TRANSPORTATION TECHNICAL REPORT

for

Sunrise Elementary School Replacement

PREPARED FOR:

Puyallup School District

PREPARED BY:

heffron transportation inc
6544 NE 61st Street, Seattle, WA 98115
ph: (206) 523-3939 ◆ fx: (206) 523-4949

August 16, 2017

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

This report presents the transportation impact analysis for the proposed replacement of Sunrise Elementary School at its existing site located at 2323-39th Avenue SE in Puyallup, Washington. It includes a description of existing and proposed conditions in the site vicinity, projected trip generation and distribution patterns, operational analysis at the site access driveways, and an assessment of the project's impacts to safety, transit service, and non-motorized facilities.

The study area, analysis approach, and assumptions were coordinated with the City of Puyallup's (City's) Traffic Engineer[1] after submittal of a *Transportation Analysis Scoping* memorandum.[2]

1.1. Project Description

1.1.1. Existing School

Sunrise Elementary School serves kindergarten through sixth grade (K-6) and consists of two main school buildings (totaling 46,432 square feet (sf)[3]) and three classrooms in two portable buildings (with 2,544 sf). The enrollment capacity of the existing school is 516 students; current (2016-17 school year) enrollment in grades K-6 was 515 students. However, there is also a Pre-K class of 15 students that brings total site enrollment to 530 students,[4] which slightly exceeds the current capacity (by 14 students).

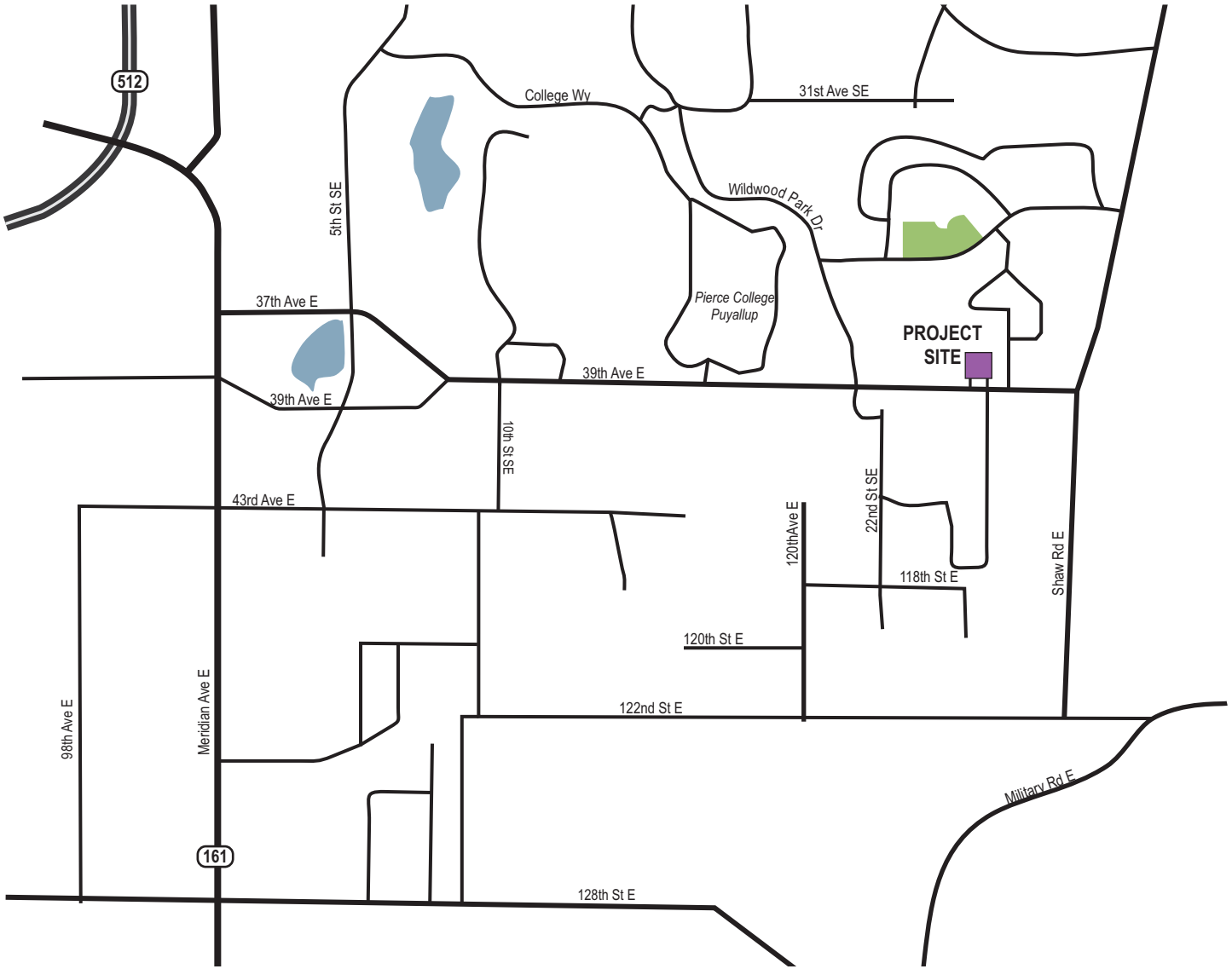
The school site has play fields located west of the buildings and on-site parking that occurs in three areas. The main parking lot south of the school building has 56 striped spaces. A separate lot located at the southwest corner of the site (south of the play fields) has 19 striped spaces with room for about 20 additional vehicles in an unstriped portion of the lot. There are 11 striped parking spaces designated for staff located to the north of the school building with paved areas and room for about 23 more vehicles. All vehicular site access is provided from two one-way driveways on 39th Avenue SE. The eastern entry-only access is located opposite 25th Street SE; the western exit-only driveway is located about 280 feet west of the entrance (measured between the closest edge of each driveway). The site location and vicinity are shown on Figure 1.

1.1.2. Proposed Replacement Project

The Puyallup School District proposes to replace the school at its existing site with a new building designed for an enrollment capacity of 730 students—an increase of 200 students compared to current enrollment. The project would replace existing structures and parking on the site with a new school building totaling about 80,500 sf.[5] The new school is proposed to retain the two access driveways on 39th Avenue SE. However, the access would be reconfigured to consolidate passenger-vehicle access separate from school buses and some staff parking. Access and egress for a new separated school bus load/unload area and staff parking (for 28 vehicles) would be provided by a two-way driveway at the same location as the existing west exit driveway. Access and egress for the main parking lot (for 79 vehicles) and the passenger vehicle load/unload area would be provided at a widened two-way driveway at the same location as the existing entrance driveway (opposite 25th Street SE). In total, the site would have 107 parking spaces for school day conditions. The school-bus and passenger-vehicle load/unload zones may also be available for parking during non-school hours (such as for evening or weekend events) providing capacity for another 48 vehicles, with a total capacity of 155. The proposed site plan is shown on Figure 2.

---

1 Sanjeev Tandle, PE, PTOE, email and phone communication, May 25, 2017.
2 Heffron Transportation, Inc., April 20, 2017.
3 Pierce County Assessor Website, Accessed, June 2017.
4 Email communication, B. Devereux – Facilities Planning Director, Puyallup School District, November 1, 2016.
5 Studio Meng-Strazzara, June 29, 2017.

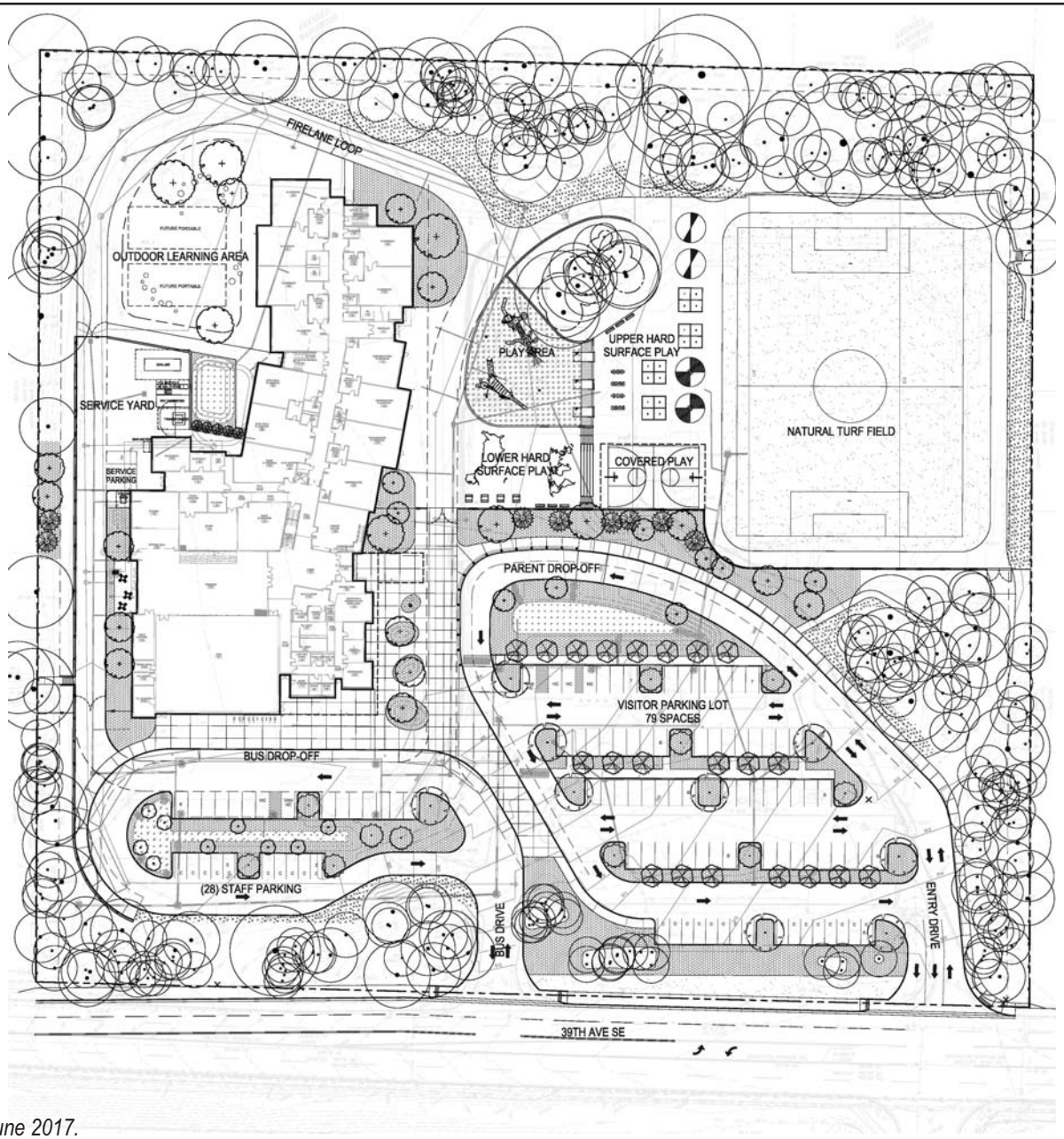


SUNRISE ELEMENTARY
School Replacement

Figure 1

Site Vicinity

heffron transportation inc



Source: Studio Meng Strazzara, June 2017.

SUNRISE ELEMENTARY
School Replacement

Figure 2

Proposed Site Plan

heffron transportation inc

2. EXISTING CONDITIONS

This section describes the existing roadway network, traffic volumes, traffic operations (in terms of levels of service), traffic safety, transit facilities, non-motorized facilities, and parking.

2.1. Roadway Network

The City designates streets as into major arterials, minor arterials, major collectors, minor collectors, and local streets depending upon the street's function in the roadway network.[6] The key roadways in the vicinity of the project site are described below.

39th Avenue SE is an east-west major arterial that connects between Shaw Road on the east and Woodland Avenue on the west. Near the school site, it has four/five lanes with two travel lanes in each direction and segments with a center two-way left-turn lane. There are curbs, gutters, and sidewalks on both sides and the roadway has a posted speed limit of 35 miles per hour (mph). Its intersections with Shaw Road to the east and Wildwood Park Drive/21st Place SE to the west are signalized with crosswalks and push-button pedestrian-actuated crossing signals.

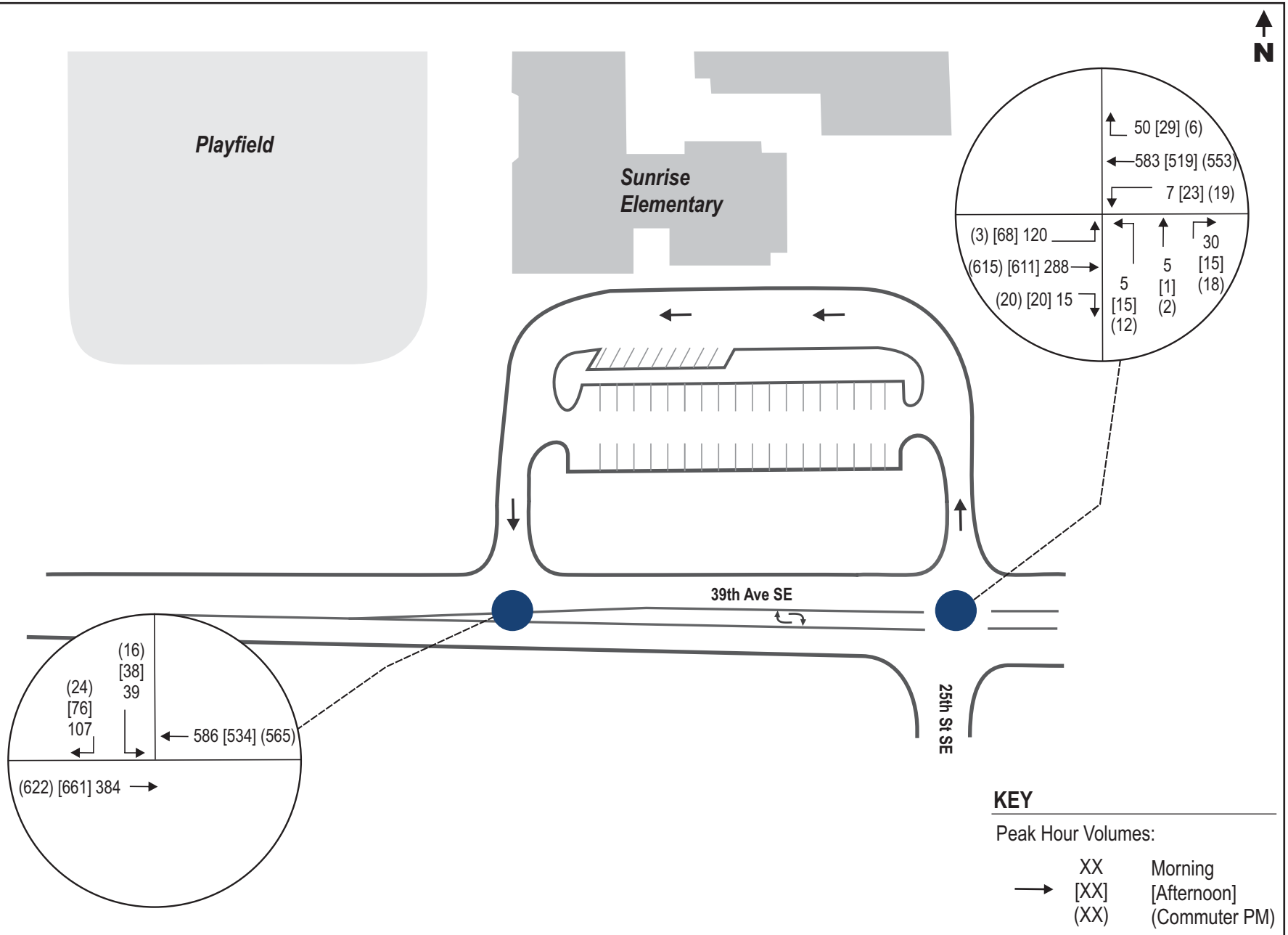
25th Street E is a two-lane north-south local residential street with a left-turn pocket on the south leg approach to 39th Avenue SE. At its intersection with 39th Avenue SE, its north leg is offset to the east of the south leg by about 230 feet (centerline-to-centerline). The south leg is aligned with the Sunrise Elementary entry driveway.

2.2. Traffic Volumes

Classes at the existing Sunrise Elementary School start at 8:55 A.M. and are dismissed at 3:16 P.M. To evaluate the potential traffic conditions in the study area during times when the school generates its highest traffic volumes (the morning arrival and afternoon dismissal peak hours), video vehicle turning movement counts were performed on Tuesday, December 13, 2016. The morning counts were performed from 7:00 to 9:30 A.M.; the afternoon counts were performed from 2:30 to 6:00 P.M. In addition, 72-hour machine counts were performed December 13 through 15, 2016 to document existing daily trip generation at the site. Subsequently, new 48-hour machine counts were performed on 39th Avenue SE to the east and west of the school site, and on 25th Street SE just south of 39th Avenue SE, on June 7 and 8, 2017.

The traffic count data were compiled to document the 2017 existing morning arrival and afternoon dismissal peak hour traffic volumes for the school. Based on the counts, the school's morning peak hour occurs from 8:00 to 9:00 A.M.; the afternoon peak hour occurs from 2:45 to 3:45 P.M. To ensure a conservative worst-case analysis, the higher volumes obtained for these hours from the June 2017 machine counts on 39th Avenue SE and 25th Street SE were used for the analysis. The existing 2017 morning arrival and afternoon dismissal peak hour traffic volumes are shown on Figure 3; the count data sheets are provided in Appendix A.

[6] City of Puyallup, *Puyallup Comprehensive Plan – Transportation Element*, 2015.



SUNRISE ELEMENTARY
School Replacement

Figure 3
Existing (2016) Traffic Volumes
Morning, Afternoon, and Commuter PM Peak Hours

heffron transportation inc

2.3. Traffic Operations

Traffic operations analyses were performed for the two site access driveway intersections on 39th Avenue SE. Traffic operations are evaluated using levels of service (LOS) with six letter designations, "A" through "F." LOS A is the best and represents the best traffic operation with little or no delay to motorists. LOS F is the worst and indicates poor traffic operations with long delays. The level of service definitions and thresholds are provided in Appendix B. The City's adopted minimum operational standard for all intersections in the City is LOS D.[7]

Levels of service were determined using procedures in the *Highway Capacity Manual 2010*.[8] Delay calculations rely on complex equations that consider a number of variables. For example, delay at signalized intersections is determined based on a complex combination of variables including: traffic volume by intersection movement, lane configuration, signal phasing and timing, and number of pedestrian crossings. Delay at unsignalized intersections is determined for vehicles that must stop or yield for oncoming traffic. That delay is related to the availability of gaps in the main street's traffic flow and the ability of a driver to enter or pass through those gaps. All level-of-service calculations were performed using the *Synchro 9.1* traffic operations analysis software. The software models reflect current intersection geometries and levels of service were reported using the *HCM 2010* module for unsignalized intersections.

Table 1 summarizes levels of service for existing (2017) morning arrival, afternoon dismissal, and PM peak hours at the site access intersections. As shown, both intersections currently operate at LOS A overall during all three peak hours. However, northbound left turns from 25th Street SE operate at LOS F during the afternoon dismissal peak hour. All other movements operate at LOS D or better during all hours. The level-of-service calculation sheets are included in Appendix C.

Table 1. Level of Service – Existing (2017) Conditions

	Morning Peak Hour (8:00 to 9:00 A.M.)		Afternoon Peak Hour (2:45 to 3:45 P.M.)		PM Peak Hour (4:00 to 5:00 P.M.)	
Unsignalized Intersection	LOS [1]	Delay [2]	LOS	Delay	LOS	Delay
39th Ave SE / 25th St SE / SES Entry (overall)	A	1.6	A	1.5	A	0.7
Northbound Left Turns	D	26.4	F	53.6	D	29.5
Northbound Thru-Right Movements	A	9.6	B	14.3	B	11.5
Eastbound Left Turns	B	10.7	A	9.7	A	9.3
Westbound Left Turns	A	8.1	A	9.6	A	9.6
39th Avenue SE / SES Exit (overall)	A	2.9	A	2.6	A	0.9
Southbound Left Turns	C	18.7	C	20.5	C	16.1
Southbound Right Turns	B	13.9	B	13.2	B	10.9

Source: Heffron Transportation, January 2017

1. *LOS = Level of service.*
2. *Delay = Average seconds of delay per vehicle.*

7 Ibid.
8 HCM 2010, Transportation Research Board, 2010.

2.4. Parking

As described previously, the existing school has on-site parking in three areas with a total of 86 striped spaces. The main lot south of the school building has 56 striped parking spaces including 2 reserved for disabled permits and 9 spaces reserved for staff. The southwest lot has 19 striped spaces with room for an additional 20 vehicles in the paved south part of this lot. There are 11 marked spaces north of the school building designated for staff parking with additional paved areas that may accommodated up to 23 more vehicles. The areas north of the building are accessed from an internal drive that is signed "District Vehicles Only."

