MML OFFICE BUILDING
TRAFFIC IMPACT ANALYSIS

City of Sumner, WA

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June 2015

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I. INTRODUCTION

Vehicular travel is an indirect yet important and dynamic element of new development which affects existing street networks and intersections near a project site. New development, such as residential subdivisions or commercial projects, typically translate into added vehicle trips on adjacent roadways which often causes an increase in traffic congestion to the local area. This study serves to examine traffic impacts related to the proposed MML Office Building. The main goals of this study focus on the assessment of existing traffic conditions and intersection congestion, forecasts of newly generated project traffic, and estimations of future delay. The first task includes the collection of general roadway information, road improvement information, entering sight distance data, and peak hour traffic counts. Next, a detailed level of service analysis of the existing volumes is made to determine present intersection congestion levels. Based on this analysis, forecasts of future travel patterns on the street system are developed using trip generation and trip distribution techniques. Following this forecast, future service levels for the key intersections are investigated. As a final step, appropriate conclusions and possible mitigation measures are defined.

II. PROJECT DESCRIPTION

The proposed project is a medical development that will construct a new 10,148 square foot orthodontics and dental office building. The site is located on the north side of 64th Street E, just east of 160th Avenue E in the City of Sumner. Access to the project will be provided by the shared YMCA parking lot located west of the project. This parking lot will have access to 64th Street and 160th Avenue. Existing on site is a single family residence that will be removed as part of the project. Land use surrounding the site is primarily a mix of residential and commercial developments. A horizon buildout/analysis year is assumed at 2017. Figure 1 shows the site location and the primary arterials. The general configuration of the project is given in the site plan of Figure 2.

III. EXISTING CONDITIONS

A. Surrounding Roadway Network

The street network serving the proposed project consists of a variety of roadways. Streets near the site mainly consist of primarily two-lane arterials. Characteristics for these roadways vary with respect to lane widths, grades, speeds, and function. Differences are based on specific designations and proximity to major employment areas in the region. The major roadways and arterials surrounding the site are listed and described on page 6.

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VICINITY MAP & ROADWAY SYSTEM

FIGURE 1

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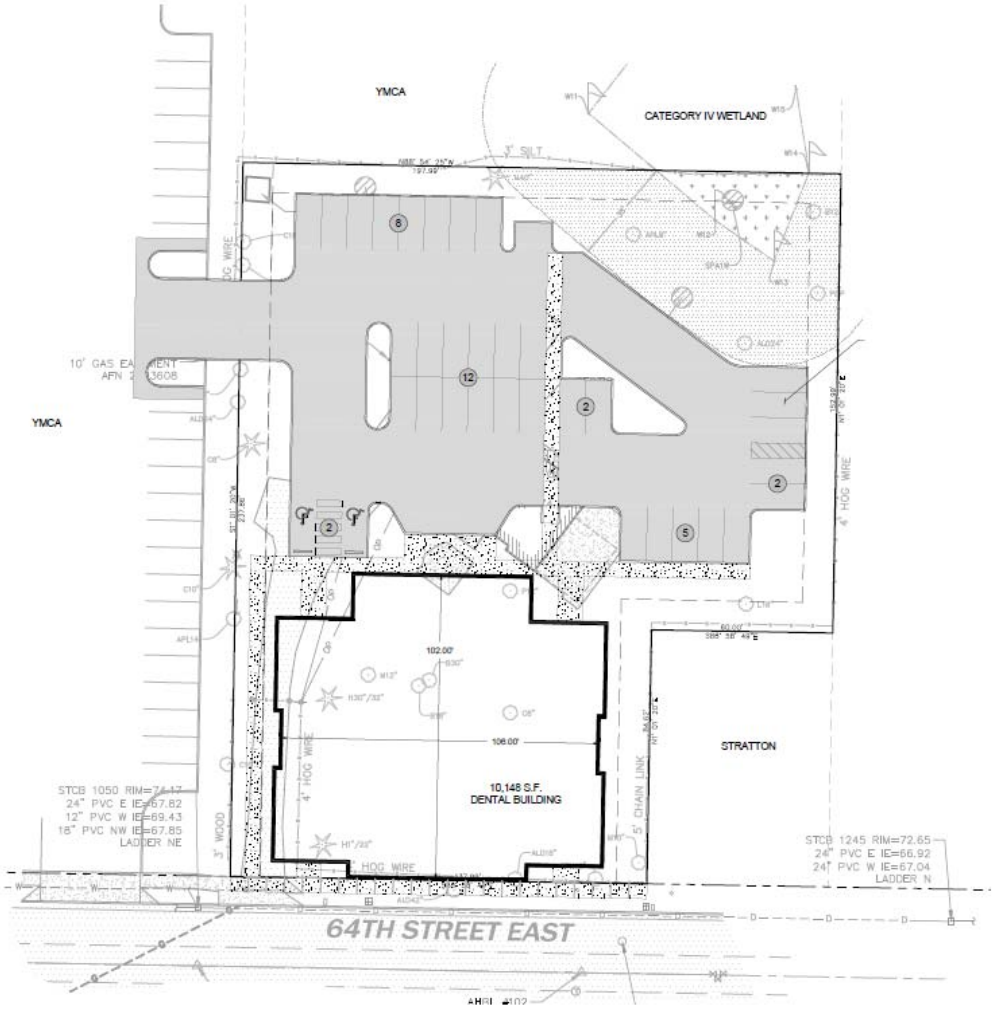

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SITE PLAN

FIGURE 2

64th Street E is a two-lane, east-west roadway that borders the south side of the site. The posted speed limit is 25 mph. Pavement surfacing is composed of conventional asphalt concrete. Lanes are roughly 12 feet wide with curb, gutter, and sidewalk shoulders. Further east shoulders are paved, transitioning into grass/gravel. On street parking is available along portions of the roadway. Grades are mild in the area.

B. Peak Hour Volumes and Travel Patterns

Field data for this study was collected in June of 2015. The traffic count used in this report was taken during the evening peak period between the hours of 4 PM and 6 PM. This specific peak period was targeted for analysis purposes since it generally represents a worst case scenario with respect to traffic conditions for commercial developments. This is primarily due to the common 8 AM to 5 PM work schedule. Most commuters return to their dwellings at the same time of day which translates to a natural peak in intersection traffic loads, especially when combined with the relatively large number of personal trips during the PM peak. Figure 3 on the following page shows the weekday PM peak volumes at the 64th Street & Sumner Tapps Highway intersection. Turning movement count data can be found in the appendix.

