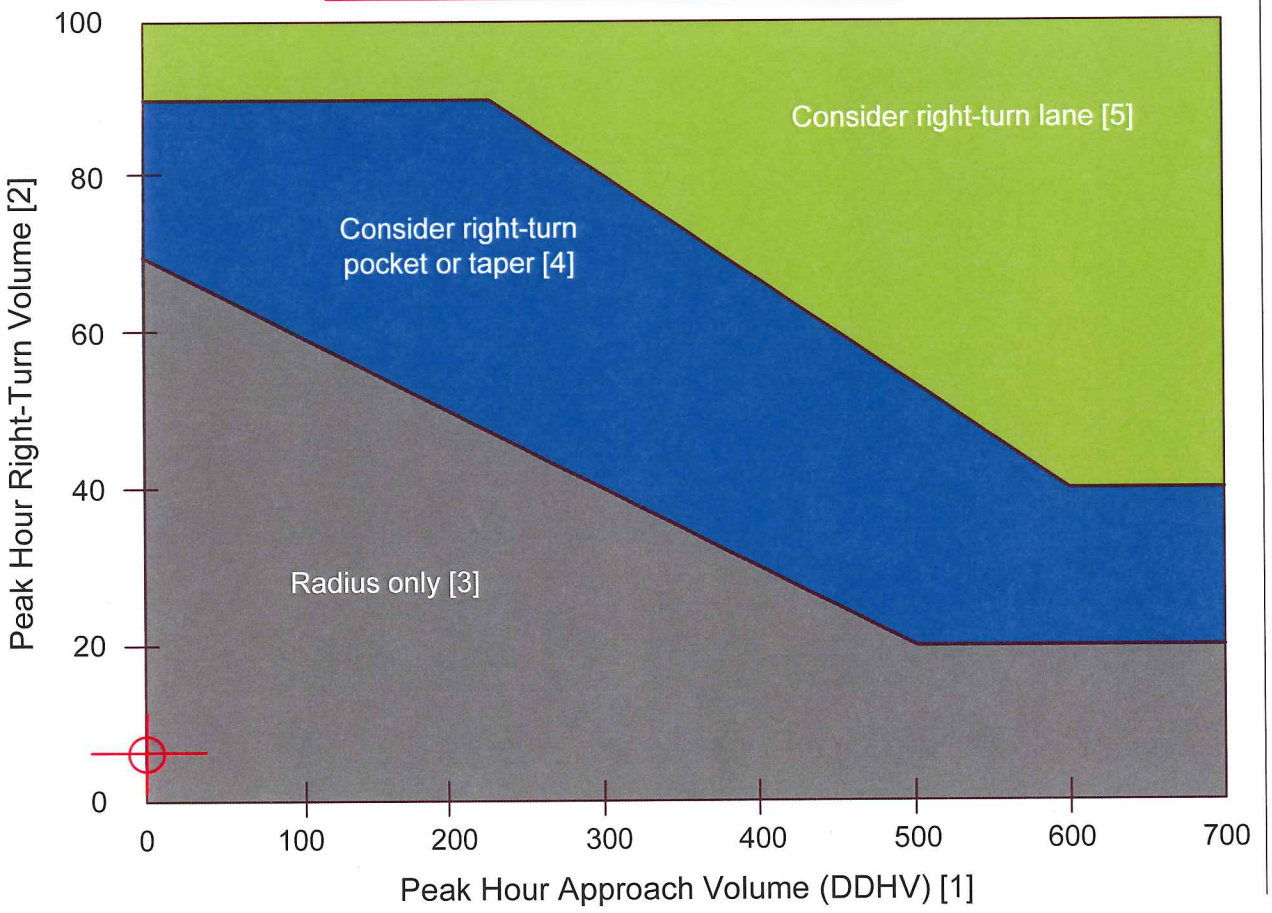
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1500	-	-	1021	921	1484	-	-
HCM Lane V/C Ratio	0.003	-	-	0.005	0.008	0.001	-	-
HCM Control Delay (s)	7.4	0	-	8.5	8.9	7.4	0	-
HCM Lane LOS	A	A	-	A	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-



Left-Turn Storage Guidelines: Two-Lane, Unsignalized

Exhibit 1310-7a

Enumclaw Franklin Rd SE & Entrances
2018 PM Peak with Project
Approach Volume: 24 vph
Right Turn Volume: 5 vph
Radius Only



Notes:

[1] For two-lane highways, use the peak hour DDHV (through + right-turn).
For multilane, high-speed highways (posted speed 45 mph or above), use the right-lane peak hour approach volume (through + right-turn).

[2] When all three of the following conditions are met, reduce the right-turn DDHV by 20:

- The posted speed is 45 mph or below
- The right-turn volume is greater than 40 VPH
- The peak hour approach volume (DDHV) is less than 300 VPH

[3] For right-turn corner design, see Exhibit 1310-6.

[4] For right-turn pocket or taper design, see Exhibit 1310-12.

[5] For right-turn lane design, see Exhibit 1310-13.

Right-Turn Lane Guidelines
Exhibit 1310-11