School-day parking demand at elementary schools is primarily driven by staffing levels and family-volunteer activity. Field counts of on-site parking demand were conducted on Wednesday, June 14, 2017, at 9:30 and 11:30 A.M. The first count found 63 parked vehicles (38 in the main lot, 4 in the southwest lot, and 21 parked north of the building); the second count found 66 vehicles (41 in the main lot, 4 in the southwest lot, and 21 parked north of the building). Based on the current school staffing level (48 employees[9]), the school generates about 1.38 parked vehicles per employee. This rate is consistent with rates for elementary schools observed by Heffron Transportation at numerous locations throughout western Washington. ITE's *Parking Generation*[10] does not include data for elementary schools based on staffing levels (the data provided are based on enrollment levels and are unclear if they reflect conditions during morning arrival, afternoon dismissal, or special events). *Parking Generation* does include an employee-based rate for middle schools of 1.22-vehicles-per-employee, which is also in the range of observations conducted by Heffron Transportation.

2.5. Traffic Safety

Collision data adjacent to the project site along 39th Avenue SE and between Wildwood Park Drive and 25th Street SE (north leg) were obtained from WSDOT. These data, reflecting the period between January 1, 2014, and June 1, 2017 (3.4 years), were examined to determine if there are any unusual traffic safety conditions that could impact or be impacted by the proposed project. The collision data are summarized in Table 2.

As shown, there was one collision at the intersection of 39th Avenue SE/25th Street SE (south leg)/Sunrise Elementary Access recorded in June 2016 at 1:45 A.M. According to WSDOT data, this collision was not related to the intersection and the contributing circumstance was identified as driver 'under influence of alcohol.'

There were nine collisions recorded during the study time period at the 39th Avenue SE/Wildwood Park Drive intersection. Seven of these collisions were identified as related to the intersection and two were identified as not related to the intersection. The seven collisions related to the intersection included two rear-end, two left turn, and two angle collisions. One collision involved a driver making a U-turn and hitting a fence. No collisions were identified along the roadway segments of 39th Avenue SE between Wildwood Park Drive and the north leg of 25th Street SE. None of the reported collisions involved bicyclists or pedestrians, and there were no fatalities. Overall, these data do not indicate any unusual traffic safety conditions.

9 Total from Sunrise Elementary Staff Directory, June 2017.
10 ITE, 4th Edition, 2010.

Table 2. Collision Summary (January 1, 2014 through June 1, 2017)

Intersection	Rear-End	Side-Swipe	Left Turn	Right Angle	Ped / Cycle	Other [a]	Total for 3.4 Years	Average/ Year
39th Ave SE / Wildwood Pk Dr	2	2	2	2	0	1	9	2.1
39th Ave SE / 25th St SE (south leg)	0	0	0	0	0	1	1	0.3
39th Ave SE / 25th St SE (north leg)	0	0	0	0	0	0	0	0.0
Roadway Segment	**Rear-End**	**Side-Swipe**	**Left Turn**	**Right Angle**	**Ped / Cycle**	**Other [a]**	**Total for 3.4Years**	**Average/ Year**
39th Ave SE – between Wildwood Pk Dr and 25th St SE (north leg)	0	0	0	0	0	0	0	0.0

Source: Washington State Department of Transportation, June 2017.

a. "Other" collision involved vehicle striking an object.

2.6. Transit Facilities and Service

The site is not directly served with transit stops; however, Pierce Transit provides bus service within the larger City of Puyallup and Pierce County areas. The closest transit stops are located nearly a mile to the west. One is located on the Pierce College Puyallup Campus and is served by Pierce Transit Route 4. Farther west, there are stops at the 39th Avenue SE/10th Street SE intersection that are served by Pierce Transit Routes 4 and 425.

2.7. Non-Motorized Transportation Facilities

As described in the *Roadway Network* section, 39th Avenue SE has sidewalks on both sides of the roadway within the study area. There are marked crosswalks with pedestrian signals at the two signalized intersections east and west of the site (about 840 feet east at Shaw Road, and about 740 feet west at Wildwood Park Drive/21st Place SE).

3. FUTURE BASELINE CONDITIONS

This section of the report presents the future conditions without the proposed project. Year 2019 was selected as the future horizon year for the analyses because this is the year the proposed Sunrise Elementary School Replacement project is planned to be complete and occupied. For comparison, and to provide an analysis of potential new traffic and parking impacts, year 2019 without-project conditions assume the existing Sunrise Elementary School would operate at its existing enrollment of 530 students. The following sections describe planned improvements, traffic volumes, and traffic operations (in terms of levels of service).

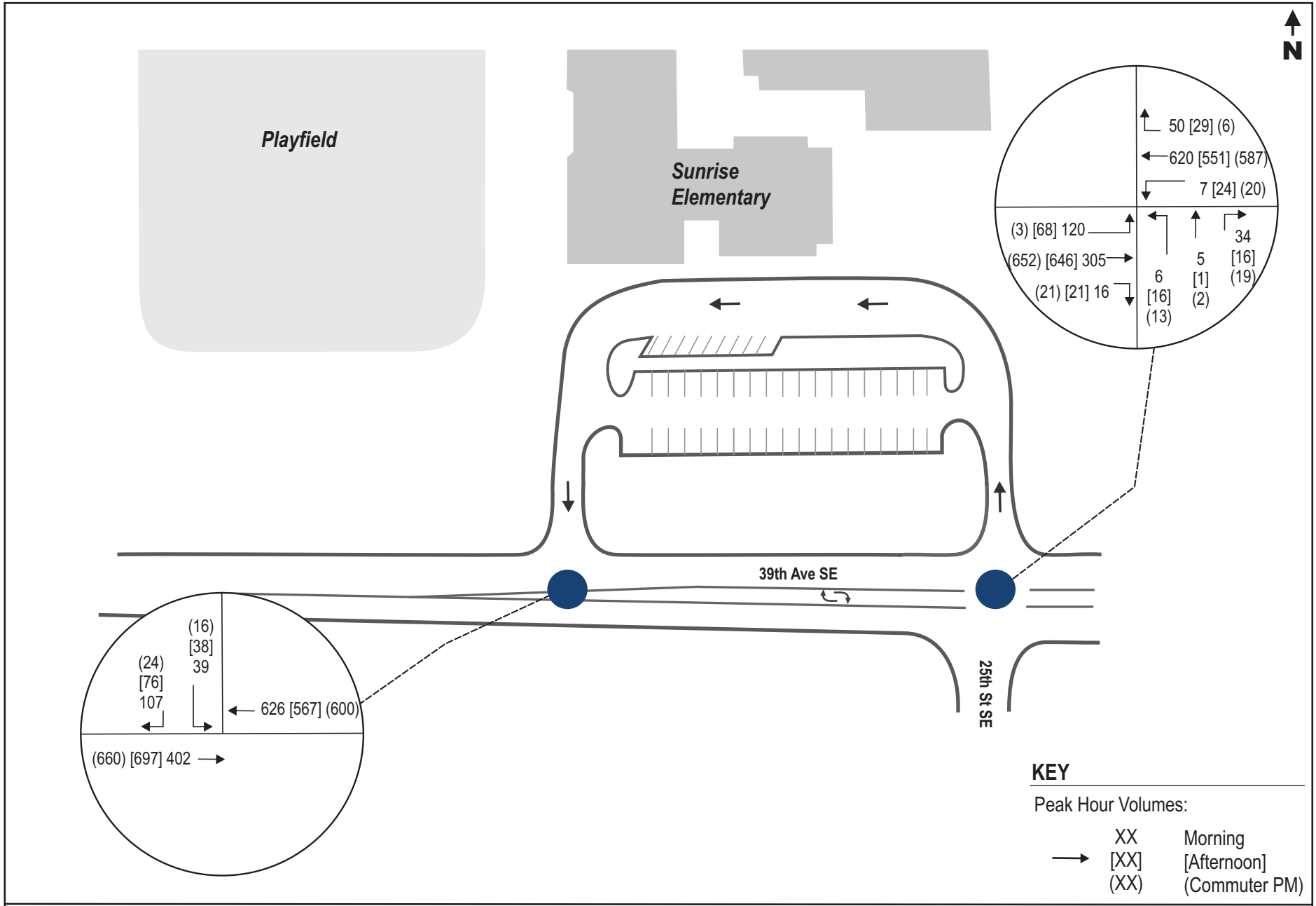
3.1. Planned Transportation Projects in Site Vicinity

The City of Puyallup's *2017-2022 Six-Year Transportation Improvement (TIP)*[11] summary sheet does not include any specific roadway improvement along 39th Avenue SE adjacent to the site that would affect the capacity or operations at the access intersections by year 2019. However, the City Traffic Engineer indicated that the City's *2018-2023 Six-Year Transportation Improvement Program (TIP)* will include a full traffic signal with marked crosswalks on all four approaches at the 39th Avenue SE/25th Street SE/Sunrise Elementary Access intersection.[12] The *Draft 2018-2023 TIP* summary sheet includes this as Project No. 56. This project is not expected to be complete prior to 2019, so the existing roadway network was assumed for 2019 baseline (without-project) analysis.

3.2. Forecast 2019 Background Traffic Volumes

Traffic forecasts were developed for future 2019 without-project conditions were based on guidance provided by the City's Traffic Engineer. A 3% compound annual growth rate was applied to the existing 2017 non-school traffic volumes on 39th Avenue SE to reflect 2019 without-project traffic estimates for each analysis period. The resulting 2019 "without project" volumes during morning arrival and afternoon dismissal peak hours are shown on Figure 4.

11 City of Puyallup, Adopted August 23, 2016.
12 Sanjeev Tandle, PE, PTOE, email and phone communication, May 25, 2017.



SUNRISE ELEMENTARY
School Replacement

Figure 4
Forecast 2019 Without-Project Traffic Volumes
Morning, Afternoon, and Commuter PM Peak Hours

heffron transportation inc

3.3. Traffic Operations

Levels of service for study area intersections were calculated for the 2019-without-project background conditions using the methodology described previously. Table 3 shows the results of the level of service analysis; results for the 2017 existing conditions are included for comparison.

As shown, the assumed increase in background traffic (3% compound annual growth) is forecast to result in increased delays during all three analysis periods. However, both intersections are projected to continue operating at LOS A overall and all movements would continue to operate at the same levels of service as existing conditions. Northbound left turns from 25th Street SE are projected to remain at LOS F during the afternoon dismissal peak hour with some additional delay, and also degrade to LOS E during the PM peak hour; all other movements would remain at LOS D or better during all hours.

Table 3. Level of Service – Background Off-Site Conditions

	Morning Peak Hour (8:00 to 9:00 A.M.)				Afternoon Peak Hour (2:45 to 3:45 P.M.)				PM Peak Hour (4:00 to 5:00 P.M.)			
	Existing		2019 w/o-Project		Existing		2019 w/o-Project		Existing		2019 w/o-Project	
Unsignalized Intersection	LOS [1]	Delay [2]	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
39th Ave SE / 25th St SE / SES Entry	A	1.6	A	1.6	A	1.5	A	1.7	A	0.7	A	0.9
Northbound Left Turns	D	26.4	D	28.3	F	53.6	F	63.2	D	29.5	E	42.3
Northbound Thru-Right	A	9.6	A	9.8	B	14.3	B	14.9	B	11.5	C	15.6
Eastbound Left Turns	B	10.7	B	11.1	A	9.7	A	9.9	A	9.3	A	9.4
Westbound Left Turns	A	8.1	A	8.2	A	9.6	A	9.8	A	9.6	A	9.8
39th Avenue SE / SES Exit (overall)	A	2.9	A	2.7	A	2.6	A	2.6	A	0.9	A	0.9
Southbound Left Turns	C	18.7	C	19.9	C	20.5	C	21.8	C	16.1	C	16.8
Southbound Right Turns	B	13.9	B	14.4	B	13.2	B	13.5	B	10.9	B	11.1

Source: Heffron Transportation, June 2017.

1. *LOS = Level of service.*
2. *Delay = Average seconds of delay per vehicle.*

4. FUTURE WITH PROJECT CONDITIONS

This section describes the conditions that would exist with the proposed new Sunrise Elementary School at its planned enrollment capacity of 730 students. Potential impacts to study-area traffic operations, site access, queuing, transit, safety, non-motorized facilities, and parking were evaluated. In addition, analysis of special event conditions and construction were examined.

4.1. Roadway Network

The new school is proposed to retain two access driveways on 39th Avenue SE. However, the access would be reconfigured to consolidate passenger-vehicle access separate from school buses and some staff parking. The reconfigured access would create two two-way driveways that would not be connected internally. The new separated school bus load/unload area and staff parking would be served by a two-way driveway at the location of the existing west exit driveway. The main parking lot and the passenger vehicle load/unload area would be served by a widened two-way driveway at the location of the existing east entrance driveway opposite 25th Street SE). Frontage improvements required by the City along 39th Avenue SE would extend the five-lane section west past the west site access driveway to provide a center left-turn pocket at both access locations.

4.2. Traffic Volumes

The proposed project is expected to generate new trips on the surrounding transportation network. With the enrollment capacity increase from 530 students to the proposed capacity of 730 students, the school is expected to generate an increase in morning, afternoon, and PM peak hour traffic compared to existing and future background conditions. The following sections describe the potential net increases in traffic expected to result from the proposed during the key analysis periods.

4.2.1. School Trip Generation Rates

Peak hour trip generation for the school was calculated based upon the counts described previously in *Section 2.2. Traffic Volumes*, and the existing school enrollment at the time of the counts (530 students). The counts reflect all school-related activities as well as extracurricular use of the school and playfields. Table 4 summarizes the results of the trip generation study for Sunrise Elementary. It lists the average number of trips generated for a weekday (24-hours), the AM peak hour (8:00 to 9:00 A.M.), afternoon peak hour (2:45 to 3:45 P.M.), and the PM peak hour of the adjacent street (4:00 and 5:00 P.M.). The current school hours (typically 8:55 A.M. to 3:16 P.M. on Tuesdays through Fridays, with a later start of 9:55 A.M. on Mondays) are not proposed to change with the project.

The average rates published in the Institute of Transportation Engineers' [ITE] *Trip Generation Manual*[13] for Elementary Schools (Land Use Code 520) are shown for comparison. As shown, the daily, AM peak hour, and afternoon peak hour rates observed at Sunrise Elementary are all somewhat higher than the average published ITE rates. The average trip rate for the PM peak hour of the adjacent street is slightly less than the published ITE rate. It is noted that these rates reflect all trips generated by the school including student pick-up/drop-offs, school bus trips, parent trips, teacher/staff trips, visitors, and after-hours use of fields or facilities. The enrollment at the time of the counts was provided by the District.

[13] ITE, 9th Edition, 2012.

Table 4. Trip Generation Summary – Sunrise Elementary School

School / Reporting Period	Enrollment [1] & Time Period	Number of Trips			Trip Rate (trips/student)			ITE Rates [2] For Comparison
		In	Out	Total	In	Out	Total	
Sunrise Elementary	530 Students [3]							
Average Weekday	24-hour	475	475	950	50%	50%	1.792	1.29 trips/student
AM Peak Hour	8:00 – 9:00 A.M.	175	146	321	55%	45%	0.606	0.45 trips/student
Afternoon Peak Hour	2:45 – 3:45 P.M.	98	115	213	46%	54%	0.400	0.28 trips/student
Street PM Peak Hour	4:00 – 5:00 P.M.	11	40	51	22%	78%	0.096	0.15 trips/student

Source: Number of trips is based on turning movement counts (TMCs) and machine counts performed at school's driveways. TMCs performed on Tuesday, Dec. 13, 2016 and machine counts performed Tuesday through Thursday, December 13-15, 2016.

1. *Enrollment in December 2016 provided by Puyallup School District.*
2. *Institute of Transportation Engineers (ITE), Trip Generation Manual, 9th Edition, 2012.*
3. *Enrollment includes 515 students in Kindergarten through Grade 6 plus 15 students in pre-kindergarten.*

4.2.2. Trip Generation Estimates for Replacement School

Table 5 summarizes the forecast trip generation for the existing and proposed replacement Sunrise Elementary School, based upon the calculated rates described above. It reflects the planned increase in number of students from an existing enrollment of 530 students to a proposed capacity of 730 students. As shown, the project is forecast to result in net increases of 360 trips per day, with 121 morning peak hour trips, 80 afternoon peak hour trips, and 19 PM peak hour trips.

Table 5. Sunrise Elementary School Replacement – Trip Generation Summary

Site Condition	Students	Daily Trips	Morning Peak Hour (8:00 to 9:00 A.M.)			Afternoon Peak Hour (2:45 to 3:45 P.M.)			PM Peak Hour (4:00 to 5:00 P.M.)		
			In	Out	Total	In	Out	Total	In	Out	Total
Proposed Replacement [1]	730	1,310	241	201	442	135	157	292	15	55	70
Existing School [2]	530	950	175	146	321	98	114	212	11	40	51
Net Change	200	360	66	55	121	37	43	80	4	15	19

Source: Heffron Transportation, Inc., January 2017 using rates developed for Sunrise Elementary from counts in December 2016.

1. *Proposed capacity of Sunrise Elementary.*
2. *Current enrollment of Sunrise Elementary.*

4.2.3. Trip Distribution and Assignment

Separate project trip distribution patterns and assignments were developed for the morning, afternoon, and PM peak hours to reflect typical patterns of some family drivers linking trips with work trips. The trip distribution patterns were based on a combination of sources including the overall residential density within the existing enrollment area for Sunrise Elementary School and a review of land uses presented in the updated *2015 Puyallup Comprehensive Plan.*[14] The current enrollment boundary for Sunrise Elementary extends between Meridian Avenue E (SR 161) to the west and Shaw Road to the east. About two-thirds of its area extends directly south of the school to 122nd Street E and southwest of the school to 128th Street E. The remaining third of the area extends directly north of the school to 31st Avenue SE and northwest of the school to 35th Avenue SE. It is recognized that attendance areas are subject to review by the Boundary Review Committee and ultimately the Puyallup School Board. The resulting total project

[14] City of Puyallup, Map 3-2, Updated December 29, 2015

trip distribution patterns and assignments for the morning arrival, afternoon dismissal, and PM peak hours are shown on Figure 5.

4.2.1. Forecast With-Project Traffic Volumes

To estimate 2019 traffic volumes with the proposed project, the project trips were added to the 2019 without-project volumes described and presented previously. Forecast 2019 with-project volumes for morning, afternoon, and PM peak hours (including school-bus trips) are shown on Figure 6.