D. Pedestrian and Bicycle Traffic

Observations for pedestrian and bicycle activity were made at the key arterials and intersections of interest. During the evening peak hour mild to moderate pedestrian volumes were noted. The growing availability of pedestrian facilities in the form of sidewalks and crosswalks help alleviate any potential conflict between motorist and non-motorist traffic.

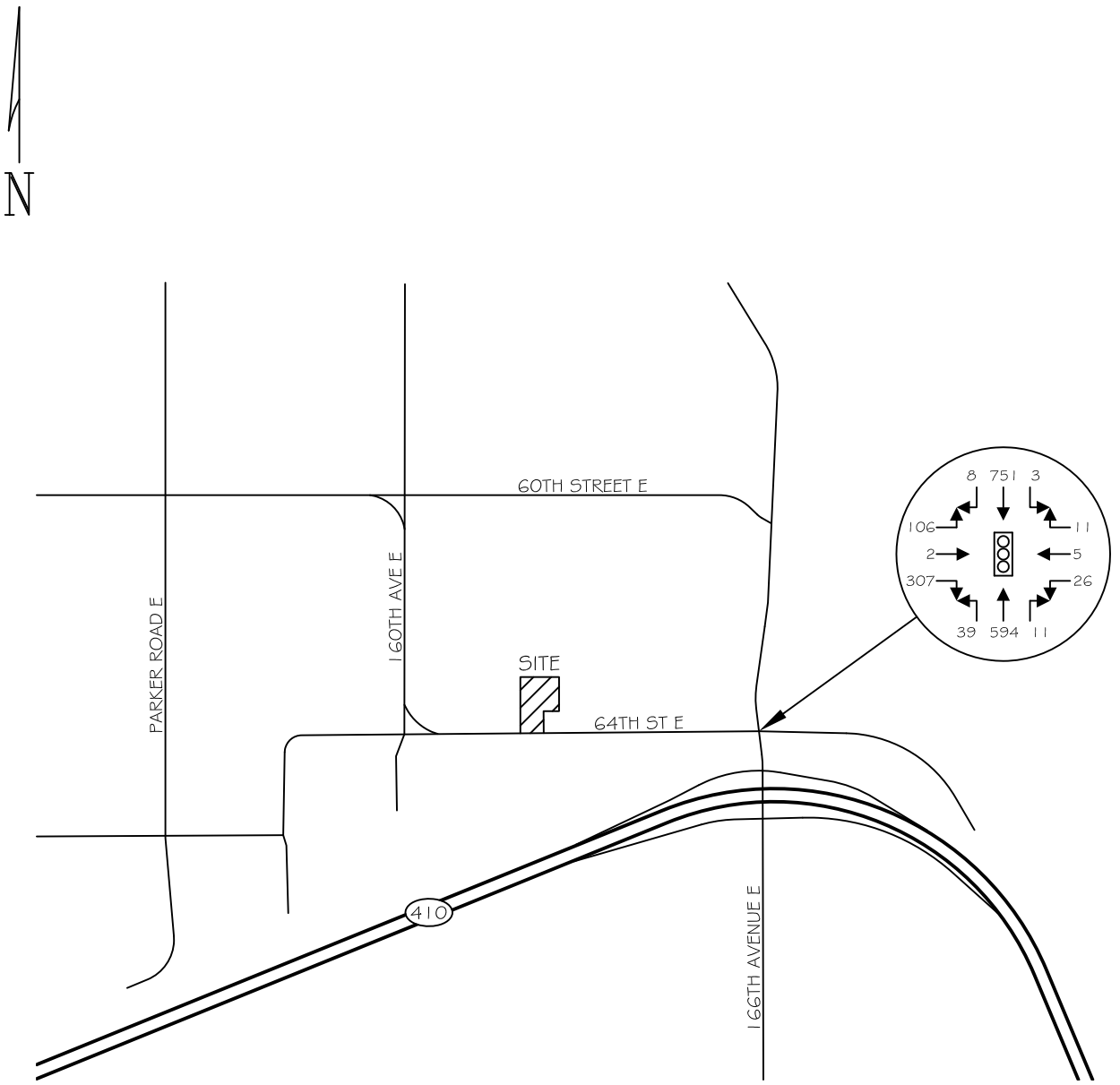
E. Transit Service

An examination of the Pierce Transit system map shows that no transportation service is currently provided in the vicinity of the site.

F. Roadway Improvements

A review of the latest City of Sumner Six-Year Transportation Improvement Program reveals two projects are planned near the site.

The SR-410 ramps along 166th Avenue are currently schedule for reconstruction (Project A-5). This project includes the installation of traffic signals and improving channelization. The westbound on/off ramp will be realigned to tie into 64th Street. Construction for this project is scheduled for 2016. The total cost is estimated at $4,000,000.



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EXISTING PM PEAK HOUR VOLUMES

FIGURE 3

Project A-6 shows 160th Avenue is scheduled to be widened and have bike lanes and sidewalks constructed to bring the roadway classification to a minor arterial. Construction is scheduled for 2015 at a cost of $3,200,000.

IV. FUTURE TRAFFIC CONDITIONS

A. Trip Generation

Trip generation is used to determine the magnitude of project impacts on the surrounding street system. Data presented in this report was taken from the Institute of Transportation Engineer's publication *Trip Generation*, 9th Edition. The designated land use for this project is defined as Medical-Dental Office Building (LUC 720). Table 1 gives a summary of the estimated project trips for the Sumner Medical-Dental project. Included are the average weekday volumes and the AM and PM peak hour volumes. Refer to the appendix for the trip generation output.