4.3. Traffic Operations

4.3.1. Levels of Service

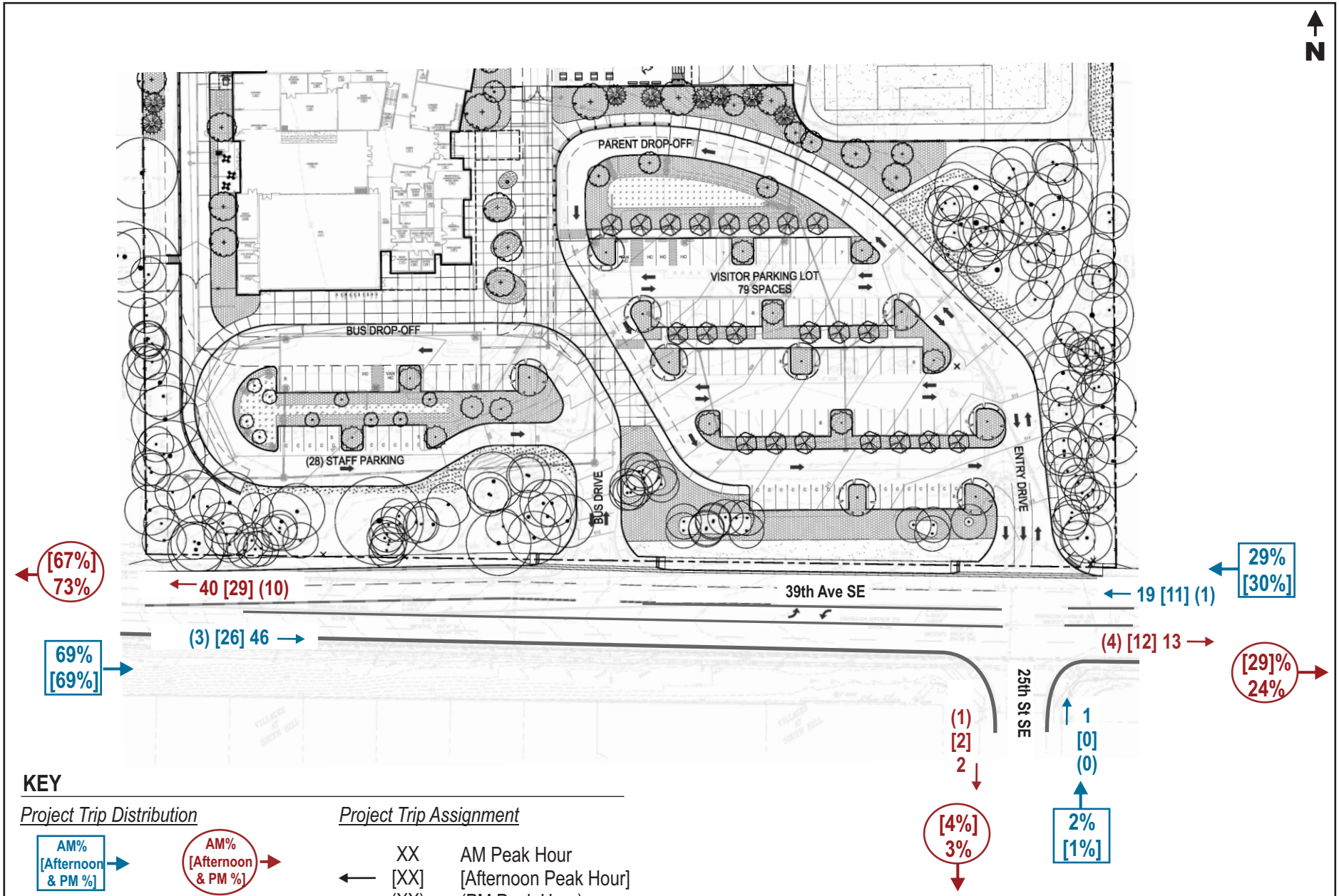
Intersection levels of service for with-project conditions were determined using the same methodology described previously. Table 6 summarizes forecast 2019-with-project levels of service; without-project results are shown for comparison. As shown, the project is expected to degrade operations at the 39th Avenue SE / 25th Street SE / Sunrise Elementary Access intersection. Northbound left-turns are forecast to degrade from LOS D to LOS F during the morning peak hour and experience large delay increases and LOS conditions during the afternoon peak hour. The southbound (exiting) left-turns from the school would also operate at LOS F with severe delays. As outlined later in this report, signalization would eliminate these impacts. The western school-bus/staff access driveway is forecast to operate at LOS A overall with all movements at LOS E or better during all three peak hours. Due to the predicted LOS E conditions, the District may desire to instruct bus drivers to turn right when exiting the site during peak periods to avoid delays. However, the HCM 2010 methodology does not account for gaps that are expected to occur with signalization of the main access driveway to the east. As a result, operations of the bus/staff access may be better than reported. Analysis using the HCM 2000 methodology, which does account for the upstream gaps, indicates the southbound movement could operate at LOS B.

Table 6. Level of Service – Future (2019) With-Project

	Morning Peak Hour (8:00 to 9:00 A.M.)				Afternoon Peak Hour (2:45 to 3:45 P.M.)				PM Peak Hour (4:00 to 5:00 P.M.)			
	2019 w/o-Project		2019 w/-Project		2019 w/o-Project		2019 w/-Project		2019 w/o-Project		2019 w/-Project	
Unsignalized Intersection	LOS [1]	Delay [2]	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
39th Ave SE / 25th St SE / SES Entry	A	1.6	C	16.1	A	1.7	C	24.6	A	0.9	A	2.5
Northbound Left Turns	D	28.3	F	62.8	F	63.2	F	144.2	E	42.3	E	48.0
Northbound Thru-Right	A	9.8	C	17.4	B	14.9	B	14.9	C	15.6	C	15.5
Eastbound Left Turns	B	11.1	B	11.2	A	9.9	A	9.9	A	9.4	A	9.5
Westbound Left Turns	A	8.2	A	8.1	A	9.8	A	9.6	A	9.8	A	9.7
Southbound Left Turns	n/a [3]		F	257.1	n/a [3]		F	355.1	n/a [3]		E	49.1
Southbound Thru-Right	n/a [3]		C	18.6	n/a [3]		C	18.1	n/a [3]		B	13.2
39th Avenue SE / SES Exit (overall)	A	2.7	A	1.4	A	2.6	A	0.9	A	0.9	A	0.4
Eastbound Left Turns	n/a [3]		B	12.2	n/a [3]		B	14.6	n/a [3]		A	9.1
Southbound Left Turns	C	19.9	E [4]	37.7	C	21.8	D [4]	33.0	C	16.8	C [4]	15.8
Southbound Right Turns	B	14.4			B	13.5			B	11.1		

Source: Heffron Transportation, June 2017.

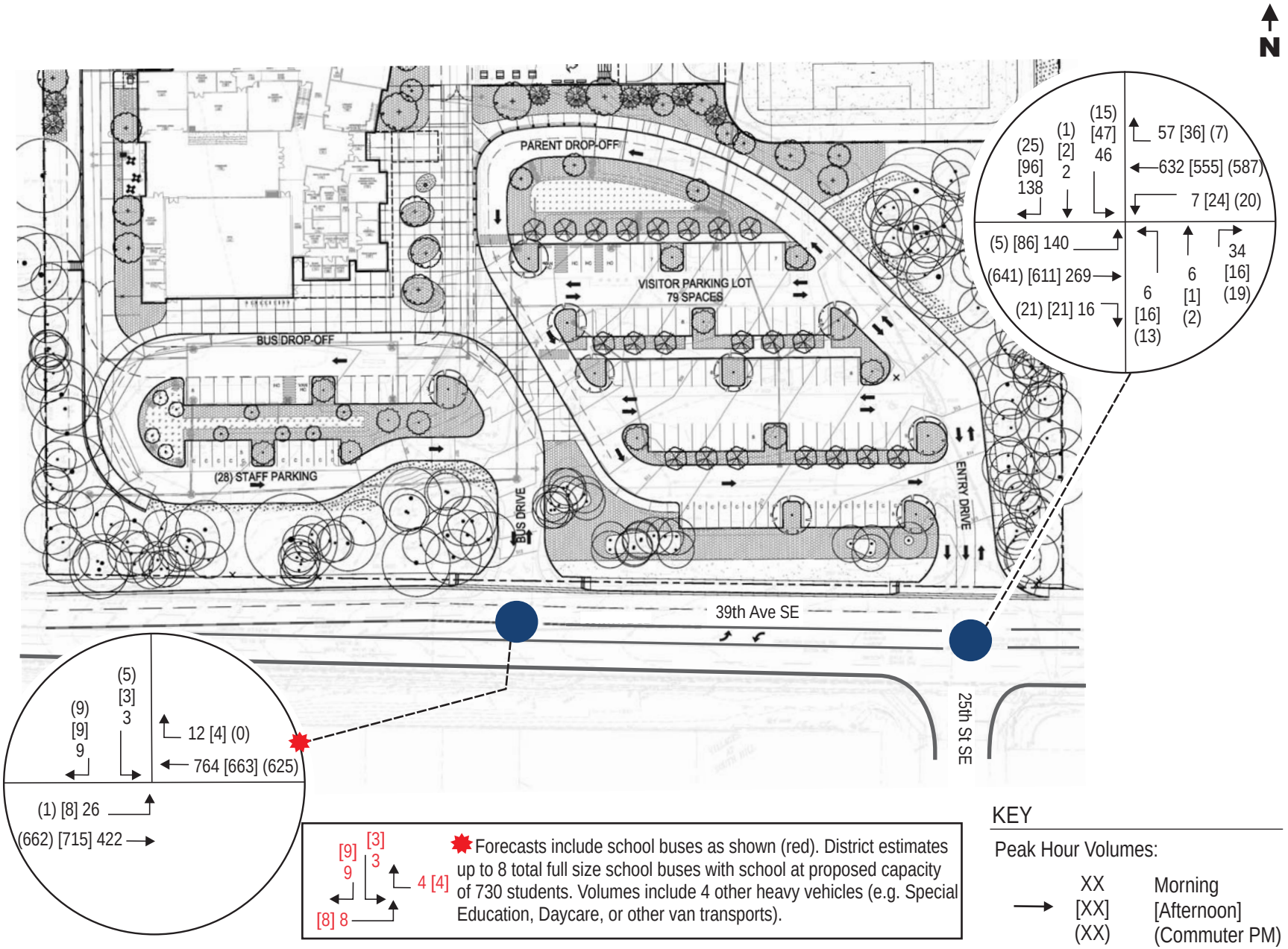
1. *LOS = Level of service.*
2. *Delay = Average seconds of delay per vehicle.*
3. *n/a = Not Applicable, movement does not exist without project.*
4. *Proposal would provide single shared outbound lane.*



SUNRISE ELEMENTARY
School Replacement

Figure 5
Trip Distribution and Assignment
Morning, Afternoon, and Commuter PM Peak Hours

heffron transportation inc



SUNRISE ELEMENTARY
School Replacement

Figure 6
Forecast 2019 With-Project Traffic Volumes
Morning, Afternoon, and Commuter PM Peak Hours

heffron transportation inc

4.3.2. Signal Warrant Analysis

As requested by the City of Puyallup, the 39th Avenue SE / 25th Street SE / Sunrise Elementary Access intersection was examined to determine if it would meet signal warrants with the project. The analysis was performed according to guidelines published in the *Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways*, *2009 Edition.*[15] The MUTCD states, "A traffic control signal should not be installed unless one or more of the factors described in this section are met." The nine (9) warrants for traffic signal installation are listed below:

- Warrant 1 – Eight-Hour Vehicular Volume (minimum volumes over eight hours)
- Warrant 2 – Four-Hour Vehicular Volume (minimum volumes over four hours)
- Warrant 3 – Peak Hour (minimum volume over one hour period)
- Warrant 4 – Pedestrian Volume
- Warrant 5 – School Crossing (adequacy of gaps near school crossing location)
- Warrant 6 – Coordinated Signal System (platooning for one-way or two-way streets)
- Warrant 7 – Crash Experience (number and type of accidents)
- Warrant 8 – Roadway Network (for organized traffic flow networks)
- Warrant 9 – Intersection Near a Grade Crossing

The volume-based **Warrant 1** (Eight Hour), **Warrant 2** (Four Hour), and **Warrant 3B** (Peak Hour) are summarized in Table 7. Note that although the Sunrise Elementary School approach is planned with a separate left-turn pocket, it was evaluated as a one-lane approach per MUTCD guidance. As shown, the projected volumes at the intersection are not expected to meet any of these warrants. Warrant 3 includes category A that states:

> *A. If all three of the following conditions exist for the same 1 hour (any four consecutive 15-minute periods) of an average day:*
>
> 1. *The total stopped time delay experienced by the traffic on one minor-street approach (one direction only) controlled by a STOP sign equals or exceeds: 4 vehicle-hours for a one-lane approach or 5 vehicle-hours for a two-lane approach; and*
> 2. *The volume on the same minor-street approach (one direction only) equals or exceeds 100 vehicles per hour for one moving lane of traffic or 150 vehicles per hour for two moving lanes; and*
> 3. *The total entering volume serviced during the hour equals or exceeds 650 vehicles per hour for intersections with three approaches or 800 vehicles per hour for intersections with four or more approaches.*

It should also be noted that, for Warrant 3 (Peak Hour), the MUTCD states, "*This signal warrant shall be applied only in unusual cases. Such cases include but are not limited to, office complexes, manufacturing plants, industrial complexes, of high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time.*" Due to the compressed period during which school traffic occurs, it could be considered for this location. Based on the operational analyses presented previously, the southbound movement would experience 4.0 vehicle-hours of delay during the morning arrival peak hour and 5.13 vehicle-hours of delay during the afternoon dismissal peak hour. The minor street approach would have a volume of 186 vehicles in the morning and 145 vehicles in the afternoon, and the total entering volume for the intersection would exceed 1,300 vehicles per hour during both periods. For each of the morning and afternoon peak hours, all three category A conditions would be met.

[15] US Department of Transportation – Federal Highway Administration, 2009.

Table 7. Signal Warrant Analysis Summary – Forecast 2019 With-Project Conditions

	Major Street (both directions) [1]	Higher Volume Minor Street Approach		Warrant Requirements Met?			
				1A	1B	2	3B
Time	39th Avenue SE	SES Dwy [2]	25th St SE [3]	600 / 150 [4]	900 / 75 [5]	Curve [6]	Curve [7]
1:00 A.M.	41	0	0				
2:00 A.M.	37	0	1				
3:00 A.M.	28	0	3				
4:00 A.M.	39	0	5				
5:00 A.M.	102	0	15				
6:00 A.M.	247	0	29				
7:00 A.M.	559	9	37				
8:00 A.M.	1,036	28	49				
9:00 A.M.	1,152	189	42	Y	Y	Y	
10:00 A.M.	885	28	21				
11:00 A.M.	951	11	18				
12:00 P.M.	950	17	26				
1:00 P.M.	1,057	16	27				
2:00 P.M.	977	13	31				
3:00 P.M.	1,200	42	32				
4:00 P.M.	1,270	149	33		Y	Y	
5:00 P.M.	1,236	52	24				
6:00 P.M.	1,274	29	34				
7:00 P.M.	1,037	13	31				
8:00 P.M.	774	6	18				
9:00 P.M.	549	2	11				
10:00 P.M.	384	0	7				
11:00 P.M.	172	0	6				
12:00 A.M.	85	2	3				
		Hours Met?		1	2	2	0
		Hours Required		8	8	4	1
		Warrant Met?		No	No	No	No

Source: Heffron Transportation, Inc., June 2017.

1. *Volumes derived from average of 48-hour counts performed June 7-8, 2017 increased using 3% compound annual growth rate and projected new trips generated by Sunrise Elementary Replacement.*
2. *Volumes reflect forecast exiting volumes from proposed Sunrise Elementary Replacement.*
3. *Volumes derived from average of 48-hour counts performed June 7-8, 2017 increased using 3% compound annual growth rate.*
4. *Warrant 1A requires major street volume to exceed 600 vehicles per hour and higher-volume minor street to exceed 150 vehicles per hour for a total of 8 hours.*
5. *Warrant 1B requires major street volume to exceed 900 vehicles per hour and higher-volume minor street to exceed 75 vehicles per hour for a total of 8 hours.*
6. *Warrant 2 requires volumes on the major and minor street to fall above the curve shown in Figure 4C-1 where 80 vph applies as the lower threshold for minor street approaches with two or more lanes.*
7. *Warrant 3 requires volumes on the major and minor street to fall above the curve shown in Figure 4C-3 where 150 vph applies as the lower threshold for minor street approaches with two or more lanes.*

Warrant 4 (Pedestrian Volume) was examined based on pedestrian volume counts performed concurrently with the intersection turning-movement counts. During the total of six hours counted (2.5 hours in the morning and 3.5 hours in the afternoon), only two pedestrian crossings of 39th Avenue SE were counted—both occurred on the east leg between 8:30 and 8:45 A.M.). With the school replacement but without a signal, the number of crossings is not expected to increase substantially and projected pedestrian volumes are not anticipated to meet the thresholds for Warrant 4 (minimum of 75).

Warrant 5 (School Crossing) was not met since there is not an established school crossing at the intersection and there is not a minimum of 20 students crossing 39th Avenue SE during any hour as stipulated in the warrant requirements. With the school replacement but without a signal, the number of crossings is not expected to increase substantially, since the areas located south of 39th Avenue SE would remain part of the school-bus service area and not part of the safe walk area for the school. The projected students crossing 39th Avenue SE is not expected to increase to 20.

Warrant 6 (Coordinated Signal System) was determined to not be applicable in this location, since the signal is not needed to maintain platooning of vehicles from adjacent signals.

Warrant 7 (Crash Experience) is "*…intended for application where the severity and frequency of crashes are the principal reasons to consider installing a traffic control signal.*" Based on the collision data presented previously in Section 2.5, there was only one collision at the 39th Avenue SE / 25th Street SE / Sunrise Elementary Access intersection over the 3.4-year analysis period. Therefore, the intersection would not meet the minimum criteria for this warrant.

Warrant 8 (Roadway Network) was determined to not be applicable, since a signal is not required at this location to encourage concentration and organization of traffic flow on the roadway network.

Warrant 9 (Intersection Near a Grade Crossing) is not applicable.

Based on the proposed site access reconfiguration planned as part of the Sunrise Elementary School Replacement project and the above signal warrant analyses, the intersection is projected to meet the category A criteria for Warrant 3 of the MUTCD warrants for signalization. Therefore, signalization of the 39th Avenue/25th Street SE/Sunrise Elementary Access intersection could be required by the City of Puyallup, if it determined Warrant 3 should be applied at this location.

4.3.3. Operational Analysis with Signalization

This section presents operational analyses of the 39th Avenue/25th Street SE/Sunrise Elementary Access intersection with signalization. The level of service analysis was prepared using the same Synchro software described previously; signal operational characteristics, including phasing and cycle length, were estimated by Heffron Transportation. Table 6 summarizes forecast 2019-with-project levels of service. As shown, if signalized, intersection is forecast to operate at LOS B with the school replacement project during all three peak hours.

Table 8. Level of Service – Future (2019) With-Project and Signalization

	Morning Peak Hour (8:00 to 9:00 A.M.)		Afternoon Peak Hour (2:45 to 3:45 P.M.)		PM Peak Hour (4:00 to 5:00 P.M.)	
Unsignalized Intersection	LOS [1]	Delay [2]	LOS	Delay	LOS	Delay
39th Ave SE / 25th St SE / SES Entry	B	19.3	B	19.4	B	16.3

Source: Heffron Transportation, June 2017.

1. *LOS = Level of service.*
2. *Delay = Average seconds of delay per vehicle.*

4.3.4. On-Site Operations & Queuing

Access Channelization

The City of Puyallup has indicated that frontage improvements along 39th Avenue SE will be required. The improvements would extend the five-lane section west past the west site access driveway and would provide a center left-turn pocket for both access locations. The improvements at the east access (opposite 25th Street SE) are proposed to include a three-lane access driveway with a left-turn lane and a shared-through-right-turn lane for southbound movements, plus a northbound entry lane. The east driveway would be aligned opposite 25th Street SE. The west driveway proposed to serve the school bus and staff parking area would remain at its current location and width with two lanes—one inbound and one outbound. The extended center-left-turn lane on 39th Avenue SE would provide eastbound left-turn storage for the west access driveway. No other channelization improvements would be required. The exact design, limits, and components of frontage improvements and the center left-turn lane on 39th Avenue SE should be coordinated with City of Puyallup staff based on the various existing constraints including: large street trees behind the sidewalk, available right-of-way, topographical constraints, and connections and transitions to facilities west of the school site frontage.

Based on the 95th-percentile queue results from the site access level-of-service analyses, the westbound left-turn queues are projected to be no greater than one vehicle during all three peak hours. Since the access would serve school buses, a queue of one vehicle could require 40 feet. Therefore, a minimum storage of 50 feet should be provided to accommodate the 95th-percentile queues.

On-Site Queuing Conditions

Peak queuing conditions are expected to increase with the larger school capacity. In the mornings, school drop-off activities usually occur with limited queues or delay. This is because arrivals tend to be spread out over the 20 to 30 minutes before school start time. During this period, family drivers generally arrive, drop off students, and then immediately leave the site. In the afternoons, many drivers arrive early and wait in the queue lane(s) or parking spaces for the students to be dismissed, and longer vehicle queues can develop.

The morning arrival queue can be modeled directly using Poisson arrival methodologies for a multi-channel service system (i.e., the number of drop-off spaces that can be used simultaneously). Assumptions documented from queuing data collection at Bellevue School District schools were used for this analysis.[16] This includes the assumption that it takes about 15 seconds for students to exit a vehicle while at the drop-off location space and the entire morning arrival time for a school occurs within 20 minutes. This equates to a service rate for each drop-off space of 4 vehicles per minute (80 vehicles in 20 minutes or a rate of 240 vehicles per hour). For the Sunrise Elementary School Replacement, the total estimated morning arrival peak hour volume is 241 vehicles (as presented in the *Trip Generation* section); however, 197 are forecast to arrive at the main load/unload area. To account for the compressed 20-minute arrival period, the arrival rate for the model is three times this level or 591 vehicles per hour.

Students could be dropped off anywhere along the load/unload zone shown on the site plan (see Figure 2), which allows 29 spaces to be used at one time. However, to provide an analysis of potential worst-case conditions, a range of 10 to 15 spaces was evaluated to estimate both the average and 95th-percentile queues for the drop-off area closest to the building. Table 9 presents the estimated queues for the assumed drop-off spaces at the proposed school during the morning arrival. As shown, the estimated morning arrival queue is expected be accommodated on-site and is not expected to exceed the available load/unload zone capacity. The queue model calculation results are included in Appendix D.

[16] Gibson Traffic Consultants, Enatai Elementary School Traffic Impact Analysis, August 2014.

Table 9. Estimated Morning Arrival Vehicle Queues

Vehicles Served Simultaneously	Average Queue	95th Percentile Queue	Exceeds On-Site Vehicle Capacity?
10 vehicles	2 vehicles	5 vehicles	No
15 vehicles	2 vehicles	5 vehicles	No

Source: Heffron Transportation, Inc., June 2017, using service rate assumptions based on observations included in the Enatai Elementary School Traffic Impact Analysis, *(Gibson Traffic Consultants, August 2014).*

Although the queue analysis and estimation model is reasonable for application to morning arrival queues, the afternoon queueing conditions are different. Family drivers arrive prior to school dismissal during a time when no vehicles are being loaded (or serviced). In addition, students arrive at their family vehicles at different rates, so the service times per vehicle are different than during morning arrival. Therefore, on-site vehicle queue estimates during afternoon school dismissal were based on observations at another District elementary school in Puyallup with an enrollment level similar to that proposed for Sunrise Elementary. Afternoon dismissal queues were observed on Wednesday, January 4, 2017 at Edgerton Elementary School,[17] which currently has enrollment of 740 students in K-6 and 33 students in pre-K. Based on those observations, the peak number of vehicles observed just before dismissal was 110 (including 45 in the main pick-up queue, about 60 waiting within the parking lot, and about 5 on surrounding streets). Based on these observations, an estimated afternoon vehicle demand estimate of 105 vehicles is a reasonable approximation for the Sunrise Elementary Replacement with enrollment capacity of 730.

Planning research and guidance from several sources suggest providing on-site queue stacking of between 1.2 and 2.0 feet per student[18] (roughly 875 to 1,460 feet or 45 to 73 vehicles). The on-site passenger-vehicle load/unload loop at 580 feet would provide space for 29 vehicles to load/unload simultaneously and the main access driveway could accommodate about 6 more vehicles before queues spill back onto 39th Avenue SE. Combined, the site proposes a total queuing/stacking length of about 700 linear feet (35 vehicles). In addition, the main visitor lot is expected to have between 40 and 50 parking spaces available in the late afternoon (those not used by staff) where family drivers can park and wait for students. Finally, during the peak few minutes around dismissal, there are typically some vehicles circulating within the drive aisles of the parking lot. In total, the site could accommodate between 75 and 105 vehicles on-site without spilling onto 39th Avenue SE, which would meet the demand expected and would fall at the upper end of the referenced guidance.

It is acknowledged that some fluctuation in volumes and queuing activities are common as they can be affected by weather, special events, and unfamiliarity with drop-off/pick-up procedures at the beginning of each school year. It is noted that family drivers with younger students are more likely to park their vehicles and walk their children to and from the school.

4.4. Transit Facilities & Service

It is unlikely that transit trips would be generated by teachers or staff at the site since the nearest transit stops are nearly a mile from the site. School bus transportation would continue to be provided to those students who qualify. The project is not expected to result in adverse impacts to transit.

17 Located at 16528-127th Avenue Court E in Puyallup.
18 Keith B. Higgins, PE, TE – Hatch Mott MacDonald, *Retooling School Drop-off/Pick-up Zones to Meet Demand,* WesternITE Meeting Paper 9C, 2010.

4.5. Non-Motorized Transportation Facilities

The project would provide frontage improvements along 39th Avenue SE as required by the City of Puyallup. These are proposed to include a new 8-foot wide sidewalk at the back of curb. With signalization of the primary access intersection on 39th Avenue SE opposite 25th Street SE, new crosswalks and pedestrian-actuated crossing signals would be provided. This would allow for students living within the Sunrise Elementary School enrollment area south of 39th Avenue SE to walk to school and use the signalized crossing. It is expected that a crossing guard would be provided to assist with crossings during morning arrival and afternoon dismissal on school days. The larger school and provision of a signalized crossing are anticipated to attract some additional pedestrian and bicycle trips within the local site vicinity, particularly from residential development located immediately to the south. Prior to opening of the replacement school, the District should review and identify any changes to walk routes, crosswalk locations, and/or crossing guard locations.

4.6. Parking

4.6.1. School Day Parking

As described previously, school-day parking at elementary schools is primarily driven by staffing levels and family-volunteer activity. The District estimates that Sunrise Elementary School could have up to 61 employees with the school at its planned capacity of 730 students. Using the parking rate derived specifically for Sunrise Elementary (1.38 parked vehicles per employee), the larger replacement school is projected to have a midday parking demand of about 84 vehicles, which is likely to occur midday when teachers, administrative staff, kitchen staff, and volunteers are typically on site. The proposed on-site parking supply of 107 spaces is expected to accommodate typical midday peak parking demand.

4.6.2. Evening Event Parking

Similar to the existing school, the Sunrise Elementary School Replacement would have common spaces and a gymnasium that are expected to be used for occasional evening and/or weekend events at the school. The types of events typically held at the school include the following.

- **Large School Events** – Typically occur about once every month or two. The largest events occur two or three times per year and usually include: Curriculum Night/Open House, Holiday Boutique, musical concerts or talent shows, and STEM or science fairs and showcases. Some of the larger events have staggered arrivals and not all attendees are on site at once, while others have fixed start and end times and all attendees are on site simultaneously.

- **PTA (or other) Meetings** – There are commonly one or two smaller PTA events per month that usually occur in the library. Typically, attendance ranges from about 30 to 100 people.

- **Community Use** – The site may be scheduled for use by community groups (e.g. Cub Scouts, Boy Scouts, Brownies, etc.) or recreational sports on the playfield or in the gymnasium. Community-use events usually have smaller attendance levels of 10 to 50 people, but may occur more frequently.

For evening events, the on-site parking supply of 107 spaces would be available. Room for another 29 parked vehicles would exist in the family-vehicle load/unload zone and another 19 parked vehicles in the school-bus load/unload zone, bringing the on-site total to 155 spaces for evening or weekend events.

For larger evening events, there are typically between 3.0 and 3.5 persons attending for each parked vehicle. This rate accounts for higher levels of carpooling (families and students in a single vehicle) as

well as drop-off activity that does not generate parked vehicles. At these rates, the on-site parking supply could accommodate events with attendance of between 465 and 540 persons. If event parking demand exceeds these levels or if larger attendance levels are expected, it may be necessary to modify the event to reduce total peak demand. For example, curriculum night could be separated into two nights based on grade levels.

4.7. Construction Traffic

The existing school will continue to operate on the site while the new school is being constructed. This will require careful coordination to make sure that construction activities do not affect school loading/unloading and parking operations when school is in session.

The District should require the selected contractor to develop a construction management plan (CMP) that addresses traffic and pedestrian control during school construction. It should define truck routes, lane closures, walkway closures, and parking disruptions, as necessary. The CMP may also include measures to keep adjacent streets clean on a daily basis at the truck exit points (such as street sweeping or on-site truck wheel cleaning) to reduce tracking dirt offsite. The CMP should identify parking locations for the construction staff; to the extent possible, construction employee parking should be contained on-site.

5. MITIGATION

5.1. Physical Improvements

Based on the analysis required by the City of Puyallup, no improvements would be required at off-site intersections to accommodate the proposed Sunrise Elementary School Replacement project. However, frontage improvements along 39th Avenue SE would consist of extending the center left-turn and making sidewalk improvements. The exact design and limits of the widening on 39th Avenue SE should be coordinated with City of Puyallup staff based on the various existing constraints including: large street trees behind the sidewalk, available right-of-way, topographical constraints, and connections and transitions to facilities west of the school site frontage.

Based on the proposed site access reconfiguration planned as part of the Sunrise Elementary School Replacement project and the signal warrant analyses presented previously, the 39th Avenue/25th Street SE/Sunrise Elementary Access intersection is projected to meet the category A criteria for Warrant 3 of the MUTCD warrants for signalization. Therefore, signalization could be required by the City of Puyallup.

5.2. Operational Recommendations

The following operational measures are recommended to reduce and minimize transportation-related impacts from the school replacement project.

A. Prior to opening of the replacement school, the District should review and identify any changes to walk routes, crosswalk locations, and/or crossing guard locations.

B. The school should develop a transportation and parking management plan to minimize the traffic and parking impacts associated with large events. The plan should identify locations for event parking (e.g. bus or passenger call load/unload zones) and ensure that all parking areas are open and available during large events. If large events are anticipated to generate demand that would exceed the on-site event parking supply, the school should examine ways to reduce the demand and event attendance (e.g. through splitting events based on grade levels).

C. The District should require the selected contractor to develop a construction management plan (CMP) that addresses traffic and pedestrian control during school construction. It should define truck routes, lane closures, walkway closures, and parking disruptions, as necessary. The CMP may also include measures to keep adjacent streets clean on a daily basis at the truck exit points (such as street sweeping or on-site truck wheel cleaning) to reduce tracking dirt offsite. The CMP should identify parking locations for the construction staff; to the extent possible, construction employee parking should be contained on-site.

5.3. Street Impact Fee

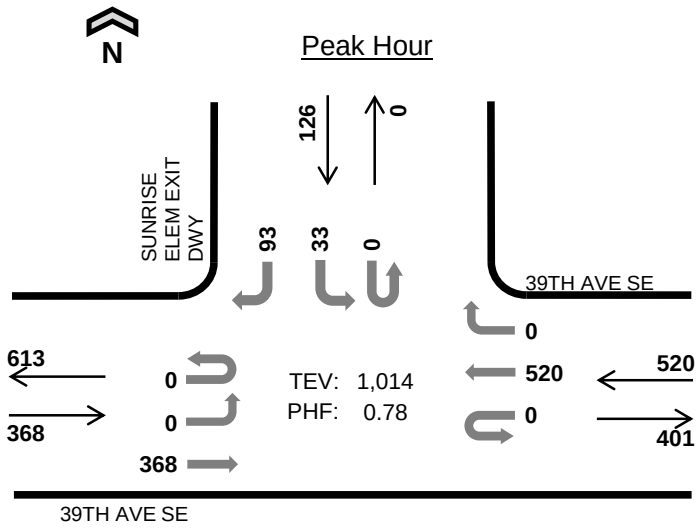
The City of Puyallup collects Street Impact Fees impact fees for new development. Based on rates published in the Puyallup Municipal Code Section 21.20.130,[19] the impact fee rate is currently $4,500 per PM peak hour trip. Based on this rate and the estimated net increase of 19.2 PM peak hour trips, the estimated impact fee would be $86,400. It should be noted that traffic impact fees are typically due and payable as a condition of issuance of a building permit based on the fee rates in effect at that time.

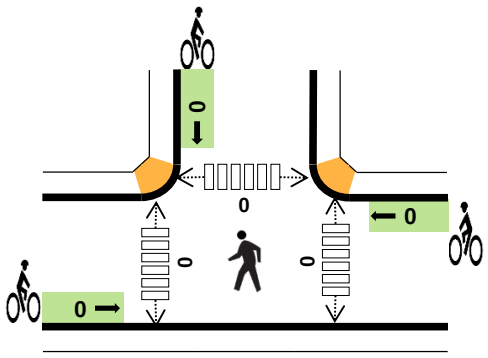
[19] Ord. 2893 § 1, 2007; Ord. 2837 § 1, 2005.

APPENDIX A
Traffic Count Data Sheets

SUNRISE ELEM EXIT DWY
39TH AVE SE

Date: Tue, Dec 13, 2016
Count Period: 7:00 AM to 9:30 AM
Peak Hour: 8:30 AM to 9:30 AM





	HV %:	PHF
EB	6.0%	0.89
WB	3.7%	0.82
NB	-	-
SB	7.9%	0.48
TOTAL	5.0%	0.78

Two-and-a-Half-Hour Count Summaries

Interval Start	39TH AVE SE Eastbound				39TH AVE SE Westbound				0 Northbound				SUNRISE ELEM EXIT DWY Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
8:30 AM	0	0	102	0	0	0	142	0	0	0	0	0	0	13	0	34	291	0
8:45 AM	0	0	103	0	0	0	158	0	0	0	0	0	0	18	0	48	327	0
9:00 AM	0	0	85	0	0	0	104	0	0	0	0	0	0	1	0	8	198	0
9:15 AM	0	0	78	0	0	0	116	0	0	0	0	0	0	1	0	3	198	1,014
Peak Hour	0	0	368	0	0	0	520	0	0	0	0	0	0	33	0	93	1,014	0

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

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
8:30 AM	12	5	0	5	***22***	0	0	0	0	***0***	0	0	0	0	***0***
8:45 AM	4	11	0	4	***19***	0	0	0	0	***0***	0	0	0	0	***0***
9:00 AM	3	1	0	1	***5***	0	0	0	0	***0***	0	0	0	0	***0***
9:15 AM	3	2	0	0	***5***	0	0	0	0	***0***	0	0	0	0	***0***
Peak Hour	22	19	0	10	***51***	0	0	0	0	***0***	0	0	0	0	***0***

Two-and-a-Half-Hour Count Summaries

Interval Start	39TH AVE SE				39TH AVE SE				0				SUNRISE ELEM EXIT DWY				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	67	0	0	0	119	0	0	0	0	0	0	2	0	7	195	0
7:15 AM	0	0	63	0	0	0	158	0	0	0	0	0	0	1	0	3	225	0
7:30 AM	0	0	59	0	0	0	182	0	0	0	0	0	0	1	0	3	245	0
7:45 AM	0	0	49	0	0	0	182	0	0	0	0	0	0	0	0	1	232	897
8:00 AM	0	0	73	0	0	0	119	0	0	0	0	0	0	0	0	5	197	899
8:15 AM	0	0	81	0	0	0	78	0	0	0	0	0	0	8	0	20	187	861
8:30 AM	**0**	**0**	**102**	**0**	**0**	**0**	**142**	**0**	**0**	**0**	**0**	**0**	**0**	**13**	**0**	**34**	**291**	907
8:45 AM	**0**	**0**	**103**	**0**	**0**	**0**	**158**	**0**	**0**	**0**	**0**	**0**	**0**	**18**	**0**	**48**	**327**	1,002
9:00 AM	**0**	**0**	**85**	**0**	**0**	**0**	**104**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**8**	**198**	1,003
9:15 AM	**0**	**0**	**78**	**0**	**0**	**0**	**116**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**3**	**198**	**1,014**
Count Total	0	0	760	0	0	0	1,358	0	0	0	0	0	0	45	0	132	2,295	0
Peak Hour	**0**	**0**	**368**	**0**	**0**	**0**	**520**	**0**	**0**	**0**	**0**	**0**	**0**	**33**	**0**	**93**	**1,014**	**0**

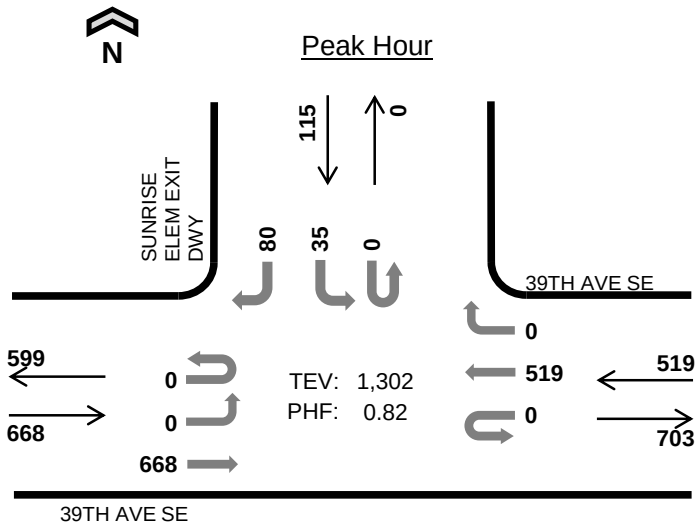
Note: Two-and-a-half-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

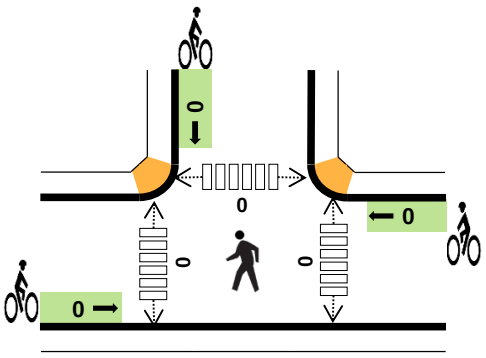
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	2	5	0	1	*8*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	2	2	0	0	*4*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	1	1	0	0	*2*	0	0	0	0	*0*	0	0	0	0	*0*
7:45 AM	3	2	0	0	*5*	0	0	0	0	*0*	0	0	0	0	*0*
8:00 AM	4	5	0	1	*10*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	5	2	0	2	*9*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	**12**	**5**	**0**	**5**	***22***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
8:45 AM	**4**	**11**	**0**	**4**	***19***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
9:00 AM	**3**	**1**	**0**	**1**	***5***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
9:15 AM	**3**	**2**	**0**	**0**	***5***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	39	36	0	14	*89*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hr	**22**	**19**	**0**	**10**	***51***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Mark Skaggs: (425) 250-0777 mark.skaggs@idaxdata.com

SUNRISE ELEM EXIT DWY
39TH AVE SE

Date: Tue, Dec 13, 2016
Count Period: 2:30 PM to 6:00 PM
Peak Hour: 3:00 PM to 4:00 PM





	HV %:	PHF
EB	2.5%	0.87
WB	2.9%	0.84
NB	-	-
SB	10.4%	0.39
TOTAL	3.4%	0.82

Three-and-a-Half-Hour Count Summaries

Interval Start	39TH AVE SE Eastbound				39TH AVE SE Westbound				0 Northbound				SUNRISE ELEM EXIT DWY Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:00 PM	0	0	193	0	0	0	96	0	0	0	0	0	0	4	0	11	304	0
3:15 PM	0	0	169	0	0	0	155	0	0	0	0	0	0	21	0	52	397	0
3:30 PM	0	0	142	0	0	0	125	0	0	0	0	0	0	7	0	10	284	0
3:45 PM	0	0	164	0	0	0	143	0	0	0	0	0	0	3	0	7	317	1,302
Peak Hour	0	0	668	0	0	0	519	0	0	0	0	0	0	35	0	80	1,302	0

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

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:00 PM	8	3	0	2	***13***	0	0	0	0	***0***	0	0	0	0	***0***
3:15 PM	4	2	0	8	***14***	0	0	0	0	***0***	0	0	0	0	***0***
3:30 PM	3	6	0	1	***10***	0	0	0	0	***0***	0	0	0	0	***0***
3:45 PM	2	4	0	1	***7***	0	0	0	0	***0***	0	0	0	0	***0***
Peak Hour	17	15	0	12	***44***	0	0	0	0	***0***	0	0	0	0	***0***