TABLE 1
Project Trip Generation
10,148 s.f. Office

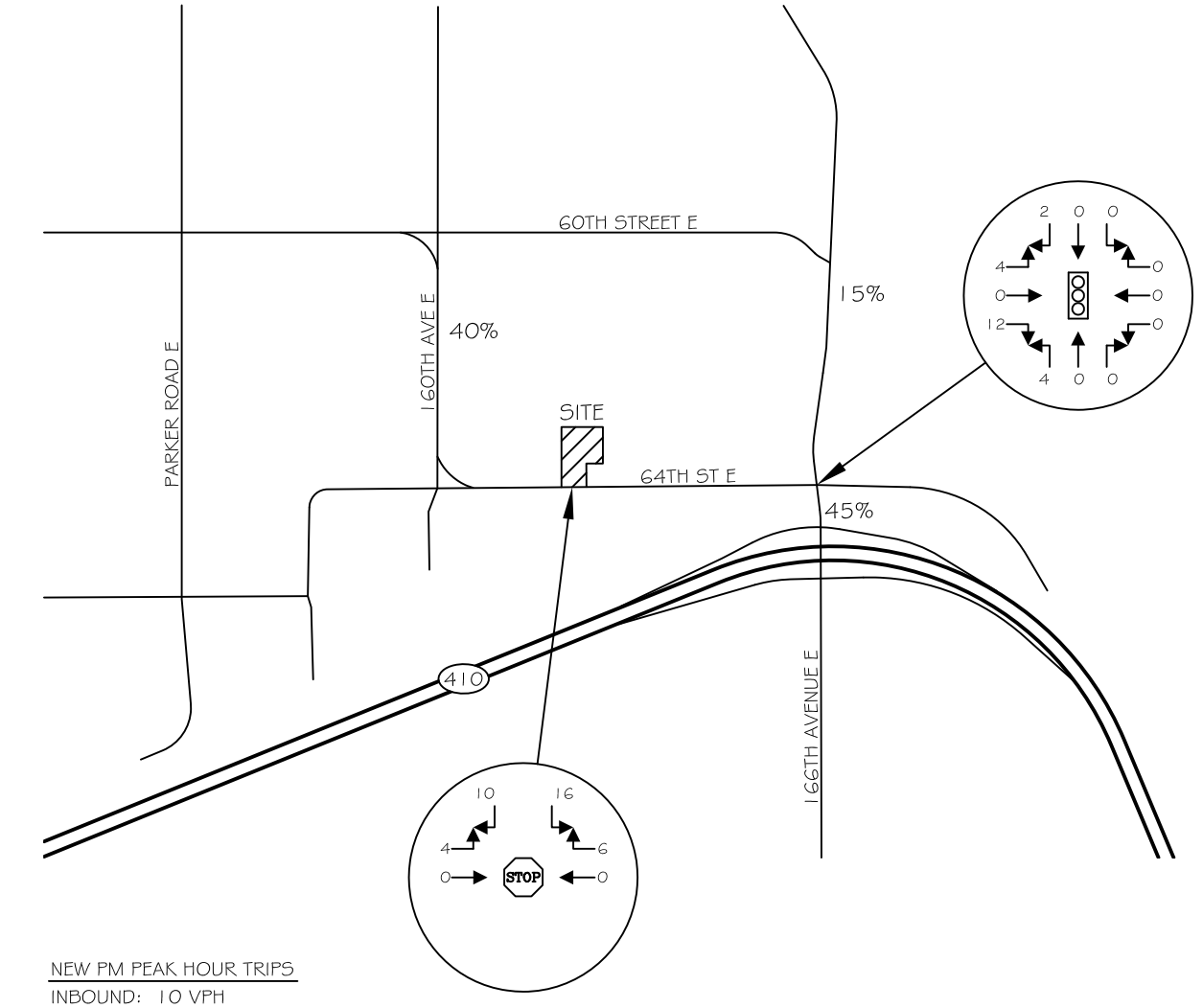
Time Period	*Volume*
AWDT	367 vpd
AM Peak Enter	19 vph
AM Peak Exit	5 vph
AM Peak Total	24 vph
PM Peak Enter	10 vph
PM Peak Exit	26 vph
PM Peak Total	36 vph

B. Trip Distribution

The pattern by which project trips disperse on the roadway network is highly variable and largely depends on driver behavior and psychological factors. Nonetheless, general estimations of traffic distribution are needed to determine the impacts of a project on nearby arterials. PM peak trips generated by the project are expected to follow the general pattern shown in Figure 4 on the following page. These figures reflect work-based and home-based trips during the peak hours. The rationale for the distribution percentages were generally based on existing travel patterns and the roadway network.

D. Future Traffic Volumes With and Without the Project

For this project a 2017 horizon analysis year of five years after gravel operations are expected to begin was used for future LOS analysis. Future traffic volumes without the project built out were derived by applying a flat 3 percent background growth rate per year to the existing traffic volumes shown in Figure 3. Pipeline volumes from the neighboring YMCA were also considered. Volumes for the YMCA were estimated off of



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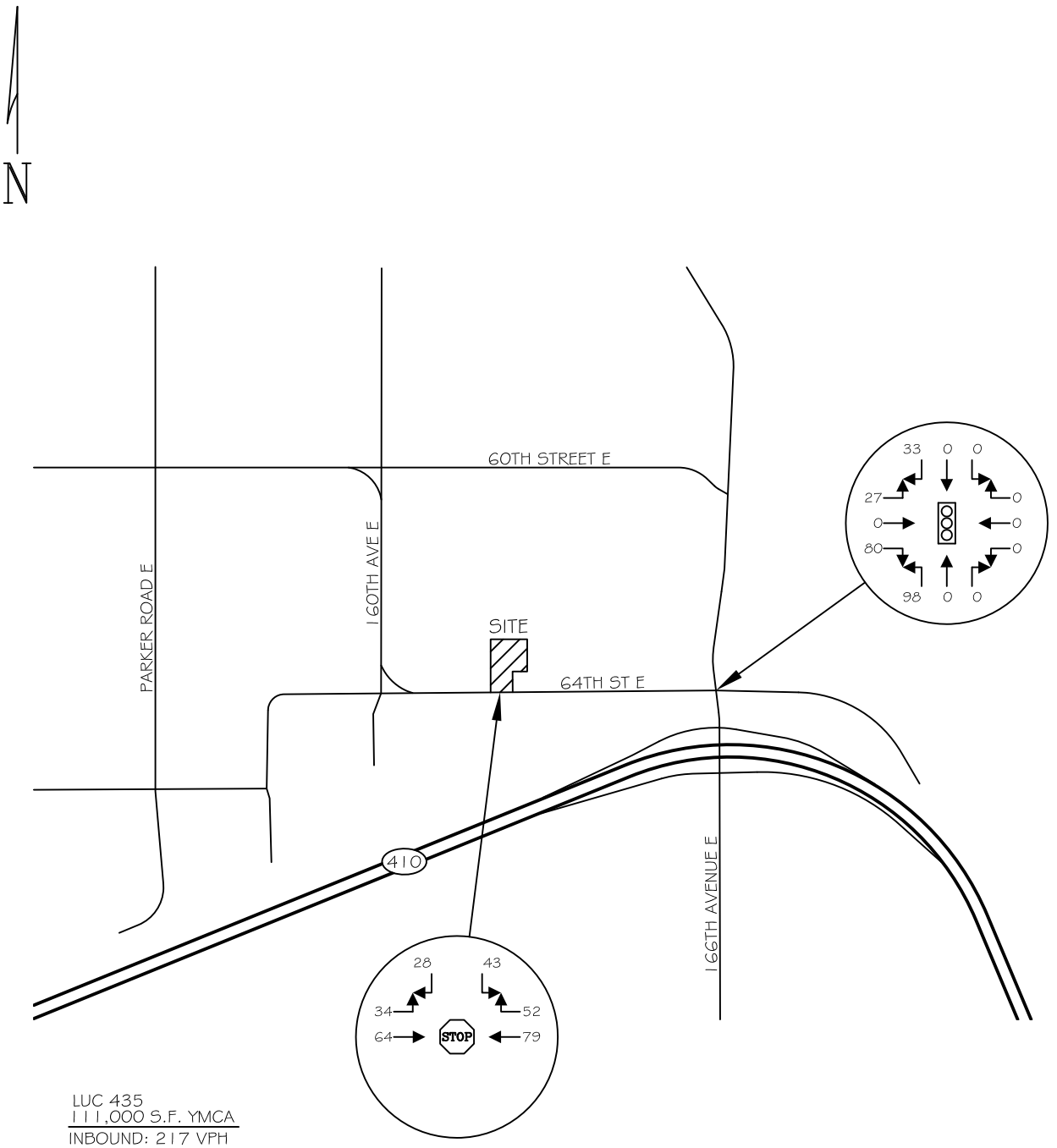
TRIP DISTRIBUTION & ASSIGNMENT