Three-and-a-Half-Hour Count Summaries

Interval Start	39TH AVE SE				39TH AVE SE				0				SUNRISE ELEM EXIT DWY				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
2:30 PM	0	0	151	0	0	0	113	0	0	0	0	0	0	5	0	4	273	0
2:45 PM	0	0	154	0	0	0	112	0	0	0	0	0	0	6	0	3	275	0
3:00 PM	**0**	**0**	**193**	**0**	**0**	**0**	**96**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**11**	**304**	0
3:15 PM	**0**	**0**	**169**	**0**	**0**	**0**	**155**	**0**	**0**	**0**	**0**	**0**	**0**	**21**	**0**	**52**	**397**	1,249
3:30 PM	**0**	**0**	**142**	**0**	**0**	**0**	**125**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**10**	**284**	1,260
3:45 PM	**0**	**0**	**164**	**0**	**0**	**0**	**143**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**7**	**317**	**1,302**
4:00 PM	0	0	146	0	0	0	126	0	0	0	0	0	0	11	0	14	297	1,295
4:15 PM	0	0	161	0	0	0	114	0	0	0	0	0	0	2	0	7	284	1,182
4:30 PM	0	0	146	0	0	0	140	0	0	0	0	0	0	2	0	2	290	1,188
4:45 PM	0	0	163	0	0	0	100	0	0	0	0	0	0	1	0	1	265	1,136
5:00 PM	0	0	157	0	0	0	116	0	0	0	0	0	0	2	0	6	281	1,120
5:15 PM	0	0	153	0	0	0	104	0	0	0	0	0	0	0	0	3	260	1,096
5:30 PM	0	0	132	0	0	0	85	0	0	0	0	0	0	0	0	2	219	1,025
5:45 PM	0	0	145	0	0	0	91	0	0	0	0	0	0	1	0	3	240	1,000
Count Total	0	0	2,176	0	0	0	1,620	0	0	0	0	0	0	65	0	125	3,986	0
Peak Hour	**0**	**0**	**668**	**0**	**0**	**0**	**519**	**0**	**0**	**0**	**0**	**0**	**0**	**35**	**0**	**80**	**1,302**	**0**

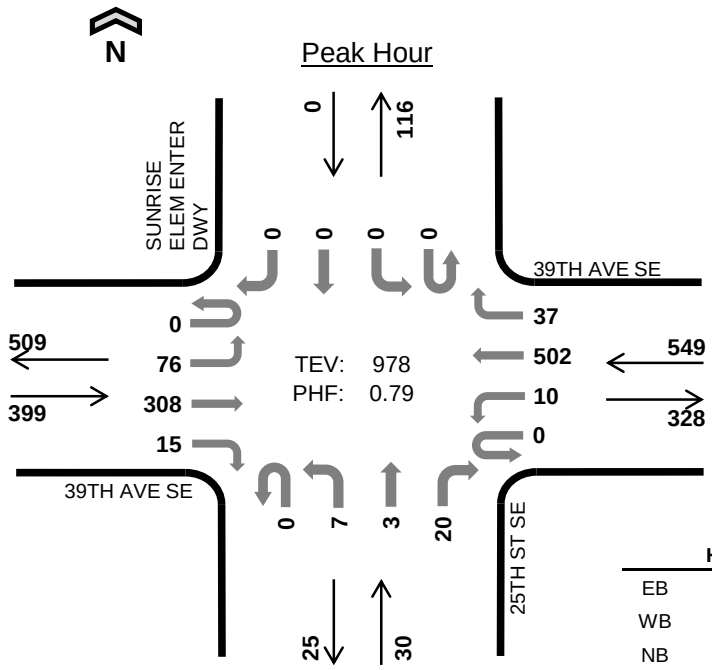
Note: Three-and-a-half-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

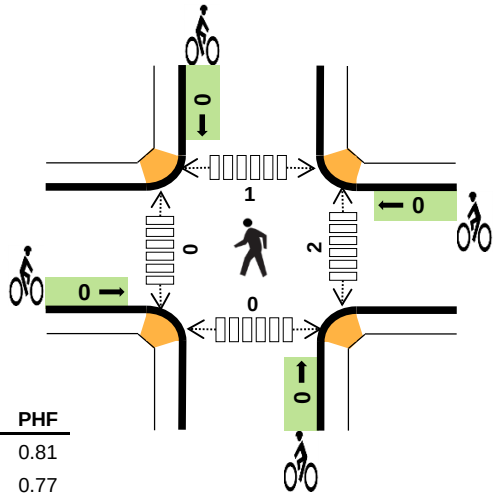
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
2:30 PM	4	4	0	1	*9*	0	0	0	0	*0*	0	0	0	0	*0*
2:45 PM	7	1	0	0	*8*	0	0	0	0	*0*	0	0	0	0	*0*
3:00 PM	**8**	**3**	**0**	**2**	***13***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
3:15 PM	**4**	**2**	**0**	**8**	***14***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
3:30 PM	**3**	**6**	**0**	**1**	***10***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
3:45 PM	**2**	**4**	**0**	**1**	***7***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
4:00 PM	2	6	0	1	*9*	0	0	0	0	*0*	0	0	0	0	*0*
4:15 PM	1	3	0	0	*4*	0	0	0	0	*0*	0	0	0	0	*0*
4:30 PM	0	1	0	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
4:45 PM	2	1	0	0	*3*	0	0	0	0	*0*	0	0	2	0	*2*
5:00 PM	1	1	0	0	*2*	0	0	0	0	*0*	0	0	0	0	*0*
5:15 PM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	1	0	0	0	*1*	0	0	0	0	*0*	0	0	1	0	*1*
5:45 PM	1	3	0	0	*4*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	36	35	0	14	*85*	0	0	0	0	*0*	0	0	3	0	*3*
Peak Hr	**17**	**15**	**0**	**12**	***44***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Mark Skaggs: (425) 250-0777 mark.skaggs@idaxdata.com

SUNRISE ELEM ENTER DWY
39TH AVE SE

Date: Tue, Dec 13, 2016
Count Period: 7:00 AM to 9:30 AM
Peak Hour: 8:30 AM to 9:30 AM





	HV %:	PHF
EB	5.3%	0.81
WB	3.5%	0.77
NB	0.0%	0.83
SB	-	-
TOTAL	4.1%	0.79

Two-and-a-Half-Hour Count Summaries

Interval Start	39TH AVE SE Eastbound				39TH AVE SE Westbound				25TH ST SE Northbound				SUNRISE ELEM ENTER DWY Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
8:30 AM	0	44	66	3	0	2	133	17	0	1	3	5	0	0	0	0	274	0
8:45 AM	0	29	87	7	0	3	158	18	0	0	0	7	0	0	0	0	309	0
9:00 AM	0	2	81	2	0	2	101	2	0	1	0	5	0	0	0	0	196	0
9:15 AM	0	1	74	3	0	3	110	0	0	5	0	3	0	0	0	0	199	978
Peak Hour	0	76	308	15	0	10	502	37	0	7	3	20	0	0	0	0	978	0

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

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
8:30 AM	11	5	0	0	***16***	0	0	0	0	***0***	2	0	0	0	***2***
8:45 AM	2	10	0	0	***12***	0	0	0	0	***0***	0	0	1	0	***1***
9:00 AM	4	1	0	0	***5***	0	0	0	0	***0***	0	0	0	0	***0***
9:15 AM	4	3	0	0	***7***	0	0	0	0	***0***	0	0	0	0	***0***
Peak Hour	21	19	0	0	***40***	0	0	0	0	***0***	2	0	1	0	***3***

Two-and-a-Half-Hour Count Summaries

Interval Start	39TH AVE SE				39TH AVE SE				25TH ST SE				SUNRISE ELEM ENTER DWY				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	6	61	1	0	1	119	5	0	4	2	8	0	0	0	0	207	0
7:15 AM	0	3	61	1	0	1	153	4	0	1	0	7	0	0	0	0	231	0
7:30 AM	0	6	51	2	0	3	187	2	0	1	0	8	0	0	0	0	260	0
7:45 AM	0	9	39	1	0	1	184	8	0	3	0	7	0	0	0	0	252	950
8:00 AM	0	12	57	2	0	0	116	8	0	1	1	3	0	0	0	0	200	943
8:15 AM	0	35	50	3	1	2	78	7	0	1	1	5	0	0	0	0	183	895
8:30 AM	**0**	**44**	**66**	**3**	**0**	**2**	**133**	**17**	**0**	**1**	**3**	**5**	**0**	**0**	**0**	**0**	**274**	909
8:45 AM	**0**	**29**	**87**	**7**	**0**	**3**	**158**	**18**	**0**	**0**	**0**	**7**	**0**	**0**	**0**	**0**	**309**	966
9:00 AM	**0**	**2**	**81**	**2**	**0**	**2**	**101**	**2**	**0**	**1**	**0**	**5**	**0**	**0**	**0**	**0**	**196**	962
9:15 AM	**0**	**1**	**74**	**3**	**0**	**3**	**110**	**0**	**0**	**5**	**0**	**3**	**0**	**0**	**0**	**0**	**199**	**978**
Count Total	0	147	627	25	1	18	1,339	71	0	18	7	58	0	0	0	0	2,311	0
Peak Hour	**0**	**76**	**308**	**15**	**0**	**10**	**502**	**37**	**0**	**7**	**3**	**20**	**0**	**0**	**0**	**0**	**978**	**0**

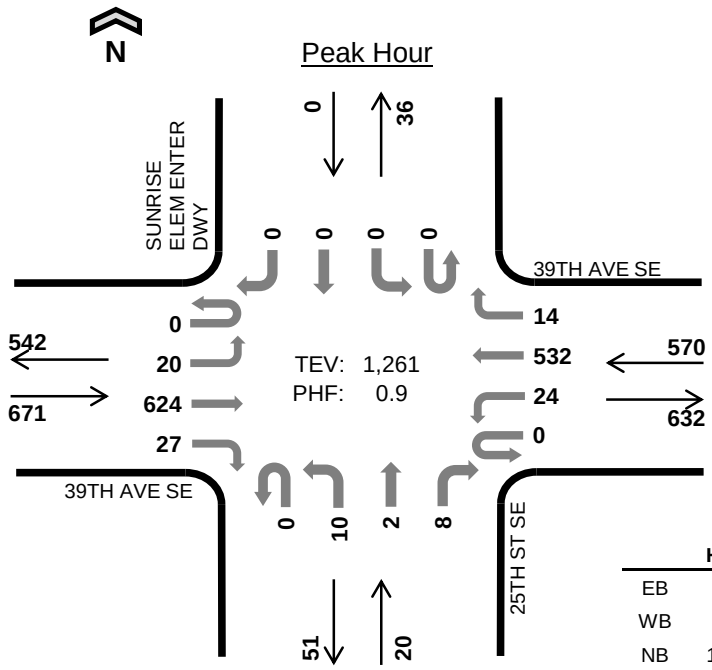
Note: Two-and-a-half-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

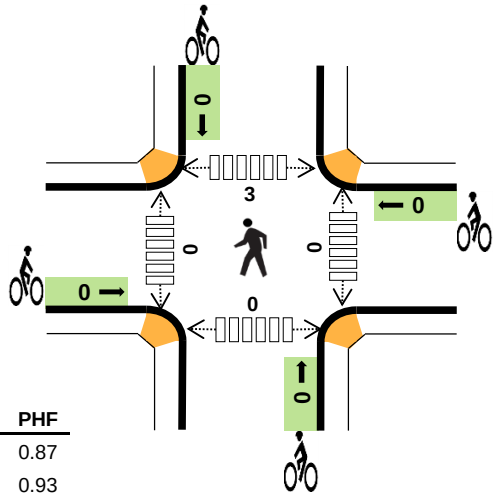
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	2	7	0	0	*9*	0	0	0	0	*0*	0	0	0	0	*0*
7:15 AM	3	2	0	0	*5*	0	0	0	0	*0*	0	0	0	0	*0*
7:30 AM	2	1	0	0	*3*	0	0	0	0	*0*	0	0	0	0	*0*
7:45 AM	4	3	0	0	*7*	0	0	0	0	*0*	0	0	0	0	*0*
8:00 AM	2	6	0	0	*8*	0	0	0	0	*0*	0	0	0	0	*0*
8:15 AM	5	2	0	0	*7*	0	0	0	0	*0*	0	0	0	0	*0*
8:30 AM	**11**	**5**	**0**	**0**	***16***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**0**	**0**	*2*
8:45 AM	**2**	**10**	**0**	**0**	***12***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**0**	*1*
9:00 AM	**4**	**1**	**0**	**0**	***5***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
9:15 AM	**4**	**3**	**0**	**0**	***7***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	39	40	0	0	*79*	0	0	0	0	*0*	2	0	1	0	*3*
Peak Hour	**21**	**19**	**0**	**0**	***40***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**1**	**0**	***3***

Mark Skaggs: (425) 250-0777 mark.skaggs@idaxdata.com

SUNRISE ELEM ENTER DWY
39TH AVE SE

Date: Tue, Dec 13, 2016
Count Period: 2:30 PM to 6:00 PM
Peak Hour: 3:15 PM to 4:15 PM





	HV %:	PHF
EB	2.4%	0.87
WB	3.0%	0.93
NB	15.0%	0.63
SB	-	-
TOTAL	2.9%	0.90

Three-and-a-Half-Hour Count Summaries

Interval Start	39TH AVE SE Eastbound				39TH AVE SE Westbound				25TH ST SE Northbound				SUNRISE ELEM ENTER DWY Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
3:15 PM	0	11	174	8	0	5	145	3	0	4	0	0	0	0	0	0	350	0
3:30 PM	0	5	146	4	0	4	125	4	0	1	0	7	0	0	0	0	296	0
3:45 PM	0	4	153	7	0	10	137	4	0	2	0	1	0	0	0	0	318	0
4:00 PM	0	0	151	8	0	5	125	3	0	3	2	0	0	0	0	0	297	1,261
Peak Hour	0	20	624	27	0	24	532	14	0	10	2	8	0	0	0	0	1,261	0

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

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
3:15 PM	7	1	1	0	***9***	0	0	0	0	***0***	0	0	3	0	***3***
3:30 PM	5	7	1	0	***13***	0	0	0	0	***0***	0	0	0	0	***0***
3:45 PM	2	4	0	0	***6***	0	0	0	0	***0***	0	0	0	0	***0***
4:00 PM	2	5	1	0	***8***	0	0	0	0	***0***	0	0	0	0	***0***
Peak Hour	16	17	3	0	***36***	0	0	0	0	***0***	0	0	3	0	***3***

Three-and-a-Half-Hour Count Summaries

Interval Start	39TH AVE SE Eastbound				39TH AVE SE Westbound				25TH ST SE Northbound				SUNRISE ELEM ENTER DWY Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
2:30 PM	0	4	143	7	0	6	108	6	0	4	2	0	0	0	0	0	280	0
2:45 PM	0	24	137	4	0	11	109	10	0	1	1	0	0	0	0	0	297	0
3:00 PM	0	28	154	4	0	3	94	12	0	1	0	0	0	0	0	0	296	0
3:15 PM	**0**	**11**	**174**	**8**	**0**	**5**	**145**	**3**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**350**	1,223
3:30 PM	**0**	**5**	**146**	**4**	**0**	**4**	**125**	**4**	**0**	**1**	**0**	**7**	**0**	**0**	**0**	**0**	**296**	1,239
3:45 PM	**0**	**4**	**153**	**7**	**0**	**10**	**137**	**4**	**0**	**2**	**0**	**1**	**0**	**0**	**0**	**0**	**318**	1,260
4:00 PM	**0**	**0**	**151**	**8**	**0**	**5**	**125**	**3**	**0**	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**297**	**1,261**
4:15 PM	0	3	158	4	0	4	110	1	0	3	0	4	0	0	0	0	287	1,198
4:30 PM	0	0	145	4	0	5	132	0	0	2	0	8	0	0	0	0	296	1,198
4:45 PM	0	0	161	4	0	5	97	2	0	2	0	3	0	0	0	0	274	1,154
5:00 PM	0	3	143	7	0	6	109	1	0	2	0	3	0	0	0	0	274	1,131
5:15 PM	0	1	149	6	0	4	91	1	0	5	0	0	0	0	0	0	257	1,101
5:30 PM	0	3	129	5	0	11	83	1	0	1	0	0	0	0	0	0	233	1,038
5:45 PM	0	2	131	7	0	6	85	0	0	4	0	0	0	0	0	0	235	999
Count Total	0	88	2,074	79	0	85	1,550	48	0	35	5	26	0	0	0	0	3,990	0
Peak Hour	**0**	**20**	**624**	**27**	**0**	**24**	**532**	**14**	**0**	**10**	**2**	**8**	**0**	**0**	**0**	**0**	**1,261**	**0**

Note: Three-and-a-half-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
2:30 PM	5	6	0	0	*11*	0	0	0	0	*0*	0	0	1	0	*1*
2:45 PM	7	2	0	0	*9*	0	0	0	0	*0*	0	0	0	0	*0*
3:00 PM	9	5	0	0	*14*	0	0	0	0	*0*	0	0	0	0	*0*
3:15 PM	**7**	**1**	**1**	**0**	***9***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**3**	**0**	*3*
3:30 PM	**5**	**7**	**1**	**0**	***13***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
3:45 PM	**2**	**4**	**0**	**0**	***6***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	*0*
4:00 PM	**2**	**5**	**1**	**0**	***8***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
4:15 PM	1	2	1	0	*4*	0	0	0	0	*0*	0	0	0	0	*0*
4:30 PM	1	1	1	0	*3*	0	0	0	0	*0*	0	0	0	0	*0*
4:45 PM	2	1	0	0	*3*	0	0	0	0	*0*	0	0	1	0	*1*
5:00 PM	0	0	1	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
5:15 PM	0	0	0	0	*0*	0	0	0	0	*0*	0	0	0	0	*0*
5:30 PM	1	1	0	0	*2*	0	0	0	0	*0*	0	0	0	0	*0*
5:45 PM	1	3	0	0	*4*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	43	38	6	0	*87*	0	0	0	0	*0*	0	0	5	0	*5*
Peak Hour	**16**	**17**	**3**	**0**	***36***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**3**	**0**	***3***

Location: SUNRISE ELEM EXIT DWY N/O 39TH AVE SE
Date Range: 12/13/2016 - 12/19/2016
Site Code: A

	Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday			Monday			Mid-Week Average		
	12/13/2016			12/14/2016			12/15/2016			12/16/2016			12/17/2016			12/18/2016			12/19/2016					
Time	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total
12:00 AM	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
1:00 AM	0	0	0	0	1	1	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
2:00 AM	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
3:00 AM	0	1	1	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
4:00 AM	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
5:00 AM	0	0	0	0	0	0	0	1	1	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
6:00 AM	0	6	6	0	7	7	0	7	7	-	-	-	-	-	-	-	-	-	-	-	-	0	7	7
7:00 AM	0	19	19	0	21	21	0	20	20	-	-	-	-	-	-	-	-	-	-	-	-	0	20	20
8:00 AM	2	132	134	4	127	131	0	125	125	-	-	-	-	-	-	-	-	-	-	-	-	2	128	130
9:00 AM	1	21	22	0	14	14	0	26	26	-	-	-	-	-	-	-	-	-	-	-	-	0	20	21
10:00 AM	0	10	10	0	5	5	0	10	10	-	-	-	-	-	-	-	-	-	-	-	-	0	8	8
11:00 AM	1	18	19	0	16	16	0	14	14	-	-	-	-	-	-	-	-	-	-	-	-	0	16	16
12:00 PM	0	10	10	0	18	18	1	20	21	-	-	-	-	-	-	-	-	-	-	-	-	0	16	16
1:00 PM	2	12	14	1	11	12	0	17	17	-	-	-	-	-	-	-	-	-	-	-	-	1	13	14
2:00 PM	0	31	31	0	31	31	0	30	30	-	-	-	-	-	-	-	-	-	-	-	-	0	31	31
3:00 PM	3	100	103	3	104	107	0	117	117	-	-	-	-	-	-	-	-	-	-	-	-	2	107	109
4:00 PM	0	40	40	0	24	24	0	32	32	-	-	-	-	-	-	-	-	-	-	-	-	0	32	32
5:00 PM	0	18	18	0	40	40	2	16	18	-	-	-	-	-	-	-	-	-	-	-	-	1	25	25
6:00 PM	0	8	8	0	9	9	0	15	15	-	-	-	-	-	-	-	-	-	-	-	-	0	11	11
7:00 PM	0	2	2	1	1	2	0	13	13	-	-	-	-	-	-	-	-	-	-	-	-	0	5	6
8:00 PM	0	1	1	0	2	2	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	1	1
9:00 PM	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
10:00 PM	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
11:00 PM	0	2	2	0	2	2	0	2	2	-	-	-	-	-	-	-	-	-	-	-	-	0	2	2
Total	**9**	**431**	**440**	**9**	**433**	**442**	**3**	**465**	**468**	-	-	-	-	-	-	-	-	-	-	-	-	**7**	**443**	**450**
Percent	**2%**	**98%**	-	**2%**	**98%**	-	**1%**	**99%**	-	-	-	-	-	-	-	-	-	-	-	-	-	**2%**	**98%**	-