FIGURE 4



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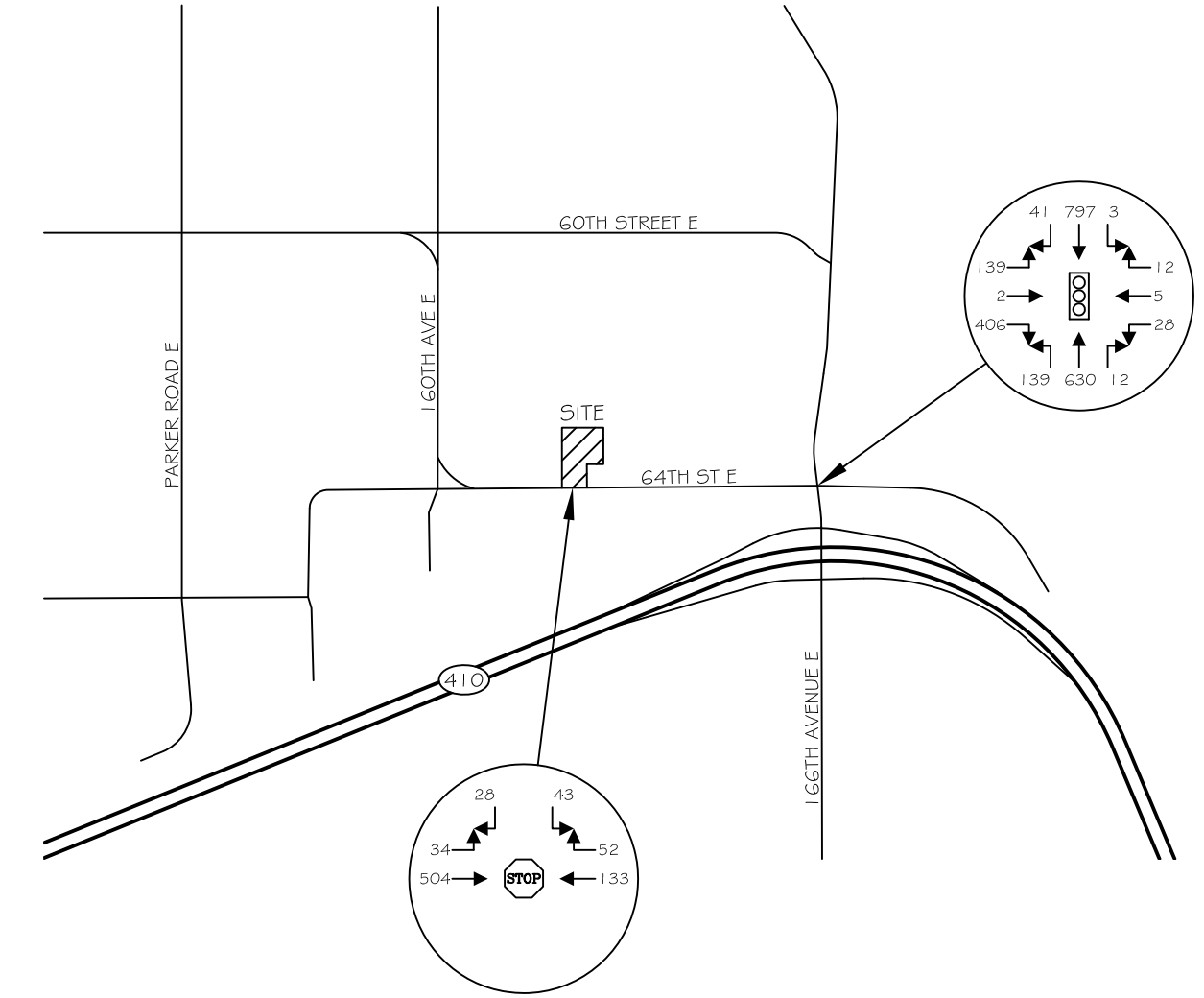
PIPELINE VOLUMES