1. Mid-week average includes data between Tuesday and Thursday.

Mark Skaggs:425-250-0777
mark.skaggs@idaxdata.com

Location: SUNRISE ELEM ENTER DWY N/O 39TH AVE SE
Date Range: 12/13/2016 - 12/19/2016
Site Code: B

	Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday			Monday			Mid-Week Average		
	12/13/2016			12/14/2016			12/15/2016			12/16/2016			12/17/2016			12/18/2016			12/19/2016					
Time	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total
12:00 AM	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
1:00 AM	0	0	0	1	0	1	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
2:00 AM	0	0	0	0	0	0	1	0	1	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
3:00 AM	1	0	1	1	0	1	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1
4:00 AM	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
5:00 AM	1	0	1	2	0	2	2	0	2	-	-	-	-	-	-	-	-	-	-	-	-	2	0	2
6:00 AM	12	1	13	11	0	11	13	0	13	-	-	-	-	-	-	-	-	-	-	-	-	12	0	12
7:00 AM	45	1	46	44	0	44	38	0	38	-	-	-	-	-	-	-	-	-	-	-	-	42	0	43
8:00 AM	172	0	172	165	1	166	163	1	164	-	-	-	-	-	-	-	-	-	-	-	-	167	1	167
9:00 AM	13	0	13	9	1	10	24	0	24	-	-	-	-	-	-	-	-	-	-	-	-	15	0	16
10:00 AM	15	0	15	8	0	8	13	0	13	-	-	-	-	-	-	-	-	-	-	-	-	12	0	12
11:00 AM	15	0	15	15	0	15	20	0	20	-	-	-	-	-	-	-	-	-	-	-	-	17	0	17
12:00 PM	8	0	8	17	0	17	17	0	17	-	-	-	-	-	-	-	-	-	-	-	-	14	0	14
1:00 PM	12	0	12	12	0	12	19	0	19	-	-	-	-	-	-	-	-	-	-	-	-	14	0	14
2:00 PM	57	0	57	45	0	45	54	0	54	-	-	-	-	-	-	-	-	-	-	-	-	52	0	52
3:00 PM	68	0	68	80	0	80	82	1	83	-	-	-	-	-	-	-	-	-	-	-	-	77	0	77
4:00 PM	9	0	9	27	0	27	16	0	16	-	-	-	-	-	-	-	-	-	-	-	-	17	0	17
5:00 PM	12	0	12	13	0	13	10	0	10	-	-	-	-	-	-	-	-	-	-	-	-	12	0	12
6:00 PM	4	0	4	6	0	6	4	0	4	-	-	-	-	-	-	-	-	-	-	-	-	5	0	5
7:00 PM	3	0	3	0	0	0	1	0	1	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1
8:00 PM	0	1	1	2	0	2	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1
9:00 PM	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
10:00 PM	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
11:00 PM	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0
Total	**447**	**3**	**450**	**458**	**2**	**460**	**477**	**2**	**479**	-	-	-	-	-	-	-	-	-	-	-	-	**461**	**2**	**463**
Percent	**99%**	**1%**	-	**100%**	**0%**	-	**100%**	**0%**	-	-	-	-	-	-	-	-	-	-	-	-	-	**99%**	**1%**	-

1. Mid-week average includes data between Tuesday and Thursday.

Mark Skaggs:425-250-0777
mark.skaggs@idaxdata.com

Location: 39TH AVE SE W/O 25TH ST SE
Date Range: 6/7/2017 - 6/13/2017
Site Code: 01

	Wednesday			Thursday			Friday			Saturday			Sunday			Monday			Tuesday			Mid-Week Average		
	6/7/2017			6/8/2017			6/9/2017			6/10/2017			6/11/2017			6/12/2017			6/13/2017					
Time	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total
12:00 AM	22	13	35	21	20	41	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22	17	38
1:00 AM	19	14	33	26	9	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23	12	34
2:00 AM	14	8	22	17	16	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	12	28
3:00 AM	11	25	36	11	26	37	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	26	37
4:00 AM	27	77	104	27	71	98	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27	74	101
5:00 AM	56	177	233	74	175	249	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	65	176	241
6:00 AM	167	378	545	147	344	491	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	157	361	518
7:00 AM	329	618	947	297	629	926	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	313	624	937
8:00 AM	394	743	1,137	374	696	1,070	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	384	720	1,104
9:00 AM	284	594	878	269	529	798	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	277	562	838
10:00 AM	389	517	906	318	550	868	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	354	534	887
11:00 AM	419	454	873	408	468	876	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	414	461	875
12:00 PM	466	476	942	508	480	988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	487	478	965
1:00 PM	468	467	935	463	444	907	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	466	456	921
2:00 PM	566	449	1,015	611	482	1,093	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	589	466	1,054
3:00 PM	588	575	1,163	629	593	1,222	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	609	584	1,193
4:00 PM	689	516	1,205	582	478	1,060	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	636	497	1,133
5:00 PM	610	532	1,142	627	451	1,078	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	619	492	1,110
6:00 PM	527	415	942	508	460	968	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	518	438	955
7:00 PM	418	298	716	406	302	708	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	412	300	712
8:00 PM	295	182	477	336	204	540	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	316	193	509
9:00 PM	230	131	361	252	95	347	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	241	113	354
10:00 PM	92	55	147	117	53	170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	105	54	159
11:00 PM	41	15	56	61	35	96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	51	25	76
Total	**7,121**	**7,729**	**14,850**	**7,089**	**7,610**	**14,699**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**7,105**	**7,670**	**14,775**
Percent	**48%**	**52%**	-	**48%**	**52%**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**48%**	**52%**	-

1. Mid-week average includes data between Tuesday and Thursday.

Mark Skaggs:425-250-0777
mark.skaggs@idaxdata.com

Location: 39TH AVE SE E/O 25TH ST SE
Date Range: 6/7/2017 - 6/13/2017
Site Code: 02

	Wednesday			Thursday			Friday			Saturday			Sunday			Monday			Tuesday			Mid-Week Average		
	6/7/2017			6/8/2017			6/9/2017			6/10/2017			6/11/2017			6/12/2017			6/13/2017					
Time	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total	EB	WB	Total
12:00 AM	5	13	18	1	21	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	17	20
1:00 AM	4	14	18	1	11	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	13	15
2:00 AM	5	8	13	1	14	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	11	14
3:00 AM	0	26	26	0	25	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	26	26
4:00 AM	7	70	77	1	69	70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	70	74
5:00 AM	18	166	184	5	167	172	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	167	178
6:00 AM	43	379	422	5	351	356	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24	365	389
7:00 AM	119	660	779	30	637	667	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	75	649	723
8:00 AM	117	651	768	40	629	669	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	79	640	719
9:00 AM	119	583	702	25	521	546	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	72	552	624
10:00 AM	123	532	655	39	544	583	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	81	538	619
11:00 AM	112	460	572	93	492	585	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	103	476	579
12:00 PM	151	498	649	112	510	622	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	132	504	636
1:00 PM	165	458	623	75	441	516	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	120	450	570
2:00 PM	202	504	706	119	543	662	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	161	524	684
3:00 PM	174	547	721	144	574	718	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	159	561	720
4:00 PM	230	532	762	120	519	639	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	175	526	701
5:00 PM	195	592	787	136	563	699	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	166	578	743
6:00 PM	160	444	604	113	470	583	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	137	457	594
7:00 PM	138	309	447	67	324	391	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	103	317	419
8:00 PM	82	182	264	54	222	276	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	68	202	270
9:00 PM	42	138	180	45	103	148	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	44	121	164
10:00 PM	9	61	70	14	54	68	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	58	69
11:00 PM	2	19	21	12	40	52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	30	37
Total	**2,222**	**7,846**	**10,068**	**1,252**	**7,844**	**9,096**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1,737**	**7,845**	**9,582**
Percent	**22%**	**78%**	-	**14%**	**86%**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**18%**	**82%**	-

1. Mid-week average includes data between Tuesday and Thursday.

Note: There was a malfunction in the tube for eastbound flow at this location. Data for eastbound at this location were not used in analysis.

Mark Skaggs:425-250-0777
mark.skaggs@idaxdata.com

Location: 25TH ST SE S/O 39TH AVE SE
Date Range: 6/7/2017 - 6/13/2017
Site Code: 03

	Wednesday			Thursday			Friday			Saturday			Sunday			Monday			Tuesday			Mid-Week Average		
	6/7/2017			6/8/2017			6/9/2017			6/10/2017			6/11/2017			6/12/2017			6/13/2017					
Time	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total	NB	SB	Total
12:00 AM	0	0	0	0	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	2
1:00 AM	0	1	1	1	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	3
2:00 AM	2	1	3	3	0	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	1	3
3:00 AM	3	1	4	6	1	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	1	6
4:00 AM	14	0	14	14	1	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	1	15
5:00 AM	29	1	30	25	3	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27	2	29
6:00 AM	36	10	46	34	5	39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35	8	43
7:00 AM	52	25	77	41	22	63	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	47	24	70
8:00 AM	30	17	47	49	26	75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40	22	61
9:00 AM	21	25	46	19	17	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20	21	41
10:00 AM	16	16	32	18	17	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	17	34
11:00 AM	27	17	44	22	21	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	19	44
12:00 PM	25	26	51	25	26	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	26	51
1:00 PM	24	24	48	34	26	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	29	25	54
2:00 PM	22	41	63	38	45	83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	43	73
3:00 PM	35	51	86	28	58	86	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32	55	86
4:00 PM	21	56	77	24	40	64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23	48	71
5:00 PM	37	58	95	27	60	87	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32	59	91
6:00 PM	27	30	57	32	48	80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30	39	69
7:00 PM	16	33	49	18	34	52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17	34	51
8:00 PM	14	35	49	7	33	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	34	45
9:00 PM	6	15	21	7	9	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	12	19
10:00 PM	2	10	12	9	14	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	12	18
11:00 PM	2	5	7	3	9	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	7	10
Total	**461**	**498**	**959**	**484**	**521**	**1,005**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**473**	**510**	**982**
Percent	**48%**	**52%**	-	**48%**	**52%**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**48%**	**52%**	-

1. Mid-week average includes data between Tuesday and Thursday.

Mark Skaggs:425-250-0777
mark.skaggs@idaxdata.com

APPENDIX B
Level of Service Definitions

Levels of service (LOS) are qualitative descriptions of traffic operating conditions. These levels of service are designated with letters ranging from LOS A, which is indicative of good operating conditions with little or no delay, to LOS F, which is indicative of stop-and-go conditions with frequent and lengthy delays. Levels of service for this analysis were developed using procedures presented in the *Highway Capacity Manual* (Transportation Research Board, 2010).

Level of service for signalized intersections is defined in terms of delay. Delay can be a cause of driver discomfort, frustration, inefficient fuel consumption, and lost travel time. Specifically, level of service criteria are stated in terms of the average delay per vehicle in seconds. Delay is a complex measure and is dependent on a number of variables including: the quality of progression, cycle length, green ratio, and a volume-to-capacity ratio for the lane group or approach in question. Table A-1 shows the level of service criteria for signalized intersections from the *Highway Capacity Manual.*

Table A-1. Level of Service Criteria

Level of Service	Average Delay Per Vehicle	General Description
A	Less than 10.0 Seconds	Free flow
B	10.1 to 20.0 seconds	Stable flow (slight delays)
C	20.1 to 35.0 seconds	Stable flow (acceptable delays)
D	35.1 to 55.0 seconds	Approaching unstable flow (tolerable delay—occasionally wait through more than one signal cycle before proceeding.
E	55.1 to 80.0 seconds	Unstable flow (approaching intolerable delay)
F	Greater than 80.0 seconds	Forced flow (jammed)

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

For unsignalized two-way-stop-controlled, all-way-stop-controlled, and roundabout intersections, level of service is based on the average delay per vehicle. The level of service for a two-way, stop-controlled intersection is determined by the computed or measured control delay and is defined for each minor movement. Delay is related to the availability of gaps in the main street's traffic flow, and the ability of a driver to enter or pass through those gaps. The delay at an all-way, stop-sign (AWSC) controlled intersection is based on saturation headways, departure headways, and service times. Delay at roundabouts is based on entry flow rates and flow rate capacity. Table A-2 shows the level of service criteria for unsignalized intersections from the *Highway Capacity Manual*.

Table A-2. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Delay (seconds per vehicle)
A	Less than 10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	Greater than 50.0

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

APPENDIX C
Level of Service Calculation Sheets

Intersection

Int Delay, s/veh 1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	120	288	15	7	583	50	5	5	30	0	0	0
Future Vol, veh/h	120	288	15	7	583	50	5	5	30	0	0	0
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	195	-	-	0	-	-	115	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	76	76	76	77	77	77	90	90	90
Heavy Vehicles, %	5	5	5	4	4	4	0	0	0	0	0	0
Mvmt Flow	150	360	19	9	767	66	6	6	39	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	834	0	0	379	0	0	1071	1521	191
Stage 1	-	-	-	-	-	-	669	669	-
Stage 2	-	-	-	-	-	-	402	852	-
Critical Hdwy	4.2	-	-	4.18	-	-	6.8	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	5.8	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.8	5.5	-
Follow-up Hdwy	2.25	-	-	2.24	-	-	3.5	4	3.3
Pot Cap-1 Maneuver	776	-	-	1162	-	-	219	120	825
Stage 1	-	-	-	-	-	-	476	459	-
Stage 2	-	-	-	-	-	-	650	379	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	776	-	-	1160	-	-	175	0	823
Mov Cap-2 Maneuver	-	-	-	-	-	-	175	0	-
Stage 1	-	-	-	-	-	-	384	0	-
Stage 2	-	-	-	-	-	-	645	0	-

Approach	EB	WB	NB
HCM Control Delay, s	3	0.1	11.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	175	823	776	-	-	1160	-	-
HCM Lane V/C Ratio	0.037	0.055	0.193	-	-	0.008	-	-
HCM Control Delay (s)	26.4	9.6	10.7	-	-	8.1	-	-
HCM Lane LOS	D	A	B	-	-	A	-	-
HCM 95th %tile Q(veh)	0.1	0.2	0.7	-	-	0	-	-

Intersection

Int Delay, s/veh 2.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↰	↱
Traffic Vol, veh/h	0	384	586	0	39	107
Future Vol, veh/h	0	384	586	0	39	107
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	77	77	55	55
Heavy Vehicles, %	0	7	8	0	8	8
Mvmt Flow	0	452	761	0	71	195

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	987	381
Stage 1	-	-	-	-	761	-
Stage 2	-	-	-	-	226	-
Critical Hdwy	-	-	-	-	6.96	7.06
Critical Hdwy Stg 1	-	-	-	-	5.96	-
Critical Hdwy Stg 2	-	-	-	-	5.96	-
Follow-up Hdwy	-	-	-	-	3.58	3.38
Pot Cap-1 Maneuver	0	-	-	0	234	600
Stage 1	0	-	-	0	407	-
Stage 2	0	-	-	0	772	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	234	600
Mov Cap-2 Maneuver	-	-	-	-	333	-
Stage 1	-	-	-	-	407	-
Stage 2	-	-	-	-	772	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	15.2
HCM LOS			C

Minor Lane/Major Mvmt	EBT	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	333	600
HCM Lane V/C Ratio	-	-	0.213	0.324
HCM Control Delay (s)	-	-	18.7	13.9
HCM Lane LOS	-	-	C	B
HCM 95th %tile Q(veh)	-	-	0.8	1.4

Intersection

Int Delay, s/veh 1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	68	611	20	23	519	29	15	1	15	0	0	0
Future Vol, veh/h	68	611	20	23	519	29	15	1	15	0	0	0
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	195	-	-	0	-	-	115	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	76	76	76	70	70	70	90	90	90
Heavy Vehicles, %	5	5	5	4	4	4	6	6	6	0	0	0
Mvmt Flow	85	764	25	30	683	38	21	1	21	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	722	0	0	789	0	0	1348	1729	396
Stage 1	-	-	-	-	-	-	946	946	-
Stage 2	-	-	-	-	-	-	402	783	-
Critical Hdwy	4.2	-	-	4.18	-	-	7.62	6.62	7.02
Critical Hdwy Stg 1	-	-	-	-	-	-	6.62	5.62	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.62	5.62	-
Follow-up Hdwy	2.25	-	-	2.24	-	-	3.56	4.06	3.36
Pot Cap-1 Maneuver	856	-	-	814	-	-	106	84	592
Stage 1	-	-	-	-	-	-	273	329	-
Stage 2	-	-	-	-	-	-	585	393	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	856	-	-	812	-	-	95	73	591
Mov Cap-2 Maneuver	-	-	-	-	-	-	95	73	-
Stage 1	-	-	-	-	-	-	246	296	-
Stage 2	-	-	-	-	-	-	563	378	-

Approach	EB	WB	NB
HCM Control Delay, s	0.9	0.4	33.3
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	95	409	856	-	-	812	-	-
HCM Lane V/C Ratio	0.226	0.056	0.099	-	-	0.037	-	-
HCM Control Delay (s)	53.6	14.3	9.7	-	-	9.6	-	-
HCM Lane LOS	F	B	A	-	-	A	-	-
HCM 95th %tile Q(veh)	0.8	0.2	0.3	-	-	0.1	-	-

Intersection

Int Delay, s/veh 2.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↰	↱
Traffic Vol, veh/h	0	661	534	0	38	76
Future Vol, veh/h	0	661	534	0	38	76
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	79	79	39	39
Heavy Vehicles, %	0	3	2	0	10	10
Mvmt Flow	0	778	676	0	97	195

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	1065	338
Stage 1	-	-	-	-	676	-
Stage 2	-	-	-	-	389	-
Critical Hdwy	-	-	-	-	7	7.1
Critical Hdwy Stg 1	-	-	-	-	6	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	-	-	-	-	3.6	3.4
Pot Cap-1 Maneuver	0	-	-	0	205	635
Stage 1	0	-	-	0	446	-
Stage 2	0	-	-	0	631	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	205	635
Mov Cap-2 Maneuver	-	-	-	-	328	-
Stage 1	-	-	-	-	446	-
Stage 2	-	-	-	-	631	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	15.6
HCM LOS			C

Minor Lane/Major Mvmt	EBT	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	328	635
HCM Lane V/C Ratio	-	-	0.297	0.307
HCM Control Delay (s)	-	-	20.5	13.2
HCM Lane LOS	-	-	C	B
HCM 95th %tile Q(veh)	-	-	1.2	1.3

Intersection

Int Delay, s/veh 0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	615	20	19	553	6	12	2	18	0	0	0
Future Vol, veh/h	3	615	20	19	553	6	12	2	18	0	0	0
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	195	-	-	0	-	-	115	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	76	76	76	66	66	66	90	90	90
Heavy Vehicles, %	5	5	5	4	4	4	6	6	6	0	0	0
Mvmt Flow	4	769	25	25	728	8	18	3	27	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	737	0	0	794	0	0	1203	1576	399
Stage 1	-	-	-	-	-	-	789	789	-
Stage 2	-	-	-	-	-	-	414	787	-
Critical Hdwy	4.2	-	-	4.18	-	-	6.92	6.62	7.02
Critical Hdwy Stg 1	-	-	-	-	-	-	5.92	5.62	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.92	5.62	-
Follow-up Hdwy	2.25	-	-	2.24	-	-	3.56	4.06	3.36
Pot Cap-1 Maneuver	845	-	-	810	-	-	171	105	589
Stage 1	-	-	-	-	-	-	398	391	-
Stage 2	-	-	-	-	-	-	624	392	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	845	-	-	808	-	-	165	0	588
Mov Cap-2 Maneuver	-	-	-	-	-	-	165	0	-
Stage 1	-	-	-	-	-	-	396	0	-
Stage 2	-	-	-	-	-	-	605	0	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	18.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	165	588	845	-	-	808	-	-
HCM Lane V/C Ratio	0.11	0.052	0.004	-	-	0.031	-	-
HCM Control Delay (s)	29.5	11.5	9.3	-	-	9.6	-	-
HCM Lane LOS	D	B	A	-	-	A	-	-
HCM 95th %tile Q(veh)	0.4	0.2	0	-	-	0.1	-	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↰	↱
Traffic Vol, veh/h	0	622	565	0	16	24
Future Vol, veh/h	0	622	565	0	16	24
Conflicting Peds, #/hr	2	0	0	2	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	94	86	86	40	40
Heavy Vehicles, %	0	1	2	0	2	2
Mvmt Flow	0	662	657	0	40	60