FIGURE 5



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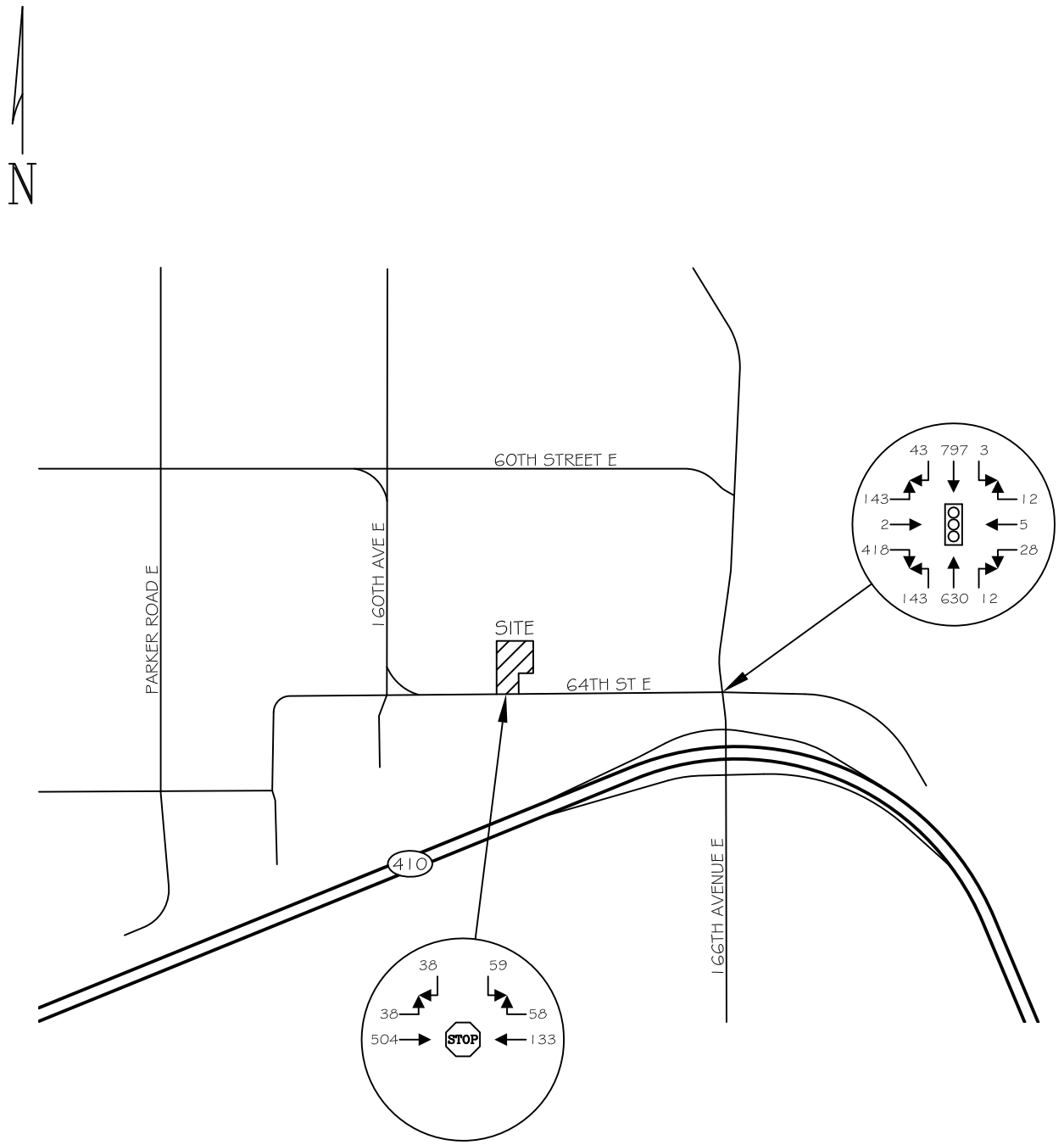
2017 PM PEAK HOUR VOLUMES WITHOUT PROJECT

FIGURE 6



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2017 PM PEAK HOUR VOLUMES WITH PROJECT

FIGURE 7

the ITE data for a Multipurpose Recreation Facility. The PM peak volumes were distributed according the distribution given in Figure 4. The YMCA will have multiple accesses, therefore the shared access was assumed to support 40 percent of the total YMCA traffic. The YMCA pipeline volumes are given in Figure 5. Future 2017 intersection volumes without project traffic are given in Figure 6. Figure 7 shows with project traffic volumes.

E. Level of Service

Peak hour delays were determined through the use of the *Highway Capacity Manual 2010*. 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. The below LOS results were calculated using the computer analysis program Synchro. Detailed descriptions of intersection LOS are given in the 2010 Highway Capacity Manual. Level of service results and accompanying approach delays for the project entrance are shown below in Table 2.

TABLE 2
Level of Service
Delays given in Seconds Per Vehicle

			Existing		Without		With	
Intersection	*Control*	*Geometry*	*LOS*	*Delay*	*LOS*	*Delay*	*LOS*	*Delay*
64th St/Tapps Hwy	Signal	Eastbound	B	19.0	C	25.8	C	27.0
		Westbound	B	15.2	B	14.4	B	14.4
		Northbound	A	8.4	B	11.6	B	11.8
		Southbound	B	11.5	B	18.1	B	18.4
		Overall	B	12.2	B	17.6	B	18.2
64th St/Entrance	Stop	Southbound	-	-	B	12.8	B	13.5
		Eastbound LT	-	-	A	7.7	A	7.7

As shown, existing delays are generally mild. Future delays show increases in LOS and overall delays. The 64th Street & Sumner Tapps Highway intersection shows that volumes associated with the new YMCA will cause increases in delays. Project traffic will have a minimal impact at this intersection. The shared access onto 64th Street will operate with satisfactory delays. Overall, the project will not have a significant impact on the main intersection supporting the majority of project traffic.

V. CONCLUSIONS AND MITIGATION

The proposed project will construct a new 10,148 square foot orthodontics and dental office building. The site is located on the north side of 64th Street E, just east of 160th Avenue E in the City of Sumner. Access to the project will be provided by the shared YMCA parking lot located west of the project, which will have access to 64th Street and 160th Avenue. The project will be a mild generator of traffic to the area with 367 daily trips expected. During the PM peak hour 36 trips are expected.

The 64th Street & Sumner Tapps Highway intersection will support the majority of project traffic. Mild delays presently exist at this intersection with LOS at LOS B or better. Future delay analysis shows delays will increase due primarily to YMCA traffic. Overall, project traffic was found not to have a significant impact on the local roadway system.

The City of Sumner collects TIF for medical-dental offices at $4,264 per thousand square feet. With credit given for the existing single family residence (at $1,177) the total TIF for the project is calculated at:

$4,264 x 10.148 - $1,177 = $42,094.07

No other mitigation is identified at this time.

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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

Detailed Average Rate Trip Calculations
For 10.148 Th.Sq.Ft. GFA of Medical-Dental Office Building(720) - [R]

Project: MML Office Bldg
Phase:

Open Date:
Analysis Date:

Description:

	Average Rate	Standard Deviation	Adjustment Factor	Driveway Volume
Avg. Weekday 2-Way Volume	36.13	10.18	1.00	367
7-9 AM Peak Hour Enter	1.89	0.00	1.00	19
7-9 AM Peak Hour Exit	0.50	0.00	1.00	5
7-9 AM Peak Hour Total	2.39	1.89	1.00	24
4-6 PM Peak Hour Enter	1.00	0.00	1.00	10
4-6 PM Peak Hour Exit	2.57	0.00	1.00	26
4-6 PM Peak Hour Total	3.57	2.47	1.00	36
AM Pk Hr, Generator, Enter	2.35	0.00	1.00	24
AM Pk Hr, Generator, Exit	1.15	0.00	1.00	12
AM Pk Hr, Generator, Total	3.50	2.35	1.00	36
PM Pk Hr, Generator, Enter	1.67	0.00	1.00	17
PM Pk Hr, Generator, Exit	2.60	0.00	1.00	26
PM Pk Hr, Generator, Total	4.27	2.50	1.00	43
Saturday 2-Way Volume	8.96	9.17	1.00	91
Saturday Peak Hour Enter	2.07	0.00	1.00	21
Saturday Peak Hour Exit	1.56	0.00	1.00	16
Saturday Peak Hour Total	3.63	1.93	1.00	37
Sunday 2-Way Volume	1.55	1.80	1.00	16
Sunday Peak Hour Enter	0.21	0.00	1.00	2
Sunday Peak Hour Exit	0.19	0.00	1.00	2
Sunday Peak Hour Total	0.40	0.00	1.00	4

Note: A zero indicates no data available.
Source: Institute of Transportation Engineers
Trip Generation Manual, 9th Edition, 2012

TRIP GENERATION 2013, TRAFFICWARE, LLC

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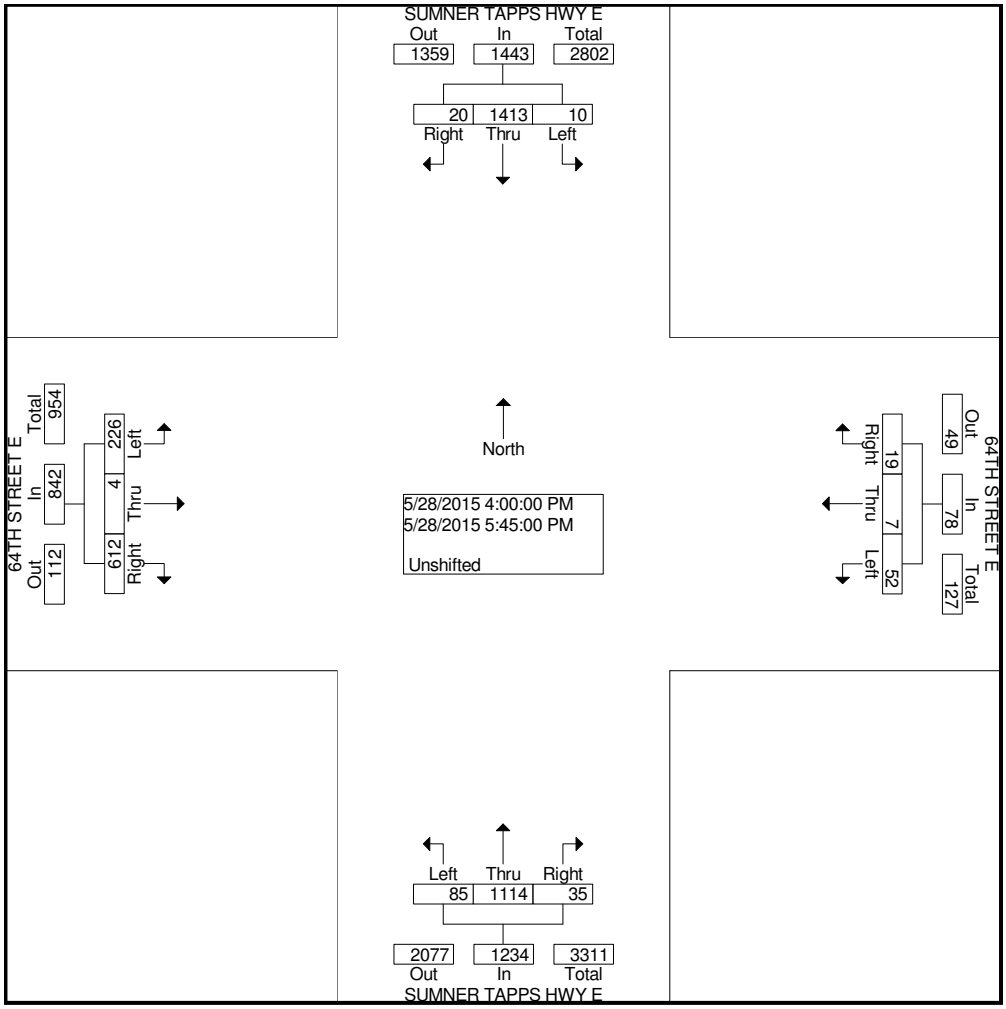
File Name : 3635a
Site Code : 00003635
Start Date : 5/28/2015
Page No : 1

Groups Printed- Unshifted

	SUMNER TAPPS HWY E Southbound			64TH STREET E Westbound			SUMNER TAPPS HWY E Northbound			64TH STREET E 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	
04:00 PM	3	155	2	3	1	11	4	116	14	74	1	29	413
04:15 PM	4	141	1	2	0	10	9	123	10	95	0	35	430
04:30 PM	0	162	2	2	0	5	8	137	11	94	0	30	451
04:45 PM	1	182	1	5	4	9	7	160	8	87	0	30	494
Total	8	640	6	12	5	35	28	536	43	350	1	124	1788
05:00 PM	0	158	0	3	0	6	3	142	9	103	1	24	449
05:15 PM	1	208	0	0	0	4	1	137	9	69	1	24	454
05:30 PM	6	203	2	3	1	7	0	155	13	48	0	28	466
05:45 PM	5	204	2	1	1	0	3	144	11	42	1	26	440
Total	12	773	4	7	2	17	7	578	42	262	3	102	1809
Grand Total	20	1413	10	19	7	52	35	1114	85	612	4	226	3597
Apprch %	1.4	97.9	0.7	24.4	9.0	66.7	2.8	90.3	6.9	72.7	0.5	26.8	
Total %	0.6	39.3	0.3	0.5	0.2	1.4	1.0	31.0	2.4	17.0	0.1	6.3	