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	988	328
Stage 1	-	-	-	-	657	-
Stage 2	-	-	-	-	331	-
Critical Hdwy	-	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	0	-	-	0	244	668
Stage 1	0	-	-	0	477	-
Stage 2	0	-	-	0	700	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	244	668
Mov Cap-2 Maneuver	-	-	-	-	363	-
Stage 1	-	-	-	-	477	-
Stage 2	-	-	-	-	700	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	13
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	363	668
HCM Lane V/C Ratio	-	-	0.11	0.09
HCM Control Delay (s)	-	-	16.1	10.9
HCM Lane LOS	-	-	C	B
HCM 95th %tile Q(veh)	-	-	0.4	0.3

Intersection

Int Delay, s/veh 1.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	120	305	16	7	620	50	6	5	34	0	0	0
Future Vol, veh/h	120	305	16	7	620	50	6	5	34	0	0	0
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	195	-	-	0	-	-	115	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	76	76	76	77	77	77	90	90	90
Heavy Vehicles, %	5	5	5	4	4	4	0	0	0	0	0	0
Mvmt Flow	150	381	20	9	816	66	8	6	44	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	883	0	0	401	0	0	1117	1592	203
Stage 1	-	-	-	-	-	-	691	691	-
Stage 2	-	-	-	-	-	-	426	901	-
Critical Hdwy	4.2	-	-	4.18	-	-	6.8	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	5.8	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.8	5.5	-
Follow-up Hdwy	2.25	-	-	2.24	-	-	3.5	4	3.3
Pot Cap-1 Maneuver	743	-	-	1140	-	-	204	108	810
Stage 1	-	-	-	-	-	-	464	449	-
Stage 2	-	-	-	-	-	-	632	360	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	743	-	-	1138	-	-	162	0	808
Mov Cap-2 Maneuver	-	-	-	-	-	-	162	0	-
Stage 1	-	-	-	-	-	-	370	0	-
Stage 2	-	-	-	-	-	-	627	0	-

Approach	EB	WB	NB
HCM Control Delay, s	3	0.1	12.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	162	808	743	-	-	1138	-	-
HCM Lane V/C Ratio	0.048	0.063	0.202	-	-	0.008	-	-
HCM Control Delay (s)	28.3	9.8	11.1	-	-	8.2	-	-
HCM Lane LOS	D	A	B	-	-	A	-	-
HCM 95th %tile Q(veh)	0.1	0.2	0.8	-	-	0	-	-

Intersection

Int Delay, s/veh 2.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↰	↱
Traffic Vol, veh/h	0	402	626	0	39	107
Future Vol, veh/h	0	402	626	0	39	107
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	77	77	55	55
Heavy Vehicles, %	0	7	8	0	8	8
Mvmt Flow	0	473	813	0	71	195

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	1049	406
Stage 1	-	-	-	-	813	-
Stage 2	-	-	-	-	236	-
Critical Hdwy	-	-	-	-	6.96	7.06
Critical Hdwy Stg 1	-	-	-	-	5.96	-
Critical Hdwy Stg 2	-	-	-	-	5.96	-
Follow-up Hdwy	-	-	-	-	3.58	3.38
Pot Cap-1 Maneuver	0	-	-	0	213	578
Stage 1	0	-	-	0	382	-
Stage 2	0	-	-	0	763	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	213	578
Mov Cap-2 Maneuver	-	-	-	-	312	-
Stage 1	-	-	-	-	382	-
Stage 2	-	-	-	-	763	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	15.9
HCM LOS			C

Minor Lane/Major Mvmt	EBT	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	312	578
HCM Lane V/C Ratio	-	-	0.227	0.337
HCM Control Delay (s)	-	-	19.9	14.4
HCM Lane LOS	-	-	C	B
HCM 95th %tile Q(veh)	-	-	0.9	1.5

Intersection

Int Delay, s/veh 1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	68	646	21	24	551	29	16	1	16	0	0	0
Future Vol, veh/h	68	646	21	24	551	29	16	1	16	0	0	0
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	195	-	-	0	-	-	115	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	76	76	76	70	70	70	90	90	90
Heavy Vehicles, %	5	5	5	4	4	4	6	6	6	0	0	0
Mvmt Flow	85	808	26	32	725	38	23	1	23	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	764	0	0	834	0	0	1417	1818	419
Stage 1	-	-	-	-	-	-	991	991	-
Stage 2	-	-	-	-	-	-	426	827	-
Critical Hdwy	4.2	-	-	4.18	-	-	7.62	6.62	7.02
Critical Hdwy Stg 1	-	-	-	-	-	-	6.62	5.62	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.62	5.62	-
Follow-up Hdwy	2.25	-	-	2.24	-	-	3.56	4.06	3.36
Pot Cap-1 Maneuver	825	-	-	782	-	-	94	74	572
Stage 1	-	-	-	-	-	-	256	313	-
Stage 2	-	-	-	-	-	-	566	375	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	825	-	-	781	-	-	84	64	571
Mov Cap-2 Maneuver	-	-	-	-	-	-	84	64	-
Stage 1	-	-	-	-	-	-	230	281	-
Stage 2	-	-	-	-	-	-	543	360	-

Approach	EB	WB	NB
HCM Control Delay, s	0.9	0.4	38.3
HCM LOS			E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	84	389	825	-	-	781	-	-
HCM Lane V/C Ratio	0.272	0.062	0.103	-	-	0.04	-	-
HCM Control Delay (s)	63.2	14.9	9.9	-	-	9.8	-	-
HCM Lane LOS	F	B	A	-	-	A	-	-
HCM 95th %tile Q(veh)	1	0.2	0.3	-	-	0.1	-	-

Intersection

Int Delay, s/veh 2.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↰	↱
Traffic Vol, veh/h	0	697	567	0	38	76
Future Vol, veh/h	0	697	567	0	38	76
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	79	79	39	39
Heavy Vehicles, %	0	3	2	0	10	10
Mvmt Flow	0	820	718	0	97	195

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	1128	359
Stage 1	-	-	-	-	718	-
Stage 2	-	-	-	-	410	-
Critical Hdwy	-	-	-	-	7	7.1
Critical Hdwy Stg 1	-	-	-	-	6	-
Critical Hdwy Stg 2	-	-	-	-	6	-
Follow-up Hdwy	-	-	-	-	3.6	3.4
Pot Cap-1 Maneuver	0	-	-	0	186	615
Stage 1	0	-	-	0	424	-
Stage 2	0	-	-	0	615	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	186	615
Mov Cap-2 Maneuver	-	-	-	-	310	-
Stage 1	-	-	-	-	424	-
Stage 2	-	-	-	-	615	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	16.3
HCM LOS			C

Minor Lane/Major Mvmt	EBT	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	310	615
HCM Lane V/C Ratio	-	-	0.314	0.317
HCM Control Delay (s)	-	-	21.8	13.5
HCM Lane LOS	-	-	C	B
HCM 95th %tile Q(veh)	-	-	1.3	1.4

Intersection

Int Delay, s/veh 0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	652	21	20	587	6	13	2	19	0	0	0
Future Vol, veh/h	3	652	21	20	587	6	13	2	19	0	0	0
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	195	-	-	0	-	-	115	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	76	76	76	66	66	66	90	90	90
Heavy Vehicles, %	5	5	5	4	4	4	6	6	6	0	0	0
Mvmt Flow	4	815	26	26	772	8	20	3	29	0	0	0

Major/Minor	Major1			Major2			Minor1		
Conflicting Flow All	781	0	0	841	0	0	1275	1670	423
Stage 1	-	-	-	-	-	-	836	836	-
Stage 2	-	-	-	-	-	-	439	834	-
Critical Hdwy	4.2	-	-	4.18	-	-	7.62	6.62	7.02
Critical Hdwy Stg 1	-	-	-	-	-	-	6.62	5.62	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.62	5.62	-
Follow-up Hdwy	2.25	-	-	2.24	-	-	3.56	4.06	3.36
Pot Cap-1 Maneuver	813	-	-	777	-	-	120	91	568
Stage 1	-	-	-	-	-	-	319	371	-
Stage 2	-	-	-	-	-	-	556	372	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	813	-	-	776	-	-	116	88	567
Mov Cap-2 Maneuver	-	-	-	-	-	-	116	88	-
Stage 1	-	-	-	-	-	-	317	369	-
Stage 2	-	-	-	-	-	-	537	360	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	25.8
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR
Capacity (veh/h)	116	373	813	-	-	776	-	-
HCM Lane V/C Ratio	0.17	0.085	0.005	-	-	0.034	-	-
HCM Control Delay (s)	42.3	15.6	9.4	-	-	9.8	-	-
HCM Lane LOS	E	C	A	-	-	A	-	-
HCM 95th %tile Q(veh)	0.6	0.3	0	-	-	0.1	-	-

Intersection

Int Delay, s/veh 0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑	↑↑		↰	↱
Traffic Vol, veh/h	0	660	600	0	16	24
Future Vol, veh/h	0	660	600	0	16	24
Conflicting Peds, #/hr	2	0	0	2	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	94	86	86	40	40
Heavy Vehicles, %	0	1	2	0	2	2
Mvmt Flow	0	702	698	0	40	60

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	1049	349
Stage 1	-	-	-	-	698	-
Stage 2	-	-	-	-	351	-
Critical Hdwy	-	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	0	-	-	0	223	647
Stage 1	0	-	-	0	455	-
Stage 2	0	-	-	0	684	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	223	647
Mov Cap-2 Maneuver	-	-	-	-	344	-
Stage 1	-	-	-	-	455	-
Stage 2	-	-	-	-	684	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	13.4
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1	SBLn2
Capacity (veh/h)	-	-	344	647
HCM Lane V/C Ratio	-	-	0.116	0.093
HCM Control Delay (s)	-	-	16.8	11.1
HCM Lane LOS	-	-	C	B
HCM 95th %tile Q(veh)	-	-	0.4	0.3

Intersection

Int Delay, s/veh 16.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	140	269	16	7	632	57	6	6	34	46	2	138
Future Vol, veh/h	140	269	16	7	632	57	6	6	34	46	2	138
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	195	-	-	0	-	-	115	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	76	76	76	77	77	77	55	55	55
Heavy Vehicles, %	0	5	5	4	4	0	0	0	0	0	0	0
Mvmt Flow	175	336	20	9	832	75	8	8	44	84	4	251

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	908	0	0	356	0	0	1132	1622	180	1413	1595	454
Stage 1	-	-	-	-	-	-	696	696	-	889	889	-
Stage 2	-	-	-	-	-	-	436	926	-	524	706	-
Critical Hdwy	4.1	-	-	4.18	-	-	7.5	6.5	6.9	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.5	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.24	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	758	-	-	1185	-	-	160	104	838	100	108	559
Stage 1	-	-	-	-	-	-	403	446	-	309	364	-
Stage 2	-	-	-	-	-	-	574	350	-	510	442	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	758	-	-	1183	-	-	70	79	836	~ 72	82	558
Mov Cap-2 Maneuver	-	-	-	-	-	-	70	79	-	~ 72	82	-
Stage 1	-	-	-	-	-	-	310	343	-	237	361	-
Stage 2	-	-	-	-	-	-	310	347	-	362	340	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.7	0.1	23.3	77.6
HCM LOS			C	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	70	343	758	-	-	1183	-	-	72	515
HCM Lane V/C Ratio	0.111	0.151	0.231	-	-	0.008	-	-	1.162	0.494
HCM Control Delay (s)	62.8	17.4	11.2	-	-	8.1	-	-	257.1	18.6
HCM Lane LOS	F	C	B	-	-	A	-	-	F	C
HCM 95th %tile Q(veh)	0.4	0.5	0.9	-	-	0	-	-	6.4	2.7

Notes

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

Intersection

Int Delay, s/veh 1.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	26	422	764	12	3	9
Future Vol, veh/h	26	422	764	12	3	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	77	77	25	25
Heavy Vehicles, %	31	4	7	33	100	100
Mvmt Flow	31	496	992	16	12	36

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1008	0	-	0	1309	504
Stage 1	-	-	-	-	1000	-
Stage 2	-	-	-	-	309	-
Critical Hdwy	4.72	-	-	-	8.8	8.9
Critical Hdwy Stg 1	-	-	-	-	7.8	-
Critical Hdwy Stg 2	-	-	-	-	7.8	-
Follow-up Hdwy	2.51	-	-	-	4.5	4.3
Pot Cap-1 Maneuver	533	-	-	-	66	321
Stage 1	-	-	-	-	161	-
Stage 2	-	-	-	-	494	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	533	-	-	-	62	321
Mov Cap-2 Maneuver	-	-	-	-	62	-
Stage 1	-	-	-	-	161	-
Stage 2	-	-	-	-	465	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	37.7
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	533	-	-	-	157
HCM Lane V/C Ratio	0.057	-	-	-	0.306
HCM Control Delay (s)	12.2	-	-	-	37.7
HCM Lane LOS	B	-	-	-	E
HCM 95th %tile Q(veh)	0.2	-	-	-	1.2

Intersection

Int Delay, s/veh 24.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	86	611	21	24	555	36	16	1	16	47	2	96
Future Vol, veh/h	86	611	21	24	555	36	16	1	16	47	2	96
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	195	-	-	0	-	-	115	-	-	80	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	76	76	76	70	70	70	39	39	39
Heavy Vehicles, %	0	5	5	4	4	0	6	6	6	0	0	0
Mvmt Flow	108	764	26	32	730	47	23	1	23	121	5	246

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	779	0	0	790	0	0	1423	1834	397	1418	1823	390
Stage 1	-	-	-	-	-	-	992	992	-	818	818	-
Stage 2	-	-	-	-	-	-	431	842	-	600	1005	-
Critical Hdwy	4.1	-	-	4.18	-	-	7.62	6.62	7.02	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.62	5.62	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.62	5.62	-	6.5	5.5	-
Follow-up Hdwy	2.2	-	-	2.24	-	-	3.56	4.06	3.36	3.5	4	3.3
Pot Cap-1 Maneuver	847	-	-	813	-	-	93	72	591	~ 99	78	614
Stage 1	-	-	-	-	-	-	256	313	-	340	393	-
Stage 2	-	-	-	-	-	-	562	369	-	459	322	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	847	-	-	811	-	-	46	60	590	~ 82	65	613
Mov Cap-2 Maneuver	-	-	-	-	-	-	46	60	-	~ 82	65	-
Stage 1	-	-	-	-	-	-	223	273	-	296	377	-
Stage 2	-	-	-	-	-	-	319	354	-	382	281	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.2	0.4	77.6	127.3
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	46	388	847	-	-	811	-	-	82	523
HCM Lane V/C Ratio	0.497	0.063	0.127	-	-	0.039	-	-	1.47	0.48
HCM Control Delay (s)	144.2	14.9	9.9	-	-	9.6	-	-	$ 355.1	18.1
HCM Lane LOS	F	B	A	-	-	A	-	-	F	C
HCM 95th %tile Q(veh)	1.8	0.2	0.4	-	-	0.1	-	-	9.5	2.6

Notes

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

Intersection						
Int Delay, s/veh	1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	8	715	663	4	3	9
Future Vol, veh/h	8	715	663	4	3	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	85	85	79	79	25	25
Heavy Vehicles, %	100	3	2	100	100	100
Mvmt Flow	9	841	839	5	12	36

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	844	0	-	0	1281	422
Stage 1	-	-	-	-	842	-
Stage 2	-	-	-	-	439	-
Critical Hdwy	6.1	-	-	-	8.8	8.9
Critical Hdwy Stg 1	-	-	-	-	7.8	-
Critical Hdwy Stg 2	-	-	-	-	7.8	-
Follow-up Hdwy	3.2	-	-	-	4.5	4.3
Pot Cap-1 Maneuver	383	-	-	-	70	376
Stage 1	-	-	-	-	209	-
Stage 2	-	-	-	-	402	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	383	-	-	-	68	376
Mov Cap-2 Maneuver	-	-	-	-	68	-
Stage 1	-	-	-	-	209	-
Stage 2	-	-	-	-	393	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	33
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	383	-	-	-	176
HCM Lane V/C Ratio	0.025	-	-	-	0.273
HCM Control Delay (s)	14.6	-	-	-	33
HCM Lane LOS	B	-	-	-	D
HCM 95th %tile Q(veh)	0.1	-	-	-	1.1

Intersection

Int Delay, s/veh 2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	641	21	20	587	7	13	2	19	15	1	25
Future Vol, veh/h	5	641	21	20	587	7	13	2	19	15	1	25
Conflicting Peds, #/hr	1	0	0	0	0	1	0	0	2	2	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	195	-	-	0	-	-	115	-	-	0	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	76	76	76	66	66	66	40	40	40
Heavy Vehicles, %	5	5	5	4	4	4	6	6	6	0	0	0
Mvmt Flow	6	801	26	26	772	9	20	3	29	38	3	63

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	783	0	0	828	0	0	1267	1662	416	1248	1671	392
Stage 1	-	-	-	-	-	-	827	827	-	831	831	-
Stage 2	-	-	-	-	-	-	440	835	-	417	840	-
Critical Hdwy	4.2	-	-	4.18	-	-	7.62	6.62	7.02	7.5	6.5	6.9
Critical Hdwy Stg 1	-	-	-	-	-	-	6.62	5.62	-	6.5	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.62	5.62	-	6.5	5.5	-
Follow-up Hdwy	2.25	-	-	2.24	-	-	3.56	4.06	3.36	3.5	4	3.3
Pot Cap-1 Maneuver	812	-	-	786	-	-	121	92	574	132	97	613
Stage 1	-	-	-	-	-	-	324	375	-	334	387	-
Stage 2	-	-	-	-	-	-	555	372	-	589	384	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	812	-	-	785	-	-	103	88	573	118	93	612
Mov Cap-2 Maneuver	-	-	-	-	-	-	103	88	-	118	93	-
Stage 1	-	-	-	-	-	-	322	372	-	331	374	-
Stage 2	-	-	-	-	-	-	479	359	-	550	381	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.3	27.9	26.3
HCM LOS			D	D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	103	376	812	-	-	785	-	-	118	504
HCM Lane V/C Ratio	0.191	0.085	0.008	-	-	0.034	-	-	0.318	0.129
HCM Control Delay (s)	48	15.5	9.5	-	-	9.7	-	-	49.1	13.2
HCM Lane LOS	E	C	A	-	-	A	-	-	E	B
HCM 95th %tile Q(veh)	0.7	0.3	0	-	-	0.1	-	-	1.2	0.4

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	662	625	0	5	9
Future Vol, veh/h	1	662	625	0	5	9
Conflicting Peds, #/hr	2	0	0	2	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	94	94	86	86	40	40
Heavy Vehicles, %	0	1	2	0	2	2
Mvmt Flow	1	704	727	0	13	23

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	729	0	-	0	1083	365
Stage 1	-	-	-	-	729	-
Stage 2	-	-	-	-	354	-
Critical Hdwy	4.1	-	-	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	2.2	-	-	-	3.52	3.32
Pot Cap-1 Maneuver	884	-	-	-	212	632
Stage 1	-	-	-	-	438	-
Stage 2	-	-	-	-	681	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	884	-	-	-	211	631
Mov Cap-2 Maneuver	-	-	-	-	211	-
Stage 1	-	-	-	-	437	-
Stage 2	-	-	-	-	679	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	15.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	884	-	-	-	369
HCM Lane V/C Ratio	0.001	-	-	-	0.095
HCM Control Delay (s)	9.1	-	-	-	15.8
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0.3