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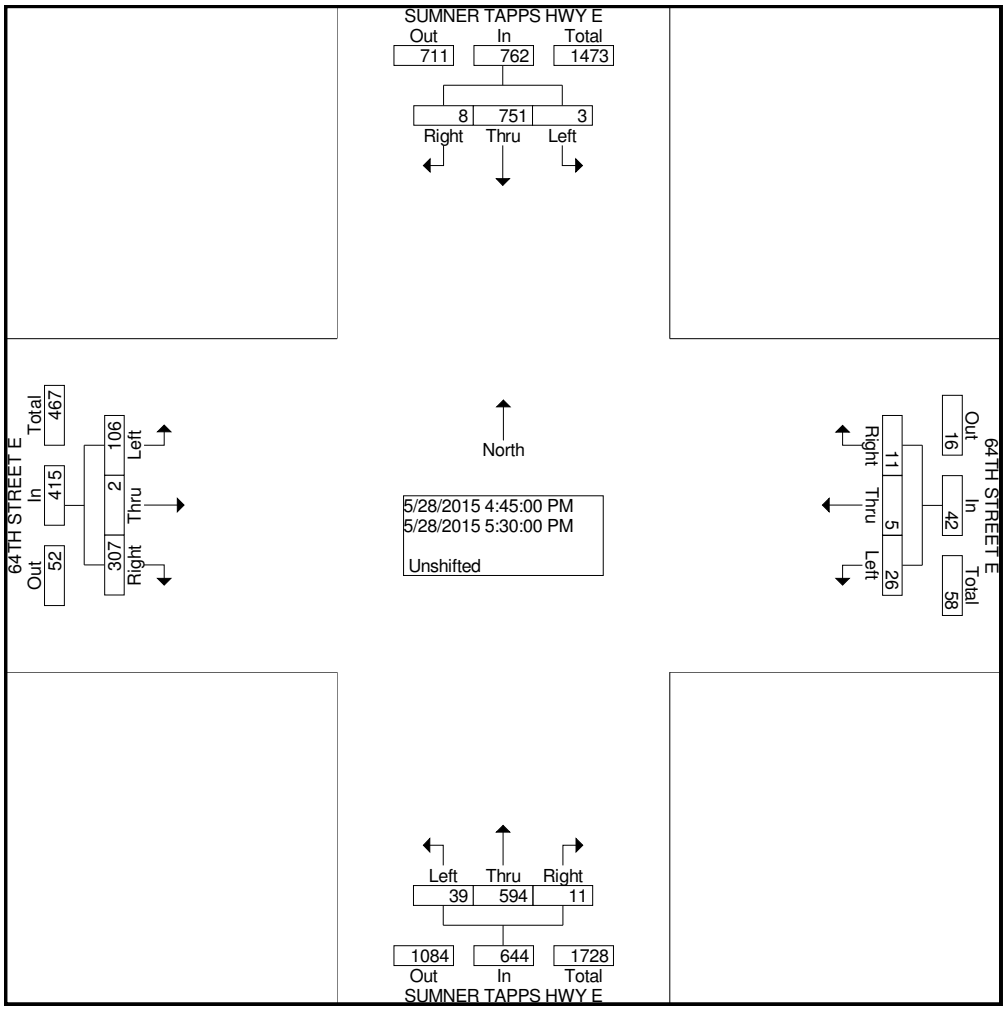
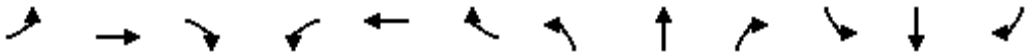
File Name : 3635a
Site Code : 00003635
Start Date : 5/28/2015
Page No : 2

	SUMNER TAPPS HWY E Southbound				64TH STREET E Westbound				SUMNER TAPPS HWY E Northbound				64TH STREET E 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 04:00 PM to 05:45 PM - Peak 1 of 1																	
Intersection	04:45 PM																
Volume	8	751	3	762	11	5	26	42	11	594	39	644	307	2	106	415	1863
Percent	1.0	98.6	0.4		26.2	11.9	61.9		1.7	92.2	6.1		74.0	0.5	25.5		
04:45 Volume	1	182	1	184	5	4	9	18	7	160	8	175	87	0	30	117	494
Peak Factor																	0.943
High Int.	05:30 PM				04:45 PM				04:45 PM				05:00 PM				
Volume	6	203	2	211	5	4	9	18	7	160	8	175	103	1	24	128	
Peak Factor				0.903				0.583				0.920				0.811	



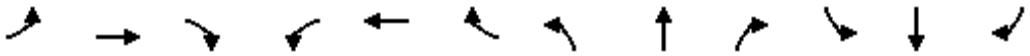


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	106	2	307	26	5	11	39	594	11	3	751	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	0		0	50		0	0		0
Storage Lanes	1		0	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.851			0.964			0.997			0.999	
Flt Protected	0.950				0.970		0.950					
Satd. Flow (prot)	1770	1585	0	0	1742	0	1770	1857	0	0	1861	0
Flt Permitted	0.728				0.574		0.343				0.999	
Satd. Flow (perm)	1356	1585	0	0	1031	0	639	1857	0	0	1859	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		171			12			3			2	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1385			528			724			616	
Travel Time (s)		31.5			12.0			16.5			14.0	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	113	2	327	28	5	12	41	632	12	3	799	9
Shared Lane Traffic (%)												
Lane Group Flow (vph)	113	329	0	0	45	0	41	644	0	0	811	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	22.0	22.0		22.0	22.0		38.0	38.0		38.0	38.0	
Total Split (%)	36.7%	36.7%		36.7%	36.7%		63.3%	63.3%		63.3%	63.3%	
Maximum Green (s)	18.0	18.0		18.0	18.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0			0.0		0.0	0.0			0.0	
Total Lost Time (s)	4.0	4.0			4.0		4.0	4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	11.4	11.4			11.4		35.1	35.1			35.1	
Actuated g/C Ratio	0.21	0.21			0.21		0.64	0.64			0.64	
v/c Ratio	0.40	0.70			0.20		0.10	0.54			0.68	
Control Delay	21.9	18.0			15.2		6.0	8.5			11.5	
Queue Delay	0.0	0.0			0.0		0.0	0.0			0.0	
Total Delay	21.9	18.0			15.2		6.0	8.5			11.5	
LOS	C	B			B		A	A			B	
Approach Delay		19.0			15.2			8.4			11.5	
Approach LOS		B			B			A			B	
Queue Length 50th (ft)	31	44			9		4	89			130	
Queue Length 95th (ft)	67	112			29		19	227			#342	
Internal Link Dist (ft)		1305			448			644			536	
Turn Bay Length (ft)	150						50					
Base Capacity (vph)	448	639			349		410	1196			1196	
Starvation Cap Reductn	0	0			0		0	0			0	
Spillback Cap Reductn	0	0			0		0	0			0	
Storage Cap Reductn	0	0			0		0	0			0	
Reduced v/c Ratio	0.25	0.51			0.13		0.10	0.54			0.68	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 54.6			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 12.2		Intersection LOS: B	
Intersection Capacity Utilization 73.9%		ICU Level of Service D	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: Sumner Tapps Hwy E & 64th Street E



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	139	2	406	28	5	12	139	630	12	3	797	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	0		0	50		0	0		0
Storage Lanes	1		0	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.851			0.963			0.997			0.993	
Flt Protected	0.950				0.970		0.950					
Satd. Flow (prot)	1770	1585	0	0	1740	0	1770	1857	0	0	1850	0
Flt Permitted	0.726				0.533		0.292				0.999	
Satd. Flow (perm)	1352	1585	0	0	956	0	544	1857	0	0	1848	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		152			13			3			7	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1385			528			724			616	
Travel Time (s)		31.5			12.0			16.5			14.0	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	148	2	432	30	5	13	148	670	13	3	848	44
Shared Lane Traffic (%)												
Lane Group Flow (vph)	148	434	0	0	48	0	148	683	0	0	895	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes										
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	22.0	22.0		22.0	22.0		38.0	38.0		38.0	38.0	
Total Split (%)	36.7%	36.7%		36.7%	36.7%		63.3%	63.3%		63.3%	63.3%	
Maximum Green (s)	18.0	18.0		18.0	18.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0			0.0		0.0	0.0			0.0	
Total Lost Time (s)	4.0	4.0			4.0		4.0	4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	15.0	15.0			15.0		34.2	34.2			34.2	
Actuated g/C Ratio	0.26	0.26			0.26		0.60	0.60			0.60	
v/c Ratio	0.42	0.82			0.19		0.46	0.62			0.81	
Control Delay	21.1	27.4			14.4		13.4	11.2			18.1	
Queue Delay	0.0	0.0			0.0		0.0	0.0			0.0	
Total Delay	21.1	27.4			14.4		13.4	11.2			18.1	
LOS	C	C			B		B	B			B	
Approach Delay		25.8			14.4			11.6			18.1	
Approach LOS		C			B			B			B	
Queue Length 50th (ft)	42	88			9		28	150			240	
Queue Length 95th (ft)	86	#220			31		76	250			#486	
Internal Link Dist (ft)		1305			448			644			536	
Turn Bay Length (ft)	150						50					
Base Capacity (vph)	427	604			310		325	1110			1106	
Starvation Cap Reductn	0	0			0		0	0			0	
Spillback Cap Reductn	0	0			0		0	0			0	
Storage Cap Reductn	0	0			0		0	0			0	
Reduced v/c Ratio	0.35	0.72			0.15		0.46	0.62			0.81	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 57.2			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.82			
Intersection Signal Delay: 17.6		Intersection LOS: B	
Intersection Capacity Utilization 115.3%		ICU Level of Service H	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: Sumner Tapps Hwy E & 64th Street E

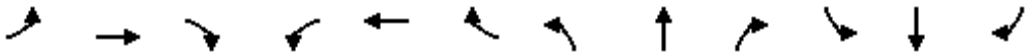
Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	34	504	133	52	43	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	2	2	0	0	0
Mvmt Flow	38	560	148	58	48	31

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	206	0	-	0	813	177
Stage 1	-	-	-	-	177	-
Stage 2	-	-	-	-	636	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1377	-	-	-	351	871
Stage 1	-	-	-	-	859	-
Stage 2	-	-	-	-	531	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1377	-	-	-	341	871
Mov Cap-2 Maneuver	-	-	-	-	431	-
Stage 1	-	-	-	-	859	-
Stage 2	-	-	-	-	516	-

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0	12.8
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1377	-	-	-	538
HCM Lane V/C Ratio	0.027	-	-	-	0.147
HCM Control Delay (s)	7.7	-	-	-	12.8
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.5



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	143	2	418	28	5	12	143	630	12	3	797	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	150		0	0		0	50		0	0		0
Storage Lanes	1		0	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.851			0.963			0.997			0.993	
Flt Protected	0.950				0.970		0.950					
Satd. Flow (prot)	1770	1585	0	0	1740	0	1770	1857	0	0	1850	0
Flt Permitted	0.726				0.524		0.290				0.999	
Satd. Flow (perm)	1352	1585	0	0	940	0	540	1857	0	0	1848	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		152			13			3			7	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1385			528			724			616	
Travel Time (s)		31.5			12.0			16.5			14.0	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	152	2	445	30	5	13	152	670	13	3	848	46
Shared Lane Traffic (%)												
Lane Group Flow (vph)	152	447	0	0	48	0	152	683	0	0	897	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane		Yes										
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	22.0	22.0		22.0	22.0		38.0	38.0		38.0	38.0	
Total Split (%)	36.7%	36.7%		36.7%	36.7%		63.3%	63.3%		63.3%	63.3%	
Maximum Green (s)	18.0	18.0		18.0	18.0		34.0	34.0		34.0	34.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0			0.0		0.0	0.0			0.0	
Total Lost Time (s)	4.0	4.0			4.0		4.0	4.0			4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Walk Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		11.0	11.0		11.0	11.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Pedestrian Calls (#/hr)	0	0		0	0		0	0		0	0	
Act Effct Green (s)	15.2	15.2			15.2		34.1	34.1			34.1	
Actuated g/C Ratio	0.26	0.26			0.26		0.59	0.59			0.59	
v/c Ratio	0.42	0.84			0.19		0.47	0.62			0.81	
Control Delay	21.1	29.0			14.4		13.9	11.3			18.4	
Queue Delay	0.0	0.0			0.0		0.0	0.0			0.0	
Total Delay	21.1	29.0			14.4		13.9	11.3			18.4	
LOS	C	C			B		B	B			B	
Approach Delay		27.0			14.4			11.8			18.4	
Approach LOS		C			B			B			B	
Queue Length 50th (ft)	43	94			9		29	150			240	
Queue Length 95th (ft)	88	#232			31		80	250			#489	
Internal Link Dist (ft)		1305			448			644			536	
Turn Bay Length (ft)	150						50					
Base Capacity (vph)	425	602			304		321	1105			1101	
Starvation Cap Reductn	0	0			0		0	0			0	
Spillback Cap Reductn	0	0			0		0	0			0	
Storage Cap Reductn	0	0			0		0	0			0	
Reduced v/c Ratio	0.36	0.74			0.16		0.47	0.62			0.81	

Intersection Summary			
Area Type:	Other		
Cycle Length: 60			
Actuated Cycle Length: 57.4			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.84			
Intersection Signal Delay: 18.2		Intersection LOS: B	
Intersection Capacity Utilization 115.4%		ICU Level of Service H	
Analysis Period (min) 15			
# 95th percentile volume exceeds capacity, queue may be longer.			
Queue shown is maximum after two cycles.			

Splits and Phases: 3: Sumner Tapps Hwy E & 64th Street E

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	38	504	133	58	59	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	2	2	0	0	0
Mvmt Flow	42	560	148	64	66	42

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	212	0	-	0	824	180
Stage 1	-	-	-	-	180	-
Stage 2	-	-	-	-	644	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1370	-	-	-	346	868
Stage 1	-	-	-	-	856	-
Stage 2	-	-	-	-	527	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1370	-	-	-	335	868
Mov Cap-2 Maneuver	-	-	-	-	426	-
Stage 1	-	-	-	-	856	-
Stage 2	-	-	-	-	511	-

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0	13.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1370	-	-	-	532
HCM Lane V/C Ratio	0.031	-	-	-	0.203
HCM Control Delay (s)	7.7	-	-	-	13.5
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.8