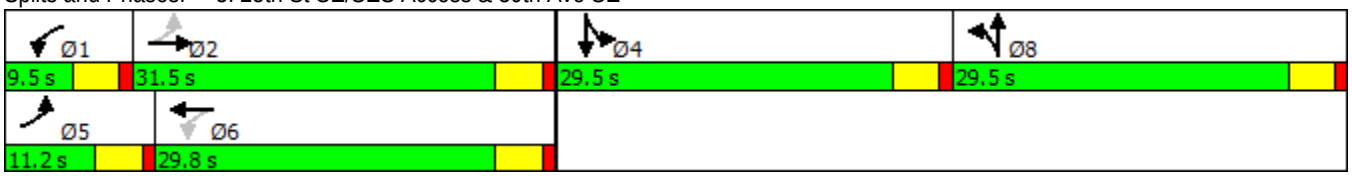
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	269	16	7	632	57	6	6	34	46	2	138
Future Volume (vph)	140	269	16	7	632	57	6	6	34	46	2	138
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	195		0	0		0	115		0	0		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor		1.00		0.98	1.00		0.99	0.97		0.98	0.97	
Frt		0.992			0.988			0.873			0.852	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	3400	0	1736	3425	0	1805	1617	0	1805	1572	0
Flt Permitted	0.181			0.539			0.950			0.950		
Satd. Flow (perm)	344	3400	0	965	3425	0	1782	1617	0	1775	1572	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			9			44			251	
Link Speed (mph)		35			35			25			15	
Link Distance (ft)		277			473			331			125	
Travel Time (s)		5.4			9.2			9.0			5.7	
Confl. Peds. (#/hr)	15		15	15		15	15		15	15		15
Peak Hour Factor	0.80	0.80	0.80	0.76	0.76	0.76	0.77	0.77	0.77	0.55	0.55	0.55
Heavy Vehicles (%)	0%	5%	5%	4%	4%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	175	336	20	9	832	75	8	8	44	84	4	251
Shared Lane Traffic (%)												
Lane Group Flow (vph)	175	356	0	9	907	0	8	52	0	84	255	0
Turn Type	pm+pt	NA		pm+pt	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2			6								
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	26.5		9.5	26.5		29.5	29.5		29.5	29.5	
Total Split (s)	11.2	31.5		9.5	29.8		29.5	29.5		29.5	29.5	
Total Split (%)	11.2%	31.5%		9.5%	29.8%		29.5%	29.5%		29.5%	29.5%	
Maximum Green (s)	6.7	27.0		5.0	25.3		25.0	25.0		25.0	25.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Walk Time (s)		7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		15.0			15.0		18.0	18.0		18.0	18.0	
Pedestrian Calls (#/hr)		15			15		15	15		15	15	
Act Effct Green (s)	38.3	37.4		32.1	26.8		8.8	8.8		10.8	10.8	
Actuated g/C Ratio	0.57	0.56		0.48	0.40		0.13	0.13		0.16	0.16	
v/c Ratio	0.50	0.19		0.02	0.66		0.03	0.21		0.29	0.55	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	20.3	13.2		14.1	23.6		28.3	13.7		29.4	9.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	20.3	13.2		14.1	23.6		28.3	13.7		29.4	9.4	
LOS	C	B		B	C		C	B		C	A	
Approach Delay		15.6			23.5			15.7			14.3	
Approach LOS		B			C			B			B	
Queue Length 50th (ft)	30	32		1	150		3	3		31	1	
Queue Length 95th (ft)	#120	120		12	#334		14	25		49	0	
Internal Link Dist (ft)		197			393			251			45	
Turn Bay Length (ft)	195						115					
Base Capacity (vph)	349	1891		520	1369		710	663		710	770	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.50	0.19		0.02	0.66		0.01	0.08		0.12	0.33	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 67.3
Natural Cycle: 95
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.66
Intersection Signal Delay: 19.3 Intersection LOS: B
Intersection Capacity Utilization 52.8% ICU Level of Service A
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: 25th St SE/SES Access & 39th Ave SE



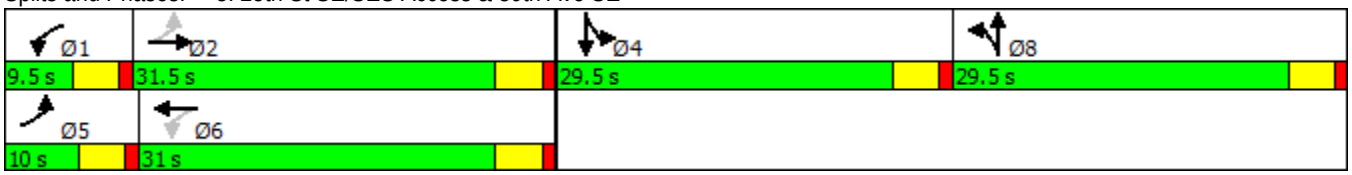
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	86	611	21	24	555	36	16	1	16	47	2	96
Future Volume (vph)	86	611	21	24	555	36	16	1	16	47	2	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	195		0	0		0	115		0	80		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99	1.00		0.99	1.00		0.99	0.97		0.98	0.97	
Frt		0.995			0.991			0.856			0.853	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	3415	0	1736	3437	0	1703	1491	0	1805	1574	0
Flt Permitted	0.223			0.295			0.950			0.950		
Satd. Flow (perm)	421	3415	0	535	3437	0	1681	1491	0	1774	1574	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			6			23			246	
Link Speed (mph)		35			35			25			15	
Link Distance (ft)		277			473			331			125	
Travel Time (s)		5.4			9.2			9.0			5.7	
Confl. Peds. (#/hr)	15		15	15		15	15		15	15		15
Peak Hour Factor	0.80	0.80	0.80	0.76	0.76	0.76	0.70	0.70	0.70	0.39	0.39	0.39
Heavy Vehicles (%)	0%	5%	5%	4%	4%	0%	6%	6%	6%	0%	0%	0%
Adj. Flow (vph)	108	764	26	32	730	47	23	1	23	121	5	246
Shared Lane Traffic (%)												
Lane Group Flow (vph)	108	790	0	32	777	0	23	24	0	121	251	0
Turn Type	pm+pt	NA		pm+pt	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2			6								
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	26.5		9.5	29.5		29.5	29.5		29.5	29.5	
Total Split (s)	10.0	31.5		9.5	31.0		29.5	29.5		29.5	29.5	
Total Split (%)	10.0%	31.5%		9.5%	31.0%		29.5%	29.5%		29.5%	29.5%	
Maximum Green (s)	5.5	27.0		5.0	26.5		25.0	25.0		25.0	25.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Walk Time (s)		7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		15.0			15.0		18.0	18.0		18.0	18.0	
Pedestrian Calls (#/hr)		15			15		15	15		15	15	
Act Effct Green (s)	28.4	26.7		25.7	21.8		9.4	9.4		12.3	12.3	
Actuated g/C Ratio	0.47	0.44		0.43	0.36		0.16	0.16		0.20	0.20	
v/c Ratio	0.31	0.52		0.09	0.62		0.09	0.10		0.33	0.49	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	16.4	19.0		14.6	22.7		28.8	14.1		28.0	8.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	16.4	19.0		14.6	22.7		28.8	14.1		28.0	8.0	
LOS	B	B		B	C		C	B		C	A	
Approach Delay		18.7			22.4			21.3			14.5	
Approach LOS		B			C			C			B	
Queue Length 50th (ft)	20	91		6	125		8	0		41	2	
Queue Length 95th (ft)	75	277		28	255		24	13		45	0	
Internal Link Dist (ft)		197			393			251			45	
Turn Bay Length (ft)	195						115			80		
Base Capacity (vph)	348	1875		347	1809		844	750		894	904	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.31	0.42		0.09	0.43		0.03	0.03		0.14	0.28	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 60.3
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.62
Intersection Signal Delay: 19.4 Intersection LOS: B
Intersection Capacity Utilization 47.1% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: 25th St SE/SES Access & 39th Ave SE



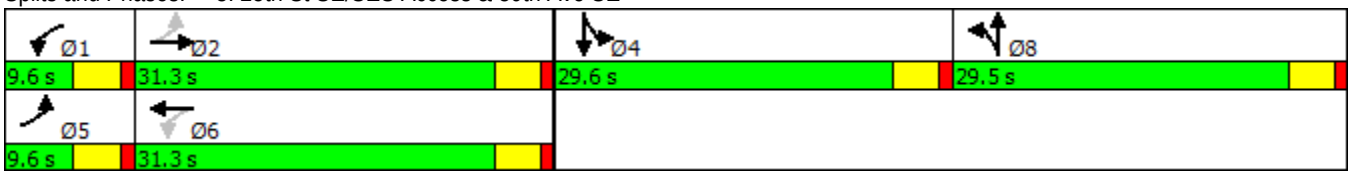
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	641	21	20	587	7	13	2	19	15	1	25
Future Volume (vph)	5	641	21	20	587	7	13	2	19	15	1	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	195		0	0		0	115		0	0		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00				1.00			0.99		1.00		
Frt		0.995			0.998			0.864			0.857	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1719	3421	0	1736	3463	0	1703	1529	0	1805	1628	0
Flt Permitted	0.309			0.266			0.950			0.950		
Satd. Flow (perm)	559	3421	0	486	3463	0	1703	1529	0	1801	1628	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			1			29			63	
Link Speed (mph)		35			35			25			15	
Link Distance (ft)		277			473			331			125	
Travel Time (s)		5.4			9.2			9.0			5.7	
Confl. Peds. (#/hr)	1					1			2	2		
Peak Hour Factor	0.80	0.80	0.80	0.76	0.76	0.76	0.66	0.66	0.66	0.40	0.40	0.40
Heavy Vehicles (%)	5%	5%	5%	4%	4%	4%	6%	6%	6%	0%	0%	0%
Adj. Flow (vph)	6	801	26	26	772	9	20	3	29	38	3	63
Shared Lane Traffic (%)												
Lane Group Flow (vph)	6	827	0	26	781	0	20	32	0	38	66	0
Turn Type	pm+pt	NA		pm+pt	NA		Split	NA		Split	NA	
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2			6								
Detector Phase	5	2		1	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	26.5		9.5	26.5		29.5	29.5		29.5	29.5	
Total Split (s)	9.6	31.3		9.6	31.3		29.5	29.5		29.6	29.6	
Total Split (%)	9.6%	31.3%		9.6%	31.3%		29.5%	29.5%		29.6%	29.6%	
Maximum Green (s)	5.1	26.8		5.1	26.8		25.0	25.0		25.1	25.1	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Walk Time (s)		7.0			7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)		15.0			15.0		18.0	18.0		18.0	18.0	
Pedestrian Calls (#/hr)		15			15		15	15		15	15	
Act Effct Green (s)	30.4	30.6		31.2	32.4		9.0	9.0		9.4	9.4	
Actuated g/C Ratio	0.54	0.55		0.56	0.58		0.16	0.16		0.17	0.17	
v/c Ratio	0.01	0.44		0.06	0.39		0.07	0.12		0.13	0.20	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Control Delay	14.2	17.3		13.7	15.2		26.0	13.1		25.7	10.3	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	14.2	17.3		13.7	15.2		26.0	13.1		25.7	10.3	
LOS	B	B		B	B		C	B		C	B	
Approach Delay		17.3			15.1			18.1			15.9	
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	1	79		4	73		5	1		9	1	
Queue Length 95th (ft)	10	293		24	256		21	14		20	0	
Internal Link Dist (ft)		197			393			251			45	
Turn Bay Length (ft)	195						115					
Base Capacity (vph)	429	1972		406	2078		899	821		957	893	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.01	0.42		0.06	0.38		0.02	0.04		0.04	0.07	

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 55.9
Natural Cycle: 95
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.44
Intersection Signal Delay: 16.3
Intersection LOS: B
Intersection Capacity Utilization 34.1%
ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 3: 25th St SE/SES Access & 39th Ave SE

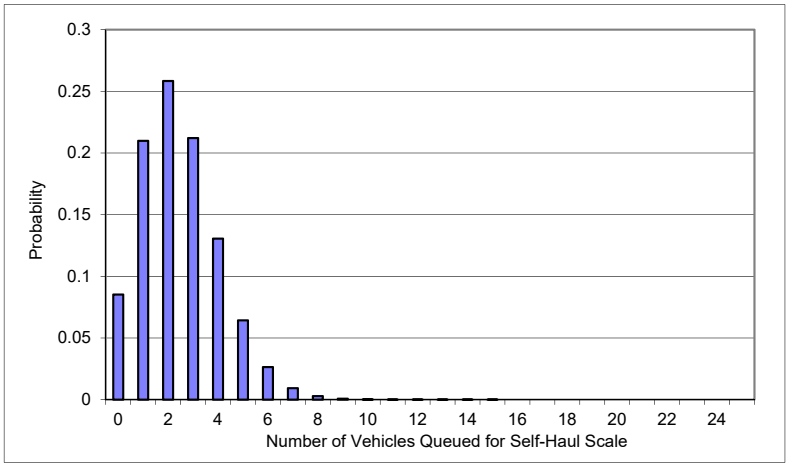


APPENDIX D
Queue Model Results

M/M/s Queueing Model for Puyallup School District's Sunrise Elementary Load/Unload Zone

Morning Peak Hour (Arrival)

Data		
λ =	591	(average arrival rate)
μ =	240.0	(average service rate)
s =	10	(# servers)



where:

L = average number of vehicles queued at the load/unload zone at any one time

L_q=average number of vehicles in queue

W = average wait time at the load/unload zone (hours)

W_q = ave. wait time in queue (hours)

ρ = Load/Unload Zone utilization

P_0 = probability of 0 vehicles at the Load/Unload Zone

P_1 = probability of 1 vehicle at the Load/Unload Zone, etc.

2 =Average number of vehicles at the load/unload zone at any one time

5 =Peak (95th-percentile) number of vehicles in load/unload zone at any one time

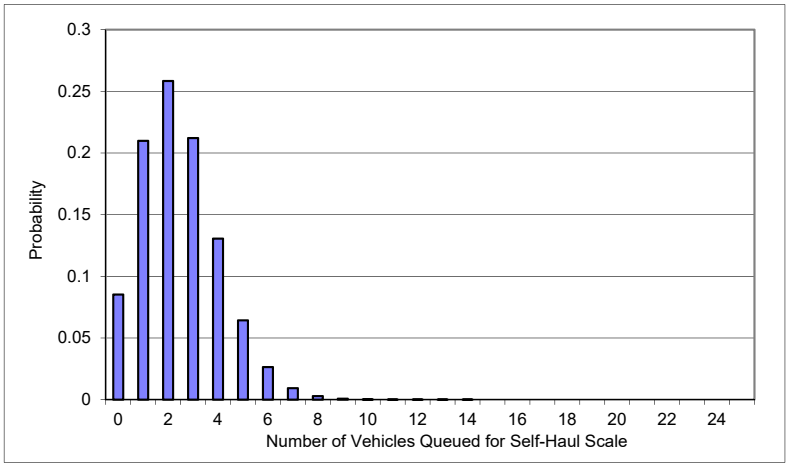
96.0% <= Closest probability to 95%

Results			
L =	2.462583458		
L_q =	8.34578E-05		
		Minutes	
W =	0.004	0.3	
W_q =	0.000	0.0	
ρ =	0.24625		
		Prob < x vehicles	
P_0 =	0.085220869	8.5%	0
P_1 =	0.209856391	29.5%	1
P_2 =	0.258385681	55.3%	2
P_3 =	0.21209158	76.6%	3
P_4 =	0.130568879	89.6%	4
P_5 =	0.064305173	96.0%	5
P_6 =	0.026391915	98.7%	6
P_7 =	0.009284299	99.6%	7
P_8 =	0.002857823	99.9%	8
P_9 =	0.000781932	100.0%	9
P_{10} =	0.000192551	100.0%	10
P_{11} =	4.74156E-05	100.0%	11
P_{12} =	1.16761E-05	100.0%	12
P_{13} =	2.87524E-06	100.0%	13
P_{14} =	7.08028E-07	100.0%	14
P_{15} =	1.74352E-07	100.0%	15
P_{16} =	4.29341E-08	100.0%	16
P_{17} =	1.05725E-08	100.0%	17
P_{18} =	2.60349E-09	100.0%	18
P_{19} =	6.41108E-10	100.0%	19
P_{20} =	1.57873E-10	100.0%	20
P_{21} =	3.88762E-11	100.0%	21
P_{22} =	9.57327E-12	100.0%	22
P_{23} =	2.35742E-12	100.0%	23
P_{24} =	5.80514E-13	100.0%	24
P_{25} =	1.42952E-13	100.0%	25
P_{25} =	3.52018E-14	100.0%	26
P_{26} =	8.66845E-15	100.0%	27
P_{27} =	2.13461E-15	100.0%	28
P_{28} =	5.25647E-16	100.0%	29
P_{29} =	1.2944E-16	100.0%	30
P_{30} =	3.18747E-17	100.0%	31
P_{31} =	7.84915E-18	100.0%	32
P_{32} =	1.93285E-18	100.0%	33
P_{33} =	4.75965E-19	100.0%	34
P_{34} =	1.17206E-19	100.0%	35
P_{35} =	2.88621E-20	100.0%	36
P_{36} =	7.10729E-21	100.0%	37
P_{37} =	1.75017E-21	100.0%	38
P_{38} =	4.30979E-22	100.0%	39
P_{39} =	1.06129E-22	100.0%	40
P_{40} =	2.61342E-23	100.0%	41

M/M/s Queueing Model for Puyallup School District's Sunrise Elementary Load/Unload Zone

Morning Peak Hour (Arrival)

Data		
λ =	591	(average arrival rate)
μ =	240.0	(average service rate)
s =	15	(# servers)



where:

L = average number of vehicles queued at the load/unload zone at any one time

L_q=average number of vehicles in queue

W = average wait time at the load/unload zone (hours)

W_q = ave. wait time in queue (hours)

ρ = Load/Unload Zone utilization

P_0 = probability of 0 vehicles at the Load/Unload Zone

P_1 = probability of 1 vehicle at the Load/Unload Zone, etc.

2 =Average number of vehicles at the load/unload zone at any one time

5 =Peak (95th-percentile) number of vehicles in load/unload zone at any one time

96.0% <= Closest probability to 95%

Results			
L =	2.462500011		
L_q =	1.13694E-08		
		Minutes	
W =	0.004	0.3	
W_q =	0.000	0.0	
ρ =	0.164166667		
		Prob < x vehicles	
P_0 =	0.08522163	8.5%	0
P_1 =	0.209858265	29.5%	1
P_2 =	0.258387988	55.3%	2
P_3 =	0.212093474	76.6%	3
P_4 =	0.130570045	89.6%	4
P_5 =	0.064305747	96.0%	5
P_6 =	0.02639215	98.7%	6
P_7 =	0.009284381	99.6%	7
P_8 =	0.002857849	99.9%	8
P_9 =	0.000781939	100.0%	9
P_{10} =	0.000192553	100.0%	10
P_{11} =	4.31055E-05	100.0%	11
P_{12} =	8.84561E-06	100.0%	12
P_{13} =	1.67556E-06	100.0%	13
P_{14} =	2.94719E-07	100.0%	14
P_{15} =	4.83831E-08	100.0%	15
P_{16} =	7.94289E-09	100.0%	16
P_{17} =	1.30396E-09	100.0%	17
P_{18} =	2.14067E-10	100.0%	18
P_{19} =	3.51426E-11	100.0%	19
P_{20} =	5.76924E-12	100.0%	20
P_{21} =	9.47117E-13	100.0%	21
P_{22} =	1.55485E-13	100.0%	22
P_{23} =	2.55255E-14	100.0%	23
P_{24} =	4.19043E-15	100.0%	24
P_{25} =	6.87929E-16	100.0%	25
P_{25} =	1.12935E-16	100.0%	26
P_{26} =	1.85402E-17	100.0%	27
P_{27} =	3.04368E-18	100.0%	28
P_{28} =	4.9967E-19	100.0%	29
P_{29} =	8.20292E-20	100.0%	30
P_{30} =	1.34665E-20	100.0%	31
P_{31} =	2.21074E-21	100.0%	32
P_{32} =	3.6293E-22	100.0%	33
P_{33} =	5.95811E-23	100.0%	34
P_{34} =	9.78123E-24	100.0%	35
P_{35} =	1.60575E-24	100.0%	36
P_{36} =	2.63611E-25	100.0%	37
P_{37} =	4.32761E-26	100.0%	38
P_{38} =	7.1045E-27	100.0%	39
P_{39} =	1.16632E-27	100.0%	40
P_{40} =	1.91471E-28	100.0%	41